Installing Bforartists

Getting Bforartists

Download Bforartists

Bforartists is currently just available for download for MS-Windows as a ziplfile from the Bforartists page.

http://www.bforartists.de/content/download

Linux and OS X versions are planned. But not yet available.

What is also available is the source code. Which can either be found at the same download page as shown above. Or at github.

https://github.com/Bforartists/Bforartists

Minimum Requirements

Check if your system meets the minimum or recommended requirements.

Always check that the graphics drivers are up to date, and that OpenGL is well supported.

Support for other hardware such as graphic tablets and 3D mice are covered later in *Supported Hardware*.

Install Bforartists

The procedure for installing a binary, either the last stable release or a daily build, is the same. Follow the steps for your operative system as listed below

Installing on Linux - Not yet!

Placeholder. The Linux version is not available yet

Download from Bforartists.de

Download the Linux version for your architecture and uncompress the file to the desired location (eg. ~/software or /usr/local).

Bforartists can now be launched by double-clicking the executable.

For easy access, you can configure your system by adding a menu entry or shortcut for Bforartists and associate and open `.blend` files with Bforartists when opening from the file browser. These settings typically belong to the Window Manager (KDE, Gnome, Unity).

Running from the terminal

To run Bforartists from the terminal without needing to be in the executable directory, add the extracted folder to the environment PATH.

Add the following command to .bash_rc or .bash_profile with Bforartists's binary:

```
export PATH=$/path/to/Bforartists-VERSION-linux-glibcVERSION-ARCH:$PATH
```

> **Tip**
>
> If you use daily builds and update Bforartists frequently, you can link or always rename your folder to 'Bforartists' and use this name for the `PATH` environment variable and for keeping the window manager menu up to date.

Avoiding Alt+Mouse Conflict

Many Window Managers default to `Alt-LMB` for moving windows, which is a shortcut that Bforartists uses to simulate a 3 button mouse. You can either have this feature disabled User Preferences ‣ Input ‣ Emulate 3 Button Mouse or you can change the Window Manager settings to use the *Meta* key instead (also called *Super* or *Windows key*):

- **KDE:** System Settings > Window Behavior > Window Behavior > Window Actions , Switch 'Alt' for 'Meta' key
- **Unity/Gnome:** enter the following in a command line (effective at next login):

```
gsettings set org.gnome.desktop.wm.preferences mouse-button-modifier '<Super>'
```

Installing on OSX - Not Yet!

Placeholder. The OS X version is not available yet

After downloading Bforartists for Mac-OSX, uncompress the file and drag `Bforartists.app` onto the Applications folder.

Tip

Because *Bforartists* doesn't use the standard OS menu system, you likely have a redundant menu-bar at the top.

To remove it see this post on Macworld, but beware that it is somewhat complex. As an alternative: simply make *Bforartists* full screen by `Alt-F11` or by File ‣ Window ‣ Toggle Window Fullscreen.

Installing on MS-Windows

There is no Windows installer available yet.

Download the `.zip` file. Choose either 32 bit or 64 Bit version, dependand of your operating system.

Place the zip file where you want Bforartists to be. This can be everywhere at your system. Then extract the zipfile. To start Bforartists you have to double click at the exe file inside the created folder now.

It is also recommend to make a shortcut towards this executable. So that you don't have to navigate to the folder all the time when you want to start Bforartists. Place this shortcut at the desktop or the quickstart taskbar.

Note

With `.zip` you have to manually extract Bforartists to the desired folder, where you can double-click the executable to run Bforartists.

There is no installer to place Bforartists on the menu, but there is also no need for administrator rights. With this option it is possible to have multiple versions of Bforartists without conflicting, as they are not actually installed on the system.

Configuring Peripheral

Multi-Monitor Setup

Graphic Tablets

3D Mice

Configuration

Here are some quick preferences that you may wish to set as quickly as possible. The full list and explanation of the preferences is in the section *User Preferences*.

Language

At File ‣ User Preferences ‣ System, enable `International Fonts` to choose the `Language` and what to translate from `Interface`, `Tooltips` and `New Data`. See more at Internationalization

Input

If you have a compact keyboard without a separate number pad enable File ‣ User Preferences ‣ Emulate Numpad.

If you don't have a middle mouse button you can enable File ‣ User Preferences ‣ Emulate 3 Button Mouse.

File and Paths

At File ‣ User Preferences ‣ File you can set options such as what external `Image Editor` to use, such as GIMP or Krita, and the Animation Player.

The `Temp` directory sets where to store files such as temporary renders and autosaves.

Tip

`//` at the start of a path in Bforartists means the directory of the currently opened `.blend` file, used to reference relative-paths.

If you trust the source of your `.blend` files, you can enable `Auto Run Python Scripts`. This option is meant to protect you from malicious Python scripts that someone can include inside a Bforartists file. This would not happen by accident, and most users leave this option on to automatically run scripts such as `Rigify` that controls the skeleton of a human rig.

Configuration and Data Paths

There are three different directories Bforartists may use, their exact locations are operating system dependent.

LOCAL
    Location of configuration and runtime data (for self contained bundle)
USER
    Location of configuration files (normally in the user's home directory).
SYSTEM
    Location of runtime data for system wide installation (may be read-only).

For system installations both **SYSTEM** and **USER** directories are needed.

For locally extracted Bforartists distributions, the user configuration and data runtime data are kept in the same sub-directory, allowing multiple Bforartists versions to run without conflict, ignoring the **USER** and **SYSTEM** files.

Note

You may need to have the "show hidden files" option checked in your file browser settings.

Platform Dependant Paths

Here are the default locations for each system:

Linux

LOCAL

```
./2.79/
```

USER

```
$HOME/.config/Bforartists/2.79/
```

SYSTEM

```
/usr/share/Bforartists/2.79/
```

Note

The path ./2.79/ is relative to the Bforartists Executable & used for self contained bundles

Note

The **USER** path will use `$XDG_CONFIG_HOME` if its set:

```
$XDG_CONFIG_HOME/Bforartists/2.79/
```

Mac OSX

LOCAL

```
./2.79/
```

USER

```
/Users/$USER/Library/Application Support/Bforartists/2.79/
```

SYSTEM

```
/Library/Application Support/Bforartists/2.79/
```

Note

OSX stores the Bforartists binary in `./Bforartists.app/Contents/MacOS/Bforartists`, so the local path to data & config is:

```
./Bforartists.app/Contents/MacOS/2.79/
```

MS-Windows

LOCAL

```
.\2.79\.
```

USER

```
C:\Documents and Settings\$USERNAME\AppData\Roaming\Bforartists Foundation\
Bforartists\2.79\
```

SYSTEM

```
C:\Documents and Settings\All Users\AppData\Roaming\Bforartists Foundation\
Bforartists\2.79\
```

Path Layout

This is the path layout which is used within the directories described above.

Where `./config/startup.blend` could be ~/.Bforartists/2.79/config/startup.blend for example.

`./autosave/ ...`

Autosave blend file location. *Windows only, temp directory used for other systems.*

Search order: `LOCAL, USER`.

`./config/ ...`

Defaults & session info.

Search order: `LOCAL, USER`.

`./config/startup.blend`
Default file to load on startup.

`./config/userpref.blend`
Default preferences to load on startup.

`./config/bookmarks.txt`
File selector bookmarks.

`./config/recent-files.txt`
Recent file menu list.

`./datafiles/ ...`

Runtime files.

Search order: `LOCAL, USER, SYSTEM`

`./datafiles/locale/{language}/`
Static precompiled language files for UI translation.

`./datafiles/icons/*.png`
Icon themes for Bforartistss user interface. *Not currently selectable in the theme preferences.*

`./datafiles/brushicons/*.png`
Images for each brush.

`./scripts/ ...`

Python scripts for the user interface and tools.

Search order: `LOCAL, USER, SYSTEM`.

`./scripts/addons/*.py`
Python add-ons which may be enabled in the user preferences, includes import/export format support, render engine integration and many handy utilities.

`./scripts/addons/modules/*.py`
Modules for add-ons to use (added to Python's sys.path).

`./scripts/addons_contrib/*.py`
Another add-ons directory which is used for community maintained add-ons (must be manually created).

`./scripts/addons_contrib/modules/*.py`
Modules for addons_contrib to use (added to Python's sys.path).

`./scripts/modules/*.py`
Python modules containing our core API and utility functions for other scripts to import (added to Python's `sys.path`).

`./scripts/startup/*.py`
Scripts which are automatically imported on startup.

`./scripts/presets/{preset}/*.py`
Presets used for storing user defined settings for cloth, render formats etc.

`./scripts/templates/*.py`
Example scripts which can be accessed from: Text Space's Header –> Text –> Script Templates.

`./python/ ...`

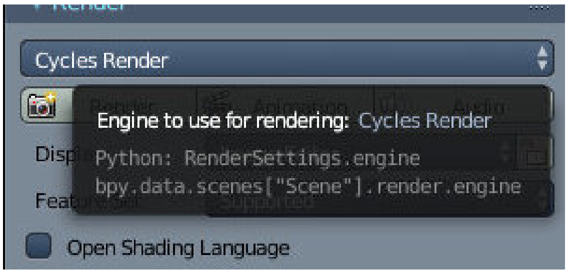
Bundled Python distribution, only necessary when the system Python installation is absent or incompatible.

Search order: `LOCAL, SYSTEM`.

Interface

Help System

Tooltips



The Mouse pointer was Stopped for a while over the Render Engines List in the Info Window.

When hovering your cursor over a button or setting, it will show you the *Tooltip*, and related details depending on the button type, such as the key-shortcut for a tool.

The *Python:* text, included last may be of interest to you if you're an animator or automating tasks, see Scripting & Extending Bforartists.

Help Menu

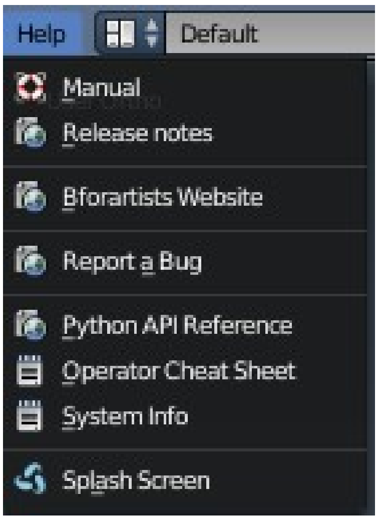
Bforartists has a range of built-in and web-based Help options.

General Web-based Help

Tip

Browser and Internet Connection

Some forms of Help start up your web browser and access the Bforartists Foundation's web servers. In order to do this, you must have configured a default web browser for your Operating System, and have a connection to the Internet.



- *Manual* - which you are now reading.
- Release Notes - The release notes on the Web for the current Bforartists version.
- Bforartists Website - The *Bforartists.org* home page.
- Report a Bug The Bforartists Bug Tracker.

  Note: in order to Report a Bug, you must register at the website.

Scripting Reference

- Python API Reference - Python application programming interface (API).
- *Operator Cheat Sheet* - Creates the `OperatorList.txt` text-block, which you can access in the *Text Editor*. You can also use Bforartists Search to generate the file. The lists the available Python operators.

Save System Info

Access Help ‣ Save System Info

This extracts system information which can be useful to include in bug reports, inspecting the configuration or diagnosing problems.

You will be prompted to save a text file `system-info.txt`.

The text file contains sections:

Bforartists
: This section shows you the Bforartists version, details about the build configuration, and the path in which Bforartists is running.

Python
: The Python version you are using, showing the paths of the Python programming language paths.

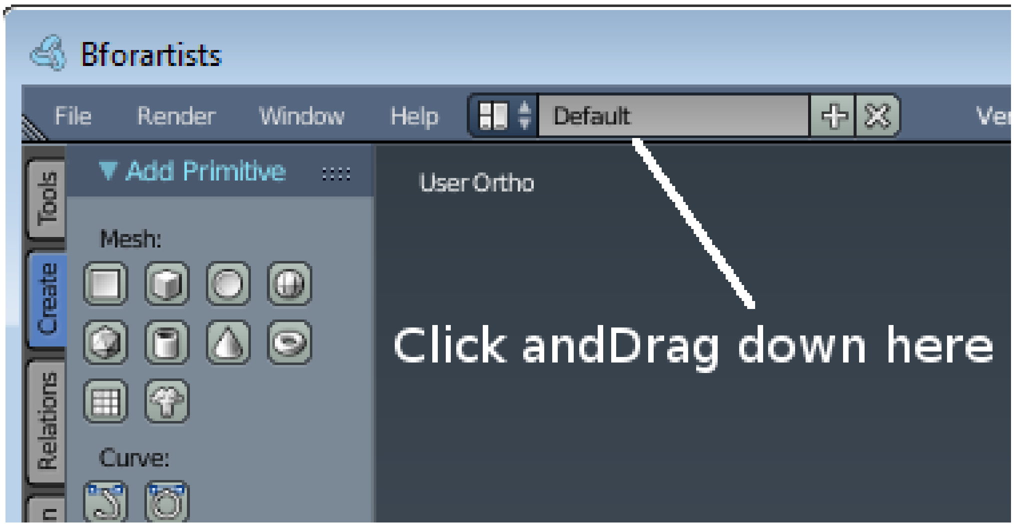
Directories
: Paths used for scripts, data-files, presets and temporary files.

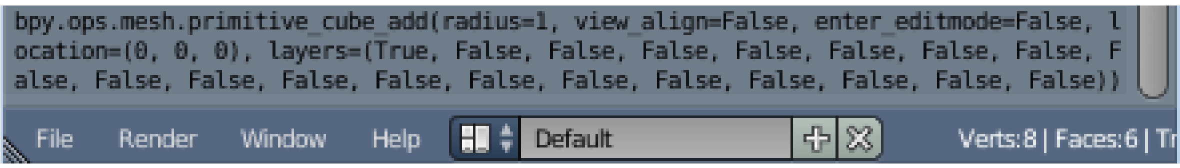
  Those directories are configured using the *User Preferences* Editor Window.

OpenGL
: This section shows the OpenGL version, the name of the manufacturer, and lists the capabilities of your hardware & driver.

Info Window Log

This is not exactly a Help menu, but it is related. If you mouse-over the line between the Info window and the 3D then click and drag the Info window down a bit, you can see the stream of Python calls that the UI is making when you work. This can be useful in creating scripts.

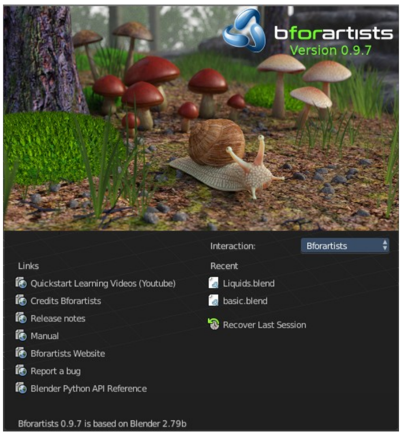




The Info Window Log after adding a Cube

Splash Screen

Usually the splash screen shows at startup until you change this behaviour in the User preference. You can also bring up the Splash screen by clicking on the Splash Screen button in the Help menu. This displays the image where you can identify the current version.



Bforartists Splash Screen

The splash screen contains also a few links to useful resources, like the official Quickstart Learning videos. Or the Python API.

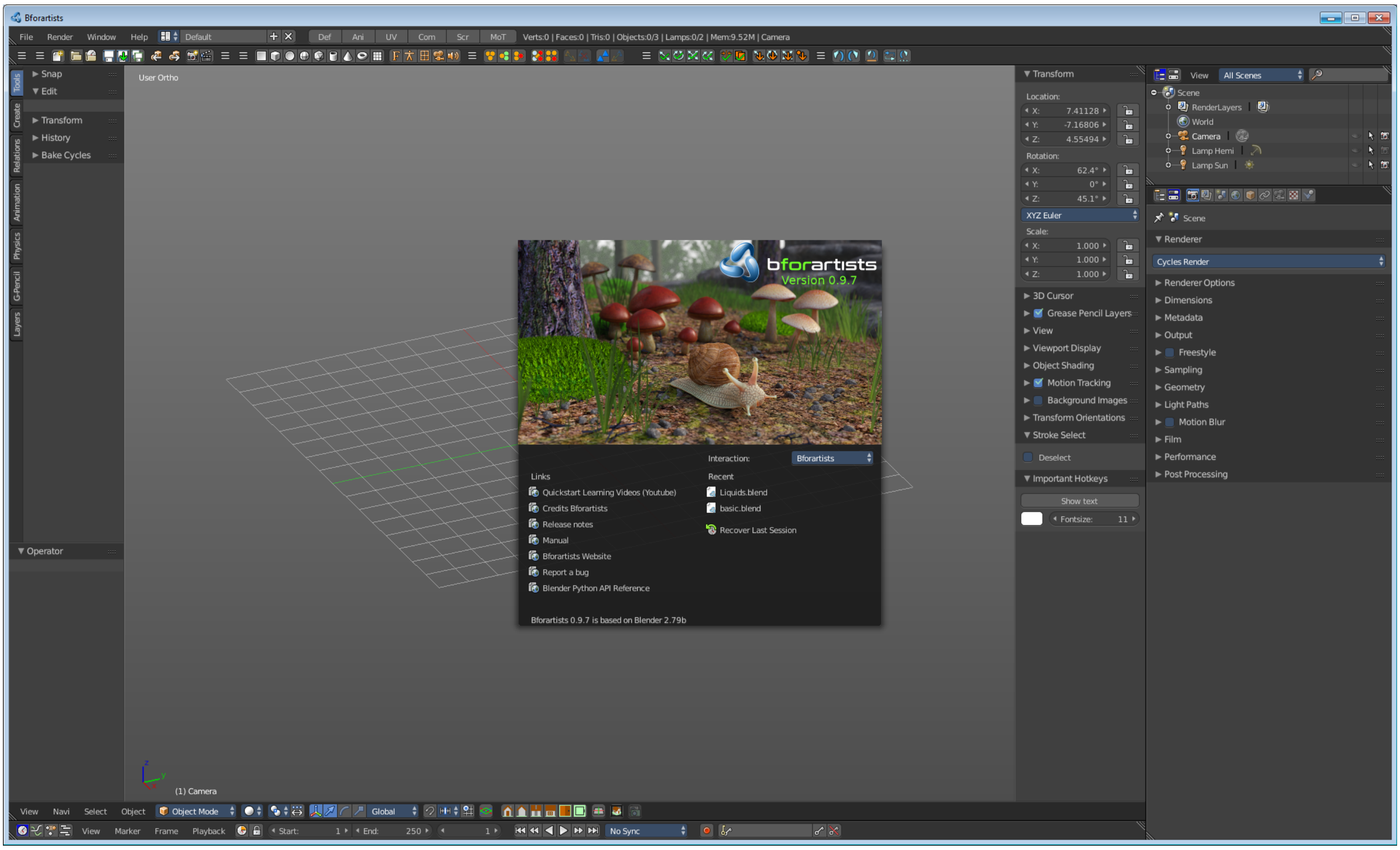
Here you can change the keymap too. The Interaction menu item.

When you install a new version, and start it the first time, then it also provides the Copy Previous settings button. Which will transfer over the settings from the previous Bforartists version.

It displays a way to recover the last session.

And in the last line you can see at which Blender version Bforartists is based.

Interface



When starting Bforartists, the splash screen appears. On the left side are links to official web pages, and on the right are your most recently opened projects.

To close the splash screen perform an action , like start a new project, press `Esc` or click anywhere inside the Bforartists Window (except on the splash screen)..

User Interface Principles

Non Overlapping

unlike the original Blender UI where this was just propaganda, the new UI for Bforartists will truely be designed to allow you to view all relevant options and tools at a glance without pushing or dragging editors around. Since all relevant elements will be accessible at top level.

Non Blocking

Tools and interface options will not block the user from any other parts of Bforartists. Bforartists typically doesn’t use pop-up boxes (requiring users to fill in data before running an operation).

Non Modal Tools

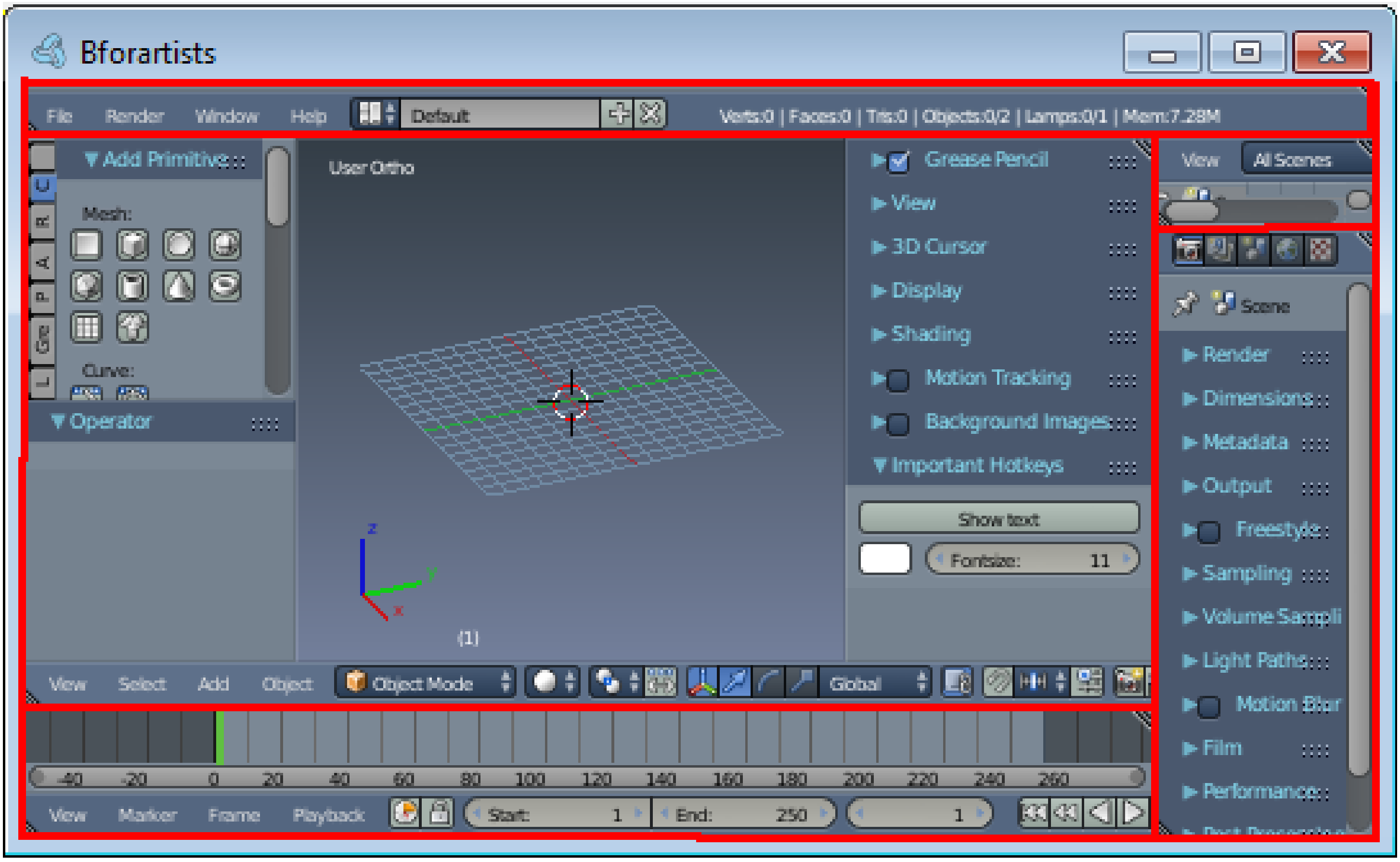
Tools can be accessed efficiently without taking time to learn dozens of hotkeys first and without the bend to a wicked UI. You can easily select between different tools by buttons.

Intuitive graphical UI centered useage

Bforartists is based at a intuitive uesage around the graphical UI. This means buttons and widgets. This doesn't exclude hotkeys. But the official Bforartists keymap is reduced to the very basics. And not the primary way to use Bforartists. You will have to add your own hotkeys when you need it.

Note
There is nevertheless still A TON of hotkeys to find in the Input manager. The reason is that the input manager handles all input. Not just the hotkeys from the tools. And some of the navigation can simply not be done without hotkeys. See also the Bforartists keymap page in the Bforartists in the Manual section of the WIKI

The Bforartists window is organized into one or more *Areas* with each area containing an *Editor*. Editors are divided into a Header and one or more Regions. Regions can have smaller structuring elements like panels with buttons, controls and widgets placed within them.

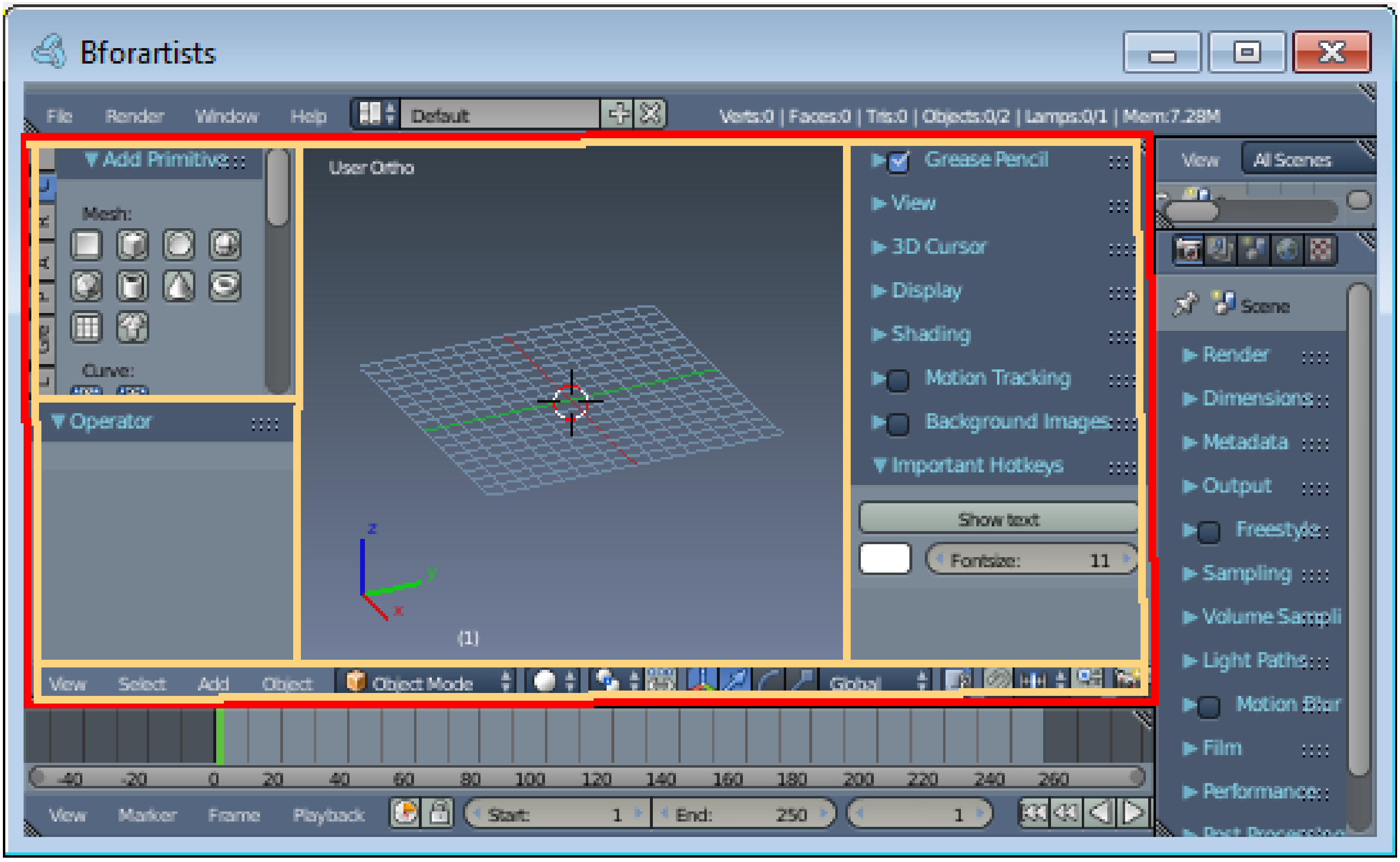


The composition of various Areas with predefined Editors in them is called a *Screen Layout*. By default Bforartists starts up with a layout of 5 Editors as shown in the image below.

Components of an Editor

In general an editor provides a way to view and modify your work through a specific part of Bforartists.

The image below shows the 3D View as an example of an editor.



The 3D View

Editors are consistently organized into following parts:

Regions

At least one region of an editor is always visible. It’s called the main region and is the most prominent part of the editor. In the 3D View above this is marked with a green frame.

Aside from that there can be more regions available. In the 3D View above these are the *Toolshelf* on the left side and the *Properties* on the right side. Additional regions mostly show context-sensitive content.

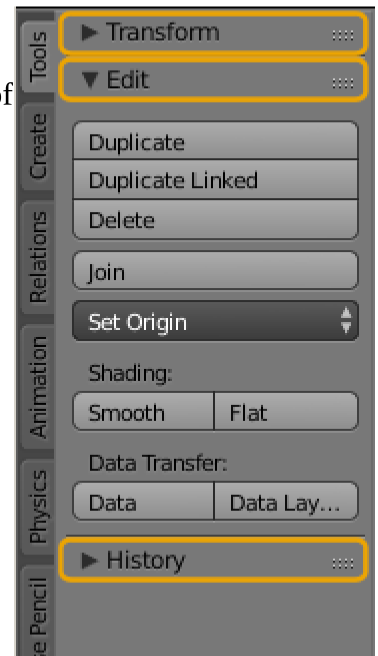
Each editor has a specific purpose, so the main region and the availability of additional regions are different between editors. See specific documentation about each editor in the *Editors* chapter.

Header

A header is a small horizontal part of an editor and sits either at the top or bottom of the area. It acts as a container for menus and commonly used tools. Much like additional regions the header can be hidden.

The 3D View above the header is marked with a purple frame.

See: *Headers* for details.



Panels

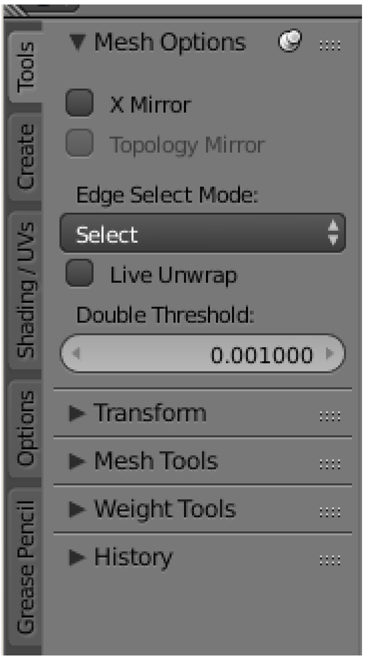
The smallest organizational unit in the user interface is a panel, which can be collapsed to hide its contents by clicking on its header. This is where the buttons, menus, checkboxes, etc. are located.

Panels are usually found in the side regions of an editor, but also make up most of the *Properties Editor*'s main region.

In the image on the right there are 3 panels: *Transfor**, *Edit* and *History*. The edit panel is expanded and the other 2 panels are collapsed. Note that you can change the order of panels by clicking on the handle in the upper right corner of a panel's title.

See: *panels* for details.

Tabs



The Toolshelf has been further structured into a set of context sensitive vertical tabs.

In the image to the right you can see the tabs: **Tools**, **Create**, etc. The **Tools** tab is currently selected, showing a set of panels containing various tools.

Pinning

Often it is desirable to view panels from different tabs at the same time. This has been solved by making panels pinnable.

A pinned panel remains visible regardless of which tab has been selected. You can pin a panel by `Shift` clicking its header, or by right clicking on the header and choosing *Pin*.

Shown in the image above is an example of the *Mesh Options* pinned in the tools tab.

Input Devices

Bforartists supports various types of input devices:

- Keyboard (recommended: keyboard with numeric keypad, english layout works best)
- Mouse (recommended: 3 button mouse with scroll wheel)
- NDOF Devices (also known as *3D Mouse*)
- Graphic Tablets

Usage of Mouse Buttons

In Bforartists the `LMB` (Left Mouse Button) is used for Selection and the `LMB` also (Left Mouse Button) initiates or confirms actions. Bforartists is not longer bound to the old Blender dogma of Action and Select mouse.

Non English Keyboard

If you use a keyboard with a non-english keyboard layout, you may stumble across bugs and quirks and odd behaviours. Blender was developed for and with the UK or US layout. Some quirks for other keyboard layouts slipped through. And quite a few of those old bugs are still unfixed in Bforartists too.

Bforartists corrects Gamma by default

Note

You can change the default keymap and default hotkeys from the *User Preferences*, however this manual assumes you are using the default keymap.

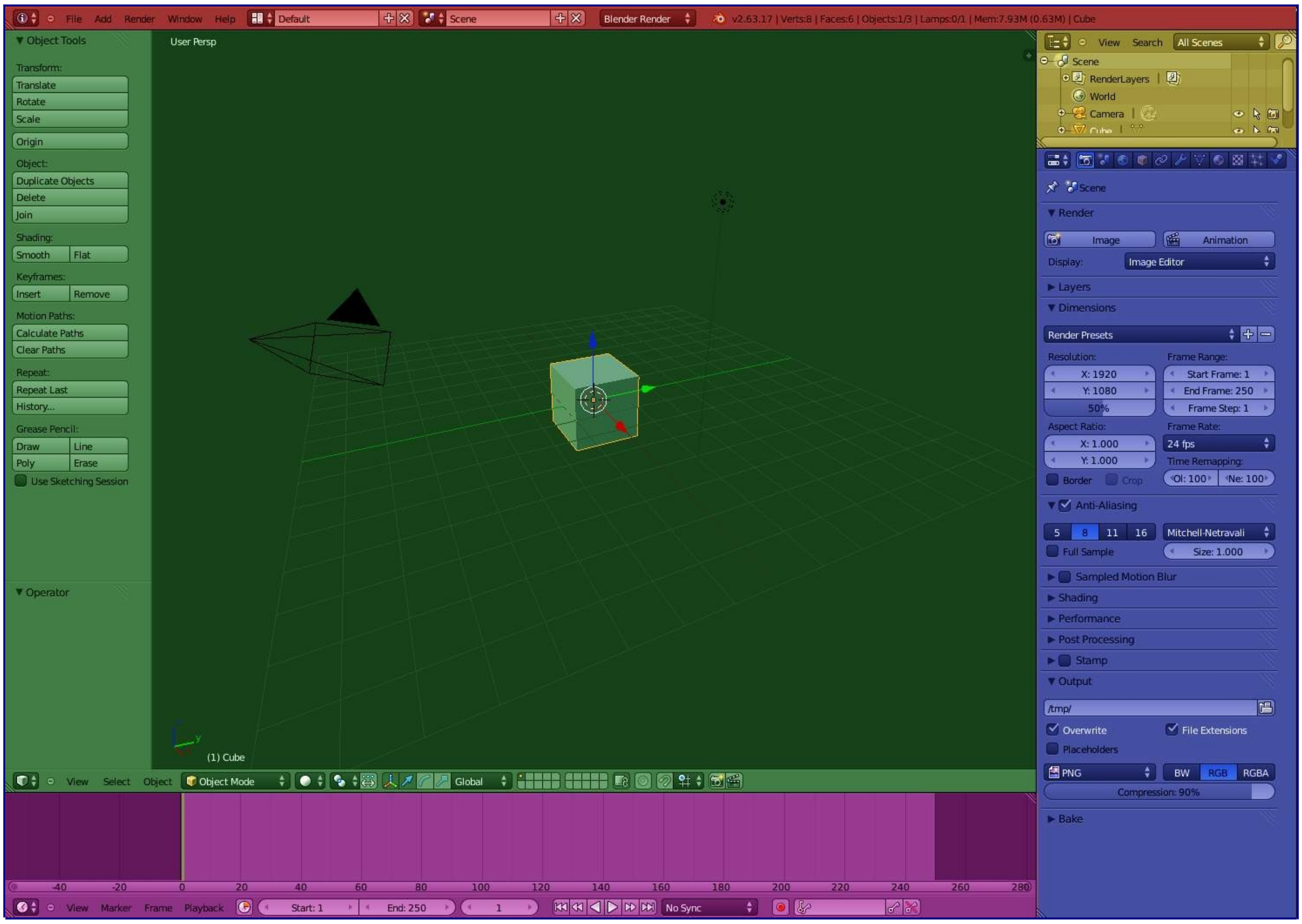
The Window System

The default scene

The default scene is separated into five windows and is loaded each time you start Bforartists or a new file. The five areas are:

- The Info Space (shaded red) at the top. *(The Info window used mainly for its header)*.
- A large 3D View (shaded green).
- A Timeline at the bottom (shaded purple).
- An Outliner at the top right (shaded yellow).
- A Properties editor at the bottom right (shaded blue).

As an introduction we will cover a few of the basic elements.



Default Bforartists scene and Window arrangement

Arranging Areas

Bforartists uses a novel screen-splitting approach to arrange areas. The application window is always a rectangle on your desktop. It divides it up into a number of re-sizable areas. An area contains the workspace for a particular type of window, like a 3D View window, or an Outliner. The idea is that you split up that big application window into any number of smaller (but still rectangular) non-overlapping area. That way, each window is always fully visible, and it is very easy to work in one window and hop over to work in another.

Maximizing an Area

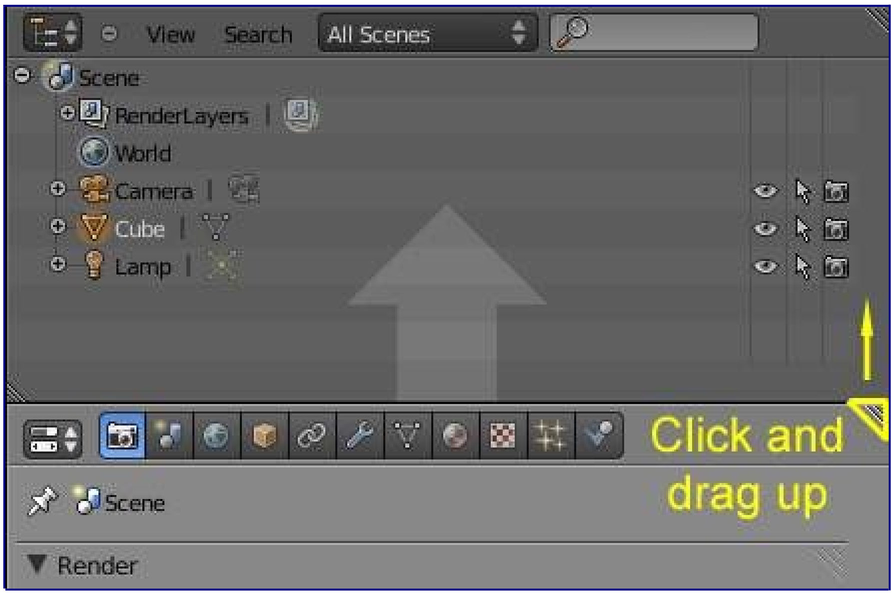
You can maximize an area to fill the whole application window with the *View –> Toggle Full Screen* menu entry. To return to normal size, use again *View –> Toggle Full Screen*. A quicker way to achieve this is to use the corresponding hotkeys that gets displayed besides . NOTE: The window your mouse is currently hovering over is the one that will be maximized using the keyboard shortcuts.

Splitting an Area

In the upper right and lower left corners of a window are the window splitter widgets, and they look like a little ridged thumb grip. It both splits and combines window panes. When you hover over it, your cursor will change to a cross. `LMB` and drag it to the left to split the window pane vertically, or downward to split it horizontally.

Joining Two Areas

In order to merge two areas, they must be the same dimension in the direction you wish to merge. For example, if you want to combine two areas that are side-by-side, they must be the same height. If the one on the left is not the same as the one on the right, you will not be able to combine them horizontally. This is so that the combined window space results in a rectangle. The same rule holds for joining two areas that are stacked on top of one another; they must both have the same width. If the one above is split vertically, you must first merge those two, and then join the bottom one up to the upper one.



To merge the current window with the one above it (in the picture the properties window is being merged “over” the Outliner), hover the mouse pointer over the window splitter. When the pointer changes to a cross, `LMB` click and drag up to begin the process of combining. The upper window will get a little darker, overlaid with an arrow pointing up. This indicates that the lower (current) area will “take over” that darkened area space. Let go of the `LMB` to merge. If you want the reverse to occur, move your mouse cursor back into the original (lower) area, and it will instead get the arrow overlay.

In the same way, windows may be merged left to right or vice versa.

If you press `Esc` before releasing the mouse, the operation will be aborted.

Changing Area Size

You can resize areas by dragging their borders with `LMB`. Simply move your mouse cursor over the border between two areas until it changes to a double-headed arrow, and then click and drag.

Swapping Contents

You can swap the contents between two areas with `Ctrl-LMB` on one of the splitters of the initial area, dragging towards the target area, and releasing the mouse there. The two areas don't need to be side by side, though they must be inside the same window.

Opening New Windows

You may wish to have a new window. This can be useful, for instance, if you have multiple monitors and want them to show different information on the same instance of Bforartists.

A new window can be created from Window ‣ Duplicate Window.

You can also create a new window from an existing area by `Shift-LMB` on a area splitter, and dragging slightly. A new window pops up, with its maximize, minimize, close and other buttons (depending on your platform), containing a single area with a duplicate of the initial window on which you performed the operation.

Once you have that new window, you can move it to the other monitor (or leave it in the current one); you can resize it (or keep it unchanged); you can also arrange its contents in the same way discussed so far (split and resize areas, and tune them as needed), and so on.

Window Headers

All windows have a header (the strip with a lighter gray background containing icon buttons). We will also refer to the header as the window *ToolBar*. The header may be at the top (as with the *Properties Window*) or the bottom (as with the *3D Window*) of a window's area. The picture below shows the header of the 3D window:

If you move the mouse over a window, its header changes to a slightly lighter shade of gray. This means that it is "focused". All hotkeys you press will now affect the contents of this window.

Hiding a header

To hide a header, move your mouse over the thin line between a window and its header, until the pointer takes the form of an up/down arrow. Then click, hold and drag with `LMB` from the window over the header to hide the latter.

Showing a header

A hidden header leaves a little plus sign (see picture). By `LMB` this, the header will reappear.

Note 1: In the 3D window, there are up to two more of these little plus signs (to the top left and right of the window). Those will open panels with several tools, not a second header.

Note 2: In some windows, the mentioned plus sign can be hard to find, because it might look like a part of other icons. One example is the Outliner, in which there are other such plus signs, thus giving the one to get the header back good camouflage.

Header position

To move a header from top to bottom or the other way round, simply `RMB` on it and select the appropriate item from the pop-up menu. If the header is at the top, the item text will read "Flip to Bottom", and if the header is at the bottom the item text will read "Flip to Top".

Tip
Theme colors Bforartists allows for most of its interface color settings to be changed to suit the needs of the user. If you find that the colors you see on screen do not match those mentioned in the Manual then it could be that your default theme has been altered. Creating a new theme or selecting/altering a pre-existing one can be done by selecting the *User Preferences* window and clicking on the *Themes* tab of the window.

Window type button

`LMB` clicking on the first icon at the left side of a header allows changing the window type. Every window frame in Bforartists may contain any type of window, allowing you to customize your window layout to your own work flows.

Menus and buttons

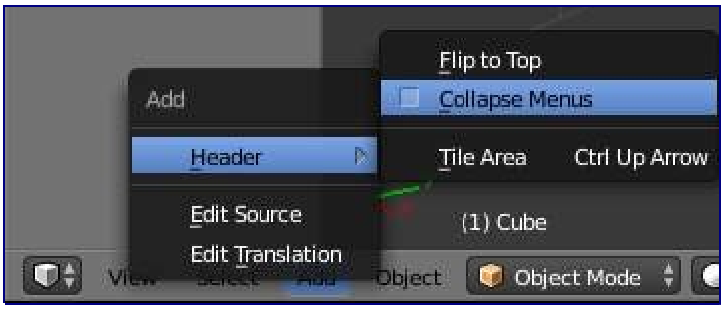
Most Window Headers, located immediately next to this first "Window Type" Menu button, exhibit a set of menus which can be hidden - again with a little minus sign. So if you cannot find a menu that was mentioned somewhere, try looking for a little plus sign (once again) next to the “Window Type” button. By clicking LMB on it, the menu will come back.

Menus allow you to directly access many features and commands, so just look through them to see what’s there. All Menu entries show the relevant shortcut keys, if any.

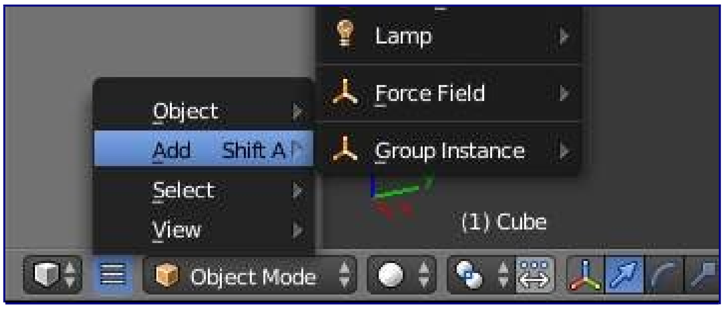
Menus and buttons will change with *Window Type* and the selected object and mode. They only show the actions that can be performed.

Collapsing Menus

Sometimes its helpful to gain some extra horizontal space in the header by collapsing menus, this can be accessed from the header context menu, simply right click on the header and enable set it to collapsed.

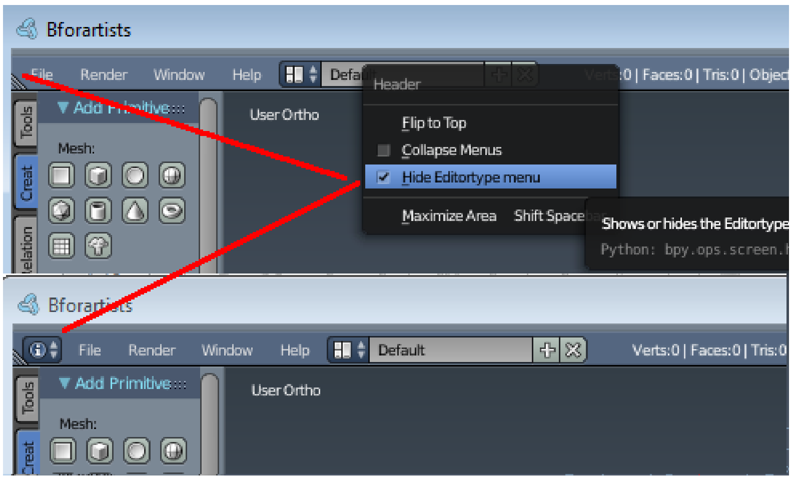


Right-click on any of the header menus Header ‣ Collapse Menus.



Access the menu from the collapsed icon.

Hiding the editor type menu



In Bforartists it is possible to hide the editor type menu. And it is in fact hidden for most editors in the standard layout.

Right click at the menu bar. And you will see a menu with the menu entry Hide Editortype Menu. This shows or hides the editor type menu.

The Console Window

The *Console Window* is an operating system text window that displays messages about Bforartists operations, status, and internal errors.

Use Cases:

- If Bforartists exits unexpectedly, the messages may indicate the cause or error.
- To see the output of Python scripts `print()` command.
- To launch with *Command Line Arguments* options.
- When troubleshooting, to see the output of `--debug` messages.

Platform Dependant Instructions

Linux

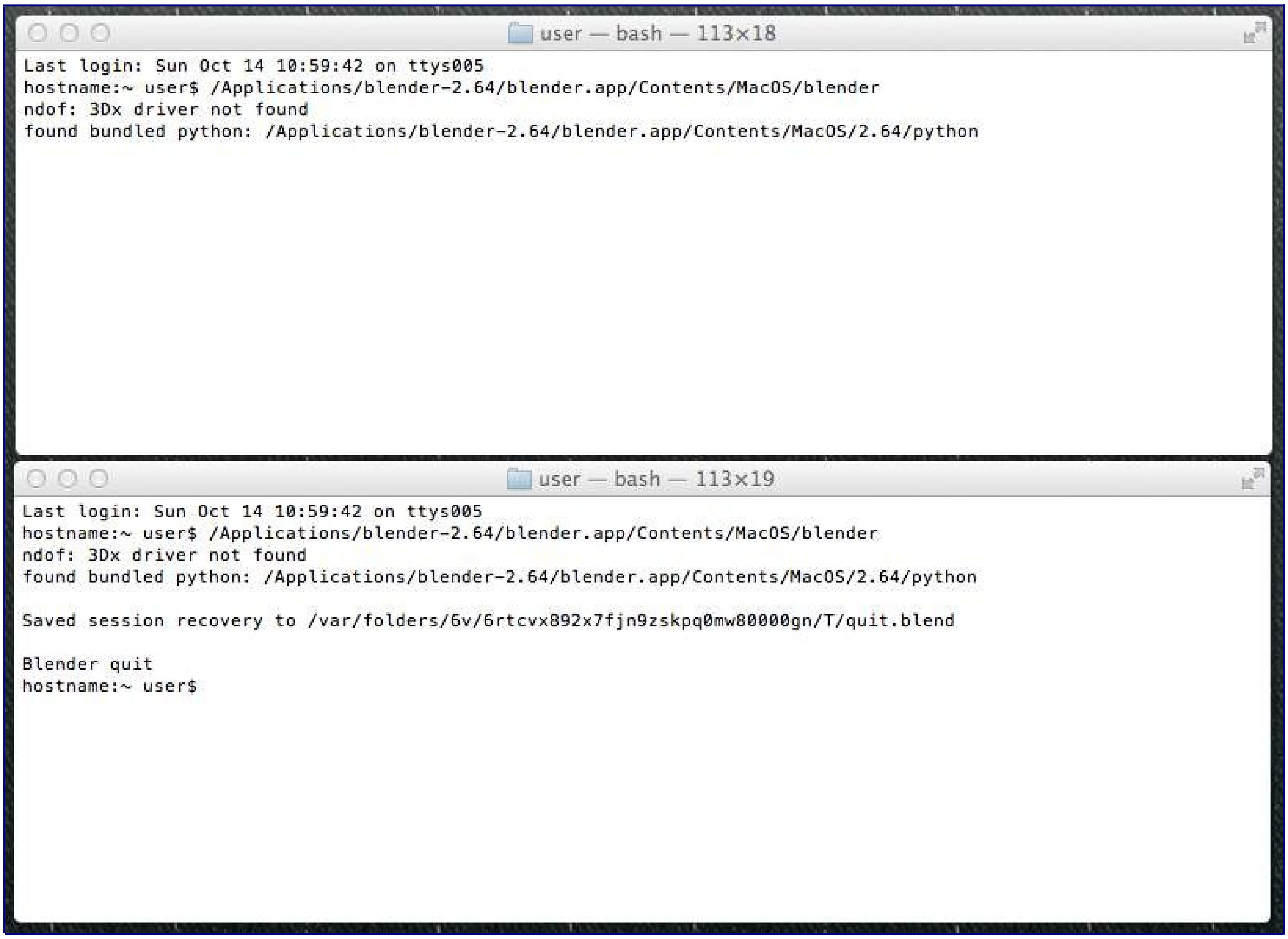
Starting Bforartists from a Linux console window.

The Bforartists *Console Window* in Linux will typically only be visible on the desktop if Bforartists is manually started from a terminal, as Bforartists outputs to the *Console Window* it is started from.

Depending on your desktop environment setup, a Bforartists icon may appear on your desktop or an entry for Bforartists added to your menu after you install Bforartists. When you start Bforartists using a desktop icon or menu entry rather than a Terminal window, the Bforartists *Console Window* text will most likely be hidden on the Terminal that your XWindows server was started from.

This screenshot shows Bforartists started from a Linux Terminal and the resulting console text being printed to it.

Mac OSX



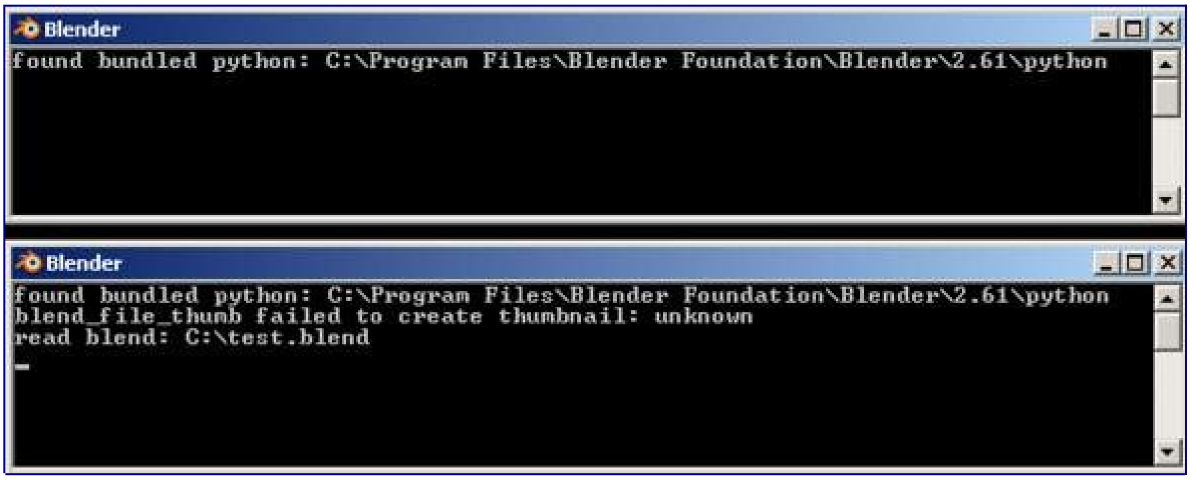
Starting Bforartists from a Mac OSX console window.

Mac-OSX uses "files" with the `.app` extension called *applications*. These files are actually folders that appear as files in Finder. In order to run Bforartists you will have to specify that path to the Bforartists executable inside this folder, to get all output printed to the terminal. You can start a terminal from Applications –> Utilities. The path to the executable in the `.app` folder is `./Bforartists.app/Contents/MacOS/Bforartists`.

If you have Bforartists installed in the Applications folder, the following command can be used:

```
/Applications/Bforartists-2.76/Bforartists.app/Contents/MacOS/Bforartists
```

MS-Windows



Bforartists's Console Window on MS-Windows.

When Bforartists is started on a MS-Windows operating system, the *Console Window* is first created as a separate window on the desktop. The main Bforartists window will also appear and the *Console Window* will then be toggled off. To display the console again, go to Window ‣ Toggle System Console.

The screenshot shows the Bforartists *Console Window* on MS-Windows directly after starting Bforartists and then a short while later after opening a file along with the relevant messages.

Tip

Closing the Bforartists Console Window

Closing the *Console Window* will also close Bforartists, losing any unsaved work.

To turn off the console without closing Bforartists, just run *Toggle System Console* again from the menu (as mentioned above).

Console Window Status and Error Messages

The *Bforartists Console Window* can display many different types of Status and Error Messages. Some messages simply inform the user what Bforartists is doing, but have no real impact on Bforartists's ability to function. Other messages can indicate serious errors that will most likely prevent Bforartists carrying out a particular task and may even make Bforartists non-responsive or shut down completely. The *Bforartists Console Window* messages can also originate internally from within the Bforartists code or from external sources such as *Python scripts*.

Common messages

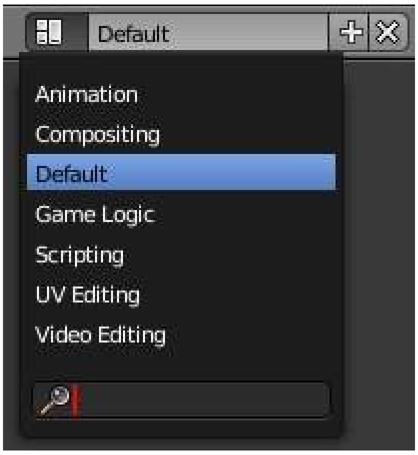
- found bundled python: (FOLDER)

  This message indicates that Bforartists was able to find the Python library for the Python interpreter embedded within Bforartists. If this folder is missing or unable to be found, it is likely that an error will occur, and this message will not appear.

- malloc returns nil()

When Bforartists carries out operations that require extra memory (RAM), it calls a function called malloc (short for memory allocate) which tries to allocate a requested amount of memory for Bforartists. If this cannot be satisfied, malloc will return nil/null/0 to indicate that it failed to carry out the request. If this happens Bforartists will not be able to carry out the operation requested by the user. This will most likely result in Bforartists operating very slowly or shutting down. If you want to avoid running out of memory you can install more memory in your system, reduce the amount of detail in your Bforartists models, or shut down other programs and services which may be taking up memory that Bforartists could use.

Screens



Layout Dropdown

Bforartists's flexibility with windows lets you create customized working environments for different tasks such as modeling, animating, and scripting. It is often useful to quickly switch between different environments within the same file.

To do each of these major creative steps, Bforartists has a set of pre-defined *screens*, that show you the types of windows you need to get the job done quickly and efficiently. *Screens* are essentially pre-defined window layouts. If you are having trouble finding a particular screen, you can use the search function at the bottom of the list (pictured right).

Default Screens available

3D View Full:	A full screen 3D view, used to preview your scene.
Animation:	Making actors and other objects move about, change shape or color, etc.
Compositing:	Combining different parts of a scene (e.g. background, actors, special effects) and filter them (e.g. color correction).
Default:	The default layout used by Bforartists for new files. Useful for modeling new objects.
Motion Tracking:	Used for motion tracking with the movie clip editor.
Scripting:	Documenting your work and/or writing custom scripts to automate Bforartists.
UV Editing:	Flattening a projection of an object mesh in 2D to control how a texture maps to the surface.

Hint

Just important when you work with more than one scene at once:

By default, each screen layout ‘remembers’ the last *scene* it was used on. Selecting a different layout will switch to the layout **and** jump to that scene.

All changes to windows, as described in *Editor Types*, are saved within one screen. Changes to one screen, wont affect others.

Configuring your Screens

Adding a new Screen Type

Click on the “Add” button() and a new frame layout will be created based on your current layout.

Deleting a Screen

You can delete a screen by using the *Delete Data-Block* button (). See *Screen and Scene selectors* above.

Rearranging a Screen

Use the *window controls* to move frame borders, split and consolidate windows. When you have a layout that you like, press `Ctrl-U` to update your User defaults. Be aware that all of the current scenes become part of those defaults, so consider customizing your layouts with only a single, simple scene.

The properties window has a special option: pressing `RMB` on its background will allow you to arrange its panels horizontally or vertically. Of the two, vertically-arranged panels have greater support.

Overriding Defaults

When you save a .blend file, the screen layouts are also saved in it. When you open a file, enabling the *Load UI* checkbox in the file browser indicates that Bforartists should use the file’s screen layouts (overriding your defaults in the process). Leaving the *Load UI* checkbox disabled tells Bforartists to use the current layout.

Additional Layouts

As you become more experienced with Bforartists, consider adding some other screen layouts to suit your workflow as this will help increase your productivity. Some examples could include:

Modeling
: Four 3D windows (top, front, side and perspective), Properties window for Editing

Lighting
: 3D windows for moving lights, UV/Image Window for displaying Render Result, Properties window for rendering and lamp properties and controls

Materials
: Properties window for Material settings, 3D window for selecting objects, Outliner, Library script (if used), Node Editor (if using *Node based materials*)

Painting

UV/Image Editor for texture painting image, 3D window for painting directly on object in UV Face Select mode, three mini-3D windows down the side that have background reference pictures set to full strength, Properties window

Hint

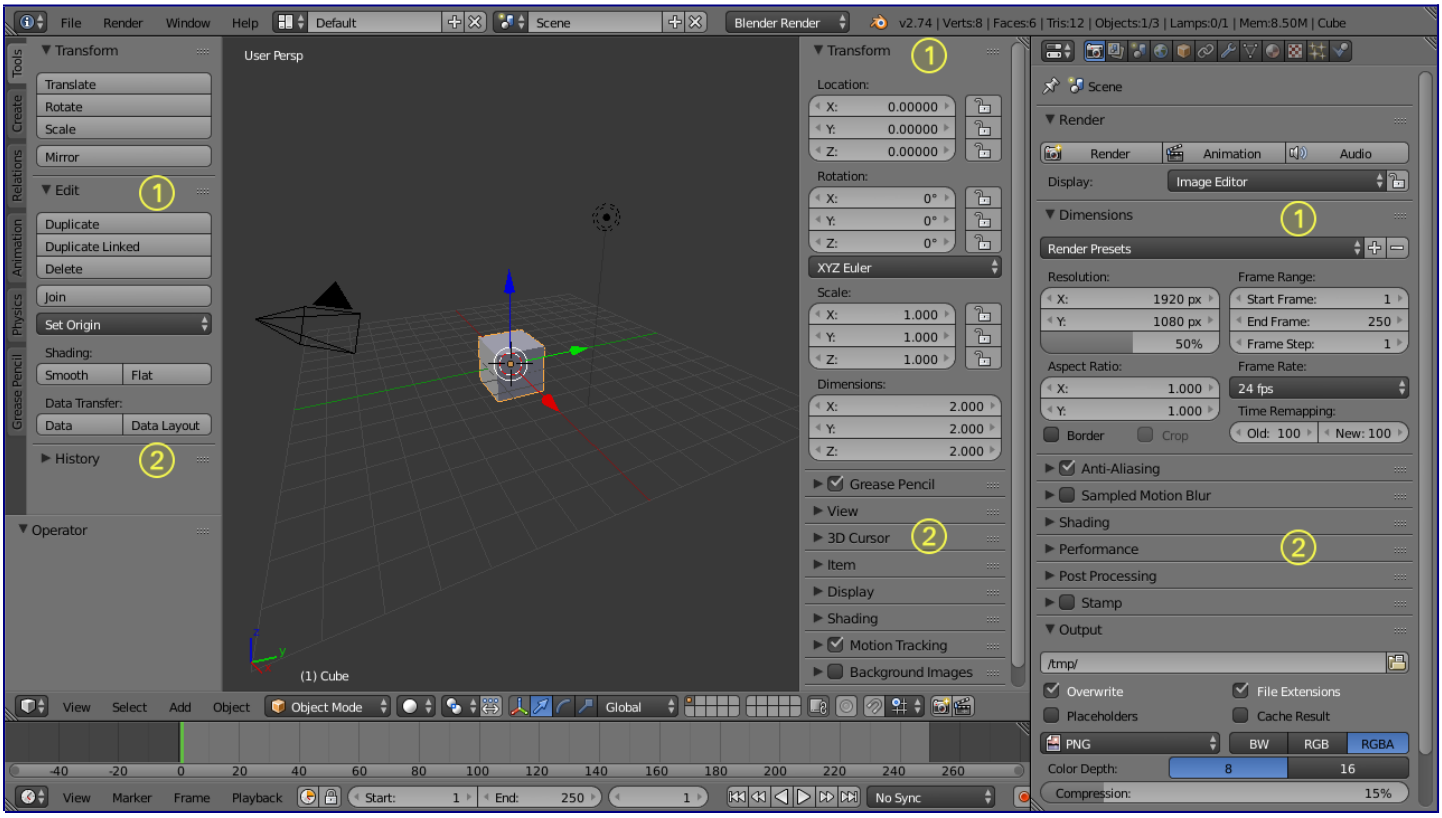
Reuse your Layouts

If you create a new window layout and would like to use it for future `.blend` files, you can save it for later reuse, see *Startup File*.

Panels

Panels are collapsible sections within regions to help organize the interface. They are heavily used in the *Properties Editor* but also appear elsewhere (For example: in the *Tool Shelf* or the *Properties Shelf*, available in some editors).

The image below shows panels in different regions in their expanded and collapsed state.



Expanded (1) and collapsed (2) Panels in the Properties Editor (right area) and in the additional Regions of the 3D View Editor (left area)

- A click with the `LMB` on the title area of a panel expands or collapses it.
- A `LMB` drag motion over the title area will expand or collapse many at once.
- A `Ctrl-LMB` click on the title area of a specific panel will collapse all other panels and make this the

only expanded one.

Some panels only show in certain contexts. So for instance the *Tool Shelf* will show different panels depending on the objects mode.

There are some options available to customize panels to your preference:

- You can change the position of a panel within its region by clicking and dragging it with the `LMB` on the little widget in the upper right corner.
- The zoom factor of a whole region with panels can be changed by `Ctrl-MMB` clicking and moving the mouse anywhere within that region or use the `NumpadPlus` and `NumpadMinus` to zoom in and out the contents. Pressing `Home` (Show All) will reset the zooming at the screen/panel focused by the mouse pointer.
- The alignment of the panels in the *Properties Editor* can be changed between vertical and horizontal. To do this click with `RMB` somewhere within the main region of the *Properties Editor* and choose either *Horizontal* or *Vertical* from the appearing menu. Keep in mind though that the panels are optimized for vertical alignment.

Buttons and Controls

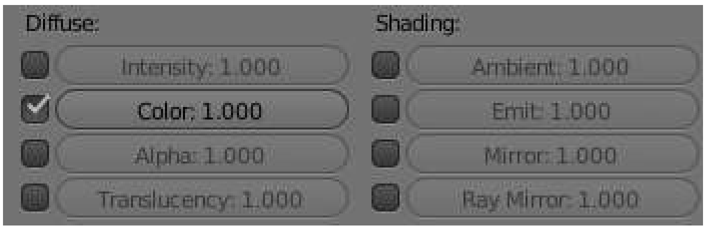
Buttons and other controls can be found in almost every *Window* of the Blender interface. The different types of controls are described below.

Operation Buttons

Operation button

These are buttons that perform an operation when clicked with `LMB`. They can be identified by their gray color in the default color scheme.

Toggle Buttons



Toggle buttons

Toggle buttons are typically displayed as check boxes. Clicking this type of button will toggle a state but will not perform any operation.

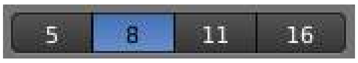
Toggle Drag

To change many toggle buttons at once, you can `LMB` drag over multiple buttons, This works for check-boxes, toggles in the outliner and layer buttons.

Note

For layer buttons (a type of toggle button) it is often useful to hold `Shift` at the same time, to set or clear many layers at once.

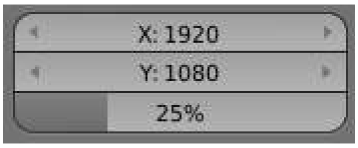
Radio Buttons



Radio buttons

Radio buttons are used to choose from a small selection of "mutually exclusive" options.

Number Buttons



Number buttons

Number buttons can be identified by their labels, which in most cases contains the name and a colon followed by a number. Number buttons can be edited in several ways:

Incremental Steps
: To change the value in steps, click `LMB` on the small triangles on the sides of the button.

Dragging
: To change the value in a wider range, hold down `LMB` and drag the mouse to the left or right.

Text Input
: Press `LMB` or `Return` to edit the value as a text field.

  When entering values by hand, this button works like any other text button.

  - Press `Return` to apply the change.
  - Press `Esc` will cancel the value.

Multi-Value Editing

Multi-value-editing

It's often useful to edit multiple values at once (object scale or render resolution for example).

This can be done by clicking on the button and dragging vertically to include buttons above/below.

After the vertical motion you can drag from side to side, or release the `LMB` to type in a value.

Expressions

You can also enter expressions such as `3*2` instead of `6`. or `5/10+3`. Even constants like `pi` (3.142) or functions like `sqrt(2)` (square root of 2) may be used.

These expressions are evaluated by Python; for all available math expressions see: math module reference

Expressions as Drivers

You may want your expression to be re-evaluated after its entered. Blender supports this using *Drivers* (a feature of the animation system).

Expression beginning with #, have a special use. Instead of evaluating the value and discarding the expression, a driver is added to the property with the expression entered.

The expression `#frame` is a quick way to access map a value to the current frame, but more complex expressions are also supported `#fmod(frame, 24) / 24` for example.

This is simply a convenient shortcut to add drivers which can also be added via the `RMB` menu.

Units

As well as expressions, you can mix units with numbers; for this to work, units need to be set in the scene settings (Metric or Imperial).

Examples of valid units include:

- `1cm`
- `1m 3mm`
- `1m, 3mm`
- `2ft`
- `3ft/0.5km`
- `2.2mm + 5' / 3" - 2yards`

Note that the commas are optional. Notice how you can mix between metric and imperial even though the display can only show one at a time.

Unit Names

Unit names have can be used with both long and short forms, here are listed recognized unit names you can use.

Plurals of the names are recognized too, so `meter` and `meters` can both be used.

Imperial Units

Full Name	Short Name(s)	Scale of a Meter
thou	`mil`	0.0000254
inch	`"`, `in`	0.0254
foot, feet	`'`, `ft`	0.3048
yard	`yd`	0.9144
chain	`ch`	20.1168

Full Name	Short Name(s)	Scale of a Meter
furlong	`fur`	201.168
mile	`mi`, `m`	1609.344

Metric Units

Full Name	Short Name(s)	Scale of a Meter
micrometer	`um`	0.000001
millimeter	`mm`	0.001
centimeter	`cm`	0.01
decimeter	`dm`	0.1
meter	`m`	1.0
dekameter	`dam`	10.0
hectometer	`hm`	100.0
kilometer	`km`	1000.0

Menu Buttons

Blender uses a variety of different menus for accessing options, tools and selecting data-blocks.

Menu Shortcuts

- Arrow keys can be used to navigate.
- Each menu item has an underlined character which can be pressed to activate it.
- Number keys or num-pad can be used to access menu items. (Where `1` is the first menu item, `2` the second... etc. For larger menus `Alt-1` the 11th... up to `Alt-0` the 20th)
- Press `Return` to activate the selected menu item.
- Press `Esc` to cancel the menu.

Header Menus

Header menus are used to configure the editor and access tools.

See *Headers* for header options.

Pop-Up Menus

Pop-up menus are displayed as regular buttons, showing a range of options. For example, the *Add Modifier* button will produce a menu with all of the available modifiers.

Modifier options

Data-Block Menus

Menu buttons are used link data-blocks to each other. data-blocks are items like *Meshes*, *Objects*, *Materials*, *Textures*, and so on.

These menu's may show a preview and allow you to search by name since its common all items wont fit in the list.

Data-block link menu with search

- The first button (with an icon of the data-block type) opens up a menu to select an item by clicking LMB.
- The second button displays the name of the linked data-block which can be edited as a regular text field.
- The "+" button duplicates the current data-block and applies it.
- The "X" button clears the link.

Sometimes there is a list of applied data-blocks (such as a list of materials used on the object). See *data-block link buttons* above.

Data-block link buttons

- To select a data-block, click LMB on it.
- To add a new section (e.g. material, or particle system), click LMB on the "+" button to the right of the list.

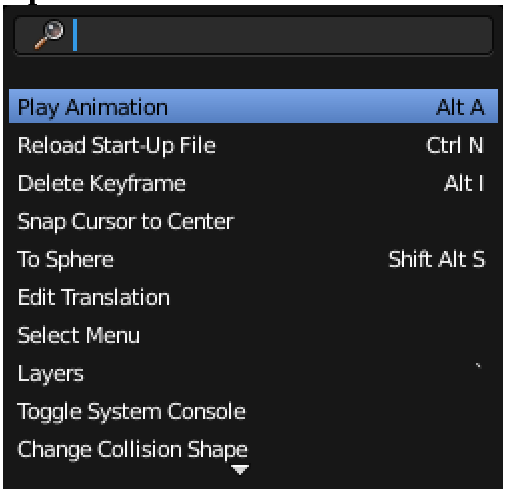
- To remove a section, click `LMB` on the “-” to the right of the list.

For details on the behavior of linking data see *data-block*.

Extended Controls

This page documents some of the more involved interface controls.

Operator Search Menu



The operator search popup.

A menu with access to all *Blender* commands is available in the Window menu at the top, or by pressing `Spacebar`. Simply start typing the name of the command you want to refine the list. When the list is sufficiently narrowed, `LMB` on the desired command or navigate with `Down` and `Up`, activate it by pressing `Return`.

Color Picker

All of the Color picker types have the common *RGB*, *HSV* and *Hex* options to show values.

Blender uses `0 - 1.0` values to express colors for *RGB* and *HSV* values.

Some colors also define an alpha value (*A*), below the color sliders.

Note

Blender corrects Gamma by default

for more information about how to disable Gamma correction in Blender, see: *Color Management and Exposure* page.

- Use `Wheel` to change overall brightness.
- Press `Backspace` to reset to the original color.

Color Picker Types

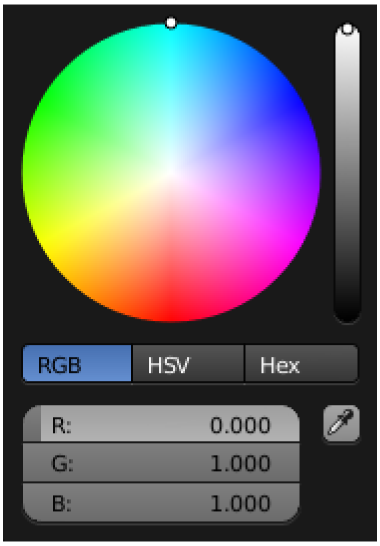
The default color picker type can be selected in the user preferences, see: *System*.

For operations that are capable of using Alpha, another slider is added at the bottom of the color picker.

- 

Square (SV + H), *Saturation, Value plus Hue.* Colors are adjusted using the a range of brightness of the base color chosen at the color bar in the middle of the picker.
- 

Square (HS + V), *Hue, Saturation plus Value.* Brightness is subtracted from the base color chosen on the square of the color picker moving the slider to the left.
- 

Square (HV + S), *Hue, Value and Saturation*. Brightness is added to the base color chosen on the square of the color picker moving the slider to the left.
- 

Circle HSV (Default). A full gamut of colors ranging from center to the borders is always shown; center is a mix of the colors.
- 

Circle HSL. A variation of the regular circle select that uses *HSL* for mixing.
-
-
-

Hexidecimal Colors

You can optionally use hexidecimal *(Hex)* values, expressed as (`RRGGBB`), a common way to represent colors for HTML and useful quicky copy/paste colors between applications.

Shorthand hex colors are also supported (`RGB`), so dark-yellow (`ffcc00`), can be written as `fc0`.

Eye Dropper

The eye dropper allows you to sample from anywhere in the Blender window.

The eyedropper can be use to select different kinds of data.

Color
: This is the most common usage.

Objects / Object-Data
: This is used with object buttons such as parent, constraints or modifiers to select an object from the 3D view.

Camera Depth
: Number buttons effecting distance can also use the eye-dropper, this is most useful for camera depth of field.

- `E` will activate the eye-dropper while hovering over a button.
- `LMB` dragging will mix the colors you drag over which can help when sampling noisy imagery.
- `Spacebar` resets and starts mixing the colors again.

Color Ramp Widget

Colorband before

Colorband after

Color Ramps enables the user to specify a range of colors based on color stops. Color stops are similar to a mark indicating where the exact chosen color should be. The interval from each of the color stops added to the ramp is a result of the color interpolation and chosen interpolation method. The available options for Color Ramps are:

Add (Button)
: Clicking on this button will add a stop to your custom weight paint map. The stops are added from the last selected stop to the next one, from left to right and they will be placed in the middle of both stops.

Delete (Button)
: Deletes the selected color stop from the list.

'F' (Button)
: Flips the color band, inverting the values of the custom weight paint range.

Numeric Field
: Whenever the user adds a color stop to the custom weight paint range, the color stop will receive an

index. This field shows the indexes added (clicking in the arrows until the counter stops), and allows the user to select the color stop from the list. The selected color stop will be shown with a dashed line.

Interpolation Options

Enables the user to choose from **4** types of calculations for the color interpolation for each color stop. Available options are:

B-Spline
: Uses a *B-Spline* Interpolation for the color stops.

Cardinal
: Uses a *Cardinal* Interpolation for the color stops.

Linear
: Uses a *Linear* Interpolation for the color stops.

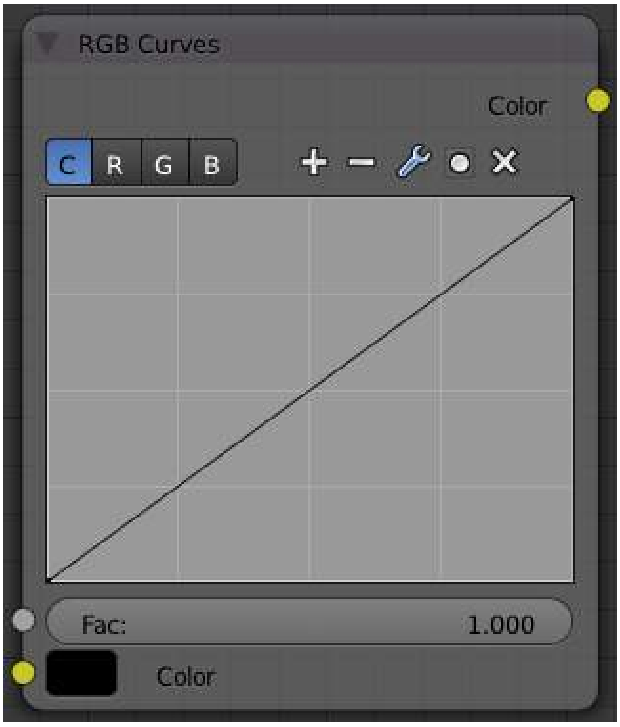
Ease
: Uses a *Ease* Interpolation for the color stops.

Constant
: Uses a *Constant* Interpolation for the color stops.

Position
: This slider controls the positioning of the selected color stop in the range.

Color Bar
: Opens a color Picker for the user to specify color and Alpha for the selected color stop. When a color is using Alpha, the Color Bar is then divided in two, with the left side showing the base color and the right side showing the color with the alpha value.

Curve Widget



The *Curve Widget* is found in several places throughout Blender, such as:

- RGB Curves node
- Vector Curves node
- Paint/Sculpt brush falloff
- Color Management curves

The purpose of the *Curve Widget* is to allow the user to modify an input (such as an image) in an intuitive manner by smoothly adjusting the values up and down using the curve.

The input values are mapped to the X-axis of the graph, and the Y-axis is mapped to the output values.

Control Points

Like all curves in Blender, the curve of the *Curve Widget* is controlled using *control points*.

By default there are two control points: one at `0.0, 0.0` and one at `1.0, 1.0`, meaning the input is mapped directly to the output (unchanged).

To move a control point

Simply click and drag it around.

To add a new control point

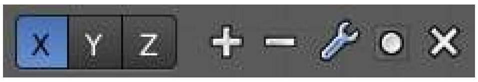
Click anywhere on the curve where there is not already a control point.

To remove a control point

select it and click the  button at the top right.

Controls

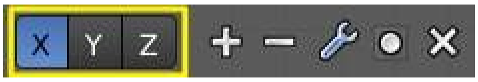
Above the curve graph is a row of controls. These are:



Node curve controls

Channel selector

Allows to select appropriate curve channel.



Curve channel selector

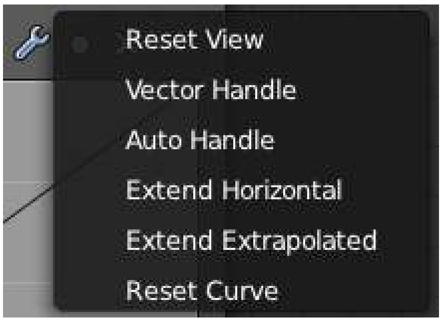
Zoom In

Zoom into the center of the graph to show more details and provide more accurate control. To navigate around the curve while zoomed in, click and drag in an empty part of the graph.

Zoom Out

Zoom out of the graph to show less details and view the graph as a whole. You cannot zoom out further than the clipping borders (see *Clipping* below).

Tools



Advanced tools for curve

Reset View

Resets view of the curve.

Vector Handle

Vector type of curve point's handle.

Auto Handle

Automatic type of curve point's handle.

Extend Horizontal

Extends the curve horizontal.

Extend Extrapolated

Extends the curve extrapolated.

Reset Curve

Resets the curve in default (removes all added curve's points).

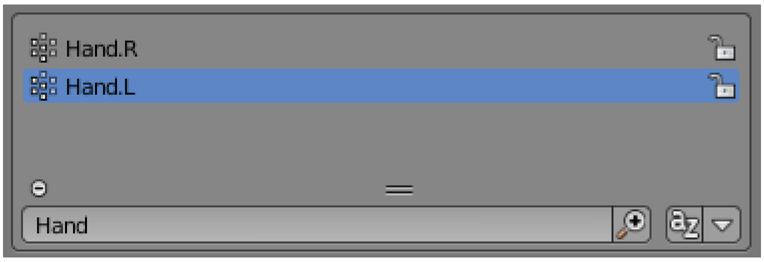
Clipping

Enable/disable clipping and set the values to clip to.

Delete

Remove the selected control point.

List View



At the bottom of a list view (like the ones found in the object data properties) there are controls for filtering and sorting and resizing.

Rename

By pressing (`Ctrl`, `LMB`) over an item's name, you can edit the text-field. This can also be achieved by double clicking.

Resize

The list view can be resized to show more or less items. Hover the mouse over the handle then click and drag the handle to expand or shrink the list.

Filter

Click the *Show filtering options* button to toggle filter option buttons.

Type part of a list item's name in the filter text box to filter items by part of their name.

Filter Include

When the magnifying glass icon has a `+` sign then only items that match the text will be displayed.

Filter Exclude

When the magnifying glass icon has a `-` sign then only items that do not match text will be displayed.

Sort

Sort list items.

Alphabetical

This button switches between alphabetical and non-alphabetical ordering.

Inverse

Sort objects in ascending or descending order. This also applies to alphabetical sorting, if selected.

Copy / Paste

Reference
Mode: All modes
Hotkeys: ctrl + c to copy, ctrl + v to paste

Copy and paste works like in many other applications too. And works in most editors. The menu entry is usual located in the menu bar as a menu item in the menus. And it's one of those things in Bforartists that has a standard hotkey.

Copy and paste in Edit mode has a special behaviour. It copies the current selection. But it does not paste the selection in Edit mode. But it pastes the selection as a new object.

To create a copy of the current selection in Edit mode, which is part of the current object, is a job for the duplicate tool.

Undo and Redo

The commands listed below will let you roll back an accidental action, redo your last action, or let you choose to recover to a specific point, by picking from a list of recent actions recorded by Blender.

Undo

If you want to undo your last action, just press `Ctrl-Z.` Or click at the Undo button in the History section in the Tool Shelf. See *Editing Preferences* section on undo to change defaults.

Redo

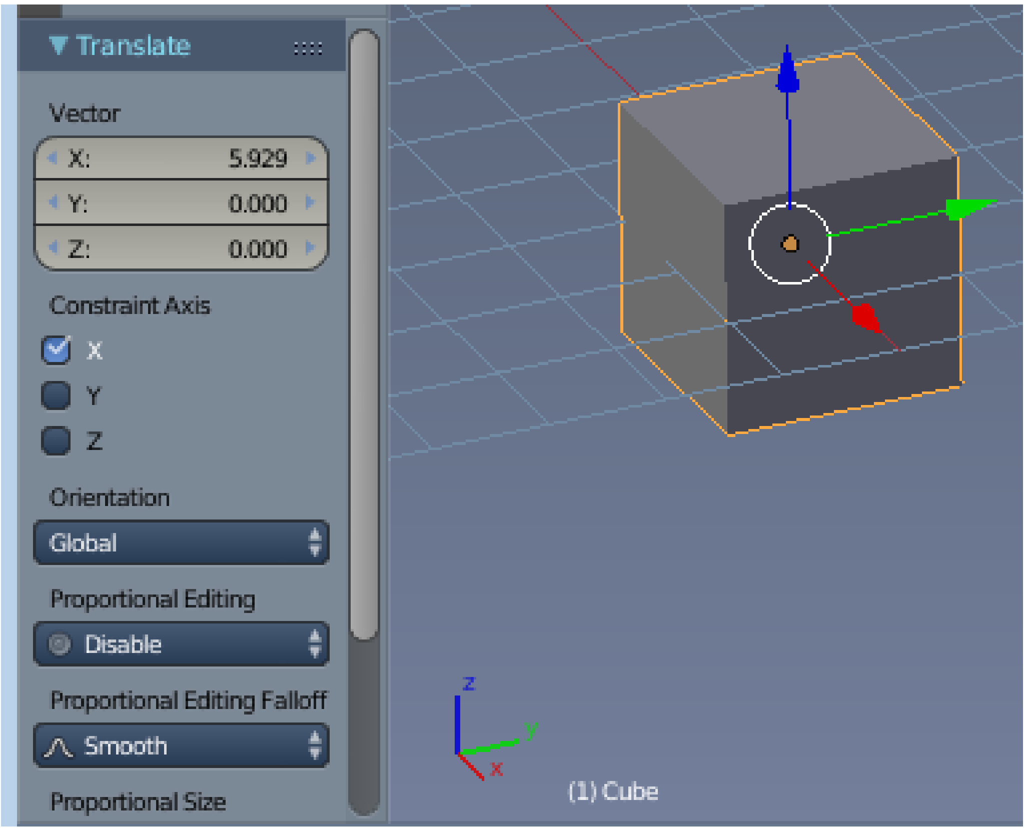
To roll back your Undo action, press `Ctrl-Shift-Z`Or click at the Undo button in the History section in the Tool Shelf.

Redo Last

Redo Last is short for *Redo(ing your) Last (Action)*. The operator area in the Tool Shelf will present you a Panel based on your last action taken and the *Mode* and *Window* in which Blender is being used.

For example, if your last action was a rotation in *Object* Mode, the Panel will show you the last value changed for the angle (see Fig:Redo Last - Rotation), where you can change your action back completely by typing **0** (zero) in the numeric field. There are other useful options, based on your action context, and you can not only Undo actions, but change them completely using the available options.

If you are in *Edit* Mode, the Window will also change its contents based on your last action taken. In our second example (at the right), the last action taken was a Vertex Move; we did a *Scale* on a Face, and, as you can see, the contents of the Pop-Up Window are different, because of your context (Edit Mode).



Tip
Operations using Redo Last Some operations produce particularly useful results if you tweak their parameters with the `F6` Menu. Take, for example, adding a Circle. If you reduce the Vertex count to 3, you get a perfect equilateral triangle.

Undo History

The Undo History Menu

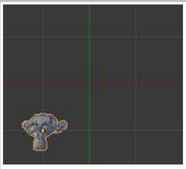
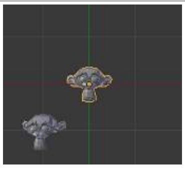
There is also a Undo History of your actions, recorded by Blender. You can access the history with `Ctrl-Alt-Z`. Or by clicking at the Undo History button in the History section of the Tool Shelf

Rolling back actions using the *Undo History* feature will take you back to the action you choose. Much like how you can alternate between going backward in time with `Ctrl-Z` and then forward with `Ctrl-Shift-Z`, you can hop around on the Undo timeline as much as you want as long as you do not make a new change. Once you do make a new change, the Undo History is truncated at that point.

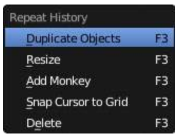
Repeat Last

The Repeat Last feature will Repeat your last action when you press `Shift-R`. Or by clicking at the Repeat History button in the History section of the Tool Shelf

In the example Images below, we duplicated a *Monkey Mesh*, and then we moved the Object a bit. Using repeat `Shift-R`, the *Monkey* was also duplicated and moved.

 Suzanne.	 After a Shift-D and move.	 After a Shift-R.

Repeat History



The Repeat Menu

The *Repeat History* feature will present you a list of the last repeated actions, and you can choose the actions you want to repeat. It works in the same way as the Undo History, explained above, but the list contains only repeated actions. To access Repeat History, use `F3`. Or by clicking at the Repeat History button in the History section of the Tool Shelf

Note

Blender uses two separate Histories, one dedicated for the *Edit* Mode, and one dedicated for the *Object* Mode.

Important

When you quit Blender, the complete list of user actions will be lost, even if you save your file before quitting.

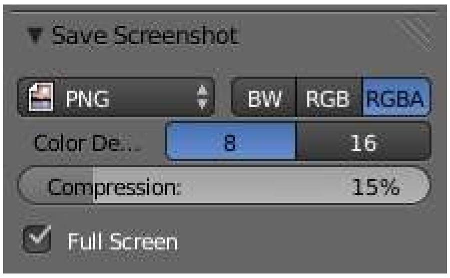
See also

Troubleshooting section on *Recovering your lost work*

Screen Capture

Screenshots

Reference
Mode: All modes Menu: Window ‣ Save Screenshot



Save Screenshot Option

A click at the Save Screenshot Button in the Windows menu will take a screenshot of your Blender window and then open the Blender *File Browser* window, allowing you to specify the name and location of the screenshot. In the example image at the right, the PNG format will be the output of the screenshot taken (settings are the same as the ones available to save render results). When the Blender *File Browser* window opens for you, at the left, there is a tab called *Save Screenshot* where you can find format settings and a checkbox with the option *Full Screen*.

- Check the Option to save the entire Blender window (full width and height of the Blender window you are using when you call the command).
- Uncheck the box to save only your active window (where your mouse is located when you call the command).

Screencasts

Reference
Mode: All modes Menu: Window ‣ Make Screencast

This is a quick way to make screen-casts from within Blender.

Note
This is limited to a single window and does *not* support audio. For recording tutorials you may want to use more comprehensive, 3rd party solutions.

Screencasts will record your actions over time either as a video or sequence of image files. The type and location of the output is determined by the settings in the *Output panel* of the Render context window. The default settings will generate a screencast consisting of a series of PNG images captured every 50 ms and stored in the */tmp* folder. If you want to record a video, set the *Output* to one of the *Movie File Formats* supported by your system listed in the *Output panel* format menu. If you are unsure what video codecs your system supports, select *AVI JPEG*.

Options in the User Preferences Editor

The FPS for video Screencasts and time between each Screenshot for an image series Screencast can be set from the *System panel* of the *User Preferences* window.

When you start Blender Screencasts, the header of the *Info Window* will change, and it will show you a button for stopping your capture.

Below, we show the normal header of the *Info Window*, when in normal Blender operation (See Fig: Info Window - Header - Normal Operation), and with the Stop button for the Screencast, when in Screencast Mode. (See Fig: Info Window - Header - Capture Stop Button).

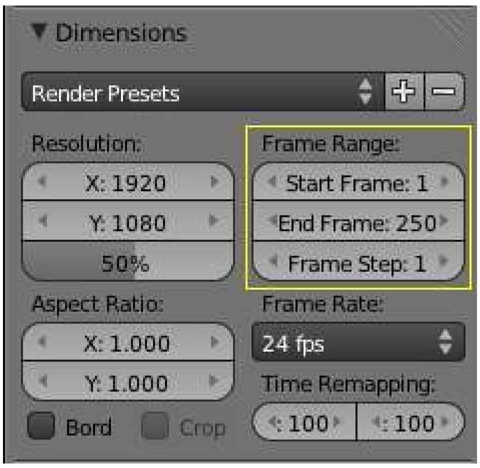
Info Window - Header - Normal Operation

Info Window - Header - Capture Stop Button

Note

The only way to stop the Screencast

Pressing the Stop button in the header of the Info Window is the only way to stop the Screencast capture. If you press `Esc`, the shortcut will only work for operations performed in the Blender *User Interface*, (it will stop animations, playbacks and so on...), but will not work to stop *Screencasts*.



Dimensions Panel - Frame Range

The frames are stored using a suffix added to their file name, where the suffix is composed of the numbers present in the fields for *start* and *end frames*, defined in the Frame Range of the Dimensions panel, Render context. (See Fig: Dimensions Panel - Frame Range - highlighted in yellow)

Note

The configuration of the End frame, present in the Frame Range of the Dimensions Panel, **will not** stop your capture automatically. You will always have to stop the Screencast manually, using the Stop button.

The Videos are generated internally in the same manner as the *Screenshots*, using the width and height of the Window you are working in. If you choose to capture to a Video file, Blender will have to pass those frames to a Video codec.

Warning

Some codecs limit the output width/height or the video quality.

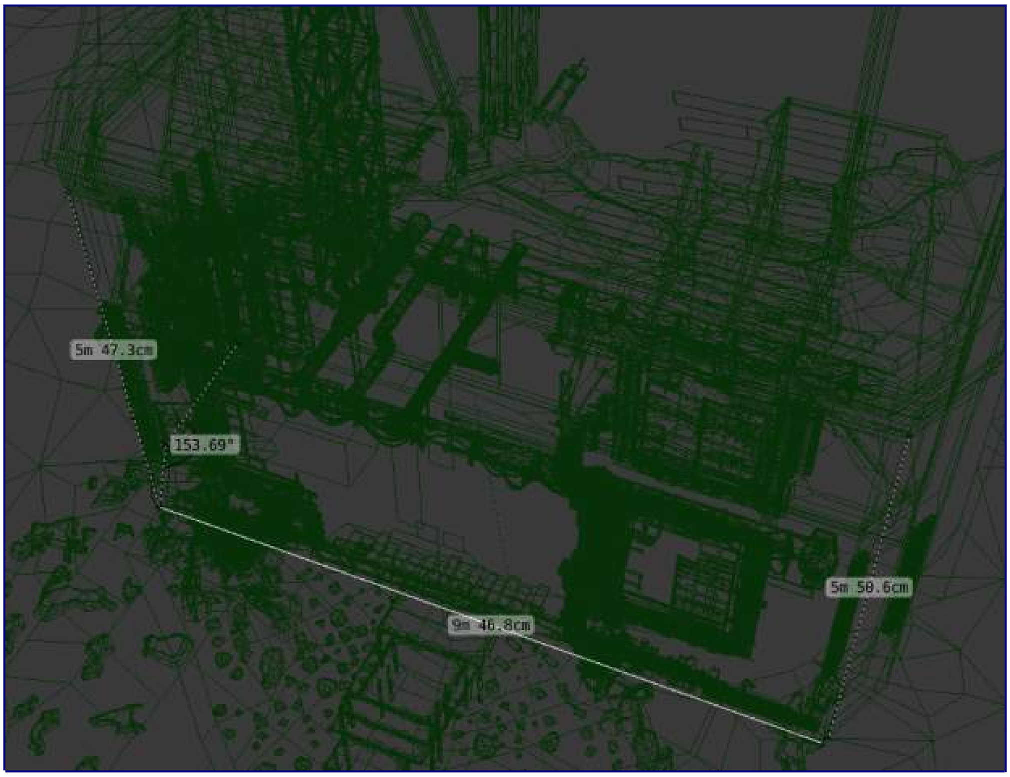
- When you save your *Screencast* in an Image format, the Images will be saved using the entire Blender Window, with full width and height, and the quality of the Image will be defined by its type (i.e. JPG, PNG, and so on) and configuration (i.e. Slider *quality* of the .JPG format).
- When you save your *Screencast* in a Video format, it will be sent to a codec. Depending on the codec limitations, the resulting output Video could be scaled down. Furthermore, some combinations of Window width and height cannot be processed by certain codecs. In these cases, the *Screencast* will try to start, but will immediately stop. In order to solve this, choose another Window format and/or another codec.

Blender Window Dimension

There is a way to match the Blender Window dimensions with the Output Video File, achieving standard dimensions for the output of the Blender Screencast. (I.e. NTSC, HD, Full HD, etc). You can control the width and height of your Blender Window, starting Blender from a Command Line. To learn more about starting Blender from a command line, see the page about *Blender Console Window*.

Ruler and Protractor

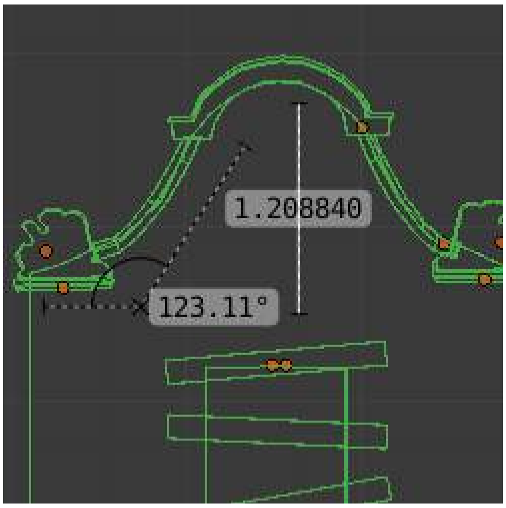
The ruler can be accessed from the toolshelf, once activated you can use the ruler to measure lengths and angles in the scene.



Example of the ruler and protractor.

Example using the ruler to measure thickness.

Usage



Here are common steps for using the ruler.

- Activate the Ruler from the toolshelf.
- Click and drag in the view-port to define the initial start/end point for the ruler.
- Orbit the view and click on either end of the ruler to re-position it. Holding `Ctrl` enables snap to elements.
- Click on the middle to measure angles.
- Press `Return` to store the ruler for later use or `Esc` to cancel.

Note

Editing operations can be used while the ruler is running, however tools like the knife can't be used at the same time.

Note

Unit settings and scale from the scene are used for displaying dimensions.

2.1 Bforartists Standard Keymap

Introduction

The interaction concept for Bforartists is the graphical UI. And so the Bforartists keymap is as reduced as possible. It still contains most of the standard navigation hotkeys, and also standard hotkeys like for copy and paste, but nearly all hotkeys for tools are removed. So that users can implement their own hotkeys how they need it and when they need it.

The keymap that you can find in the Input Manager in the User Preferences is nevertheless still pretty heavy as you can see here. That's because the Input Manager in the user preferences contains all available user interaction. And not just the usual hotkeys to call tools like in other software. There is no distinction between tools and things like editor manipulation. Every user interaction is defined here. So be careful what you change at the here listed input nodes. You may remove a vital part to deal with windows for example.

The hotkeys are also editor specific. So there are lots of repetitions when you need the same hotkeys across several editors too. Navigation hotkeys for example.

Legend

LMB= Left Mouse Button
RMB = Right Mouse Button
Action mouse is the opposite of the select mouse. Bforartists uses LMB select. So the Action Mouse is RMB. And the Select Mouse is LMB.

The concept to use Action mouse and Select mouse is a Blender relict. It's one of the reasons why there was RMB select at all. And will most probably vanish in the further Bforartists development.

Window

Window - Some menu stuff, some general hotkeys like enter to confirm.				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Reload Startup file creates a new scene	Info Editor / File / New	Window / Reload Startup File	Ctrl N	
Open file	Info Editor / File / Open	Window / Open Blender File	Ctrl O	
Save File	Info Editor / File / Save	Window / Save Blender File	Ctrl S	
Save File as	Info Editor / File / Save as	Window / Save As Blender File	Shift Ctrl S	
Save File as Copy	Info Editor / File / Save Copy	Window / Save As Blender File	Ctrl Alt S	
Search Menu	Info Editor / Window / Search Menu	Info Editor / File / Save Copy	Spacebar	
Unknown. Ndof device for 3dConnexion	No Location	Windows / Call Menu	Ndof	Cannot test
Unknown. Ndof device for 3dConnexion	No Location	Windows / Context Scale Float	Ndof Plus	Cannot test
Unknown. Ndof device for 3dConnexion	No Location	Windows / Context Scale Float	Ndof Minus	Cannot test
Unknown. Ndof device for 3dConnexion	No Location	Windows / Context Scale Float	Shift Ndof Plus	Cannot test
Unknown. Ndof device for 3dConnexion	No Location	Windows / Context Scale Float	Shift Ndof Minus	Cannot test
Unknown	No Location	Windows / Update Reports Display	Timer	No hotkey at all.

Screen / Screen (Global)

Screen / Screen (Global)				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Unknown	No Location	Screen / Screen (Global) / Animation Step	Timer 0	No hotkey at all
Unknown	No Location	Screen / Screen (Global) / Region Alpha	Timer Region	No hotkey at all
Change to the next screen layout.	Info Editor / Layout Dropdown box in the menu bar	Screen / Screen (Global) / Set Screen	Ctrl Right Arrow	
Change to the previous screen layout	Info Editor / Layout Dropdown box in the menu bar	Screen / Screen (Global) / Set Screen	Ctrl Left Arrow	
Toggles the current selected editor between Fullscreen and Windowed. WITHOUT menus	RMB menu of the menu bars	Screen / Screen (Global) / Toggle Maximize Area	Ctrl Up Arrow	
Toggles the current selected editor between Fullscreen and Windowed. WITHOUT menus	RMB menu of the menu bars	Screen / Screen (Global) / Toggle Maximize Area	Ctrl Down Arrow	
Toggles the 3D view between a single screen and a quad layout	3D View / View / Toggle Quad View	Screen / Screen (Global) / Toggle Quad View	Ctrl Alt Q	

Screen / Screen (Global)				
Flips the UI region (Tool Shelf) where you have the mouse over to the other side of the current editor. Like the header. Or the sidebars to the left or to the right	None	Screen / Screen (Global) / Flip Region	F5	No menu entry. Hotkey only functionality.
Calls the Last operator panel as a floating menu	None - The original location is at the bottom of the tool shelf	Screen / Screen (Global) / Redo Last	F6	
Reloads all Python scripts, including the Bforartists UI scripts made with Python	Info Editor / Window / Reload Scripts	Screen / Screen (Global) /	F8	
Execute. Like entering a value, then press enter	None	Screen / Screen (Global) / Execute File Window	Return	No menu entry. Hotkey only functionality.
Execute. Like entering a value, then press enter	None	Screen / Screen (Global) / Execute File Window	Numpad Enter	No menu entry. Hotkey only functionality.
Cancel file load	None	Screen / Screen (Global) / Cancel File load	Esc	No menu entry. Hotkey only functionality.
Undo	Sometimes in Object menu, sometimes in Edit menu. Also in 3D View Toolshelf / History	Screen / Screen (Global) / Undo	Ctrl Z	
Redo Sometimes in Object menu, sometimes in Edit menu. Also in 3D View Toolshelf / History	Sometimes in Object menu, sometimes in Edit menu. Also in 3D View Toolshelf / History	Screen / Screen (Global) / Redo	Shift Ctrl Z	
Undo History	Sometimes in Object menu, sometimes in Edit menu. Also in 3D View Toolshelf / History	Screen / Screen (Global) / Redo	Ctrl Alt Z	
Render a single image	Info Editor / Render / Render Image	Screen / Screen (Global) / Render	F12	
Render animation sequence	Info Editor / Render / Render Animation	Screen / Screen (Global) / Render	Ctrl F12	
Escapes the Render View	No Menu entry	Screen / Screen (Global) / Cancel Render View	Esc	
Show / Hide Render View	Info Editor / Render / Show / Hide Render View	Screen / Screen (Global) / Show / Hide Render View	F11	

Screen /Screen Editing

Screen /Screen Editing - All around dealing with the editor windows. Split, join, etc. DO NOT CHANGE!				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Split / Join window code. Needed for Move Area edges and Area Options	None	Screen / Screen Editing / Handle Area Action Zones	LMB	No menu entry. Mouse functionality.
Make new floating window. First part. You need both parts.	None	Screen / Screen Editing / Handle Area Action Zones	Shift LMB	No menu entry. Mouse functionality.
Drag into other editor window to swap position with it. First part. You need both parts.	None	Screen / Screen Editing / Handle Area Action Zones	Ctrl LMB	No menu entry. Mouse functionality.
Split Area code	None	Screen / Screen Editing / Split area		No menu entry. Mouse functionality.

Screen /Screen Editing - All around dealing with the editor windows. Split, join, etc. DO NOT CHANGE!				
Join Area code	None	Screen / Screen Editing / Join Area		No menu entry. Mouse functionality.
Make new floating window. Second part. You need both parts.	None	Screen / Screen Editing / Duplicate Area into new Window	Shift	No menu entry. Mouse functionality.
Drag into other editor window to swap position with it. Second part. You need both parts.	None	Screen / Screen Editing / Swap Areas	Ctrl	No menu entry. Mouse functionality.
Scale Region Size	None	Screen / Screen Editing / Scale Region Size		No menu entry. Mouse functionality.
Toggle Fullscreen Area	No idea where it could be	Screen / Screen Editing / Toggle Fullscreen Area		No menu entry. Mouse functionality.
Split Windows	None	Screen / Screen Editing / Move Area Edges	LMB	No menu entry. Mouse functionality.
Join Windows	None	Screen / Screen Editing / Area Options	RMB	No menu entry. Mouse functionality.

Screen / Header

Header - DO NOT CHANGE!				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Calls the RMB menu at headers	Every header menu bar	Header / Header Toolbox	RMB	No menu entry. Mouse functionality.

View 2D

View 2D - Global navigation stuff for 2D panels and editors. DO NOT CHANGE!				
Function	Surface menu location	User Preferences location	Hotkey	Special note
???	None	View 2D / Scroller Activate	LMB	No menu entry. Mouse functionality.
???	None	View 2D / Scroller Activate	MMB	No menu entry. Mouse functionality.
???	None	View 2D / Pan View	MMB	No menu entry. Mouse functionality.
???	None	View 2D / Pan View	Shift MMB	No menu entry. Mouse functionality.
???	None	View 2D / Pan View	Mouse/ Trackpad pan	No menu entry. Mouse functionality.
???	None	View 2D / Scroll right	Ctrl Wheel down	No menu entry. Mouse functionality.
???	None	View 2D / Scroll left	Ctrl Wheel up	No menu entry. Mouse functionality.
???	None	View 2D / Scroll down	Shift Wheel down	No menu entry. Mouse functionality.
???	None	View 2D / Scroll up	Shift Wheel up	No menu entry. Mouse functionality.
Ndof device for 3dConnexion	None	View 2D / NDOF Pan/Zoom	Ndof Motion	Cannot test
???	UV Editor / View / View Zoom Out	View 2D / Zoom out	Wheel out	No menu entry. Mouse functionality.

View 2D - Global navigation stuff for 2D panels and editors. DO NOT CHANGE!				
???	UV Editor / View / View Zoom In	View 2D / Zoom in	Wheel in	No menu entry. Mouse functionality.
???	None	View 2D / Zoom out	Numpad -	No menu entry. Entry already exists for scroll wheel functionality above.
???	None	View 2D / Zoom in	Numpad +	No menu entry. Entry already exists for scroll wheel functionality above.
???	None	View 2D / Zoom 2D View	Ctrl Mouse/ Trackpad pan	No menu entry. Mouse functionality.
???	None	View 2D / Smooth view 2D	Timer 1	No hotkey at all
???	None	View 2D / Scroll down	Wheel down	No menu entry. Mouse functionality.
???	None	View 2D / Scroll up	Wheel up	No menu entry. Mouse functionality.
???	None	View 2D / Scroll right	Wheel down	No menu entry. Mouse functionality.
???	None	View 2D / Scroll left	Wheel up	No menu entry. Mouse functionality.
???	None	View 2D / Zoom 2D View	Ctrl MMB	No menu entry. Mouse functionality.
???	None	View 2D / Zoom 2D View	Mouse/Trackpad Zoom	No menu entry. Mouse functionality.

View 2D Buttons List

View 2D Buttons List - Global navigation stuff for 2D panels and editors. DO NOT CHANGE!				
Function	Surface menu location	User Preferences location	Hotkey	Special note
UV Editor Toolshelf navigation	None	View 2D Buttons List / Scroller Activate	LMB	No menu entry. Mouse functionality.
UV Editor Toolshelf navigation	None	View 2D Buttons List / Scroller Activate	MMB	No menu entry. Mouse functionality.
UV Editor Toolshelf navigation	None	View 2D Buttons List / Pan View	MMB	No menu entry. Mouse functionality.
UV Editor Toolshelf navigation	None	View 2D Buttons List / Scroller Activate	Mouse /Trackpad Pan	No menu entry. Mouse functionality.
UV Editor Toolshelf navigation	None	View 2D Buttons List / Scroll down	Wheel down	No menu entry. Mouse functionality.
UV Editor Toolshelf navigation	None	View 2D Buttons List / Scroll up	Wheel up	No menu entry. Mouse functionality.
UV Editor Toolshelf navigation	None	View 2D Buttons List / Scroll down	Page down	No menu entry possible.
UV Editor Toolshelf navigation	None	View 2D Buttons List / Scroll up	Page Up	No menu entry possible.
UV Editor Toolshelf navigation	None	View 2D Buttons List / Zoom 2D View	Ctrl Middle Mouse	No menu entry. Mouse functionality.
UV Editor Toolshelf navigation	None	View 2D Buttons List / Zoom 2D View	Mouse/ Trackpad Zoom	No menu entry. Mouse functionality.
UV Editor Toolshelf navigation	None	View 2D Buttons List / Zoom 2D View	Ctrl Mouse/Trackpad Pan	No menu entry. Mouse functionality.
UV Editor Toolshelf navigation	None	View 2D Buttons List / Zoom out	Numpad -	No menu entry possible.

View 2D Buttons List - Global navigation stuff for 2D panels and editors. DO NOT CHANGE!				
UV Editor Toolshelf navigation	None	View 2D Buttons List / Zoom in	Numpad +	No menu entry possible.
UV Editor Toolshelf navigation	None	View 2D Buttons List / Reset View	Home	No menu entry possible.

User Interface

User Interface - Needs Investigation as a whole! - DOES NOT EXIST IN BLENDER 2.78c - Most probably an experimental change in the master.

Function	Surface menu location	User Preferences location	Hotkey	Special note
???	???	User Interface / Eyedropper	E	
???	???	User Interface / Eyedropper Data-Block	E	
???	???	User Interface / Eyedropper Depth	E	
???	???	User Interface / Copy Data Path	Shift Ctrl C	
???	???	User Interface / Copy Data Path	Shift Ctrl Alt C	
???	???	User Interface / Insert Keyframe (Buttons)	I	
???	???	User Interface / Clear Keyframe (Buttons)	Shift Alt I	
???	???	User Interface / Add Driver	Ctrl D	
???	???	User Interface / Remove Driver	Ctrl Alt D	
???	???	User Interface / Add to Keying Set	K	
???	???	User Interface / Remove from Keying Set	Alt K	

3D View / 3D View (Global)

3D View / 3D View (Global) - Mainly all the navigation stuff

Function	Surface menu location	User Preferences location	Hotkey	Special note
Needed for the 3D manipulator to work	None	3D View / 3D View (Global) / 3D Manipulator	Shift Left Mouse	No menu entry. Mouse functionality.
Needed for the 3D manipulator to work	None	3D View / 3D View (Global) / 3D Manipulator	Any Left mouse	**No menu entry. Mouse functionality. Covered by the Important Hotkeys addon**
Sets the 3D cursor position to Mouse position.	None	3D View / 3D View (Global) / Set 3D Cursor	Alt Action Mouse	**No menu entry. Mouse functionality. Covered by the Important Hotkeys addon**
Rotate view	3D view / tool shelf /tools tab / transform panel / Rotate Button	3D View / 3D View (Global) / Rotate View	RMB	
Rotate view	None	3D View / 3D View (Global) / Rotate View	Alt MMB	**Workaround to allow rotation with knife mode too!**

3D View / 3D View (Global) - Mainly all the navigation stuff				
Move view	3D view / tool shelf /tools tab / transform panel / Translate Button	3D View / 3D View (Global) / Move View	MMB	
Zoom view. See also the other zoom methods.	3D view / tool shelf /tools tab / transform panel / Scale Button	3D View / 3D View (Global) / Zoom View	Ctrl MMB	
Dolly View moves the World camera forward or backward. Be careful with that one! You can trap yourself that regular zoom seems to have no more effect.	3D Viewport / View / Navigation / Dolly Zoom	3D View / 3D View (Global) / Dolly View	Shift Ctrl MMB	
Brings the selected object into focus. With all regions.	3D Viewport / View / View Selected all Regions	3D View / 3D View (Global) / View Selected	Ctrl Numpad 0	
Brings the selected object into focus	3D Viewport / View / View Selected	3D View / 3D View (Global) / View Selected	Numpad 0	
Locks the view to active object	3D Viewport / View / View Selected	3D View / 3D View (Global) / View Lock to active	Shift Numpad ,	
Unlocks the view of the formerly locked object	3D Viewport / View / Align View /	3D View / 3D View (Global) / View Lock to active	Alt Numpad ,	
???	None	3D View / 3D View (Global) / Smooth View		Event mapping Timer
Rotates the view with trackpad	None	3D View / 3D View (Global) / Rotate View	Mouse/Trackpad pan	**No menu entry. Mouse functionality. Covered by the Important Hotkeys addon**
Rotates the view with trackpad	None	3D View / 3D View (Global) / Rotate View	Mouse/Trackpad Rotate	**No menu entry. Mouse functionality. Covered by the Important Hotkeys addon**
Moves the view with trackpad	None	3D View / 3D View (Global) / Move View	Shift Mouse/Trackpad pan	**No menu entry. Mouse functionality. Covered by the Important Hotkeys addon**
Zooms the view with trackpad	None	3D View / 3D View (Global) / Zoom View	Mouse/Trackpad Zoom	**No menu entry. Mouse functionality. Covered by the Important Hotkeys addon**
Zooms the view with trackpad	None	3D View / 3D View (Global) / Zoom View	Ctrl Mouse/Trackpad pan	**No menu entry. Mouse functionality. Covered by the Important Hotkeys addon**
Zooms in	3D Viewport / View / View Selected	3D View / 3D View (Global) / Zoom View	Numpad +	**Covered by the Important Hotkeys addon**
Zooms out	3D Viewport / View / View Selected	3D View / 3D View (Global) / Zoom View	Numpad -	**Covered by the Important Hotkeys addon**
Zooms in	None	3D View / 3D View (Global) / Zoom View	Ctrl = (german keyboard Ctrl *)	**No menu entry.** Double Entry! But may be useful for laptop users that has no numpad. **Covered by the Important Hotkeys addon**
Zooms out	None	3D View / 3D View (Global) / Zoom View	Ctrl -	**No menu entry.** Double Entry! But may be useful for laptop users that has no numpad.**Covered by the Important Hotkeys addon**

3D View / 3D View (Global) - Mainly all the navigation stuff				
Zooms in	None	3D View / 3D View (Global) / Zoom View	Wheel in	**No menu entry. Mouse functionality. Covered by the Important Hotkeys addon**
Zooms out	None	3D View / 3D View (Global) / Zoom View	Wheel out	**No menu entry. Mouse functionality. Covered by the Important Hotkeys addon**
Moves in. Dolly View moves the World camera forward or backward. Be careful with that one! You can trap yourself that regular zoom seems to have no more effect.	None	3D View / 3D View (Global) / Dolly View	Shift Numpad +	**No menu entry. Double Entry! The regular way to dolly zoom is with middle mouse button. But may be useful for laptop users that has no mouse with mmb.**
Moves out. Dolly View moves the World camera forward or backward. Be careful with that one! You can trap yourself that regular zoom seems to have no more effect.	None	3D View / 3D View (Global) / Dolly View	Shift Numpad -	**No menu entry. Double Entry! The regular way to dolly zoom is with middle mouse button. But may be useful for laptop users that has no mouse with mmb.**
Moves in. Dolly View moves the World camera forward or backward. Be careful with that one! You can trap yourself that regular zoom seems to have no more effect.	None	3D View / 3D View (Global) / Dolly View	Shift Ctrl = (german keyboard Shift Ctrl *)	**No menu entry. Double Entry! The regular way to dolly zoom is with middle mouse button.But may be useful for laptop users that has no numpad.**
Moves out. Dolly View moves the World camera forward or backward. Be careful with that one! You can trap yourself that regular zoom seems to have no more effect.	None	3D View / 3D View (Global) / Dolly View	Shift Ctrl -	**No menu entry. Double Entry! The regular way to dolly zoom is with middle mouse button.But may be useful for laptop users that has no numpad.**
Zooms Camera 1:1 when you are in camera view. Means it fits the passepartout left and right into the screen.	3D Viewport / View / Navigation / Zoom Camera 1:1	3D View / 3D View (Global) / Zoom Camera 1:1	Shift Numpad Enter	
Centers the view to the current active Lock Center, in camera view	3D Viewport / View / Align View / View Camera Center	3D View / 3D View (Global) / View Lock Center	Home (Pos1 at german keyboard)	
Centers view at the 3D cursor	3D Viewport / View / Align View / Center View to cursor	3D View / 3D View (Global) / Center View to cursor	Alt Home (Alt Pos1 at german keyboard)	
Centers view at the current mouse position	3D Viewport / View / Navigation / Center View to mouse	3D View / 3D View (Global) / Center View to mouse	Alt F	
Views all	3D Viewport / View / View all	3D View / 3D View (Global) / View All	Home (Pos1 at german keyboard)	
Switches between active camera and World view	3D Viewport / View / Cameras / Active Camera	3D View / 3D View (Global) / View Numpad	Numpad ,	
Switches to Front Ortho sight	3D Viewport / View / Front	3D View / 3D View (Global) / View Numpad	Numpad 1	
Orbit down	3D Viewport / View / Navigation / Orbit down	3D View / 3D View (Global) / View Orbit	Numpad 2	
Switches to Left Ortho sight	3D Viewport / View / Front	3D View / 3D View (Global) / View Numpad	Numpad 3	

3D View / 3D View (Global) - Mainly all the navigation stuff				
Orbit Left	3D Viewport / View / Navigation / Orbit Left	3D View / 3D View (Global) / View Orbit	Numpad 4	
Changes between orthographic and perspectivic presentation of the 3D viewport.	3D Viewport / View / View Persp/Ortho	3D View / 3D View (Global) / View Persp/ Ortho	Numpad 5	
Orbit Right	3D Viewport / View / Navigation / Orbit Right	3D View / 3D View (Global) / View Orbit	Numpad 6	
Switches to Top Ortho sight	3D Viewport / View / Top	3D View / 3D View (Global) / View Numpad	Numpad 7	
Orbit Up	3D Viewport / View / Navigation / Orbit Up	3D View / 3D View (Global) / View Orbit	Numpad 8	
Switches to Back Ortho sight	3D Viewport / View / Back	3D View / 3D View (Global) / View Numpad	Ctrl Numpad 1	
Switches to Left Ortho sight	3D Viewport / View / Left	3D View / 3D View (Global) / View Numpad	Ctrl Numpad 3	
Switches to Bottom Ortho sight	3D Viewport / View / Bottom	3D View / 3D View (Global) / View Numpad	Ctrl Numpad 7	
Moves the view down	3D Viewport / View / Pan down	3D View / 3D View (Global) / View Pan	Ctrl Numpad 2	
Moves the view left	3D Viewport / View / Pan Left	3D View / 3D View (Global) / View Pan	Ctrl Numpad 4	
Moves the view right	3D Viewport / View / Pan Right	3D View / 3D View (Global) / View Pan	Ctrl Numpad 6	
Moves the view up	3D Viewport / View / Pan Up	3D View / 3D View (Global) / View Pan	Ctrl Numpad 8	
Mirrors the axis orientation	3D Viewport / View / Navigation / Orbit opposite	3D View / 3D View (Global) / View Orbit	Numpad 9	
Moves the view right	None	3D View / 3D View (Global) / View Pan	Ctrl Wheel Up	No menu entry. Mouse functionality. Double Entry! But may be useful for laptop users that has no numpad.
Moves the view left	None	3D View / 3D View (Global) / View Pan	Ctrl Wheel Down	No menu entry. Mouse functionality. Double Entry! But may be useful for laptop users that has no numpad.
Moves the view up	None	3D View / 3D View (Global) / View Pan	Shift Wheel Up	No menu entry. Mouse functionality. Double Entry! But may be useful for laptop users that has no numpad.
Moves the view up	None	3D View / 3D View (Global) / View Pan	Shift Wheel down	No menu entry. Mouse functionality. Double Entry! But may be useful for laptop users that has no numpad.
Orbit Left	None	3D View / 3D View (Global) / View Orbit	Ctrl Alt Wheel Up	No menu entry. Mouse functionality. Double Entry! But may be useful for laptop users that has no numpad.
Orbit right	None	3D View / 3D View (Global) / View Orbit	Ctrl Alt Wheel Down	No menu entry. Mouse functionality. Double Entry! But may be useful for laptop users that has no numpad.
Orbit up	None	3D View / 3D View (Global) / View Orbit	Shift Alt Wheel Up	No menu entry. Mouse functionality. Double Entry! But may be useful for laptop users that has no numpad.

3D View / 3D View (Global) - Mainly all the navigation stuff				
Orbit down	None	3D View / 3D View (Global) / View Orbit	Shift Alt Wheel Down	No menu entry. Mouse functionality. Double Entry! But may be useful for laptop users that has no numpad.
Rolls the view counter clockwise	None	3D View / 3D View (Global) / View Roll	Shift Ctrl Wheel up	No menu entry. Mouse functionality. Double Entry! But may be useful for laptop users that has no numpad.
Rolls the view clockwise	None	3D View / 3D View (Global) / View Roll	Shift Ctrl Wheel down	No menu entry. Mouse functionality. Double Entry! But may be useful for laptop users that has no numpad.
Switches to Front Ortho, but with the selected Object in center.	3D Viewport / View / Align View / Front	3D View / 3D View (Global) / View Numpad	Shift Numpad 1	
Switches to Right Ortho, but with the selected Object in center.	3D Viewport / View / Align View / Right	3D View / 3D View (Global) / View Numpad	Shift Numpad 3	
Switches to Top Ortho, but with the selected Object in center.	3D Viewport / View / Align View / Top	3D View / 3D View (Global) / View Numpad	Shift Numpad 7	
Switches to Back Ortho, but with the selected Object in center.	3D Viewport / View / Align View / Back	3D View / 3D View (Global) / View Numpad	Shift Ctrl Numpad 1	
Switches to Left Ortho, but with the selected Object in center.	3D Viewport / View / Align View / Left	3D View / 3D View (Global) / View Numpad	Shift Ctrl Numpad 3	
Switches to Bottom Ortho, but with the selected Object in center.	3D Viewport / View / Align View / Bottom	3D View / 3D View (Global) / View Numpad	Shift Ctrl Numpad 7	
Switches between local view and global view	3D Viewport / View / Global/Local	3D View / 3D View (Global) / Local View	Numpad /	
Ndof device for 3dConnexion	None	3D View / 3D View (Global) / Ndof Orbit View with Zoom	Ndof Motion	Cannot test
Ndof device for 3dConnexion	None	3D View / 3D View (Global) / Ndof Orbit View	Ctrl Ndof Motion	Cannot test
Ndof device for 3dConnexion	None	3D View / 3D View (Global) / Ndof Pan View	Shift Ndof Motion	Cannot test
Ndof device for 3dConnexion	None	3D View / 3D View (Global) / Ndof Move View	Shift Ctrl Ndof Motion	Cannot test
Ndof device for 3dConnexion	None	3D View / 3D View (Global) / View Selected	Ndof fit	Cannot test
Ndof device for 3dConnexion	None	3D View / 3D View (Global) / Ndof Orbit View with Zoom3D View / 3D View (Global) / Ndof Orbit View with Zoom	Ndof roll ccw	Cannot test
Ndof device for 3dConnexion	None	3D View / 3D View (Global) / View Roll	Ndof roll cw	Cannot test
Ndof device for 3dConnexion	None	3D View / 3D View (Global) / View Roll	Ndof Front	Cannot test
Ndof device for 3dConnexion	None	3D View / 3D View (Global) / View Numpad	Ndof Back	Cannot test
Ndof device for 3dConnexion	None	3D View / 3D View (Global) / View Numpad	Ndof Left	Cannot test
Ndof device for 3dConnexion	None	3D View / 3D View (Global) / View Numpad	Ndof Right	Cannot test

3D View / 3D View (Global) - Mainly all the navigation stuff				
Ndof device for 3dConnexion	None	3D View / 3D View (Global) / View Numpad	Ndof Top	Cannot test
Ndof device for 3dConnexion	None	3D View / 3D View (Global) / View Numpad	Ndof Bottom	Cannot test
Ndof device for 3dConnexion	None	3D View / 3D View (Global) / View Numpad	Shift Ndof Front	Cannot test
Ndof device for 3dConnexion	None	3D View / 3D View (Global) / View Numpad	Shift Ndof Right	Cannot test
Ndof device for 3dConnexion	None	3D View / 3D View (Global) / View Numpad	Shift Ndof Top	Cannot test
Activate/Select	None	3D View / 3D View (Global) / Activate/Select	Select Mouse	No menu entry. Mouse functionality. Fundamental interaction. **Covered by the Important Hotkeys addon**
Activate/Select	None	3D View / 3D View (Global) / Activate/Select	Shift Select Mouse	No menu entry. Mouse functionality. Fundamental interaction. **Covered by the Important Hotkeys addon**
Activate/Select	None	3D View / 3D View (Global) / Activate/Select	Ctrl Select Mouse	No menu entry. Mouse functionality. Fundamental interaction
Activate/Select	None	3D View / 3D View (Global) / Activate/Select	Alt Select Mouse	No menu entry. Mouse functionality. Fundamental interaction
Activate/Select	None	3D View / 3D View (Global) / Activate/Select	Shift Ctrl Select Mouse	No menu entry. Mouse functionality. Fundamental interaction
Activate/Select	None	3D View / 3D View (Global) / Activate/Select	Ctrl Alt Select Mouse	No menu entry. Mouse functionality. No menu entry. Mouse functionality. Fundamental interaction
Activate/Select	None	3D View / 3D View (Global) / Activate/Select	Shift Alt Select Mouse	No menu entry. Mouse functionality. Fundamental interaction
Activate/Select	None	3D View / 3D View (Global) / Activate/Select	Shift Ctrl Alt Select Mouse	No menu entry. Mouse functionality. Fundamental interaction
Border Select	3D Viewport / Select / Border Select	3D View / 3D View (Global) / Border Select	B	
Lasso Select, select	3D Viewport / Select / Lasso Select	3D View / 3D View (Global) / Lasso Select	Ctrl Action Mouse (with lmb select action mouse is rmb)	Event Mapping Tweak
Lasso Select, deselect	None	3D View / 3D View (Global) / Lasso Select	Shift Ctrl Action Mouse (with lmb select action mouse is rmb)	**No menu entry.** Event Mapping Tweak
Circle Select	3D Viewport / Select / Circle Select	3D View / 3D View (Global) / Circle Select	G	
Copy	3D Viewport / Object / Copy	3D View / 3D View (Global) / Copy Selection to Buffer	Ctrl C	
Paste	3D Viewport / Object / Paste	3D View / 3D View (Global) / Paste Selection from Buffer	Ctrl V	
Move	3D Viewport / Tool Shelf / Tools / Transform tab / Translate	3D View / 3D View (Global) / Translate	W	

3D View / 3D View (Global) - Mainly all the navigation stuff				
Move	None	3D View / 3D View (Global) / Translate		**No menu entry.** Event mapping Tweak. **Covered by the Important Hotkeys addon**
Rotate	3D Viewport / Tool Shelf / Tools / Transform tab / Rotate	3D View / 3D View (Global) / Rotate	E	
Scale	3D Viewport / Tool Shelf / Tools / Transform tab / Scale	3D View / 3D View (Global) / Resize	R	
Part of the Reset 3D View Addon. Resets the 3D View.	3D Viewport / View / Reset 3D View	3D View / 3D View (Global) / Reset 3D View	Numpad *	
Stroke Select addon. Activates stroke select with hold down key.	3D Viewport / Select / Stroke Select	3D View / 3D View (Global) / Stroke Select	I Select Mouse	
Toggles the 3D Widget in the viewport	3D Viewport / Header / 3d Widget button	3D View / 3D View (Global) / Context Toggle	Q	
Rolls the view counter clockwise	3D View / Navigation / Roll Left	3D View / 3D View (Global) / View Roll	Shift Ctrl Numpad 4	
Rolls the view clockwise	3D View / Navigation / Roll Right	3D View / 3D View (Global) / View Roll	Shift Ctrl Numpad 6	

3D View - Object Mode

3D View - Object Mode				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Select all / Deselect all	3D Viewport / Select / (De)select all	3D View / Object Mode / (De)select All	A	
Inverse selection	3D Viewport / Select / Inverse	3D View / Object Mode / (De)select All	Ctrl I	
Make Parent	3D Viewport / Object / Parent	3D View / Object Mode / Make Parent	Ctrl P	One of the Popup Panels that we have to keep for now!
Show hidden Objects	3D Viewport / Object / Show Hide / Show Hidden	3D View / Object Mode / Clear Restrict View	Alt H	
Hide selected Object	3D Viewport / Object / Show Hide / Hide selected	3D View / Object Mode / Set Restrict View	H	
Hide unselected Object(s)	3D Viewport / Object / Show Hide / Hide unselected	3D View / Object Mode / Set Restrict View	Shift H	
Delete	3D Viewport / Object / Delete	3D View / Object Mode / Delete	Delete	
Duplicate Objects	3D Viewport / Object / Duplicate Objects	3D View / Object Mode / Duplicate Objects	Shift D	
Join Object	3D Viewport / Object / Join	3D View / Object Mode / Join	Ctrl J	
Adds a SDS modifier to selected object and sets SDS Level to value	3D Viewport / Object / Subdivide / Subdivision Set	3D View / Object Mode / Subdivision Set	Ctrl 0	
Adds a SDS modifier to selected object and sets SDS Level to value	3D Viewport / Object / Subdivide / Subdivision Set	3D View / Object Mode / Subdivision Set	Ctrl 1	
Adds a SDS modifier to selected object and sets SDS Level to value	3D Viewport / Object / Subdivide / Subdivision Set	3D View / Object Mode / Subdivision Set	Ctrl 2	

3D View - Object Mode				
Adds a SDS modifier to selected object and sets SDS Level to value	3D Viewport / Object / Subdivide / Subdivision Set	3D View / Object Mode / Subdivision Set	Ctrl 3	
Adds a SDS modifier to selected object and sets SDS Level to value	3D Viewport / Object / Subdivide / Subdivision Set	3D View / Object Mode / Subdivision Set	Ctrl 4	
Adds a SDS modifier to selected object and sets SDS Level to value	3D Viewport / Object / Subdivide / Subdivision Set	3D View / Object Mode / Subdivision Set	Ctrl 5	
Inverses the current Selection	3D Viewport / Select / Inverse	3D View / Object Mode / Clear Parent	Ctrl I	

3D View - Mesh

Mesh - Edit Mode				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Selects a edgeloop	None	3D View / Mesh / Loop Select	Alt Select Mouse	**No menu entry. Mouse functionality. Covered by the Important Hotkeys addon**
Selects a edgeloop, adds to selection.	None	3D View / Mesh / Loop Select	Shift Alt Select Mouse	**No menu entry. Mouse functionality. Covered by the Important Hotkeys addon**
Selects a ring loop	None	3D View / Mesh / Edge Ring Select	Ctrl Alt Select Mouse	**No menu entry. Mouse functionality. Covered by the Important Hotkeys addon**
Selects a ring loop, adds to selection.	None	3D View / Mesh / Edge Ring Select	Shift Ctrl Alt Select Mouse	**No menu entry. Mouse functionality. Covered by the Important Hotkeys addon**
Select shortest path between srating and end edge	None	3D View / Mesh / Pick shortest path	Ctrl Select Mouse	**No menu entry. Mouse functionality. Covered by the Important Hotkeys addon**
Selects / deselects all	3D View / Select / (De)select all	3D View / Mesh / (De)select all	A	
Inverts the selection	3D View / Select / Inverse	3D View / Mesh / (De)select all	Ctrl I	
Select more	3D View / Select / Select More	3D View / Mesh / Select More	Ctrl Numpad +	
Select less	3D View / Select / Select Less	3D View / Mesh / Select Less	Ctrl Numpad -	
Select Linked	3D View / Select / Linked Pick Select	3D View / Mesh / Select Linked	L	
Deselect Linked	3D View / Select / Linked Pick Deselect	3D View / Mesh / Select Linked	Shift L	
Hide selected Object	3D Viewport / Mesh / Show Hide / Hide selected	3D View / Mesh / Hide selection	H	
Hide unselected Object(s)	3D Viewport / Mesh / Show Hide / Hide unselected	3D View / Mesh / Hide selection	Shift H	
Show hidden Objects	3D Viewport / Mesh / Show Hide / Show Hidden	3D View / Mesh / Reveal Hidden	Alt H	

Mesh - Edit Mode				
Extrude and Move on Normals	3D Viewport / Mesh / Extrude / Region	3D View / Mesh / Extrude and Move on Normals	S	Original Hotkey was E. But E is occupied by navigation now. So changed it to S
Adds a duplicate	3D Viewport / Mesh / Add Duplicate	3D View / Mesh / Add Duplicate	Shift D	
Adds a duplicate of selection at mouse position, slightly rotates source object and target object	3D Viewport / Tool Shelf / Tools / Mesh Tools/ DupliEx	3D View / Mesh / Duplicate or Extrude to Cursor	Ctrl Action Mouse	
Adds a duplicate of selection at mouse position, slightly rotates target object only	3D Viewport / Tool Shelf / Tools / Mesh Tools/ DupliExRot	3D View / Mesh / Duplicate or Extrude to Cursor	Shift Ctrl Action Mouse	
Calls the Delete menu quiz	3D Viewport / Mesh / Delete	3D View / Mesh / Delete	Ctrl + Delete	
Calls the Knife tool	3D Viewport / Tool Shelf / Tools / Mesh Tools/ Knife	3D View / Mesh / Knife Topology Tool	K	
Calls the Knife tool for new topology. Needs a selection	3D Viewport / Tool Shelf / Tools / Mesh Tools/ Select	3D View / Mesh / Knife Topology Tool	Shift K	
Calls the Unwrap submenu	3D Viewport / Tool Shelf / Shading / UV's / UV's / Unwrap	3D View / Mesh / Call Menu	U	Keep this one until the new UI is done. Very useful time saver!
Adds a SDS modifier to selected object and sets SDS Level to value	3D Viewport / Mesh / Subdivide / Subdivision Set	3D View / Mesh / Subdivision Set	Ctrl 0	
Adds a SDS modifier to selected object and sets SDS Level to value	3D Viewport / Mesh / Subdivide / Subdivision Set	3D View / Mesh / Subdivision Set	Ctrl 1	
Adds a SDS modifier to selected object and sets SDS Level to value	3D Viewport / Mesh / Subdivide / Subdivision Set	3D View / Mesh / Subdivision Set	Ctrl 2	
Adds a SDS modifier to selected object and sets SDS Level to value	3D Viewport / Mesh / Subdivide / Subdivision Set	3D View / Mesh / Subdivision Set	Ctrl 3	
Adds a SDS modifier to selected object and sets SDS Level to value	3D Viewport / Mesh / Subdivide / Subdivision Set	3D View / Mesh / Subdivision Set	Ctrl 4	
Adds a SDS modifier to selected object and sets SDS Level to value	3D Viewport / Mesh / Subdivide / Subdivision Set	3D View / Mesh / Subdivision Set	Ctrl 5	
Deletes mode dependant what is selected in Edit mode.	3D Viewport / Mesh / Delete	3D View / Mesh / Smart Delete	Delete	
Sets selection mode to Vertices	3D Viewport / toolbar	3D View / Mesh / Select Mode	X	
Sets selection mode to Edge	3D Viewport / toolbar	3D View / Mesh / Select Mode	C	
Sets selection mode to Face	3D Viewport / toolbar	3D View / Mesh / Select Mode	V	
Make vertex parent parents an object to a vertice	3D Viewport / Tool Shelf / Relations / Make Vertex Parent	3D View / Mesh / Make Vertex Parent	Ctrl P	
Calls the Delete menu quiz	3D Viewport / Mesh / Delete	3D View / Mesh / Delete	Ctrl + Delete	
Clear Seam for Unwrapping	3D Viewport / Tool Shelf / Shading/UV's / UV's	3D View / Mesh / Mark Seam	N	
Deletes mode dependant what is selected in Edit mode.	3D Viewport / Mesh / Delete	3D View / Mesh / Smart Delete	Delete	

Mesh - Edit Mode				
Separate	3D Viewport / Mesh / Separate	3D View / Mesh / Separate	P	
Mark Seam for Unwrapping	3D Viewport / Tool Shelf / Shading/UV's / UV's	3D View / Mesh / Mark Seam	M	
Adds a edgeloop across selected faces, which can then be moved. Right click centers the loop.	3D Viewport / Tool Shelf / Tools / Mesh Tools /	3D View / Mesh / Loop Cut and Slide	Ctrl R	

3D View - Curve

3D View - Curve - everything connected with curve editing				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Add Vertex	None	3D View / Curve / Add Vertex	Ctrl Action Mouse	
Selects or deselects all	3D Viewport / Select / (De)select all	3D View / Curve / (De)select all	A	
Inverts the selection	3D Viewport / Select / Inverse	3D View / Curve / (De)select all	Ctrl I	
Select more	3D Viewport / Select / Select More	3D View / Curve / Select More	Ctrl Numpad +	
Select less	3D Viewport / Select / Select Less	3D View / Curve / Select Less	Ctrl Numpad -	
Select Linked	3D View / Select / Linked Pick Select	3D View / Curve / Set Linked	L	
Deelect Linked	3D View / Select / Linked Pick Deselect	3D View / Curve / Set Linked	Shift L	
Picks shortest path	None	3D View / Curve / Picks shortest path	Ctrl Select Mouse	**No menu entry. Mouse only action. Covered by the Important Hotkeys addon**
Extrudes a new path segment	3D Viewport / Tool Shelf / Tools / Curve Tools / Extrude	3D View / Curve / Extrude	S	
Add Duplicate	3D Viewport / Curve / Add Duplicate	3D View / Curve / Add Duplicate	Shift D	
Delete	3D Viewport / Curve / Delete	3D View / Curve / Delete	Delete	
Show hidden Objects	3D Viewport / Curve / Show Hide / Show Hidden	3D View / Curve / Reveal Hidden	Alt H	
Hide selected Object	3D Viewport / Curve / Show Hide / Hide selected	3D View / Curve / Hide selection	H	
Hide unselected Object(s)	3D Viewport / Curve / Show Hide / Hide unselected	3D View / Curve / Hide selection	Shift H	
Separate	3D Viewport / Curve / Separate	3D View / Curve / Separate	P	
Make Vertex Parent parents an object to a vertex	3D Viewport / Tool Shelf / Relations / Make Vertex Parent	3D View / Curve / Make Vertex Parent	Ctrl P	

3D View - Armature

3D View - Armature				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Sketch delete. Works for skeleton sketching	3D Viewport / Properties toolbar Skeleton Sketching / Delete Strokes	3D View / Armature / Delete	Delete	
Ends the stroke from the skeleton sketching	None	3D View / Armature / End Stroke	Right Mouse	**No menu entry. Mouse only action. Covered by the Important Hotkeys addon**
Ends the stroke from the skeleton sketching	None	3D View / Armature / Cancel Stroke	Esc	**No menu entry. Cancel with esc should be obvious. And rmb ends the stroke too. Not covered by the Important Hotkeys addon. But should be obvious enough. And is not really workflow important.**
Draws skeleton sketching	None	3D View / Armature / Gesture	Shift Left Mouse	**No menu entry. Mouse only action. Covered by the Important Hotkeys addon**
Draws skeleton sketching	None	3D View / Armature / Draw Stroke	LMB	**No menu entry. Mouse only action. Covered by the Important Hotkeys addon**
Draws skeleton sketching	None	3D View / Armature / Draw Stroke	Ctrl LMB	**No menu entry. Mouse only action. Covered by the Important Hotkeys addon**
Draws skeleton sketching	None	3D View / Armature / Draw	Mouse Move	**No menu entry. Mouse only action. Covered by the Important Hotkeys addon**
Draws skeleton sketching	None	3D View / Armature / Draw	Ctrl Mouse Move	**No menu entry. Mouse only action. Covered by the Important Hotkeys addon**
Hide selected bone/s	3D View / Armature / Show/Hide	3D View / Armature / Hide selected Bones	H	
Hide unselected bone/s	3D View / Armature / Show/Hide	3D View / Armature / Hide selected Bones	Shift H	
Show hidden bones	3D View / Armature / Show/Hide	3D View / Armature / Reveal Hidden	Alt H	
Select more	3D View / Select / More	3D View / Armature / Select More	Ctrl Numpad +	
Select less	3D View / Select / Less	3D View / Armature / Select Less	Ctrl Numpad -	
Select connected bones	3D View / Select / Connected	3D View / Armature / Select Connected	L	Hotkey Only Tool!
Picks shortest path between start and end point and selects everything in between	None	3D View / Armature / Pick shortest Path	Ctrl Select Mouse	**No menu entry. Mouse only action.**
Duplicate	3D View / Armature / Duplicate	3D View / Armature / Duplicate	Shift D	
Extrude	3D View / Armature / Extrude	3D View / Armature / Extrude	S	
Extrudes with option Forked enabled. Bones extrudes from the center of the selected joints.	3D View / Armature / Extrude forked	3D View / Armature / Extrude forked	Shift S	
Extrudes the bone to mouse position.	None	3D View / Armature / Click Extrude	Ctrl Select Mouse	**No menu entry. Mouse only action.** Remapped from Action to select mouse.

3D View - Armature				
Inverts the selection	3D View / Select / Inverse	3D View / Armature / (De)select all	Ctrl I	Inverts the selection
Deletes the selected bones.	3D View / Armature / Delete Selected Bones	3D View / Armature / Delete Selected Bones	Delete	
Make Parent	3D Viewport / Armature / Parent	3D View / Armature / Make Parent	Ctrl P	
Clear Parent	3D Viewport / Armature / Parent	3D View / Armature / Clear Parent	Alt P	
Separate	3D Viewport / Armature / Separate	3D View / Armature / Separate	P	

3D View - Metaball

3D View - Metaball				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Show hidden	3D View / Metaball / Show/Hide /	3D View / Armature / Reveal Hidden	Alt H	
Hide selected	3D View / Metaball / Show/Hide /	3D View / Armature / Hide selected	H	
Hide unselected	3D View / Metaball / Show/Hide /	3D View / Armature / Hide selected	Shift H	
Delete	3D View / Metaball / Delete	3D View / Metaball / Delete	Delete	
Selects or deselects all.	3D View / Select / (De)select all	3D View / Metaball / (De)select all	A	
Inverts the selection	3D View / Select / Inverse	3D View / Metaball / (De)select all	Ctrl I	

3D View - Lattice

3D View - Lattice				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Selects or deselects all.	3D View / Select / (De)select all	3D View / Lattice / (De)select all	A	
Inverts the selection	3D View / Select / Inverse	3D View / Lattice / (De)select all	Ctrl I	
Select more	3D View / Select / Select more	3D View / Lattice / Select More	Ctrl Numpad +	
Select less	3D View / Select / Select less	3D View / Lattice / Select Less	Ctrl Numpad -	
Make Vertex Parent	3D View / Lattice / Make Vertex Parent	3D View / Lattice / Make Vertex Parent	Ctrl P	

3D View - Font

3D View - Font				
Function	Surface menu location	User Preferences location	Hotkey	Special note

3D View - Font				
Deletes selected text	3D View / Text / Delete	3D View / Font / Delete	Delete	**No menu entry. Standard text editor hotkey that exists in other text editors without menu entry too.**
Deletes last letter	None	3D View / Font / Delete	Backspace	**No menu entry. Standard text editor hotkey that exists in other text editors without menu entry too.**
Deletes whole text	None	3D View / Font / Delete	Ctrl Backspace	**No menu entry. Standard text editor hotkey that exists in other text editors without menu entry too.**
Text navigation	None	3D View / Font / Move Cursor	Home	**No menu entry. Standard text editor hotkey that exists in other text editors without menu entry too.**
Text navigation	None	3D View / Font / Move Cursor	End	**No menu entry. Standard text editor hotkey that exists in other text editors without menu entry too.**
Text navigation	None	3D View / Font / Move Cursor	Left Arrow	**No menu entry. Standard text editor hotkey that exists in other text editors without menu entry too.**
Text navigation	None	3D View / Font / Move Cursor	Right Arrow	**No menu entry. Standard text editor hotkey that exists in other text editors without menu entry too.**
Text navigation	None	3D View / Font / Move Cursor	Ctrl Left Arrow	**No menu entry. Standard text editor hotkey that exists in other text editors without menu entry too.**
Text navigation	None	3D View / Font / Move Cursor	Ctrl Right Arrow	**No menu entry. Standard text editor hotkey that exists in other text editors without menu entry too.**
Text navigation	None	3D View / Font / Move Cursor	Up Arrow	**No menu entry. Standard text editor hotkey that exists in other text editors without menu entry too.**
Text navigation	None	3D View / Font / Move Cursor	Down Arrow	**No menu entry. Standard text editor hotkey that exists in other text editors without menu entry too.**
Text navigation	None	3D View / Font / Move Cursor	Page Up	**No menu entry. Standard text editor hotkey that exists in other text editors without menu entry too.**
Text navigation	None	3D View / Font / Move Cursor	Page Down	**No menu entry. Standard text editor hotkey that exists in other text editors without menu entry too.**
Text navigation	None	3D View / Font / Move Select	Shift Home	**No menu entry. Standard text editor hotkey that exists in other text editors without menu entry too.**
Text navigation	None	3D View / Font / Move Select	Shift End	**No menu entry. Standard text editor hotkey that exists in other text editors without menu entry too.**

3D View - Font				
Text navigation	None	3D View / Font / Move Select	Shift Left Arrow	**No menu entry. Standard text editor hotkey that exists in other text editors without menu entry too.**
Text navigation	None	3D View / Font / Move Select	Shift Right Arrow	**No menu entry. Standard text editor hotkey that exists in other text editors without menu entry too.**
Text navigation	None	3D View / Font / Move Select	Shift Ctrl Left Arrow	**No menu entry. Standard text editor hotkey that exists in other text editors without menu entry too.**
Text navigation	None	3D View / Font / Move Select	Shift Ctrl Right Arrow	**No menu entry. Standard text editor hotkey that exists in other text editors without menu entry too.**
Text navigation	None	3D View / Font / Move Select	Shift Up Arrow	**No menu entry. Standard text editor hotkey that exists in other text editors without menu entry too.**
Text navigation	None	3D View / Font / Move Select	Shift Down Arrow	**No menu entry. Standard text editor hotkey that exists in other text editors without menu entry too.**
Text navigation	None	3D View / Font / Move Select	Shift Page Up	**No menu entry. Standard text editor hotkey that exists in other text editors without menu entry too.**
Text navigation	None	3D View / Font / Move Select	Shift Page Down.	**No menu entry. Standard text editor hotkey that exists in other text editors without menu entry too.**
Text navigation	None	3D View / Font / Change Spacing	Alt Left Arrow	**No menu entry. Standard text editor hotkey that exists in other text editors without menu entry too.**
Text navigation	None	3D View / Font / Change Spacing	Alt Right Arrow	**No menu entry. Standard text editor hotkey that exists in other text editors without menu entry too.**
Text navigation	None	3D View / Font / Change Character	Alt Up Arrow	**No menu entry. Standard text editor hotkey that exists in other text editors without menu entry too.**
Text navigation	None	3D View / Font / Change Character	Alt Down Arrow	**No menu entry. Standard text editor hotkey that exists in other text editors without menu entry too.**
Select All	3D View / Edit / Select All	3D View / Font / Select All	Ctrl A	
Copy Text	3D View / Edit / Copy Text	3D View / Font / Copy Text	Ctrl C	
Cut Text	3D View / Edit / Copy Text	3D View / Font / Copy Text	Ctrl X	
Paste Text	3D View / Edit / Paste Text	3D View / Font / Paste Text	Ctrl V	
Line Break	None	3D View / Font / Line Break	Return	**No menu entry. Standard text editor hotkey that exists in other text editors without menu entry too.**
Insert Text		3D View / Font / Insert Text		**No menu entry.** Event Mapping Keyboard

3D View - Font				
Insert Text	None	3D View / Font / Insert Text	Alt Backspace	**No menu entry. Standard text editor hotkey that exists in other text editors without menu entry too.**

3D View - Pose

3D View - Pose				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Calls the Make Parent panel	3D View / Pose / Parent	3D View / Pose / Parent	Ctrl P	One of the panels to keep for now
Hide selected	3D View / Pose / Show/Hide	3D View / Pose / Hide selected	H	
Hide unselected	3D View / Pose / Show/Hide	3D View / Pose / Hide selected	Shift H	
Show hidden	3D View / Pose / Show/Hide	3D View / Pose / Reveal Selected	Alt H	
Copy pose	3D View / Pose / Copy pose	3D View / Pose / Copy pose	Ctrl C	
Paste Pose	3D View / Pose / Paste pose	3D View / Pose / Paste pose	Ctrl V	
Selects or deselects all.	3D View / Pose / (De)select all	3D View / Pose / (De)select all	A	
Inverts the selection	3D View / Pose / Inverse	3D View / Pose / (De)select all	Ctrl I	
Select connected bones	3D View / Select / Connected	3D View / Armature / Select Connected	L	Hotkey Only Tool!

3D View - Vertex Paint

3D View - Vertex Paint				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Vertex Paint	None	3D View / Vertex Paint / Vertex Paint	LMB	
Turns Mouse into a colour picker.	3D View / Tool Shelf / Tools / Brush /	3D View / Vertex Paint / Sample Color	S	
Sets the brush radius	3D View / Tool Shelf / Tools / Brush / Radius Slider	3D View / Vertex Paint / Radial Control	F	**Covered by the Important Hotkeys addon**
Sets the brush radius with a value in the middle	3D View / Tool Shelf / Tools / Brush / Radius Slider	3D View / Vertex Paint / Radial Control	Shift F	**Covered by the Important Hotkeys addon**
Sets the brush direction. Useful for painting with maps. Like for scales.	3D View / Tool Shelf / Tools / Brush / Radius Slider	3D View / Vertex Paint / Radial Control	Ctrl F	**Covered by the Important Hotkeys addon**
Brush Mode Stencil navigation	None	3D View / Vertex Paint / Stencil Brush Control	Shift Ctrl RMB	**No menu entry. Mouse only action.** Original hotkey RMB conflicts with new navigation. Set to Shift Ctrl RMB. **Covered by the Important Hotkeys addon**
Brush Mode Stencil navigation	None	3D View / Vertex Paint / Stencil Brush Control	Shift RMB	**No menu entry. Mouse only action. Covered by the Important Hotkeys addon**

3D View - Vertex Paint				
Brush Mode Stencil. Changes the angle value in the Texture tab	3D View / Tool Shelf / Tools / Texture	3D View / Vertex Paint / Stencil Brush Control	Ctrl RMB	**Covered by the Important Hotkeys addon**
Brush Mode Stencil navigation	None	3D View / Vertex Paint / Stencil Brush Control	Alt RMB	**No menu entry. Mouse only action. Covered by the Important Hotkeys addon**
Brush Mode Stencil navigation	None	3D View / Vertex Paint / Stencil Brush Control	Shift Alt RMB	**No menu entry. Mouse only action. Covered by the Important Hotkeys addon**
Brush Mode Stencil navigation	None	3D View / Vertex Paint / Stencil Brush Control	Ctrl Alt RMB	**No menu entry. Mouse only action. Covered by the Important Hotkeys addon**

3D View - Weight Paint

3D View - Weight Paint				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Weight Paint	None		LMB	**No menu entry. Mouse only action.**
Click at a bone to select it for weightpaiting.	None	3D View / Weight Paint / Weight Paint	CTRL Action Mouse	**No menu entry. Mouse only action. Covered by the Important Hotkeys addon**
Calls Weight Paint Sample Group panel, which shows the available group for the current position	None	3D View / Weight Paint / Weight Paint Sample Weight	Shift Action Mouse	**No menu entry. Mouse only action.**
Draws a gradient at the weightmap	None	3D View / Weight Paint / Weight Gradient	Alt LMB	**No menu entry. Mouse only action. Covered by the Important Hotkeys addon**
Draws a gradient at the weightmap	None	3D View / Weight Paint / Weight Gradient	Ctrl Alt LMB	**No menu entry. Mouse only action. Covered by the Important Hotkeys addon**
Should set the brush radius. Doesn't work. Not in Blender neither.	3D View / Tool Shelf / Tools / Brush / Radius Slider	3D View / Weight Paint / Radial Control	F	
Sets the brush radius with a value in the middle	3D View / Tool Shelf / Tools / Brush / Radius Slider	3D View / Weight Paint / Radial Control	Shift F	
Sets the brush direction. Useful for painting with maps. Like for scales.	3D View / Tool Shelf / Tools / Brush / Radius Slider	3D View / Weight Paint / Radial Control	Ctrl F	
Brush Mode Stencil.	None	3D View / Weight Paint / Stencil Brush Control	Shift Ctrl RMB	**No menu entry. Mouse only action.** Original hotkey RMB conflicts with new navigation. Set to Shift Ctrl RMB. **Covered by the Important Hotkeys addon**
Brush Mode Stencil.	None	3D View / Weight Paint / Stencil Brush Control	Shift RMB	**No menu entry. Mouse only action. Covered by the Important Hotkeys addon**
Brush Mode Stencil. Changes the angle value in the Texture tab	3D View / Tool Shelf / Tools / Texture	3D View / Weight Paint / Stencil Brush Control	Ctrl RMB	**Covered by the Important Hotkeys addon**
Brush Mode Stencil.	None	3D View / Weight Paint / Stencil Brush Control	Alt RMB	**No menu entry. Mouse only action. Covered by the Important Hotkeys addon**

3D View - Weight Paint				
Brush Mode Stencil.	None	3D View / Weight Paint / Stencil Brush Control	Shift Alt RMB	**No menu entry. Mouse only action. Covered by the Important Hotkeys addon**
Brush Mode Stencil.	None	3D View / Weight Paint / Stencil Brush Control	Ctrl Alt RMB	**No menu entry. Mouse only action. Covered by the Important Hotkeys addon**

3D View - Weight Paint Vertex Selection

3D View - Weight Paint Vertex Selection				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Selects or deselects all.	3D View / Select / (De)select all	3D View / Weight Paint Vertex Selection / (De)select all	A	
Inverts the selection	3D View / Select / Inverse	3D View / Weight Paint Vertex Selection / (De)select all	Ctrl I	
Border Select	3D View / Select / Border Select	3D View / Weight Paint Vertex Selection / Border Selec	B	
Lasso Select	None	3D View / Weight Paint Vertex Selection / Lasso Select		**No menu entry.** Event Mapping Tweak
Lasso Select	None	3D View / Weight Paint Vertex Selection / Lasso Select		**No menu entry.** Event Mapping Tweak
Cirlcle Select	3D View / Select / Border Select	3D View / Weight Paint Vertex Selection / Cirlcle Select	C	

3D View - Face Mask - Face selection masking on.

3D View - Face Mask - Face selection masking on.				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Selects or deselects all.	3D View / Select / (De)select all	3D View / Face Mask / (De)select all	A	
Inverts the selection	3D View / Select / Inverse	3D View / Face Mask / (De)select all	Ctrl I	
Hide selected	3D View / Brush / Show/Hide /	3D View / Face Mask / Hide selected	H	
Hide unselected	3D View / Brush / Show/Hide /	3D View / Face Mask / Hide selected	Shift H	
Show hidden	3D View / Brush / Show/Hide /	3D View / Face Mask / Reveal Hidden	Alt H	
Select Linked	3D View / Select / Linked Pick Select	3D View / Face Mask / Select Linked Pick	L	
Select Linked	3D View / Select / Linked Pick Deselect	3D View / Face Mask / Select Linked Pick	Shift L	

3D View - Image Paint

3D View - Image Paint - already a reason to investigate. The Mode is called Texture Paint.				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Image Paint	None	3D View / Image Paint / Image Paint	LMB	**No menu entry. Mouse only action.**

3D View - Image Paint - already a reason to investigate. The Mode is called Texture Paint.				
Image Paint	None	3D View / Image Paint / Image Paint	Ctrl LMB	**No menu entry. Mouse only action.**
Inverts the current selected colour to paint with	3D View / Tool Shelf / Tools / Brush / toggle button	3D View / Image Paint / Brush Colors Flip	X	
Turns Mouse into a colour picker.	3D View / Tool Shelf / Tools / Brush / eyedropper button	3D View / Image Paint / Sample Color	S	
Sets the brush radius	3D View / Tool Shelf / Tools / Brush / Radius Slider	3D View / Image Paint / Radial Control	F	
Sets the brush radius with a value in the middle	3D View / Tool Shelf / Tools / Brush / Radius Slider	3D View / Image Paint / Radial Control	Shift F	
Sets the brush direction. Useful for painting with maps. Like for scales.	3D View / Tool Shelf / Tools / Brush / Radius Slider	3D View / Image Paint / Radial Control	Ctrl F	
Sets the brush direction. Useful for painting with maps. Like for scales.	3D View / Tool Shelf / Tools / Brush / Radius Slider	3D View / Image Paint / Radial Control	Ctrl Alt F	
Brush Mode Stencil.	3D View / Tool Shelf / Tools / Texture mask - when mask mapping is stencil	3D View / Image Paint / Stencil Brush Control	Shift Ctrl RMB	
Brush Mode Stencil.	3D View / Tool Shelf / Tools / Texture mask - when mask mapping is stencil	3D View / Image Paint / Stencil Brush Control	Shift RMB	
Brush Mode Stencil. Changes the angle value in the Texture tab	3D View / Tool Shelf / Tools / Texture mask - when mask mapping is stencil	3D View / Image Paint / Stencil Brush Control	Ctrl RMB	
Brush Mode Stencil.	3D View / Tool Shelf / Tools / Texture mask - when mask mapping is stencil	3D View / Image Paint / Stencil Brush Control	Alt RMB	
Brush Mode Stencil.	3D View / Tool Shelf / Tools / Texture mask - when mask mapping is stencil	3D View / Image Paint / Stencil Brush Control	Shift Alt RMB	
Brush Mode Stencil.	3D View / Tool Shelf / Tools / Texture mask - when mask mapping is stencil	3D View / Image Paint / Stencil Brush Control	Ctrl Alt RMB	

3D View Sculpt

3D View Sculpt				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Sculpt	None	3D View / Sculpt / Sculpt	LMB	**No menu entry. Mouse only action.**
Sculpt	None	3D View / Sculpt / Sculpt	Ctrl LMB	**No menu entry. Mouse only action.**
Sculpt	None	3D View / Sculpt / Sculpt	Shift LMB	**No menu entry. Mouse only action.**

3D View Sculpt				
Show Bounding Box	3D View / Hide/Mask / Show Bounding Box	3D View / Sculpt / Hide/Show	Shift H	
Hide Bounding Box	3D View / Hide/Mask / Hide Bounding Box	3D View / Sculpt / Hide/Show	H	
Show All	3D View / Hide/Mask / Show All	3D View / Sculpt / Hide/Show	Alt H	
Adds a Multires modifier to selected object and sets SDS Level to value	3D View / Sculpt / Subdivide /	3D View / Sculpt / Subdivision Set	Ctrl 0	
Adds a Multires modifier to selected object and sets SDS Level to value	3D View / Sculpt / Subdivide /	3D View / Sculpt / Subdivision Set	Ctrl 1	
Adds a Multires modifier to selected object and sets SDS Level to value	3D View / Sculpt / Subdivide /	3D View / Sculpt / Subdivision Set	Ctrl 2	
Adds a Multires modifier to selected object and sets SDS Level to value	3D View / Sculpt / Subdivide /	3D View / Sculpt / Subdivision Set	Ctrl 3	
Adds a Multires modifier to selected object and sets SDS Level to value	3D View / Sculpt / Subdivide /	3D View / Sculpt / Subdivision Set	Ctrl 4	
Adds a Multires modifier to selected object and sets SDS Level to value	3D View / Sculpt / Subdivide /	3D View / Sculpt / Subdivision Set	Ctrl 5	
Sets Detail size of brush in Dyntopo mode!	3D View / Tool Shelf / Tools / Dyntopo / Set Detail Size	3D View / Sculpt / Set Detail Size	Shift D	
Sets the brush radius	3D View / Tool Shelf / Tools / Brush / Radial Control	3D View / Sculpt / Radial Control	F	
Sets the brush radius with a value in the middle	3D View / Tool Shelf / Tools / Brush / Radial Control	3D View / Sculpt / Radial Control	Shift F	
Sets the brush direction. Useful for painting with maps. Like for scales.	3D View / Tool Shelf / Tools / Brush / Radial Control	3D View / Sculpt / Radial Control	Ctrl F	
Brush Mode Stencil.	3D View / Tool Shelf / Tools / Texture - shows with Brush mapping Stencil	3D View / Sculpt / Stencil Brush Control	Shift Ctrl Alt RMB	
Brush Mode Stencil.	3D View / Tool Shelf / Tools / Texture - shows with Brush mapping Stencil	3D View / Sculpt / Stencil Brush Control	Shift RMB	
Brush Mode Stencil.	3D View / Tool Shelf / Tools / Texture - shows with Brush mapping Stencil	3D View / Sculpt / Stencil Brush Control	Ctrl RMB	
Brush Mode Stencil.	3D View / Tool Shelf / Tools / Texture - shows with Brush mapping Stencil	3D View / Sculpt / Stencil Brush Control	Alt RMB	
Brush Mode Stencil.	3D View / Tool Shelf / Tools / Texture - shows with Brush mapping Stencil	3D View / Sculpt / Stencil Brush Control	Shift Alt RMB	

3D View Sculpt				
Brush Mode Stencil.	3D View / Tool Shelf / Texture - shows with Brush mapping Stencil	3D View / Sculpt / Stencil Brush Control	Ctrl Alt RMB	

3D View - Particle

3D View - Particle. Note that most hotkeys are just available for hair.				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Selects or deselects all.	3D View / Select / (De)select all	3D View / / (De)select all	A	
Inverts the selection	3D View / Select / Inverse	3D View / Particle / (De)select all	Ctrl I	
Select more	3D View / Select / Select More	3D View / Particle / Select More	Ctrl Numpad +	
Select less	3D View / Select / Select Less	3D View / Particle / Select Less	Ctrl Numpad -	
Select Linked, in particle mode with Hair	3D View / Select / Select linked	3D View / Particle / Select Linked	L	
Select Linked, in particle mode with Hair	3D View / Select / Deselect linked	3D View / Particle / Select Linked	Shift L	
Delete	3D View / Particle / Delete	3D View / Particle / Delete	Delete	
Show All	3D View / Particle / Show/ Hide / Show All	3D View / Particle / Hide/Show	Alt H	
Hide Selected	3D View / Particle / Show/ Hide / Hide Selected	3D View / Particle / Hide/Show	H	
Hide Unselected	3D View / Particle / Show/ Hide / Show Hidden	3D View / Particle / Hide/Show	Shift H	
Painting with the brush	None	3D View / Particle / 3D Manipulator	Any LMB	**No menu entry. Mouse only action.**
Painting with the brush	None	3D View / Particle / Brush Edit	LMB	**No menu entry. Mouse only action.**
Painting with the brush	None	3D View / Particle / Brush Edit	Shift LMB	**No menu entry. Mouse only action.**
Sets the brush radius	3D View / Sidebar / Tools / Brush / Radial Control Size	3D View / Particle / Radial Control	F	
Sets the brush strength	3D View / Sidebar / Tools / Brush / Radial Control Strength	3D View / Particle / Radial Control	Shift F	

3D View - Knife Tool Modal Map

3D View - Knife Tool Modal Map				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Cancel	None	3D View / Knife Tool Modal Map / Cancel	Any Esc	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in knife mode**
Panning	None	3D View / Knife Tool Modal Map / Panning	Any MMB	**No menu entry. Mouse only action. Covered by the tooltip in the menu bar that appears when you are in knife mode**

3D View - Knife Tool Modal Map				
	None	3D View / Knife Tool Modal Map /	Any Dbl-LMB	**No menu entry. Mouse only action.** Unlabeled
Add Cut	None	3D View / Knife Tool Modal Map / Add Cut	Any LMB	**No menu entry. Mouse only action. Covered by the tooltip in the menu bar that appears when you are in knife mode**
Cancel	None	3D View / Knife Tool Modal Map / Cancel	Any RMB	**No menu entry. Mouse only action. Covered by the tooltip in the menu bar that appears when you are in knife mode**
Confirm	None	3D View / Knife Tool Modal Map / Confirm	Any Return	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in knife mode**
Confirm	None	3D View / Knife Tool Modal Map / Confirm	Any Numpad Enter	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in knife mode**
Confirm	None	3D View / Knife Tool Modal Map / Confirm	Any Spacebar	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in knife mode**
End current cut	None	3D View / Knife Tool Modal Map / End current cut	E	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in knife mode**
Snap to Midpoints On	None	3D View / Knife Tool Modal Map / Snap to Midpoints On	Any Left Ctrl	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in knife mode**
Snap to Midpoints Off	None	3D View / Knife Tool Modal Map / Snap to Midpoints Off	Any Left Ctrl	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in knife mode**
Snap to Midpoints On	None	3D View / Knife Tool Modal Map / Snap to Midpoints On	Any Right Ctrl	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in knife mode**
Snap to Midpoints Off	None	3D View / Knife Tool Modal Map / Snap to Midpoints Off	Any Right Ctrl	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in knife mode**
Ingore Snapping On	None	3D View / Knife Tool Modal Map / Ingore Snapping On	Any Left Shift	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in knife mode**
Ingore Snapping Off	None	3D View / Knife Tool Modal Map / Ingore Snapping Off	Any Left Shift	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in knife mode**
Ingore Snapping On	None	3D View / Knife Tool Modal Map / Ingore Snapping On	Any Right Shift	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in knife mode**
Ingore Snapping Off	None	3D View / Knife Tool Modal Map / Ingore Snapping Off	Any Right Shift	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in knife mode**

3D View - Knife Tool Modal Map				
Toggle Angle Snapping	None	3D View / Knife Tool Modal Map / Toggle Angle Snapping	C	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in knife mode**
Toggle Cut Through	None	3D View / Knife Tool Modal Map / Toggle Cut Through	Z	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in knife mode**

3D View - Paint Stroke Modal

3D View - Paint Stroke Modal				
Function	Surface menu location	User Preferences location	Hotkey	Special note
End paint stroke	None	3D View / Paint Stroke Modal / Paint Stroke Modal	Any Esc	**No menu entry.**

3D View - Paint Curve

3D View - Paint Curve - Texture painting with stroke mode curve.				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Add Curve Point and Slide	None	3D View / Paint Curve / Add Curve Point and Slide	Ctrl Action Mouse	**No menu entry. Mouse only action.**
Select Paint Curve Point	None	3D View / Paint Curve / Select Paint Curve Point	Select Mouse	**No menu entry. Mouse only action.**
Select Paint Curve Point	None	3D View / Paint Curve / Select Paint Curve Point	Shift Select Mouse	**No menu entry. Mouse only action.**
Slide Paint Curve Point	None	3D View / Paint Curve / Slide Paint Curve Point	Action Mouse	**No menu entry. Mouse only action.**
Slide Paint Curve Point	None	3D View / Paint Curve / Slide Paint Curve Point	Shift Action Mouse	**No menu entry. Mouse only action.**
Select Paint Curve Point	???	3D View / Paint Curve / Select Paint Curve Point	A	No Menu Entry since there is no menu for Texture Paint Stroke Method Curve at all.
Place Cursor	None	3D View / Paint Curve / Place Cursor	Action Mouse	**No menu entry. Mouse only action.**
Remove Paint Curve Point		3D View / Paint Curve / Remove Paint Curve Point	Delete	No Menu Entry since there is no menu for Texture Paint Stroke Method Curve at all.Original Key was X. Deleting is Delete, so mapped to Delete.
Draw Curve		3D View / Paint Curve / Draw Curve	Return	No Menu Entry since there is no menu for Texture Paint Stroke Method Curve at all.
Draw Curve		3D View / Paint Curve / Draw Curve	Numpad Enter	No Menu Entry since there is no menu for Texture Paint Stroke Method Curve at all.
Translate	3D View / Navi / Translate	3D View / Paint Curve / Translate	W	
Translate		3D View / Paint Curve / Translate		**No menu entry.** Event mapping Tweak
Rotate	3D View / Navi / Rotate	3D View / Paint Curve / Rotate	E	
Resize	3D View / Navi / Resize	3D View / Paint Curve / Resize	R	

3D View - Object Non Modal

3D View - Object Non Modal - Formerly the tab nonsense to jump back and forth between different modes. Now the switch between all available modes by using the numbers above the letters				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Object Mode	3D View / Dropdown Box in menu bar	3D View / Object Non-modal /	1	
Edit Mode	3D View / Dropdown Box in menu bar	3D View / Object Non-modal /	2	
Sculpt Mode	3D View / Dropdown Box in menu bar	3D View / Object Non-modal /	3	
Vertex Paint	3D View / Dropdown Box in menu bar	3D View / Object Non-modal /	4	
Weight Paint	3D View / Dropdown Box in menu bar	3D View / Object Non-modal /	5	
Texture Paint	3D View / Dropdown Box in menu bar	3D View / Object Non-modal /	6	
Pose Mode	3D View / Dropdown Box in menu bar	3D View / Object Non-modal /	7	

3D View - View 3D Walk Modal

3D View - View 3D Walk Modal - Just active in Walk mode navigation. Can be activated in 3D View / View / Navigation / Walk Navigation				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Cancel	None	3D View / View 3D Walk Modal / Cancel	Any Esc	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Cancel	None	3D View / View 3D Walk Modal / Cancel	Any RMB	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Confirm	None	3D View / View 3D Walk Modal / Confirm	Any LMB	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Confirm	None	3D View / View 3D Walk Modal / Confirm	Any Return	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Confirm	None	3D View / View 3D Walk Modal / Confirm	Any Numpad Enter	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Fast Enable	None	3D View / View 3D Walk Modal / Fast Enable	Any Left Shift	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Fast Disable	None	3D View / View 3D Walk Modal / Fast Disable	Any Left Shift	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**

3D View - View 3D Walk Modal - Just active in Walk mode navigation. Can be activated in 3D View / View / Navigation / Walk Navigation				
Slow Enable	None	3D View / View 3D Walk Modal / Slow Enable	Any Left Alt	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Slow Disable	None	3D View / View 3D Walk Modal / Slow Disable	Any Left Alt	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Move Forward	None	3D View / View 3D Walk Modal / Move Forward	Any W	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Move Backward	None	3D View / View 3D Walk Modal / Move Backward	Any S	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Move Left (Strafe)	None	3D View / View 3D Walk Modal / Move Left (Strafe)	Any A	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Move Right (Strafe)	None	3D View / View 3D Walk Modal / Move Right (Strafe)	Any D	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Move Up	None	3D View / View 3D Walk Modal / Move Up	Any E	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Move Down	None	3D View / View 3D Walk Modal / Move Down	Any Q	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Stop Move Forward	None	3D View / View 3D Walk Modal / Stop Move Forward	Any W	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Stop Move Backward	None	3D View / View 3D Walk Modal / Stop Move Backward	Any S	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Stop Move Left (Strafe)	None	3D View / View 3D Walk Modal / Stop Move Left (Strafe)	Any A	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Stop Move Right (Strafe)	None	3D View / View 3D Walk Modal / Stop Move Right (Strafe)	Any D	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Stop Move Up	None	3D View / View 3D Walk Modal / Stop Move Up	Any E	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Stop Move Down	None	3D View / Walk Modal / Stop Move Down	Any Q	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Move Forward	None	3D View / View 3D Walk Modal / Move Forward	Up Arrow	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**

3D View - View 3D Walk Modal - Just active in Walk mode navigation. Can be activated in 3D View / View / Navigation / Walk Navigation				
Move Backward	None	3D View / View 3D Walk Modal / Move Backward	Down Arrow	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Move Left (Strafe)	None	3D View / View 3D Walk Modal / Move Left (Strafe)	Left Arrow	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Move Right (Strafe)	None	3D View / View 3D Walk Modal / Move Right (Strafe)	Right Arrow	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Stop Move Forward	None	3D View / View 3D Walk Modal / Stop Move Forward	Any Up Arrow	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Stop Move Backward	None	3D View / View 3D Walk Modal / Stop Move Backward	Any Down Arrow	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Stop Move Left (Strafe)	None	3D View / View 3D Walk Modal / Stop Move Left (Strafe)	Any Left Arrow	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Stop Move Right (Strafe)	None	3D View / View 3D Walk Modal / Stop Move Right (Strafe)	Any Right Arrow	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Toggle Gravity	None	3D View / View 3D Walk Modal / Toggle Gravity	Tab	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Toggle Gravity	None	3D View / View 3D Walk Modal / Toggle Gravity	G	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Jump	None	3D View / View 3D Walk Modal / Jump	Any V	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Jump Stop	None	3D View / View 3D Walk Modal / Jump Stop	Any V	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Teleport	None	3D View / View 3D Walk Modal / Teleport	Any Spacebar	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Teleport	None	3D View / View 3D Walk Modal / Teleport	Any MMB	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Accellerate	None	3D View / View 3D Walk Modal / Accelerate	Any Numpad +	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Decelerate	None	3D View / View 3D Walk Modal / Decelerate	Any Numpad -	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**

3D View - View 3D Walk Modal - Just active in Walk mode navigation. Can be activated in 3D View / View / Navigation / Walk Navigation				
Accelerate	None	3D View / View 3D Walk Modal / Accelerate	Any Wheel Up	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**
Decelerate	None	3D View / View 3D Walk Modal / Decelerate	Any Wheel Down	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in walk mode**

3D View - View 3D Fly Modal

3D View - View 3D Fly Modal - Just active in Fly mode navigation. Can be activated in 3D View / View / Navigation / Fly Navigation				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Cancel	None	3D View / View 3D Fly Modal / Cancel	Any Esc	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in fly mode**
Cancel	None	3D View / View 3D Fly Modal / Cancel	Any RMB	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in fly mode**
Confirm	None	3D View / View 3D Fly Modal / Confirm	Any LMB	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in fly mode**
Confirm	None	3D View / View 3D Fly Modal / Confirm	Any Return	**No menu entry. Covered by No menu entry. the tooltip in the menu bar that appears when you are in fly mode**
Confirm	None	3D View / View 3D Fly Modal / Confirm	Any Spacebar	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in fly mode**
Confirm	None	3D View / View 3D Fly Modal / Confirm	Any Numpad Enter	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in fly mode**
Accellerate	None	3D View / View 3D Fly Modal / Accellerate	Any Numpad +	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in fly mode**
Decelerate	None	3D View / View 3D Fly Modal / Decelerate	Any Numpad -	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in fly mode**
Accelerate	None	3D View / View 3D Fly Modal / Accellerate	Any Wheel Up	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in fly mode**
Decelerate	None	3D View / View 3D Fly Modal / Decelerate	Any Wheel Down	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in fly mode**
	None	3D View / View 3D Fly Modal /		Mouse Trackpad Pan Event

3D View - View 3D Fly Modal - Just active in Fly mode navigation. Can be activated in 3D View / View / Navigation / Fly Navigation				
Pan Enable	None	3D View / View 3D Fly Modal / Pan Enable	Any MMB	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in fly mode**
Pan Disable	None	3D View / View 3D Fly Modal / Pan Disable	Any MMB	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in fly mode**
Fly Forward	None	3D View / View 3D Fly Modal / Fly Forward	W	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in fly mode**
Fly Backward	None	3D View / View 3D Fly Modal / Fly Backward	S	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in fly mode**
Fly Left	None	3D View / View 3D Fly Modal / Fly Left	A	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in fly mode**
Fly Right	None	3D View / View 3D Fly Modal / Fly Right	D	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in fly mode**
Fly Up	None	3D View / View 3D Fly Modal / Fly Up	E	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in fly mode**
Fly Down	None	3D View / View 3D Fly Modal / Fly Down	Q	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in fly mode**
Fly Up	None	3D View / View 3D Fly Modal / Fly Up	R	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in fly mode**
Fly Down	None	3D View / View 3D Fly Modal / Fly Down	F	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in fly mode**
Fly Forward	None	3D View / View 3D Fly Modal / Fly Forward	Up Arrow	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in fly mode**
Fly Backward	None	3D View / View 3D Fly Modal / Fly Backward	Down Arrow	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in fly mode**
Fly Left	None	3D View / View 3D Fly Modal / Fly Left	Left Arrow	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in fly mode**
Fly Right	None	3D View / View 3D Fly Modal / Fly Right	Right Arrow	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in fly mode**
X Axis Correction	None	3D View / View 3D Fly Modal / X Axis Correction	X	**No menu entry. Covered by the tooltip in the menu bar that appears when you are in fly mode**

3D View - View 3D Fly Modal - Just active in Fly mode navigation. Can be activated in 3D View / View / Navigation / Fly Navigation				
X Axis Correction	None	3D View / View 3D Fly Modal / X Axis Correction	Z	**No menu entry.** **Covered by the tooltip in the menu bar that appears when you are in fly mode**
Precision Enable	None	3D View / View 3D Fly Modal / Precision Enable	Any Left Alt	**No menu entry.** **Covered by the tooltip in the menu bar that appears when you are in fly mode**
Precision Disable	None	3D View / View 3D Fly Modal / Precision Disable	Any Left Alt	**No menu entry.** **Covered by the tooltip in the menu bar that appears when you are in fly mode**
Precision Enable	None	3D View / View 3D Fly Modal / Precision Enable	Any Left Shift	**No menu entry.** **Covered by the tooltip in the menu bar that appears when you are in fly mode**
Precision Disable	None	3D View / View 3D Fly Modal / Precision Disable	Any Left Shift	**No menu entry.** **Covered by the tooltip in the menu bar that appears when you are in fly mode**
Rotation Enable	None	3D View / View 3D Fly Modal / Rotation Enable	Any Left Ctrl	**No menu entry.** **Covered by the tooltip in the menu bar that appears when you are in fly mode**
Rotation Disable	None	3D View / View 3D Fly Modal / Rotation Disable	Any Left Ctrl	**No menu entry.** **Covered by the tooltip in the menu bar that appears when you are in fly mode**

3D View - View 3D Rotate Modal

3D View - View 3D Rotate Modal - Needs Investigation! How do we enter this mode?				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Confirm	None	3D View / View 3D Rotate Modal / Confirm	Any MMB	**No menu entry.**
Confirm	None	3D View / View 3D Rotate Modal / Confirm	Any Esc	**No menu entry.**
Enable Axis Snap	None	3D View / View 3D Rotate Modal / Enable Axis Snap	Any Left Alt	**No menu entry.**
Disable Axis Snap	None	3D View / View 3D Rotate Modal / Disable Axis Snap	Any Left Alt	**No menu entry.**

3D View - View 3D Move Modal

3D View - View 3D Move Modal - Needs Investigation! How do we enter this mode?				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Confirm	None	3D View / View 3D Move Modal / Confirm	Any MMB	**No menu entry.**
Confirm	None	3D View / View 3D Move Modal / Confirm	Any Esc	**No menu entry.**

3D View - View 3D Zoom Modal

3D View - View 3D Zoom Modal - Needs Investigation! How do we enter this mode?				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Confirm	None	3D View / View 3D Zoom Modal / Confirm	Any MMB	**No menu entry.**
Confirm	None	3D View / View 3D Zoom Modal / Confirm	Any Esc	**No menu entry.**

3D View - View 3D Dolly Modal

3D View - View 3D Dolly Modal - Needs Investigation! How do we enter this mode?				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Confirm	None	3D View / View 3D Dolly Modal / Confirm	Any MMB	**No menu entry.**
Confirm	None	3D View / View 3D Dolly Modal / Confirm	Any Esc	**No menu entry.**

3D View - 3D View Generic

3D View - 3D View Generic				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Calls or hides the Properties sidebar	3D View / View / Properties	3D View / 3D View Generic / Properties	Ctrl T	
Calls or hides the Tool Shelf sidebar	3D View / View / Tool Shelf	3D View / 3D View Generic / Tool Shelf	T	

Graph Editor / Graph Editor (Global)

Graph Editor / Graph Editor (Global)				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Set Cursor	None	Graph Editor / Graph Editor (Global) / Set Cursor	Action Mouse	**No menu entry. Mouse only action**
Mouse Select Keys	None	Graph Editor / Graph Editor (Global) / Mouse Select Keys	Select Mouse	**No menu entry. Mouse only action**
Mouse Select Keys	None	Graph Editor / Graph Editor (Global) / Mouse Select Keys	Alt Select Mouse	**No menu entry. Mouse only action**
Mouse Select Keys	None	Graph Editor / Graph Editor (Global) / Mouse Select Keys	Shift Select Mouse	**No menu entry. Mouse only action**
Mouse Select Keys	None	Graph Editor / Graph Editor (Global) / Mouse Select Keys	Shift Alt Select Mouse	**No menu entry. Mouse only action**
Mouse Select Keys	None	Graph Editor / Graph Editor (Global) / Mouse Select Keys	Ctrl Alt Select Mouse	**No menu entry. Mouse only action**
Mouse Select Keys	None	Graph Editor / Graph Editor (Global) / Mouse Select Keys	Shift Ctrl Alt Select Mouse	**No menu entry. Mouse only action**
Select Left/Right	None	Graph Editor / Graph Editor (Global) /	Ctrl Select Mouse	**No menu entry. Mouse only action**
Select Left/Right	None	Graph Editor / Graph Editor (Global) /	Shift Ctrl Select Mouse	**No menu entry. Mouse only action**
Select All	Graph Editor / Select /	Graph Editor / Graph Editor (Global) / Select All	A	

Graph Editor / Graph Editor (Global)				
Invert Selection	Graph Editor / Select / Invert Selection	Graph Editor / Graph Editor (Global) / Select All	Ctrl I	
Border Select	Graph Editor / Select / Border Select	Graph Editor / Graph Editor (Global) / Border Select	B	
Lasso Select	None	Graph Editor / Graph Editor (Global) / Lasso Select		**No menu entry.** Event Mapping Tweak
Lasso Select	None	Graph Editor / Graph Editor (Global) / Lasso Select		**No menu entry.** Event Mapping Tweak
Circle Select	Graph Editor / Select / Circle Select	Graph Editor / Graph Editor (Global) / Circle Select	G	
Select More	Graph Editor / Select / Select More	Graph Editor / Graph Editor (Global) / Select More	Ctrl Numpad +	
Select Less	Graph Editor / Select / Select Less	Graph Editor / Graph Editor (Global) / Select Less	Ctrl Numpad -	
Duplicate	Graph Editor / Key / Duplicate	Graph Editor / Graph Editor (Global) / Duplicate	Shift D	
Insert Keyframes	None	Graph Editor / Graph Editor (Global) / Click-Insert Keyframes	Ctrl Action Mouse	**No menu entry. Mouse only action**
Copy Keyframes	Graph Editor / Key / Copy Keyframes	Graph Editor / Graph Editor (Global) / Copy Keyframes	Ctrl C	
Paste Keyframes	Graph Editor / Key / Paste Keyframes	Graph Editor / Graph Editor (Global) / Paste Keyframes	Ctrl V	
Paste Keyframes flipped	Graph Editor / Key / Paste Flipped	Graph Editor / Graph Editor (Global) / Paste Keyframes	Shift Ctrl V	
View All	Graph Editor / View / View All	Graph Editor / Graph Editor (Global) / View All	Home	
View All. Ndof device for 3dConnexion		Graph Editor / Graph Editor (Global) / View All	NDOF Fit	Cannot test
View Selected	Graph Editor / View / View Selected	Graph Editor / Graph Editor (Global) / View Selected	Numpad .	
View Frame	Graph Editor / View / View Frame	Graph Editor / Graph Editor (Global) / View Frame	Numpad 0	
Translate	Graph Editor / Key / Translate	Graph Editor / Graph Editor (Global) / Translate	W	
Translate	None			Event Type Tweak
Rotate	Graph Editor / Key / Rotate	Graph Editor / Graph Editor (Global) / Rotate	E	
Resize	Graph Editor / Key / Resize	Graph Editor / Graph Editor (Global) / Resize	R	
Delete Keyframes	Graph Editor / Key / Delete Keyframes	Graph Editor / Graph Editor (Global) / Delete Keyframes	Delete	

Graph Editor / Graph Editor Generic

Graph Editor / Graph Editor Generic				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Opens /closes the Properties sidebar	Graph Editor / View / Properties	Graph Editor / Graph Editor Generic / Properties	Ctrl T	
Hide selected curve	Graph Editor / Channel / Hide selected curve	Graph Editor / Graph Editor Generic / Hide Curves	H	

Graph Editor / Graph Editor Generic				
Hide unselected curves	Graph Editor / Channel / Hide unselected curves	Graph Editor / Graph Editor Generic / Hide Curves	Shift H	
Show all curves	Graph Editor / Channel / Show all curves	Graph Editor / Graph Editor Generic / Reveal Curves	Alt H	

Dopesheet (Global)

Dopesheet (Global)				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Mouse Select Keys	None	Dopesheet (Global) / Mouse Select Keys	Select Mouse	**No menu entry. Mouse only action**
Mouse Select Keys	None	Dopesheet (Global) / Mouse Select Keys	Alt Select Mouse	**No menu entry. Mouse only action**
Mouse Select Keys	None	Dopesheet (Global)/ Mouse Select Keys	Shift Select Mouse	**No menu entry. Mouse only action**
Mouse Select Keys	None	Dopesheet (Global)/ Mouse Select Keys	Shift Alt Select Mouse	**No menu entry. Mouse only action**
Mouse Select Keys	None	Dopesheet (Global)/ Mouse Select Keys	Ctrl Alt Select Mouse	**No menu entry. Mouse only action**
Mouse Select Keys	None	Dopesheet (Global)/ Mouse Select Keys	Shift Ctrl Alt Select Mouse	**No menu entry. Mouse only action**
Select Left/Right	None	Dopesheet (Global)/ Mouse Select Keys	Ctrl Select Mouse	**No menu entry. Mouse only action**
Select Left/Right	None	Dopesheet (Global)/ Mouse Select Keys	Shift Ctrl Select Mouse	**No menu entry. Mouse only action**
Select All	Dope Sheet / Select / Select All	Dopesheet (Global)/ Select All	A	
Inverts Selection	Dope Sheet / Select / Invert Selection	Dopesheet (Global)/ Select All	Ctrl I	
Border Select	Dope Sheet / Select / Border Select	Dopesheet (Global)/ Border Select	B	
Lasso Select	???	Dopesheet (Global)/ Lasso Select		Event Type Tweak
Lasso Select	???	Dopesheet (Global)/ Lasso Select		Event Type Tweak
Circle Select	Dope Sheet / Select / Circle Select	Dope Sheet (Global)/ Circle Select	G	
Select more	Dope Sheet / Select / Select More	Dopesheet (Global)/ Select More	Ctrl Numpad +	
Select less	Dope Sheet / Select / Select Less	Dopesheet (Global)/ Select Less	Ctrl Numpad -	
Copy Keyframes	Dope Sheet / Key / Copy Keyframes	Dopesheet (Global)/ Copy Keyframes	Ctrl C	
Paste Keyframes	Dope Sheet / Key / Paste Keyframes	Dopesheet (Global)/ Paste Keyframes	Ctrl V	
Paste Keyframes flipped?	None	Dopesheet (Global)/ Paste Keyframes	Shift Ctrl V	
View All	Dope Sheet / View / View All	Dopesheet (Global)/ View All	Home	
View All. Ndof device for 3dConnexion		Dopesheet (Global)/ View All	NDOF Fit	Cannot test

Dopesheet (Global)				
View Selected	Dope Sheet / View / View Selected	Dopesheet (Global)/ View Selected	Numpad ,	
View Frame	Dope Sheet / View / View Frame	Dopesheet (Global)/ View Frame	Numpad 0	
Calls a Find Channels panel	Dope Sheet / Channel / Find Channel	Dopesheet (Global)/ Find Channel	Ctrl F	
Grab / Move	Dope Sheet / Key / Transform	Dopesheet (Global) / Transform	W	
Time Translate		Dopesheet (Global) / Transform		Event Type Tweak
Extend	Dope Sheet / Key / Transform	Dopesheet (Global) / Transform	E	
Scale	Dope Sheet / Key / Transform	Dopesheet (Global) / Transform	R	
Slide	Dope Sheet / Key / Transform	Dopesheet (Global) / Transform	Shift T	
Delete Keyframes	Dope Sheet / Key / Delete Keyframes	Dopesheet (Global) / Delete Keyframes	Delete	

Dopesheet Generic

Dopesheet Generic				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Opens / closes the Properties Panel	Dope Sheet / View /	Dopeshet Generic / Properties	Ctrl T	

NLA Channels / NLA Editor (Global)

NLA Channels / NLA Editor (Global)				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Mouse Select Keys	None	NLA Editor / NLA Editor (Global) / Mouse Select	Select Mouse	**No menu entry. Mouse only action**
Mouse Select Keys	None	NLA Editor / NLA Editor (Global) / Mouse Select	Shift Select Mouse	**No menu entry. Mouse only action**
Select Left/Right	None	NLA Editor / NLA Editor (Global) / Select Left/Right	Ctrl Select Mouse	**No menu entry. Mouse only action**
Select Left/Right	None	NLA Editor / NLA Editor (Global) / Select Left/Right	Shift Ctrl Select Mouse	**No menu entry. Mouse only action**
Select All	NLA / Select / Select All	NLA Editor / NLA Editor (Global) / (De)Select All	A	
Inverts Selection	NLA / Select / Invert Selection	NLA Editor / NLA Editor (Global) / (De)Select All	Ctrl I	
Border Select	NLA / Select / Border Select	NLA Editor / NLA Editor (Global) / Border Select	B	
View All	NLA / View / View All	NLA Editor / NLA Editor (Global) / View All	Home	
View All. Ndof device for 3dConnexion		NLA Editor / NLA Editor (Global) / View All	NDOF Fit	Cannot test!

NLA Channels / NLA Editor (Global)				
View Selected	View / View Selected	NLA Editor / NLA Editor (Global) / View Selected	Numpad ,	
Delete Strips	NLA / Edit / Delete Strips	NLA Editor / NLA Editor (Global) / Delete Strips	Delete	
Move Strips up	NLA / Edit / Move Strips up	NLA Editor / NLA Editor (Global) / Move Strips up	Page Up	
Move Strips down	NLA / Edit / Move Strips down	NLA Editor / NLA Editor (Global) / Move Strips down	Page Down	
Transform	None	NLA Editor / NLA Editor (Global) / /Transform		Event Mapping Tweak
Extend	NLA / Edit / Transform /	NLA Editor / NLA Editor (Global) / /Transform	E	
Scale	NLA / Edit / Transform / Scale	NLA Editor / NLA Editor (Global) / Transform	R	
Transform / Move	NLA / Edit / Transform / Grab/Move	NLA Editor / NLA Editor (Global) / Transform	W	

NLA Channels / NLA Channels

NLA Channels / NLA Channels				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Mouse Click on NLA Channels	None	NLA Editor / NLA Channels / Mouse Click on NLA Channels	LMB	**No menu entry. Mouse only action**
Mouse Click on NLA Channels	None	NLA Editor / NLA Channels / Mouse Click on NLA Channels	Shift LMB	**No menu entry. Mouse only action**
Delete	NLA Editor / Edit / Delete Strips	NLA Editor / NLA Channels / Delete	Delete	

NLA Channels / NLA Generic

NLA Channels / NLA Generic				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Opens/ Closes the Properties Sidebar	NLA Editor / View / Properties	NLA Editor / NLA Generic / Properties	Ctrl T	
Exit Tweak Mode.	NLA Editor / Edit / Stop tweaking Strip Actions	NLA Editor / NLA Generic / Exit Tweak Mode	Tab	
Enter Tweak Mode.	NLA Editor / Edit / Start tweaking Strip Actions	NLA Editor / NLA Generic / Enter Tweak Mode	Tab	
Exit Tweak Mode. Isolate Action	NLA Editor / Edit / Stop tweaking Stashed Action	NLA Editor / NLA Generic / Exit Tweak Mode	Shift Tab	
Enter Tweak Mode. Isolate Action	NLA Editor / Edit / Start tweaking Stashed Action	NLA Editor / NLA Generic / Enter Tweak Mode	Shift Tab	

Timeline

Timeline				
Function	Surface menu location	User Preferences location	Hotkey	Special note

Timeline				
View All	Timeline / View / View All	Timeline / View All	Home	
View All. Ndof device for 3dConnexion	None	Timeline / View All	NDOF Fit	Cannot test

Image / Image (Global)

Image / Image (Global)				
Function	Surface menu location	User Preferences location	Hotkey	Special note
View All	UV Image Editor / View / View All	Image / Image (Global) / View All	Home	
View Center	UV Image Editor / View / View Center	Image / Image (Global) / View Center	Numpad ,	Shows when you have a UV mesh in the editor.
View Pan	None	Image / Image (Global) / View Pan	MMB	**No menu entry. Mouse only action**
View Pan	None	Image / Image (Global) / View Pan	Shift MMB	**No menu entry. Mouse only action**
View Pan	None	Image / Image (Global) / View Pan	Mouse/Trackpad Pan	Trackpad for laptops.
View All. Ndof device for 3dConnexion	None	Image / Image (Global) /	NDOF Fit	Cannot test!
NDOF Pan/Zoom. Ndof device for 3dConnexion	None	Image / Image (Global) / NDOF Pan/Zoom	NDOF Motion	Cannot test!
View Zoom In	UV/Image Editor / View / View Zoom In	Image / Image (Global) / View Zoom in	Wheel In	
View Zoom Out	UV/Image Editor / View / View Zoom Out	Image / Image (Global) / View Zoom Out	Wheel Out	
View Zoom in	None	Image / Image (Global) / View Zoom in	Numpad +	**No menu entry. Double functionality, see above.**
View Zoom Out	None	Image / Image (Global) / View Zoom Out	Numpad -	**No menu entry. Double functionality, see above.**
View Zoom	None	Image / Image (Global) /	Ctrl MMB	
View Zoom	None	Image / Image (Global) /	Mouse/Trackpad Zoom	Trackpad for laptops.
View Zoom	None	Image / Image (Global) /	Ctrl Mouse/Trackpad Pan	Trackpad for laptops.
Change Frame.	None	Image / Image (Global) / Change Frame	Left Mouse	**No menu entry. Mouse only action**
Sample Color.	None	Image / Image (Global) / Sample Color	Action Mouse	**No menu entry. Mouse only action**
Set Curves Point.	None	Image / Image (Global) / Set Curves Point	Ctrl Action Mouse	**No menu entry. Mouse only action**
Set Curves Point.	None	Image / Image (Global) / Set Curves Point	Shift Action Mouse	**No menu entry. Mouse only action**
Open Image	UV/Image Editor / Image / Open Image	Image / Image (Global) / Open Image	Ctrl O	
New Image	UV/Image Editor / Image / New Image	Image / Image (Global) / New Image	Ctrl N	
View All	UV/Image Editor / View / View All	Image / Image (Global) / View All	Numpad 0	

Image / UV Editor

Image / UV Editor				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Select	None	Image / UV Editor / Select	Select Mouse	**No menu entry. Mouse only action**
Select	None	Image / UV Editor / Select	Shift Select Mouse	**No menu entry. Mouse only action**
Loop Select. No menu item possible, works with mouse position	None	Image / UV Editor / Loop Select	Shift Select Mouse	**No menu entry. Mouse only action**
Loop Select. No menu item possible, works with mouse position	None	Image / UV Editor / Loop Select	Alt Select Mouse	**No menu entry. Mouse only action**
Border Select	UV/Image Editor / Select / Border Select	Image / UV Editor /	B	
Circle Select	UV/Image Editor / Select / Circle Select	Image / UV Editor /	G	
Lasso Select	None	Image / UV Editor / Lasso Select		Event Mapping Tweak
Lasso Select	None	Graph Editor / Graph Editor (Global) / Lasso Select		Event Mapping Tweak
Select Linked Pick	UV/Image Editor / Select / Linked Pick	Image / UV Editor / Select Linked Pick	L	
Select More	UV/Image Editor / Select / More	Image / UV Editor / Select More	Ctrl Numpad +	
Select Less	UV/Image Editor / Select / Less	Image / UV Editor /	Ctrl Numpad -	
Select All	UV/Image Editor / Select / Select All	Image / UV Editor / Select All	A	
Hide selected Object	UV/Image Editor / UVs / Show/Hide Faces / Hide Selected	Image / UV Editor / Hide selection	H	
Hide unselected Object(s)	UV/Image Editor / UVs / Show/Hide Faces / Hide Unselected	Image / UV Editor / Hide selection	Shift H	
Show hidden Objects	UV/Image Editor / UVs / Show/Hide Faces / Reveal Hidden	Image / UV Editor / Reveal Hidden	Alt H	
Set 2D Cursor	None	Image / UV Editor /	Action Mouse	**No menu entry. Mouse only action**
Set Tile	None	Image / UV Editor /	Shift Action Mouse	**No menu entry. Mouse only action**
Translate	UV/Image Editor / Toolshelf / Transform	Image / UV Editor / Translate	W	
Translate	None	Image / UV Editor / Translate		Event mapping Tweak
Rotate	UV/Image Editor / Toolshelf / Transform	Image / UV Editor /	E	
Resize	UV/Image Editor / Toolshelf / Transform	Image / UV Editor /	R	
Mirror	None	Image / UV Editor /	Ctrl M	
Inverts Selection	UV/Image Editor / Select / Invert Selection	Image / UV Editor / Select All	Ctrl I	

Image / UV Editor				
Select Linked Pick	UV/Image Editor / Select / Linked Pick Extend	Image / UV Editor / Select Linked Pick	Shift L	

Image / Image Paint

Image / Image Paint				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Image Paint	None	Image / Image Paint / Image Paint	LMB	**No menu entry. Mouse only action**
Image Paint	None	Image / Image Paint / Image Paint	Ctrl LMB	**No menu entry. Mouse only action**
Brush Colors Flip. Toggles the current colour	Tool Shelf / Paint / Toggle Fouregrou8nd and Background Brush colours.	Image / Image Paint / Brush Colors Flip	X	
Grab Clone	None	Image / Image Paint / Grab Clone	RMB	**No menu entry. Mouse only action**
Sample Color	UV/IMage Editor / Sidebar / Paint	Image / Image Paint / Sample Color	S	
Radial Control	UV/IMage Editor / Sidebar / Paint	Image / Image Paint / Radial Control	F	
Radial Control	UV/IMage Editor / Sidebar / Paint	Image / Image Paint / Radial Control	Shift F	
Radial Control	UV/IMage Editor / Sidebar / Paint	Image / Image Paint / Radial Control	Ctrl F	
Radial Control	UV/IMage Editor / Sidebar / Paint	Image / Image Paint / Radial Control	Ctrl Alt F	
Stencil Brush control	UV/IMage Editor / Sidebar / Texture Mask with Mask Mapping Stencil	Image / Image Paint / Stencil Brush control	Shift Ctrl RMB	
Stencil Brush control	UV/IMage Editor / Sidebar / Texture Mask with Mask Mapping Stencil	Image / Image Paint / Stencil Brush control	Shift RMB	
Stencil Brush control	UV/IMage Editor / Sidebar / Texture Mask with Mask Mapping Stencil	Image / Image Paint / Stencil Brush control	Ctrl RMB	
Stencil Brush control	UV/IMage Editor / Sidebar / Texture Mask with Mask Mapping Stencil	Image / Image Paint / Stencil Brush control	Alt RMB	
Stencil Brush control	UV/IMage Editor / Sidebar / Texture Mask with Mask Mapping Stencil	Image / Image Paint / Stencil Brush control	Shift Alt RMB	
Stencil Brush control	UV/IMage Editor / Sidebar / Texture Mask with Mask Mapping Stencil	Image / Image Paint / Stencil Brush control	Ctrl Alt RMB	

Image / UV Sculpt

Image / UV Sculpt				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Sculpt UVs	None	Image / UV Sculpt / Sculpt UVs	LMB	**No menu entry. Mouse only action**

Image / UV Sculpt				
Sculpt UVs	None	Image / UV Sculpt / Sculpt UVs	Ctrl LMB	**No menu entry. Mouse only action**
Sculpt UVs	None	Image / UV Sculpt / Sculpt UVs	Shift LMB	**No menu entry. Mouse only action**
Radial Control for UV/Image Editor in UV Sculpt Mode	None	Image / UV Sculpt / Radial Control	F	**No menu entry. Deserves a hint somewhere, but important hotkey tool is 3D view only.**
Radial Control for UV/Image Editor in UV Sculpt Mode	None	Image / UV Sculpt / Radial Control	Shift F	**No menu entry. Deserves a hint somewhere, but important hotkey tool is 3D view only.**

Image / Image generic

Image / Image generic				
Function	Surface menu location	User Preferences location	Hotkey	Special note
New Image	UV/Image Editor/ Image / New Image	Image / Image generic / New Image	Ctrl N	
Open Image	UV/Image Editor/ View / Open Image	Image / Image generic / Open Image	Ctrl O	
Save Image	UV/Image Editor/ Image / Save Image	Image / Image generic / Save Image	Ctrl S	
Properties	UV/Image Editor/ View / Properties	Image / Image generic / Properties	N	
Tool Shelf	UV/Image Editor/ View / Tool Shelf	Image / Image generic / Tool Shelf	T	

Outliner

Outliner				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Rename Item	None	Outliner / Rename Item	double-LMB	**No menu entry. Mouse Only action**
Activate Item		Outliner / Activate Item	LMB	**No menu entry. Mouse Only action**
Activate Item		Outliner / Activate Item	Shift LMB	**No menu entry. Mouse Only action**
Activate Item		Outliner / Activate Item	Ctrl LMB	**No menu entry. Mouse Only action**
Activate Item		Outliner / Activate Item	Shift Ctrl LMB	**No menu entry. Mouse Only action**
Border Select	Outliner / View / Border Select	Outliner / Border Select	B	
Open/Close Item		Outliner / Open/Close Item	Return	**No menu entry.**
Open/Close Item		Outliner / Open/Close Item	Shift Return	**No menu entry.**
Rename Item		Outliner / Rename Item	Ctrl LMB	**No menu entry. Mouse Only action**
Calls a RMB menu		Outliner / Execute Operation	RMB	**No menu entry. Mouse Only action**

Outliner				
Scroll Page		Outliner / Scroll Page	Page Down	**No menu entry.**
Scroll Page		Outliner / Scroll Page	Page Up	**No menu entry.**
Toggle Selected	Outliner / View / Toggle Selected	Outliner / Toggle Selected	A	
Expand/Collapse All	Outliner / View / Expand/ Collapse All	Outliner / Expand/Collapse All	Shift A	

Node Editor / Node Editor Global

Node Editor / Node Editor Global				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Select	None	Node Editor / Node Editor Global / Select	Action Mouse	**No menu entry. Mouse Only action**
Select	None	Node Editor / Node Editor Global / Select	Select Mouse	**No menu entry. Mouse Only action**
Select	None	Node Editor / Node Editor Global / Select	Ctrl Action Mouse	**No menu entry. Mouse Only action**
Select	None	Node Editor / Node Editor Global / Select	Ctrl Select Mouse	**No menu entry. Mouse Only action**
Select	None	Node Editor / Node Editor Global / Select	Alt Action Mouse	**No menu entry. Mouse Only action**
Select	None	Node Editor / Node Editor Global / Select	Alt Select Mouse	**No menu entry. Mouse Only action**
Select	None	Node Editor / Node Editor Global / Select	Ctrl Alt Action Mouse	**No menu entry. Mouse Only action**
Select	None	Node Editor / Node Editor Global / Select	Ctrl Alt Select Mouse	**No menu entry. Mouse Only action**
Select	None	Node Editor / Node Editor Global / Select	Shift Action Mouse	**No menu entry. Mouse Only action**
Select	None	Node Editor / Node Editor Global / Select	Shift Select Mouse	**No menu entry. Mouse Only action**
Select	None	Node Editor / Node Editor Global / Select	Shift Ctrl Action Mouse	**No menu entry. Mouse Only action**
Select	None	Node Editor / Node Editor Global / Select	Shift Ctrl Select Mouse	**No menu entry. Mouse Only action**
Select	None	Node Editor / Node Editor Global / Select	Shift Alt Action Mouse	**No menu entry. Mouse Only action**
Select	None	Node Editor / Node Editor Global / Select	Shift Alt Select Mouse	**No menu entry. Mouse Only action**
Select	None	Node Editor / Node Editor Global / Select	Shift Ctrl Alt Action Mouse	**No menu entry. Mouse Only action**Crazy Hotkey. But probably not to solve in another way.
Select	None	Node Editor / Node Editor Global / Select	Shift Ctrl Alt Select Mouse	**No menu entry. Mouse Only action**Crazy Hotkey. But probably not to solve in another way.
Border Select	None	Node Editor / Node Editor Global / Border Select		Event Mapping Tweak
Lasso Select	None	Node Editor / Node Editor Global / Lasso Select		Event Mapping Tweak
Lasso Select	None	Node Editor / Node Editor Global / Lasso Select		Event Mapping Tweak

Node Editor / Node Editor Global				
Circle Select	Node Editor / Select / Circle Select	Node Editor / Node Editor Global / Circle Select	G	
Link Nodes	None	Node Editor / Node Editor Global / Link Nodes	LMB	**No menu entry. Mouse Only action**
Link Nodes	None	Node Editor / Node Editor Global / Link Nodes	Ctrl LMB	**No menu entry. Mouse Only action**
Resize Node	None	Node Editor / Node Editor Global / Resize Node	LMB	**No menu entry. Mouse Only action**
Cut Links	None	Node Editor / Node Editor Global / Cut Links	Ctrl LMB	**No menu entry. Mouse Only action**
Link Viewer	None	Node Editor / Node Editor Global / Link Viewer	Shift Ctrl LMB	**No menu entry. Mouse Only action**
Background Image Move	None	Node Editor / Node Editor Global /	Alt MMB	**No menu entry. Mouse Only action**
Background Image Zoom	Node Editor / View / Backdrop / Zoom Out	Node Editor / Node Editor Global / Background Image Zoom	V	
Background Image Zoom	Node Editor / View / Backdrop / Zoom In	Node Editor / Node Editor Global / Background Image Zoom	Alt V	
Background Image Fit	Node Editor / View / Backdrop / Fit Backdrop	Node Editor / Node Editor Global / Background Image Fit	Alt Home	
Displays the colour information of the Background Image under the current mouse position. Position, RGB Values, HSV, etc.	None	Node Editor / Node Editor Global / Backimage Sample	Alt Action Mouse	**No menu entry. Mouse Only action**
Duplicate	Node Editor / Node / Duplicate	Node Editor / Node Editor Global / Duplicate	Shift D	
Duplicate with keep inputs	Node Editor / Node / Duplicate Keep Input	Node Editor / Node Editor Global / Duplicate	Shift Ctrl D	
Hide	Node Editor / Node / Hide	Node Editor / Node Editor Global / Hide	H	
Toggle Node Preview	Node Editor / Node / Toggle Node Preview	Node Editor / Node Editor Global / Toggle Node Preview	Shift H	
Toggle Hidden Node Sockets	Node Editor / Node / Toggle Hidden Node Sockets	Node Editor / Node Editor Global / Toggle Hidden Node Sockets	Ctrl H	
View All	Node Editor / View / View All	Node Editor / Node Editor Global / View All	Home	
View All. Ndof device for 3dConnexion	Node Editor / View / View All	Node Editor / Node Editor Global / View All	Ndof Fit	Cannot test
View Selected	Node Editor / View / View Selected	Node Editor / Node Editor Global / View Selected	Numpad ,	
Border Select	Node Editor / Select / Border Select	Node Editor / Node Editor Global / Border Select	B	
Delete	Node Editor / Node / Delete	Node Editor / Node Editor Global / Delete	Delete	
(De)select all	Node Editor / Select / (De)select all	Node Editor / Node Editor Global / (De)select all	A	
Invert Selection	Node Editor / Select / Inverse	Node Editor / Node Editor Global / (De)select all	Ctrl I	
Copy to Clipboard	Node Editor / Node / Copy	Node Editor / Node Editor Global / Copy to Clipboard	Ctrl C	

Node Editor / Node Editor Global				
Paste from Clipboard	Node Editor / Node / Paste	Node Editor / Node Editor Global / Paste from Clipboard	Ctrl V	
Move and Attach	Node Editor / Node / Translate	Node Editor / Node Editor Global / Move and Attach	W	
Move and Attach	None	Node Editor / Node Editor Global / Move and Attach		Event mapping tweak
Move and Attach	None	Node Editor / Node Editor Global / Move and Attach		Event mapping tweak
Translate	None	Node Editor / Node Editor Global / Translate		Event mapping tweak
Translate	None	Node Editor / Node Editor Global / Translate		Event mapping tweak
Rotate	Node Editor / Node / Rotate	Node Editor / Node Editor Global / Rotate	E	
Resize	Node Editor / Node / Resize	Node Editor / Node Editor Global / Resize	R	
Detach	Node Editor / Node / Detach Linked Move	Node Editor / Node Editor Global / Detach	Alt D	
Detach	None	Node Editor / Node Editor Global / Detach		Event mapping tweak
Detach	None	Node Editor / Node Editor Global / Detach		Event mapping tweak
Translate	Node Editor / Node / Translate	Node Editor / Node Editor Global / Translate	W	

Node Editor / Generic

Node Editor / Generic				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Calls or closes the Properties panel	Node Editor / View / Properties	Node Editor / Node Editor Generic / Properties	Ctrl T	
Calls or closes the Tool Shelf panel	Node Editor / View / Tool Shelf	Node Editor / Node Editor Generic / Tool Shelf	T	

Sequencer / Sequencer (Global)

Sequencer / Sequencer (Global) - NOTE THAT I WILL NOT FIX THE VIDEO EDITING STUFF! Video editing module is deprecated. It is still available. But Bforartists does not offer any support for it.

The red marked hotkeys in this seciton are just marked for the very unlikely case that we really spend the time to change anyhting here

Function	Surface menu location	User Preferences location	Hotkey	Special note
(De)select all	Sequencer / Select/ (De)select all	Sequencer / Sequencer (Global) / De)select all	A	
Inverse	Sequencer / Select / Inverse	Sequencer / Sequencer (Global) / De)select all	Ctrl I	
Un-Mute Strips	None	Sequencer / Sequencer (Global) / Un-Mute Strips	Shift Alt H	Needs Investigation. Needs Menu entry.
Duplicate Strips	Sequencer / Strip / Duplicate Strips	Sequencer / Sequencer (Global) / Duplicate Strips	Shift D	
Erase Strips	Sequencer / Strip / Erase Strips	Sequencer / Sequencer (Global) / Erase Strips	Delete	

Sequencer / Sequencer (Global) - NOTE THAT I WILL NOT FIX THE VIDEO EDITING STUFF! Video editing module is deprecated. It is still available. But Bforartists does not offer any support for it. The red marked hotkeys in this seciton are just marked for the very unlikely case that we really spend the time to change anyhting here				
Copy	None	Sequencer / Sequencer (Global) /	Ctrl C	Remove Icons in Menu bar. Needs Menu entry!
Paste	None	Sequencer / Sequencer (Global) /	Ctrl V	Remove Icons in Menu bar. Needs Menu entry!
Toggle Meta Strips. What metastrips? What does this do?	None	Sequencer / Sequencer (Global) /	Tab	Needs Investigation!
View All	Sequencer / View / View All	Sequencer / Sequencer (Global) /	Home	
View All . Ndof device for 3dConnexion	None	Sequencer / Sequencer (Global) /	NDOF Fit	Cannot test
View Selected	Sequencer / View / View Selected	Sequencer / Sequencer (Global) /	Numpad ,	
Jump to Strip	None	Sequencer / Sequencer (Global) /	Page Up	Needs Menu entry!
Jump to Strip	None	Sequencer / Sequencer (Global) /	Page Down	Needs Menu entry!
Jump to Strip	None	Sequencer / Sequencer (Global) /	Alt Page Up	Needs Menu entry!
Jump to Strip	None	Sequencer / Sequencer (Global) /	Alt Page Down	Needs Menu entry!
Remove Gaps. What gaps?	None	Sequencer / Sequencer (Global) /	Shift Back Space	Needs Investigation! Needs Menu entry!
Cut Multicam. What does this do?	None	Sequencer / Sequencer (Global) / Cut Multicam	1	Needs Investigation! Needs Menu entry!
Cut Multicam. What does this do?	None	Sequencer / Sequencer (Global) / Cut Multicam	2	Needs Investigation! Needs Menu entry!
Cut Multicam. What does this do?	None	Sequencer / Sequencer (Global) / Cut Multicam	3	Needs Investigation! Needs Menu entry!
Cut Multicam. What does this do?	None	Sequencer / Sequencer (Global) / Cut Multicam	4	Needs Investigation! Needs Menu entry!
Cut Multicam. What does this do?	None	Sequencer / Sequencer (Global) / Cut Multicam	5	Needs Investigation! Needs Menu entry!
Cut Multicam. What does this do?	None	Sequencer / Sequencer (Global) / Cut Multicam	6	Needs Investigation! Needs Menu entry!
Cut Multicam. What does this do?	None	Sequencer / Sequencer (Global) / Cut Multicam	7	Needs Investigation! Needs Menu entry!
Cut Multicam. What does this do?	None	Sequencer / Sequencer (Global) / Cut Multicam	8	Needs Investigation! Needs Menu entry!
Cut Multicam. What does this do?	None	Sequencer / Sequencer (Global) / Cut Multicam	9	Needs Investigation! Needs Menu entry!
Cut Multicam. What does this do?	None	Sequencer / Sequencer (Global) / Cut Multicam	0	Needs Investigation! Needs Menu entry!
Activate/Select	None	Sequencer / Sequencer (Global) / Activate/Select	Select Mouse	
Activate/Select	None	Sequencer / Sequencer (Global) / Activate/Select	Shift Select Mouse	
Activate/Select	None	Sequencer / Sequencer (Global) / Activate/Select	Alt Select Mouse	
Activate/Select	None	Sequencer / Sequencer (Global) / Activate/Select	Shift Alt Select Mouse	

Sequencer / Sequencer (Global) - NOTE THAT I WILL NOT FIX THE VIDEO EDITING STUFF! Video editing module is deprecated. It is still available. But Bforartists does not offer any support for it. The red marked hotkeys in this seciton are just marked for the very unlikely case that we really spend the time to change anyhting here				
Activate/Select	None	Sequencer / Sequencer (Global) / Activate/Select	Ctrl Select Mouse	
Activate/Select	None	Sequencer / Sequencer (Global) / Activate/Select	Shift Ctrl Select Mouse	
Select more	Sequencer/ Select / Select More	Sequencer / Sequencer (Global) / Select More	Ctrl Numpad +	
Select less	Sequencer / Select / Select Less	Sequencer / Sequencer (Global) / Select Less	Ctrl Numpad -	
Select Pick Linked	???	Sequencer / Sequencer (Global) / Select Pick Linked	L	Hotkey is NOT from the menu item Select Linked. Needs Investigation
Select Pick Linked	???	Sequencer / Sequencer (Global) / Select Pick Linked	Shift L	Hotkey is NOT from the menu item Select Linked. Needs Investigation. Needs Menu entry.
Border Select	None	Sequencer / Sequencer (Global) / Border Select	B	Needs Menu entry.
Context Set. What?	None	Sequencer / Sequencer (Global) / Context Set	O	Needs Menu entry. Needs Investigation
Sequence Slide. Grabs the current active clip and moves it with the mouse. Why? You can click at the clip and do the same. Odd double functionality.	None	Sequencer / Sequencer (Global) / Sequence Slide.	G	Needs Investigationg
Sequence Slide	None	Sequencer / Sequencer (Global) / Sequence Slide		Event Mapping Tweak

Sequencer / SequencerCommon

Sequencer / SequencerCommon				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Opens or closes the Properties sidebar	Sequencer / View / Properties	Sequencer / SequencerGlobal / Properties	Ctrl T	

Sequencer / SequencerPreview

Sequencer / SequencerPreview				
Function	Surface menu location	User Preferences location	Hotkey	Special note
View All	None	Sequencer / SequencerPreview / View All	Home	
View All . Ndof device for 3dConnexion	None	Sequencer / SequencerPreview / View All	NDOF Fit	Cannot test
Border Offset View Does nothing? In what mode?	None	Sequencer / SequencerPreview / Border Offset View	O	Needs Investigation
Sets sequencer View Zoom Ratio to 1:1	None	Sequencer / SequencerPreview / Sequencer View Zoom Ratio	Numpad 1	Different ratios Needs Menu entry. They have for other functionality.

Sequencer / SequencerPreview				
Displays the colour values under the mouse when holding action mouse and hovering over the movie	None	Sequencer / SequencerPreview / Sample Color	Action Mouse	

Logic Editor

Logic Editor - Note that the Logic Editor as part of the Game Engine is not officially supported by Bforartists.				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Properties	???	Logic Editor / Properties	Ctrl T	
Cut Links	???	Logic Editor / Cut Links	Ctrl LMB	
Calls a Menu	???	Logic Editor / Call Menu	Shift A	
View All	???	Logic Editor / View All	Home (pos1)	
View All	???	Logic Editor / View All	NDOF Fit	

File Browser / File Browser (Global)

File Browser / File Browser (Global)				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Delete selected Files	None	File Browser / File Browser (Global) /	Delete	No menu entry. Hotkey only functionality
Smooth Scroll		File Browser / File Browser (Global) /		No menu entry. Event Mapping Timer
Toggles the sidebar	File Browser / Select / Toggle Bookmarks	File Browser / File Browser (Global) /	T	

File Browser / File Browser Main

File Browser / File Browser Main				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Execute File Window	None	File Browser / File Browser Main / Execute File Window	double-LMB	**No menu entry. Mouse Only action**
Activate/Select File	None	File Browser / File Browser Main / Activate/Select File	LMB	**No menu entry. Mouse Only action**
Activate/Select File	None	File Browser / File Browser Main / Activate/Select File	Shift LMB	**No menu entry. Mouse Only action**
Activate/Select File	None	File Browser / File Browser Main /	Shift Ctrl LMB	**No menu entry. Mouse Only action**
Activate/Select File	None	File Browser / File Browser Main /	RMB	**No menu entry. Mouse Only action**
Activate/Select File	None	File Browser / File Browser Main /	Shift RMB	**No menu entry. Mouse Only action**
Activate/Select File	None	File Browser / File Browser Main /	Alt RMB	**No menu entry. Mouse Only action**
Walk Select/Deselect File	None	File Browser / File Browser Main / Walk Select/Deselect File	Up Arrow	**Needs Menu entry!**

File Browser / File Browser Main				
Walk Select/Deselect File	None	File Browser / File Browser Main / Walk Select/Deselect File	Shift Up Arrow	**Needs Menu entry!**
Walk Select/Deselect File	None	File Browser / File Browser Main / Walk Select/Deselect File	Shift Ctrl Up Arrow	**Needs Menu entry!**
Walk Select/Deselect File	None	File Browser / File Browser Main / Walk Select/Deselect File	Down Arrow	**Needs Menu entry!**
Walk Select/Deselect File	None	File Browser / File Browser Main / Walk Select/Deselect File	Shift Down Arrow	**Needs Menu entry!**
Walk Select/Deselect File	None	File Browser / File Browser Main / Walk Select/Deselect File	Shift Ctrl Down Arrow	**Needs Menu entry!**
Walk Select/Deselect File	None	File Browser / File Browser Main / Walk Select/Deselect File	Left Arrow	**Needs Menu entry!**
Walk Select/Deselect File	None	File Browser / File Browser Main / Walk Select/Deselect File	Shift Left Arrow	**Needs Menu entry!**
Walk Select/Deselect File	None	File Browser / File Browser Main / Walk Select/Deselect File	Shift Ctrl Left Arrow	**Needs Menu entry!**
Walk Select/Deselect File	None	File Browser / File Browser Main / Walk Select/Deselect File	Right Arrow	**Needs Menu entry!**
Walk Select/Deselect File	None	File Browser / File Browser Main / Walk Select/Deselect File	Shift Right Arrow	**Needs Menu entry!**
Walk Select/Deselect File	None	File Browser / File Browser Main / Walk Select/Deselect File	Shift Ctrl Right Arrow	**Needs Menu entry!**
(De)select all files	File Browser / Select / (De)select all files	File Browser / File Browser Main /	A	
Activate/Select File	File Browser / Select / Border Select	File Browser / File Browser Main / Activate/Select File	B	
Activate/Select File	None	File Browser / File Browser Main / Activate/Select File		Event Mapping Tweak
Rename File or Directory	None	File Browser / File Browser Main / Rename File or Directory	Ctrl LMB	
Highlight File	None	File Browser / File Browser Main / Highlight File	Any Mouse Move	
Increment Number in Filename by 1	The little + button left from the cancel button	File Browser / File Browser Main /	Numpad +	
Increment Number in Filename by 10	None	File Browser / File Browser Main / Increment Number in Filename	Shift Numpad +	**No menu entry. So rarely used, doesn't really deserve a menu entry.**
Increment Number in Filename by 100	None	File Browser / File Browser Main / Increment Number in Filename	Ctrl Numpad +	**No menu entry. So rarely used, doesn't really deserve a menu entry.**
Decrease Number in Filename by 1	The little - button left from the cancel button	File Browser / File Browser Main / Increment Number in Filename	Numpad -	

File Browser / File Browser Main				
Decrease Number in Filename by 10	None	File Browser / File Browser Main / Increment Number in Filename	Shift Numpad -	**No menu entry. So rarely used, doesn't really deserve a menu entry.**
Decrease Number in Filename by 100	None	File Browser / File Browser Main / Increment Number in Filename	Ctrl Numpad -	**No menu entry. So rarely used, doesn't really deserve a menu entry.**

File Browser / File Browser Buttons

File Browser / File Browser Buttons				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Increment Number in Filename by 1	Filebrowser ,the tiny plus button besides the edit box	File Browser / File Browser Buttons /	Numpad +	
Increment Number in Filename by 10	None	File Browser / File Browser Buttons / Increment Number in Filename	Shift Numpad +	**No menu entry. So rarely used, doesn't really deserve a menu entry.**
Increment Number in Filename by 100	None	File Browser / File Browser Buttons / Increment Number in Filename	Ctrl Numpad +	**No menu entry. So rarely used, doesn't really deserve a menu entry.**
Decrease Number in Filename by 1	Filebrowser ,the tiny minus button besides the edit box	File Browser / File Browser Buttons / Increment Number in Filename	Numpad -	
Decrease Number in Filename by 10	None	File Browser / File Browser Buttons / Increment Number in Filename	Shift Numpad -	**No menu entry. So rarely used, doesn't really deserve a menu entry.**
Decrease Number in Filename by 100	None	File Browser / File Browser Buttons / Increment Number in Filename	Ctrl Numpad -	**No menu entry. So rarely used, doesn't really deserve a menu entry.**

Info

Info - Those items would deserve a menu entry. But the menu bar is used as the general file bar. And so the menu items for the Info area would be confusing since the Info area is hidden by default.				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Select Report	None	File / Select Report	Select Mouse	**No menu entry. Mouse Only action**
Selects or deselects all text	None	File / (De)select all	A	**No menu entry. See above.**
Brings up a rectangle select	None	File / Border Select	B	**No menu entry. See above.**
Replay Operator.	None	File / Replay Operator.	R	**No menu entry. See above.**
Delete Reports	None	File / Delete Reports	Delete	**No menu entry. See above.**
Copy Reports to Clipboard	None	File / Copy Reports to Clipboard	Ctrl C	**No menu entry. See above.**

Property Editor

Property Editor				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Opens a rmb menu where you can select to arrage the properties horizontally or vertically	None	Property Editor / Toolbox	RMB	**No menu entry. Mouse Only action**

Text / Text (Global)

Text / Text (Global)				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Context Int Cycle	None	Text / Text (Global) / Context Int Cycle	Ctrl Wheel Up	**No menu entry. Common Text editor Hotkeys**
Context Int Cycle	None	Text / Text (Global) / Context Int Cycle	Ctrl Wheel Down	**No menu entry. Common Text editor Hotkeys**
Context Int Cycle	None	Text / Text (Global) / Context Int Cycle	Ctrl Numpad +	**No menu entry. Common Text editor Hotkeys**
Context Int Cycle	None	Text / Text (Global) / Context Int Cycle	Ctrl Numpad -	**No menu entry. Common Text editor Hotkeys**
Create Text Block	Text / Text / Create Text Block	Text / Text (Global) / Create Text Block	Ctrl N	
Open Text Block	Text / Text / Open Text Block	Text / Text (Global) / Open Text Block	Alt O	
Reload	Text / Text / Reload	Text / Text (Global) / Reload	Alt R	
Save	Text / Text / Save	Text / Text (Global) / Save	Alt S	
Save As	Text / Text / Save As	Text / Text (Global) / Save As	Shift Crtl S	Changed from Shift Ctrl Alt S to appwide standard hotkey Shift Crtl S.
Run Script	Text / Text / Run Script	Text / Text (Global) / Run Script	Alt P	
Cut	Text / Edit / Cut	Text / Text (Global) / Cut	Ctrl X	
Copy	Text / Edit / Copy	Text / Text (Global) / Copy	Ctrl C	
Paste	Text / Edit / Paste	Text / Text (Global) / Paste	Ctrl V	
Duplicate Line	Text / Edit / Duplicate Line	Text / Text (Global) / Duplicate Line	Ctrl D	
Select All	Text / Edit / Select All	Text / Text (Global) / Select All	Ctrl A	
Selects the whole Line.	Text / Edit / Select Line	Text / Text (Global) / Select Line	Shift Ctrl A	
Select Word	None	Text / Text (Global) / Select Word	double-LMB	**No menu entry. Mouse Only action**
Move selected Lines up	Text / Edit / Move Line(s) up	Text / Text (Global) / Move Lines	Shift Ctrl Up Arrow	
Move selected Lines down	Text / Edit / Text / Edit / Move Line(s) up	Text / Text (Global) / Move Lines	Shift Ctrl Down Arrow	
Indent	Text / Format / Indent	Text / Text (Global) / Indent	Tab	
Unindent	Text / Format / Unindent	Text / Text (Global) / Unindent	Shift Tab	
Move Cursor to start of line	None	Text / Text (Global) / Move Cursor	Home	**No menu entry. Common Text editor Hotkeys**
Move Cursor to end of line	None	Text / Text (Global) / Move Cursor	End	**No menu entry. Common Text editor Hotkeys**
Move Cursor to the right	None	Text / Text (Global) / Move Cursor	Left Arrow	**No menu entry. Common Text editor Hotkeys**
Move Cursor to the left	None	Text / Text (Global) / Move Cursor	Right Arrow	**No menu entry. Common Text editor Hotkeys**
Move Cursor to the right by word space	None	Text / Text (Global) / Move Cursor	Ctrl Left Arrow	**No menu entry. Common Text editor Hotkeys**
Move Cursor to the left by word space	None	Text / Text (Global) / Move Cursor	Ctrl Right Arrow	**No menu entry. Common Text editor Hotkeys**

Text / Text (Global)				
Move Cursor to line above	None	Text / Text (Global) / Move Cursor	Up Arrow	**No menu entry. Common Text editor Hotkeys**
Move Cursor to line below	None	Text / Text (Global) / Move Cursor	Down Arrow	**No menu entry. Common Text editor Hotkeys**
Move Cursor up by text height	None	Text / Text (Global) / Move Cursor	Page Up	**No menu entry. Common Text editor Hotkeys**
Move Cursor down by text height	None	Text / Text (Global) / Move Cursor	Page Down	**No menu entry. Common Text editor Hotkeys**
Move Cursor to start of text	None	Text / Text (Global) / Move Cursor	Ctrl Home	**No menu entry. Common Text editor Hotkeys**
Move Cursor to end of text	None	Text / Text (Global) / Move Cursor	Ctrl End	**No menu entry. Common Text editor Hotkeys**
Select Text of line before the caret	None	Text / Text (Global) / Move Select	Shift Home	**No menu entry. Common Text editor Hotkeys**
Select Text of line after the caret	None	Text / Text (Global) / Move Select	Shift End	**No menu entry. Common Text editor Hotkeys**
Expands the text selection to the left	None	Text / Text (Global) / Move Select	Shift Left Arrow	**No menu entry. Common Text editor Hotkeys**
Expands the text selection to the right	None	Text / Text (Global) / Move Select	Shift Right Arrow	**No menu entry. Common Text editor Hotkeys**
Expands the text selection to the left by word space	None	Text / Text (Global) / Move Select	Shift Ctrl Left Arrow	**No menu entry. Common Text editor Hotkeys**
Expands the text selection to the right by words space	None	Text / Text (Global) / Move Select	Shift Ctrl Right Arrow	**No menu entry. Common Text editor Hotkeys**
Expands the text selection upwards by one line	None	Text / Text (Global) / Move Select	Shift Up Arrow	**No menu entry. Common Text editor Hotkeys**
Expands the text selection downwards by one line	None	Text / Text (Global) / Move Select	Shift Down Arrow	**No menu entry. Common Text editor Hotkeys**
Expands the text selection upwards by the width of the text window	None	Text / Text (Global) / Move Select	Shift Page Up	**No menu entry. Common Text editor Hotkeys**
Expands the text selection downwards by the width of the text window	None	Text / Text (Global) / Move Select	Shift Page Down	**No menu entry. Common Text editor Hotkeys**
Expands the text selection upwards to the start of the text	None	Text / Text (Global) / Move Select	Shift Ctrl Home	**No menu entry. Common Text editor Hotkeys**
Expands the text selection downwards to the end of the text	None	Text / Text (Global) / Move Select	Shift Ctrl End	**No menu entry. Common Text editor Hotkeys**
Deletes selection / next character	Text Editor / Edit / Delete / Next Character	Text / Text (Global) / Delete	Delete	
Deletes selection / deletes previous character	Text Editor / Edit / Delete / Previous Character	Text / Text (Global) / Delete	Back Space	
Deletes next word	Text Editor / Edit / Delete / Next Word	Text / Text (Global) / Delete	Ctrl Delete	
Deletes previous word	Text Editor / Edit / Delete / Previous Word	Text / Text (Global) / Delete	Ctrl Back Space	
Toggle Overwrite	None	Text / Text (Global) /	Insert	**No menu entry. Common Text editor Hotkeys**
Scrollbar	None	Text / Text (Global) / Scrollbar	LMB	**No menu entry. Mouse Only action**
Scrollbar	None	Text / Text (Global) / Scrollbar	MMB	**No menu entry. Mouse Only action**

Text / Text (Global)				
Scroll	None	Text / Text (Global) / Scroll	MMB	**No menu entry. Mouse Only action**
Scroll	None	Text / Text (Global) / Scroll	Mouse Trackpad Pan	
Set Selection	None	Text / Text (Global) / Set Selection		Event Mapping Tweak
Set Cursor	None	Text / Text (Global) / Set Cursor	LMB	**No menu entry. Mouse Only action**
Set Selection	None	Text / Text (Global) / Set Selection	Shift LMB	**No menu entry. Mouse Only action**
Scroll	None	Text / Text (Global) / Scroll	Wheel Up	**No menu entry. Common Text editor Hotkeys**
Scroll	None	Text / Text (Global) / Scroll	Wheel Down	**No menu entry. Common Text editor Hotkeys**
Line Break	None	Text / Text (Global) / Line Break	Return	**No menu entry. Common Text editor Hotkeys**
Line Break	None	Text / Text (Global) / Line Break	Numpad Enter	**No menu entry. Common Text editor Hotkeys**
Text Auto Complete	None	Text / Text (Global) / Text Auto Complete	Ctrl Spacebar	**No menu entry. Common Text editor Hotkeys**
Line Number	None	Text / Text (Global) / Line Number		Event Mapping Text Input
insert	None	Text / Text (Global) / insert		Event Mapping Text Input

Text / Text Generic

Text / Text Generic

Function	Surface menu location	User Preferences location	Hotkey	Special note
Find	Text / Edit / Find	Text / Text Generic / Find	Ctrl F	
Properties	Text / View / Properties	Text / Text Generic / Properties	Ctrl T	

Console

Console

Function	Surface menu location	User Preferences location	Hotkey	Special note
Move Cursor Previous Word	Console / Edit / Cursor to Previous Word	Console / Move Cursor	Ctrl Left Arrow	
Move Cursor Next Word	Console / Edit / Cursor to Next Word	Console / Move Cursor	Ctrl Right Arrow	
Move Cursor Line Begin	Console / Edit / Cursor to Line Begin	Console / Move Cursor	Home	
Move Cursor Line End	Console / Edit / Cursor to Line End	Console / Move Cursor	End	
Scale text up	Console / Edit / Zoom Text out	Console / Context Int Cycle	Ctrl Wheel Up	
Scale text down	Console / Edit / Zoom Text in	Console / Context Int Cycle	Ctrl Wheel Down	
Scale text up	None	Console / Context Int Cycle	Ctrl Numpad +	No menu entry. Same functionality is already given with menu item Zoom Text out

Console				
Scale text down	None	Console / Context Int Cycle	Ctrl Numpad -	No menu entry. Same functionality is already given with menu item Zoom Text In
Move caret left	Console / Edit / Cursor to next Character	Console / Move Cursor	Left Arrow	
Move caret right	Console / Edit / Cursor to previous Character	Console / Move Cursor	Right Arrow	
Move caret up	Console / Edit / History Cycle	Console / History Cycle	Up Arrow	
Move caret down	Console / Edit / History Cycle	Console / History Cycle	Down Arrow	
Delete next character	Console / Edit / Delete /	Console / Delete	Delete	
Delete previous character	Console / Edit / Delete / Previous Characater	Console / Delete	Backspace	
Delete previous character	None	Console / Delete	Shift Backspace	No menu entry. Same functionality is already given with menu item Previous Characater
Delete next word	Console / Edit / Delete / Next Word	Console / Delete	Ctrl Delete	
Delete previous word	Previous Word	Console / Delete	Ctrl Back Space	
Clears the whole line	Console / Console / Clear Line	Console / Clear Line	Shift Return	
Clears the whole line	None	Console / Clear Line	Shift Numpad Enter	No menu item. Same functionality is already given with menu item Clear Line.
Execute	Console / Console / Console Execute	Console / Console Execute	Return	
Execute	None	Console / Console Execute	Numpad Enter	No menu item. Same functionality is already given with menu item Console Execute
Autocomplete	Console / Autocomplete button in header	Console / Console Autocomplete	Ctrl Spacebar	
Copy as script	Console / Console / Copy as script	Console / Copy to Clipboard as script	Shift Ctrl C	
Copy	Console / Console / Copy	Console / Copy to Clipboard	Ctrl C	
Paste	Console / Console / Paste	Console / Paste from Clipboard	Ctrl V	
Set caret	None	Console / Set Selection	Left Mouse	No menu item. Mouse bound action.
Select whole word	None	Console / Select word	dbl-Left Mouse	No menu item. Mouse bound action.
Insert	None	Console / Insert	Ctrl Tab	No menu item. There was no way to add it to the menu.
Indents the line	Console / Console / Indent	Console / Indent	Tab	
Unindents the line	Console / Console / Unindent	Console / Unindent	Shift Tab	
Insert		Console /		No menu item. Event Mapping Text Input

Clip / Clip (Global)

Clip / Clip (Global)				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Open Clip	Clip / Clip / Open Clip	Clip / Clip (Global) / Open Clip	Alt O	
Tools	Clip / View / Tools	Clip / Clip (Global) / Tools	T	
Properties	Clip / View / Properties	Clip / Clip (Global) / Properties	Ctrl T	
Set Solver Keyframe.	None	Clip / Clip (Global) / Set Solver Keyframe	Q	Needs menu entry!
Set Solver Keyframe.	None	Clip / Clip (Global) / Set Solver Keyframe	Shift E	Needs menu entry

Clip / Clip Editor

Clip / Clip Editor				
Function	Surface menu location	User Preferences location	Hotkey	Special note
View Pan	None	Clip / Clip Editor /	MMB	**No menu entry. Mouse Only action**
View Pan	None	Clip / Clip Editor /	Shift MMB	**No menu entry. Mouse Only action**
View Pan	None	Clip / Clip Editor /	Mouse/Trackpad Pan	laptop trackpad field
View Zoom	None	Clip / Clip Editor / View Zoom	Ctrl MMB	**No menu entry. Mouse Only action**
View Zoom		Clip / Clip Editor / View Zoom	Mouse/Trackpad Zoom	laptop trackpad field
View Zoom	None	Clip / Clip Editor / View Zoom	Ctrl Mouse/Trackpad Pan	laptop trackpad field
View Zoom In	Clip Editor / View / View zoom in	Clip / Clip Editor / View Zoom In	Wheel In	
View Zoom Out	Clip Editor / View / View zoom in	Clip / Clip Editor / View Zoom Out	Wheel Out	
View Zoom In	None	Clip / Clip Editor / View Zoom In	Numpad +	**No menu entry. Double functionality from above**
View Zoom Out	None	Clip / Clip Editor / View Zoom Out	Numpad -	**No menu entry. Double functionality from above**
View Zoom Ratio 1:1	Clip / View /View Zoom Ratio 1:1	Clip / Clip Editor / View Zoom Ratio	Numpad 1	
View All	Clip / View /View All	Clip / Clip Editor / View All	Home	
View Fit	Clip / View /View Fit	Clip / Clip Editor / View Fit	F	
View Selected	Clip / View /View Selected	Clip / Clip Editor / View Selected	Numpad .	
View All. Ndof device for 3dConnexion	None	Clip / Clip Editor /	NDOF Fit	Cannot test
NDOF Pan/Zoom. Ndof device for 3dConnexion	None	Clip / Clip Editor /	NDOF Motion	Cannot test
Jump to Frame.	None	Clip / Clip Editor / Jump to Frame	Shift Ctrl Left Arrow	???
Jump to Frame.	None	Clip / Clip Editor / Jump to Frame	Shift Ctrl Right Arrow	???
Jump to Frame.	None	Clip / Clip Editor / Jump to Frame	Shift Alt Left Arrow	???

Clip / Clip Editor				
Jump to Frame.	None	Clip / Clip Editor / Jump to Frame	Shift Alt Left Arrow	???
Change Frame	None	Clip / Clip Editor / Change Frame	LMB	**No menu entry. Mouse Only action**
Select	None	Clip / Clip Editor / Select	Select Mouse	**No menu entry. Mouse Only action**
Select	None	Clip / Clip Editor / Select	Shift Select Mouse	**No menu entry. Mouse Only action**
(De)select all	Clip / Select / (De)select all	Clip / Clip Editor / (De)select all	A	
Inverts the selection	Clip / Select / Inverse	Clip / Clip Editor / (De)select all	Ctrl I	
Border Select	Clip / Select / Border Select	Clip / Clip Editor / Border Select	B	
Circle Select	Clip / Select / Circle Select	Clip / Clip Editor / Circle Select	G	
Lasso Select	None	Clip / Clip Editor / Lasso Select		Event Mapping Tweak
Lasso Select	None	Clip / Clip Editor / Lasso Select		Event Mapping Tweak
Add Marker and Slide	None	Clip / Clip Editor / Add Marker and Slide	Ctrl LMB	**No menu entry. Mouse Only action**
Delete Marker	Clip / Track / Delete Marker	Clip / Clip Editor / Delete Marker	Shift Delete	
Slide Marker	None	Clip / Clip Editor / Slide Marker	LMB	**No menu entry. Mouse Only action**
Disable Markers	None	Clip / Clip Editor / Disable Markers	Shift D	Needs menu entry!
Delete Track	Clip / Track / Delete Track	Clip / Clip Editor / Delete Track	Delete	
Hide Selected	Clip / Track / Show/Hide / Hide Selected	Clip / Clip Editor / Hide Tracks	H	
Hide Unselected	Clip / Track / Show/Hide / Hide Unselected	Clip / Clip Editor / Hide Tracks	Shift H	
Show Hidden	Clip / Track / Show/Hide / Show Hidden	Clip / Clip Editor / Hide Tracks Clear	Alt H	
Side Plane Marker	None	Clip / Clip Editor / Side Plane Marker	Action Mouse	**No menu entry. Mouse Only action**
Insert Keyframe	None	Clip / Clip Editor / Insert Keyframe	I	Needs menu entry!
Delete Keyframe	None	Clip / Clip Editor / Delete Keyframe	Alt I	Needs menu entry!
Translate	Clip / Track / Transform / Translate	Clip / Clip Editor / Translate	W	
Translate		Clip / Clip Editor / Translate		Event Mapping Tweak
Resize	Clip / Track / Transform / Resize	Clip / Clip Editor / Resize	R	
Rotate		Clip / Clip Editor / Rotate	E	Needs menu entry!
Set 2 D Cursor		Clip / Clip Editor /	Action Mouse	**No menu entry. Mouse Only action**
Copy Tracks	Clip / Track / Copy Tracks	Clip / Clip Editor / Copy Tracks	Ctrl C	
Paste Tracks	Clip / Track / Paste Tracks	Clip / Clip Editor / Paste Tracks	Ctrl V	

Clip / Clip Graph Editor

Clip / Clip Graph Editor - Needs investigation as a whole.				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Change Frame		Clip / Clip Graph Editor / Change Frame	Action Mouse	**No menu entry. Mouse Only action**
Select		Clip / Clip Graph Editor / Select	Select Mouse	**No menu entry. Mouse Only action**
Adds to selection		Clip / Clip Graph Editor / Select	Shift Select Mouse	**No menu entry. Mouse Only action**
(De)select all Markers		Clip / Clip Graph Editor / (De)select all Markers	A	
Inverts Marker Selection		Clip / Clip Graph Editor / (De)select all Markers	Ctrl I	
Border Select		Clip / Clip Graph Editor / Border Select	B	
Delete Curve		Clip / Clip Graph Editor / Delete Curve	Delete	
Delete Knot		Clip / Clip Graph Editor / Delete Knot	Shift Delete	
View All	Clip / View / Home	Clip / Clip Graph Editor / View All	Home	
View All. Ndof device for 3dConnexion		Clip / Clip Graph Editor / View All	NDOF Fit	Cannot test
Center Current Frame	Clip / View / Center Current Frame	Clip / Clip Graph Editor / Center Current Frame	Numpad ,	
Context Toggle		Clip / Clip Graph Editor / Context Toggle	L	
Clear Track Path		Clip / Clip Graph Editor / Clear Track Path	Alt T	
Clear Track Path		Clip / Clip Graph Editor / Clear Track Path	Shift T	
Clear Track Path		Clip / Clip Graph Editor / Clear Track Path	Shift Alt T	
Disable Markers		Clip / Clip Graph Editor / Disable Markers	Shift D	
Translate	None	Clip / Clip Graph Editor / Translate	W	
Translate		Clip / Clip Graph Editor / Translate		
Resize	None	Clip / Clip Graph Editor / Resize	R	
Rotate	None	Clip / Clip Graph Editor / Rotate	E	

Clip / Clip Dopesheet Editor

Clip / Clip Dopesheet Edior				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Select Channel	None	Clip / Clip Dopesheet Edior /	Action Mouse	**No menu entry. Mouse Only action**

Clip / Clip Dopesheet Edior				
View All	???	Clip / Clip Dopesheet Edior /	Home	Needs menu entry!
View All. Ndof device for 3dConnexion	Clip / View / Home	Clip / Clip Dopesheet Edior /	NDOF View	Cannot Test

Grease Pencil / Grease Pencil(Global)

Grease Pencil / Grease Pencil(Global) - Grease Pencil hotkeys general				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Grease Pencil draw	None	Grease Pencil / Grease Pencil(Global) / Grease Pencil draw	D LMB	**No menu entry. Mouse Only action**
Grease Pencil draw	None	Grease Pencil / Grease Pencil(Global) / Grease Pencil draw	Ctrl D LMB	**No menu entry. Mouse Only action**
Grease Pencil draw	None	Grease Pencil / Grease Pencil(Global) / Grease Pencil draw	Ctrl D RMB	**No menu entry. Mouse Only action**
Grease Pencil draw	None	Grease Pencil / Grease Pencil(Global) / Grease Pencil draw	D RMB	**No menu entry. Mouse Only action**
Grease Pencil draw	None	Grease Pencil / Grease Pencil(Global) / Grease Pencil draw	Eraser	Event mapping Eraser
Context Toggle	Header / Mode Menu	Grease Pencil / Grease Pencil(Global) / Context Toggle	D Tab	This one is a mode!
Calls a Pie Menu	None	Grease Pencil / Grease Pencil(Global) / Call Pie Menu	D Q	**No menu entry. Calls a Pie menu**
Calls a Pie Menu	None	Grease Pencil / Grease Pencil(Global) / Call Pie Menu	D W	**No menu entry. Calls a Pie menu**
Add Blank Frame	G-Pencil tab / Grease Pencil panel / Insert	Grease Pencil /Grease Pencil Stroke edit mode / Add Blank Frame	D B	

Grease Pencil / Grease Pencil in Stroke edit mode

Grease Pencil - Grease Pencil in Stroke edit mode. This hotkeys and menus are just available when you are in Edit Strokes mode.				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Strokes Edit Mode Toggle	None	Grease Pencil /Grease Pencil Stroke edit mode / Strokes Edit Mode Toggle	Tab	This one is a mode!
Call Pie Menu.	None	Grease Pencil /Grease Pencil Stroke edit mode / Call Pie Menu	D E	**No menu entry. Calls a Pie menu**
Radial Control for pencil strength	None	Grease Pencil /Grease Pencil Stroke edit mode / Radial Control	Ctrl F	**No menu entry.**
Grease Pencil Interpolation	None	Grease Pencil /Grease Pencil Stroke edit mode / Grease Pencil Interpolation	Ctrl Alt E	**No menu entry.**

Grease Pencil - Grease Pencil in Stroke edit mode. This hotkeys and menus are just available when you are in Edit Strokes mode.				
Interpolate Sequence	None	Grease Pencil /Grease Pencil Stroke edit mode / Interpolate Sequence	Shift Ctrl E	**No menu entry.**
Stroke Sculpt	None	Grease Pencil /Grease Pencil Stroke edit mode / Stroke Sculpt	S Left Mouse	**No menu entry. Mouse Only action**
Stroke Sculpt	Tool Shelf / G-Pencil tab / Sculpt Strokes Panel / Sculpt Strokes	Grease Pencil /Grease Pencil Stroke edit mode / Stroke Sculpt	S Left Mouse	
Radial Control		Grease Pencil /Grease Pencil Stroke edit mode / Radial Control	Shift F	**No menu entry. Mouse Only action**
Calls a radial control menu when Edit strokes Enable editing is active and pressing F.	None	Grease Pencil /Grease Pencil Stroke edit mode / Radial Control	F	It's for proportional editing. Select one vertice of the greasepencil, and that will define the influence of the proportional editing.
Select / Deselect all	3D View / Tool Shelf / Select / (De) Select all	Grease Pencil /Grease Pencil Stroke edit mode / (De)select all strokes	A	
Inverts the current selection	3D View / Tool Shelf / Grease Pencil Tab / Edit Strokes panel / Inverse	Grease Pencil /Grease Pencil Stroke edit mode / (De)select all strokes	Ctrl I	
Circle Select	3D View / Tool Shelf / Grease Pencil Tab / Edit Strokes panel / Circle Select button	Grease Pencil /Grease Pencil Stroke edit mode / Circle Select	G	
Border Select	3D View / Tool Shelf / Grease Pencil Tab / Edit Strokes panel / Border Select button	Grease Pencil /Grease Pencil Stroke edit mode / Border Select	B	
Lasso select strokes Event mapping	None	Grease Pencil /Grease Pencil Stroke edit mode / Lasso select strokes		Event mapping Tweak
Lasso select strokes Event mapping	None	Grease Pencil /Grease Pencil Stroke edit mode / Lasso select strokes		Event mapping Tweak
Lasso select strokes Event mapping	None	Grease Pencil /Grease Pencil Stroke edit mode / Lasso select strokes		Event mapping Tweak
Lasso select strokes Event mapping	None	Grease Pencil /Grease Pencil Stroke edit mode / Lasso select strokes		Event mapping Tweak
Select knot, This deselects the other selected knots	None	Grease Pencil /Grease Pencil Stroke edit mode / Select	Select Mouse	**No menu entry. Mouse Only action**
Adds the selection to the current selection	None	Grease Pencil /Grease Pencil Stroke edit mode / Select	Shift Select Mouse	**No menu entry. Mouse Only action**
Selects whole stroke	None	Grease Pencil /Grease Pencil Stroke edit mode / Select	Alt Select Mouse	**No menu entry. Mouse Only action**
Selects linked stroke	3D View / Tool Shelf / Grease Pencil Tab / Edit Strokes panel / Select Linked	Grease Pencil /Grease Pencil Stroke edit mode / Select linked	L	
Selects linked stroke	None	Grease Pencil /Grease Pencil Stroke edit mode / Select linked	Ctrl L	Possible Double entry. Same as above? Exact same values

Grease Pencil - Grease Pencil in Stroke edit mode. This hotkeys and menus are just available when you are in Edit Strokes mode.				
Selects Grouped stroke	3D View / Tool Shelf / Grouped	Grease Pencil /Grease Pencil Stroke edit mode / Select Grouped	Shift G	
Expands the selection	3D View / Tool Shelf / Grease Pencil Tab / Edit Strokes panel / Select More	Grease Pencil /Grease Pencil Stroke edit mode / Select more	Ctrl Numpad +	
Reduces the selection	3D View / Tool Shelf / Grease Pencil Tab / Edit Strokes panel / Select Less	Grease Pencil /Grease Pencil Stroke edit mode / Select less	Ctrl Numpad -	
Duplicates the currently selected stroke	3D View / Tool Shelf / Grease Pencil Tab / Edit Strokes panel / Duplicate	Grease Pencil /Grease Pencil Stroke edit mode / Duplicate Strokes	Shift D	
Calls a delete menu quiz	3D View / Tool Shelf / Edit Strokes Panel	Grease Pencil /Grease Pencil Stroke edit mode / Call Menu	Delete	
Dissolve	3D View / Gpencil / Delete	Grease Pencil /Grease Pencil Stroke edit mode / Dissolve	Ctrl X	
Delete selected points without splitting stroke	3D View / Tool Shelf / Grease Pencil Tab / Edit Strokes panel / Dissolve	Grease Pencil /Grease Pencil Stroke edit mode / Dissolve	Ctrl Delete	
Delete all active Frames	3D View / Gpencil / Delete	Grease Pencil /Grease Pencil Stroke edit mode / Delete all active Frames	Shift X	
Join Strokes	3D View / Gpencil / Join	Grease Pencil /Grease Pencil Stroke edit mode / Join Strokes	Ctrl J	
Join Strokes	3D View / Gpencil / Join	Grease Pencil /Grease Pencil Stroke edit mode / Join Strokes	Shift Ctrl J	
Copy strokes	3D View / Tool Shelf / Grease Pencil Tab / Edit Strokes panel / Delete	Grease Pencil /Grease Pencil Stroke edit mode / Copy	Ctrl C	
Paste strokes	3D View / Tool Shelf / Grease Pencil Tab / Edit Strokes panel / Delete	Grease Pencil /Grease Pencil Stroke edit mode / Paste	Ctrl V	
Convert Grease Pencil	3D View / Gpencil / Convert to Geometry	Grease Pencil /Grease Pencil Stroke edit mode / Convert Grease Pencil	Alt C	
Show all layers	3D View / Gpencil / Show all Layers	Grease Pencil /Grease Pencil Stroke edit mode / Show all layers	Alt H	
Hide selected Grease pencil layer	3D View / Gpencil / Hide active Layer	Grease Pencil /Grease Pencil Stroke edit mode / Hide Layer(s)	H	
Hide all Grease pencil layers	3D View / Gpencil / Show active layer only	Grease Pencil /Grease Pencil Stroke edit mode / Hide Layer(s)	Shift H	
Isolate Layer	None	Grease Pencil /Grease Pencil Stroke edit mode /	Numpad *	Needs menu entry!
Move Strokes to Layer	3D View / Gpencil / Move Strokes to Layer	Grease Pencil /Grease Pencil Stroke edit mode / Move Strokes to Layer	M	
Select Brush	3D View / Tool Shelf / Grease Pencil Tab / Edit Strokes panel / Drawing Brushes edit field	Grease Pencil /Grease Pencil Stroke edit mode / Select Brush	1	
Select Brush	3D View / Tool Shelf / Grease Pencil Tab / Edit Strokes panel / Drawing Brushes edit field	Grease Pencil /Grease Pencil Stroke edit mode / Select Brush	2	

Grease Pencil - Grease Pencil in Stroke edit mode. This hotkeys and menus are just available when you are in Edit Strokes mode.				
Select Brush	3D View / Tool Shelf / Grease Pencil Tab / Edit Strokes panel / Drawing Brushes edit field	Grease Pencil /Grease Pencil Stroke edit mode / Select Brush	3	
Select Brush	3D View / Tool Shelf / Grease Pencil Tab / Edit Strokes panel / Drawing Brushes edit field	Grease Pencil /Grease Pencil Stroke edit mode / Select Brush	4	
Select Brush	3D View / Tool Shelf / Grease Pencil Tab / Edit Strokes panel / Drawing Brushes edit field	Grease Pencil /Grease Pencil Stroke edit mode / Select Brush	5	
Select Brush	3D View / Tool Shelf / Grease Pencil Tab / Edit Strokes panel / Drawing Brushes edit field	Grease Pencil /Grease Pencil Stroke edit mode / Select Brush	6	
Select Brush	3D View / Tool Shelf / Grease Pencil Tab / Edit Strokes panel / Drawing Brushes edit field	Grease Pencil /Grease Pencil Stroke edit mode / Select Brush	7	
Select Brush	3D View / Tool Shelf / Grease Pencil Tab / Edit Strokes panel / Drawing Brushes edit field	Grease Pencil /Grease Pencil Stroke edit mode / Select Brush	8	
Select Brush	3D View / Tool Shelf / Grease Pencil Tab / Edit Strokes panel / Drawing Brushes edit field	Grease Pencil /Grease Pencil Stroke edit mode / Select Brush	9	
Select Brush	3D View / Tool Shelf / Grease Pencil Tab / Edit Strokes panel / Drawing Brushes edit field	Grease Pencil /Grease Pencil Stroke edit mode / Select Brush	0	
Move	3D View / Tool Shelf / Grease Pencil Tab / Edit Strokes panel / Delete	Grease Pencil /Grease Pencil Stroke edit mode / Show all layers	W	
Move	None	Grease Pencil /Grease Pencil Stroke edit mode / Translate		Event mapping Tweak
Rotate	3D View / Tool Shelf / Grease Pencil Tab / Edit Strokes panel / Delete	Grease Pencil /Grease Pencil Stroke edit mode / Rotate	E	
Scale	3D View / Tool Shelf / Grease Pencil Tab / Edit Strokes panel / Scale	Grease Pencil /Grease Pencil Stroke edit mode / Resize	R	
Mirror	3D View / Tool Shelf / Grease Pencil Tab / Edit Strokes panel / Mirror	Grease Pencil /Grease Pencil Stroke edit mode / Mirror	Ctrl M	
Bend	3D View / Tool Shelf / Grease Pencil Tab / Edit Strokes panel / Bend	Grease Pencil /Grease Pencil Stroke edit mode / Bend	Shift W	
To Sphere	3D View / Tool Shelf / Grease Pencil Tab / Edit Strokes panel / To Sphere	Grease Pencil /Grease Pencil Stroke edit mode / To Sphere	Shift Alt S	
Scales the currtent selected stroke section bigger or smaller	3D View / Tool Shelf / Grease Pencil Tab / Edit Strokes panel / Shrinkfatten	Grease Pencil /Grease Pencil Stroke edit mode / Transform	Alt S	
Context Toggle Values		Grease Pencil /Grease Pencil Stroke edit mode / Context Toggle Values	O	Remove this

Grease Pencil - Grease Pencil in Stroke edit mode. This hotkeys and menus are just available when you are in Edit Strokes mode.				
Context Toggle Values		Grease Pencil /Grease Pencil Stroke edit mode / Context Toggle Values	Alt O	Remove this

Mask Editing

Mask Editing - UV Image Editor in Mask mode. But also other locations.				
Function	Surface menu location	User Preferences location	Hotkey	Special note
New Mask	UV Image Editor / Header, Mask Dropdown box	Mask Editing / New Mask	Alt N	
Call Menu	None	Mask Editing / Call Menu	Shift A	Needs Menu entry
What Context does Toggle here? Not to catch.	???	Mask Editing / Context Toggle	O	Context is usually something to remove ...
Add Vertex and Slide	None	Mask Editing /	Ctrl Action Mouse	**No menu entry. Mouse Only action**
Add FeatherVertex and Slide	None	Mask Editing / Add FeatherVertex and Slide	Shift Action Mouse	**No menu entry. Mouse Only action**
Delete	UV Image Editor / Mask / Delete	Mask Editing / Delete	Delete	
Select	None	Mask Editing / Select	Select Mouse	**No menu entry. Mouse Only action**
Select	None	Mask Editing / Select	Shift Select Mouse	**No menu entry. Mouse Only action**
(De)select all	UV Image Editor / Select / (De)Select all	Mask Editing / (De)select all	A	
Invert Selection	UV Image Editor / Select / Inverse	Mask Editing / (De)select all	Ctrl I	
Select Linked all	UV Image Editor / Select / Select Linked	Mask Editing / Select Linked all	Ctrl L	
Select Linked	None	Mask Editing / Select Linked	L	**No menu entry. Mouse action. The mouse needs to be over the spline**
Select Linked	None	Mask Editing / Select Linked	Shift L	**No menu entry. Mouse action. The mouse needs to be over the spline**
Border Select	UV Image Editor / Select / Border Select	Mask Editing / Border Select	B	
Circle Select	UV Image Editor / Select / Circle Select	Mask Editing / Circle Select	G	
Lasso Select	None	Mask Editing / Lasso Select		Event Mapping Tweak
Lasso Select	None	Mask Editing / Lasso Select		Event Mapping Tweak
Select More	UV Image Editor / Select / Select More	Mask Editing / Select More	Ctrl Numpad +	
Select Less	UV Image Editor / Select / Select Less	Mask Editing / Select Less	Ctrl Numpad -	
Clear Restrict View	UV Image Editor / Mask / Show / Hide	Mask Editing / Clear Restrict View	Alt H	
Set Restrict View	UV Image Editor / Mask / Show / Hide	Mask Editing / Set Restrict View	H	
Set Restrict View	UV Image Editor / Mask / Show / Hide	Mask Editing / Set Restrict View	Shift H	

Mask Editing - UV Image Editor in Mask mode. But also other locations.				
Select	None	Mask Editing / Select	Ctrl Select Mouse	**No menu entry. Mouse Only action**
Toggle Cyclic	UV Image Editor / Mask / Toggle Cyclic	Mask Editing /	Alt C	Toggle is usually something to remove ...
Slide Point	None	Mask Editing / Slide Point	Action Mouse	**No menu entry. Mouse Only action**
Slide Spline Curvature	None	Mask Editing / Slide Spline Curvature	Action Mouse	**No menu entry. Mouse Only action**
Set Handle Type	None	Mask Editing / Set Handle Type	V	Needs Menu entry
Recalc Normals	UV Image Editor / Mask / Recalc Normals	Mask Editing / Recalc Normals	Ctrl N	
Make Parent	UV Image Editor / Mask / Make Parent	Mask Editing / Make Parent	Ctrl P	
Clear Parent	UV Image Editor / Mask / Clear Parent	Mask Editing / Clear Parent	Alt P	
Insert Shapekey	UV Image Editor / Mask / Animation	Mask Editing / Insert Shapekey	I	
Clear Shape Key	UV Image Editor / Mask / Animation	Mask Editing / Clear Shape Key	Alt I	
Add Duplicate	None	Mask Editing / Add Duplicate	Shift D	Neeeds menu entry!
Copy Splines	UV Image Editor / Mask / Copy Splines	Mask Editing / Copy Splines	Ctrl C	
Paste Splines	UV Image Editor / Mask / Paste Splines	Mask Editing / Paste Splines	Ctrl V	
Set 2D Cursor	None	Mask Editing / Set 2D Cursor	Action Mouse	**No menu entry. Mouse Only action**
Translate	UV Image Editor / Mask / Transform	Mask Editing / Translate	W	
Translate	None	Mask Editing / Translate		Event Mapping Tweak
Resize	UV Image Editor / Mask / Transform	Mask Editing / Resize	R	
Rotate	UV Image Editor / Mask / Transform	Mask Editing / Rotate	E	
Scale Feather	UV Image Editor / Mask / Transform	Mask Editing / Transform	Alt S	

Frames

Frames - Timeline stuff				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Frame Offset by a step of ten	None	Frames / Frame Offset	Shift Up Arrow	No menu entry. Would just confuse.
Frame Offset by a step of ten	None	Frames / Frame Offset	Shift Down Arrow	No menu entry. Would just confuse.
Frame Offset	None	Frames / Frame Offset	Left Arrow	No menu entry. Would just confuse.
Frame Offset	None	Frames / Frame Offset	Right Arrow	No menu entry. Would just confuse.
Frame Offset	None	Frames / Frame Offset	Alt Wheel Down	No menu entry. Would just confuse.

Frames - Timeline stuff				
Frame Offset	None	Frames / Frame Offset	Alt Wheel Up	No menu entry. Would just confuse.
Jump to Keyframe	None	Frames / Jump to Keyframe	Media Last	No menu entry. Would just confuse.
Jump to Keyframe	None	Frames / Jump to Keyframe	Media First	No menu entry. Would just confuse.
Cancel Animation	None	Frames / Cancel Animation	Esc	No menu entry. Would just confuse.
Cancel Animation	None	Frames / Cancel Animation	Media Stop	No menu entry. Would just confuse.

Markers

Markers - Marker menu for various animation editors like timeline and graph editor. Add marker adds a mark at the bottom of the timeline, dopesheet and graph editor.

Function	Surface menu location	User Preferences location	Hotkey	Special note
Move Time Marker	None	Markers / Move Time Marker		Event Mapping Tweak
Duplicate Time Marker	Graph, Dopesheet, NLA Editor / Marker / Duplicate Marker	Markers / Duplicate Time Marker	Shift D	
Select Time Marker	None	Markers / Select Time Marker	Select Mouse	**No menu entry. Mouse Only action**
Select Time Marker	None	Markers /Select Time Marker	Shift Select Mouse	**No menu entry. Mouse Only action**
Select Time Marker	None	Markers / Select Time Marker	Ctrl Select Mouse	**No menu entry. Mouse Only action**
Select Time Marker	None	Markers / Select Time Marker	Shift Ctrl Select Mouse	**No menu entry. Mouse Only action**
Marker Border Select	Graph, Dopesheet, NLA Editor / Select / Border Select	Markers / Marker Border Select	B	
(De)select all markers	Graph, Dopesheet, NLA Editor / Select / (De)select all	Markers / (De)select all markers	A	
Delete Markers	Graph, Dopesheet, NLA Editor / Marker / Delete	Markers / Delete Markers	Delete	
Move Time Marker	None	Markers / Move Time Marker	W	**No menu entry. Mouse Only action**
Bind Camera to Marker	Graph, Dopesheet, NLA Editor / View / Bind Camera to Marker	Markers / Bind Camera to Marker	Ctrl B	

Animation

Animation

Function	Surface menu location	User Preferences location	Hotkey	Special note
Change Frame	None	Animation / Change Frame	Action Mouse	**No menu entry. Mouse Only action**

Animation Channels - Dope Sheet and Graph Editor

Animation Channels - Dope Sheet and Graph Editor				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Mouse Click on Channels	None	Animation Channels / Mouse Click on Channels	LMB	**No menu entry. Mouse Only action**
Mouse Click on Channels	None	Animation Channels / Mouse Click on Channels	Shift LMB	**No menu entry. Mouse Only action**
Mouse Click on Channels	None	Animation Channels / Mouse Click on Channels	Shift Ctrl LMB	**No menu entry. Mouse Only action**
Rename Channels	None	Animation Channels / Rename Channels	Ctrl LMB	**No menu entry. Mouse Only action**
Rename Channels	None	Animation Channels / Rename Channels	double-LMB	**No menu entry. Mouse Only action**
Set Channel Keyframes	None	Animation Channels / Set Channel Keyframes	double-LMB	**No menu entry. Mouse Only action**
Set Channel Keyframes	None	Animation Channels / Set Channel Keyframes	Shift double-LMB	**No menu entry. Mouse Only action**
Select All	/ Select / Select All	Animation Channels / Select All	A	
Inverts Selection	/ Select / Invert Selection	Animation Channels / Select All	Ctrl I	
Border Select	/ Select / Border Select	Animation Channels / Border Select	B	
Border Select	None	Animation Channels / Border Select		Event mapping Tweak
Delete Channels	/ Channel / Delete Channels	Animation Channels / Delete Channels	Delete	
Expands Channels	/ Channel / Expands Channels	Animation Channels / Expands Channels	Numpad +	
Collapse Channels	/ Channel / Collapse Channels	Animation Channels / Collapse Channels	Numpad -	
Expands Channels	/ Channel / Expands Channels	Animation Channels / Expands Channels	Ctrl Numpad +	
Collapse Channels	/ Channel / Collapse Channels	Animation Channels / Collapse Channels	Ctrl Numpad -	
Move Channels	/ Channel / Move / To Top	Animation Channels / Move Channels	Page Up	
Move Channels	/ Channel / Move / Up	Animation Channels / Move Channels	Page Down	
Move Channels	/ Channel / Move / Down	Animation Channels / Move Channels	Shift Page Up	
Move Channels	/ Channel / Move / To Bottom	Animation Channels / Move Channels	Shift Page Down	

View 3D Gesture Circle

View 3D Gesture Circle				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Cancel	None	View 3D Gesture Circle / Cancel	Any Esc	
Cancel	None	View 3D Gesture Circle / Cancel	Any RMB	

View 3D Gesture Circle				
Confirm	None	View 3D Gesture Circle / Confirm	Any Return	
Confirm	None	View 3D Gesture Circle / Confirm	Numpad Enter	
Select	None	View 3D Gesture Circle / Select	LMB	
Deselect	None	View 3D Gesture Circle / Deselect	Shift LMB	
No Operation	None	View 3D Gesture Circle / No Operation	Shift LMB	
Deselect	None	View 3D Gesture Circle / Deselect	MMB	
No Operation	None	View 3D Gesture Circle / No Operation	MMB	
No Operation	None	View 3D Gesture Circle / No Operation	LMB	
Subtract	None	View 3D Gesture Circle / Subtract	Wheel Up	
Subtract	None	View 3D Gesture Circle / Subtract	Numpad -	
Add	None	View 3D Gesture Circle / Add	Wheel Down	
Add	None	View 3D Gesture Circle / Add	Numpad +	
Size	None	View 3D Gesture Circle / Size	Mouse Trackpad/Pan	

Gesture Straight Line

Gesture Straight Line				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Cancel	None	Gesture Straight Line / Cancel	Any Esc	
Cancel	None	Gesture Straight Line / Cancel	Any RMB	
Begin	None	Gesture Straight Line / Begin	LMB	
Select	None	Gesture Straight Line / Select	LMB	

Gesture Zoom Border

Gesture Zoom Border				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Cancel	None	Gesture Zoom Border / Cancel	Any Esc	
Cancel	None	Gesture Zoom Border / Cancel	Any RMB	
Begin	None	Gesture Zoom Border / Begin	LMB	
In	None	Gesture Zoom Border / In	LMB	
Begin	None	Gesture Zoom Border / Begin	MMB	
Out	None	Gesture Zoom Border / Out	MMB	

Gesture Border

Gesture Border				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Cancel	None	Gesture Border / Cancel	Any Esc	
Cancel	None	Gesture Border / Cancel	Any RMB	
Select	None	Gesture Border / Select	Any RMB	
Begin	None	Begin Gesture Border /	Shift LMB	
Deselect	None	Gesture Border / Deselect	Shift LMB	
Begin	None	Gesture Border / Begin	LMB	
Select	None	Gesture Border / Select	Any LMB	
Begin	None	Gesture Border / Begin	MMB	
Deselect	None	Gesture Border / Deselect	MMB	

Standard Modal Map

Standard Modal Map - Needs investigation as a whole. What does this do?				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Cancel	None	Standard Modal Map /	Any Esc	
Apply	None	Standard Modal Map / Apply	Any LMB	
Apply	None	Standard Modal Map / Apply	Any Return	
Apply	None	Standard Modal Map / Apply	Any Numpad Enter	
Steps on	None	Standard Modal Map / Steps on	Any Left Ctrl	
Steps off	None	Standard Modal Map / Steps off	Any Left Ctrl	

Transform Modal Map

Transform Modal Map - Needs investigation as a whole. What does this do?				
Function	Surface menu location	User Preferences location	Hotkey	Special note
Cancel	None	Transform Modal Map / Cancel	Any Esc	
Confirm	None	Transform Modal Map / Confirm	Any LMB	
Confirm	None	Transform Modal Map / Confirm	Any Return	
Confirm	None	Transform Modal Map / Confirm	Any Numpad Enter	
Translate	None	Transform Modal Map / Translate	W	
Rotate	None	Transform Modal Map / Rotate	E	
Resize	None	Transform Modal Map / Resize	R	
Snap Toggle	None	Transform Modal Map / Snap Toggle	Shift Tab	
Invert Snap On	None	Transform Modal Map / Invert Snap On	Any Left Ctrl	
Invert Snap Off	None	Transform Modal Map / Invert Snap Off	Any Left Ctrl	
Invert Snap On	None	Transform Modal Map / Invert Snap On	Any Right Ctrl	

Transform Modal Map - Needs investigation as a whole. What does this do?				
Invert Snap Off	None	Transform Modal Map / Invert Snap Off	Any Right Ctrl	
Add Snap Point	None	Transform Modal Map / Add Snap Point	A	
Remove last Snap Point	None	Transform Modal Map /	Alt A	
Increase Proportional Influence	None	Transform Modal Map / Increase Proportional Influence	Page Up	
Decrease Proportional Influence	None	Transform Modal Map / Decrease Proportional Influence	Page Down	
Increase Proportional Influence	None	Transform Modal Map / Increase Proportional Influence	Shift Page Up	
Decrease Proportional Influence	None	Transform Modal Map / Decrease Proportional Influence	Shift Page Down	
Increase Proportional Influence	None	Transform Modal Map / Increase Proportional Influence	Wheel Down	
Decrease Proportional Influence	None	Transform Modal Map / Decrease Proportional Influence	Wheel Up	
Increase Proportional Influence	None	Transform Modal Map / Increase Proportional Influence	Shift Wheel Down	
Decrease Proportional Influence	None	Transform Modal Map / Decrease Proportional Influence	Shift Wheel Up	
Adjust Proportional Influence	None	Transform Modal Map /	Mouse/Trackpad Pan	
Select next Edge Slide Edge	None	Transform Modal Map / Select next Edge Slide Edge	Alt Wheel Down	
Select previous Edge Slide Edge	None	Transform Modal Map / Select previous Edge Slide Edge	Alt Wheel Up	
Increase Max AutoIK Chain Length	None	Transform Modal Map / Increase Max AutoIK Chain Length	Shift Page Up	
Decrease Max AutoIK Chain Length	None	Transform Modal Map / Decrease Max AutoIK Chain Length	Shift Page Down	
Increase Max AutoIK Chain Length	None	Transform Modal Map / Increase Max AutoIK Chain Length	Shift Wheel Down	
Decrease Max AutoIK Chain Length	None	Transform Modal Map / Decrease Max AutoIK Chain Length	Shift Wheel Up	
Toggle Direction for Node Auto-offset	None	Transform Modal Map / Toggle Direction for Node Auto-offset	T	

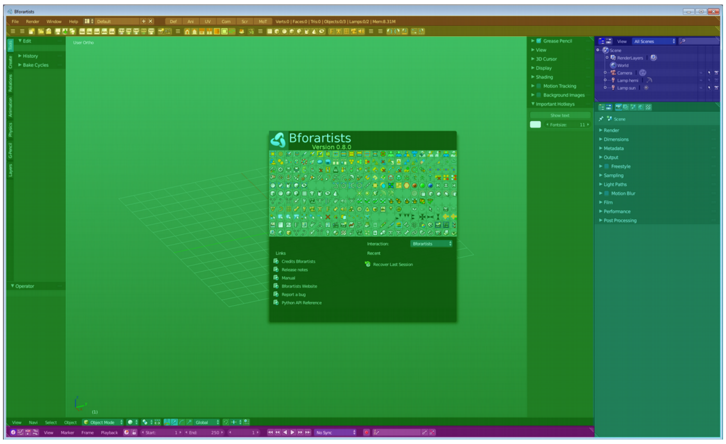
Eyedropper Modal Map

Eyedropper Modal Map - Needs investigation as a whole. What does this do?				
Function	Surface menu location	User Preferences location	Hotkey	Special note

Eyedropper Modal Map - Needs investigation as a whole. What does this do?				
Cancel	???	Eyedropper Modal Map / Cancel	Any Esc	
Cancel	???	Eyedropper Modal Map / Cancel	Any Right Mouse	
Confirm Sampling	???	Eyedropper Modal Map / Confirm Sampling	Any Return	
Confirm Sampling	???	Eyedropper Modal Map / Confirm Sampling	Any Numpad Enter	
Confirm Sampling	???	Eyedropper Modal Map / Confirm Sampling	Any Left Mouse	
Start Sampling	???	Eyedropper Modal Map / Start Sampling	Any Left Mouse	
Reset Sampling	???	Eyedropper Modal Map / Reset Sampling	Any Spacebar	

2.2 - Layouts

Introduction



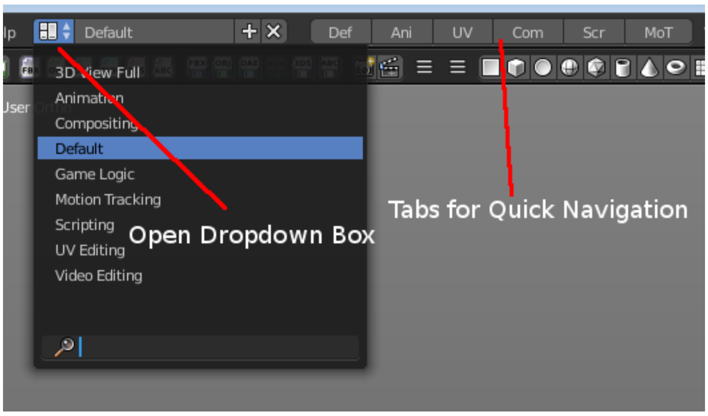
The Bforartists Interface is made of several layouts. We have one for general 3D work, one for scripting, one for UV editing and so on.

And every layout is made of several editors. See image. Which brings the functionality to the layout. Every editor type has another purpose.

The upper menu bar is a editor called Info editor. Below is the Toolbar editor. The green area is the 3D View editor, the blue little area up right is the Outliner Editor, the bluegreen editor below is the Properties editor. And the collapsed small bar at the bottom is the Timeline.

We will explain the single editors and their functionality and menus in detail at a one by one base. Here we will talk about the layouts in general. The editors are just covered for the layout needs here.

Switching Layouts



The first important interaction is the ability to switch between the existing different layouts. This can be done in two ways. By the six tabs for quick navigation. And in the layout dropdown box.

The six tabs are connected to the six most important layouts. In the order: Default, Animation, UV Editing, Compositing, Scripting and Motion Tracking.

To switch between layouts by the dropdown box you have to click at this symbol left of the dropdown box. A list will open with the available Layouts. And here you can choose which layout you want to load in the dropdown list by clicking at it.

WARNING!

Do NOT delete the tab button layouts from the dropdown box. This will make the tab buttons disfunctional.

Hint

Just important when you work with more than one scene at once:

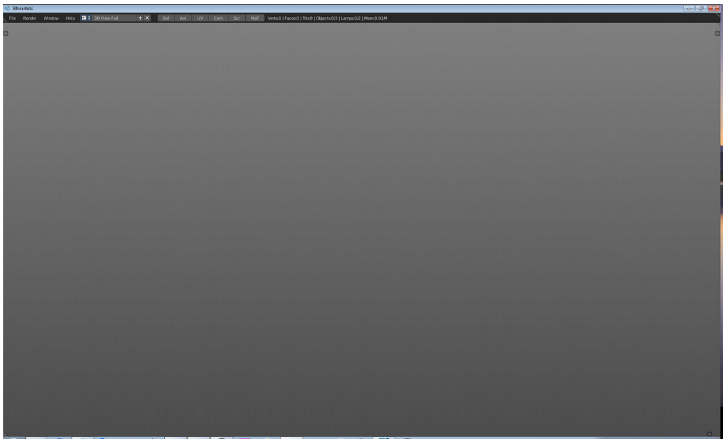
By default, each screen layout ‘remembers’ the last *scene* it was used on. Selecting a different layout will switch to the layout **and** jump to that scene.

Standard Layouts

The Standard layouts are 3D View full, Animation, Compositing, Default, Motion Tracking, Scripting and UV Editing. Plus a layout for Video editing. And one for the game logic. Both features that are not officially supported by Bforartists. Please use the Blender documentation here.

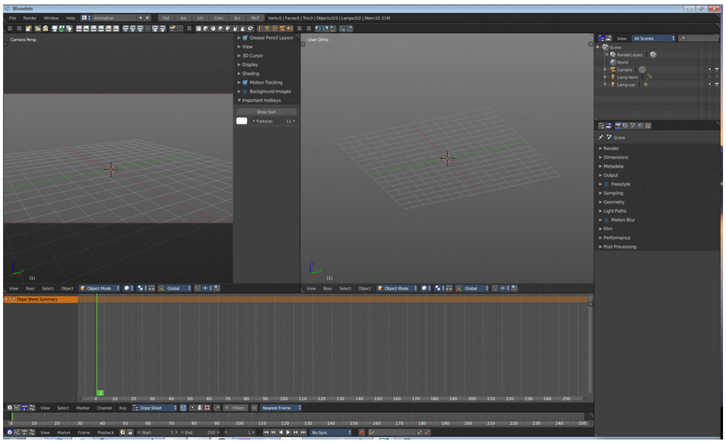
3D View full

This layout gives you a maximized 3D view that hides every other toolbar and editor. This layout is useful when you want to have a look at the whole scene in a fullscreen manner. It just shows the 3D View Editor.



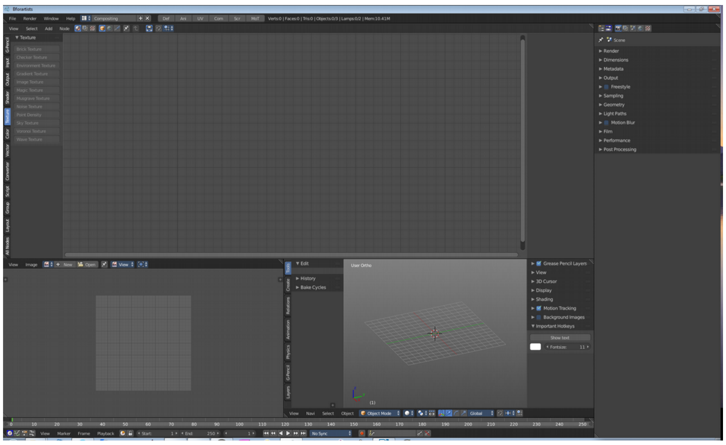
Animation

This layout provides you with a layout that is optimized for Animation tasks. It contains two 3D View editors, a Info Editor, a Outliner Editor, a Properties Editor, a Timeline Editor, a Dope Sheet Editor and a Graph editor.

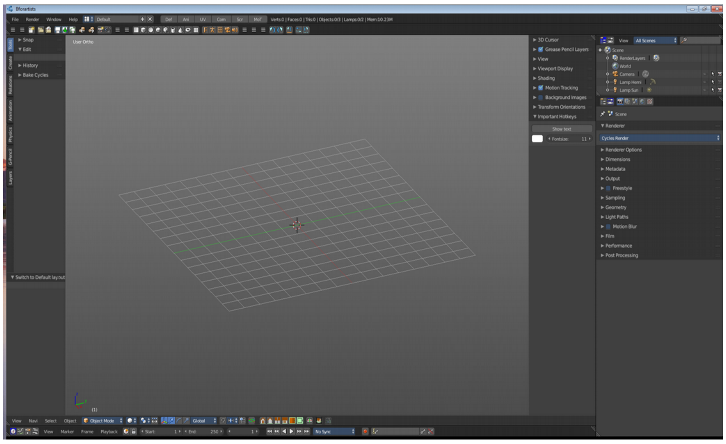


Compositing

This layout gives you a compositing layout. This layout is also meant for working at textures and materials. It contains a Node Editor, a Info editor, a UV Image Editor, a 3D View Editor, a Properties Editor and a Timeline editor.

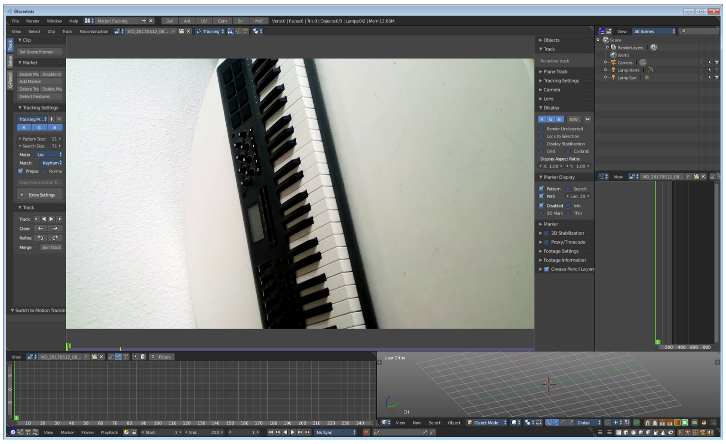


Default



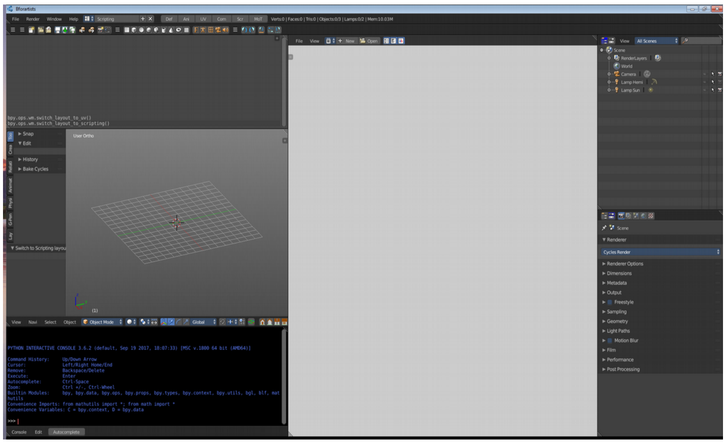
This layout is for general 3D work. Here you work at your 3D scene. Here happens modeling, texturing, etc. It is also the layout with which Bforartists opens up. It contains a 3D View editor, a Info editor, a Timeline editor, a Outliner editor and a Properties editor.

Motion Tracking



This layout gives you a layout for Motion Tracking.

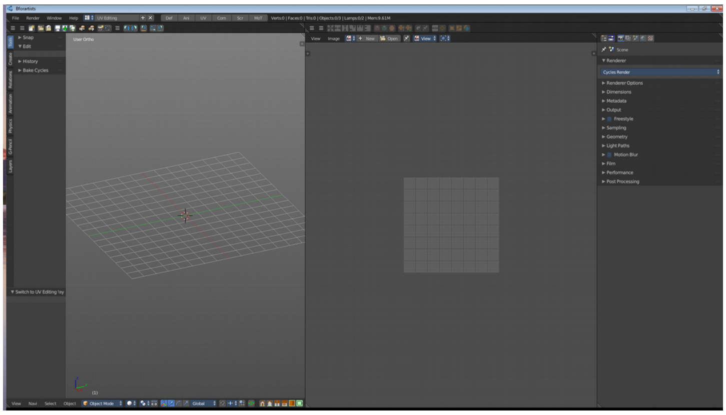
Scripting



The scripting layout gives you a layout where you can write Python code. It contains a Info editor, a 3D View editor, a Console editor, a Text editor, a Outliner Editor and a Properties Editor.

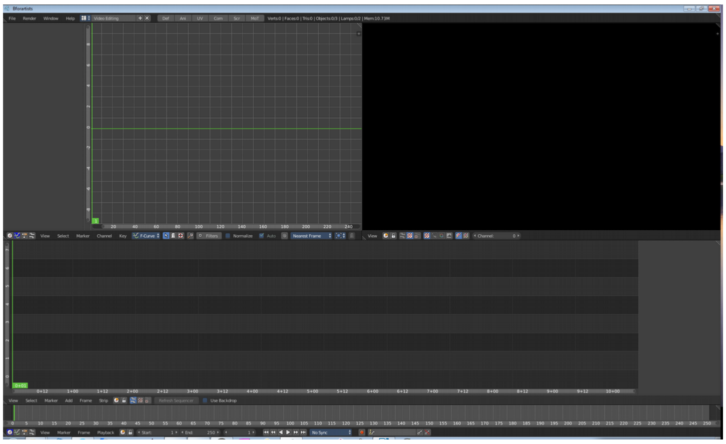
UV Editing

The UV Editing ist made for texturing and UV mapping. It contains a Info Editor, a UV Image Editor and a 3D View editor.



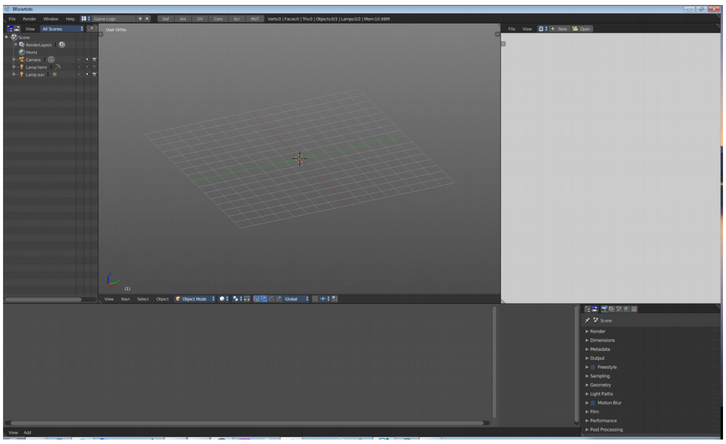
Video Editing

The Video Editing is made for editing videos. It contains a Graph Editor, a Timeline, and two Video Sequence Editors.



Game Logic

The Game Logic layout is made for developing a game. It contains a Outliner, a Logic Editor, a Text Editor, and a Properties Editor.

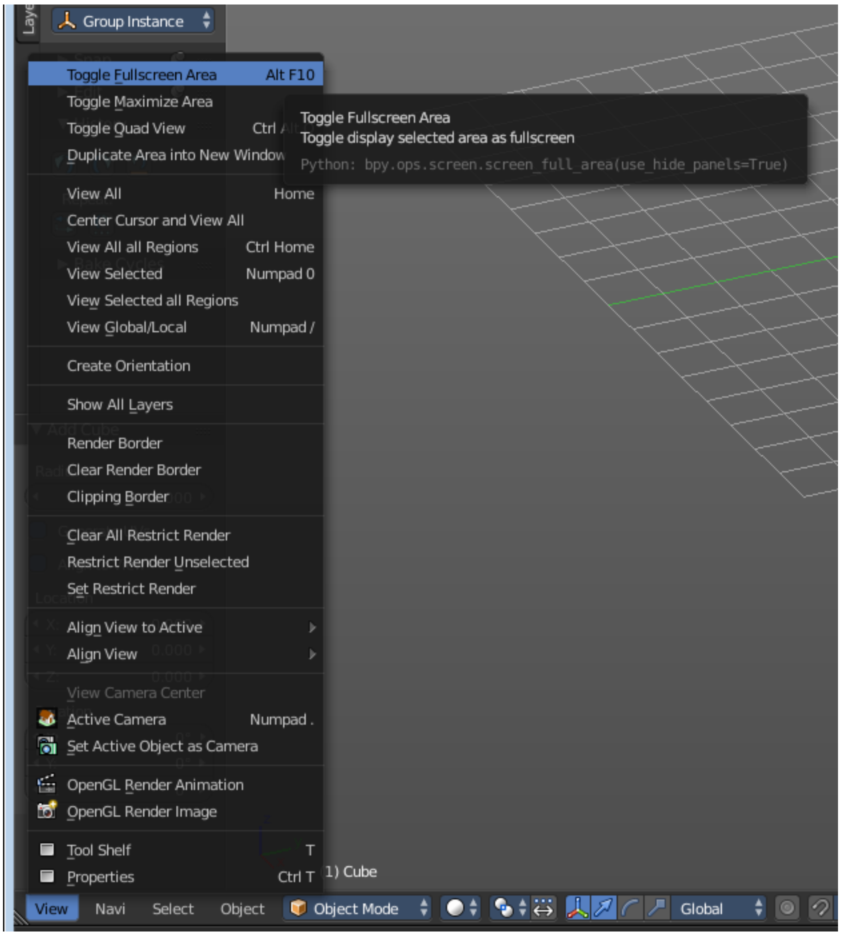


Modifying Layouts

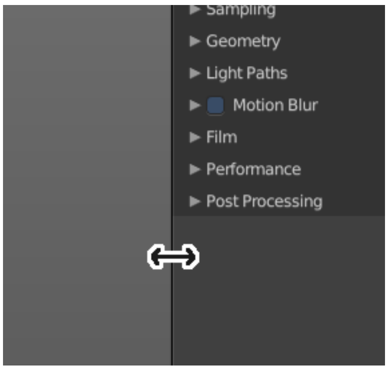
The standard layouts can be modified. You can resize the editor windows, drag-open more editors, drag-close editors away, etc.

Maximizing an Editor Window

You can maximize an editor in the layout to fill the whole screen in the View menu. The menu item Toggle Full Screen. The same menu item will return the editor back to its initial state. This feature is dependant of the mouse position when you use the hotkey. The editor under the mouse will be maximized.



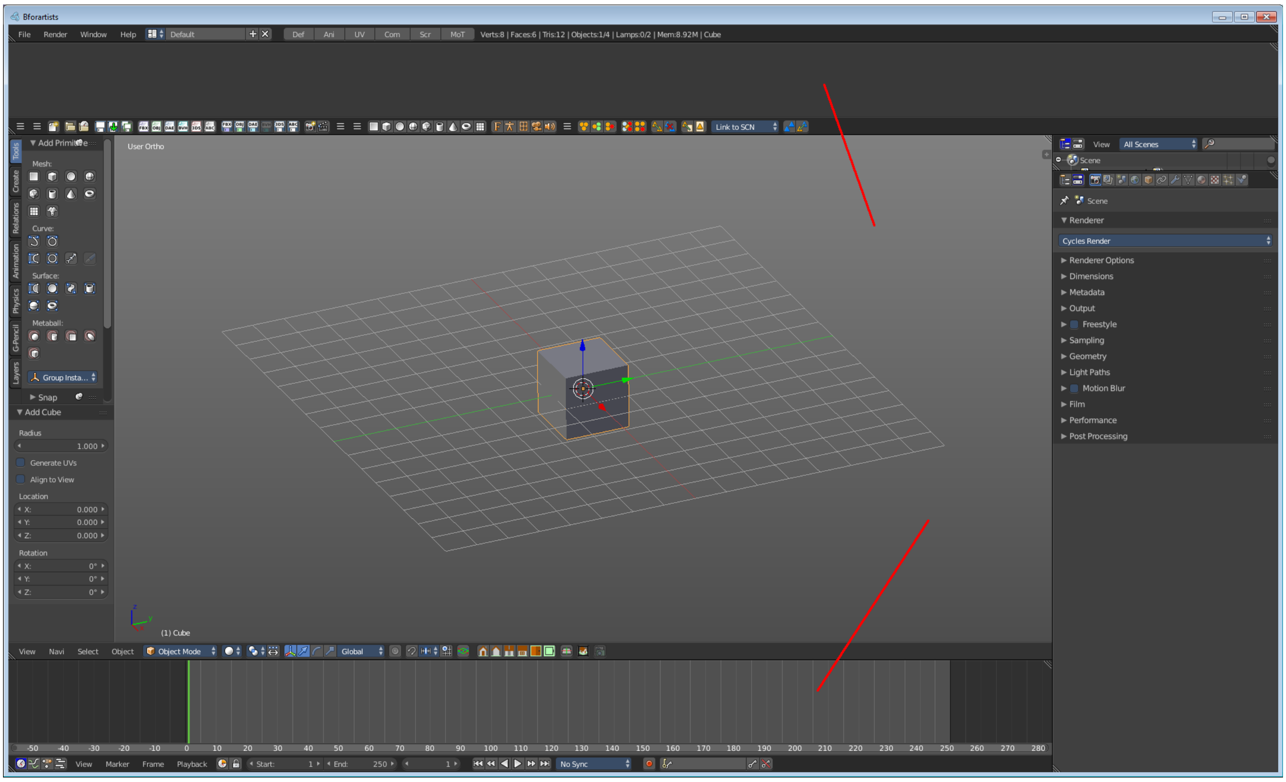
Resizing Editor Windows



Move the mouse over a border between the editors. The mouse cursor will turn into a double arrow. Drag the arrow around and the editor will resize with your moving mouse.

In the Default layout there are two editors that are collapsed to just show the menu. The menu bar at the top is a own editor. The Info editor. You can drag it down to reveal a text field. Here Bforartists displays all the former actions as strings. When you create a primitive for example, then it displays a string with the python command for it.

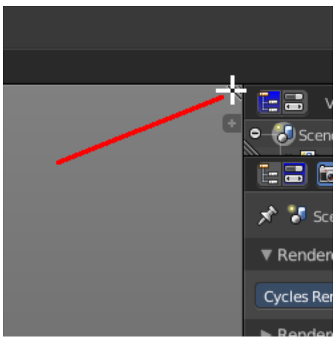
The other collapsed editor is at the bottom. The timeline.

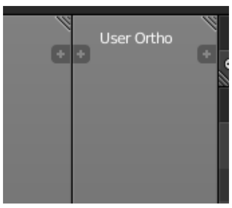


Splitting Editor Windows

There is a little triangle area in the upleft and downright corner of the editors. When you move the mouse over it then the mouse pointer turns into a white cross.

When you click and drag the mouse inwards of the current editor, then the editor splits up. You open a second 3D view for example.

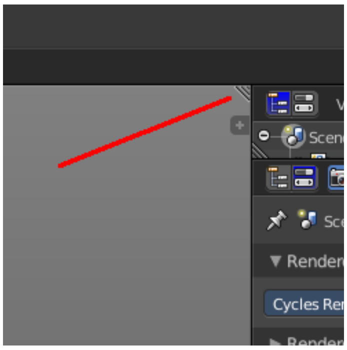


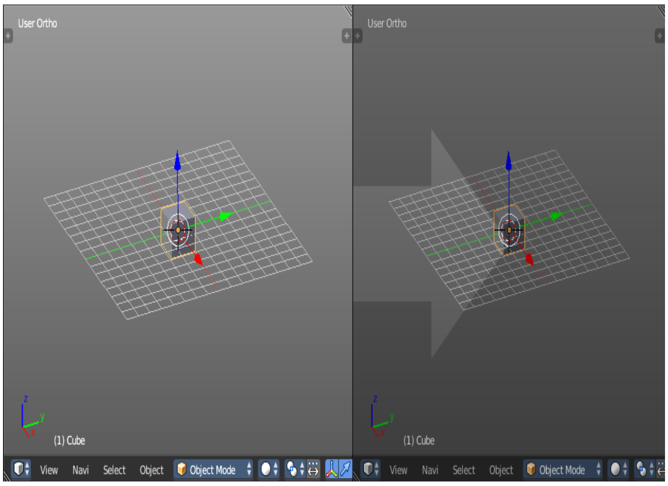


Unioning Editor Windows

There is a little triangle area in the upleft and downright corner of the editors. When you move the mouse over it then the mouse pointer turns into a white cross.

When you click and drag the mouse outwards of the current editor, then the editor unions with the neighbour editor. Note that this just works when they are in one row, horizontally or vertically.





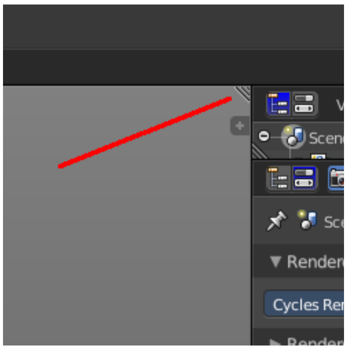
Swapping Contents

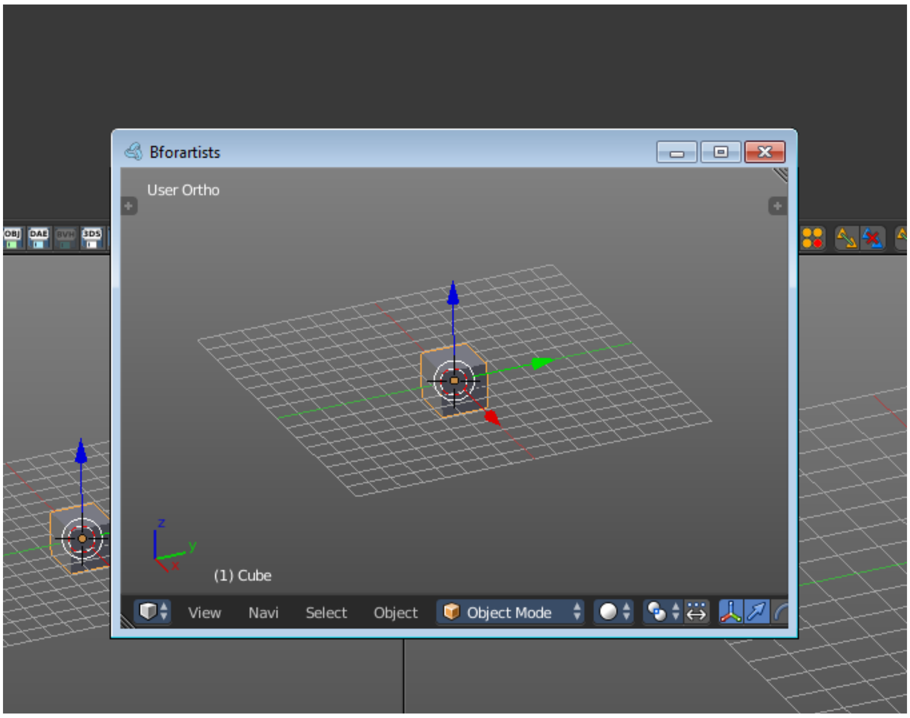
You can swap the contents between two editors with clicking at the triangle area, press `Ctrl-LMB` and drag into the target editor.

Make Editor Window floating

There is a little triangle area in the upleft and downright corner of the editors. When you move the mouse over it then the mouse pointer turns into a white cross.

Hold down Shift, and drag the mouse. The editor will detach from the Blender surface. This is useful for a multi monitor setup for example. Now you can place this editor at Monitor 2.

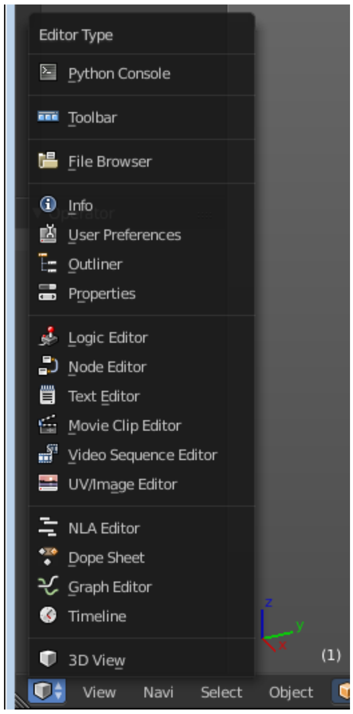




Note that there is no way to reintegrate this floating editor window back into the Blender UI once it is detached.

You have to close it.

Change Editor Type



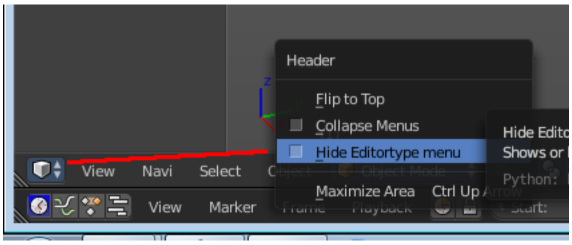
When you split an editor then you get a second editor window. This is of the same type than the original editor window. Means when you have split the 3D View then you have two 3D views now. But with a little difference. It has the so called Editor Type menu visible.

Have a closer look at the menu bar of the new created editor, at the left. Here you can find the Editor type menu in the new created editor. This is the place where you can change the editor type for the new created editor.

You can also change the editors in the standard layouts to something else. You just need to show the Editor Type Menu there, and then you can change the editor type also there. See next point.

A closer explanation of the single editors follows in the chapter Editors.

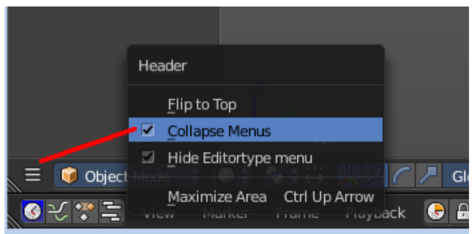
Show / Hide the editor type menu



You might have noticed that the editor type menu is not available in the editors of the standard layouts. This is to reduce visual noise and to free some UI space.

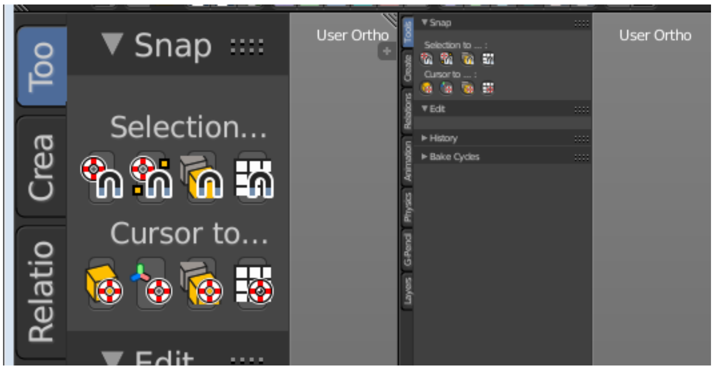
You can show and hide this editor type menu. To do so right click at an empty space somewhere at the menu bar of an editor. You will see a menu now. And here you can check or uncheck the menu item Hide Editortype Menu to show or hide the Editor Type menu.

Collapse Menus



The text menus can be collapsed to free some UI space. Right click at an empty space somewhere at the menu bar of an editor. You will see a menu now. Here you can choose if you want to display the text menu collapsed or expanded.

Resize Tool Shelf and Properties content



You can resize the Tool Shelf content and the Properties Sidebar content. This means that you can zoom in or out. This trick also works in the Properties Editor.

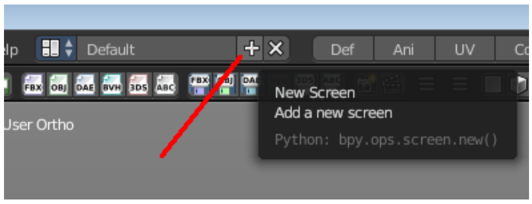
Move the mouse over the upper region of the Tool Shelf.
Hold down Ctrl key
Click with Middle Mouse button. The mouse pointer will turn into two white triangles.
Now drag up or down to resize the area content

OR

Move the mouse over the upper region of the Tool Shelf.
Simply press Numpad + or Numpad -

To reset the area content to default scale move the mouse over the area and press Home key (german keyboard layout Pos 1)

Create new Layout

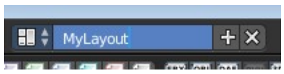


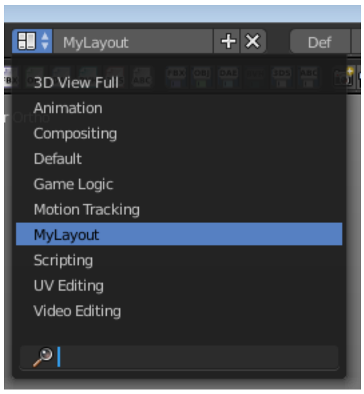
You can either modify an existing layout. Or you can create a new layout. And do your modifications there.

This can be done in the upper menu bar. Have a look at the plus sign at the right of the dropdown box.

Click it, and you will get a new layout in the text field. The new layout will be based at the layout that you had loaded when you clicked the plus button.

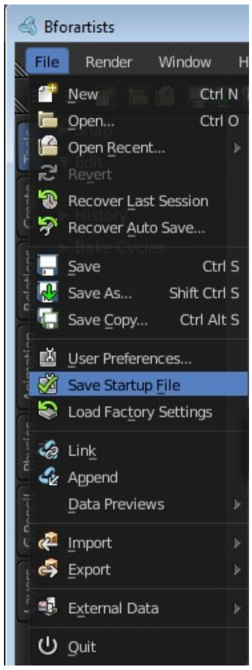
Now rename the layout. Click in the text field and change the layout name to whatever name you want.





It will be part of the layout list now. But just as long as you haven't closed Bforartists. When you want to keep the new layout and the changes at it, then you need to save the modifications. See next point.

Save changes at the Layout

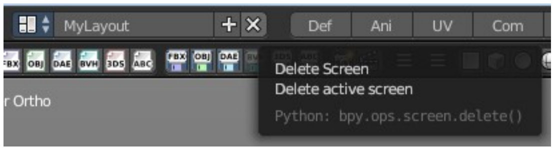


You cannot save new layouts or modifications at an existing layout directly. To save modifications at an existing layout you have to save the Startup File. This menu item can be found in the File menu.

Note that this also affects other changes. Bforartists will for example now start with the currently active layout. And it will also preserve the changes that you did at other layouts before saving.

So when you work at a layout be sure that you don't accidentally do changes at other areas. And before you save the startup file you should switch back to the layout with which you want to start Bforartists.

Delete Layout



Layouts can also be deleted. To do so simply click at the X button besides the dropdown box.

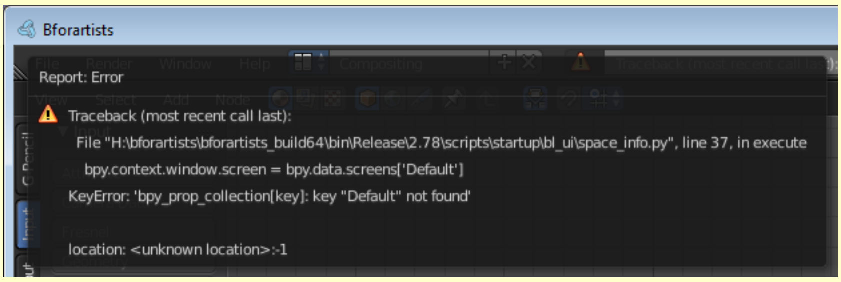
That's just half of the job though. When you reopen Bforartists then the layout is back. When you want to remove the layout permanently then you have to save the Startup file. See above.

WARNING!

Do NOT delete the tab layouts from the dropdown box. This will make the tab buttons disfunctional. And you will get a warning when you click these buttons.

The tab layouts are: Default, Animation, UV Editing, Compositing, Scripting and Motion Tracking.

In case you have deleted them accidentally, simply readd them.

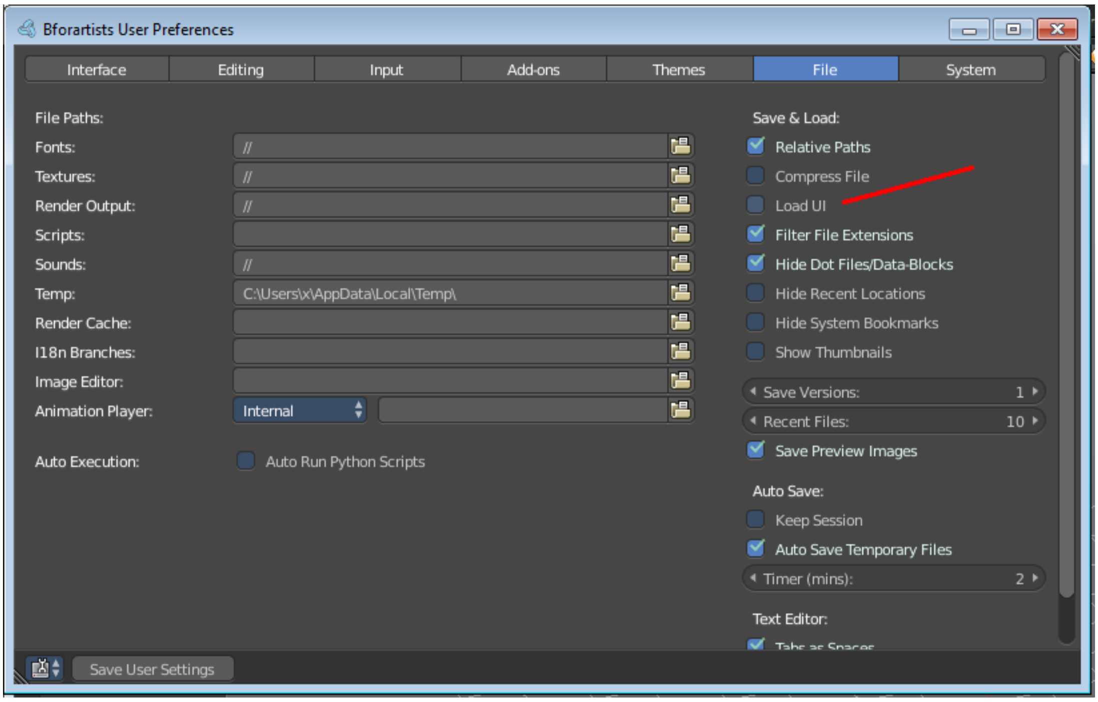


Load Layout from Blend Files

Every blend file saves also the layout in which the scene is at the point of saving. Means you can load a layout from the blend file.

This feature is off by default since it is usually unwanted behaviour to load layouts from other people.

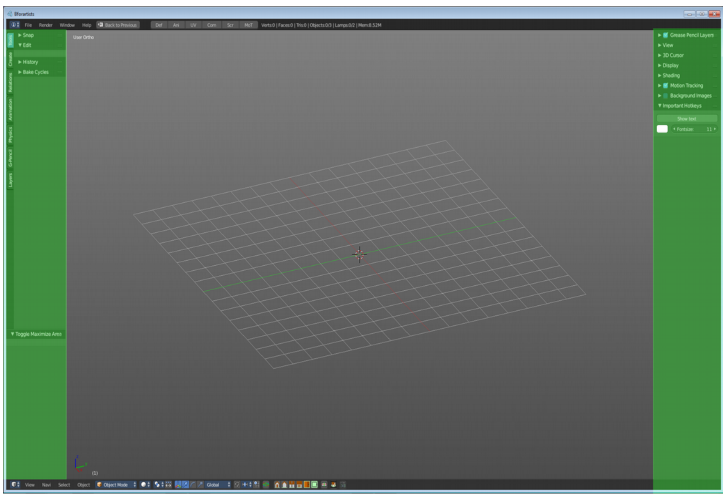
You can turn it on in the User Preferences in the File tab. Tick the menu item Load UI. Then save User Settings.



Note that now all Blend files that you open will load the layout that the Blend files are saved with.

Tool Shelf and Properties Sidebar

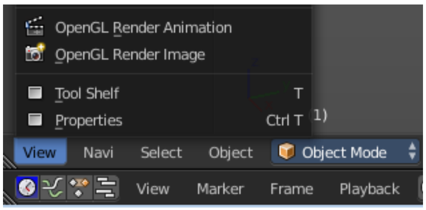
Some editors have a Tool Shelf or a Properties Sidebar. Or both. They can be resized by dragging. They can be closed and opened. They can even be rearranged to be left or right. The screenshot shows the 3D view. Left is the Tool Shelf. Right is the Properties sidebar.



Opening and closing by menu and hotkey

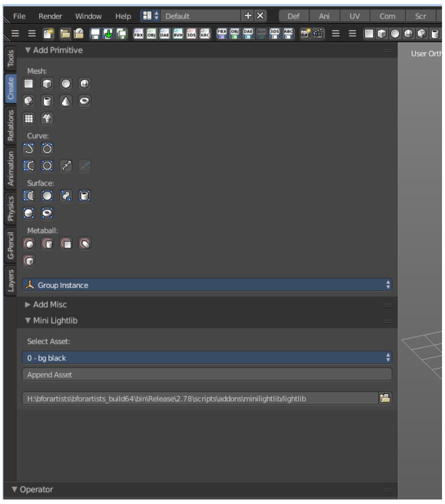
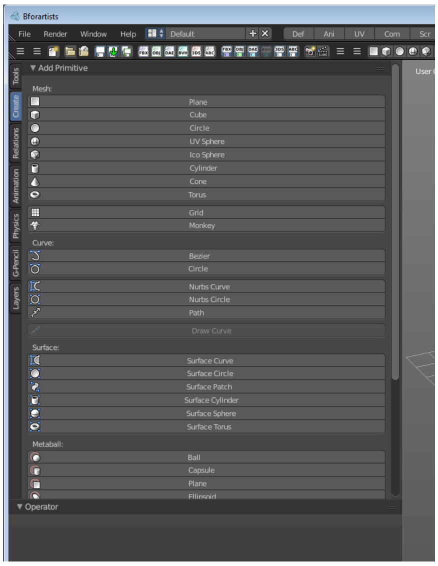
The view menu provides you with menus to close and to open the Tool shelf and the Properties sidebar.

It also shows the hotkeys for those two items.



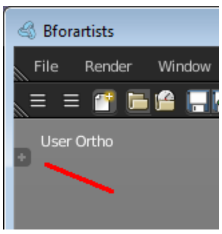
Resize

You can grab the border and drag the Tool Shelf and the Properties Sidebar to the left or to the right to expand or to close them. Text buttons will stretch across the whole width. But the icon buttons will not follow. They have a fixed width of four icon buttons per row.

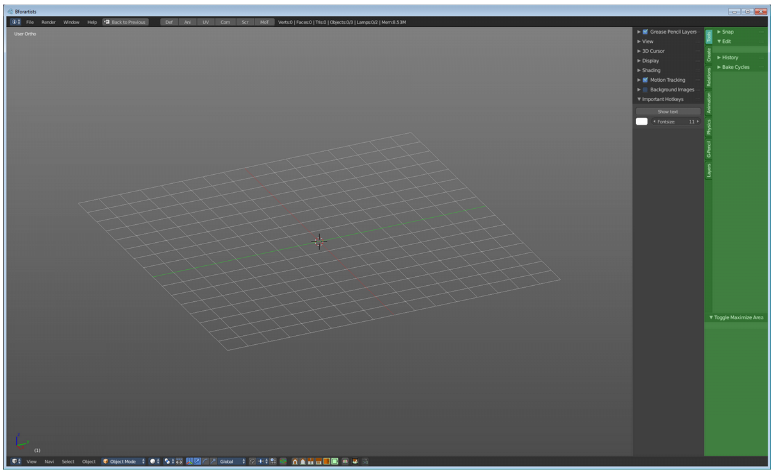
Open Sidebar by Plus Button

When a sidebar is closed then you will see a little plus button. When you click at this button then the sidebar will reappear.



Rearrange Sidebars

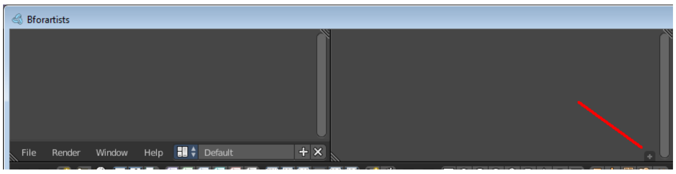
The sidebars can be rearranged to be shown at the left side or the left side. To do so move your mouse over one sidebar, and press F5. The sidebar will jump to the other side now.



Header

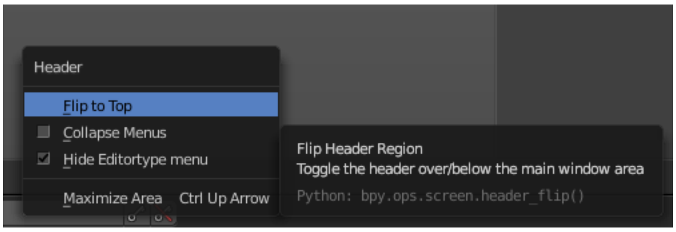
Every editor has a header area. It usually contains the menu. And some tools or settings.

Show / Hide header

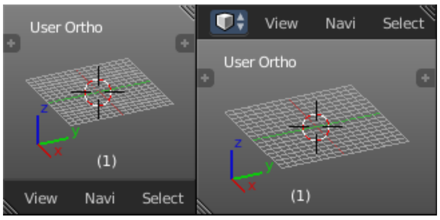


You can hide the header by simply dragging at the border to close it. A little plus button will now show. When you want to reveal the header then click this plus button.

Flip Header to top or bottom

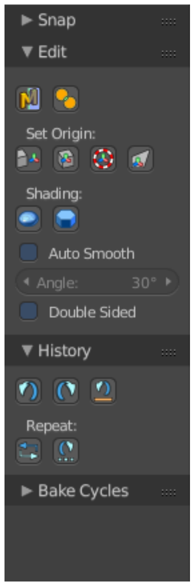


The header can either be displayed at the top or at the bottom.
Right click at an empty space somewhere at the menu bar of an editor. You will see a menu now. Here you can choose if you want to display the menu bar at the top of the editor, or at the bottom.



Panels

A Panel is a container that contains tools and settings. At the right you see the History panel.



Panels can be rearranged in order. Simply drag them over each other to achieve the order that you need.

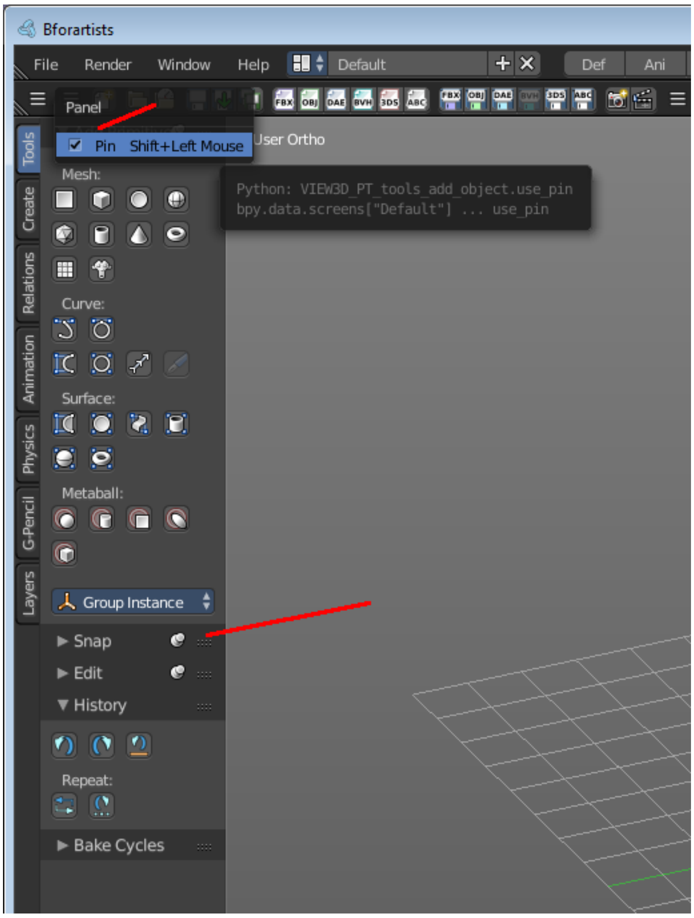
Panels can be expanded and collapsed by clicking at the title bar.

When you hold down ctrl and click at the title bar then this panel will open, and all other panels will close.

Panels in the 3D View editor are mode dependant. When you are in Edit mode then you might see other panels in the Tool Shelf than in Object Mode.

Tabs

The 3D View editor and the Node editor have Tabs in the Tool Shelf. Tabs. This tabs help to organize the available tools into categories. In the 3D view it's also a common place where addons adds themselves.



Pinning panels

Normally the tabs just displays the panels of the current tab. But you can pin panels so that they display always.

Right click at the tab that you want to pin. A menu pops up. Check the Pin checkbox. The tab will now show a pin, and will display permanently.

To unpin the panel simply click at the Pin icon.

2.3 - Grease Pencil

Grease Pencil Introduction

Years ago people needed a way to quickly draw on their monitors, they did this with a tool called a grease pencil. This is especially helpful for animators who need to add notes directly on their screen. However, not everyone wants to draw on their monitors. So a digital version was made, also called a grease pencil.

You can use the Grease Pencil tool to draw freehand sketches and annotations in most of the Editors. The sketches that are made are saved with the blend-file so they can be seen at any time, a disadvantage of the old grease pencil. However, you can also do much more with the digital grease pencil such as:

- Planning animation poses and motion curves.

- Sketching out model topology.
- Hand-drawn storyboarding in 3D.
- As director’s tool to review shots.
- 2D animations

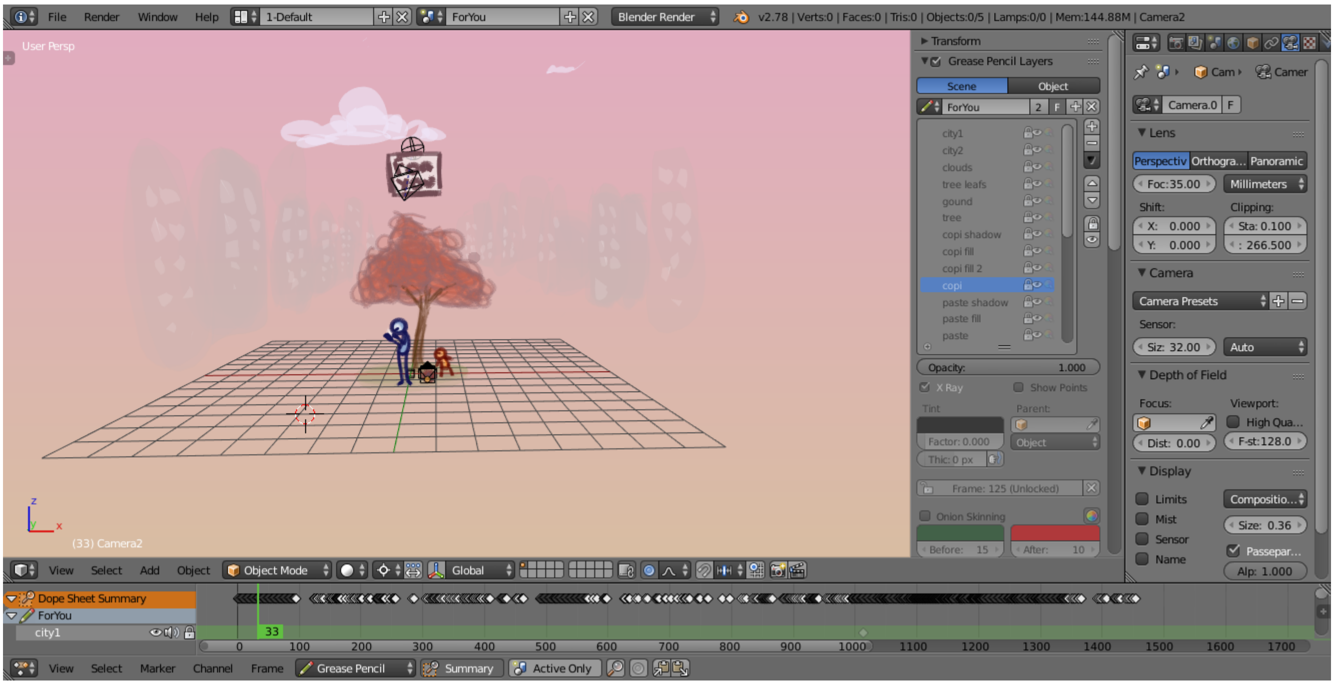
An advanced use of *Grease Pencil* is for different tools (e.g. add-ons). Allowing you to draw where the tool is to take effect.

https://player.vimeo.com/video/155635261

Drawing Strokes

Enable the *Grease Pencil* by clicking *Draw, Line, Poly or Erase* from the Tool Shelf T. A new layer will be automatically added for you to draw on.

A new layer can be added from the Grease Pencil panel in the Properties region. This panel can also be used to customize the color, opacity and thickness of the pencil lines. Changes to these settings will affect all strokes on the current layer.



An example of the Grease Pencil.

Grease Pencil sketches can be converted to editable geometry and used to aid the animation process.

Drawing

Reference
Mode: All Modes Panel: Tool Shelf ‣ Grease Pencil ‣ Grease Pencil

The Tool Shelf provides a number of options for drawing with the *Grease Pencil* which are detailed below.

Draw `D-LMB`

Draw a new stroke (multiple short, connected lines). The stroke will finish when you release the mouse button.

Line `Ctrl-D-LMB`

Draw a new line in rubber band mode. The line will finish when you release the mouse button.

Poly `Ctrl-D-RMB`

Draw connected lines by clicking on position you want to add the next point. Lines will be automatically added to connect the two points. Holding `LMB` down and sliding mouse lets you place the new point/segment preview. The transformation of the point is locked to X/Y axis set by initial direction of the mouse movement.

Erase `D-RMB`, `Eraser`

Erases segments of strokes that fall within the radius of the eraser "brush" (with a linear falloff from the center of the eraser circle). The erasing will continue until the mouse button is released, while trying to reduce the thickness of strokes before removing them. The eraser operates on all visible and editable layers. If begun with *Erase*, either `RMB` or `LMB` will erase strokes. Its cursor is a red circle with a dashed outline.

The size of the eraser "brush" can be controlled with `Wheel`, or with `NumpadPlus` and `NumpadMinus`, while still holding `RMB`.

Additive Drawing

With the "Additive Drawing" option enabled the active frame's strokes will be carried over/copied if you start drawing on an empty frame (i.e. one without any keyframe already). This saves the effort of keeping a Dopes sheet open, and to remember to duplicate the current frame before starting to draw the next pose (or risk managing to draw the perfect pose, but without everything else).

This option makes it easier to animate shots where you're building on a result from a previous frame. Examples of cases where this comes in handy includes animating facial expressions (when all outlines are on the same layer), or animating "growing" things (e.g. vines, or concentric circles growing from a central point).

> **Note**
>
> Even without this option enabled, this is the default behavior when using the eraser on an "empty" frame. This makes it easier to do shots where you're just changing parts of the facial expression, or if you're animating an "eraser" effect.

Continuous Drawing

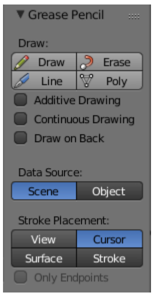
Continuous Drawing allows for rapid sketching with the *Grease Pencil* when multiple strokes are desired. So that you only have to hold `D` once for the first stroke. Besides the checkbox Continuous Drawing is also enabled if the `D` key is released while pressing `LMB`. The eraser for one-off strokes (`RMB`) is still available. Note that with the *Eraser* both `LMB` or `RMB` can be used when drawing has started.

Use `Esc` or `Return` or clicking outside the current viewport (e.g. another region or editor) to exit the mode. Continuous drawing can be disabled using `E` key in order to get fast access to sculpt mode.

Draw on Back

New strokes are moved behind the drawing when confirming the drawing tool (lowered to the bottom of the stack).

Stroke Placement



Grease Pencil panel.

Defines how the strokes are converted to 3D (or 2D) space.

View
: New strokes are placed in screen space (2D) and are locked to the view.

Cursor
: New strokes are drawn in 3D-space, with position determined by the 3D cursor and the view rotation at the time of drawing. *Cursor* is available as an option in the *UV/Image Editor* but it functions identically to the *View* option. *(3D View only)*

Surface
: New strokes are drawn in 3D-space, with their position projected onto the first visible surface. *(3D View only)*

Stroke
: New strokes are drawn in 3D-space, with their position projected onto existing visible strokes. Note that strokes created with *View* are not in 3D-space and are not considered for this projection. *(3D View only)*

Only Endpoints
: Applies the drawing setting only to the endpoints of the stroke. The part of the stroke between the endpoints is adjusted to lie on a plane passing through the endpoints.

The effect of different Drawing Settings on Grease Pencil strokes.

Tip
Notes For Tablet Users: • The thickness of a stroke at a particular point is affected by the pressure used when drawing that part of the stroke. • The “eraser” end of the stylus can be used to erase strokes.

Enable Editing
See Stroke Edit Mode. A overlay is displayed in the top-right corner of editors when enabled.

Tools

- Convert to Geometry
- Ruler and Protractor

Layers

Reference
Mode: All Modes Panel: Properties region ‣ Grease Pencil Layers

Grease Pencil sketches are organized in layers, much like the image layers in the GIMP or Photoshop®. These layers are not related to any of the other layer systems in Bforartists.

The layers' main purpose is to gather sketches that are related in some meaningful way (e.g. "blocking notes", "director's comments on blocking", or "guidelines"). For this reason, all the strokes on a layer (not just those made after a particular change) are affected by that layer's color, opacity, and stroke thickness settings.

Layers are managed in the *Grease Pencil Panel* of the *Properties region* `N` shown here.

Grease Pencil Panel.

Grease Pencil Data

Use the following controls to Add, Remove or adjust the position of a layer in the list.

Source
- **Scene**
  - Grease Pencil data is attached to the current scene is used, unless the active object already has Grease Pencil data (i.e old files).
- **Object**
  - Grease Pencil data is attached to the active object are used. This is required when using pre 2.73 add-ons.

Grease Pencil
- Used to select the Grease Pencil data-block to use for layers. For controls see Data-Block Menu.

Active Layer

A List Views & Presets of layers attached to each scene or object.

- **Parent (bone icon)**
  - Indicates that a parent has been set for the layer.
- **Lock (padlock icon)**
  - Locks the ability to edit the current layers layer.
- **Hide (eye icon) `H`**
  - Hides the current layer in the drawing region.
- **Unlock Color (palette with arrow icon)**
  - Unprotects selected colors from further editing and/or frame changes.
- **Isolate (padlock icon) `NumpadAsterix`**
  - To restrict editing to the active layer only.
- **Isolate (visible) (eye icon)**
  - An option of *Isolate* to also affect the visibility.
- **Specials**
  - **Duplicate Layer**
    - Creates a copy of the current layer.

Show All `Alt-H`
: Makes all hidden layers visible.

Hide Others `Shift-H`
: Makes all non selected layers hidden.

Lock/Unlock All
: Locks/Unlocks all of the layers. This can be useful to prevent unwanted editing.

Merge Down
: Merges the current layer with the layer below it.

Note
By default, most operations occur only on the *active* layer highlighted in the list.

Appearance Settings

These settings can be used to change how the active layer appears.

Opacity
: The transparency of the layer.

X-Ray
: Makes the lines visible when they pass behind other objects in the scene.

Show Points
: Draws the start/end points that make up the stroke.

Tint

Color
: The color to tint the layer.

Factor
: The amount that the *Tint Color* has on the layer.

Thickness Change

A relative change in pixels to apply to the thickness of all stroke in the active layer (works like a modifier).

Apply (hand and bulged in blue line icon)
: If the apply button is pressed, the thickness change is applied and the value is reset to zero.

Animation

Parent

An Data ID to select the parent object. The strokes of the layer will follow parent transformations.

Type

Type of parent relation.

Object, Armature, Bone

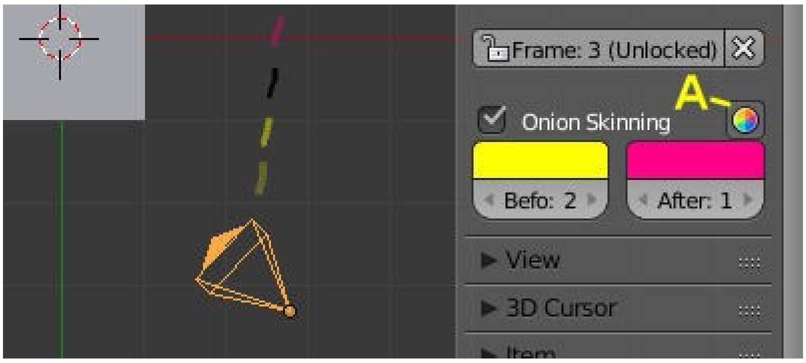
Lock Frame
: Locks the current frame displayed by layer.

Delete Frame

Deletes the active frame for the active Grease Pencil Layer.

Onion Skinning

Onion-skinning, also known as ghosting, helps an animator by displaying the neighboring frames as a faded trail.



Grease Pencil Onion Skinning.

A: Use Custom Colors

Onion Skinning
: Checkbox to enable onion skinning.

Always Use (camera icon)
: If enabled ghosts are displayed when scrubbing the view and/or playing back animation.

Use Custom Colors (palette icon)
: Toggles to use the *Before* and *After* controls to change the color of the ghosted frames.

Before/After
: **Color**
  : The color of the strokes before/after the current frame.

  Before/After Range
  : The maximum number of ghosts to show before/after the current frame. 0 will only show the previous/next sketch, and -1 will not show any frames before/after current.

Colors

Reference
Mode: Stroke Edit Mode
Panel: Properties region ‣ Grease Pencil Colors

Palette

A Data-Block Menu to select a palette, which is a set of colors. Switching palettes will change all strokes color in all layers if the same color are linked.

New +

If there are more than one palette, all colors of the old palette will be transferred to the new selected palette.

- If the color exist in the new palette (same name), the stroke is linked to new color.
- If the color does not exist in the new palette, a new color is added to the palette in order to keep the stroke.

Colors

A List Views & Presets of colors grouped in the palette linked as stroke or fill colors. If a color with strokes is removed, all strokes of this color are removed. Any change to line color or fill color, will change any stroke of any layer using this color. A palette must contain at least one color, so the last one cannot be deleted.

Lock (padlock icon)
ToDo.

Hide (eye icon)
ToDo.

Ghost (ghost icon)
ToDo.

Specials
ToDo.

Stroke
Sets the line color and the maximum opacity (which is also affected by the brush strength).

Fill
Sets the color of the interior space enclosed by the strokes. Increase the opacity from zero to make the fill visible. Fill works best on convex shapes, unless you are using *High Quality Fill* (see below).

Volumetric Strokes
An alternative drawing technique by drawing strokes as a series of filled screen-aligned discs. Get best results with partial opacity and large stroke widths.

High Quality Fill
Uses a better fill algorithm that works better for concave drawings.

Brushes

Drawing Brushes

Reference
Mode: Stroke Edit Mode Panel: Tool Shelf ‣ Grease Pencil ‣ Drawing Brushes

Brushes

A List Views & Presets of preset brushes. You can switch between the brushes using keyboard numbers from `1` to `0`. The selected drawing brush is the brush in the list located at that position.

Thickness

Width of full pressure strokes in pixels constant to the viewport i.e. not affected by the zoom. The thickness can be lower depending of the pressure.

Sensibility

Adjust the sensibility of the thickness to the pressure of the pencil on the tablet. This pressure can be disabled using the right small button.

Strength

Similar to sensibility, but affect the alpha value of the color. This parameter allows to get effects as color fading or watercolor.

Randomness

The properties for *Sensibility* and *Strength* additionally have a randomness factor which can be enabled using the jagged line icon to the right of the number sliders.

Jitter

Define a jitter randomness in the stroke.

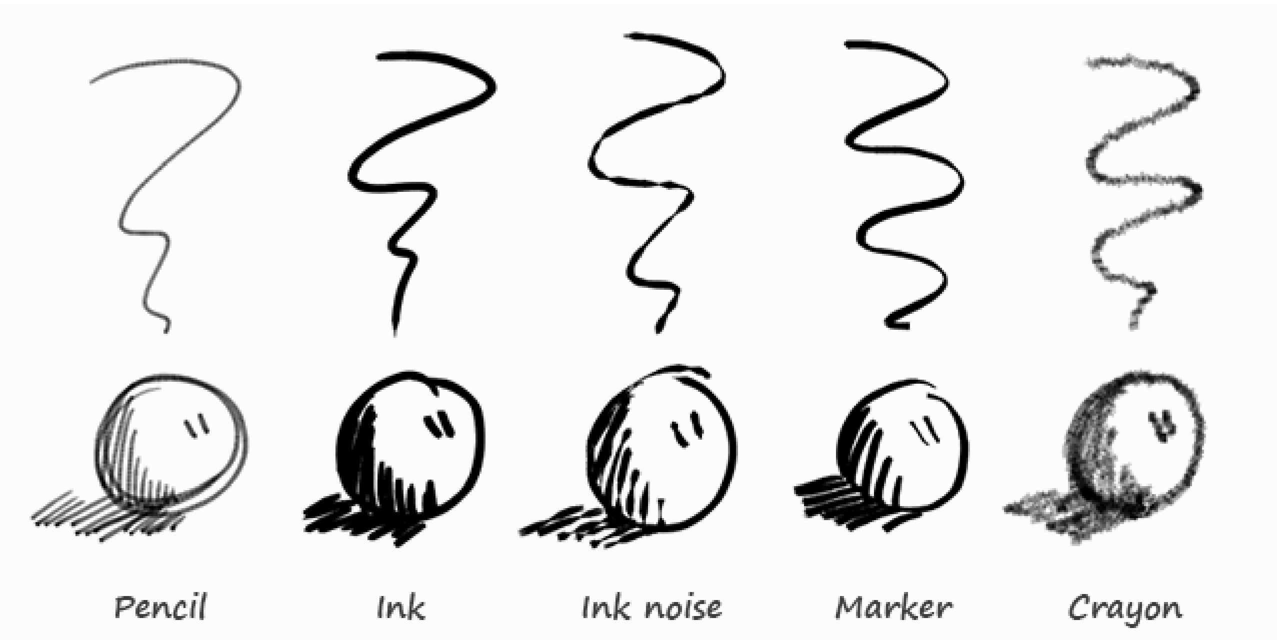
Angle

Defines the angle when the thickness of the stroke will be 100%. Any change in the direction will change the thickness.

Factor

Defines the effect for drawing angle changes in the thickness.

> **Tip**
>
> The *Angle* and *Angle Factor* parameters allow to create drawing brushes such as markers that change the thickness depending of the angle of drawing. This gets a more artistic drawing and less “computer” lines.



Preset Brushes.

Stoke Quality

These settings are per-brush settings that are applied after each stroke is drawn (when converting from 2D/screen space coordinates to 3D/data space coordinates). These are per-brush settings so that you can apply varying proprieties to different types of brushes. E.g higher smoothing and/or subdivision for final “beauty”, and less smoothing/subdivision for initial “blocking” strokes.

Smooth

Defines how much smoothing is applied (using the same method as the “Smooth” Brush). It is used to get rid of jagged edges and jitter/hand shake.

Smoothing Iterations
Defines how many times smoothing is applied. On each additional round of smoothing performed, the strength of the smoothing applied is halved, i.e. on the first round, it will be 100% of smoothing factor, then 50%, then 25%, etc. This setting is most useful for improving the quality of heavily subdivided strokes, where the multiple rounds of smoothing can help reduce “faceting” artifacts.

Subdivision Steps

Defines how many times the stroke will be subdivided. Each time the stroke is subdivided, extra stroke points are added between each pair of existing stroke points. The main use of this setting is to make strokes look less “faceted” (especially large strokes drawn quickly). Strokes are subdivided before smoothing is applied.

Randomness
Amount of randomness to add new new strokes after subdivision.

Brush Curves

Reference
Mode: Stroke Edit Mode Panel: Tool Shelf ‣ Grease Pencil ‣ Brush Curves

This panel allows you to adjust the parameters used with tablets to get personal preferences. The available curves that can be edited are:

- Sensitivity
- Strength
- Jitter

Read more about using the Curve Widget.

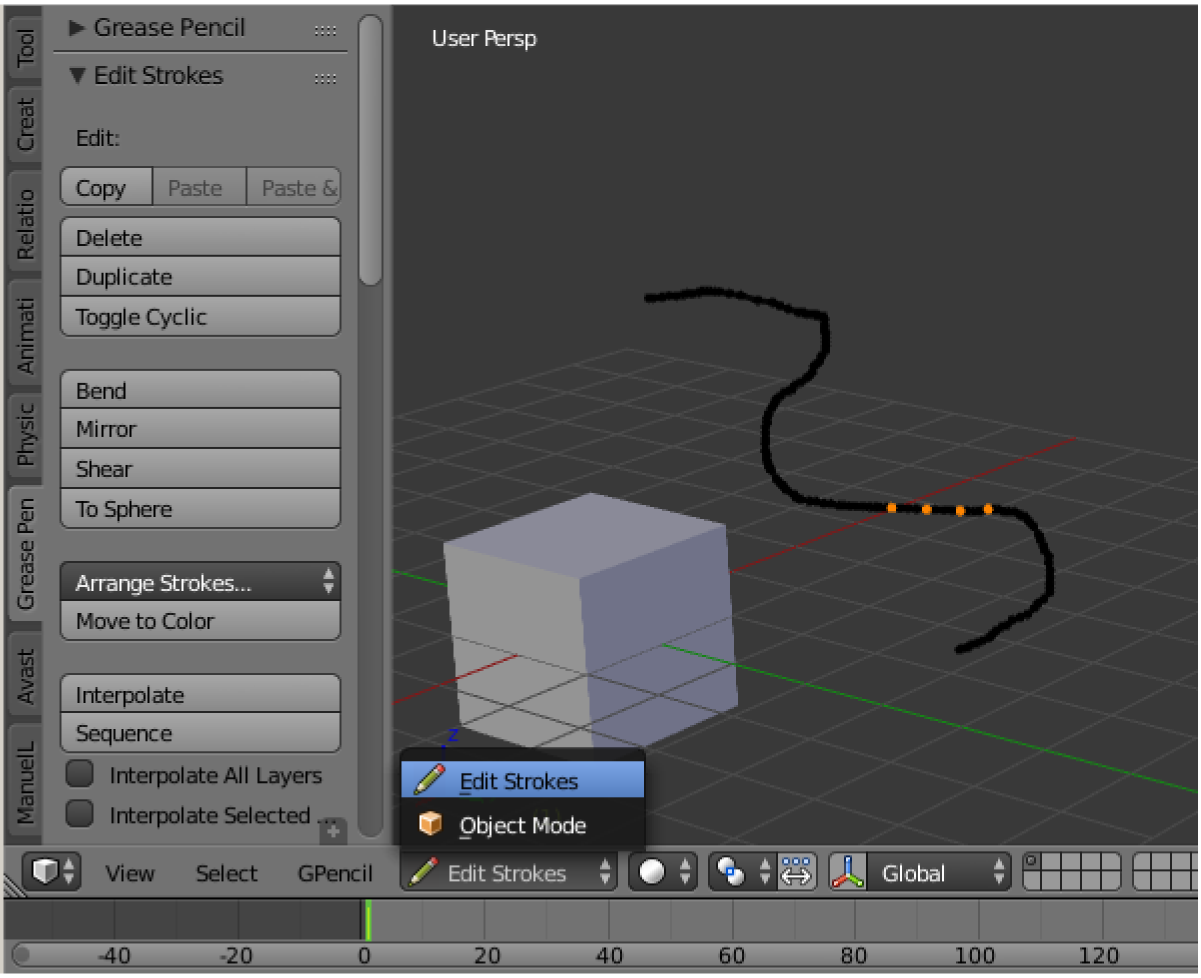
Stroke Edit Mode

Enter Stroke Edit Mode with the *Mode* select menu in the 3D Views header or toggle the *Enable Editing* in the

Grease Pencil panel, or use `D-Tab`. In this mode, many common editing tools will operate on Grease Pencil stroke points instead.

These tools let you move and reshape grease pencil strokes after they have been drawn.

Open the Grease Pencil tab on the Tool Shelf. Look for the tools in the Edit Strokes panel shown here:



Edit panel with grease pencil strokes.

Selecting

Grease pencil strokes are formed from a series of connected vertex points. To make changes, first select points on the strokes that you want to edit. You can only select points on the active layer. The selected points are highlighted as in the image above.

> **Hint**
>
> Set the layer's *Stroke Thickness* to 1 to make the points more visible.

Use the mouse to select the points, or one of the selection buttons in the panel as detailed in Basic Selection.

Various selection functions similar to those available when editing meshes can be used:

Select All	`A`
Border Select	`B`
Circle Select	`C`
Lasso Select	`Ctrl-LMB`
Select Linked	`L`, `Ctrl-L`
Select More	`Ctrl-NumpadPlus`
Select Less	`Ctrl-NumpadMinus`
Select Stroke	`Alt-LMB`

Editing

Header

Some tools can be access through the 3D View header. e.g. Copy/Paste.

Onion Skinning
Toggles Onion Skinning.

Selection Mask, Alpha
See Further Options.

Menu

Shrink/Flatten `Alt-S`
Adjust the pressure values of selected stroke points. This provides a way to modify the thickness of strokes by moving the mouse or the `Wheel`.

Delete All Active Frame `D-X`
Deletes all strokes in the active frame. It can be accessed using `D-X` (anywhere), as well as `Shift-X` (Edit Strokes Mode only) or the GPencil ‣ Delete menu. This makes it easier to quickly get rid of throwaway scribbles.

Move to Layer `M`
Can be used to move strokes between layers (including to a new layer).

Edit Strokes Panel

Reference
Mode: Edit Stroke Mode

Panel: Tool Shelf ‣ Grease Pencil ‣ Edit Strokes

Menu: GPencil

Copy `Ctrl-C`
: Copies the selected Grease Pencil strokes (or actually, points and segments).

Paste `Ctrl-V`
: Pastes the previously copied strokes.

Paste & Merge
: Pastes the previously copied strokes and merge in active layer.

Delete `X`
: **Points**
: Delete the selected points, leaving a gap in the stroke.
: **Dissolve**
: Reconnect the ends so there is no gap in the stroke.
: **Strokes**
: Delete the entire stroke containing any selected points.
: **Frame**
: Delete a frame when doing Animating Sketches.

Duplicate `Shift-D`
: Make a copy of the selected points at the same location. Use the mouse to *Translate* them into position. `LMB` places them at their new position. `RMB` cancels and removes the duplicates.

Toggle Cyclic
: Close or open the selected stroke by adding an edge from the last to first point.

Bend `Shift-W`
: Bends selected item between the 3D cursor and the mouse.

Mirror `Ctrl-M`
: Mirrors selected strokes along one or more axises.

Shear `Shift-Ctrl-Alt-S`
: Shears selected items along the horizontal screen axis.

To Sphere `Shift-Alt-S`
: Move selected vertices outward in a spherical shape around the midpoint.

Arrange Strokes

Arranges the selection of strokes up/down in the drawing order of the active layer.

Bring Froward, Send Backward, Bring to Front, Send to Back

Move to Color
: Sets the active color as the new color to all selected strokes.

Interpolate
: **Interpolate** *Ctrl-Alt-E*
: Interpolates grease pencil strokes between frames.
: **Sequence** *Shift-Ctrl-E*
: Interpolates full grease pencil strokes sequence between frames.
: **Interpolate All Layers**
: Checkbox to interpolates all layers, not only active.
: **Interpolate Selected Strokes**
: Checkbox to interpolates only the selected strokes in the original frame.

Join Strokes
: **Type**

Join ***Ctrl-J***

Joins selected strokes.

Join & Copy ***Shift-Ctrl-J***

Joins selected strokes as a new stroke.

Leave Gaps

Leaves gaps between joined strokes instead of linking them.

Flip Direction

Flips the start and end of a stroke.

Show Directions

Displays stroke drawing direction with a bigger green dot of the start point and a smaller red dot for the end point.

Reproject Strokes

Reprojects the selected strokes from the current viewpoint to get all points on the same plane again. This can be useful to fix problem from accidental 3D cursor movement, or viewport changes.

Sculpt Strokes Panel

Reference
Mode: Edit Stroke Mode
Panel: Tool Shelf ‣ Grease Pencil ‣ Sculpt Strokes
Menu: GPencil ‣ Sculpt Strokes/Brushes
Hotkey: `E-LMB`

Several tools for editing Grease Pencil strokes are provided in the form of brushes which you can use to “paint” or “sculpt” the appearance of the strokes without having to keep doing a tedious select-tweak-select-tweak pattern of edits.

Hold `E-LMB` and drag to sculpt.

Brushes

The brushes currently implemented are:

Smooth

Allows you to selectively relax jitter/shake and bumpiness, to tidy up messy parts of your sketches.

Affect Pressure

Use this option to perform smoothing on stroke thickness values.

Thickness

The Thickness Brush can be used to increase (Add) or decrease (Subtract) the thickness of the parts of the stroke under the cursor.

Strength

Increase/decrease (`Ctrl`) the alpha value of the stroke, E.g. for creating fading effects.

Grab

Takes the stroke points which fall within the brush circle when the sculpting action begins, and allows you to translate this set of points.

Push

The Push Brush is very similar to the Grab brush, in that it also allows the user to translate stroke points.

However, unlike the Grab Brush, the Push Brush is not restricted to operating only on the first set of points which were under the brush when the sculpt action was initiated. Instead, on each brush movement, the points currently under the brush get moved based on the amount the brush has moved since the last time it was evaluated.

Twist

Used to twist/rotate points around the cursor, creating a “swirling” effect. It is useful for applying low levels of distortion to stroke points. The *Direction* controls whether the points are rotated in a clockwise (CW) or anti-clockwise (CCW) direction.

Pinch/Inflate

Used to draw points away from the cursor, or towards it.

Pinch

Draw points towards the cursor.

Inflate

Push points away from the cursor.

Randomize

Randomizes the stoke attributes. e.g. with *Position* enabled it displaces the points randomly in screen space to create jittered/jagged lines.

Clone Brush

Used to paste the previously copied points (in the Copy/Paste buffer on the active layer), located at the point where you clicked.

Hold `LMB` and drag to position and adjust the pasted strokes. The strokes center follows the movements of the brush/cursor (“Stamp Mode”).

Use Falloff

When the *Use Falloff* option is enabled, instead of moving all the newly pasted strokes by the same amount, only the points that are currently under the cursor get affected. Thus, this in this mode of operation, the brush is closer to a Paste and Push operation instead (“Stamp and Smudge”).

Common Options

Radius `Shift-F`/`Wheel`

The size of the brush. Increase/decrease brush size with `Shift-F` when not sculpting or with `Wheel` while sculpting (i.e. with the pen tip down, or mouse button held).

Strength `Ctrl-F`/`Shift-Wheel`

The Strength off the brush, can be changed by the pressure of the stylus. (In/decrease see *Radius*).

Use Falloff

Enables a linear falloff to calculate the influence of the brush on a point. That is, a point closer to the midpoint of the brush (i.e. the point under the cursor) will get affected more than the ones at the edges.

Direction `E-Ctrl-LMB`

Radio button to invert the brush effect.

Affect

Enable sculpt for position, strength (alpha value) and thickness in Smooth and Randomize brush.

Further Options

Selection Mask

Used to restrict the brush to only operating on the selected points.

Alpha `Ctrl-H`

Alpha value of the visualization for selected vertices. The visibility can be toggled (hide/unhide) using `Ctrl-H`.

Animating Sketches

You can use Grease Pencil to create 2D animations (e.g. in flipbook style) and mixing it with 3D objects and composition.

Sketches are stored on the frame that they were drawn on, as a separate drawing (only on the layer that they exist on). A keyframe is automatically add per layer. Each drawing is visible until the next drawing for that layer is encountered. The only exception to this is the first drawing for a layer, which will also be visible before the frame it was drawn on.

Therefore, it is simple to make a pencil-test/series of animated sketches:

1. Go to first relevant frame. Draw.
2. Jump to next relevant frame. Draw some more.
3. Keep repeating process, and drawing until satisfied. Voila! Animated sketches.

See also

Grease Pencil mode in the Dope Sheet editor.

Compositing

The grease pencil layers create a pass inside OpenGL render result. This result can be exported to `EXR multilayer` and used in composition.

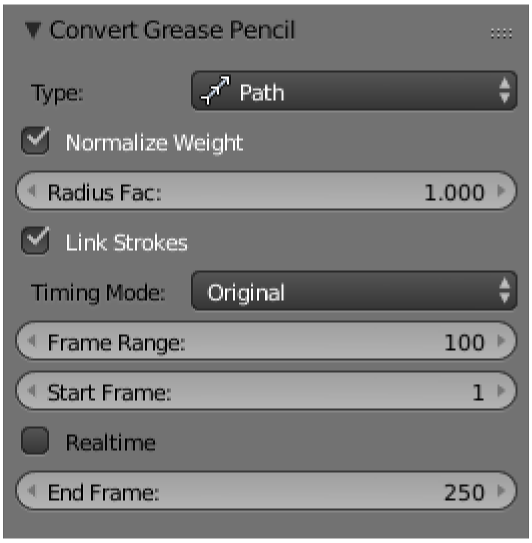
ToDo.

https://youtu.be/vSD5mN7LT_g

Convert to Geometry

Reference
Mode: All Modes

Panel: Tool Shelf ‣ Grease Pencil ‣ Grease Pencil ‣ Tools: Convert to Geometry...
Menu: GPencil ‣ Convert to Geometry...
Hotkey: `Alt-C`



The Convert to Curve options.

In the 3D View, sketches on the active layer can be converted to geometry, based on the current view settings, by transforming the points recorded when drawing (which make up the strokes) into 3D-space. Currently, all points will be used, so it may be necessary to simplify or subdivide parts of the created geometry for standard use.

Sketches can currently be converted into curves, as proposed by the *Convert Grease Pencil* menu popped-up by the *Convert* button in the grease pencil properties.

Options

Type

The type of object to convert to.

Path
: Create NURBS 3D curves of order 2 (i.e. behaving like polylines).

Bézier Curve
: Create Bézier curves, with free “aligned” handles (i.e. also behaving like polylines).

Polygon Curve
: Bézier Curve with strait line segments (auto handles).

Note

Converting to Mesh

If you want to convert your sketch to a mesh, simply choose first *NURBS*, and then convert the created curve to a mesh.

Normalize Weight

Will scale weights value so that they tightly fit into the (0.0 to 1.0) range. (enabled by default)

All this means that with a pressure tablet, you can directly control the radius and weight of the created curve, which can affect e.g. the width of an extrusion, or the size of an object through a *Follow Path*

Constraint or *Curve* Modifier!

Link Strokes
Will create a single spline, i.e. curve element. (enabled by default) from all strokes in active grease pencil layer. This especially useful if you want to use the curve as a path. All the strokes are linked in the curve by "zero weights/radii" sections.

Timing

Grease pencil stores "dynamic" data, i.e. how fast strokes are drawn. When converting to curve, this data can be used to create an *Evaluate Time* F-Curve (in other words, a path animation), that can be used e.g. to control another object's position along that curve (*Follow Path* constraint, or, trough a driver, *Curve* modifier). So this allows you to reproduce your drawing movements.

Warning
All those "timing" options need *Link Stroke* to be enabled, else they would not make much sense!

Timing Mode

This control let you choose how timing data are used.

No Timing
Just create the curve, without any animation data (hence all following options will be hidden).
Linear
The path animation will be a linear one.
Original
The path animation will reflect to original timing, including for the "gaps" (i.e. time between strokes drawing).
Custom Gaps
The path animation will reflect to original timing, but the "gaps" will get custom values. This is especially useful if you have very large pauses between some of your strokes, and would rather like to have "reasonable" ones!

Frame Range
The "length" of the created path animation, in frames. In other words, the highest value of *Evaluation Time*.
Start Frame
The starting frame of the path animation.
Realtime
When enabled, the path animation will last exactly the same duration it took you do draw the strokes.
End Frame
When *Realtime* is disabled, this defines the end frame of the path animation. This means that the drawing timing will be scaled up or down to fit into the specified range.
Gap Duration
Custom Gaps only. The average duration (in frames) of each gap between actual strokes. Please note that the value entered here will only be exact if *Realtime* is enabled, else it will be scaled, exactly as the actual strokes' timing is!

Example

Here is a simple "hand writing" video created with curves converted from sketch data:

https://youtu.be/VwWEXrnQAFI

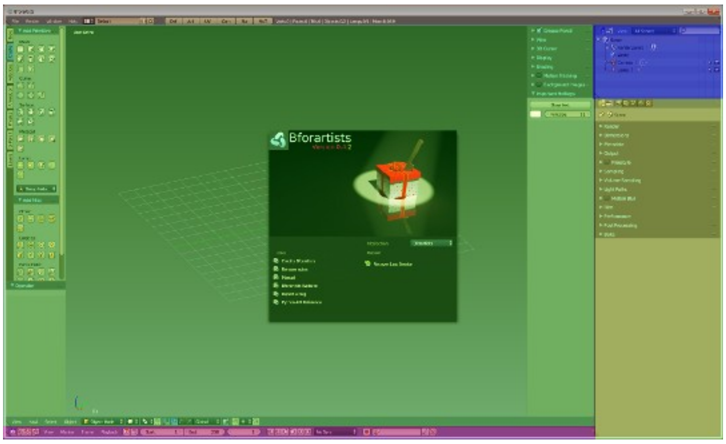
The blend-file from the above example can be found here.

https://wiki.blender.org/index.php/file:ManGreasePencilConvertToCurveDynamicExample.blend

Editors

Introduction

The Bforartists Interface is made of several layouts.



And every layout is made of several editors. See image. The editors brings the functionality to the layout. Every editor type has another purpose.

In this chapter we will talk about the general aspects of the editors. And give an overview over the available editor types and their purpose.

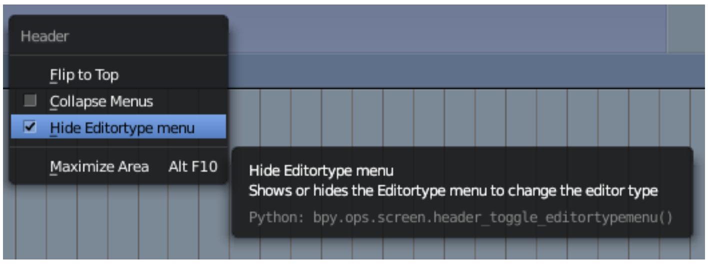
The detailled description happens for every editor one by one then.

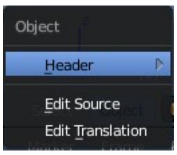
Hidden menus

The editors contains a few hidden menus. Nearly every UI element contains a context menu that can be called by right click. The content varys from element to element, dependant of what options are available.

The Header menu

The header menu can be accessed by right clicking at an empty space of a menu bar. It is also accessible in the context menu of an UI element in the menu bar. Like a button.



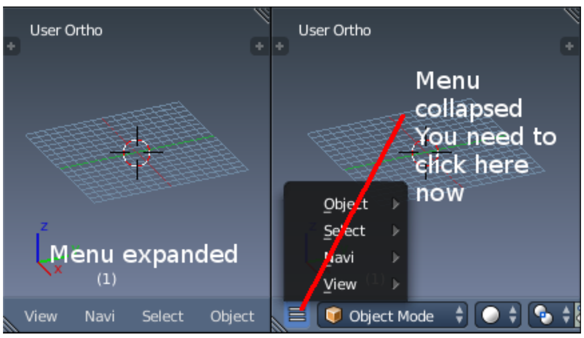


Flip to Top

The Flip to Top menu item enables you to flip the whole menu bar to the top or to the bottom

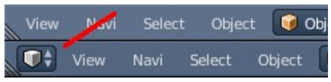
Collapse Menus

The Collapse menus menu item makes the text menu items either be displayed expanded. Or as a single little button that you have to click first so that the menu can be accessed.



Hide Editortype menu

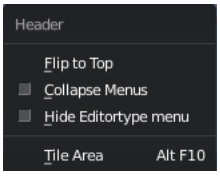
The Hide Editortype menu shows or hides the Editortype menu in the menu bar.



Maximize Area - Tile Area

Maximize Area maximizes this editor.

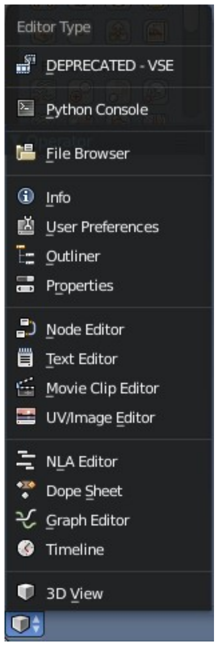
When the editor is maximized then this menu item turns into Tile area. Which returns the editor to the previous state then.

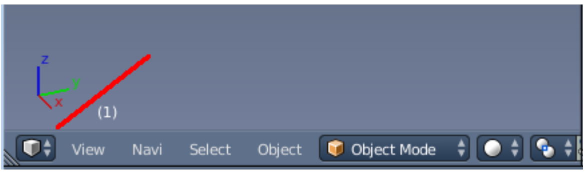


The editor type menu

The Editor Type menu gives you an overview of all available editor types. And here you can switch to another editortype.

This menu is in the standard layouts hidden. See Header Menu, Hide Editortype menu.



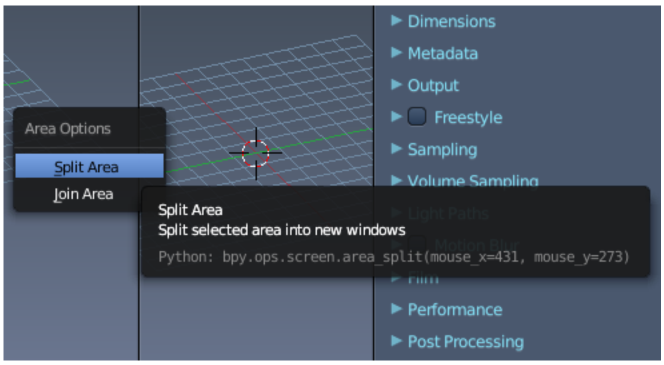


Area Options

When you hover over a border between two editors and right click, then you will see the Area Options menu.

Split area

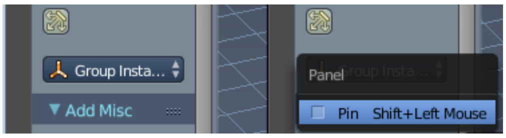
Split area splits the current editor at mouse position into two new editors.



Join Area

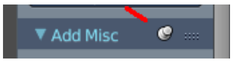
Join Area joins the current editor with the neighbour editor if possible.

Pin Panels menu in Tool Shelf

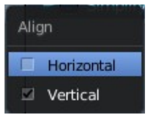


This one is a Tool Shelf only behaviour. When you right click at the title bar of a panel then you will see the Pin menu. Here you can pin the panel to stay visible in all tabs.

When ticked then the title bar of the panel shows a pin.



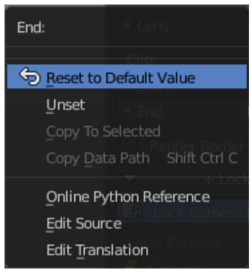
Align



This feature lets you align the panels horizontally or vertically. You can find this menu for example in the Properties editor by right clicking.

Horizontal aligns the panels horizontal. Vertical aligns the panels vertical.

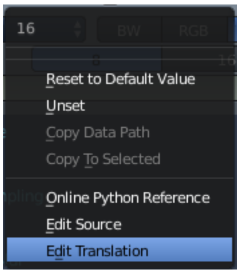
RMB menu entries

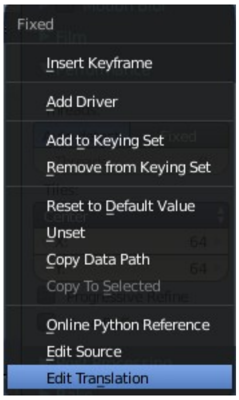


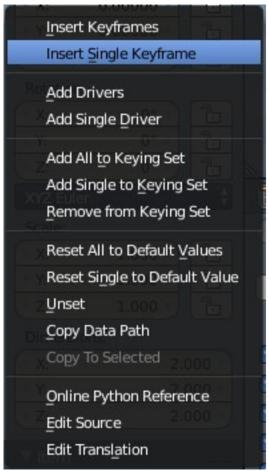
Every tool or UI element has a RMB menu where you can find various things.

The content is varying, dependant of the tool where you right click at. Value edit boxes have for example a Reset to Default Value menu item. For other tools you might be able to add or change the shortcut here. They all have the last three menu items, Online Python Reference, Edit source and Edit translation.

A few examples:







Add Shortcut / Change Shortcut

The Add Shortcut / Change Shortcut button allows you to assign a new shortcut to the tool or to change an existing shortcut for the tool. Note that this may or may not work proper. For some tools you might need to change the shortcut in the User preferences.

Online Python Reference

The Online Python Reference button opens the Bforartists Online Python reference page in your browser.

Edit Source

The Edit Source button opens the corresponding Python file for this element. Note that you need to be in the Scripting layout. The file loads in the Text editor there.

Edit Translation

This is a developer entry. It allows you to edit the *.mo translation files directly. But you need to have a special setup here. Which is currently not documented.

Reset to Default Value

Reset to Default Value is usually a RMB menu entry when you right click at a edit box. It resets the value to the default value.

Reset All to Default Value

Reset All to Default Value is usually a RMB menu entry when you right click at a edit box combo made of two, three or more edit boxes together. It resets the value for all the edit boxes in the combo to the default value.

Reset Single to Default Value

Reset Single to Default Value is usually a RMB menu entry when you right click at a edit box combo made of two, three or more edit boxes together. It resets the value for the single edit box under the mouse to the default value.

Unset

Unset is usually a RMB menu entry when you right click at a edit box. It is somehow similar to Reset to Default Value. But it clears the property instead of resetting it to the default value. Which can end in another value.

Add Driver

In Bforartists lots of things can be animated. Also buttons. Add Driver does exactly what it tells. It adds a driver for animation needs to the element.

Add Drivers

In Bforartists lots of things can be animated. Also buttons. Add Drivers does exactly what it tells. It adds a driver for animation needs to the elements.

Add Single Driver

In Bforartists lots of things can be animated. Also buttons. Add Driver does exactly what it tells. It adds a driver for animation needs to the single element under the mouse.

Add to Keying Set

Add to Keying Set adds the information of the element to the current keyframe.

Add All to Keying Set

Add All to Keying Set adds the information of the element to the current keyframe.

Add single to Keying Set

Add to Keying Set adds the information of the element to the current keyframe.

Remove from Keying Set

Remove from Keying Set removes the information of the element from the current keyframe.

Copy Data Path

Copy Data Path copies the RNA data path for this property

Copy to Selected

Copy to Selected copies the property of this element to selected objects or bones

Resize Tool Shelf and Properties content

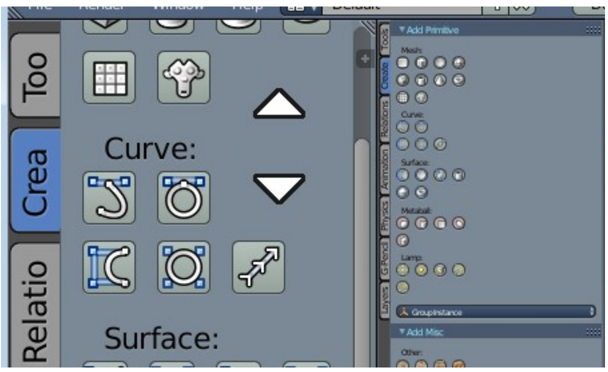
You can resize the Tool Shelf content and the Properties Sidebar content. This means that you can zoom in or out. This trick also works in the Properties Editor.

Move the mouse over the upper region of the Tool Shelf.
Hold down Ctrl key
Click with Middle Mouse button. The mouse pointer will turn into two white triangles.
Now drag up or down to resize the area content

OR

Move the mouse over the upper region of the Tool Shelf.
Simply press Numpad + or Numpad -

To reset the area content to default scale move the mouse over the area and press Home key (german keyboard layout Pos 1)



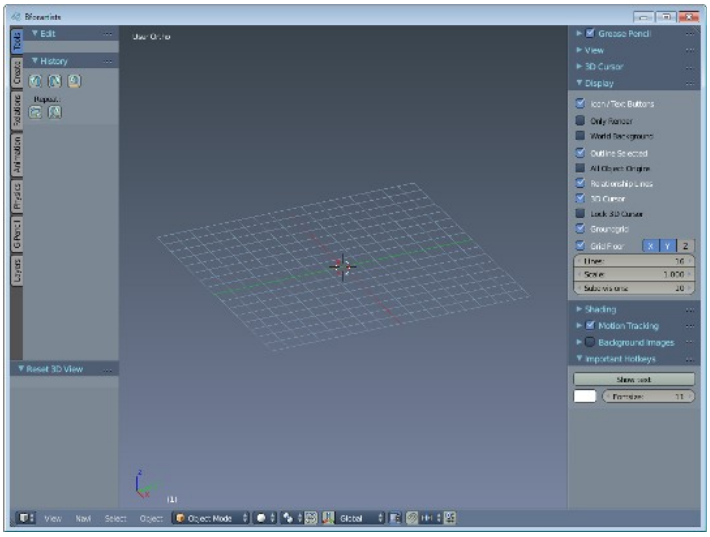
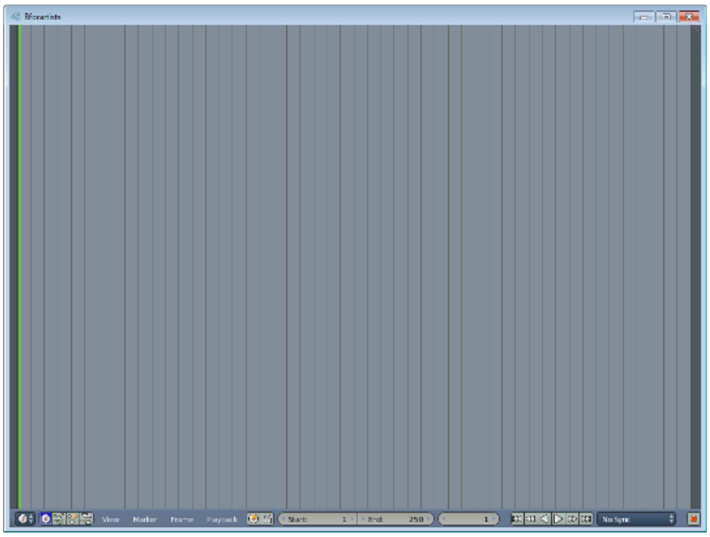
Miscellaneous

Hotkey recognition

The hotkeys are dependant of the mouse position. Means when your mouse is over the 3d View, then the hotkeys from the 3D View gets recognized. This means when your mouse is not over the 3D View but the Outliner, and you press the hotkey for let's say move, then this hotkey will not be recognized.

A special behaviour shows the sidebars here. They are part of the editors. But to have the mouse over the toolbars at the side can already prevent a hotkey from being triggered. Your mouse needs to stay in the active part of the editor.

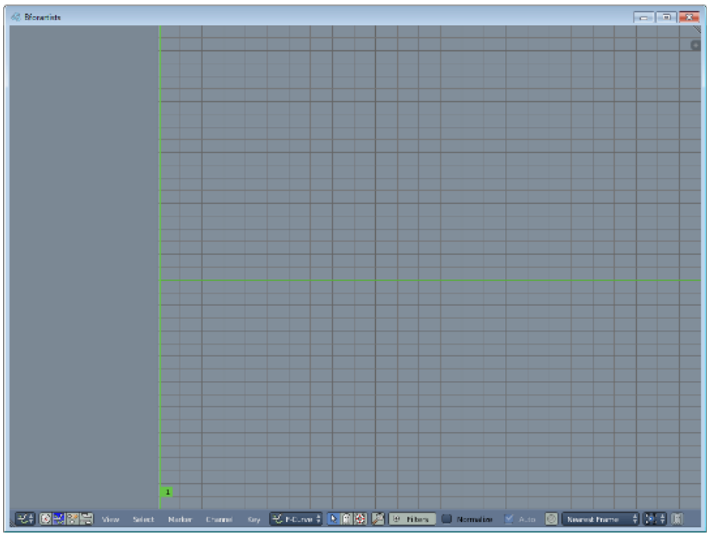
The editor types

3D View The 3D View is the editor where you do your 3D work. Here you can model meshes, etc. . It's the core editor for everything where you work at your 3D data. You will find it in every layout where you need to display your 3d data.	
Timeline The timeline editor provides you with a toolbar for all animation needs. Start, stop, record, set keying set, etc. The Timeline is one of four special editors for animation needs. You will find it in the animation layout. But also in the standard 3D layout.	

Dope Sheet

The Dope Sheet Editor is the place where you deal with keyframes.

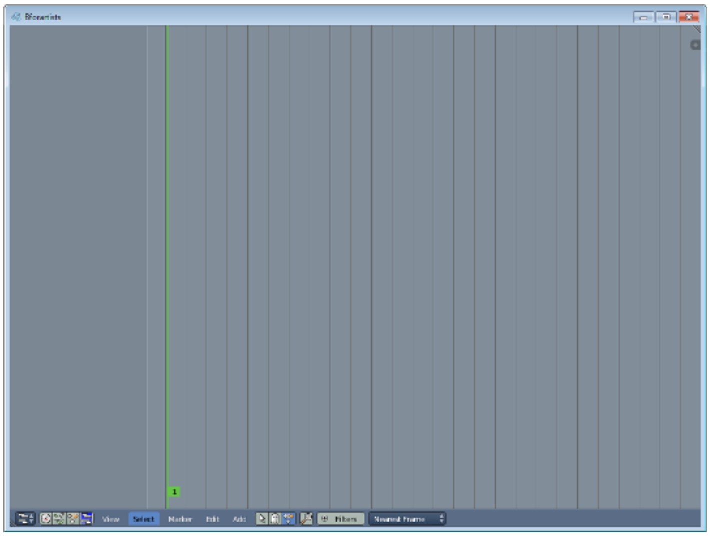
The Dope Sheet Editor is one of four special editors for animation needs. You will find it in the animation layout.



NLA Editor

The NLA Editor is the place where you work with Clips and Actions.

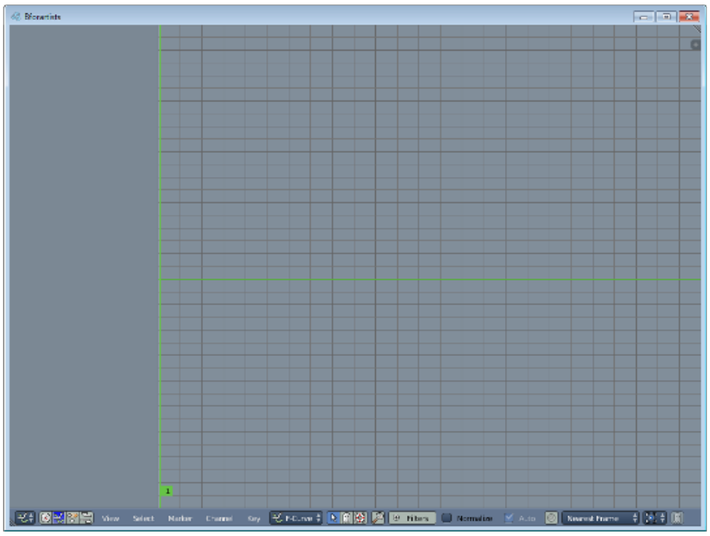
The NLA Editor is one of four special editors for animation needs. You will find it in the animation layout.



Graph Editor

The Graph Editor is the place where you work with function curves.

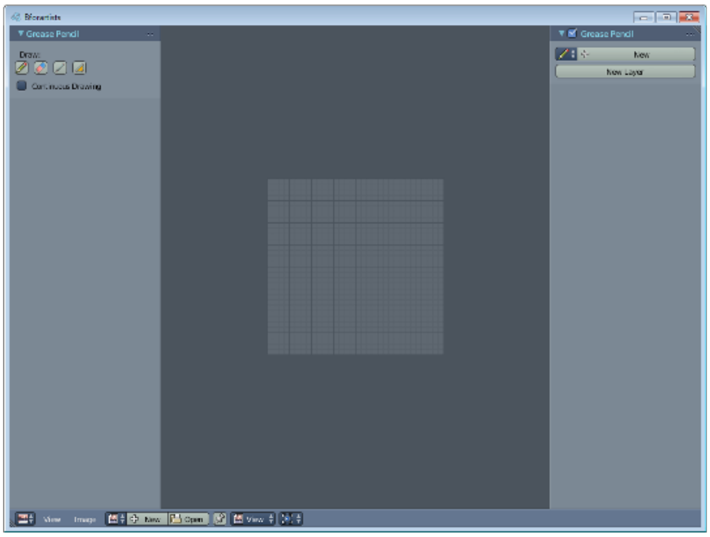
The Graph Editor is one of four special editors for animation needs. You will find it in the animation layout.



UV / Image Editor

The UV / Image Editor is the place where you work with textures and UV mapping.

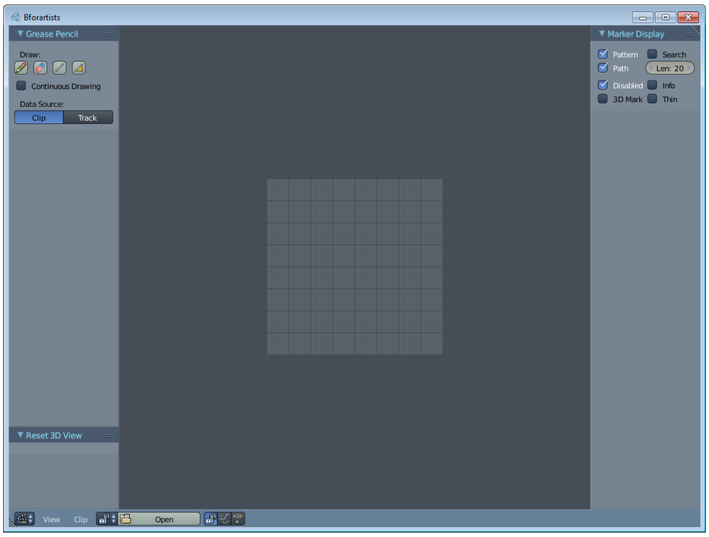
You will find it in the UV editing Layout and the Compositing layout.



Movie Clip Editor

The movie clip editor is for tracking purposes.

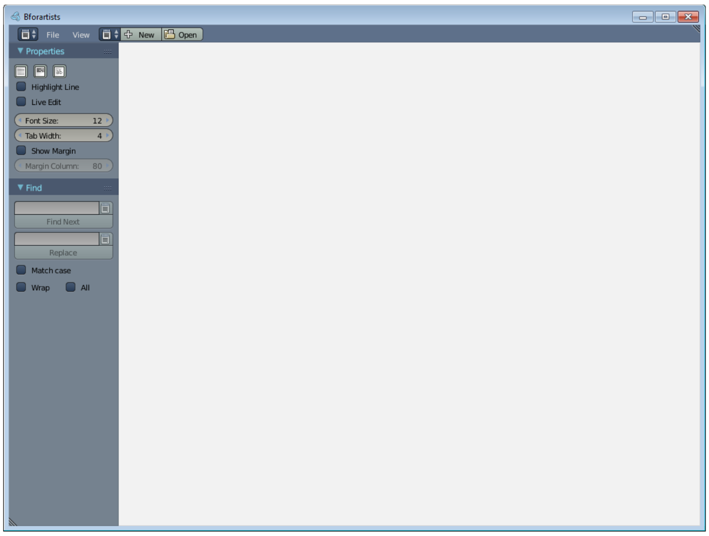
You will find it in the Motion Tracking layout.



Text Editor

The Text Editor is the place where you write code. The scripts for addons for example.

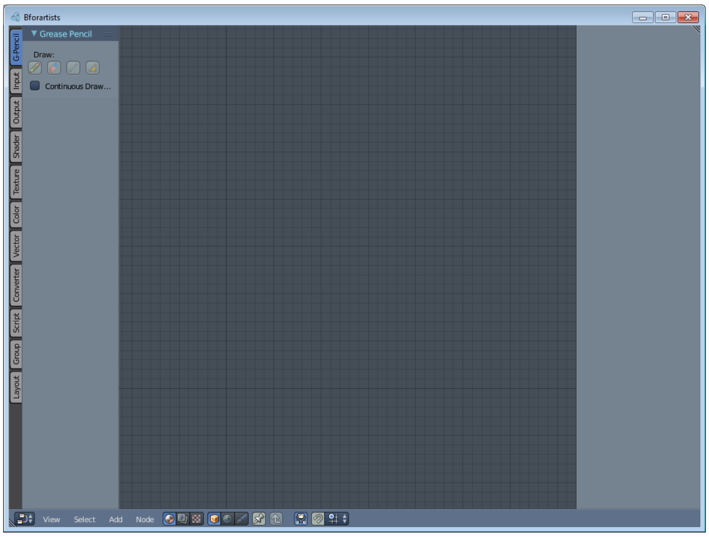
You will find it in the Scripting layout.



Node Editor

The Node editor is the place where you create the material for the renderer Cycles. It is also the place where you create and apply compositing effects.

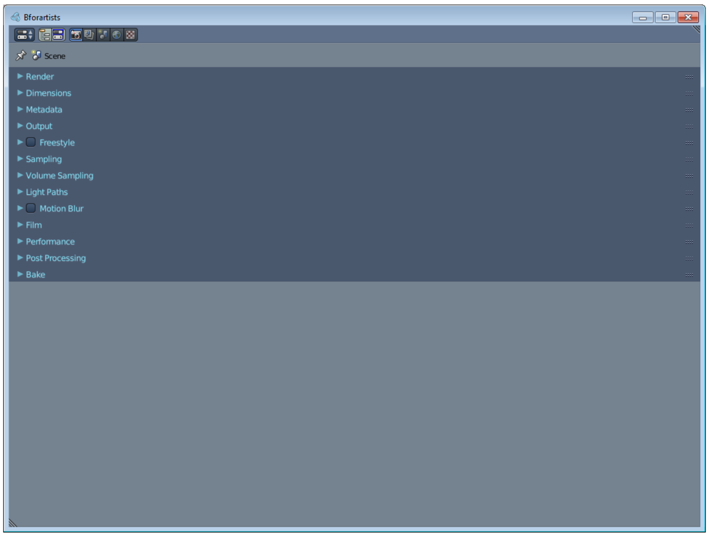
You will find it in the Compositing layout.



Properties Editor

The Properties editor is the place where you can see and tweak all properties for the 3D scene. The range goes from render settings across object settings up to particle settings.

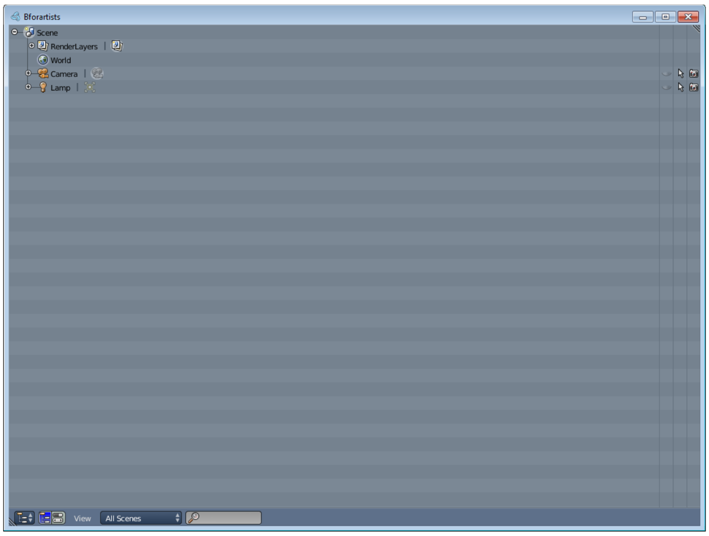
You will find it in the Default layout, the Animation layout and the Scripting layout.



Outliner

The Outliner is the place that gives you an overview of what is in the scene.

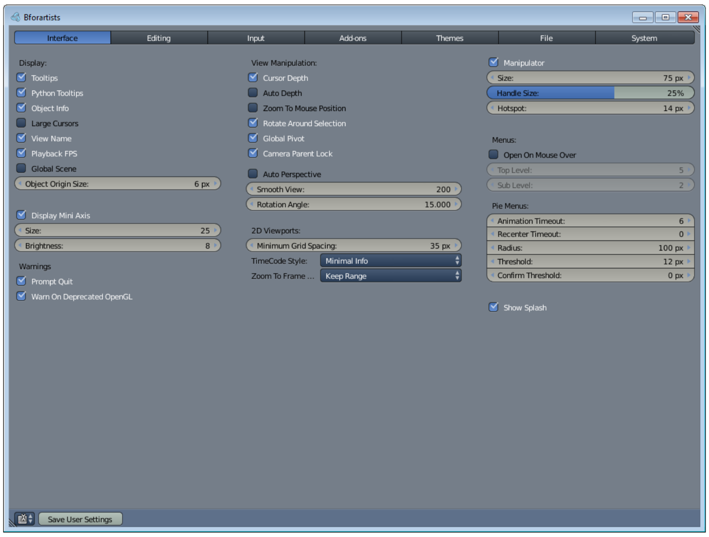
You will find it in the Default layout, the Compositing layout, the Animation layout and the Scripting layout.



User Preferences

The User preferences is the place where you manage all the settings of the software. Theme, Keymap, etc.

This editor is not present in the standard layouts. This editor can be called by the file menu -> User Preferences.

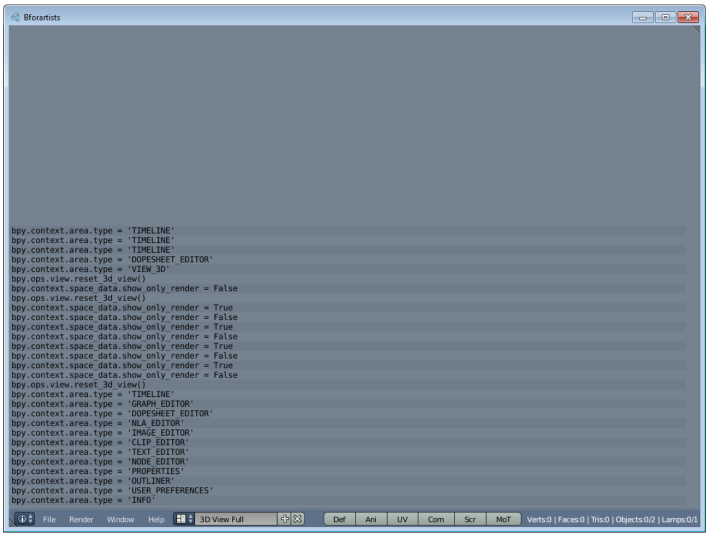


Info Editor

The Info editor is normally collapsed. And serves as the file menu for the 3D view. Here you can load a new scene etc.

It is a bit more though than just the main menu bar. It's a own editor. With a list of the last performed operations. Including error messages.

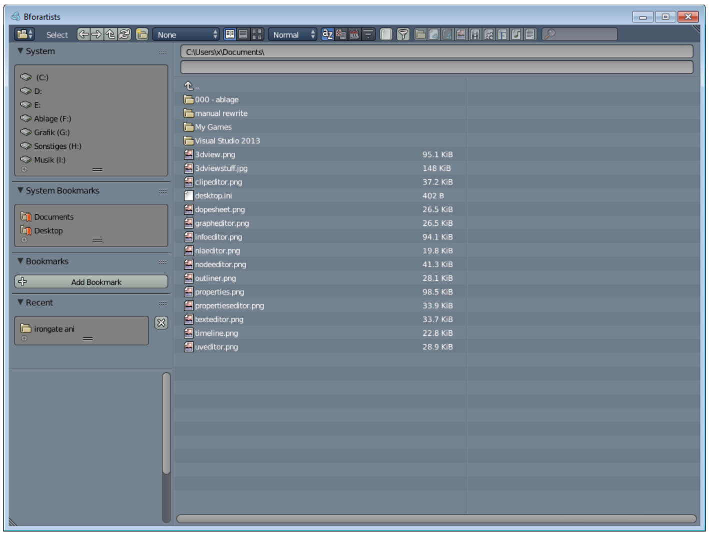
This editor is in all layouts.



File Browser

The File Browser is the editor in which you can load and save data. Your last blend file for example.

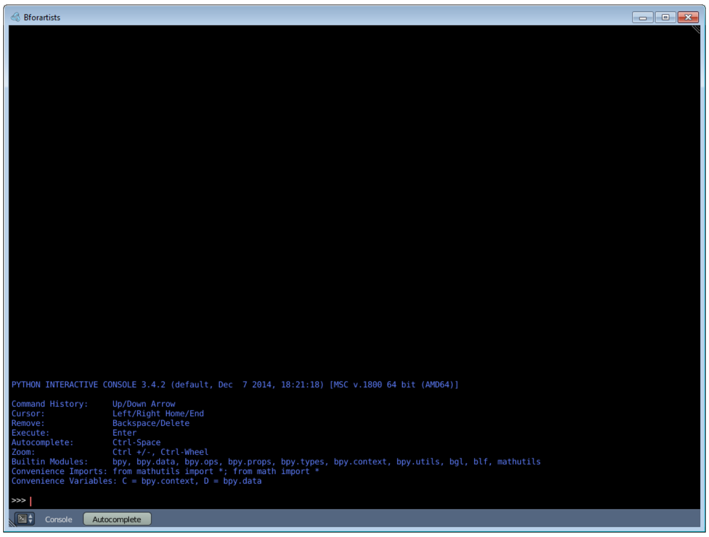
This editor is not part of the standard layouts. It usually gets called when you load or save a data.



Python Console

The Python console gives you access to the Python API.

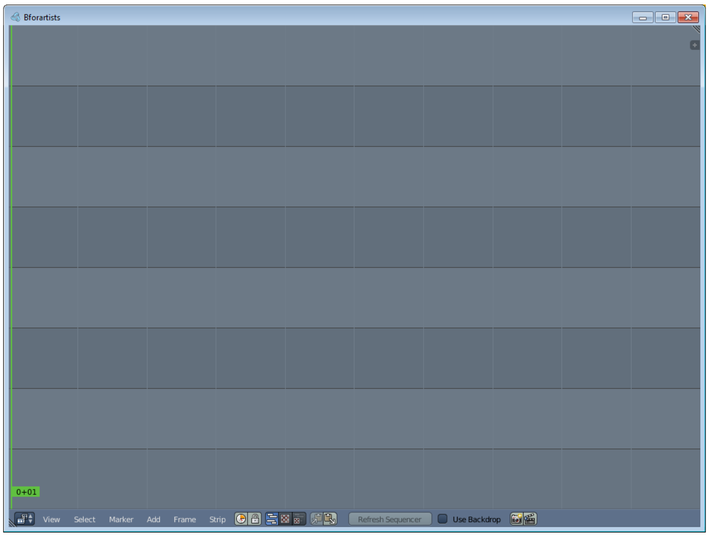
You will find it in the Scripting layout.



VSE

The VSE Editor, or longer, the Video Sequence Editor, is the part where you could deal with video clips.

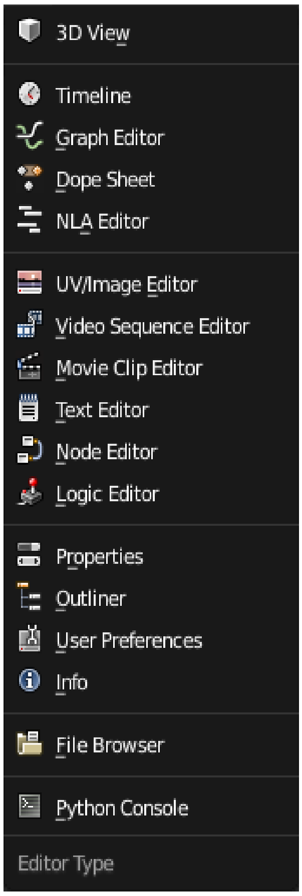
Cutting videos is deprecated in Bforartists. And is not documented. When you want to cut videos then please use Blender.



3.1 Editors - 3D View

Editors

Bforartists provides a number of different *Editor* types for displaying and modifying different aspects of data.



It is also possible to open the same Editor type multiple times to have different views on the same data.

Read more about arranging areas

3D

- 3D View

Animation

- Timeline
- Graph Editor
- Dope Sheet
- NLA Editor

Image/Video

- UV/Image Editor
- Video Sequence Editor
- Movie Clip Editor

Nodes/Logic

- Text Editor
- Node Editor
- Logic Editor

Settings

- Properties Editor
- Outliner
- Preferences
- Info

Other

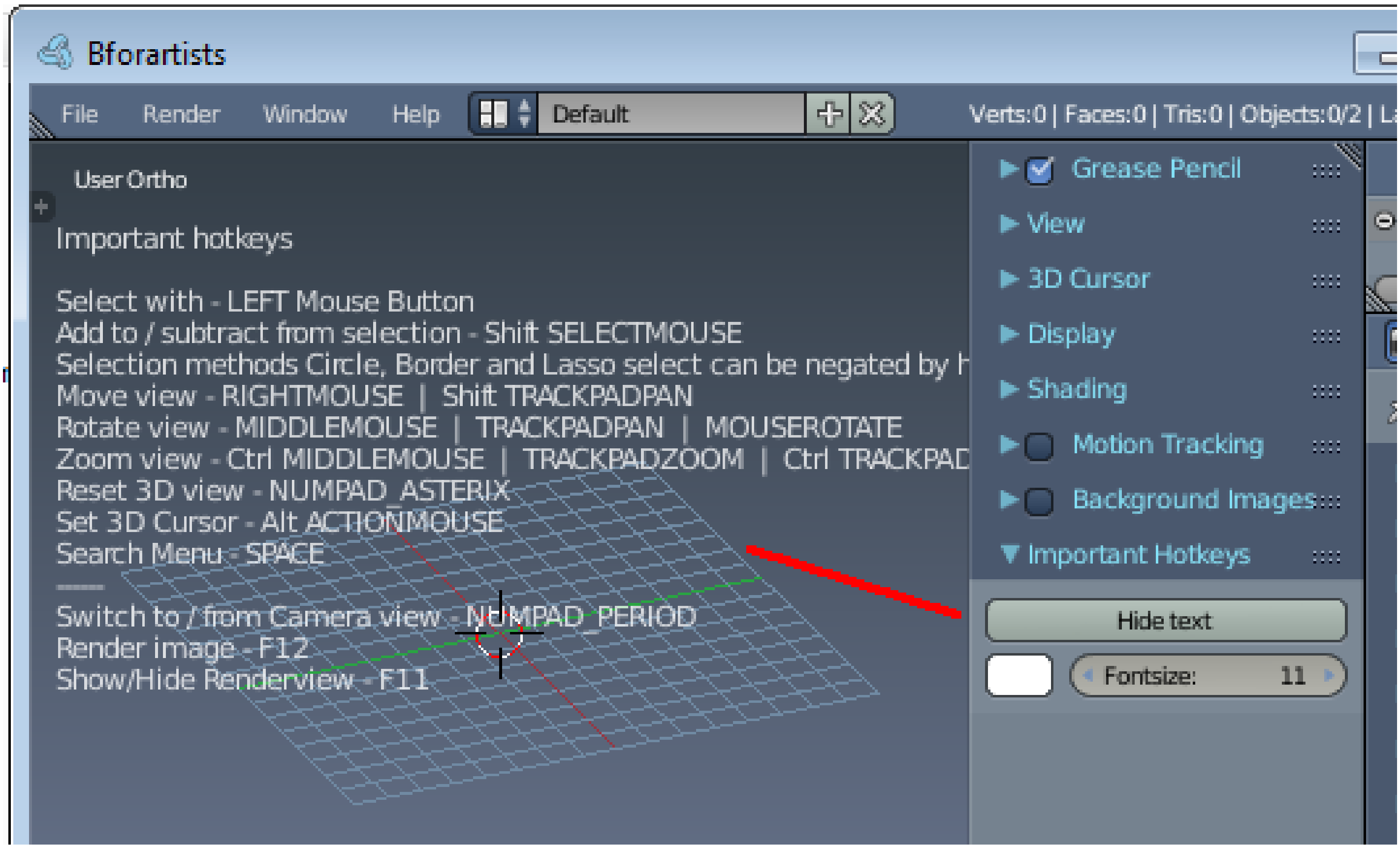
- File Browser
- Python Console

3D View

The 3D View is used to interact with the 3D scene for a variety of purposes, such as modeling, animation, texture painting, etc.

Navigating in the 3D space is done with the use of both mouse movement and keyboard shortcuts. They can vary, dependand of the used keymap.

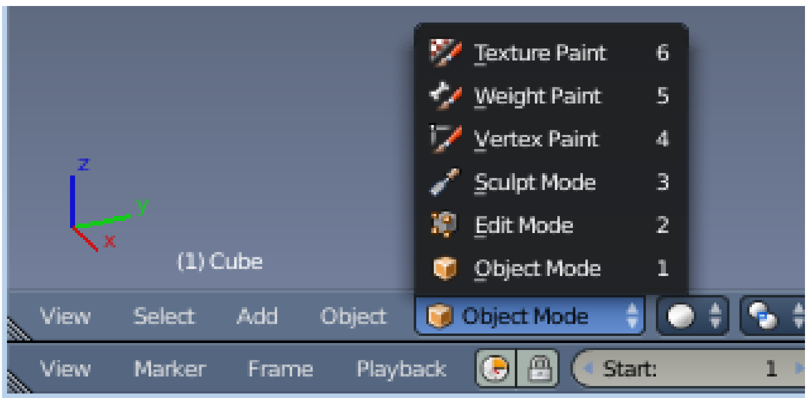
Turn on the Important Hotkeys addon to see the basic navigation hotkeys



Modes

Bforartists has a number of *Modes* used for editing different kinds of data:

- Object Mode
- Edit Mode
- Pose Mode
- Sculpt Mode
- Vertex Paint
- Weight Paint
- Texture Paint
- Particle Edit



The mode can be changed using the menu in the 3D View header, or using the hotkey associated with that mode.

Regions of the 3D View

Toolshelf

The Toolshelf is a context-sensitive region containing tools depending on the current mode (for example, modeling tools in *Edit Mode*, brush tools in *Sculpt Mode*...).

For more information on specific tools available, see:

- *Transformations*
- *History*
- *Creating Objects*
- *Parents*
- *Groups*
- Animation
- Rigid Body
- Grease Pencil
- Modeling
- Sculpting
- Vertex Paint
- Weight Paint
- Texture Paint

Properties Region

The Properties Region contains properties of the active object and selected objects (such as their locations), as well as properties of the editor itself (such as *Display* settings and *background images*).

Note that the Properties region might vanish in the further Bforartists development.

Header

Contains various menus, buttons and options based on the current mode, such as:

- *Shading mode*
- *Pivot options*
- *Transform manipulator*
- *Proportional Edit*
- *Snapping*

Navigating

To Do

Note that the Bforartists UI is still under heavy development. The following information may not be longer complete or valid.

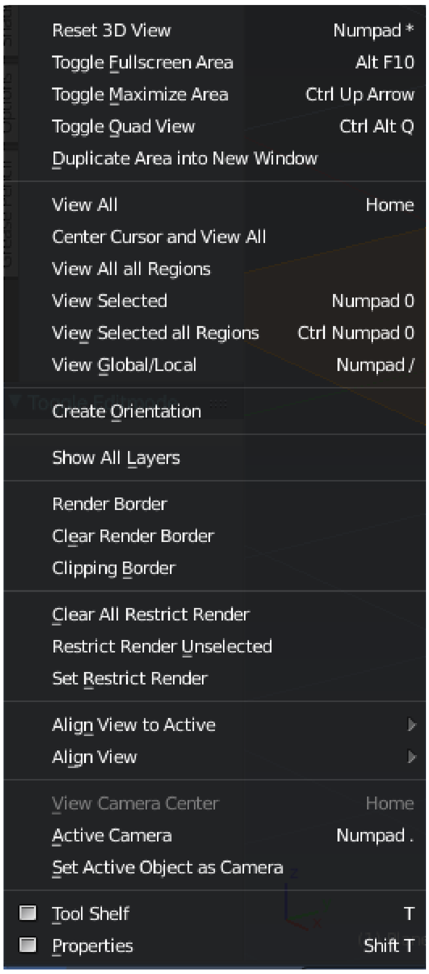
More than one tool has been removed, added, and/or will find its place at another location. The whole graphical UI may still change in further versions. Means the menu items may have another location then.

The *3D View* is where you perform most of the object modeling and scene creation. Bforartists has a wide array of tools and options to support you in efficiently working with your mouse, keyboard and numpad.

3D Window Header

The *3D View* window is comprised of a workspace and a header. The header is shown at the bottom or top of the workspace, and can be hidden if desired. The header shows you a menu and the current mode, as explained below.

View Menu



Properties Panel
Toggles the *Properties side panel*

Tool Shelf
Toggles the Tool Shelf

Set Active Object as Camera
Sets the current active Object as a camera

Active Camera
Toggles between the view of the current active camera and the 3D view camera

View Camera Center
Centers the pasepartout of the camera to fit into the 3D view

Set Restrict Render
Turns off the rendering of the elected geometry of the same type. Example: make three cubes, select two, click Set Restrict Render, and the selected cubes will turn off its rendering in the Outliner.
Note that this item is just available when you have an object selected in the scene.

Restrict Render unselected
Turns off the rendering of the unselected geometry of the same type. Example: make three cubes, select one, click Restrict Render unselected, and the other two cubes will turn off its rendering in the Outliner.
Note that this item is just available when you have an object selected in the scene.

Clear Restrict Render

Turns back on the rendering of the objects
Note that this item is just available when you have an object selected in the scene.

Clipping Border...

Allows you to define a clipping border to limit the 3D view display to a portion of 3D space.

Clear Render Border

Removes the restriction to render just a portion of the screen

Render Border

Render a defined area of the screen. It's a rectangle tool.

Show all Layers

Makes all of the display layers visible.

Create orientation

Allows you to create and to use a user defined orientation

View Global/Local

Global view shows all of the 3D objects in the scene. Local view only displays the selected objects. This helps if there are many objects in the scene, that may be in the way. Accidentally pressing `NumpadSlash` can happen rather often if you're new to Bforartists, so if a bunch of the objects in your scene seem to have mysteriously vanished, try turning off local view.

***View Selected* all Regions**

Zooms the 3D view to encompass all the *selected* objects in all available 3D views

View Selected

Zooms the 3D view to encompass all the *selected* objects in current view.

View All all Regions

Zooms the 3D view to encompass *all* the objects in the current scene in all Views

Center Cursor and view All

Zooms the 3D view to encompass *all* the objects in the current scene in the current view, and resets the 3D cursor back to the center of the groundgrid.

View All

Zooms the 3D view to encompass *all* the objects in the current scene in the current view

Duplicate area in new window

Clones the current 3D view in a new window

Toggle Quad View

Toggles a four pane 3D view, each showing a different angle of the scene.

Toggle Maximize Area

Toggle Display selected Area as Fullscreen / maximized

***Toggle Full Screen* Area**

Maximizes the *3D View* window to fill the full screen area.

Navi Menu

The Navigation menu,in short Navi Menu, contains the tools to navigate in the 3D space

Orbit Left, Right, Up, Down, Opposite
Orbits the view in the defined direction

Roll Right, Roll Left
Rolls the view to right or left

Pan Down, Pan Up, Pan Right, Pan Left
Pans the view up, down, right, left

Zoom Border
Allows you to define the area you want to zoom in and out by a rectangle

Zoom In, Zoom Out
Zooms the 3D view in and out

Zoom Camera 1:1
Resets the Camera zoom back to 1:1. Just available when you are in Camera mode.

Dolly View
Dolly in/out in the View. Note that you can trap yourself with zoom when you use this tool. Handle with care!

Center view to mouse
Centers the view to the current Mouse position.

Fly Navigation
Enter the Fly Navigation Mode

Walk Navigation
Enter the Walk Navigation

View Navigation
Enter the View Navigation. You can look around from the camera point.

Playback Animation
Starts and stops to play the animation

Scale, Rotate, Translate
Transforms the current selected object. You can scale it, rotate it, and move it.

Select Menu

This menu contains tools for selecting objects and geometry. Its content changes dependant of what type of object is selected and in what mode you are.

Read more about Selecting in the Selection chapter

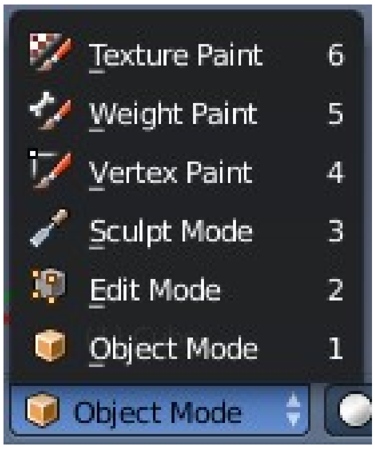
Object Menu

This menu appears when in Object Mode. And the content changes dependant of what type of object is selected. In edit mode, it will change to the appropriate menu with editing tools.

Read more about Objects in the Objects chapter

Modes

Bforartists has a number of *Modes* used for editing different kinds of data:



- Object Mode
- Edit Mode
- Pose Mode
- Sculpt Mode
- Vertex Paint
- Weight Paint
- Texture Paint
- Particle Edit

The mode can be changed using the menu in the 3D View header, or using the hotkey associated with that mode.

Object Mode

mode allows you to work with objects as a whole.

Edit Mode

Allows you to modify the shape of the object.

Sculpt Mode

In this mode your cursor becomes a tool to shape the object

The cursor becomes a brush in:

- Vertex Paint mode
- Weight Paint mode
- Texture Paint mode.

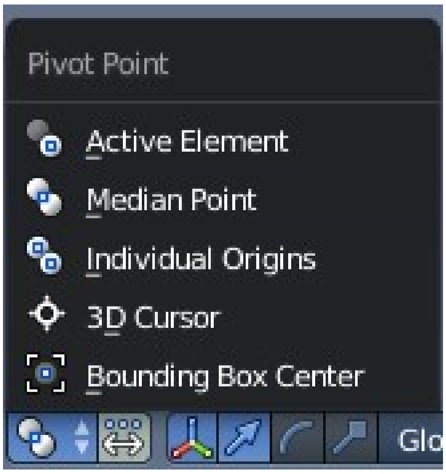
ViewPort Shading List

Allows you to change the way 3D objects are displayed in the viewport.

- Bounding Box
- Wireframe
- Solid
- Texture
- Material
- Rendered

Pivot Point Selector

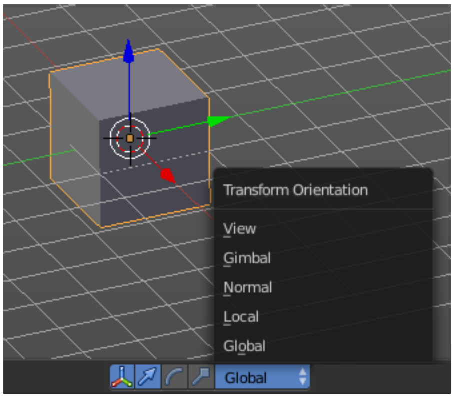
When rotating or scaling an object or group of vertices/edges/faces, you may want to shift the pivot point (the transformation center) in 3D space. Using this selector, you can change the pivot point to the location of the:



- Active Element
- Median Point *the average center spot of the selected items*
- Individual Origins
- 3D Cursor
- Bounding Box Center

Use the *Object Center* to switch between transforming the entire objects, or just the position of the objects

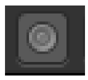
Transform (Manipulator) Selectors



Transform Manipulators is a widget. They allow you to scale, rotate or move objects by grabbing (clicking with your mouse) their controls and moving your mouse in the corresponding axis.

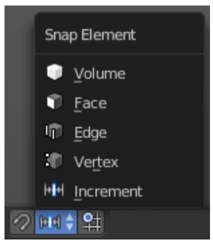
The widget can be oriented in various ways.

Proportional Editing



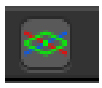
Enables proportional editing.

Snap to Mesh



This “magnet” button controls the snapping tools that help with transforming and modeling objects.

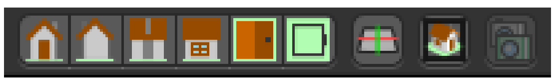
Reset 3D View



Resets the 3D view to the default zoom, rotation and scale. Reset 3D View is an addon, and can be disabled in the User Preferences.

Align View buttons

Align View Buttons provides you with buttons to switch the view.



From left to right: Front, Back, Left Right, Top, Bottom. The seventh button is to switch between orthographic and perspectivic view. Button 8 is to view from the active camera. Button 9 sets the active camera. Note that you need to have a camera object selected to make this button activated.

Align View is an addon, and can be disabled in the User Preferences.

3D View

To be able to work in the three dimensional space that Bforartists uses, you must be able to change your viewpoint as well as the viewing direction of the scene. While we will describe the *3D View* window, most of the other windows have similar functions. For example, it is possible to translate and zoom a *Buttons* window and its panels.

Tip

Mouse Buttons and Numpad

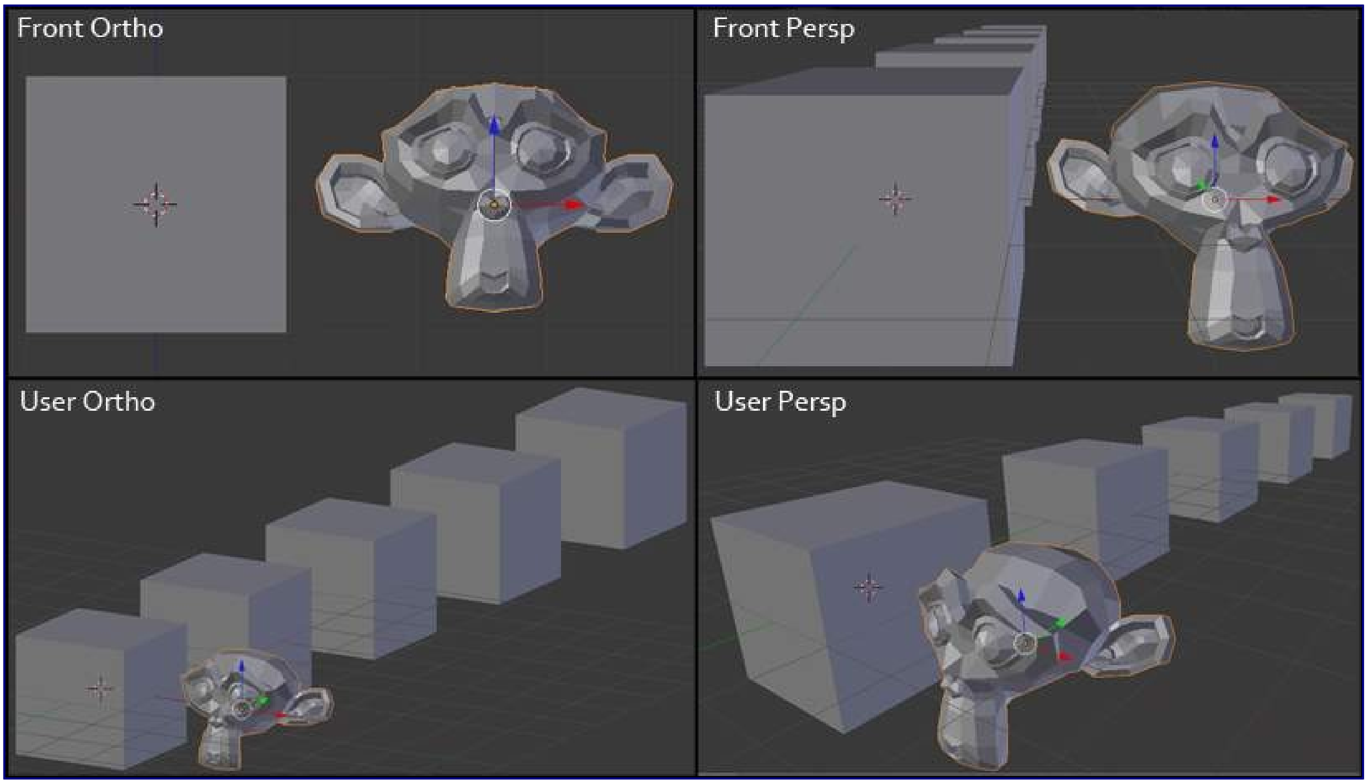
If you have a mouse with less than three buttons or a keyboard without numpad, see the *Keyboard and Mouse* page of the manual to learn how to use them with Bforartists.

Perspective and Orthographic Views

Reference

Mode: All modes
Menu: View ‣ Perspective / View ‣ Orthographic
Hotkey: `Numpad5`

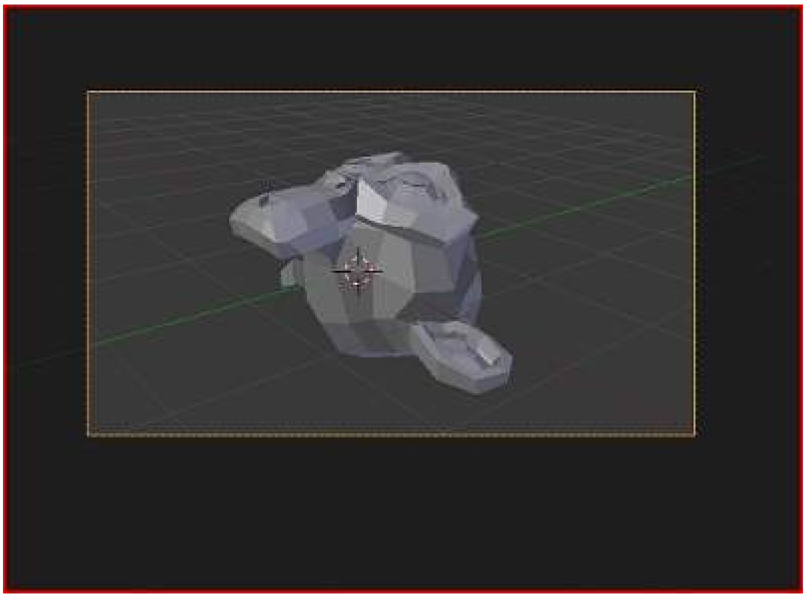
Each 3D viewport supports two different types of projection. These are demonstrated in the *Orthographic (left) and perspective (right) projections* image below.



Orthographic (left) and perspective (right) projections.

Our eye is used to perspective viewing because distant objects appear smaller. Orthographic projection often seems a bit odd at first, because objects stay the same size regardless of their distance. It is like viewing the scene from an infinitely distant point. Nevertheless, orthographic viewing is very useful (it is the default in Bforartists and most other 3D applications), because it provides a more “technical” insight into the scene, making it easier to draw and judge proportions.

Options



Demonstration of camera view.

To change the projection for a 3D view, choose the View ‣ Orthographic or the View ‣ Perspective menu entry. The `Numpad5` shortcut toggles between the two modes. Changing the projection for a 3D view does not affect the way the scene will be rendered. Rendering is in perspective by default. If you need to create an orthographic rendering, select the camera, go to the *Object Data* context and press the *Orthographic* button in the *Lens* panel.

The View ‣ Camera menu entry sets the 3D view to camera mode (`Numpad0`). The scene is then displayed as it will be rendered later (see *Demonstration of camera view*). The rendered image will contain everything within the orange dotted line. Zooming in and out is possible in this view, but to change the viewpoint, you have to move or rotate the camera.

See also

- *Render perspectives*
- *Camera View*
- Camera Clipping
- `Camera Projections`

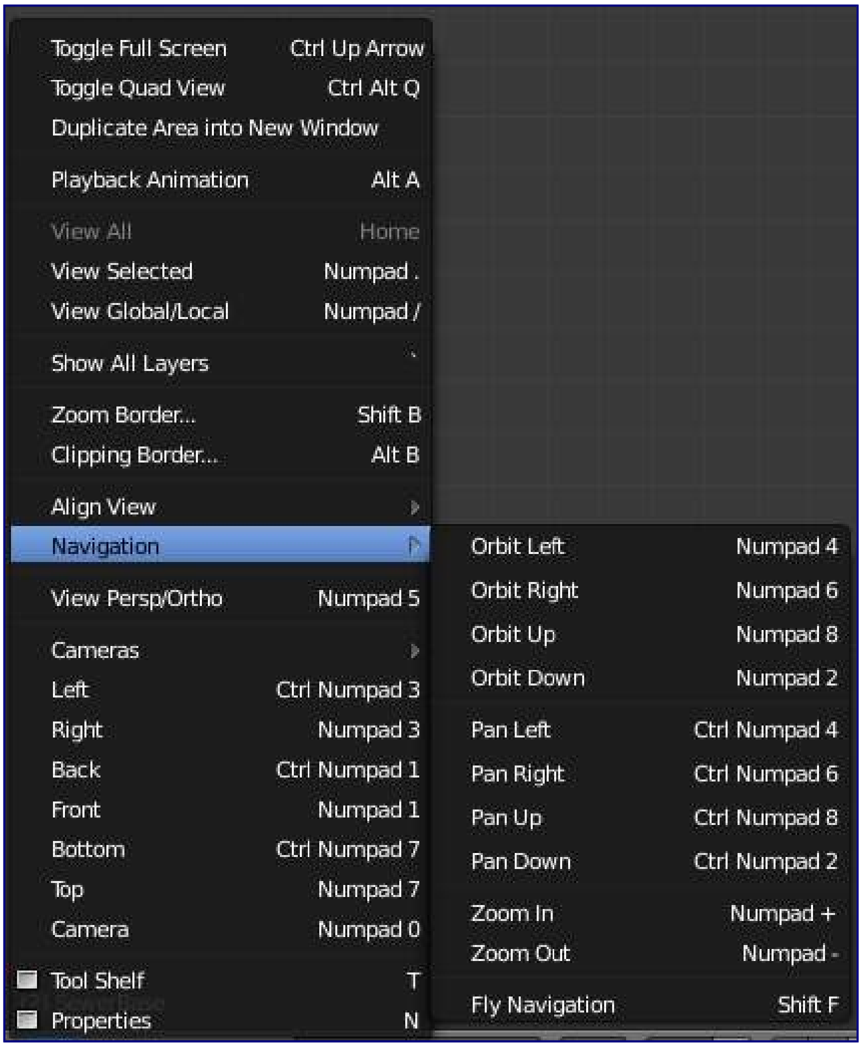
Rotating the View

Reference

Mode: All modes

Menu: View ‣ Navigation

`Hotkey: Numpad2 / Numpad4 / Numpad6 / Numpad8 / Ctrl-Alt-Wheel`



A 3D viewport’s View menu.

Bforartists provides four default viewing directions: *Side*, *Front*, *Top* and *Camera* view. Bforartists uses a right-angled “Cartesian” coordinate system with the Z axis pointing upwards. “Side” corresponds to looking along the X axis, in the negative direction, “Front” along the Y axis, and “top” along the Z axis. The *Camera* view shows the current scene as seen from the camera view point.

Options

You can select the viewing direction for a 3D viewport with the *View* menu entries, or by pressing the hotkeys `Numpad3` for “side”, `Numpad1` for “front”, `Numpad7` for “top”. You can select the opposite directions if you hold `Ctrl` while using the same numpad shortcuts. Finally `Numpad0` gives access to the “camera” viewpoint.

Apart from these four default directions, the view can be rotated to any angle you wish. Click and drag `MMB` on the viewport’s area. If you start in the middle of the window and move up and down or left and right, the view is rotated around the middle of the window. Alternatively, if the *Emulate 3 button mouse* option is select in the *User Preferences* you can press and hold `Alt` while dragging `LMB` in the viewport’s area.

To change the viewing angle in discrete steps, use `Numpad8` and `Numpad2` (which correspond to vertical `MMB` dragging, from any viewpoint), or use `Numpad4` and `Numpad6` (or `Ctrl-Alt-Wheel`) to rotate the scene around the Z global axis from your current point of view.

Note

Hotkeys

Remember that most hotkeys affect **the active window** (the one that has focus), so check that the mouse cursor is in the area you want to work in before your use the hotkeys.

See also

- Orbit Style Preference
- Auto-Perspective Preference

Panning the View

Reference

Mode: All modes
Menu: *View –> Navigation*

To pan the view, hold down `Shift` and drag `MMB` in the 3D Viewport. For discrete steps, use the hotkeys `Ctrl-Numpad8`, `Ctrl-Numpad2`, `Ctrl-Numpad4` and `Ctrl-Numpad6` as with rotating (note: you can replace `Ctrl` by `Shift`). For those without a middle mouse button, you can hold `Shift Alt` while dragging with `LMB`.

Zooming the View

Reference

Mode: All modes
Menu: *View –> Navigation*

You can zoom in and out by holding down `Ctrl` and dragging `MMB`. The hotkeys are `NumpadPlus` and `NumpadMinus`. The View ‣ Navigation sub-menu holds these functions too as well. Refer to the 3D viewport's *View* menu image above for more information.

If you have a wheel mouse, you can perform all of the actions in the 3D viewport that you would do with `NumpadPlus` and `NumpadMinus` by rotating the `Wheel`. To zoom a *Buttons* window, hold `Ctrl-MMB` and move your mouse up and down.

Hint

If You Get Lost

If you get lost in 3D space, which is not uncommon, two hotkeys will help you: Home changes the view so that you can see all objects (View ‣ View All menu entry), while NumpadPeriod zooms the view to the currently selected objects when in perspective mode (View ‣ View Selected menu entry).

Zoom Border

The *Zoom Border* tool allows you to specify a rectangular region and zoom in so that the region fills the 3d view.

You can access this through the *View* menu, or the shortcut `Shift-B`, then `LMB` click and drag a rectangle to zoom into.

Alternatively you can zoom out using the `MMB`.

Dolly the View

Reference
Mode: All modes

In most cases its sufficient to zoom the view to get a closer look at something, however you may notice that at a certain point you cannot zoom any closer.

This is because Bforartists stores a view-point thats used for orbiting and zooming, This works well in many cases but sometimes you want to move the view-point to a different place - This is what Dolly supports, allowing you to transport the view from one place to another.

You can dolly back and fourth by holding down `Ctrl-Shift` and dragging `MMB`.

Aligning the View

Align View

These options allow you to align and orient the view in different ways. They are found in the *View Menu*

Align View to Selected menu

These options align your view with specified local axes of the selected object, bone or in *Edit* mode, with the normal of the selected face.

Hold down `Shift` while using the numpad to set the view axis.

Center Cursor and View All

moves the cursor back to the origin **and** zooms in/out so that you can see everything in your scene.

Align Active Camera to View, `Ctrl-Alt-Numpad0`

Gives your active camera the current viewpoint

View selected, `NumpadPeriod`

Focuses view on currently selected object/s by centering them in the viewport, and zooming in until they fill the screen.

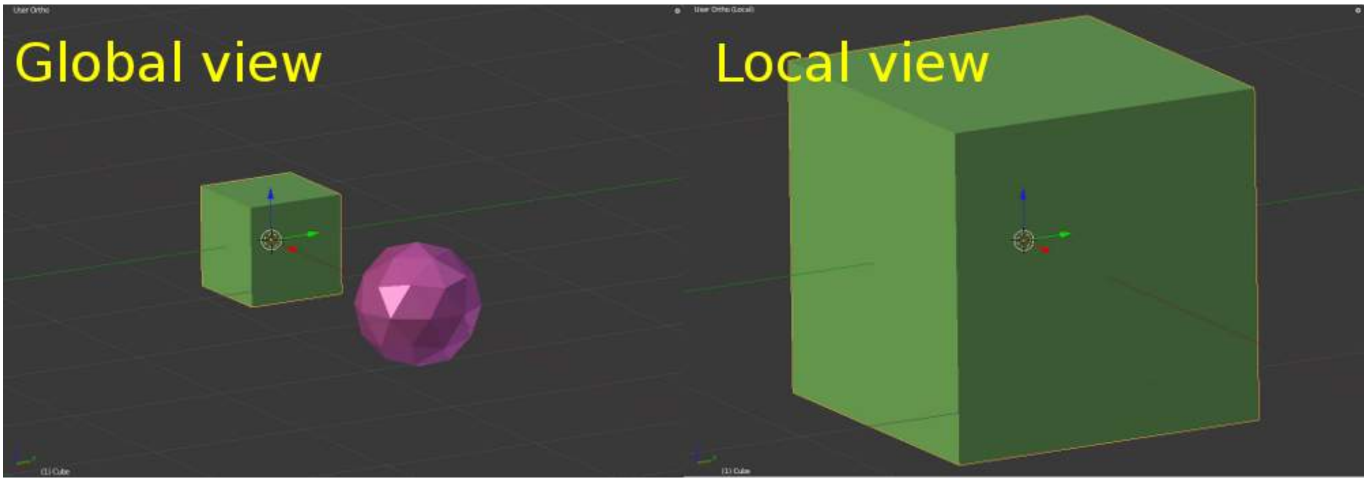
Center view to cursor, `Alt-Home`

Centers view to 3D-cursor

View Selected
See above

View All `Home`
Frames all the objects in the scene, so they are visible in the viewport.

Local and Global View



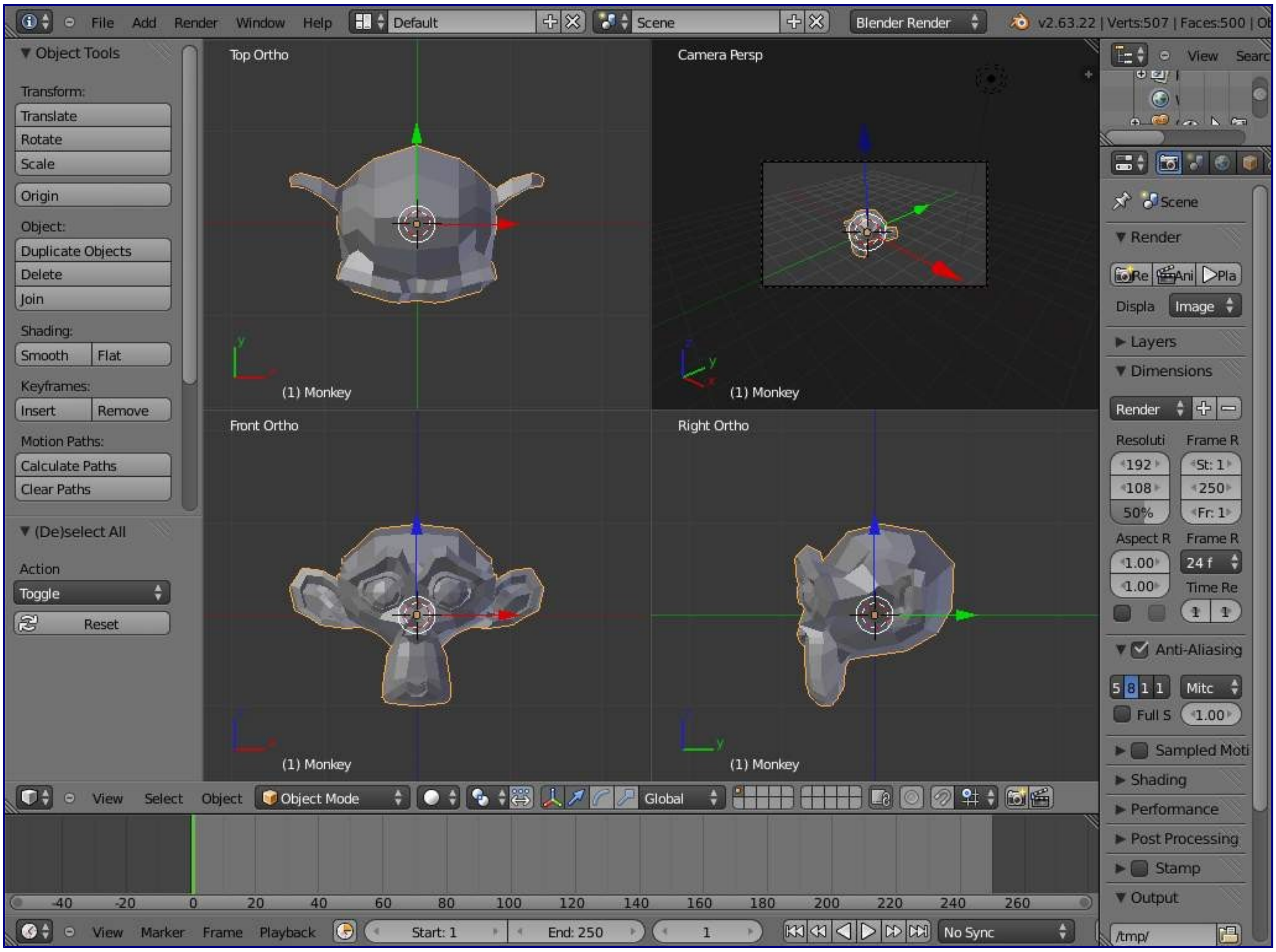
Global and Local view

You can toggle between *Local* and *Global* view by selecting the option from the *View Menu* or using the shortcut `NumpadSlash`. Local view isolates the selected object or objects, so that they are the only ones visible in the viewport. This is useful for working on objects that are obscured by other ones, or have heavy geometry. Press `NumpadSlash` to return to *Global View*.

This can be used to speed up viewport performance in heavy scenes, or allow you to focus on a specific object without others getting in your way.

Quad View

Reference
Mode: All modes Menu: View ‣ Toggle Quad View



Quad View

Toggling Quad View will split the 3D window into 4 views: 3 *Ortho* views and a *Camera* / *User View*. This view will allow you to instantly see your model from a number of view points. In this arrangement, you can zoom and pan each view independently but you cannot rotate the view. Note that this is different from splitting the windows and aligning the view manually. In Quad View, the four views are still part of a single 3D window. So they share the same draw options and layers.

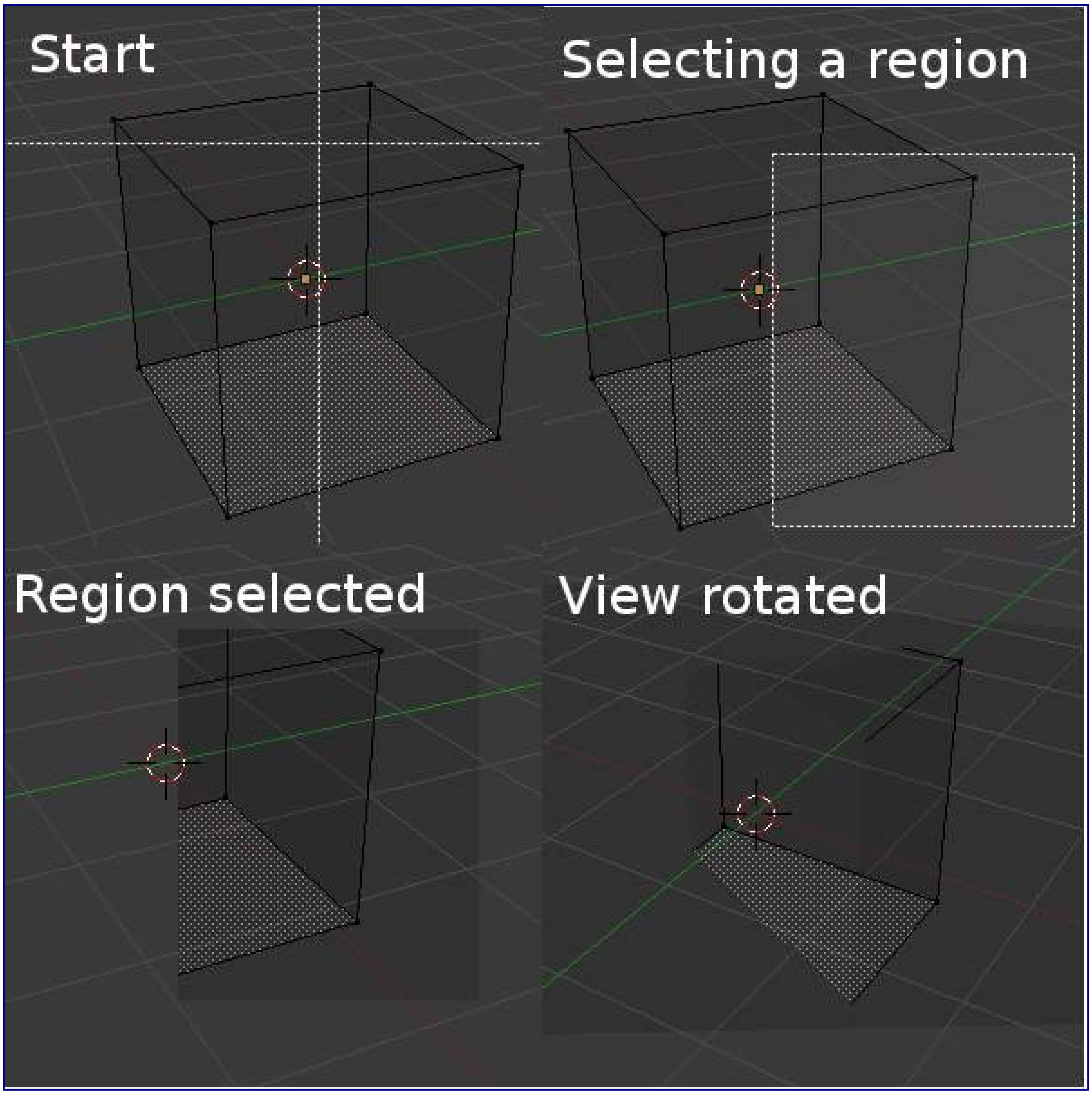
If you want to be able to rotate each view, you can un-check the *Locked* option.

However in sometimes its preferable to split the view, so each can have its own configuration.

Read more about splitting areas

View Clipping Border

Reference
Mode: All modes Menu: View ‣ Set Clipping Border



Region/Volume clipping.

To assist in the process of working with complex models and scenes, you can set the view clipping to visually isolate what you’re working on.

Once clipping is used, you will only see whats inside a volume you’ve defined. Tools such as paint, sculpt, selection, transform-snapping etc. will also ignore geometry outside the clipping bounds.

Once activated, you have to draw a rectangle with the mouse, in the wanted 3D view. The created clipping volume will then be:

- A right-angled parallelepiped (of infinite length) if your view is orthographic.
- A rectangular-based pyramid (of infinite height) if your view is in perspective.

To delete this clipping click at the button again

Example

The *Region/Volume clipping* image shows an example of using the clipping tool with a cube. This will generate a dashed cross-hair cursor. Click with the `LMB` and drag out a rectangular region shown in the upper right. Now a region is defined and clipping is applied against that region in 3D space. Notice that part of the cube is now invisible or clipped. Rotate the view and you will see that only what is inside the pyramidal volume is visible. All the editing tools still function as normal but only within the pyramidal clipping volume.

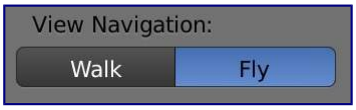
The dark gray area is the clipping volume itself. Once clipping is deactivated, all of 3D space will become visible again.

Walk/Fly Mode

When you have to place the view, normally you do as described above.

However, there are cases in which you really prefer to just navigate your model, especially if it’s very large, like environments or some architectural model. In these cases viewing the model in perspective mode has limitations, for example after zooming a lot of panning is extremely uncomfortable and difficult, or you apparently cannot move the camera any nearer. As an example, try to navigate to a very distant object in the view with traditional methods (explained above) and see what you can get.

With walk/fly modes you move, pan, tilt, and dolly the camera around without any of those limitations.



View Navigation.

In the *User Preferences window* select the navigation mode you want to use as default when invoking the View Navigation operator. Alternatively you can call the individual modes from the View Navigation menu.

Note

This mode actually *moves* the camera used by the view. This means that when you are in camera view, it moves the active camera’‘, which is another way to place and aim it.

Walk Mode

Reference

Mode: All modes
Menu: View ‣ View Navigation ‣ Walk Navigation

Usage

On activation the mouse pointer will move at the center of the view, and a cross marker will appear...

This navigation mode behaves similar to the first person navigation system available in most 3d world games nowadays. It works with a combination of keyboard keys (`WASD`) and mouse movement. By default the navigation is in the ‘free’ mode, with no gravity influence. You can toggle between gravity and free mode during the navigation (`Tab`).

To move to places more quickly you can teleport (`Spacebar`) around your scene. If there is an object in front of the walk cross/aim you will move in that direction until you reach the point (offset by the ‘camera height’ value set in the [Doc:2.6/Manual/Preferences|User Preferences window]]).

If the defaults values (speed, mouse sensitivity, ...) need adjustments for your project, in the Preferences you can select a few options for the navigation system:

Fly Mode

Reference
Mode: All modes Menu: View ‣ View Navigation ‣ Fly Navigation `Hotkey: Shift-F`

Usage

On activation the mouse pointer will move at the center of the view, and a squared marker will appear – a sort of HUD...

Some of the options of Fly mode are influenced by the position of the mouse pointer relative to the center of the view itself, and the squared marker around this center provides a sort of “safe region” where you can place the mouse for it to have no effect on the view. The more you take the mouse pointer away from the marker, the more you pan, or track, etc.

Shortcuts

- Move the mouse left/right to pan the view left/right or move it up/down to tilt the view up/down.
- Move the view forward/backward: - `WheelUp` or `NumpadPlus`} to accelerate the movement forward. - `WheelDown` or to `NumpadMinus`} to accelerate the movement backward.

  > So if the view is already moving forward, `WheelDown`/`NumpadMinus`} will eventually stop it and then move it backward, etc.

- Drag the `MMB` to dolly. In this case the view can move laterally on its local axis at the moment you drag the mouse – quite obviously, dragging left/right/up/down makes the view dolly on the left/right/up/down respectively.

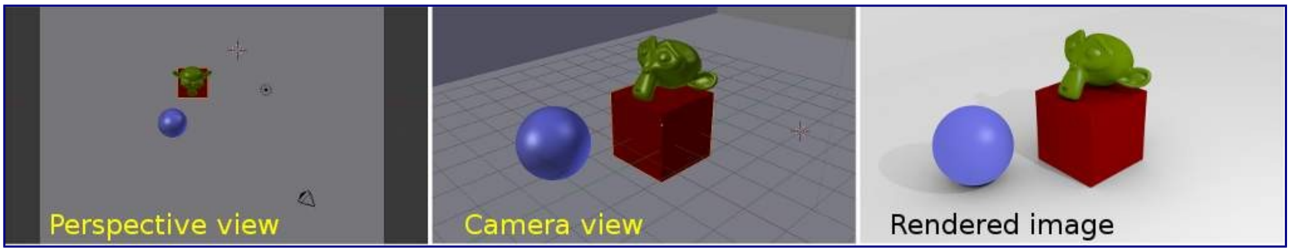
When you are happy with the new view, click `LMB` to confirm. In case you want to go back from where you started, press `Esc` or `RMB`, as usual.

Camera View

Reference
Mode: All modes Menu: View ‣ Camera ‣ Active Camera

Cameras View can be used to virtually compose shots and preview how the scene will look when rendered.

Pressing `Numpad0` will show the scene as viewed from the currently active camera. In this view you can also set the *Render Border* which defines the portion of the camera view to be rendered.



Camera view provides a preview for the final rendered image.

There are several different ways to navigate and position the camera in your scene, some of them are explained below.

Camera Navigation

There are several different ways to navigate and position the camera in your scene, some of them are explained below.

Note
Remember that the active "camera" might be any kind of object. So these actions can be used, for example, to position and aim a lamp.

Align Active Camera to View

Reference
Mode: *Object* mode

This feature allows you to position and orient the active camera to match your current view-port.

Select a camera and then move around in the 3D view to a desired position and direction for your camera (so that you're seeing what you want the camera to see). Now click at Align Active Camera to View to align the camera to the current view. This also switches to the camera view.

Camera View Positioning

By enabling Lock Camera to View in the View menu of the View Properties panel, while in camera view, you can navigate the 3d view-port as usual, while remaining in camera view. Controls are exactly the same as when normally moving in 3d.

Roll, Pan, Dolly, and Track

To perform these camera moves, the camera must first be *selected*, so that it becomes the active object (while viewing through it, you can `RMB` -click on the solid rectangular edges to select it). The following actions also assume that you are in camera view. Having done so, you can now manipulate the camera using the given commands that are used to manipulate any object.

See also

Fly/Walk Mode
When you are in walk/fly mode, navigation actually moves your camera:
Lock Camera to View
When enabled, performing typical view manipulation operations will move the camera object.

Objects

The geometry of a scene is constructed from one or more Objects. These objects can range from lamps to light your scene, basic 2D and 3D shapes to fill it with models, armatures to animate those models, to cameras to take pictures or video of it all.

Types of Objects

Meshes
Meshes are objects composed of Polygonal Faces, Edges and/or Vertices, and can be edited extensively with Bforartists's mesh editing tools. The default scene features a cube, which is one of the many included basic building-block shapes called *Mesh Primitives*

Curves
Curves are mathematically defined objects which can be manipulated with control handles or control points (instead of vertices), to manage their length and curvature.

Surfaces
Surfaces are patches that are also manipulated with control points. These are useful for simple rounded forms and organic landscapes.

Meta Objects
Meta Objects (or Metaballs) are objects formed by a mathematical function (with no control points or vertices) defining the 3D volume in which the object exists. Meta Objects have a liquid-like quality, where when two or more Metaballs are brought together, they merge by smoothly rounding out the connection, appearing as one unified object.

Text
Text objects create a two dimensional representation of a string of characters.

Armatures
Armatures are used for *rigging* 3D models in order to make them poseable and animateable.

Lattice
Lattices are non-renderable wireframes, commonly used for taking additional control over other objects with help of the *Lattice Modifier*.

Empty
Empties are null objects that are simple visual transform nodes that do not render. They are useful for controlling the position or movement of other objects.

Speaker
Brings to scene source of sound.

Cameras
This is the virtual camera that is used to determine what appears in the render.

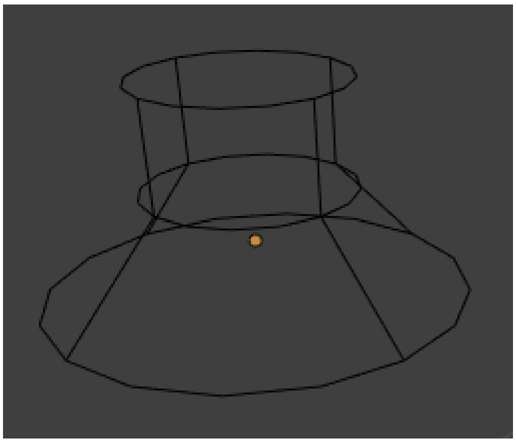
Lamps

These are used to place light sources in the scene.

Force Fields

Force fields are used in physical simulations. They give simulations external forces, creating movement, and are represented in 3d editor by small control objects.

Speaker



Speaker Object.

The speaker object is used to give sound in the 3D Viewport. After adding the object the various settings can be changed in the properties editor.

Options

Sound

Mute

Toggles whether or not the sound can be heard.

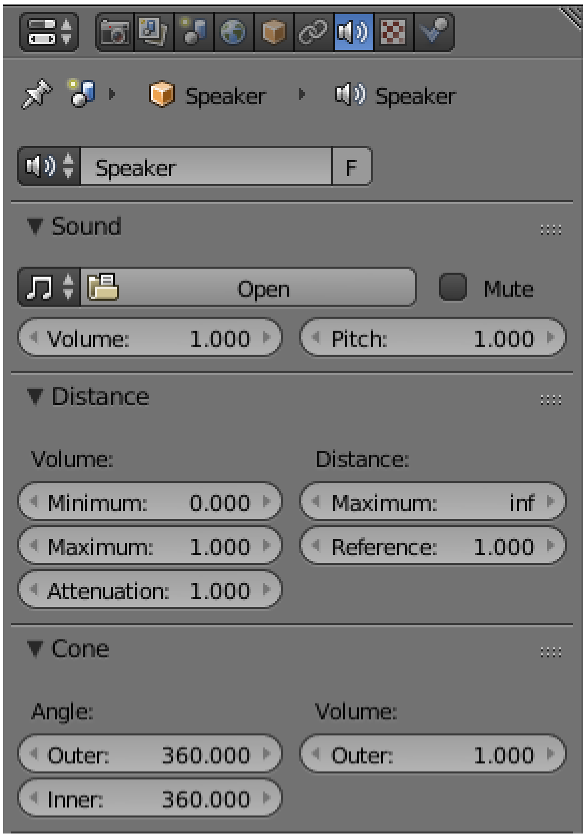
Volume

Adjust the loudness of the sound

Pitch

Can be used to bend the pitch of the sound to be either deeper or higher.

Distance



Volume:

Minimum
  Minimum volume, no matter how far the object is.
Maximum
  Maximum volume, no matter how far the object is.
Attenuation
  How strong the distance affects the volume.

Distance:

Maximum
  Maximum distance for volume calculation.
Reference
  Reference distance at which volume is 100%.

Cone

Angle:

Outer
  Angle of the outer cone in degrees. Outside this cone the volume is the outer cone volume (see below). Between the inner and outer cone the volume is interpolated.
Inner
  Angle of the inner cone in degrees. Inside the cone the volume is 100%.

Volume:

Outer

Volume outside the outer cone.

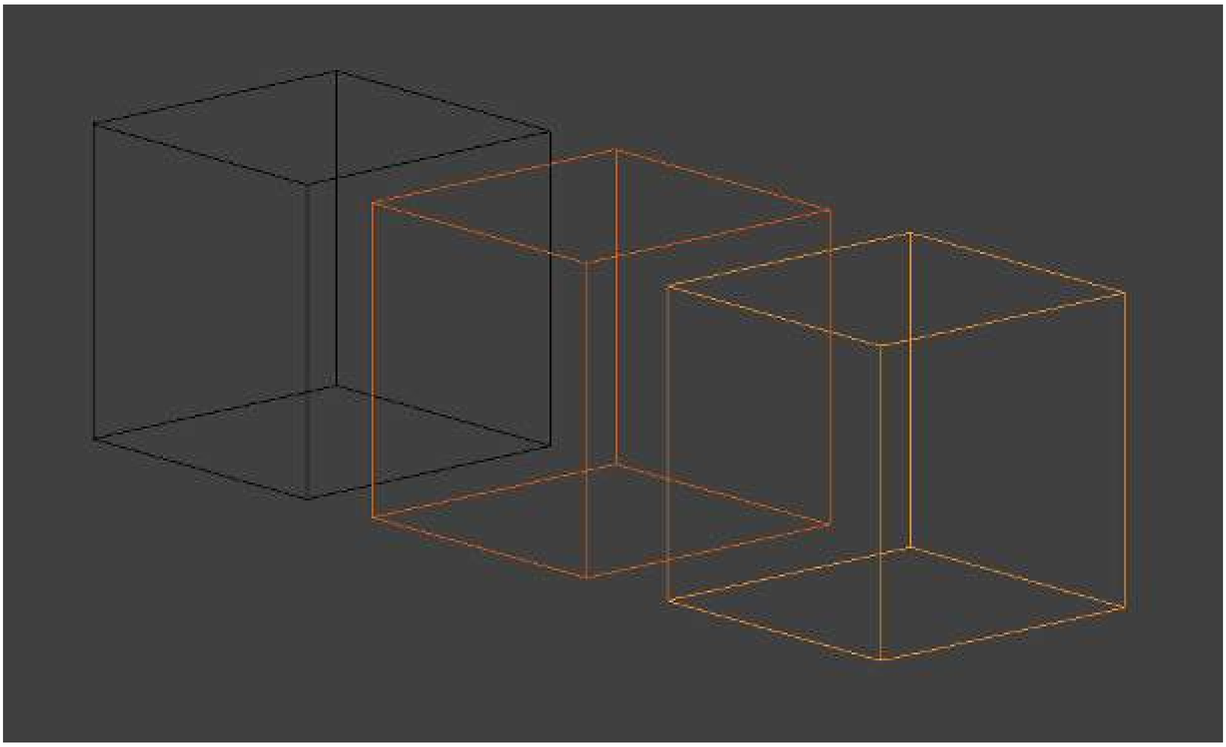
Selecting

Introduction

Selection determines which elements will be the target of our actions. Bforartists has advanced selection methods. Both in *Object mode* and in *Edit mode*.

Selections and the Active Object

Bforartists distinguishes between two different states of selection:



Unselected object in black, selected object in orange, and active object in yellow

- In *Object mode* the last (de)selected item is called the “Active Object” and is outlined in yellow (the others are orange). There is exactly one active object at any time (even when nothing is selected).

  Many actions in Bforartists use the active object as a reference (for example linking operations). If you already have a selection and need to make a different object the active one, simply re-select it with `Shift and Left mouseclick`

- All other selected objects are just selected. You can select any number of objects.

Point Selection

The simplest form of object *selection* is to click at it.

To *add to the selection*, use `Shift-LMB` on more objects.

If the *objects are overlapping* in the view, you can use `Alt-LMB` to cycle through possible choices.

If you want *to add to a selection* this way then the shortcut becomes `Shift-Alt-LMB`.

To *activate an object* that is already selected, click `Shift-LMB` on it.

To *deselect* an active object, click `Shift-RMB` one time - and hence two clicks if the object isn't active. Note that this only works if there are no other objects under the mouse. Otherwise it just adds those to the selection. There appears to be no workaround for this bug.

Rectangular or Border Select

Reference
Mode: *Object mode* and *Edit mode* Menu: *Select –> Border Select*

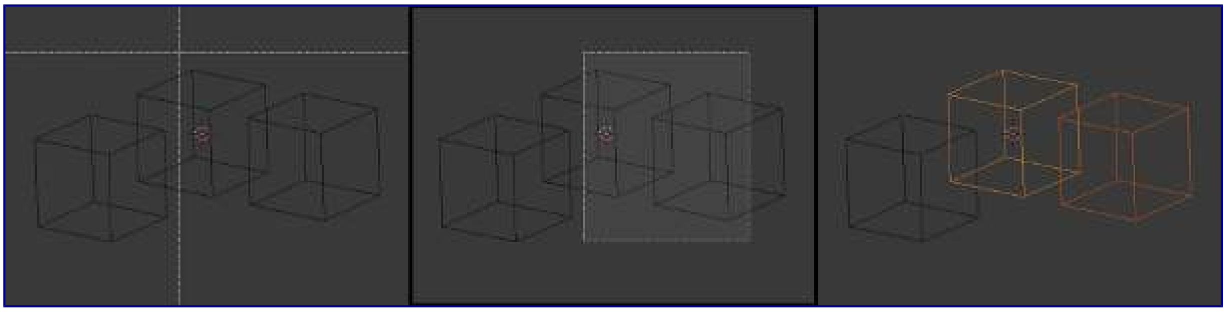
Description

With *Border Select* you draw a rectangle while holding down `LMB`. Any object that lies even partially within this rectangle becomes selected.

For deselecting objects, use `MMB` or *Border Select* again with holding `Shift`.

To cancel the selection use `RMB`.

Example



Border selecting in three steps

Border Select has been activated in the first image and is indicated by showing a dotted cross-hair cursor. In the second image, the *selection region* is being chosen by drawing a rectangle with the `LMB`. The rectangle is only covering two cubes. Finally, in the third image, the selection is completed by releasing `LMB`.

Notice in the third image, the bright color of left-most selected cube. This means it is the "active object", the last selected object prior to using the *Border Select* tool.

Hints

Border Select adds to the previous selection, so in order to select only the contents of the rectangle, deselect all with `A` first.

Lasso Select

Reference
Mode: *Object mode* and *Edit mode*
Menu: no entry in the menu
`Hotkey: Ctrl-LMB`

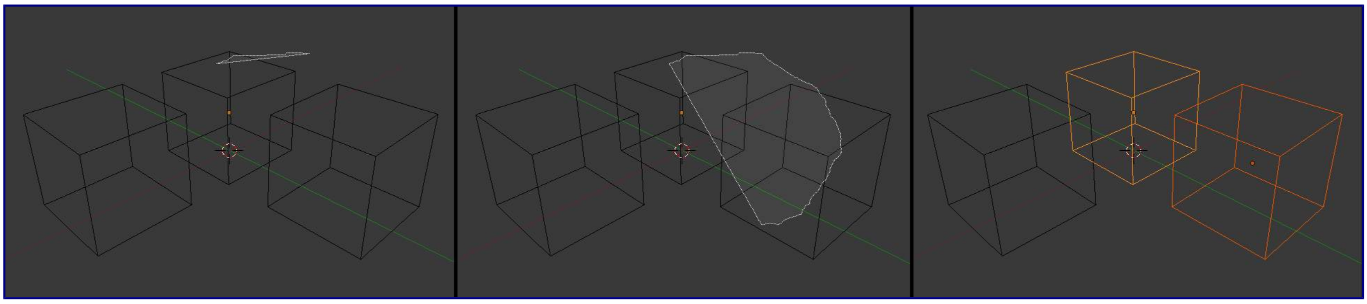
Description

Lasso select is used by drawing a dotted line around the pivot point of the objects, in *Object mode*.

Usage

While holding `Ctrl` down, you simply have to draw around the pivot point of each object you want to select with `LMB`.

Lasso select adds to the previous selection. For deselection, use `Ctrl-Shift-LMB`.

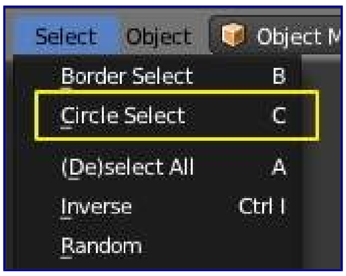


Lasso selection example

Circle Select

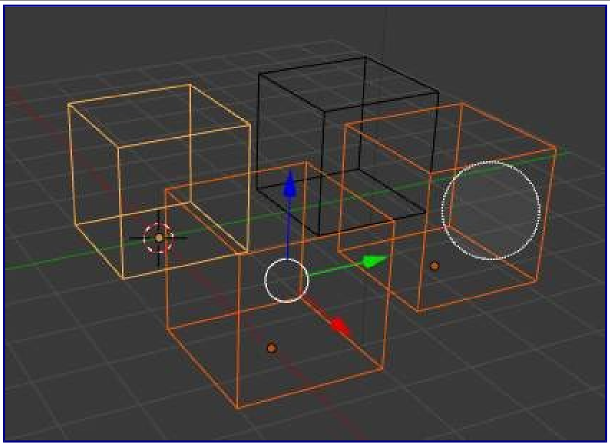
Reference
Mode: *Object mode* and *Edit mode*
Menu: *Select –> Circle Select*

Description

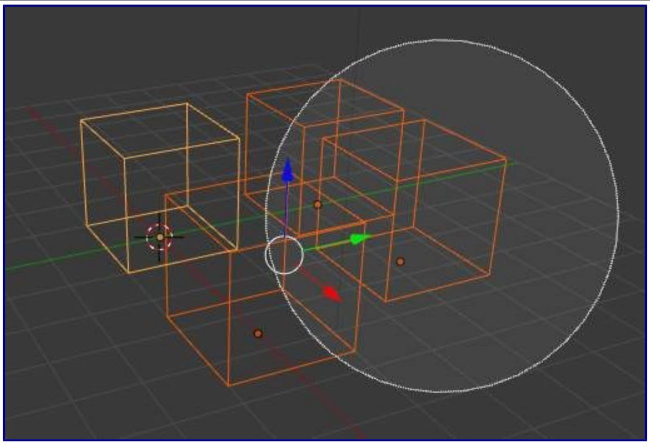


Main selection menu

Circle Select is used by moving with dotted circle through objects with `LMB`. You can select any object by touching of circle area. It is possible to dynamically change the diameter of circle by scrolling `MMB` as seen in pictures below. Deselection is under the same principle - `MMB`. To cancel the selection use `RMB` or key `Esc`,



Circle selection



...with huge circle

Menu Selection

The selection methods described above are the most common. There are also many more options accessible through the *Select* menu of the 3D view.

Each is more adapted to certain operations.

Select Grouped

Reference
Mode: *Object mode* Menu: *Select –> Grouped*

There are two ways to organize the objects in relation to one another. The first one is *parenting*, and the second is simple *grouping*. We can use these relationships to our advantage by selecting members of respective families or groups.

Options

Select –> Grouped in *Object mode* uses the active object as a basis to select all others.

Available options are:

Children
: Selects all children of the active object recursively.

Immediate Children
: Selects all direct children of the active object.

Parent
: Selects the parent of this object if it has one.

Siblings
: Select objects that have the same parent as the active object. This can also be used to select all root level objects (objects with no parents).

Type
: Select objects that are the same type as the active one.

Layer
: Objects that have at least one shared layer.

Group
: Objects that are part of a group (rendered green with the default theme) will be selected if they are in one of the groups that the active object is in.

Object Hooks
: Every hook that belongs to the active object.

Pass
: Select objects assigned to the same render pass. Render passes are set in *Properties –> Object –> Relations* and can be used in the *Node Compositor* (*Add –> Convertor –> ID Mask*.)

Color
: Select objects with same *Object Color*. Object colors are set in *Properties –> Object –> Display –> Object Color*.)

Properties
: Select objects with same *Game Engine Properties*.

Keying Set
: Select objects included in active Keying Set.

Lamp Type
: Select matching lamp types.

Pass Index
: Select matching object pass index.

Select linked

Reference
Mode: *Object* mode Menu: *Select –> Linked*

Selects all objects which share a common data-block with the active object.

Options

Select –> Linked in *Object mode* uses the active object as a basis to select all others.

Available options are:

Object Data
: Selects every object that is linked to the same Object Data, i.e. the data-block that specifies the type (mesh, curve, etc.) and the build (constitutive elements like vertices, control vertices, and where they are in space) of the object.

Material
: Selects every object that is linked to the same material data-block.

Texture
: Selects every object that is linked to the same texture data-block.

Dupligroup
: Selects all objects that use the same **Group** for duplication.

Particle System
: Selects all objects that use the same **Particle System**

Library
: Selects all objects that are in the same Library *Library (Object Data)*

Select All by Type

Reference
Mode: *Object* mode Menu: *Select –> Select All by Type*

The types are *Mesh*, *Curve*, *Surface*, *Meta*, *Font*, *Armature*, *Lattice*, *Empty*, *Camera*, *Lamp*, *Speaker*.

With this tool it becomes possible to select every **visible** object of a certain type in one go.

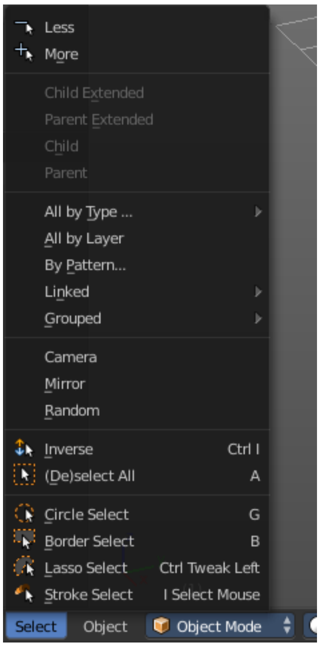
Options

Select All by Type in *Object* mode offers an option for every type of object that can be described by the *ObData* data-block.

Just take your pick.

Select All by Layer

Reference
Mode: *Object* mode Menu: *Select –> Select All by Layer*



All by Layer selection menu

Layers are another means to regroup your objects to suit your purpose.

This option allows the selection of every single object that belongs to a given layer, visible or not, in one single command.

Options

In the *Tool Shelf –> Select by Layer* the following options are available:

Match
: The match type for selection.

Extend
: Enable to add objects to current selection rather than replacing the current selection.

Layer
: The layer on which the objects are.

Tip
Selection of Objects Rather than using the *Select All by Layer* option, it might be more efficient to make the needed layers visible and use A on them. This method also allows objects to be deselected.

Other Menu Options

Available options on the first level of the menu are:

Select Pattern...
: Selects all objects whose name matches a given pattern. Supported wildcards: * matches everything, ? matches any single character, [abc] matches characters in "abc", and [!abc] match any character not in "abc". The matching can be chosen to be case sensitive or not. As an example *house* matches any name that contains "house", while floor* matches any name starting with "floor".

Select Camera
: Select the active camera.

Mirror
: Select the Mirror objects of the selected object eg. L.sword –> R.sword.

Random
: Randomly selects unselected objects based on percentage probability on currently active layers. On selecting the command a numerical selection box becomes available in the *Tool Shelf*. It's important to note that the percentage represents the likelihood of an unselected object being selected and not the percentage amount of objects that will be selected.

Inverse
: Selects all objects that were not selected while deselecting all those which were.

(De)select All
: If anything was selected it is first deselected. Otherwise it toggles between selecting and deselecting every visible object.

Less
: Decreases the selection

More
: Increases the selection

Child
: Select the child objects in the hierarchy

Parent
: Select the Parent object of the hierarchy

Child Extended

Select the child objects in the hierarchy

Parent Extended

Select the Parent object of the hierarchy

Transforms

Transformations refer to a number of operations that can be performed on a selected Object or Mesh that alters its position or characteristics.

Each object can be moved, rotated and scaled in *Object Mode*. However, not all of these transformations have an effect on all objects. For example, scaling a camera has no effect on the render dimensions.

Basic transformations include:

- *Grabbing (moving)*
- *Rotating*
- *Scaling*

These three transforms are the three big ones however more, advanced transformations can be found in the *Advanced Transformations* section.

For making other changes to the geometry of editable objects, you should use *Edit Mode*.

Once you’ve added a basic object, you remain in *Object Mode*.

The object’s wireframe should now appear orange. This means that the object is now selected and active.

Grab/Move

Reference
Mode: *Object* Mode, *Edit* Mode, and *Pose* Mode for the 3D View; *UV/Image Editor* Tools, *Sequence Editor*, *Dopesheet*, and *Graph Editor* for other specific types of Grab/Move operation. Menu: Context Sensitive, Object Based –> *Transform* –> *Grab/Move*

In Object Mode, the grab/move option lets you translate (move) objects. It also lets you translate any elements that make up the object within the 3D space of the active 3D viewport. Grab/Move works similarly here as it does in the Node Editor, Graph Editor, UV Editor, Sequencer, etc.

Options and other details will be discussed in their respective sections.

Translation Display

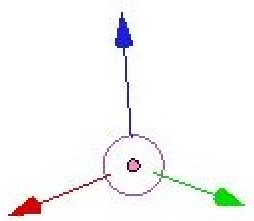
While Grab/Move is active, the amount of change in the X, Y and Z co-ordinates is displayed at the bottom left corner of the 3D View window.

3D View

There are **2** ways to Grab/Move in *3D View*:

- Using shortcuts and combinations of shortcuts.
- Using the *Transform Widget* helper. This can be toggled from the *Translation Widget* in the header of the 3DView.

Transform Widget



Translation Widget

In the default installation of Bforartists, this is the *Transform Widget*. It is active by default. You can use the widget by holding `LMB` over it and dragging in the 3D view.

Note
This behavior can be changed using *Release Confirms* in the *User Preferences*, so that a single RMB drag can be used to move and confirm.

Controling Grab/Move Precision

In addition to the Axis constraint options listed above, Bforartists offers options to limit the amount of the transformation in small or predefined steps.

`Shift`
: Slow translation mode. While still in the grab mode i.e. after `G` is pressed, holding down `Shift` reduces how quickly the object moves and allows extra precision.

`Ctrl`
: This activates *snapping* based on the snapping constraint which has been already set. You may not be able to enable every snapping option in all cases.

`Ctrl-Shift`
: Precise snap. This option will move the object with high precision along with the snapping constraint.

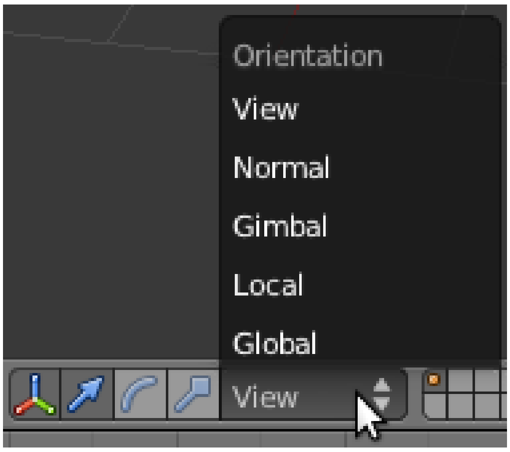
X/Y/Z + decimal number

This option limits the transformation to the specified axis and the decimal number specified will be the magnitude of the translation along that axis. This decimal number is displayed at the bottom left corner of the 3D view window as it is entered.

- Hitting `Backspace` during number entry and deleting the number removes the numerical specification option but the object will remain constrained to the same axis.
- Hitting `/` during number entry switches the number being entered to its reciprocal, e.g. `2 /` results in 0.5 (1/2), `2 / 0` results in 0.05 (1/20).
- The axis of movement can be changed at any time during translation by typing X/Y/Z.

Orientations

There are 5 standard orientation references for all transformations. You can find out more about transform orientations *here*.



Orientation choice menu

Each mode is a co-ordinate system in which transformations can be carried out. These orientations can be chosen from the pop-up menu to the side of the controls which toggle and select the transformation manipulator widgets.

If you have changed the orientation to something other than Global, you can hotkey your chosen axis of orientation by hitting the relevant axis modifying hotkey **twice** instead of just once. Hitting the axis modifying hotkey three times reverts back to Global orientation.

Numerical Entry Display

Other Editor Windows

In other editors such as the UV/Image Editor, Sequence Editor, Dopesheet and Graph Editor, the Grab/Move Operations are used to move objects or elements - the difference from 3D View is that only two axes are used - usually **X** and **Y**. You can use many of the same Grab/Move hotkeys in other editor windows and they will work much the same way as they do in 3D View. Rotating and scaling also work in certain editors as well.

Tip

Moving an object in Object mode changes the object’s origin. Moving the object’s vertices/edges/faces in Edit Mode doesn’t change the object’s origin.

Rotate

Reference

Mode: *Object* and *Edit* modes
Menu: Object/Mesh/Curve/Surface ‣ Transform ‣ Rotate

Description

Rotation is also known as a spin, twist, orbit, pivot, revolve, or roll and involves changing the orientation of elements (vertices, edge, face, Object etc) around one or more axes or the element’s Pivot Point. There are multiple ways to rotate an element which include:

- The keyboard shortcut
- The 3D manipulator widget
- The Properties menu

Basic rotation usage and common options are described below. For additional information, you may wish to read the Transform Control and Orientation pages which provide more information about options such as Precision, Axis Locking, Numeric Input, Snapping and the different types of Pivot Point.

Read more about Transform Control Read more about Transform Orientations

---

Usage

Rotation using the keyboard shortcut

The hotkeys vary, dependant of the chosen keymap, For the current standard hotkeys see the Important Hotkeys addon.

The amount of rotation will be displayed in the bottom left hand corner of the 3D window.

Rotation values

Constraining the rotation axis (axis locking)

Rotation can be constrained to a particular axis or axes through the use of *Axis Locking*. To constrain rotation, the following shortcuts can be used:

- `Rotate Hotkey, then X`: Rotate only along the **X Axis**

- `Rotate Hotkey`, `Y`: Rotate only along the **Y Axis**
- `Rotate Hotkey`, `Z`: Rotate only along the **Z Axis**

Axis locking can also be enabled by pressing the `MMB` after enabling rotation and moving the mouse in the desired direction e.g.

- `Rotate Hotkey`, move the mouse along the X axis, `MMB`: Rotate only along the **X Axis**

Fine Tuning The Rotation

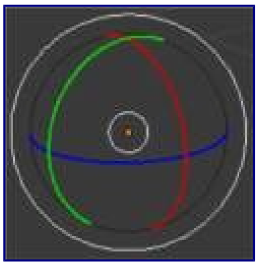
Precise control can be had over rotation through the use of the `Shift` and `Ctrl` keys to limit rotation to discrete amounts. You can also enter a *numerical value* in degrees to specify the amount of rotation after after initiating a rotation transformation.

- Hold `Ctrl` down while performing a rotation to rotate the selected element in 5 degree increments.
- Hold `Shift` down while performing a rotation to rotate the selected element in 0.01 degree increments.
- Hold `Shift-Ctrl` down while performing a rotation to rotate the selected element in 1 degree increments.
- Press `Rotate Hotkey`, type in a number and press `Return` to confirm.
- Press `Rotate Hotkey twice` to enable Trackball rotation.

Tip
Orientation dependant rotations By default, all rotations happen around a Global Orientation. You can change the rotation orientation by pressing the axis key twice. For example, pressing `R`, `X`, `X` will by default set rotation to occur around the local orientation.

Read more about Precision Control Read more about Numerical Transformations Read more about Transform Orientations

Rotation with the 3D Transform Manipulator



Rotation Transform Manipulator

In the 3D View header, ensure that the Transform Manipulator is enabled (the red, green, and blue triad is selected). Set the manipulator type to rotation (the highlighted arc icon shown below).

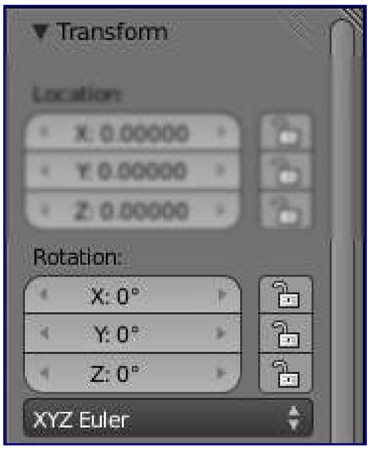
- Select your element with `RMB`.
- Use `LMB` and drag any of the three colored axes on the rotation manipulator to rotate your object along

that axis. You can also use `Shift`, `Ctrl` or numeric input with the 3D manipulator widget for further control.

- Your changes will be applied when you release `LMB` or press `Spacebar` or `Return`. Your changes will be cancelled if you press `RMB` or `Esc`.

Read more about the 3D Transform Manipulator

Rotation with the Properties Panel



Rotation transform properties panel.

Rotation values can also be specified in the Properties panel (`N`) by altering the degree value in the rotation slider of the Transform panel. Rotation along particular axes can be enabled or disabled by toggling the padlock icon. The rotation mode (Euler, Axis Angle, Quaternion) can also be set in this panel from the drop down box.

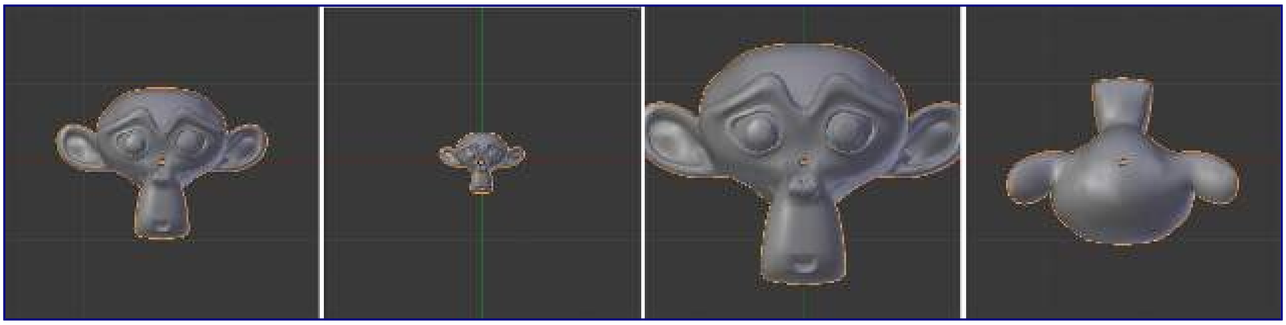
Scale

Reference
Mode: *Object* and *Edit* modes Menu: Object/Mesh/Curve/Surface ‣ Transform ‣ Scale

Description

Pressing the `Scale hotkey` will enter the *Scale* transformation mode where the selected element is scaled inward or outward according to the mouse pointer’s location. The element’s scale will increase as the mouse pointer is moved away from the Pivot Point and decrease as the pointer is moved towards it. If the mouse pointer crosses from the original side of the Pivot Point to the opposite side, the scale will continue in the negative direction and flip the element.

Read more about Pivot Points



Basic scale usage. From left to right, the panels show: the original Object, a scaled down Object, a scaled up Object and a scale-flipped Object.

There are multiple ways to scale an element which include:

- The keyboard shortcut
- The 3D manipulator widget
- The Properties menu

Basic scale usage and common options are described below. For additional information, you may wish to read the Transform Control and Orientation pages which provide more information about options such as Precision, Axis Locking, Numeric Input, Snapping and the different types of Pivot Point.

Usage

Scaling using the keyboard shortcut

The hotkeys vary, dependant of the chosen keymap, For the current standard hotkeys see the Important Hotkeys addon.

The amount of scaling will be displayed in the bottom left hand corner of the 3D window.

Scale values

Constraining the scaling axis (axis locking)

Scaling can be constrained to a particular axis or axes through the use of *Axis Locking*. To constrain scaling, the following shortcuts can be used:

- `Scale Hotkey`, `X`: Scale only along the **X Axis**
- `Scale Hotkey`, `Y`: Scale only along the **Y Axis**
- `Scale Hotkey`, `Z`: Scale only along the **Z Axis**

Axis locking can also be enabled by pressing the `MMB` after enabling scaling and moving the mouse in the desired direction e.g.

- `Scale Hotkey`, move the mouse along the X axis, `MMB`: Scale only along the **X Axis**

Read more about Axis Locking

Fine Tuning The Scaling

Precise control can be had over scaling through the use of the `Shift` and `Ctrl` keys to limit scaling to discrete amounts. You can also enter a *numerical value* in Bforartists Units (BU) to specify the amount of scaling after after initiating a scale transformation.

- Hold `Ctrl` down while scaling to scale the selected element in degree 0.1 BU increments.
- Hold `Shift` down while scaling to scale the selected element in very fine increments.
- Hold `Shift-Ctrl` down while scaling to scale the selected element in 0.01 BU increments.
- Press S, type in a number and press `Return` to confirm.

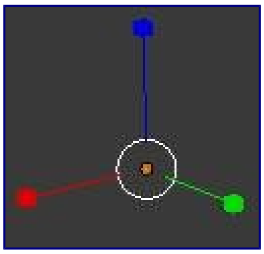
Tip
Orientation dependent scaling By default, all scaling happens around a Global Orientation. You can change the scaling orientation by pressing the axis key twice. For example, pressing S, X, X will by default set scaling to occur around the local orientation.

Read more about Precision Control

Read more about Numerical Transformations

Read more about Transform Orientations

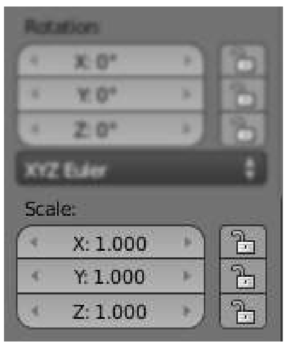
Scaling with the 3D Transform Manipulator



Scaling Transform Manipulator

In the 3D View header, ensure that the Transform Manipulator is enabled (the red, green, and blue triad is selected). Set the manipulator type to scale (the highlighted square icon shown below).

- Select your element with RMB.
- Use LMB and drag any of the three colored axes on the scaling manipulator to scale your object along that axis. You can also use `Shift`, `Ctrl` or numeric input with the 3D manipulator widget for further control.
- Your changes will be applied when you release LMB or press `Spacebar` or `Return`. Your changes will be cancelled if you press RMB or `Esc`.



Scaling with the Properties Panel

Scale values can also be specified in the Properties panel (N) by altering the amount value in the scaling slider of the Transform panel. Scaling along particular axes can be enabled or disabled by toggling the padlock icon.

Duplication

There are two types of object duplication, being Duplicate and Linked Duplicates which instance their object-data.

Instancing

Each Bforartists object type (mesh, lamp, curve, camera *etc.*) is composed from two parts: an *Object* and *Object Data* (sometimes abbreviated to *ObData*):

Object
Holds information about the position, rotation and size of a particular element.

Object Data

Holds everything else. For example:

Meshes:	Store geometry, material list, vertex groups... etc.
Cameras:	Store focal length, depth of field, sensor size... etc.

Each object has a link to its associated object-data, and a single object-data may be shared by many objects.

Duplicate

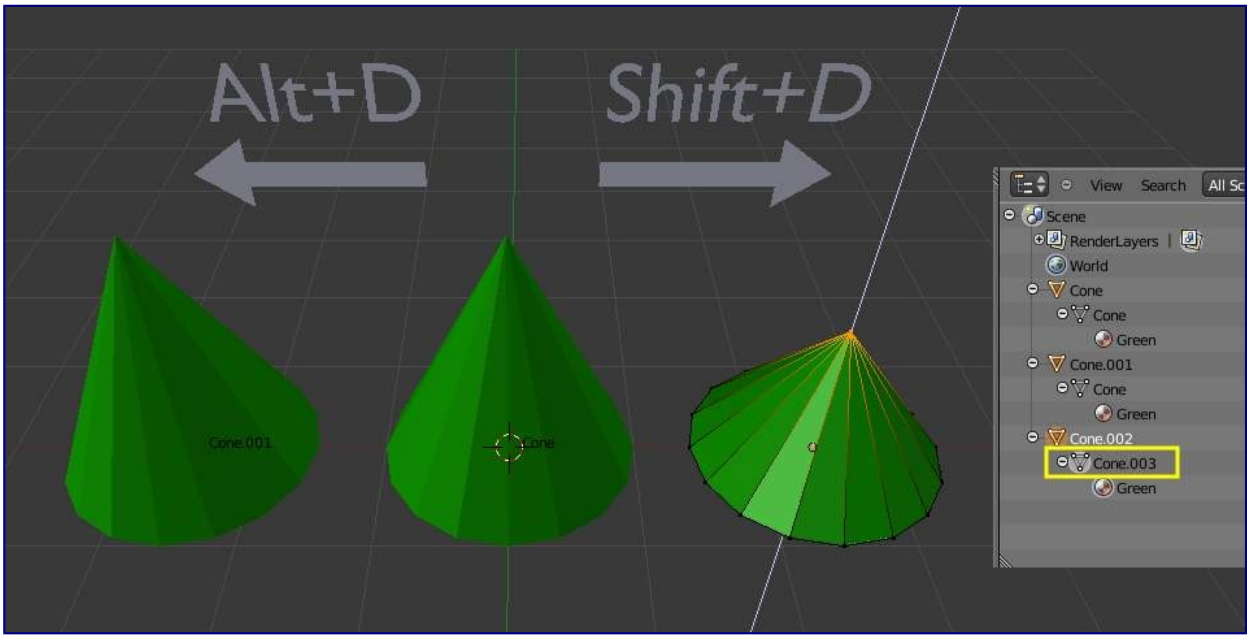
Reference
Mode: *Edit* and *Object* modes Menu: *Object –> Duplicate*

This will create a visually-identical copy of the selected object(s). The copy is created at the same position as the original object and you are automatically placed in *Grab* mode. See the example below.

This copy is a new object, which shares some data-blocks with the original object (by default, all the Materials, Textures, and Ipos), but which has copied others, like the mesh, for example. This is why this form of duplication is sometimes called “shallow link”, because not all data-blocks are shared; some of them are “hard copied”!

Note that you can choose which types of data-block will be linked or copied when duplicating: in the User Preferences, Editing Page.

Examples



The mesh Cone.006 of object Cone.002 is being edited. The mesh's Unique data-block ID name is highlighted in the Outliner.

The cone in the middle has been (1) link duplicated to the left and (2) duplicated to the right.

- The duplicated right cone is being edited, the original cone in the middle remains unchanged. The mesh data has been copied, not linked.
- Likewise, if the right cone is edited in object mode, the original cone remains unchanged. The new object's transform properties or data-block is a copy, not linked.
- When the right cone was duplicated, it inherited the material of the middle cone. The material properties were linked, not copied.

See above if you want separate copies of the data-blocks normally linked.

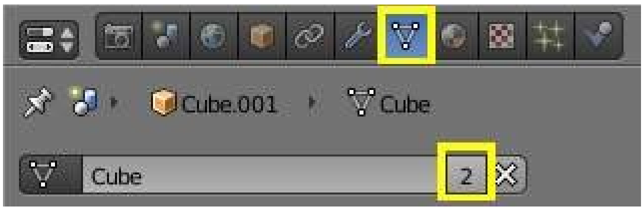
Linked Duplicates

Reference
Mode: *Object* mode Menu: *Object –> Duplicate Linked*

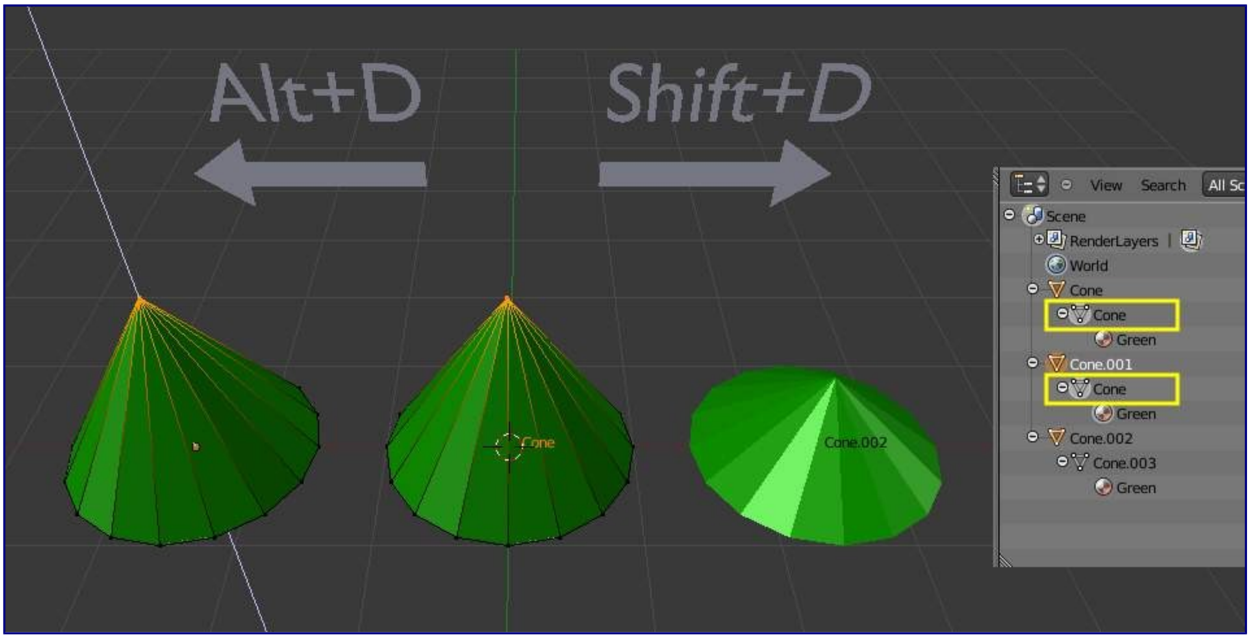
You also have the choice of creating a *Linked Duplicate* rather than a *Duplicate*; this is called a deep link. This will create a new object with **all** of its data linked to the original object. If you modify one of the linked objects in *Edit mode*, all linked copies are modified. Transform properties (object data-blocks) still remain copies, not links, so you still can rotate, scale, and move freely without affecting the other copy. Reference (*Duplicate Example*) for the discussions below.

Hint
If you want to make changes to an object in the new linked duplicate independently of the original object, you will have to manually make the object a "single-user" copy by `LMB` *the number in the Object Data panel of*

the Properties Window.



Examples



The object Cone.001 was linked duplicated. Though both these cones are separate objects with unique names, the single mesh named Cone, highlighted in the Outliner, is shared by both.

The left cone is a *Linked Duplicate* of the middle cone.

- As a vertex is moved in *Edit mode* in one object, the same vertex is moved in the original cone as well. The mesh data are links, not copies.
- In contrast, if one of these two cones is rotated or rescaled in object mode, the other remains unchanged. The transform properties are copied, not linked.
- As in the previous example, the newly created cone has inherited the material of the original cone. The material properties are linked, not copied.

A common table has a top and four legs. Model one leg, and then make linked duplicates three times for each of the remaining legs. If you later make a change to the mesh, all the legs will still match. Linked duplicates also apply to a set of drinking glasses, wheels on a car... anywhere there is repetition or symmetry.

Procedural Duplication

Reference
Mode: *Object mode* and *Edit mode*

Panel: Object settings

There are currently four ways in Bforartists to procedurally duplicate objects. These options are located in the *Object* menu.

Verts
: This creates an instance of all children of this object on each vertex (for mesh objects only).

Faces
: This creates an instance of all children of this object on each face (for mesh objects only).

Group
: This creates an instance of the group with the transformation of the object. Group duplicators can be animated using actions, or can get a Proxy.

Frames
: For animated objects, this creates an instance on every frame. As you'll see on this topic's subpage, this is also a *very* powerful technique for arranging objects and for modeling them.

Copying & Linking Objects Between Scenes

Sometimes you may want to link or copy objects between scenes. This is possible by first selecting objects you want to link and then using: Object ‣ Make Links ‣ Object to Scene.

This makes the same object exist in 2 different scenes at once, including its position and animation data. You can tell this is a *multi-user* object by the blue color of its center-circle

If you don't want the objects to be shared between the scenes, you can make them *Single-User* by using: Object ‣ Make Single User ‣ Object.

Further information on working with scenes can be found *here*.

Linked Library Duplication

Reference
Menu: *File –> Link Append*

Linked Libraries :Linked Libraries are also a form of duplication. Any object or data-block in other `.blend` files can be reused in the current file.

Hint

- If you want transform properties (i.e. object data-blocks) to be "linked", see the page on *parenting*.
- Material Transparency will not display when instancing dupli-groups; this is a known limitation of Bforartists's view-port.

DupliVerts

Reference
Mode: *Object* mode *Panel: Object –> Duplication*

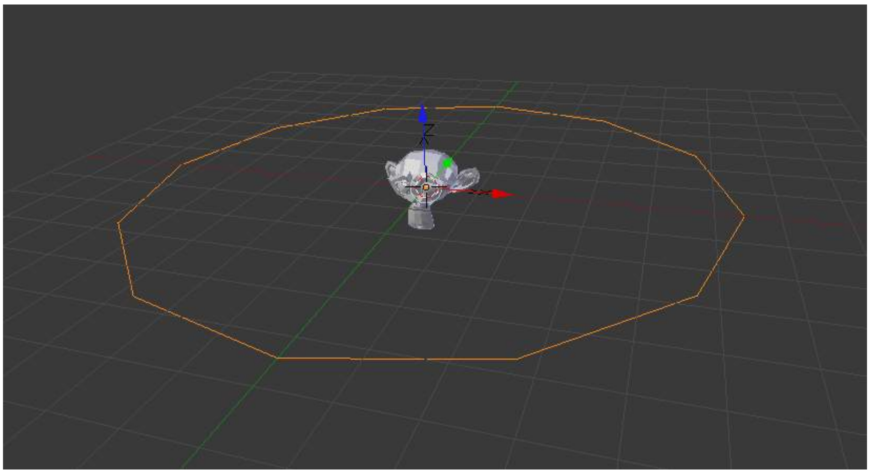
Duplication Vertices or *DupliVerts* is the duplication of a base object at the location of the vertices of a mesh. In other words, when using *DupliVerts* on a mesh, an instance of the base object is placed on every vertex of the mesh.

There are actually two approaches to modeling using *DupliVerts*. They can be used as an arranging tool, allowing us to model geometrical arrangements of objects (e.g. the columns of a Greek temple, the trees in a garden, an army of robot soldiers, the desks in a classroom). The object can be of any object type which Bforartists supports. The second approach is to use them to model an object starting from a single part of it (e.g. the spikes in a club, the thorns of a sea-urchin, the tiles in a wall, the petals in a flower).

Note
Download example .blend file *You can download a file with the examples described on this page. In this .blend, the first example, a monkey parented to a circle is on layer 1; while a tentacle parented to an icosphere is on layer 2.*

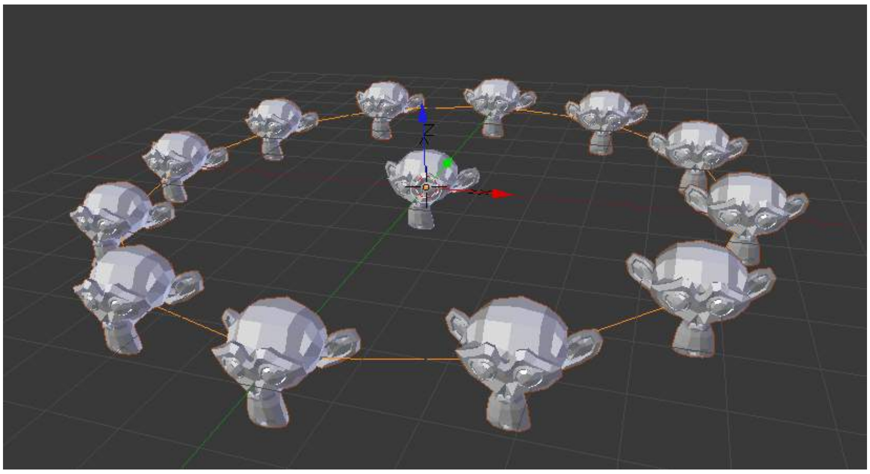
DupliVerts as an Arranging Tool

Setup



A monkey head and a circle

All you need is a base object (e.g. the *tree* or the *column*) and a pattern mesh with its vertices following the pattern you have in mind. In this section, we will use a simple scene for the following part. We'll be using a monkey head located at the origin of the coordinate system as our base object and a circle at the same location as our parent mesh.



Dupliverted monkeys

First, in *Object mode*, select the base object and add the circle to the selection (order is very important here), and parent the base object to the circle. Now, the circle is the parent of the monkey; if you move the circle, the monkey will follow it.

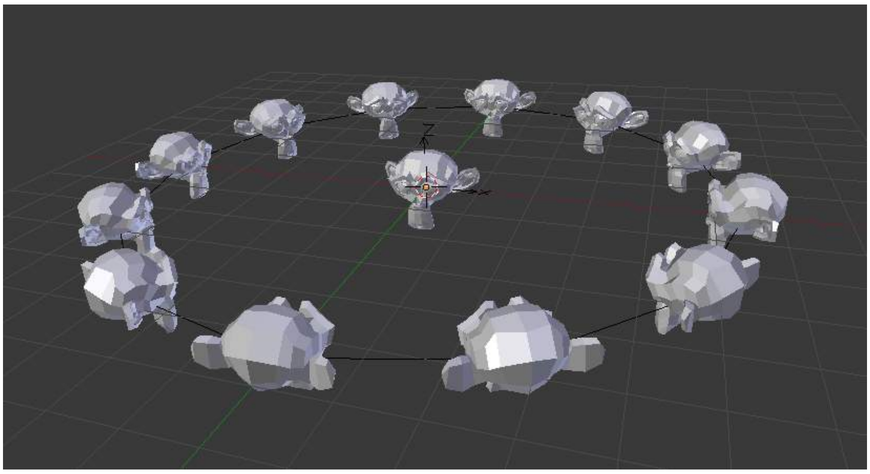
With only the circle selected, enable *Duplication vertices* in the *Object* panel–> *Duplication –> Verts*. A monkey head should be placed at every vertex of the circle.

The original monkey head at the center and the parent mesh are still shown in the 3D view but neither will be rendered. If the placement and rotation of your monkey head is odd, you might need to clear its rotation.

Rearranging

If you now select the base object and modify it in either object or edit mode, all changes will also affect the shape of all duplicate objects. You can also select the parent mesh to modify the arrangement of the duplicates; adding vertices will also add more base objects. Note that the base objects will inherit changes made to the parent mesh in object mode, but not in edit mode - so scaling the circle up in object mode will enlarge the monkey head, while scaling the circle up in edit mode will only increase the distance between the base objects.

Orientation

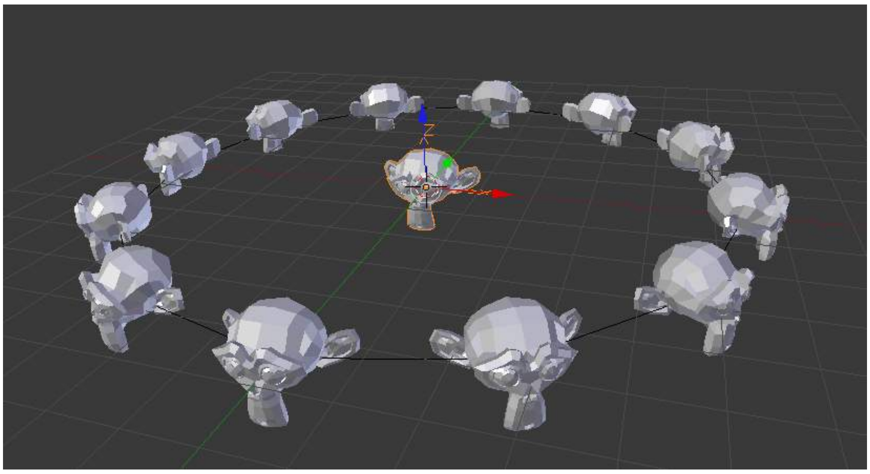


Orientation enabled, orientation +Y

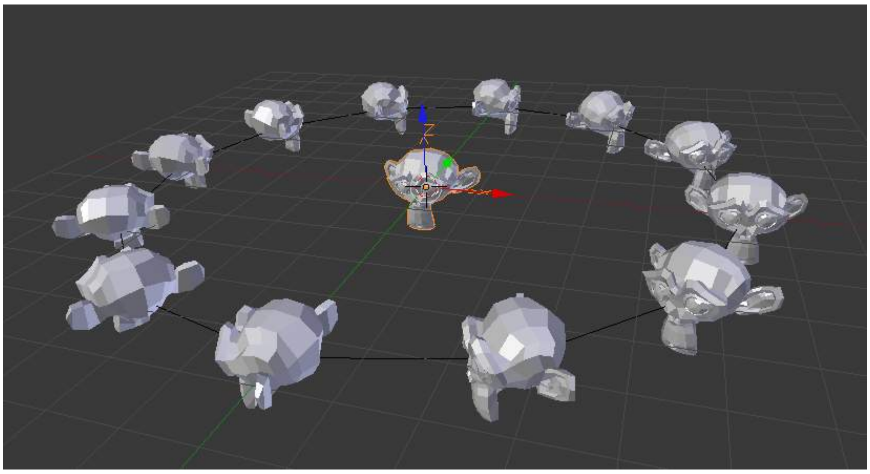
The orientation of the base objects can be controlled by enabling *Rotation* in the *Duplication* panel. This will rotate all base objects according to the vertex normals of the parent mesh.

To change the orientation of the duplicated objects, select the base object and in the *Object –> Relations extras* panel change the *Tracking Axes*.

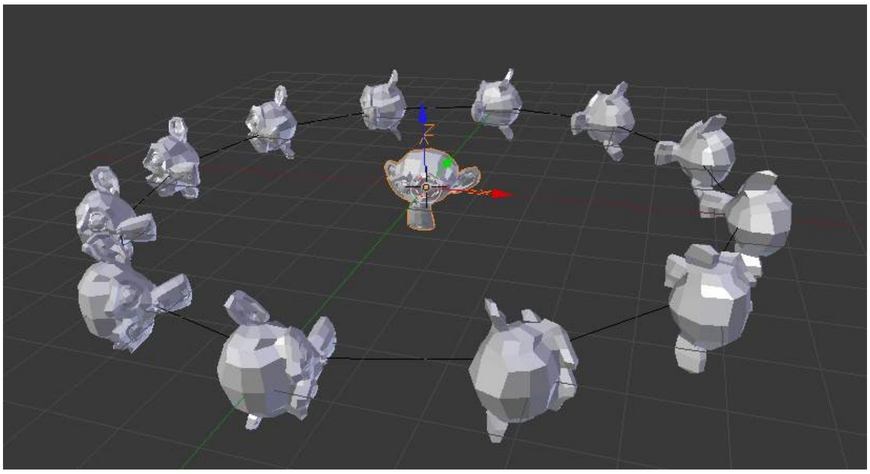
Output of various orientations:



Negative Y



Positive X



Positive Z, up X

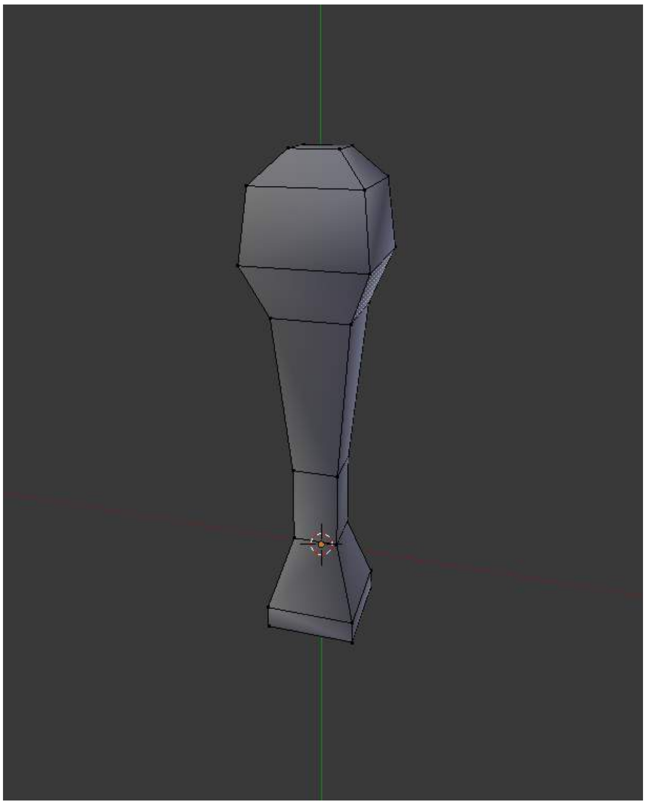
Note

The axes of an object can be made visible in the Object –> Display panel. To display the vertex normals of the parent mesh, tab into edit mode and enable this function in Properties –> Display panel where you can also resize the displayed normals as necessary.

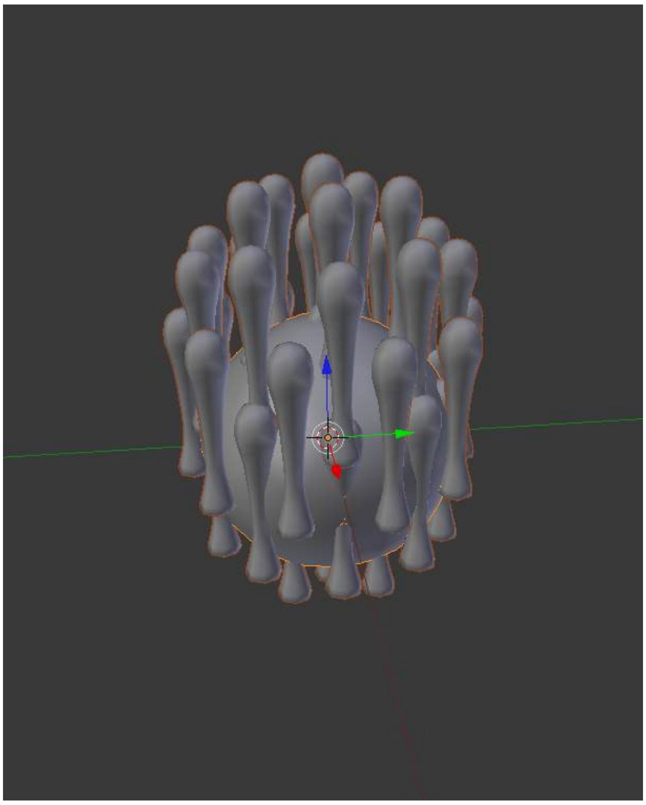
DupliVerts as a Modeling Tool

Very interesting models can be made using DupliVerts and a standard primitive. In this example, a simple tentacle was made by extruding a cube a couple of times. The tentacle object was then parented to an icosphere. With dupli *Rotation* enabled for the parent mesh (the icosphere), the orientation of the base object (the tentacle) was adapted to the vertex normals of the parent mesh

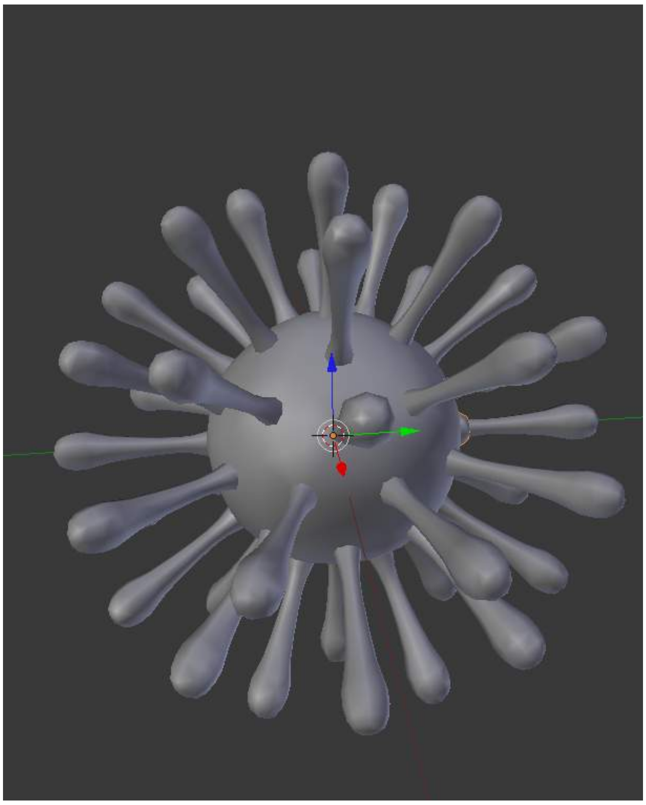
(in this case the tentacle was rotated -90- about the X axis in edit mode).



A simple tentacle set to smooth



Tentacle dupliverted onto the parent mesh



Rotation enabled to align duplicates

As in the previous example, the shape and proportions of the arrangement can now be tweaked.

To turn all duplicates into real objects, simply select the icosphere and *Object –> Apply –> Make Duplicates Real.* To make the icosphere and the tentacle a single object, make sure they are all selected and go to *Object –>*

Join

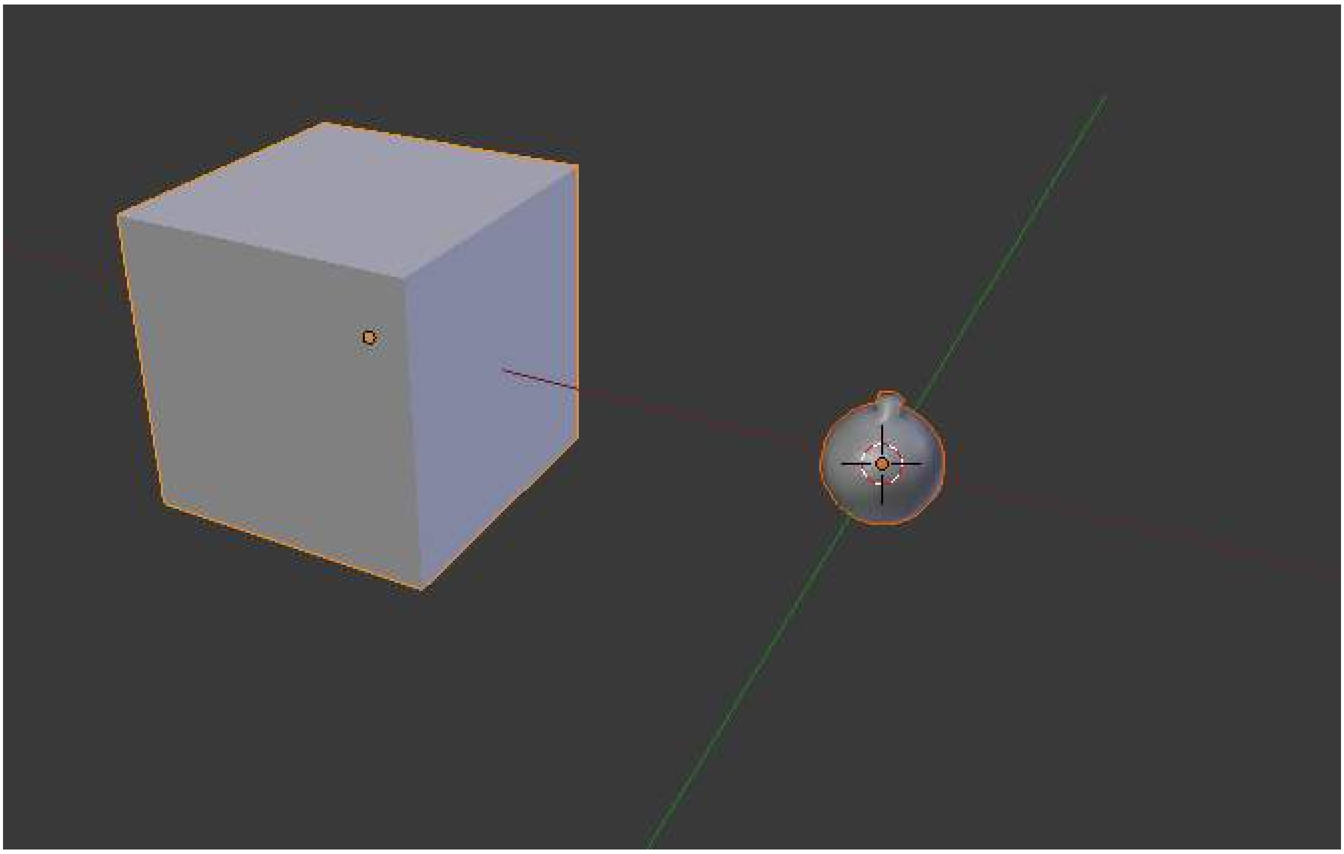
DupliFaces

Reference
Mode: *Object* mode Panel: *Object –> Duplication*

Duplication Faces or *DupliFaces* is the capability to replicate an object on each face of a parent object. One of the best ways to explain this is through an example illustration.

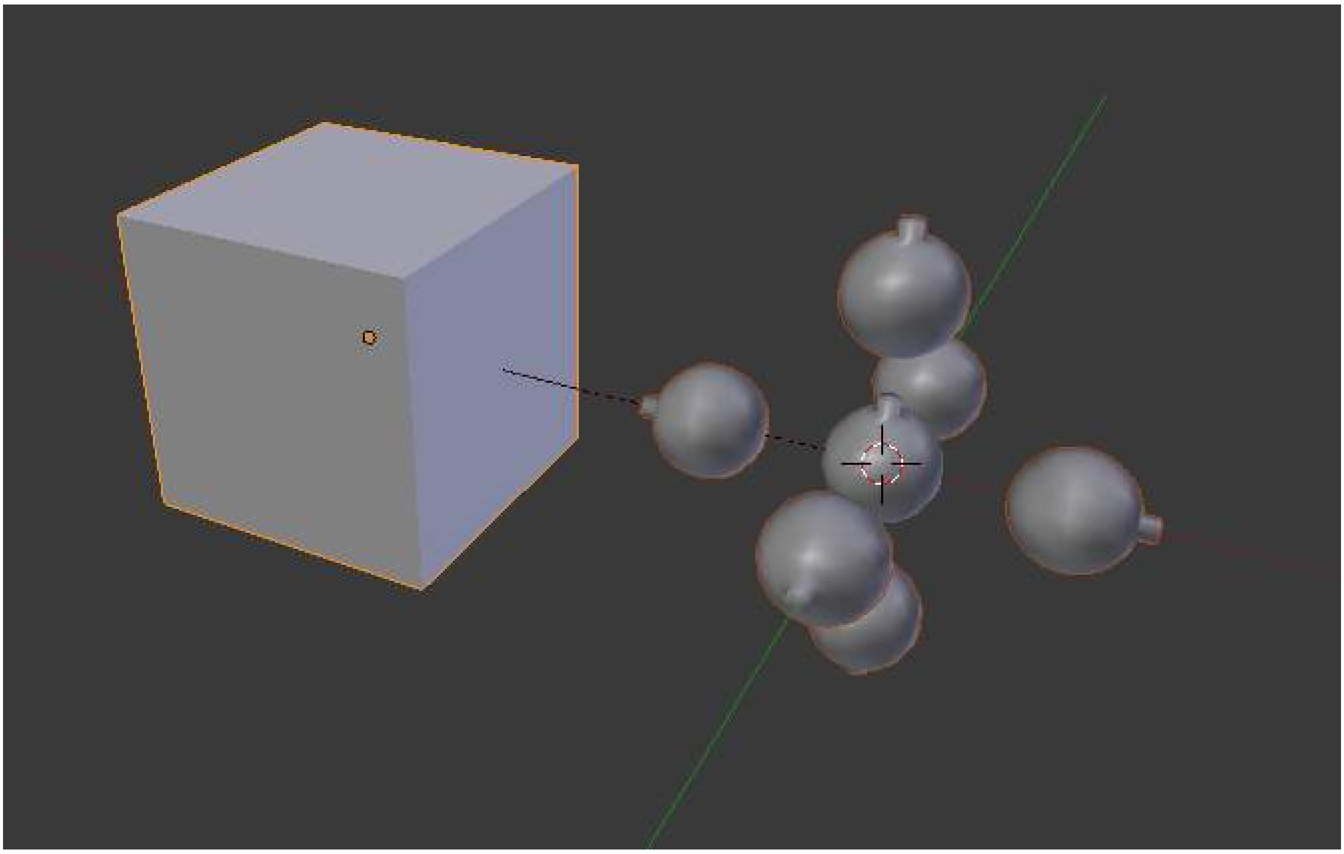
Note
Example .blend file *Download the .blend file used for the examples on this page here http://wiki.Bforartists.org/index.php/:File:Manual-2.5-Duplifaces-Example01.blend*

Basic usage



A cube and a sphere

In this example we will use a UV sphere with an extruded “north pole” as our base object and cube as our parent mesh. To parent the sphere to the cube, in *Object mode*, first select the sphere, then select the cube (order is very important here), and finally parent it.



Duplication Faces applied to the cube

Next, in the *Object* context’s *Duplication* panel, enable *Faces*. The sphere is duplicated one for each face of the cube.

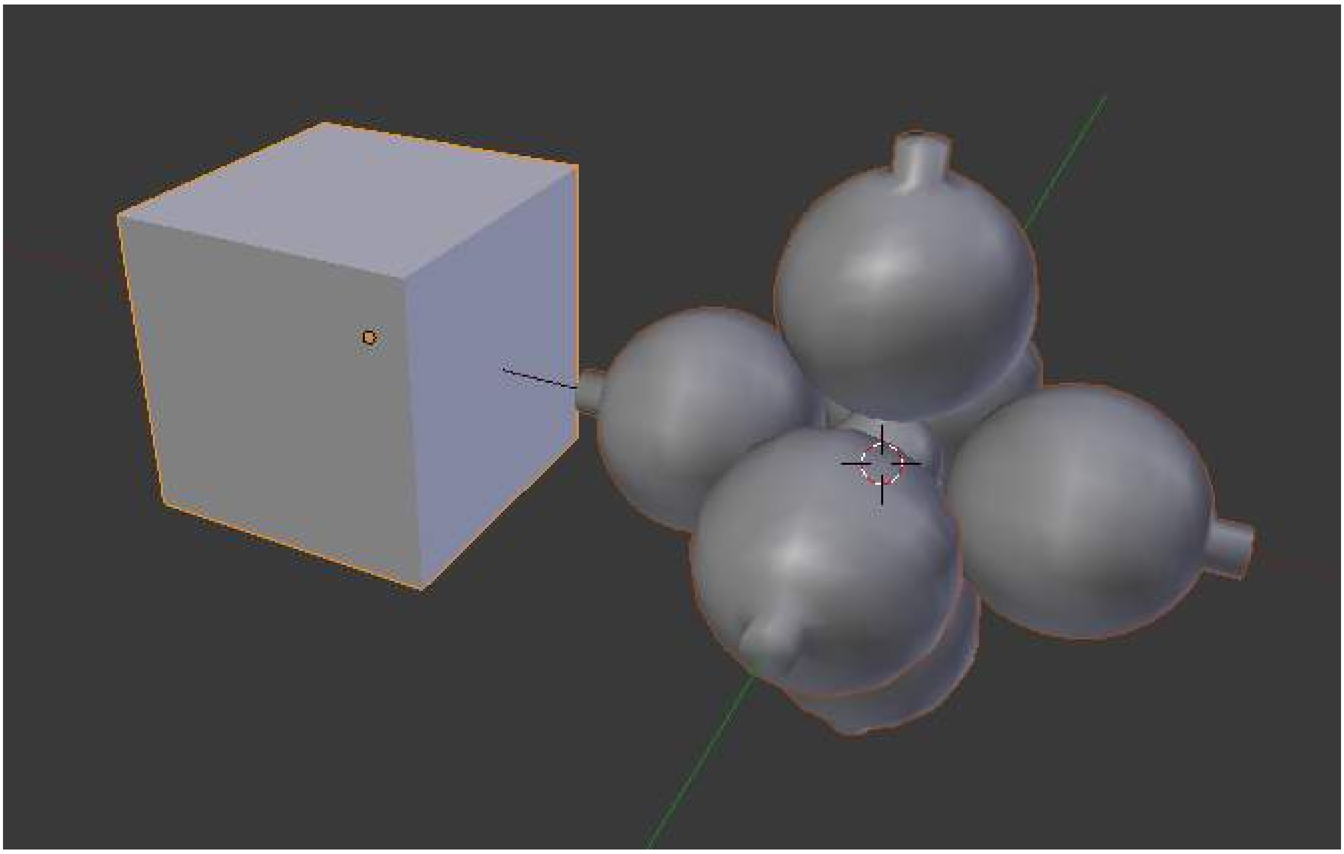
Note

Inherited properties

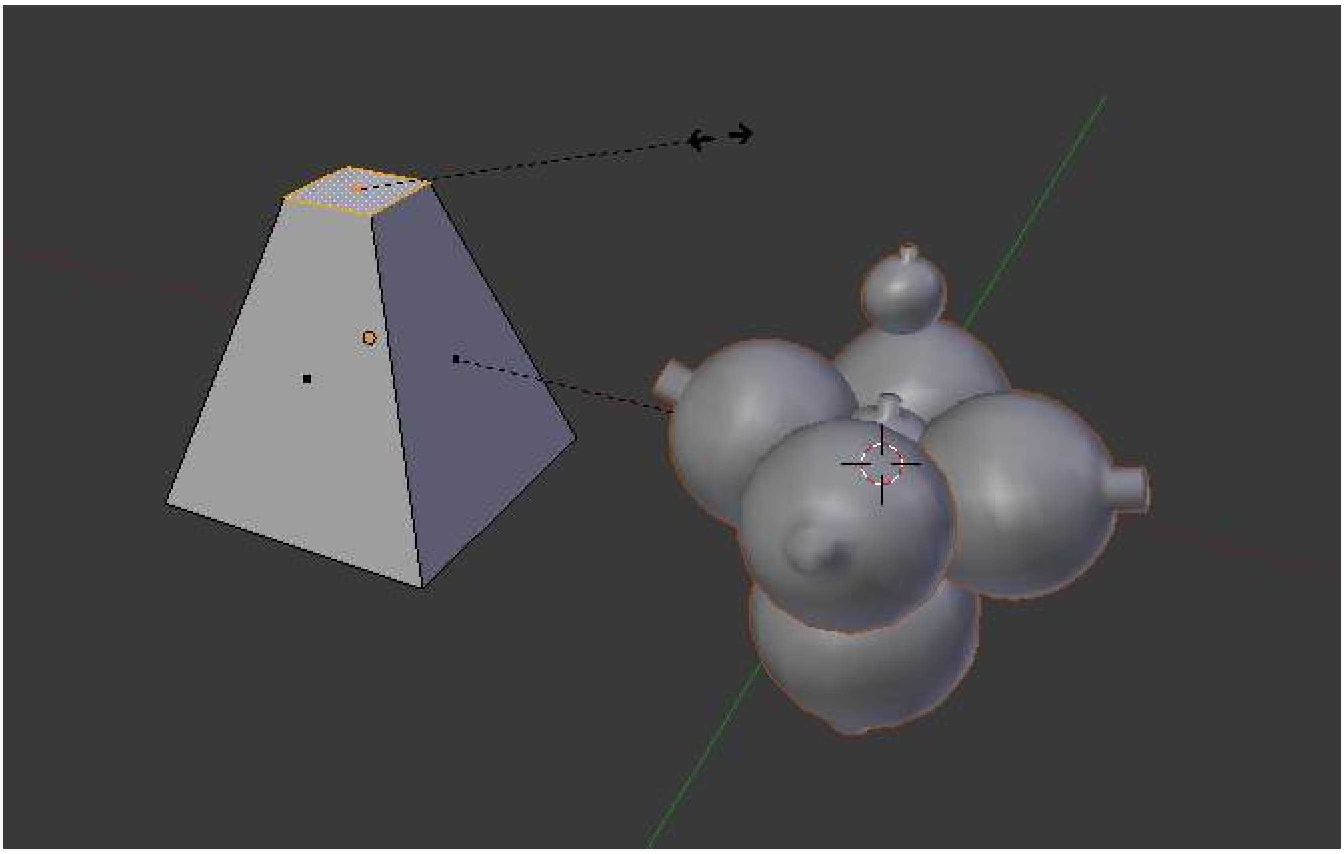
The location, orientation, and scale of the duplicated child(ren) matches that of the faces of the parent. So, if several objects are parented to the cube, they will all be duplicated once for each face on the cube. If the cube is subdivided (in Edit Mode `W`*), every child will be duplicated for each face on the cube.*

Both the parent object and original are displayed as editable “templates” in 3D view, but neither is rendered.

Scale



Scale enabled



Top face of cube scaled down

By enabling *Scale* for the parent object, the scale of the child objects will be adapted to the size of each face in the parent object.

Thus, by rescaling the face of the parent object, the size of the duplicated object will change accordingly.

Limitations / Considerations

The positioning of the duplicated geometry relative to the face is dependent upon the position of the child objects relative to the duplicator's origin. This can lead to some visual artifacts in the editor as the geometry of the original objects overlaps or intersects with the duplicates. One workaround is to move the origin of the duplicator mesh off of the plane of the faces.

If the geometry of the children is not symmetrical then the orientation of the face (as determined by the order of its vertices) could matter. As of 2.70 Bforartists does not have tools which allow you to adjust the ordering of the vertices on a face.

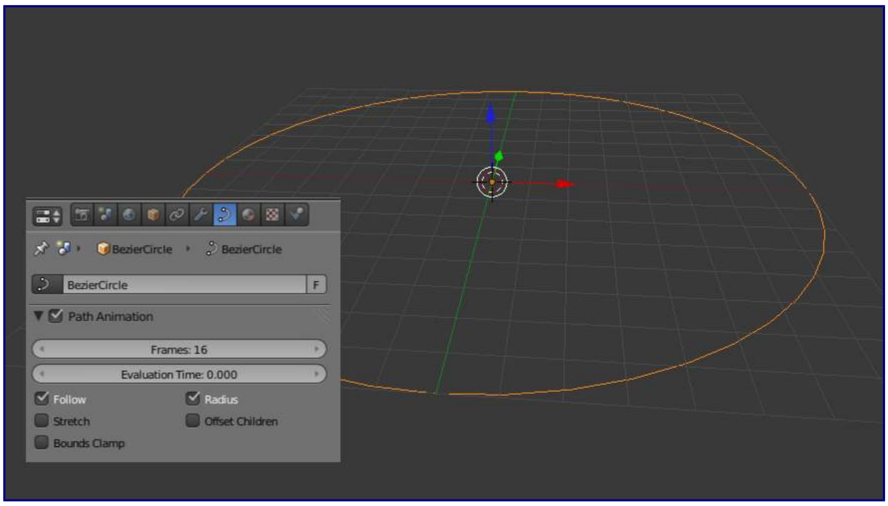
However, there is a workflow that lets you control for this. Make a single square and enable the Duplication / Faces so you can see the duplicated geometry in your editor window. If the orientation is not what you want, rotate the face until it is how you want. Typically you want to do the rotation in Edit mode, not Object mode, but this is not a hard rule.

Once you have the orientation correct, Duplicate the face and move the duplicate where you want it. Repeat this process until you have enough faces. Since it is common for these faces to butt up against one another, your geometry will have lots of duplicate vertices. Use the Remove Doubles button in the Tools panel.

DupliFrames

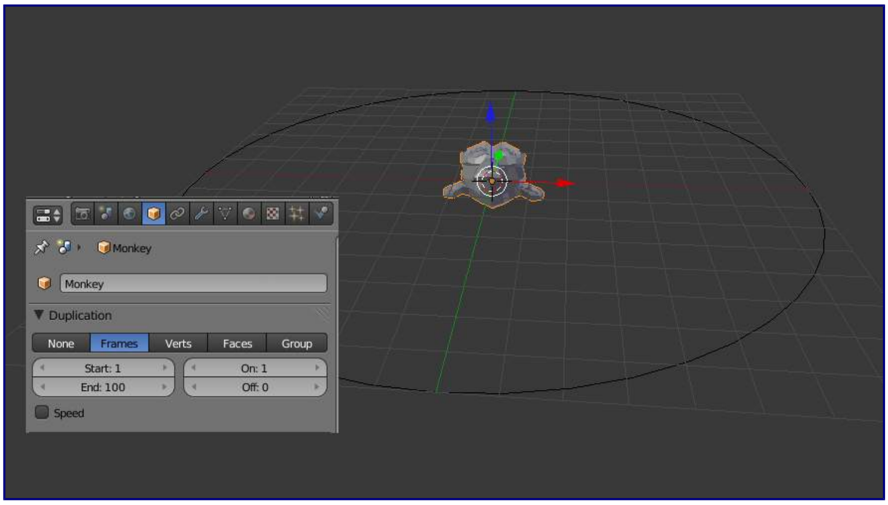
DupliFrames is a tool to duplicate objects at frames distributed along a path. This is a useful tool to quickly arrange objects.

Examples



Settings for the curve

Add a *Bezier Circle* and scale it up. In the *Curve* menu under *Path Animation* enable *Follow* and set *Frames* to something more reasonable than 100 (say 16).



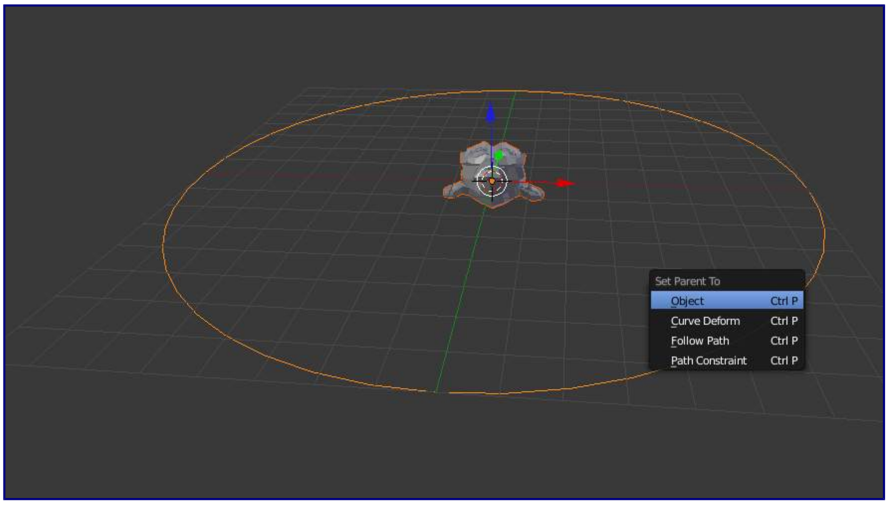
Settings for the object

Add a *Monkey*. In the *Object* menu under *Duplication* enable *Frames* and disable *Speed*.

Note

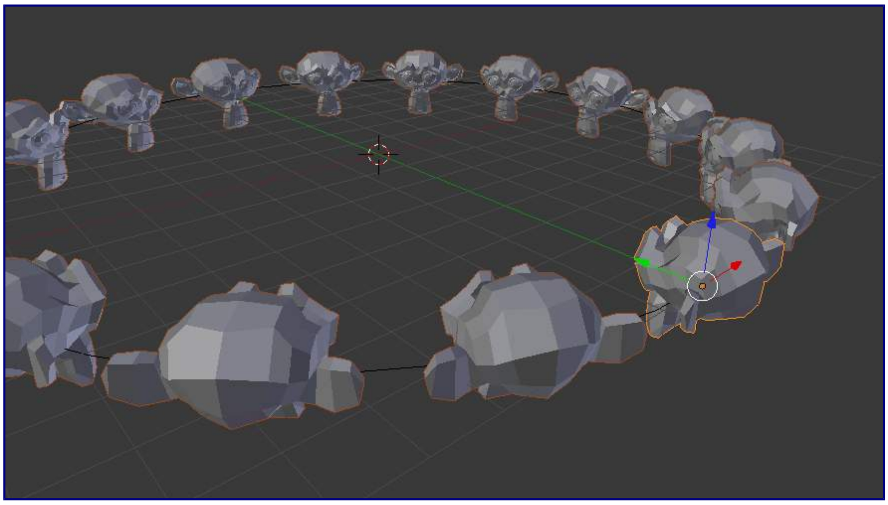
Speed

The Speed option is used when the parent-child relationship is set to Follow Path (see below). In this example, the monkey will then travel along the circle over 16 frames.



Parenting

To parent the monkey to the Bezier circle, first select the monkey then the curve (so that the curve is the active object) and `Ctrl-P`. Select the monkey and reset its origin.



Orientation tweaks

You can now change the orientation of the monkey by either rotating it (either in *Edit mode* or *Object mode*) or by changing the *Tracking Axes* under *Animation Hacks* (with the monkey selected). The arrangement of monkeys can, of course, be further enhanced by editing the curve.

To transform all monkeys into real objects, first *Make Duplicates Real*. All monkeys are now real objects, but still linked copies. To change this, Object ‣ Make Single User ‣ ObjectData` then choose *All*.

Note

There are many alternatives to Dupliframes. Which tool to use depends on context.

- To use a small curve as a profile and a larger curve as a path, simply use the former as a *Bevel Object* to the latter.
- To arrange objects along a curve, combining an *Array Modifier* and a *Curve Modifier* is often useful.
- *Dupliverts can be used to arrange objects, for example, along a circle or across a subdivided plane.*

External links

- Bforartists Artists: Dupliframes in 2.5

DupliGroup

Reference

Mode: *Object* mode
Panel: Object –> Duplication –> Group

Duplication Group or *DupliGroup* allows you to create an instance of a group for each instance of another object.

Basic Usage

- **Create a number of objects and group them by**
  - selecting them all,
  - Group them by menu item Object / Group
  - eventually rename your group in *Object –> Groups*
- **Create a DupliGroup by**
  - adding another object, say an *Empty*,
  - in *Object –> Duplication* enable *Group*, and
  - select the name of your newly created group in the selection box that appears.

DupliGroup and Dynamic Linking

See *Appending and Linking* to understand how to dynamically link data from another `.blend` file into the current file. You can dynamically link groups from one blend file to another. When you do so, the linked group does not appear anywhere in your scene until you create an object controlling where the group instance appears.

Example

- Link a group from another file into your scene, as described in *Appending and Linking*.

From here, you can use the easy way or the hard way:

- **The easy way:**
  - Select *Add –> Group Instance –>* `[name of group you just linked]`.
- **The hard way:**
  - Select *Add –> Empty*, and select the empty that you added.
  - Switch to the *Object* context, and in the *Duplication* panel, click *Group*.
  - In the dropdown box that appears next to *Group:*, pick the group that you linked.

At this point, an instance of the group will appear. You can duplicate the empty, and the DupliGroup settings will be preserved for each empty. This way, you can get multiple copies of linked data very easily.

Making a DupliGroup Object Real

Say you want to make further edits on an DupliGroup instance:

Simply select your DupliGroup and convert the DupliGroup into regular objects that can be transformed and animated normally.

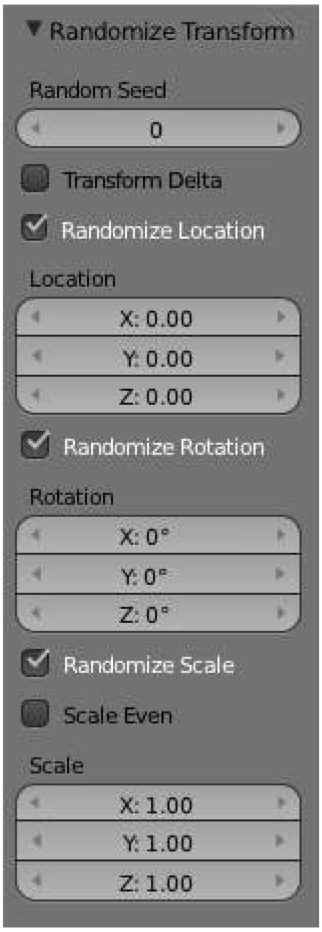
Note

Note that if the DupliGroup was linked from an external file the Object Data (mesh, materials, textures, transforms) will also still be linked from the original group. However, the various object's parent-child relationships do not carry over.

Advanced Transformations

Randomize Transform

Reference
Mode: *Object* mode Menu: Object ‣ Transform ‣ Randomize Transform



Randomize transform options

The randomize transform tool allows you to apply random translate, rotate, and scale values to an object or multiple objects. When applied on multiple objects, each object gets its own seed value, and will get different transform results from the rest.

Options

Random Seed
: The random seed is an offset to the random transformation. A different seed will produce a new result.

Transform Delta
: Randomize Delta Transform values instead of regular transform.

Randomize Location
: Randomize Location vales

Location
: The maximum distances the objects can move along each axis.

Randomize Rotation

Randomize rotation values.

Rotation

The maximum angle the objects can rotate on each axis

Randomize Scale

Randomize scale values.

Scale Even

Use the same scale for each axis.

Scale

The maximum scale randomization over each axis.

Separate

Reference
Mode: *Edit* mode
Menu: *Tool Shelf, Tools Tab, Mesh Tools*

At some point, you'll come to a time when you need to cut parts away from a mesh to be separate. Well, the operation is easy.

To separate an object, the vertices (or faces) must be selected and then separated, though there are several different ways to do this.

Suzanne dissected neatly

Selected

This option separates the selection to a new object.

All Loose Parts

Separates the mesh in its unconnected parts.

By Material

Creates separate mesh objects for each material.

Join

Reference
Mode: *Object* mode Menu: Tool Shelf –> *Tools, Edit Panel, Join button*

Joining makes one single object from all selected objects. Objects must be of the same type. Origin point is obtained from the previously *active* object. Performing a join is equivalent to adding new objects while in *Edit mode*. The non-active objects are deleted and their meshes added to the active object, so that only the active object remains. This only works with editable objects containing meshes and curves.

Object Origins

Each object has an origin point. The location of this point determines where the object is located in 3D space. When an object is selected, a small circle appears, denoting the origin point. The location of the origin point is important when translating, rotating or scaling an object. See *Pivot Points* for more.

Moving Object Centers

Object Centers can be moved to different positions through *3D View window –> Transform –> Origin*:

Geometry to Origin
: Move model to origin and this way origin of the object will also be at the center of the object.

Origin to Geometry
: Move origin to the center of the object and this way origin of the object will also be at the center of the object.

Origin to 3D Cursor
: Move origin of the model to the place of the 3D cursor.

Origin to Center of Mass
: Move origin to calculated center of mass of model.

Transform Control

Transform controls can be used to modify and control the effects of the available transformations.

Precision

Reference
Mode: *Object* and *Edit* modes `Hotkey: Ctrl and/or Shift`

Description

Holding `Ctrl` during a transform operation (such as grab, rotate or scale) will toggle Transform Snapping. When the Snap Element is set to *Increment*, this allows the transformation to be performed in fixed amounts.

Holding `Shift` during a transform operation will transform the object at 1/10th the speed, allowing much finer control.

The magnitude of the transformation can be viewed in the 3D window header in the bottom left hand corner. Releasing `Ctrl` or `Shift` during the transformation will cause the movement to revert back to its normal mode of operation.

Note

The snapping behaviors described on this page **only** apply when Increment Snap is selected.

Read more about Window Headers

Usage

With hotkeys

Press the navigation hotkeys, and then hold either `Ctrl`, `Shift` or `Ctrl-Shift`.

With the Transform Manipulator

Hold `Ctrl`, `Shift` or `Ctrl-Shift` and click on the appropriate manipulator handle. Then move the mouse in the desired direction. The reverse action will also work i.e. clicking the manipulator handle and then holding the shortcut key for precision control.

Read more about the Transform Manipulator

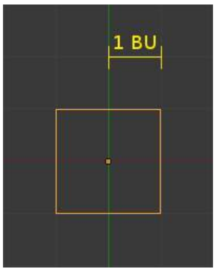
Tip

Combining with other controls

All of the precision controls detailed on the page can be combined with the *Axis Locking* controls and used with the different *Pivot Points*.

Holding CTRL

Grab/move transformations



1 Bforartists Unit - shown at the default zoom level.

For grab/move operations at the default zoom level, holding `Ctrl` will cause your selection to move by increments of 1 Bforartists Unit (1 BU) (i.e. between the two light grey lines). Zooming in enough to see the next set of grey lines will now cause `Ctrl` movements to occur by 1/10 of a BU. Zooming in further until the next set of grey lines becomes visible will cause movement to happen by 1/100 of a BU and so on until the zoom limit is reached. Zooming out will have the opposite effect and cause movement to happen by increments of 10, 100 etc BU.

Read more about Zooming

Rotation transformations

Holding `Ctrl` will cause rotations of 5 degrees.

Scale transformations

Holding `Ctrl` will cause size changes in increments of 0.1 BU.

Note

Snapping modes

Note that if you have a Snap Element option enabled, holding `Ctrl` will cause the selection to snap to the nearest element.

Read more about Snapping

Holding SHIFT

Holding `Shift` during transformations allows for very fine control that does not rely on fixed increments. Rather, large movements of the mouse across the screen only result in small transformations of the selection.

Holding CTRL and SHIFT

Grab/move transformations

For grab/move operations at the default zoom level, holding `Ctrl-Shift` will cause your selection to move by increments of 1/10 Bforartists Units. Holding `Ctrl-Shift` at any zoom level will cause the transformation increments to always be 1/10 of the increment if you were only holding `Ctrl`.

Rotation transformations

Holding `Ctrl-Shift` will cause rotations of 1 degree.

Scale transformations

Holding `Ctrl-Shift` will cause size changes in 0.01 BU increments.

Numeric input

Numeric input in the 3D window header

Using the mouse for transformations is convenient, but if you require more precise control, you can also enter numeric values. After pressing one of the navigation hotkeys, type a number to indicate the magnitude of the transformation.

You can see the numbers you enter in the bottom left hand corner of the 3D window header. Negative numbers and decimals can be entered by pressing the minus (`Minus`) and period (`.`) keys respectively.

Translation

To move Objects, vertices, faces or edges select the element, press `G` and then type a number. By default and with no other key presses, movement will occur along the X-axis. To confirm the movement, press `Return` or `LMB`. To cancel the movement, press `Esc` or `RMB`. If you mistype the value, press `Backspace` to cancel the current entry and retype a new value.

To enter numeric values for multiple axes, use the `Tab` key after entering a value for the axis. e.g. To move an Object, one (1) Bforartists unit on all three axes press: A navigation hotkey, let's say W for move, `1`, `Tab`, `1`, `Tab`, `1`. This will move the element one unit along the X-axis, followed by the Y-axis and then the Z-axis.

You can also combine numeric input with axis locking to limit movement to a particular axis. To do so, press a navigation hotkey, let's say W for move, followed by `X`, `Y` or `Z` to indicate the axis. Then type in the transform amount using (`0` - `9`) followed by `Return` to confirm. Pressing `X`, `Y` or `Z` will initially constrain movement to the *Global* axis. Pressing `X`, `Y` or `Z` again will constrain movement to the orientation set in the *Transform*

Orientation setting of the 3D window header.

Read more about Transform Orientations

Read more about Axis Locking

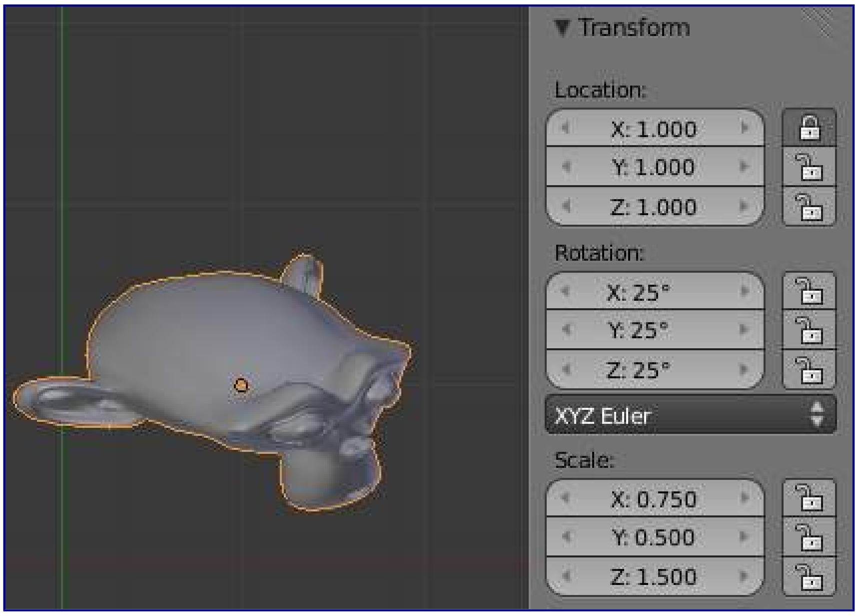
Rotation

To specify a value for clockwise rotation, press navigation hotkey for rotate, (`0` - `9`), then `Return` to confirm. To specify counter-clockwise rotation press navigation hotkey for rotate, `Minus`, (kbd:*0* - `9`), then `Return` to confirm. Note that 270 degrees of clockwise rotation is equivalent to -90 degrees of counter-clockwise rotation.

Scaling

Objects, faces and edges can be scaled by pressing the navigation hotkey for scale , (`0` - `9`), then `Return` to confirm., Scaling transformations can also be constrained to an axis by pressing `X`, `Y` or `Z` after pressing `the navigation hotkey for scale`. Essentially, scaling with numeric values works in almost identical fashion to translation. The primary difference is that by default, scaling applies equally to all three axes. e.g. pressing `the navigation hotkey for scale` , `0.5`, `Return` will scale an Object by 0.5 on all three axes.

Numeric input via the Properties shelf



Transformations can also be entered through the Transform panel on the Properties shelf.

It is also possible to enter numeric values for each transformation using the *Transform* panel found on the Properties shelf. The *Transform* panel can also be used to prevent transformations along particular axes by clicking the lock icon.

Transform Properties

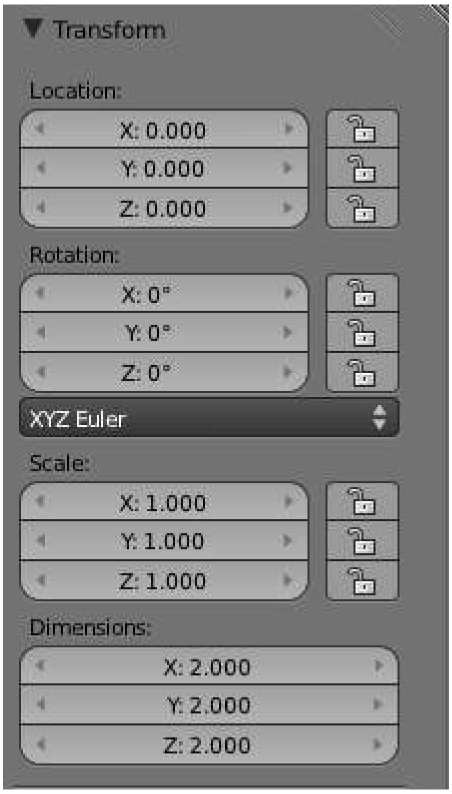
Each object stores its position, orientation, and scale values. These may need to be manipulated numerically, reset, or applied.

Transform Properties Panel

Reference
Mode: *Edit* and *Object* modes Menu: Object ‣ Transform Properties

The *Transform Properties* section in the *View Properties* panel allows you to view and manually/numerically control the position, rotation, and other properties of an object, in *Object* mode. In *Edit* mode, it mainly allows you to enter precise coordinates for a vertex, or median position for a group of vertices (including an edge/face). As each type of object has a different set of options in its *Transform Properties* panel in *Edit* mode, see their respective descriptions in the *Modeling chapter*.

Options in Object mode



Transform Properties panel in Object mode.

Location
: The object's center location in global coordinates.

Rotation
: The object's orientation, relative to the global axes and its own center.

Scale
: The object's scale, relative to its center, in local coordinates (i.e. the *Scale X* value represents the scale along the local X-axis). Each object (cube, sphere, etc.), when created, has a scale of one Bforartists unit in each local direction. To make the object bigger or smaller, you scale it in the desired dimension.

Dimensions

The object’s basic dimensions (in Bforartists units) from one outside edge to another, as if measured with a ruler. For multi-faceted surfaces, these fields give the dimensions of the bounding box (aligned with the local axes - think of a cardboard box just big enough to hold the object).

Use this panel to either edit or display the object’s transform properties such as position, rotation and/or scaling. These fields change the object’s center and then affects the aspect of all of its *vertices* and faces.

Transform Properties Locking

The locking feature of the Location, Rotation and Scale fields allows you to control a transform property solely from the properties panel. Once a lock has been activated any other methods used for transformation are blocked. For example, if you locked the *Location X* field then you can’t use the mouse to translate the object along the global X axis. However, you can still translate it using the *Location X* edit field. Consider the locking feature as a rigid constraint only changeable from the panel.

To lock a field, click the padlock icon next to the field. The field is unlocked if the icon appears as (

), and it is locked if the icon appears as (

).

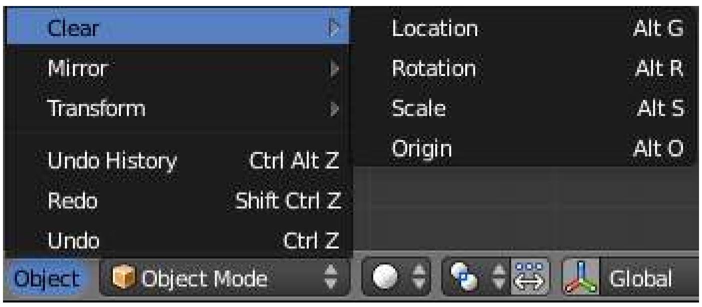
Clear Object transformations

Reference
Mode: *Object* mode Menu: Object ‣ Clear ‣ Clear Location/Clear Scale/Clear Rotation/Clear Origin

Description

Clearing transforms simply resets the transform values. The objects location and rotation values return to 0, and the scale returns to 1.

Clear Options



Clear Transformation menu

Clear Location
: Clear (reset) the location of the selection. This will move the selection back to the coordinates 0,0,0.

Clear Scale
: Clear (reset) the scale of the selection. This will resize the selection back to the size it was when created.

Clear Rotation
: Clear (reset) the rotation of the selection. This will set the rotation of the selection to 0 degrees in each plane.

Clear Origin
: Clear (reset) the origin of the Child objects. This will cause Child objects to move to the coordinates of the parent.

Apply Object transformations

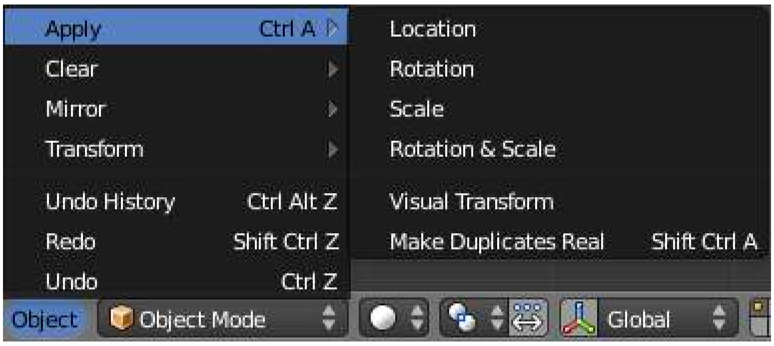
Reference
Mode: *Object* mode Menu: Object ‣ Apply ‣

Applying transform values essentially resets the values of object’s position, rotation, or scale, but does not actually do anything to the object. The center point is moved to the origin and the transform values are set to zero. In terms of scale, the scale values return to 1.

To apply a transform select the *Apply* sub-menu from the *Object menu* and select the appropriate transform to apply

Make Duplicates Real unlinks linked duplicates so each duplicate now has its own data-block.

Apply Options



Apply Transformation menu

Apply Location
: Apply (set) the location of the selection. This will make Bforartists consider the current location to be equivalent to 0 in each plane i.e. the selection will not move, the current location will be considered to be the “default location”. The Object Center will be set to actual 0,0,0 (where the colored axis lines intersect in each view).

Apply Rotation
: Apply (set) the rotation of the selection. This will make Bforartists consider the current rotation to be equivalent to 0 degrees in each plane i.e. the selection will not rotated, the current rotation will be

considered to be the “default rotation”.

Apply Scale

Apply (set) the scale of the selection. This will make Bforartists consider the current scale to be equivalent to 0 in each plane i.e. the selection will not scaled, the current scale will be considered to be the “default scale”.

Apply Rotation and Scale

Apply (set) the rotation and scale of the selection. Do the above two applications simultaneously.

Apply Visual Transform

Apply (set) the result of a constraint and apply this back to the Object’s location, rotation and scale. See the following post for more detailed discussion: Apply visual transform.

Make Duplicate Real

Make any duplicates attached to this Object real so that they can be edited.

Proportional Edit

Proportional Edit is a way of transforming selected elements (such as vertices) while having that transformation affect other nearby elements. For example, having the movement of a single vertex cause the movement of unselected vertices within a given range. Unselected vertices that are closer to the selected vertex will move more than those farther from it (i.e. they will move proportionally relative to the location of the selected element). Since proportional editing affects the nearby geometry, it is very useful when you need to smoothly deform the surface of a dense mesh.

Note

Sculpting

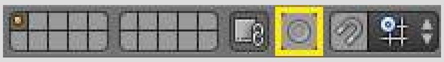
Bforartists also has Sculpting that contains brushes and tools for proportionally editing a mesh without seeing the individual vertices.

Object mode

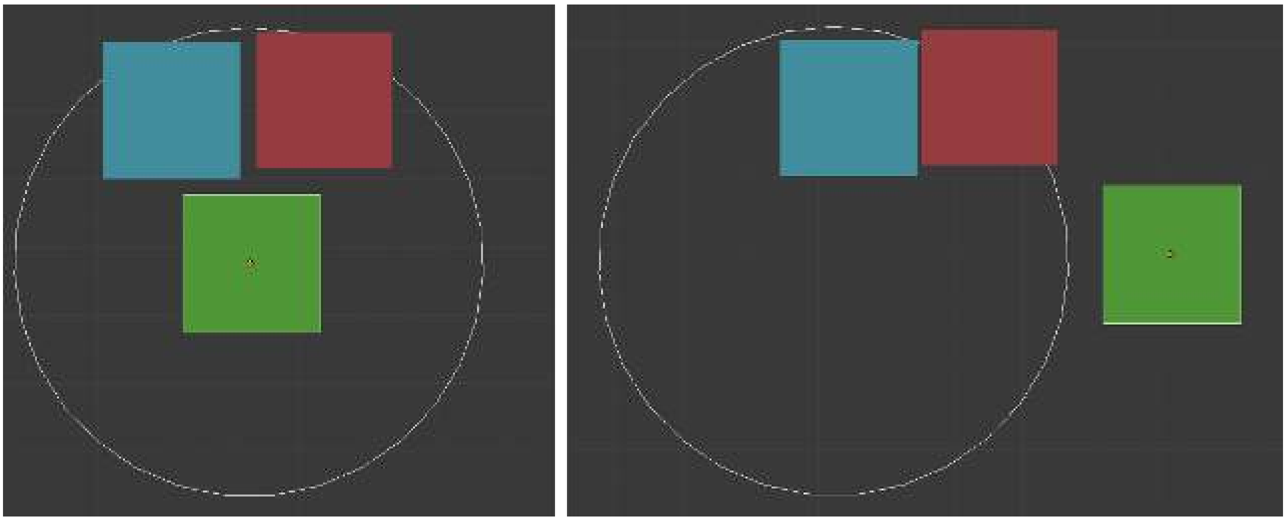
Reference

Mode: *Object mode*

Menu: Via the icon in the header indicated by the yellow square in the below image.



Proportional editing is typically used in *Edit mode*, however, it can also be used in *Object mode*. In *Object mode* the tool works on entire objects rather than individual mesh components. In the image below, the green cube is the active Object, while the red and blue cubes are located within the proportional edit tool’s radius of influence. When the green cube is moved to the right, the other two cubes follow the movement.



Proportional editing in Object mode.

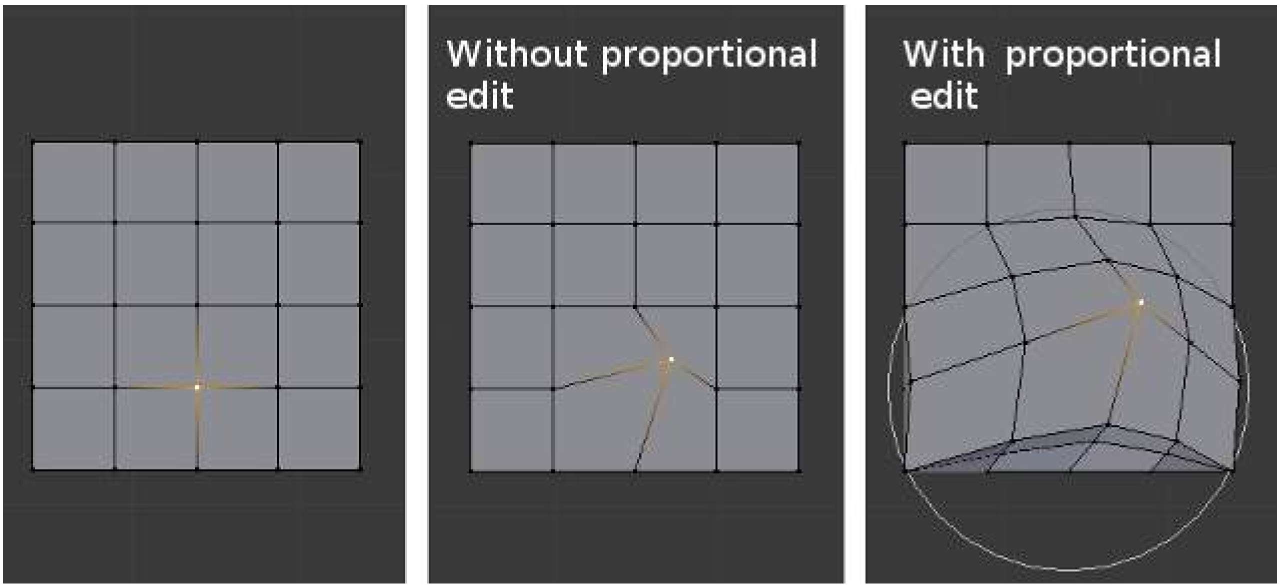
Edit mode

Reference

Mode: *Edit mode*

Menu: Mesh ‣ Proportional Editing and via the highlighted icon in the below image

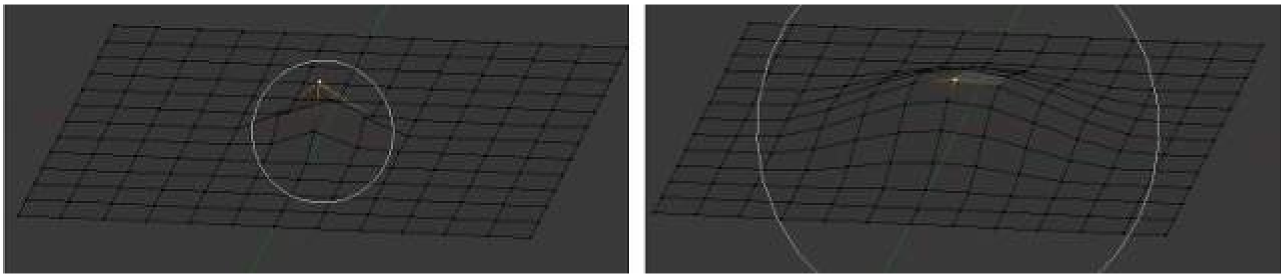
When working with dense geometry, it can become difficult to make subtle adjustments to the vertices without causing visible lumps and creases in the model's surface. When you face situations like this the proportional editing tool can be used to smoothly deform the surface of the model. This is done by the tool's automatic modification of unselected vertices within a given range.



Proportional editing in Edit mode.

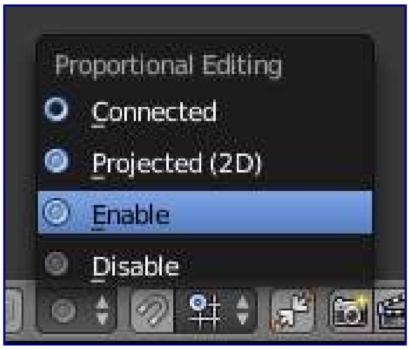
Influence

You can increase or decrease the radius of the proportional editing influence with the mouse wheel `WheelUp` / `WheelDown` or `PageUp` / `PageDown` respectively. As you change the radius, the points surrounding your selection will adjust their positions accordingly.



Influence circle.

Options



Proportional Editing tool.

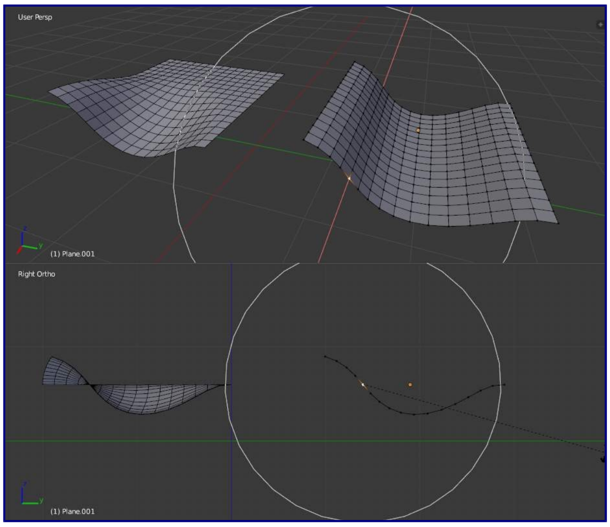
Falloff menu.

The *Proportional Editing* mode menu is on the *3D View* header.

Disable
: Proportional Editing is Off, only selected vertices will be affected.

Enable
: Vertices other than the selected vertex are affected, within a defined radius.

Projected (2D)
: Depth along the view is ignored when applying the radius.



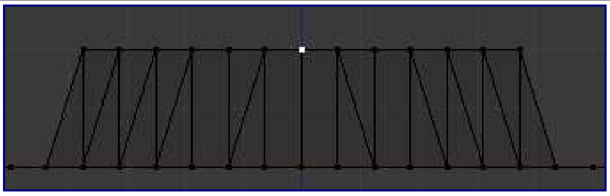
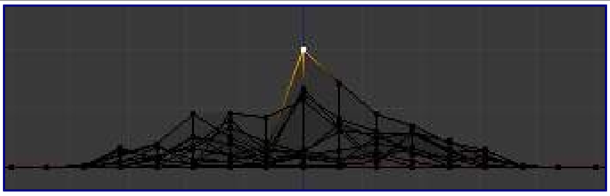
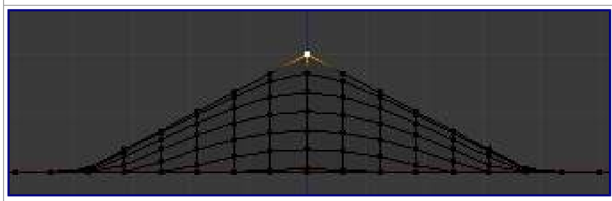
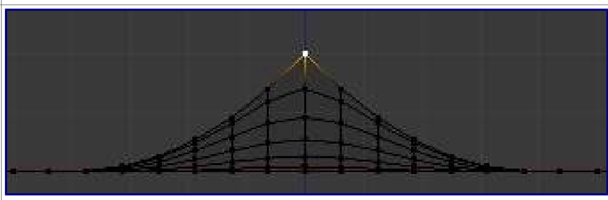
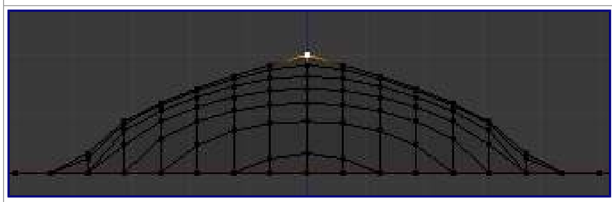
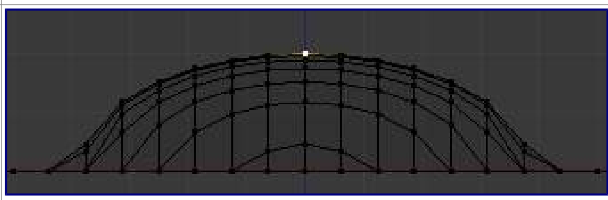
The difference between regular and Projected (2D) proportional option (right).

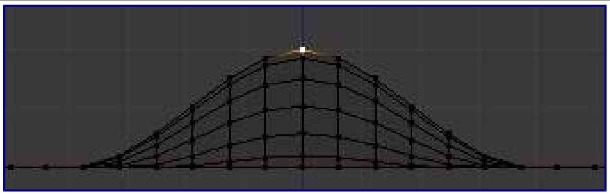
Connected

Rather than using a radius only, the proportional falloff spreads via connected geometry. This means that you can proportionally edit the vertices in a finger of a hand without affecting the other fingers. While the other vertices are physically close (in 3D space), they are far away following the topological edge connections of the mesh. The icon will have a grey center when *Connected* is active. This mode is only available in *Edit mode*.

Falloff

While you are editing, you can change the curve profile used by either using the Mesh ‣ Proportional Falloff submenu, using the toolbar icon (*Falloff menu*), or by pressing `Shift-O` to toggle between the various options.

 Constant, No Falloff.	 Random Falloff.
 Linear Falloff.	 Sharp Falloff.
 Root Falloff.	 Sphere Falloff.

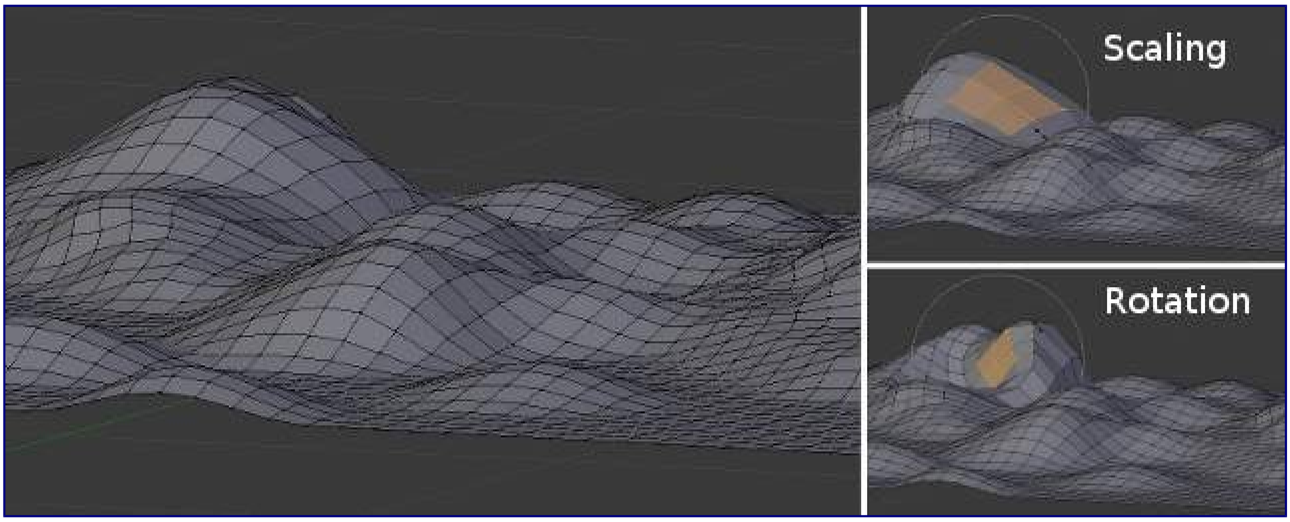


Smooth Falloff.

Examples

Switch to a front view (`Numpad1`) and activate the grab tool with `G`. As you drag the point upwards, notice how nearby vertices are dragged along with it. When you are satisfied with the placement, click `LMB` to fix the position. If you are not satisfied, cancel the operation and revert your mesh to the way it looked before with `RMB` (or `Esc`).

You can use the proportional editing tool to produce great effects with the scaling (`S`) and rotation (`R`) tools, as *A landscape obtained via proportional editing* shows.



A landscape obtained via proportional editing.

Combine these techniques with vertex painting to create fantastic landscapes. The *final rendered landscape* image below shows the results of proportional editing after the application of textures and lighting.

Final rendered landscape.

Manipulators

Reference
Mode: *Object* and *Edit* modes

In combination with *axis locking*, the normal Transform commands, can be used to manipulate objects along any axis. However, there may be times when these options are not adequate. For example, when you want to translate a single face on a randomly rotated object in a direction perpendicular to the face’s normal. In instances like this, *Transform Manipulators* may be useful.

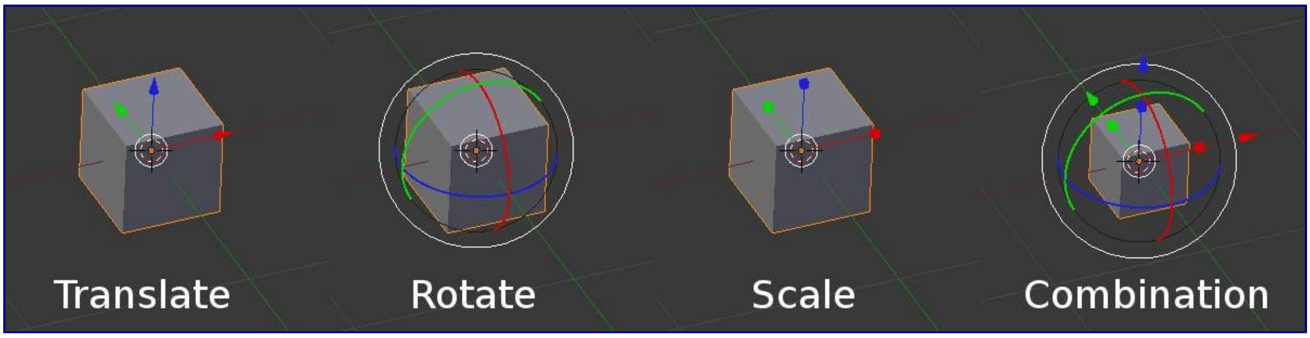
Manipulator options in the Window Header.

Transform manipulators provide a visual representation of the transform options and allow movement, rotation and scaling along any axis, mode and orientation of the 3D view. The manipulator can be enabled by clicking on the axis icon from the manipulator options portion of the window header or via the shortcut key `Ctrl-Spacebar`.

There is a separate manipulator for each Transform Command. Each manipulator can be used separately or in combination with the others. Clicking with `Shift-LMB` on multiple manipulator icons (arrow, arc, box) will combine manipulator options.

Manipulators can be accessed in the header of the *3D View* window:

- Axis: Enable/disable the manipulators.
- Arrow: Translation.
- Arc: Rotation.
- Box: Scale.
- Transform Orientation menu: choice of the transformation orientation.



Manipulator Options

Manipulator controls

- Holding down `Ctrl` constrains the action to set increments. Holding down `Shift` **after** you `LMB` the manipulator handle will constrain the action to smaller increments.

- Holding down Shift **before** you LMB click on one of the handles will cause the manipulator action to be performed relative to the other two axes (you can let go of Shift once you have clicked). For example, if you Shift then LMB the Z axis handle of the translate manipulator, movement will occur in the X and Y planes.
- When in rotate mode, LMB on the white circle (largest circle around the rotation manipulator) will be equivalent to pressing R.
- When in rotate mode, LMB on the grey circle (small inner circle at the center of the rotation manipulator) will be equivalent to pressing R twice. This will start *trackball* rotation.

Read more about constraining transformations Read more about axis locking Read more about trackball rotation

Manipulator Preferences

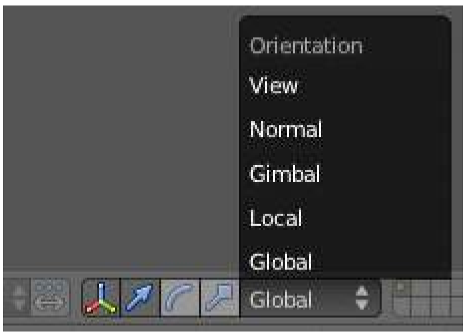
Manipulator preferences.

The settings of the manipulator (e.g. its size) can be found in the *Interface* section of the *User Preferences* window.

Size
Diameter of the manipulator.
Handle Size
Size of manipulator handles, as a percentage of the manipulator radius (`size / 2`).
Hotspot
Hotspot size (in pixels) for clicking the manipulator handles.

Choosing the Transform Orientation

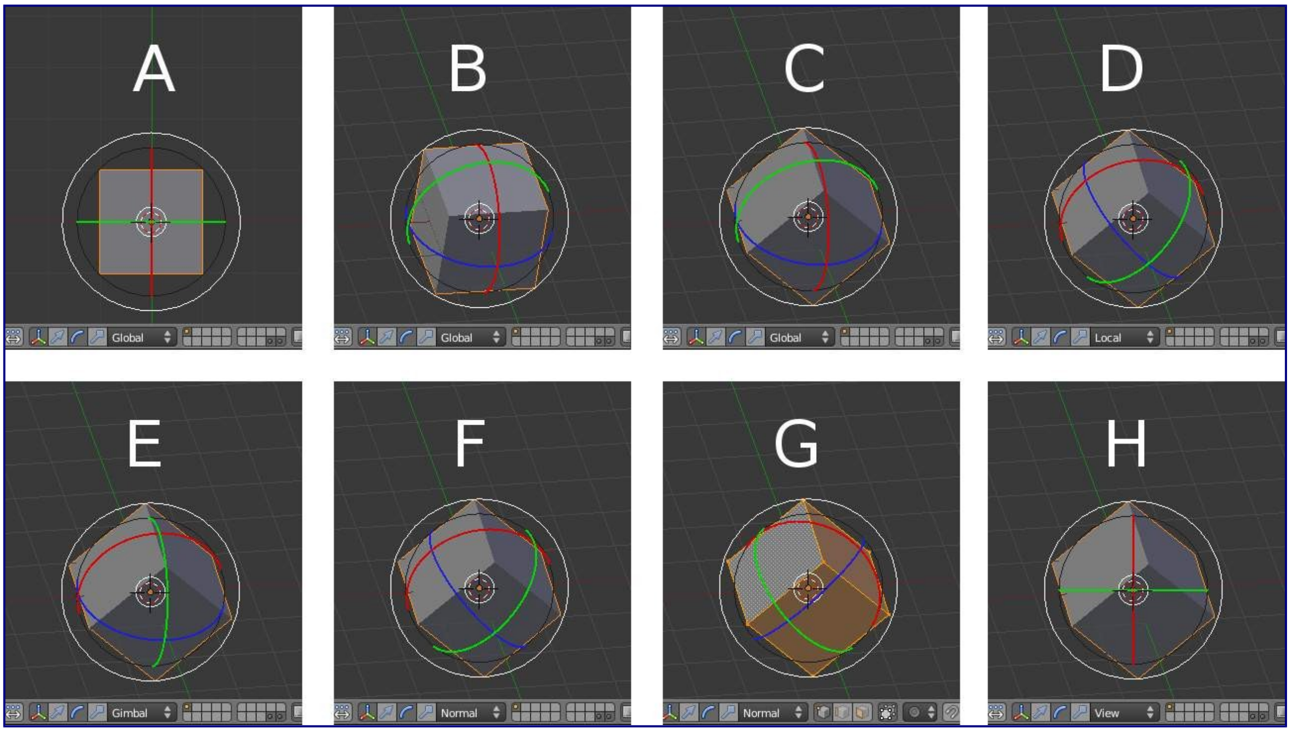
Reference
Mode: *Object* and *Edit* modes



Transform Orientation options.

You can also change the *orientation of the Transform Manipulator* to global, local, gimbal, normal or view from the Transform options menu. The image below shows a cube with the rotation manipulator active in multiple transform orientations. Notice how the manipulator changes depending on the orientation selected (compare A with F).

Similarly, notice how when normal orientation (F and G) is selected the manipulator changes between *Object mode* and *Edit mode*. The normal orientation manipulator will also change depending on what is selected in *Edit mode* i.e. the orientation is based on the normal of the selection which will change depending on how many and which faces, edges or vertices are selected.

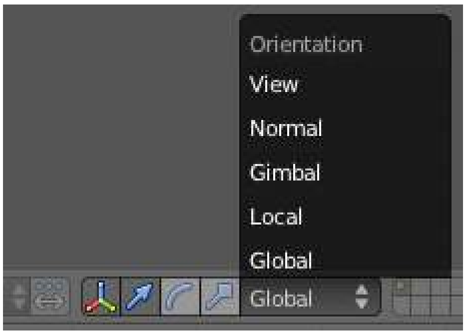


Transform manipulator orientation options.

1. Standard cube in default top view with *global* orientation selected
2. Standard cube with view rotated and *global* orientation selected
3. Randomly rotated cube with view rotated and *global* orientation selected
4. Randomly rotated cube with *local* orientation selected
5. Randomly rotated cube with *gimbal* orientation selected
6. Randomly rotated cube with *normal* orientation selected
7. Randomly rotated cube, vertices selected with *normal* orientation selected
8. Randomly rotated cube with *view* orientation selected

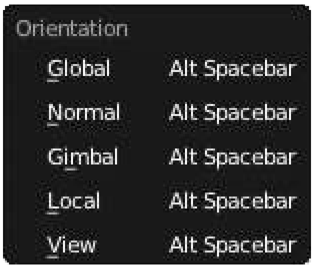
Transform Orientations

Reference
Mode: *Object* and *Edit* modes



Transform orientations selection menu.

Orientations affect the behavior of Transformations: Location, Rotation, and Scale. You will see an effect on the 3D Manipulator (the widget in the center of the selection), as well as on transformation constraints (like *axis locking*). This means that, when you press the navigation hotkey for move and `X`, it will constrain to the *global* x-axis, but if you press the navigation hotkey for move`-X-X` it will constrain to your *Transform Orientation* s x-axis.

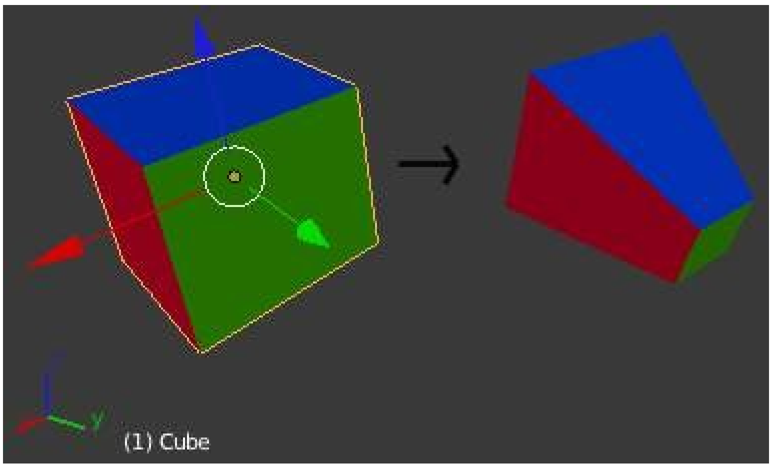


Alt+Space Menu.

The Orientations options can be set on the 3D View's header (or "footer", since it is at the bottom of the view by default), or with `Alt-Spacebar` or through the *Orientation* menu in a 3D view header.

In addition to the four built-in options, you can define your own custom orientation (see Custom Orientations below).

Our Demo Cube



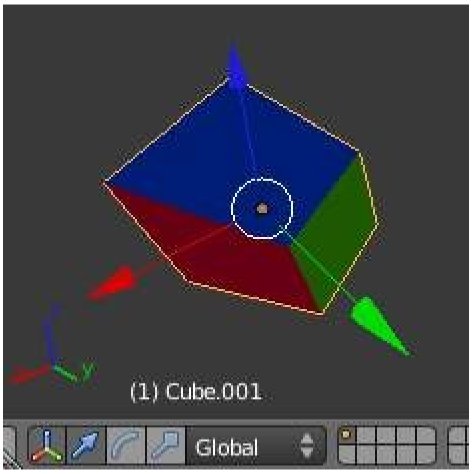
To demonstrate the various behaviors, we add some colors to the default cube, rotate it -15º along its local z- and x-axes, and we scale its “y” face down.

Please note two things:

- The “Mini-axis” in the lower-left corner, which represents the Global x/y/z orientation.
- The *“Object Manipulator”* widget emanating from the selection, which represents the current Transform Orientation.
    - If you click on one of the axes of the Manipulator with `LMB`, it will allow you to constrain movement to only this direction. An example of a keyboard equivalent is the navigation hotkey for move`, Z, Z`.
    - If you `Shift-LMB` click, it will lock the axis you clicked on and allow you to move in the plane of the two remaining axes. The keyboard analogue is the navigation hotkey for move`, Shift-Z, Shift-Z`.

Orientations

Global

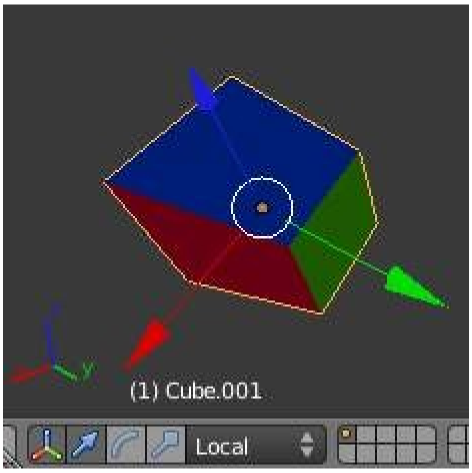


Global.

The manipulator matches the global axis.

When using the Global orientation, the orientation’s XYZ matches world’s XYZ axis. When this mode is selected, the local coordinates of the object are subjected to the Global coordinates. This is good to place objects in the scene. To constrain an axis, press `G` and the desired axis. To constrain to a local axis, press the desired axis two times. The difference between Global and Local, is more noticeable when you have an object in which the origin is not located at the exact center of the object, and doesn’t match the Global coordinates.

Local

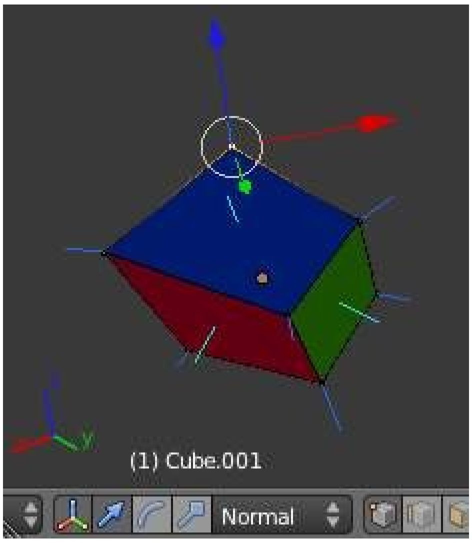


Local.

The manipulator matches the object axis.

Notice that, here, the Manipulator is at a slight tilt (it is most visible on the object's y-axis, the green arrow). This is due to our 15º rotation of the object. This demonstrates the difference between local coordinates and global coordinates. If we had rotated the object 90º along its x-axis, we would see that the object's "Up" is the world's "Forward" – or the object's z-axis would now be the world's y-axis. This orientation has an effect on many parts of the interface, so it is important to understand the distinction.

Normal



Normal.

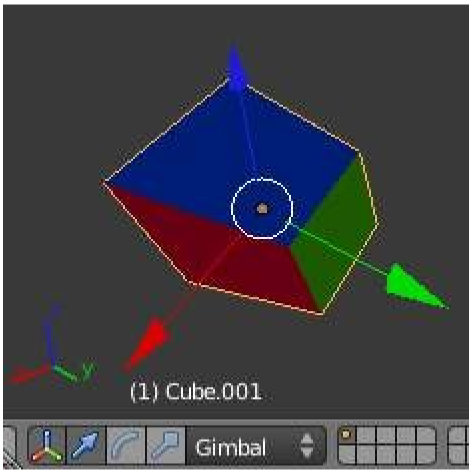
The z-axis of the manipulator will match the normal vector of the selection.

In Object Mode, this is equivalent to Local Orientation, in Edit Mode, it becomes more interesting.

As you see, the light blue lines indicate the faces' normals, and the darker blue lines indicate the vertex normals (these were turned on in the N Properties Panel under Mesh Display ‣ Normals ‣ Face and *Vertex*). Selecting any given face will cause our Manipulator's z-axis to align with that normal. The same goes for Vertex Select Mode. Edge Select is different–A selected Edge has the z-axis aligned with it (so you will have to look at the Manipulator widget to determine the direction of x and y). If you select several elements, it will orient towards the average of those normals.

A great example of how this is useful is in Vertex Select Mode: Pick a vertex and then do the navigation hotkey for move`, Z, Z` to tug it away from the mesh and shove it into the mesh. To make this even more useful, select a nearby vertex and press `Shift- the navigation hotkey for rotate` to repeat the same movement—except along that second vertex's normal instead.

Gimbal



Gimbal.

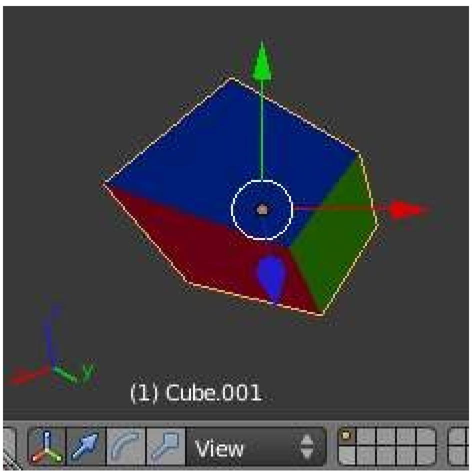
Gimbal's behavior highly depends on the current *Rotation Mode* (accessible in the `N` Properties Panel in the *3D View*, in top section, *Transform*).

XYZ Euler
: The manipulator handles are aligned to the euler axis, allowing you to see the discreet XYZ axis underlying the euler rotation, as well as possible gimbal lock.

Axis Angle
: The x, y, and z coordinates define a point relative to the object origin through which an imaginary "skewer" passes. The w value is the rotation of this skewer. Here, the Manipulator's z-axis stays aligned with this skewer.

Quaternion
: Though Quaternion rotation is very different from the Euler and Axis Angle rotation modes, the Manipulator behaves the same as in *Local* mode.

View



View.

The manipulator will match the 3D view:

Y:	Up/Down
X:	Left/Right,
Z:	Towards/Away from you.

This way you can constrain movement to one View axis with the navigation hotkey for move `-X-X`.

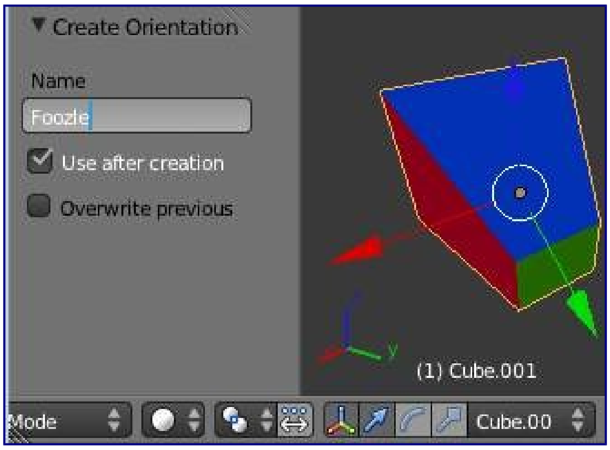
Custom Orientations

Reference
Mode: *Object* and *Edit* modes

custom orientation

You can define custom transform orientations, using object or mesh elements. Custom transform orientations defined from objects use the local orientation of the object whereas those defined from selected mesh elements (vertices, edges, faces) use the normal orientation of the selection.

The *Transform Orientations* panel, found in the Properties Panel, can be used to manage transform orientations: selecting the active orientation, adding and deleting custom orientations.



Renaming a Custom Orientation

The default name for these orientations comes from whatever you have selected. If an edge, it will be titled, “Edge,” if an object, it will take that object’s name, etc. The Toolshelf (`T` in the 3D View) allows you to rename the custom orientation after you press `Ctrl-Alt-Spacebar`.

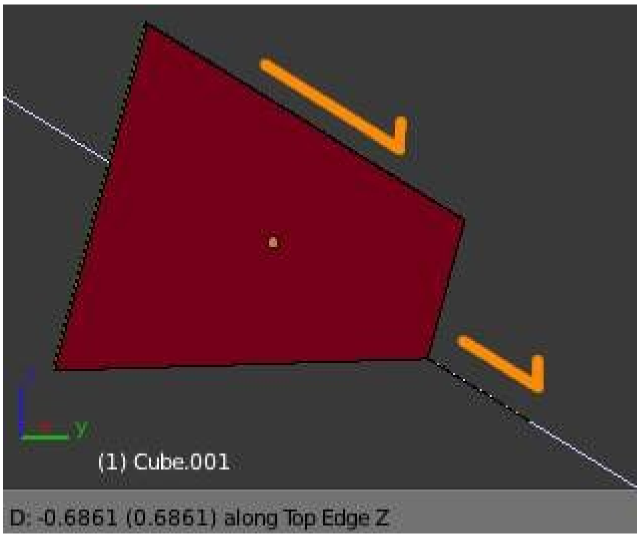


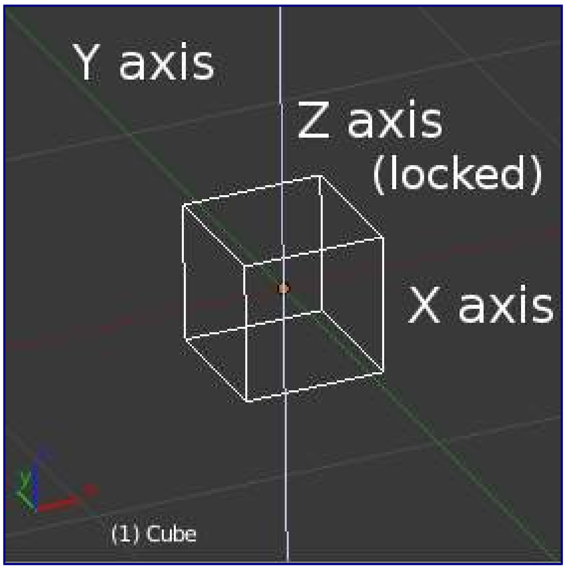
Figure 1.

The technique of creating custom orientations can become important in creating precise meshes. In *Figure 1*, to achieve this effect:

- Select the object's sloping top edge
- Create a Custom Orientation with `Ctrl-Alt-Spacebar` and rename it "Top Edge".
- Select the objects's bottom, right edge.
- Extrude
- Cancel the extrusion's default movement by pressing `RMB` or `Esc`.
- Hit `G` to reinitiate movement.
- Hit the navigation hotkey for scale`-Z` to constrain to the "Top Edge" orientation.

Axis Locking

Description



Axis locking

Transformations (translation/scale/rotation) in *Object* and *Edit* mode, as well as extrusion in *Edit* mode) can be locked to particular axis relative to the current *transform orientation*. By locking a transformation to a particular axis you are restricting transformations to a single dimension.

Usage

A locked axis will display in a brighter color than an unlocked axis. For example in the image to the right, the Z axis is drawn in light blue as movement is constrained to this axis. This example can be achieved in two ways:

- Press the navigation hotkey for move to enable translation, press `Z` to constrain movement to the Z-axis.
- Press `the navigation hotkey for move` to enable translation, move the mouse in the Z direction, then press `MMB`.

Axis locking types

Axis locking

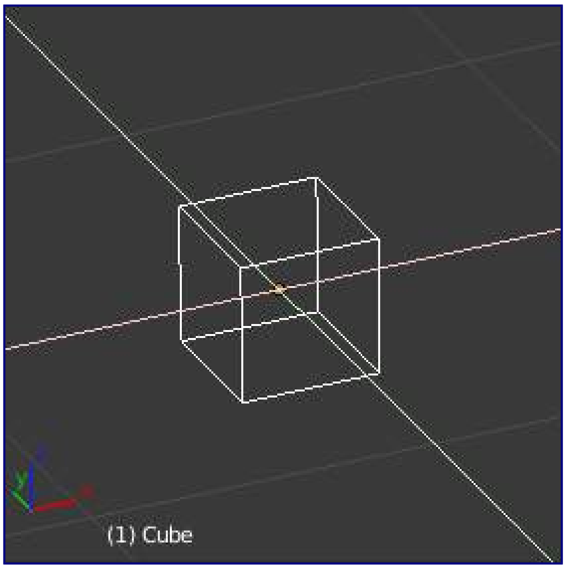
Reference
Mode: *Object* and *Edit* modes (translate, rotate, scale, extrude)

Axis locking limits the transformation to a single axis (or forbids transformations along two axes). An object, face, vertex or other selectable item will only be able to move, scale or rotate in a single dimension.

Plane locking

Reference
Mode: *Object* and *Edit* modes (translate, scale) Hotkey: `Shift-X`, `Shift-Y`, `Shift-Z` or `Shift-MMB`

after moving the mouse in the desired direction.

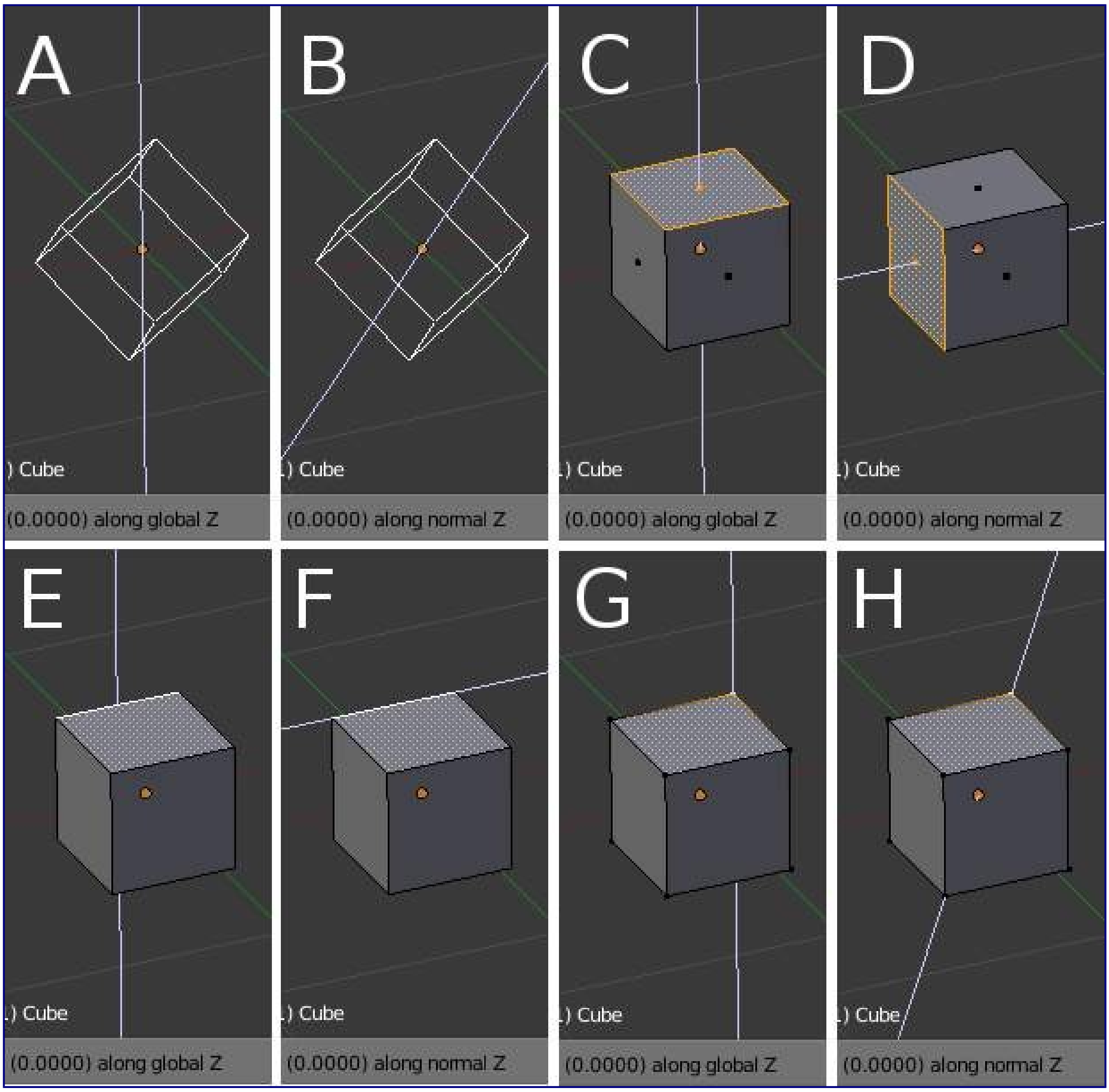


Plane locking

Plane locking locks the transformation to *two* axes (or forbids transformations along one axis), thus creating a plane in which the element can be moved or scaled freely. Plane locking only affects translation and scaling.

Note that for rotation, both axis and plane locking have the same effect because a rotation is always constrained around one axis. *Trackball* type rotations cannot be locked at all.

Axis locking modes



Axis locking modes

A single key press constrains movement to the corresponding *Global* axis. A second key press of the *same* key constrains movement to the current transform orientation selection (except if it is set to *Global*, in which case the *Local* orientation is used). Finally, a third key press of the same key removes constraints.

For example, if the current transform orientation is set to *Normal*, pressing the navigation hotkey for move to start translation, followed by Z will lock translation in the Z direction relative to the *Global* orientation, pressing Z again will lock translation to the Z axis relative to the *Normal* orientation. Pressing Z again will remove all constraints. The current mode will be displayed in the left hand side of the *3D window header*.

As can be seen in the *Axis locking modes* image, the direction of the transform also takes into account the selection. Sections A and B show Z axis locking in *Global* and *Normal* orientations respectively. C and D show the same situation with face selection, E and F with edge selection and G and H with vertex selection.

Note that using a locked axis does not prevent you from using the keyboard to enter *numeric transformation* values.

Snapping

There are two types of snap operations that you can use in Bforartists. The first type snaps your selection or cursor to a given point while the second type is used during transformations (translate, rotate, scale) and snaps your selection to elements within the scene.

Snap

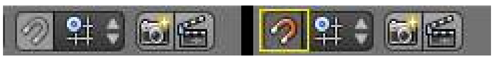
Reference
Mode: *Object* and *Edit* modes

The *Snap* menu (also available from the 3D header in both *Object* and *Edit* mode (Object ‣ Snap and Mesh ‣ Snap). This menu provides a number of options to move the cursor or your selection to a defined point (the cursor, selection or the grid).

Selection to Grid
Snaps the currently selected object(s) to the nearest grid point.
Selection to Cursor
Snaps the currently selected object(s) to the cursor location.
Cursor to Selected
Moves the cursor to the center of the selected object(s).
Cursor to Center
Moves the cursor to the center of the grid.
Cursor to Grid
Moves the cursor to the nearest grid point.
Cursor to Active
Moves the cursor to the center of the active object.

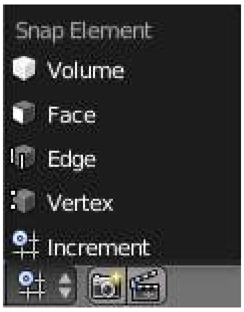
Transform Snapping

The ability to snap Objects and Mesh element to various types of scene elements during a transformation is available by toggling the magnet icon (which will turn red) in the 3D view’s header buttons.



Magnet icon in the 3D view header (red when enabled).

Snap Element



Snap Element menu

Volume
: Snaps to regions within the volume of the first Object found below the mouse cursor. Unlike the other options, this one controls the depth (i.e. Z-coordinates in current view space) of the transformed element. By toggling the button that appears to the right of the snap target menu (see below), target objects will be considered as a whole when determining the volume center.

Face
: Snap to the surfaces of faces in mesh objects. Useful for retopologizing.

Edge
: Snap to edges of mesh objects.

Vertex
: Snap to vertices of mesh objects.

Increment

: Snap to grid points. When in Orthographic view, the snapping increment changes depending on zoom level.

Note
In this context the grid does not mean the visual grid cue displayed. Snapping will use the resolution of the displayed grid, but all transformations are relative to the initial position (before the snap operation).

Snap Target

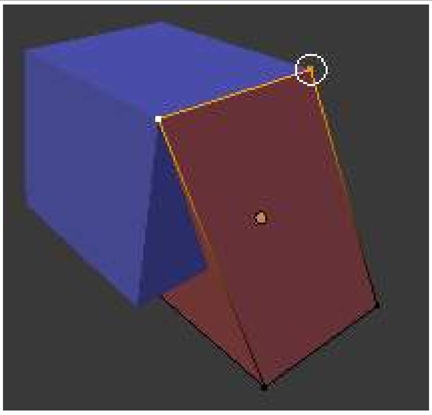
Snap target options become active when either *Vertex*, *Edge*, *Face*, or *Volume* is selected as the snap element. These determine what part of the selection snaps to the target objects.

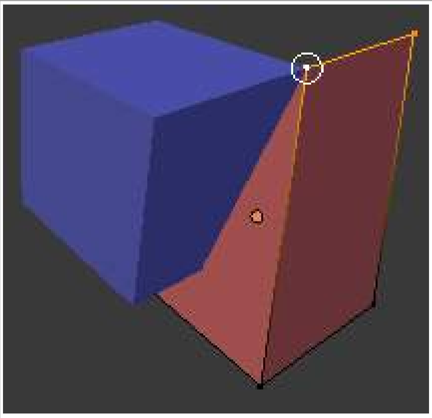
Active
: Moves the active element (vertex in Edit mode, object in Object mode) to the target.

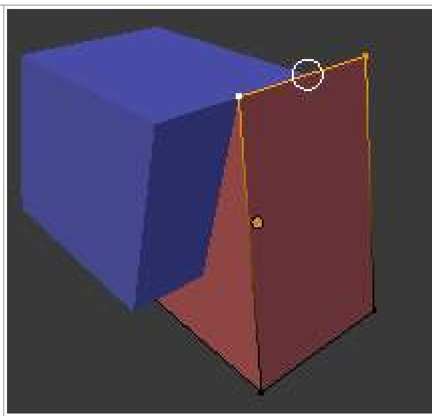
Median
: Moves the median of the selection to the target.

Center
: Moves the current transformation center to the target. Can be used with 3D cursor to snap with an offset.

Closest
: Moves the closest point of the selection to the target.

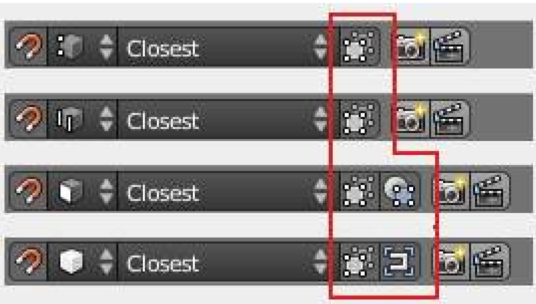

Closest


Active


Median

Additional snap options

Object mode



Edit mode

As seen by the red highlighted areas in the image above, additional controls are available to alter snap behaviour. These options vary between mode (Object and Edit) as well as Snap Element. The four options available are:

- 

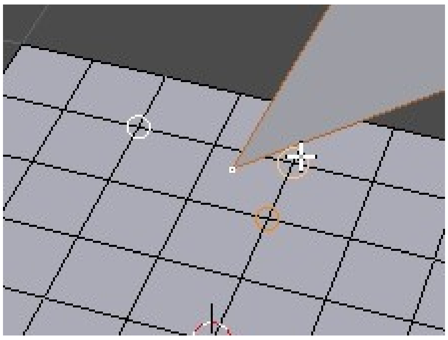
  Align rotation with the snapping target.
- 

  Project individual elements on the surface of other objects.
- 

  Snaps elements to its own mesh.
- 

  Consider Objects as whole when finding volume center.

Multiple Snap Targets



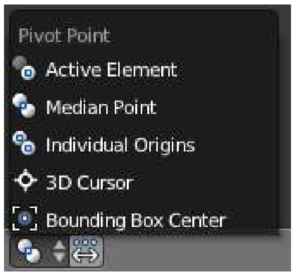
Multiple snapping targets.

Once transforming a selection with Snapping on (not just with the `Ctrl` key held), you can press A to mark the current snapping point, then proceed to mark as many other snapping points as you wish and the selection will be snapped to the average location of all the marked points.

Marking a point more than once will give it more weight in the averaged location.

Pivot Point

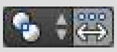
Reference
Mode: *Object mode* and *Edit mode*
Menu: `Droplist in the header of the 3D view`



The pivot point is the point in space around which all rotations, scalings and mirror transformations are centered. You can choose one of five *Pivot Points* from a drop-down list in the header of any 3D area, as seen here in (*Pivot Point modes*). The pages below describe each *Pivot Point* mode in more detail.

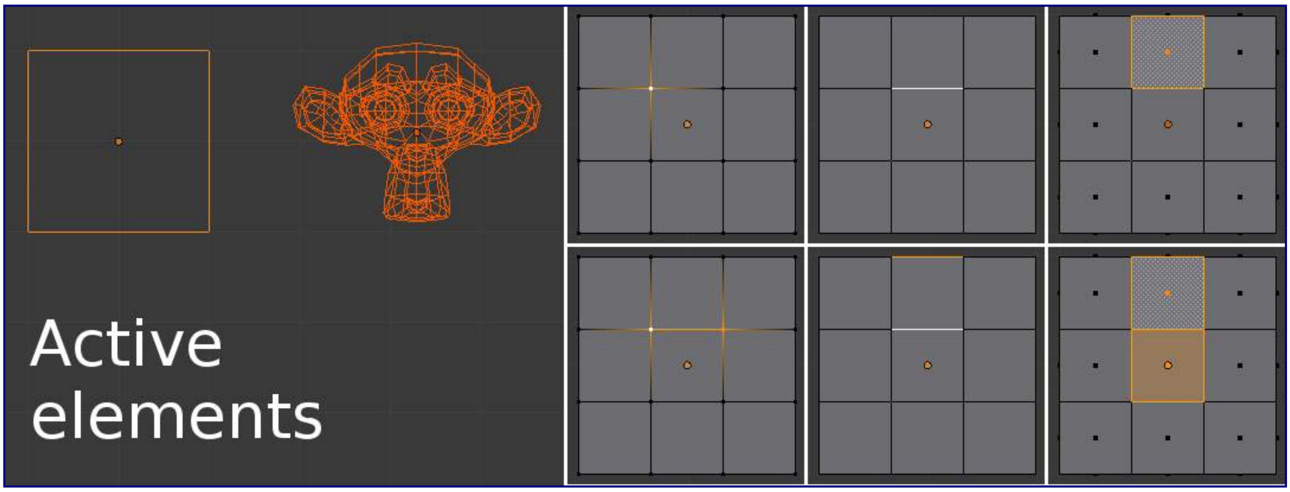
Note that even if the above examples use meshes, the same rules apply for other types (curves, surfaces...) as well.

Active Element as Pivot

Reference
Mode: *Object mode* and *Edit mode*
Menu: Select from the following icon in the 3D window header 

The *active* element can be an Object, vertex, edge or a face. The active element is the last one to be selected and will be shown in a lighter orange color when in *Object mode* and white when in *Edit mode*. With *Active element as Pivot* set to active, all transformations will occur relative to the active element.

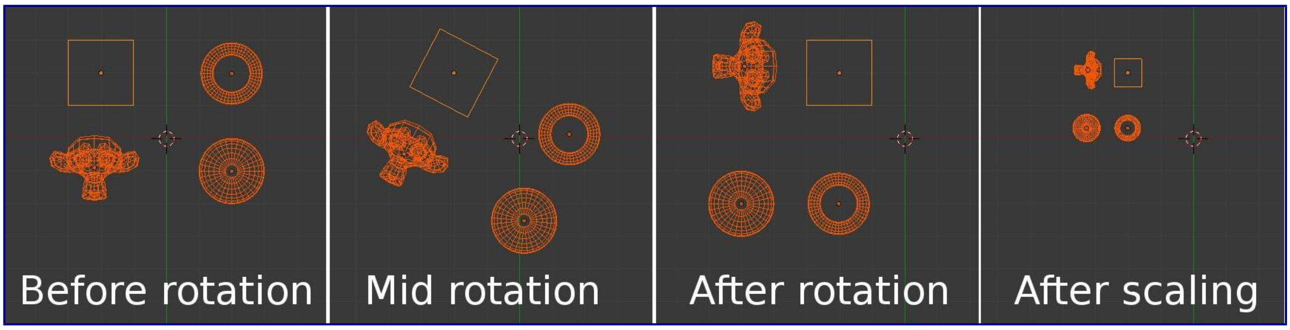
Read more about selecting different *Pivot Points*



Display of active elements in Object mode is shown on the left of the image where the active element (cube) is a lighter orange. Active elements for vertices, edges and faces in Edit mode are displayed in white and are shown on the right.

In Object mode

When in *Object mode*, rotation and scaling happen around the active Object's center. This is shown by the figure to the below where the active Object (the cube) remains in the same location (note its position relative to the 3D cursor) while the other Objects rotate and scale in relation to the active element.



Rotation and scaling with the cube as the active element.

In Edit mode

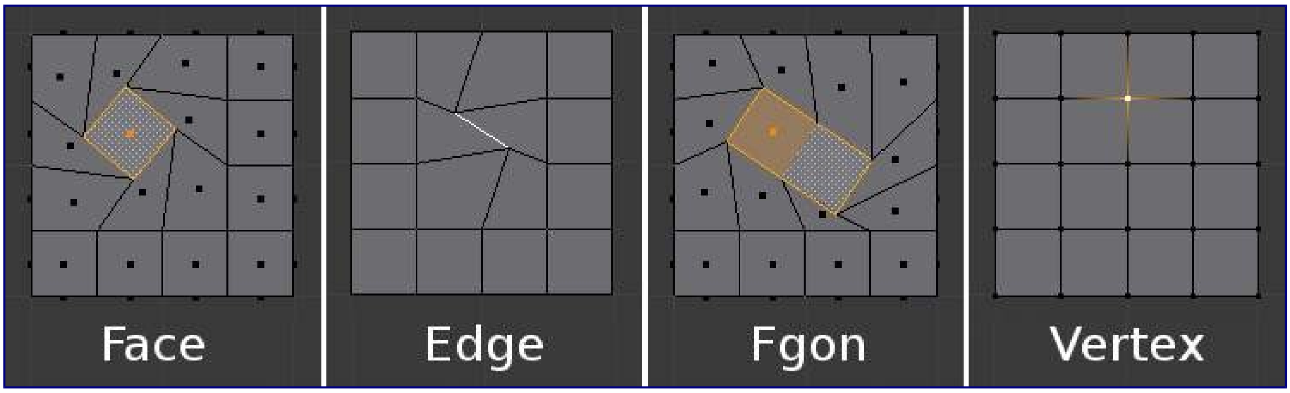
Using the active element as a pivot point in *Edit mode* may seem complex but all the possible transformations follow a few rules:

- The pivot point is always at the median of the active element(s).
- The transformations occur by transformation of the **vertices** of the selected element(s). If an unselected element shares one or more vertices with a selected element then the unselected one will get some degree of transformation also.

Let's examine the following examples: in each case we will see that the two rules apply.

Single selection

When one single element is selected it becomes automatically active. In the image below, you can see that when it is transformed its vertices move, with the consequence that any adjacent element which shares one or more vertices with the active element is also transformed.



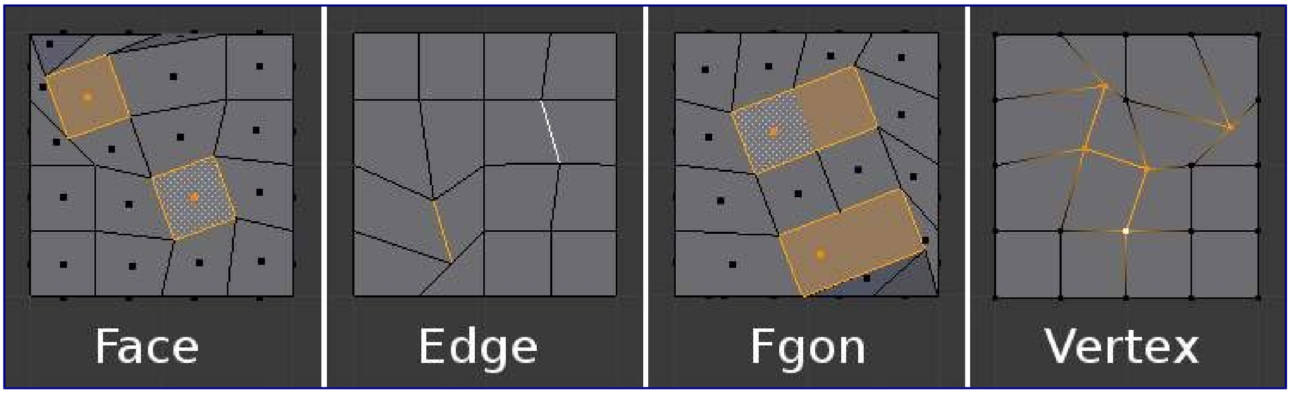
Edit mode and only one element selected.

Let's review each case:

- *Faces* have their pivot point where their selection dot appears, which is where the median of their vertices is.
- *Edges* have their pivot point on their middle since this is always where the median of an edge is.
- A single *Vertex* has no dimensions at all so it can't show any transformation (except translation, which is not affected by the pivot point).

Multiple selection

When multiple elements are selected they all transform. The pivot points stay in the same place as what we've seen above, with only one exception for Fgons. In the image below, the selected elements have been rotated.



Edit mode and multiple selections.

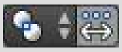
- For *Faces* the transformation occurs around the selection dot of the active face.
- *Edges* also keep the same behavior with their pivot point at their median.
- *Fgons* behave exactly like faces.
- There is a case for *Vertices* this time: the active Vertex is where the pivot point resides. All other vertices are transformed relative to it.

Median Point as Pivot

Reference

Mode: *Object mode* and *Edit mode*

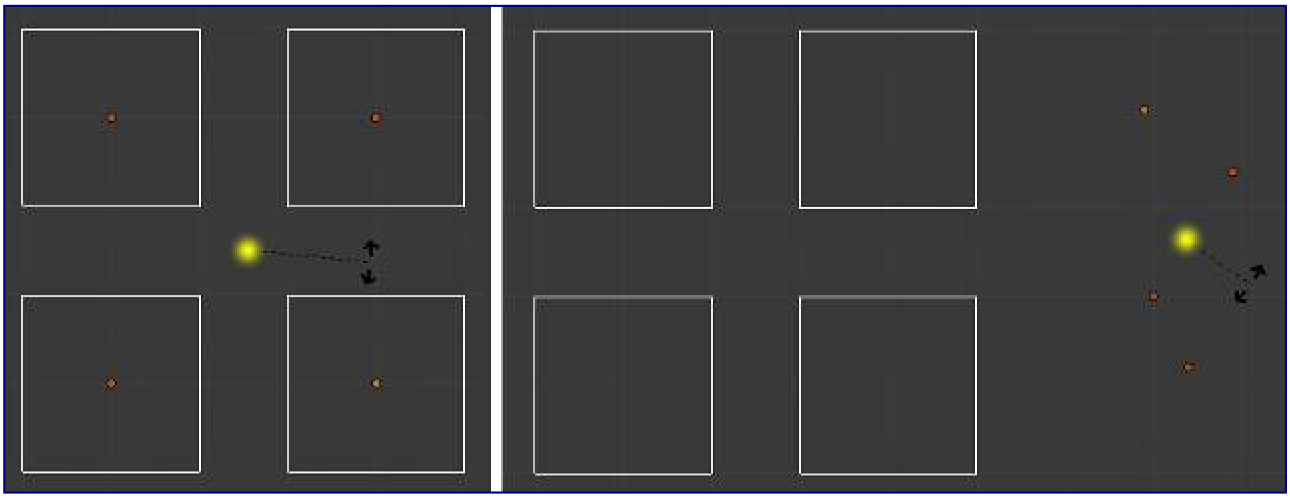
Menu: Select from the following icon in the 3D window header



The *Median Point* can be considered to be broadly similar to the concept of Center of Gravity (COG). If we assume that every element (Object, face, vertex etc) of the selection has the same mass, the median point would sit at the point of equilibrium for the selection (the COG).

In Object Mode

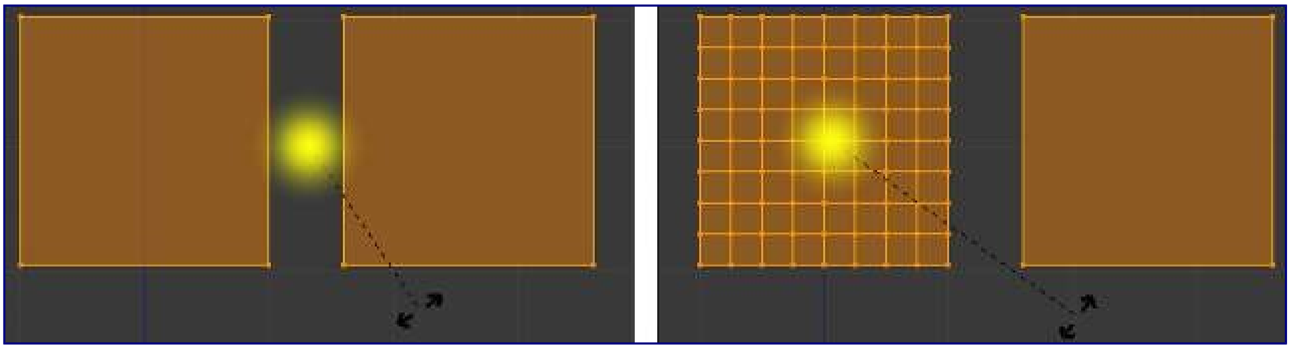
In Object Mode, Bforartists only considers the Object centers when determining the median point. This can lead to some counterintuitive results. In the Object Mode median points image below, you can see that the median point is between the Object centers and can be nowhere near the Objects' mesh.



Median points in Object Mode. The Median point is indicated by the yellow dot.

In Edit Mode

In Edit Mode, the median point is determined via the part of the selection that has the most elements. For example, in the *Median points in Edit Mode* image, when there are two cubes with an equal number of vertices, the median point lies directly between the two cubes. However, if we subdivide one cube multiple times so that it has many more vertices, you can see that the median point has shifted to the region with the most vertices.



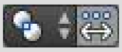
Median points in Edit Mode. The Median point is indicated by the yellow dot.

Individual Origins as Pivot

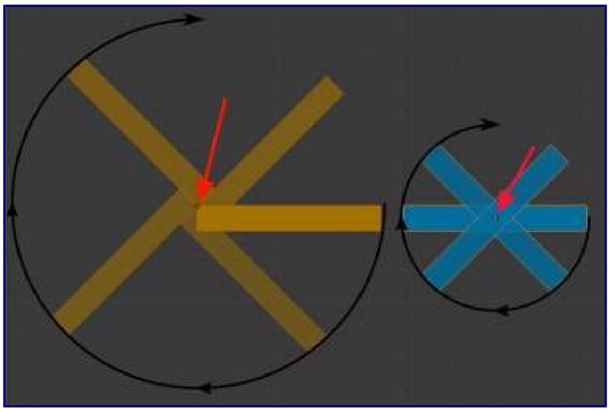
Reference

Mode: *Object mode* and *Edit mode*

Menu: Select from the following icon in the 3D window header



In Object mode



Rotation around individual origins.

The Origin of an Object is shown in the 3D view by a small orange circle. This is highlighted in the image to the right by the red arrow. The origin tells Bforartists *where that Object is in 3D space*. What you see in the 3D view (vertices, edges etc) is what makes up the Object.

While the Origin is equivalent to the center of the *Object*, it does not have to be located in the center of the *Mesh*. This means that an Object can have its center located on one end of the mesh or even completely outside the mesh. For example, the orange rectangle in the image has its Origin located on the far left of the mesh.

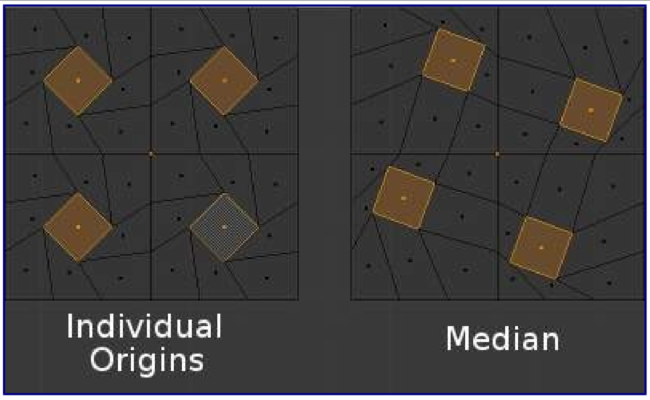
Now let’s examine *Rotation around the individual origins*.

- The blue rectangle has its Origin located in the center of the mesh, while the orange rectangle has its Origin located on the left hand side.

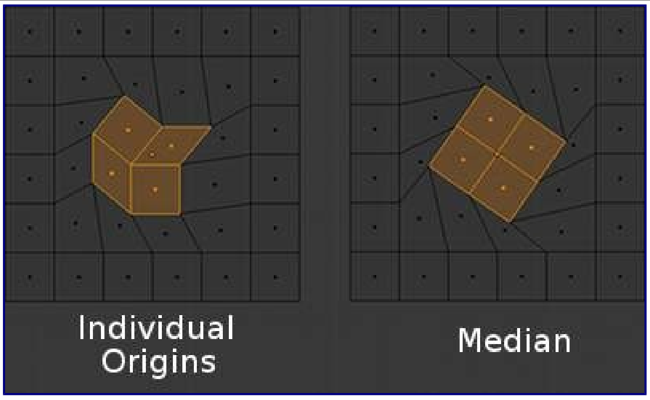
- When the Pivot Point is set to *Individual Origins*, the center of each Object (indicated by the red arrow) remains in place while the Object rotates around it in the path shown by the black arrow.

In Edit mode

In Edit mode, setting the Pivot Point to Individual Origins produces different results when the selection mode is set to Vertex, Edge or Face. For example, Vertex mode produces results similar to setting the pivot point to median and Edge mode often produces distorted results. Using Individual Origins in Face mode produces the most predictable results.

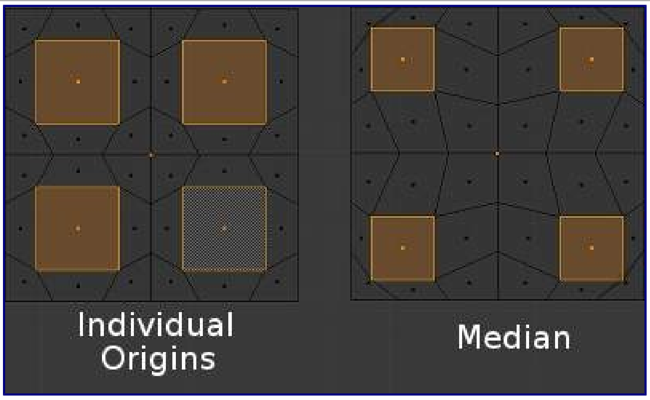


Rotation of individual faces with the pivot point indicated by the image text.

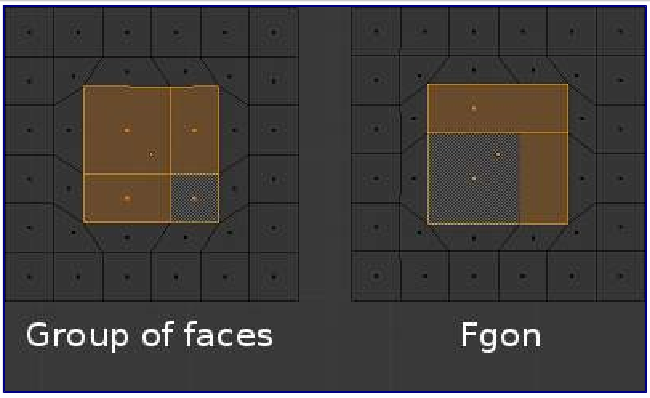


Rotation of grouped faces with the pivot point indicated by the image text.

As can be seen in the images above, faces that touch each other will deform when rotated when the pivot point is set to Individual Origins. Faces that do not touch will rotate around their Individual Origins (their center).



Scaling with non-touching faces.



Scaling with touching faces.

Groups of faces and Fgons can be scaled without their outside perimeter being deformed. However, the individual faces inside will not be scaled uniformly.

Modeling with faces and individual origins as the pivot point.

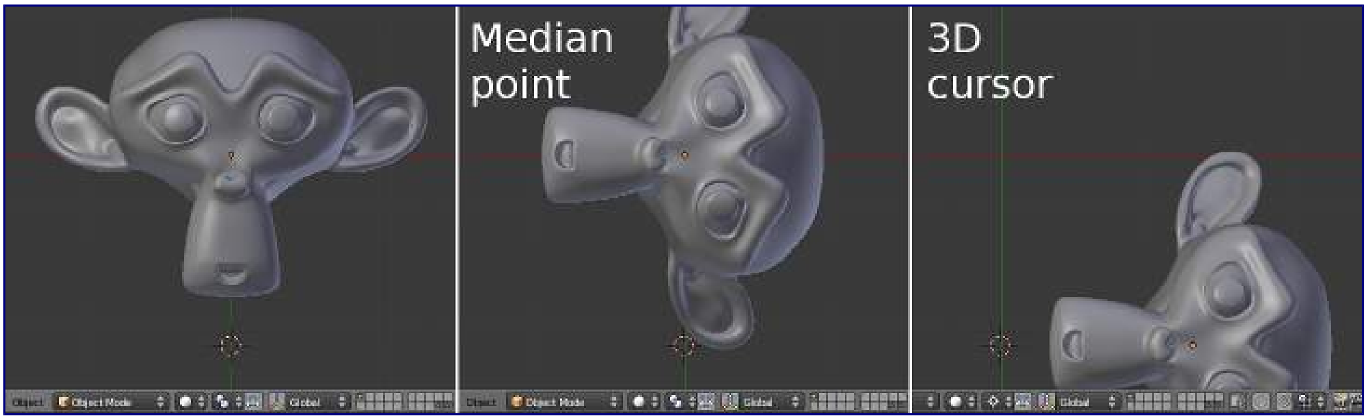
Once you are aware of its limitations and pitfalls, this tool can save a lot of time and lead to unique shapes. This “anemone” was modeled from a 12 sided cylinder in about 10 minutes by repeatedly using this workflow: extrusions of individual faces, scaling with *median as a pivot point*, and scaling and rotations of those faces with *Individual Origins as pivot points*.

3D Cursor as Pivot

Reference
Mode: *Object mode* and *Edit mode*

The 3D cursor is the most intuitive of the pivot points. With the 3D cursor selected as the active pivot point (from either the *Window Header* or via the `.` hotkey), simply position the 3D cursor and then do the required transformation. All rotation and scaling transformations will now be done relative to the location of the 3D cursor. The image below shows the difference when rotating an Object from its starting position (first panel) 90 degrees around the median point (second panel) and 90 degrees around the 3D cursor (third panel).

Read more about selecting different *Pivot Points*



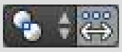
Rotation around the 3D cursor compared to the median point.

Bounding Box Center as Pivot

Reference

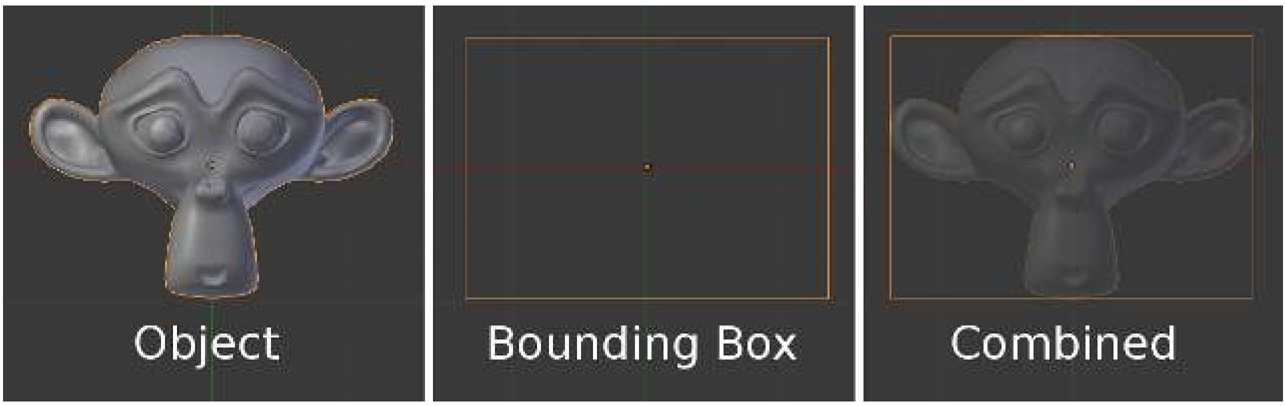
Mode: *Object mode* and *Edit mode*

Menu: Select from the following icon in the 3D window header



The bounding box is a rectangular box that is wrapped as tightly as possible around the selection. It is oriented parallel to the world axes. In this mode the pivot point lies at the center of the bounding box. You can set the pivot point to bounding box with the `,` hotkey or via the menu in the *Window Header*. The image below shows how the Object’s Bounding Box size is determined by the size of the Object.

Read more about selecting different *Pivot Points*

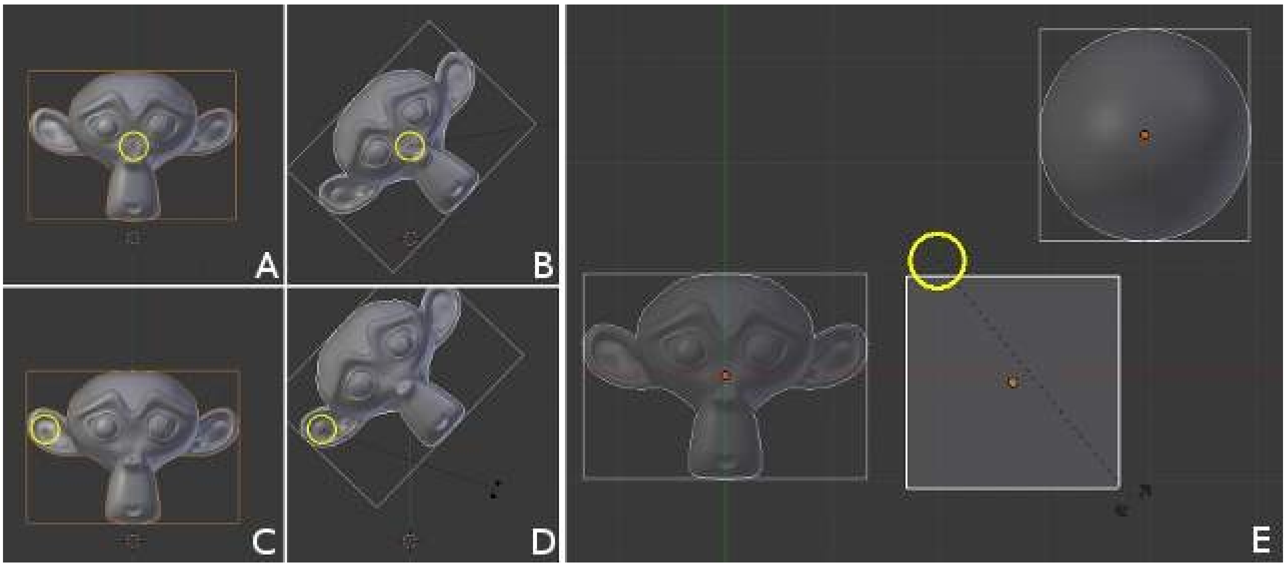


Relationship between an Object and its Bounding Box.

In Object mode

In *Object* mode, the bounding box is wrapped around the Object and transformation takes place relative to the location of the Object center (indicated by the yellow circle). The image below shows the results of using the Bounding Box as the pivot point in a number of situations.

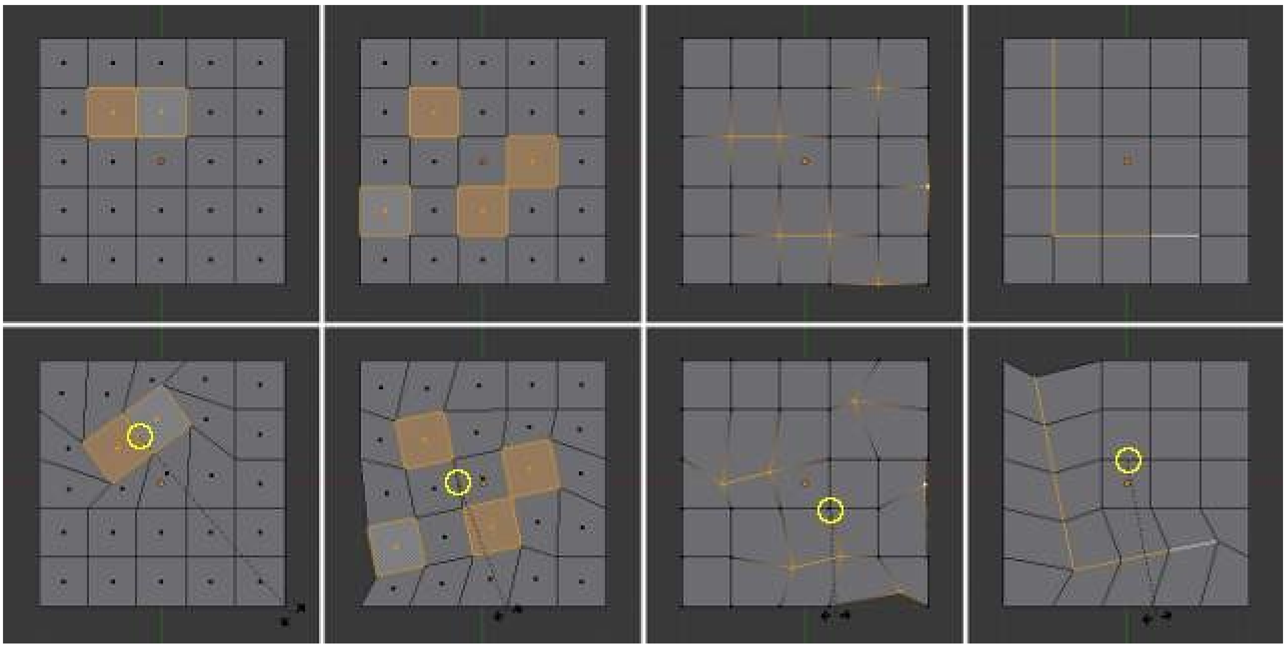
For example, images A (before rotation) and B show rotation when the Object center is in its default position, while images C (before rotation) and D shows the result when the Object center has been moved. Image E shows that when multiple Objects are selected, the pivot point is calculated based on the Bounding Box of all the selected Objects.



The grid of four images on the left (ABCD) shows the results of Object rotation when the pivot point is set to Bounding Box. The image to the right (E) shows the location of the Bounding Box pivot point when multiple Objects are selected. The pivot point is shown by a yellow circle.

In Edit mode

This time it is the ObData that is enclosed in the bounding box. The bounding box in *Edit mode* takes no account of the Object(s) centers, only the center of the selected vertices.

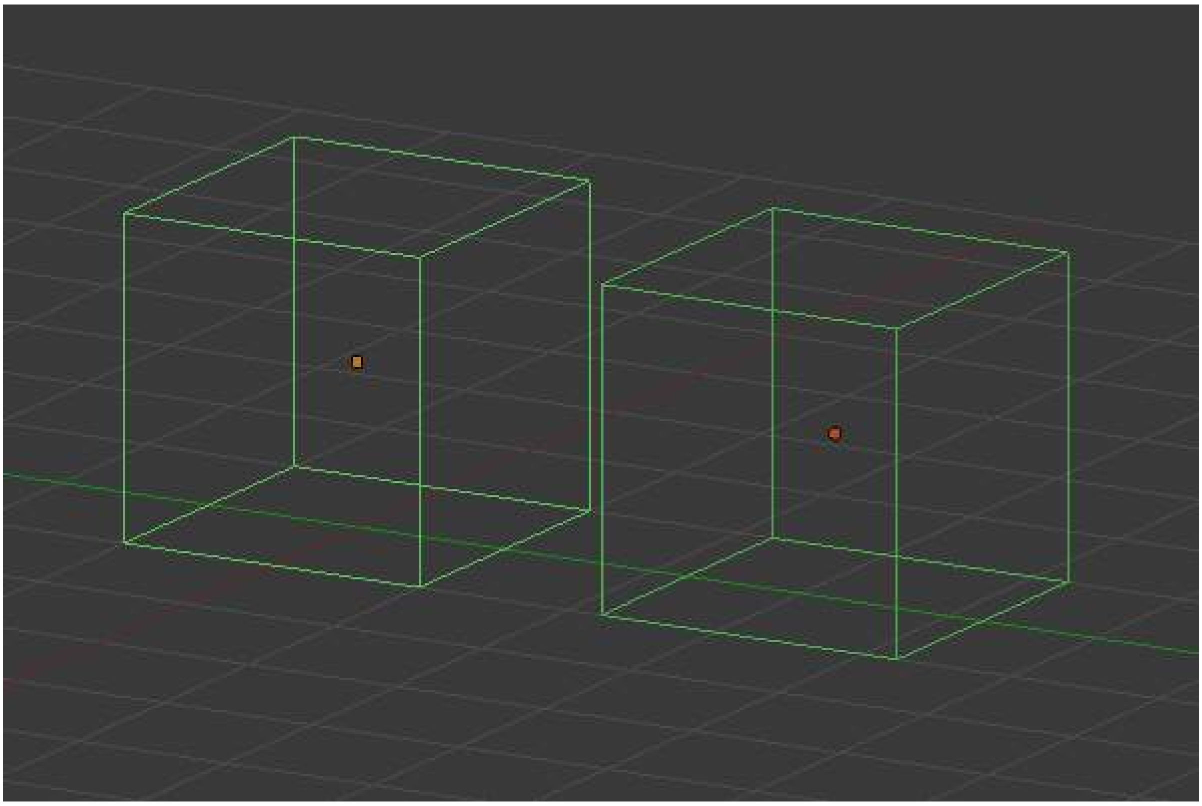


The effects of rotation in different mesh selection modes when the bounding box is set as the pivot point. The pivot point is shown by a yellow circle.

Relationships

Relationships describes everything around interaction of objects. Grouping etc.

Grouping objects



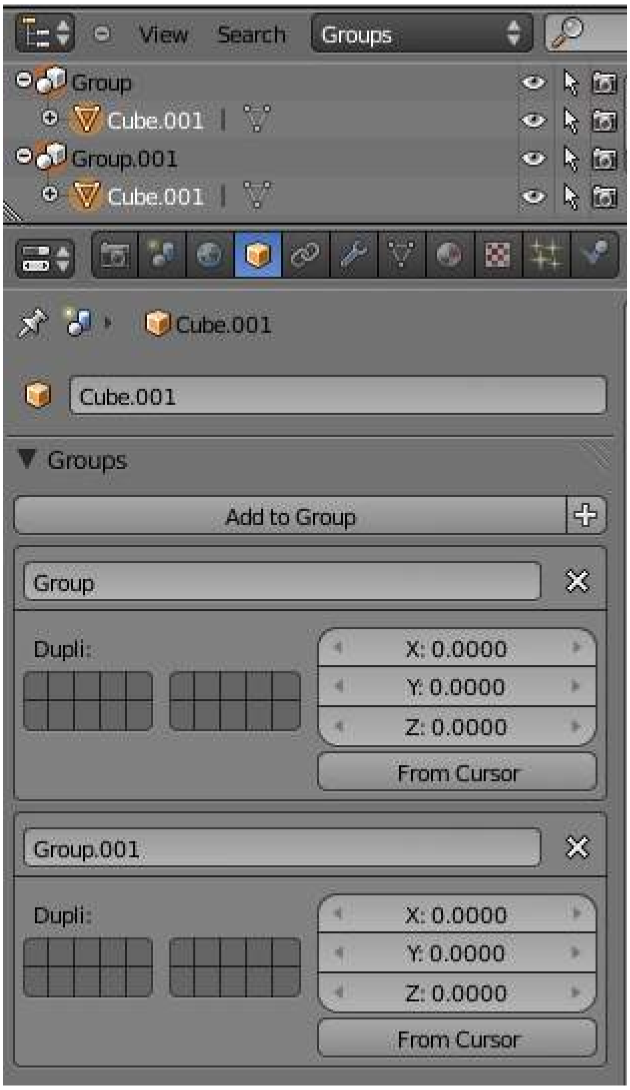
Grouped objects

There can be many objects in a scene: A typical stage scene consists of furniture, props, lights, and backdrops. Bforartists helps you keep everything organized by allowing you to group like objects together.

Group objects together without any kind of transformation relationship. Use groups to just logically organize your scene, or to facilitate one-step appending or linking between files or across scenes. Objects that are part of a group always shows as light green when selected; see image (*Grouped objects*).

Options

Creating a Group
: Look in the Object menu / Group submenu



Naming a Group

Naming a Group

All groups that an object has been assigned to are listed in the *Object Properties Panel* ‘s *Relations* panel. To rename a group, simply click in the groups name field. To name groups in the *Outliner* window, select *Groups* as the outliner display from the header combo box, and `Ctrl-LMB` click on the group name. The name will change to an editable field; make your changes and press `Return`.

Restricting Group Contents via Layers

The cluster of layer buttons attached to each group determines from which layers the group objects will be included when duplicated. If your group contains objects on layers 10, 11 and 12, but you disable the layer 12 button in the group controls, duplicates of that group (using the *Dupligroup* feature) will only show the portions of the group that reside in layers 10 and 11.

Appending or Linking Groups

To append a group from another `.blend` file, consult *this page*. In summary, File ‣ Link / Append Link Select a `.blend` file and, and then the group.

Removing Groups

To remove a object from a group, under the object context button, open the “Groups” pane. Find the name of the group from which you wish to remove the object, and click the x to the right of the group name.

Select Grouped

Reference
Mode: *Object mode* Menu: *Select –> Grouped*

Select objects by parenting and grouping characteristics. See *Select Grouped* for more information.

Parenting Objects

When modeling a complex object, such as a watch, you may choose to model the different parts as separate objects. However, all of the parts may be attached to each other. In these cases, you want to designate one object as the parent of all the children. Movement, rotation or scaling of the parent also affects the children.

To parent objects, select at least two objects (select the *Child Objects* first, and select the *Parent Object* last), and press `Ctrl-P`. The *Set Parent To* dialog will pop up allowing you to select from one of several possible different parenting types. Selecting one of the entries in *Set Parent To* confirms, and the child/children to parent relationship is created.

The last object selected will be the *Active Object* (outlined in light orange), and will also be the *Parent Object*. If you selected multiple objects before selecting the parent, they will all be children of the parent and will be at the same level of the hierarchy (they are “siblings”).

The *Set Parent To* pop-up dialog is context sensitive, which means the number of entries it displays can change depending on what objects are selected when the `Ctrl-P` shortcut is used.

For non-inverse-mode, press `Shift-Ctrl-P` instead. This creates an alternative parent-child-relationship where child-objects exist entirely in the parent’s coordinate system. This is the better choice for CAD purposes, for example.

Moving, rotating or scaling the parent will also usually move/rotate/scale the child/children. However moving/rotating/scaling the child/children of the parent will not result in the parent moving/rotating/scaling. In other words, the direction of influence is from parent to child and not child to parent.

In general when using the `Ctrl-P` or [3D View Editor Header > Object Menu > Parent Menu] entires to parent objects, the *Child Objects* can only have one *Parent Object*. If a *Child Object* already has a *Parent Object* and you give it another parent then Bforartists will automatically remove the previous parent relationship.

Bforartists supports many different types of parenting, listed below:

- Object
- Armature Deform
- Bone
- Curve Deform
- Path Constraint
- Lattice Deform
- Vertex

- Vertex (Triangle)

Object Parent

Object Parent is the most general form of parenting that Bforartists supports. If will take selected objects and make the last selected object the *Parent Object*, while all other selected objects will be *Child Objects*.

Object (Keep Transform) Parent

Object (Keep Transform) Parent works in a very similar way to *Object Parent* the major difference is in whether the *Child Objects* will remember any previous transformations applied to them from the previous *Parent Object*.

Since explaining this in an easy to understand technical way is hard, lets instead use an example to demonstrate.

Assume that we have a scene consisting of 3 objects, those being 2 Empty Objects named “EmptyA” and “EmptyB”, and a Monkey object. See figure 1.

Figure 1 - Scene with 2 Empties and a Monkey, no parenting currently active.

Figure 1 shows the 3 objects with no parenting relationships active on them.

If you select the Monkey object by `RMB` click and then `Shift-RMB` click “EmptyA” object and press `Ctrl-P` and then select *Object* from the *Set Parent To* pop-up dialog box. This will result in “EmptyA” object being the *Parent Object* of the Monkey object. With only “EmptyA” selected rotating/scaling/moving it will result in the Monkey object being altered respectively.

Scale the “EmptyA” object, so that the Monkey becomes smaller and moves to the left a little. See figure 2.

Figure 2 - Scene with Monkey object being the Child Object of "EmptyA". "EmptyA" has been scaled resulting in the Monkey also being scaled and moved to the left.

If you select only the Monkey object by `RMB` click and then `Shift-RMB` click "EmptyB" object and press `Ctrl-P` and select *Object* from the *Set Parent To* pop-up dialog box. This will result in "EmptyB" object being the *Parent Object* of the Monkey object. Notice that when you change the parent of the Monkey the scale of the Monkey changed. See figure 3.

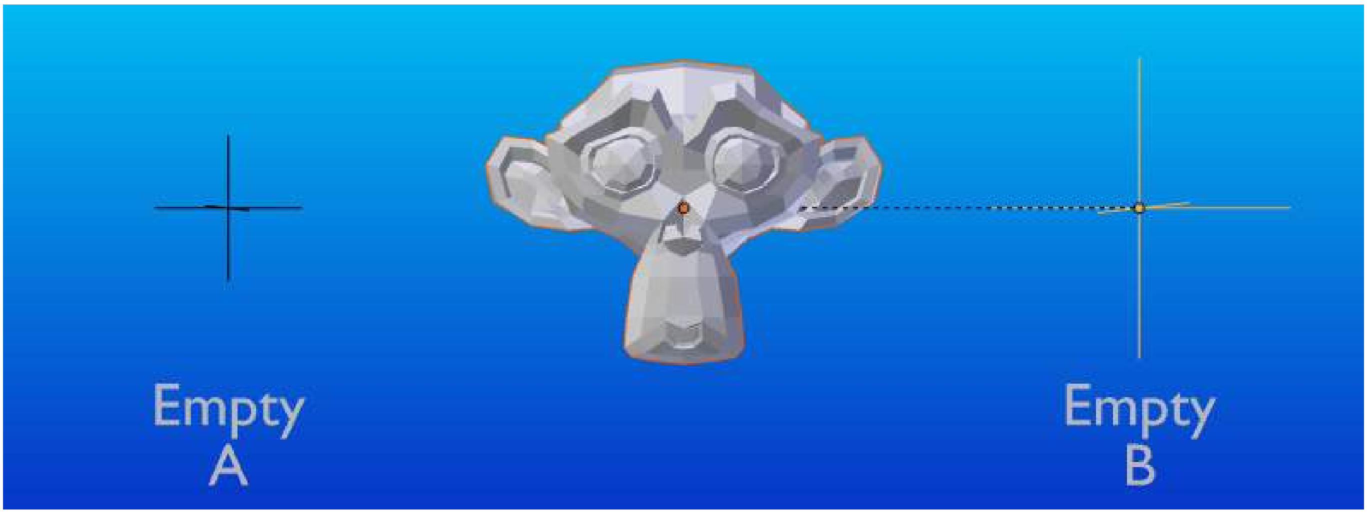


Figure 3 - Scene with Monkey object having its a parent changed from "EmptyA" to "EmptyB" and the resulting change in scale.

This happens because the Monkey object never had its scale altered directly, the change came about because it was the child of "EmptyA" which had its scale altered. Changing the Monkey's parent to "EmptyB" resulted in those indirect changes in scale being removed, because "EmptyB" has not had its scale altered.

This is often the required behaviour, but it is also sometimes useful that if you change your *Parent Object* that the *Child Object* keep any previous transformations it got from the old *Parent Object*; If instead when changing the *Parent Object* of the Monkey from "EmptyA" to "EmptyB" we had chosen parenting type *Object (Keep Transform)*, the Monkey would keep its scale information it obtained from the old parent "EmptyA" when it is assigned to the new parent "EmptyB"; See Figure 4.

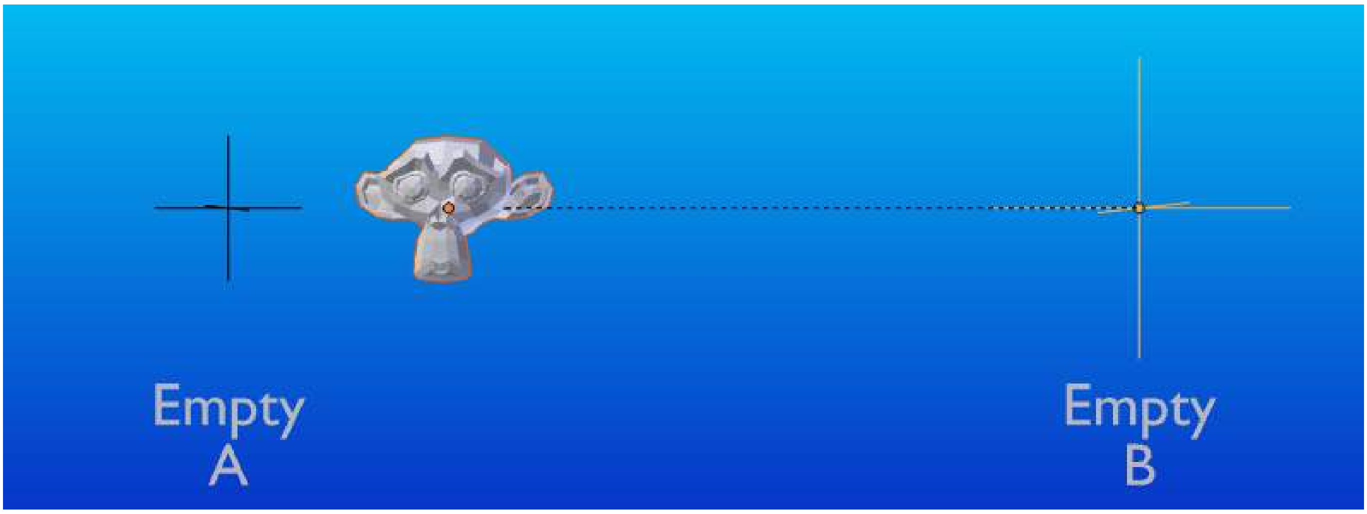


Figure 4 - Scene with Monkey object having its a parent changed from “EmptyA” to “EmptyB” using ‘Object (Keep Transform)’ parent method.

If you want to follow along with the above description here is the blend file used to describe *Object (Keep Transform)* parenting method:

File:Parent_-_Object_(Keep_Transform)_(Demo_File).blend

Armature Deform Parent

An Armature in Bforartists can be thought of as similar to the armature of a real skeleton, and just like a real skeleton an Armature can consist of many bones. These bones can be moved around and anything that they are attached to or associated with will move and deform in a similar way.

In Bforartists Armature Object Types are usually used to associate certain bones of an Armature to certain parts of a Mesh Object Types Mesh Geometry. You are then able to move the Armature Bones and the Mesh Object will deform. See figure 5.

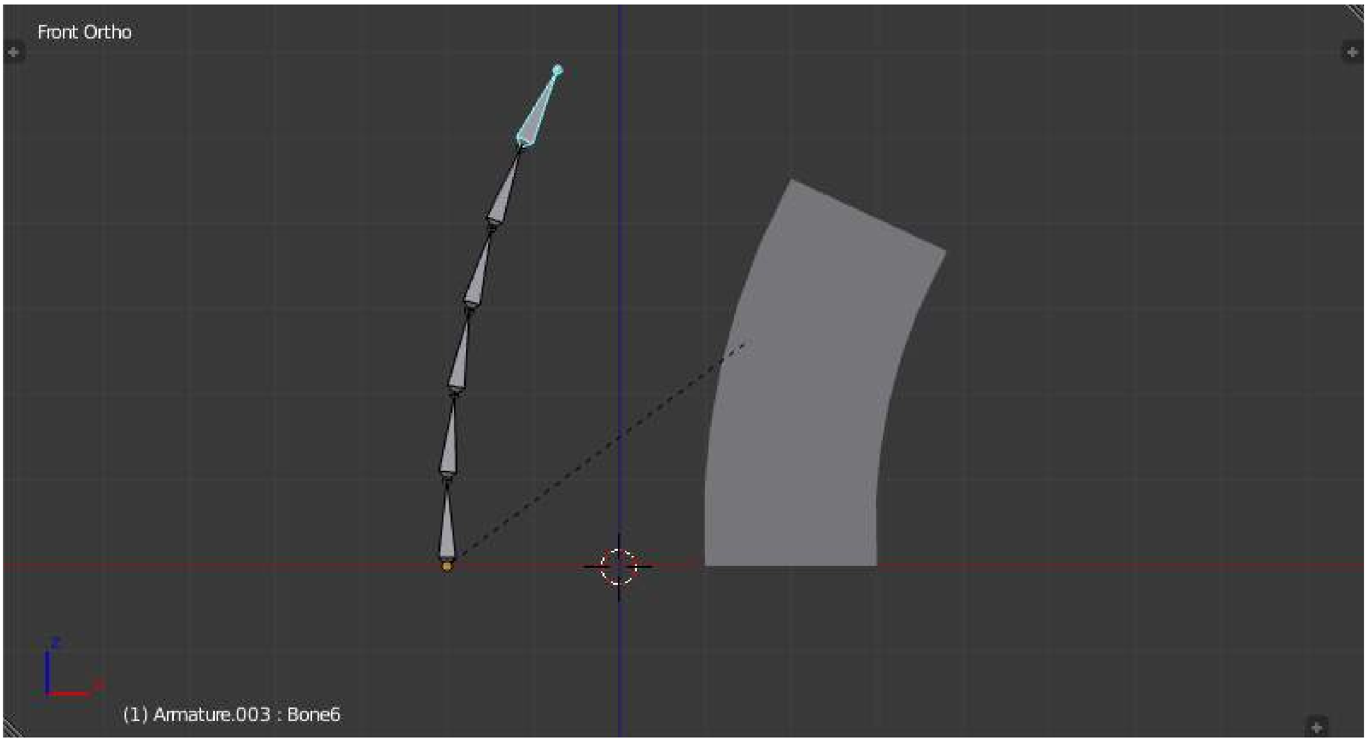


Figure 5 - Armature Object Bone associated with another Mesh Object, as the bone move the Mesh deforms similarly.

Armature Deform Parenting is one of the most flexible ways of associating Bones in an Armature to another Object, it gives a lot of freedom but that comes at the price of a little complexity, as there are multiple steps involved in setting up Armature Deform Parenting such that deformations are actually carried out.

Bforartists has several different ways of Parenting an Armature to an object, most of them can automate several of the steps involved, but all of them ultimately do all the steps we describe for Armature Deform Parenting.

Using the Armature Deform Parenting operator is the first step in setting up the relationship between an Armature Object and it's Child Objects.

To use Armature Deform Parenting you must first select all the Child Objects that will be influenced by the Armature and then lastly select the Armature Object itself. Once all the Child Objects and the Armature Object are selected press `Ctrl-P` and select Armature Deform in the Set Parent To pop-up dialog. See figure 6.

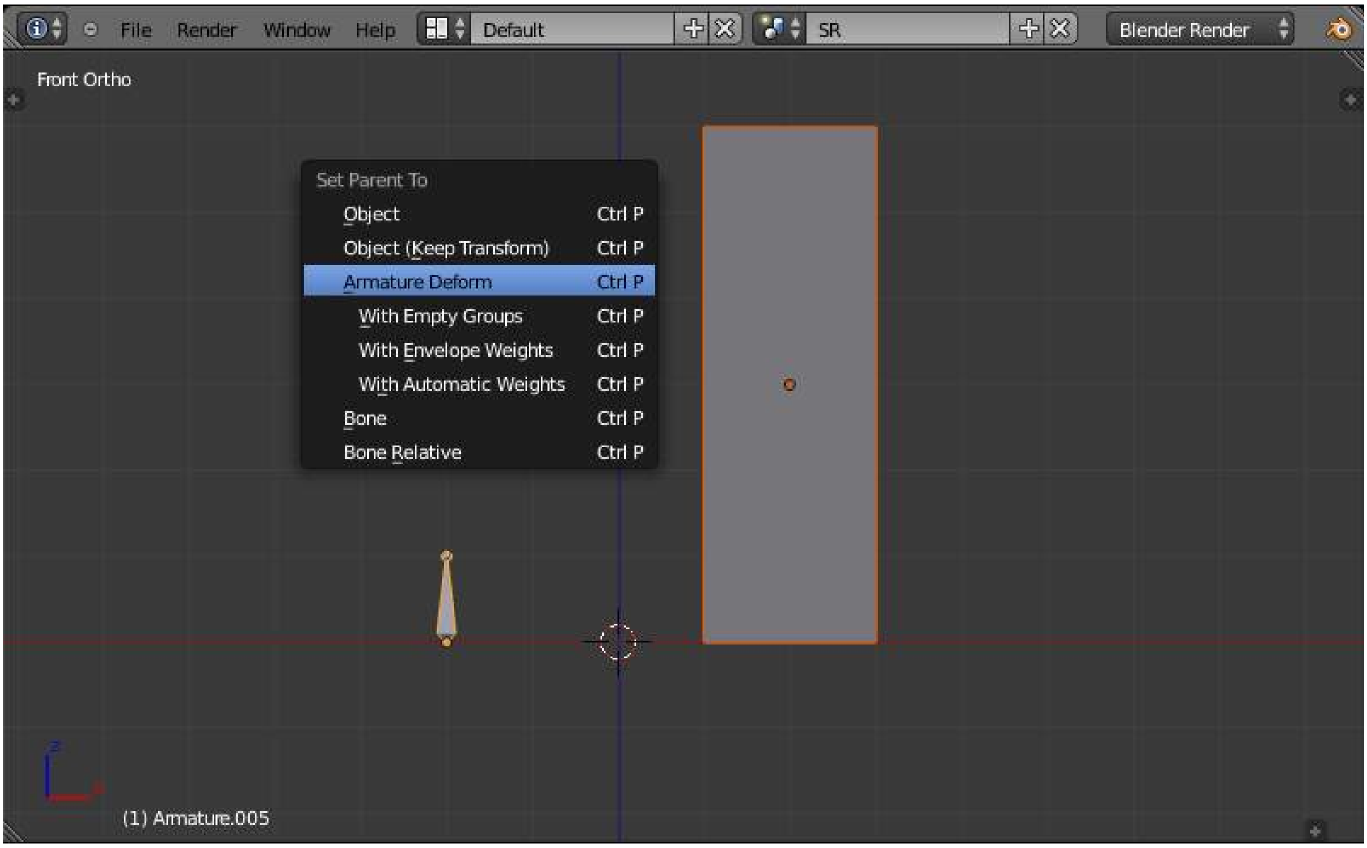


Figure 6 - Set Parent To dialog with Armature Deform Parenting option highlighted.

Once this is done the Armature Object will be the Parent Object of all the other Child Objects, also we have informed Bforartists that the Bones of the Armature Object can be associated with specific parts of the Child Objects so that they can be directly manipulated by the Bones.

At this point however all Bforartists knows is that the Bones of the Armature could be used to alter the Child Objects, we haven't yet told Bforartists which Bones can alter which Child Objects or by how much.

To do that we must individually select each Child Object individually and toggle into Edit Mode on that Child Object. Once in Edit Mode we can then select the vertices we want to be influenced by the Bones in the Armature. Then with the vertices still selected navigate to [Properties Editor > Object Data Context > Vertex Groups Panel] and create a new Vertex Group with the same name as the Bone that you want the selected vertices to be influenced by.

Once the Vertex Group has been created we then assign the selected vertices to the Vertex Group by clicking the Assign Button. By default when selected vertices are assigned to a Vertex Group they will have an Influence Weight of `1.0` This means that they are fully influenced when a Bone they are associated with is moved, if the Influence Weight had been `0.5` then when the bone moves the vertices would only move half as much. See figure 7.

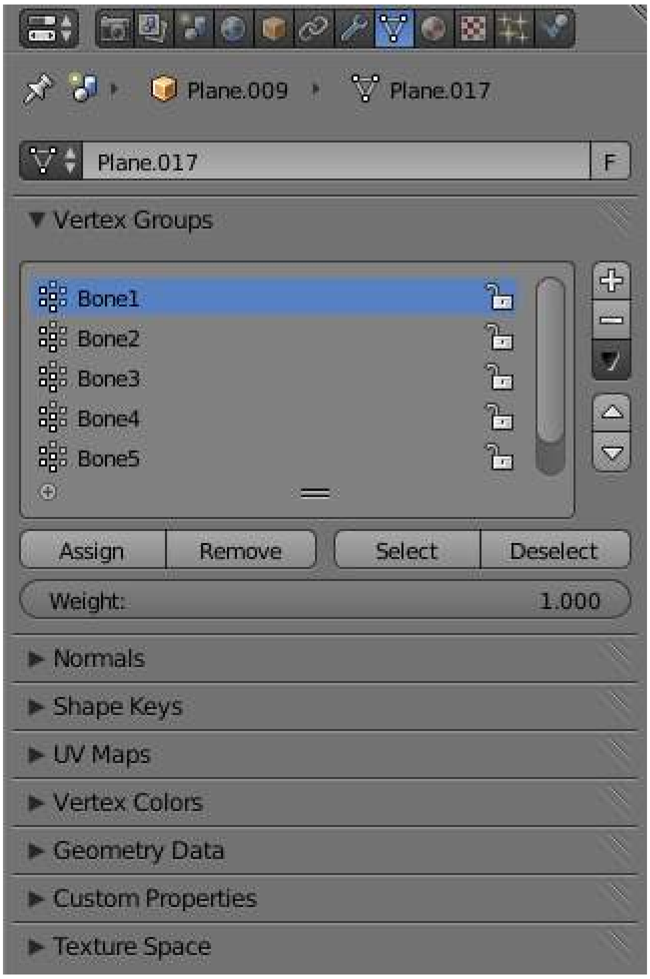


Figure 7 - Properties Editor > Object Data Context > Vertex Groups Panel with Assign Button and influence Weight Slider highlighted.

Once all these steps have been carried out, the Bones of the Armature Object should be associated with the Vertex Groups with the same names as the Bones. You can then select the Armature Object and switch to Pose Mode in the [3D View Editor Header > Mode Select Button]. See figure 8.

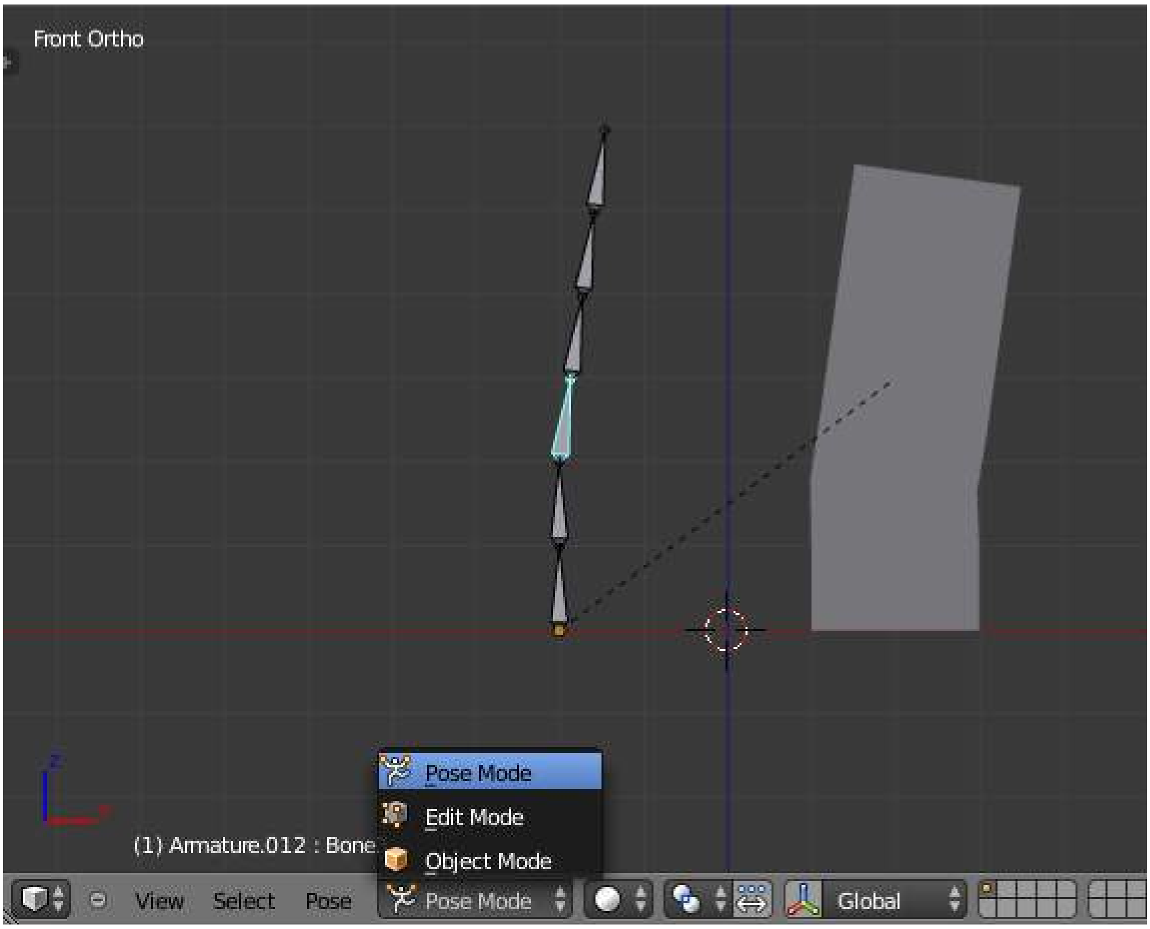


Figure 8 - 3D View Editor Header > Mode Select Button] set to Pose Mode, with Armature Bone highlighted in Cyan and effecting the Mesh Object

Once in Pose Mode transforming one of the Bones of the Armature that has been associated with vertices of an object will result in those vertices also being transformed.

Armature Deform Parent With Empty Groups

The Armature Deform With Empty Groups parenting method works in almost the same way as Armature Deform parenting with one difference. That difference is that when you parent a Child Object to an Armature Object the names of the bones in the armature are copied to the Child Objects in the form of newly created Vertex Groups, one for each different deforming armature bone name. The newly created Vertex Groups will be empty this means they will not have any vertices assigned to those Vertex Groups. You still must manually select the vertices and assign them to a particular Vertex Group of your choosing to have bones in the armature influence them.

For example if you have an Armature Object which consists of 3 bones named BoneA, BoneB and BoneC and Cube Mesh Object type called Cube. If you parent the Cube Child Object to the Armature Parent Object the Cube will get 3 new Vertex Groups created on it called BoneA, BoneB and BoneC. Notice that each Vertex Group is empty. See figure 21.

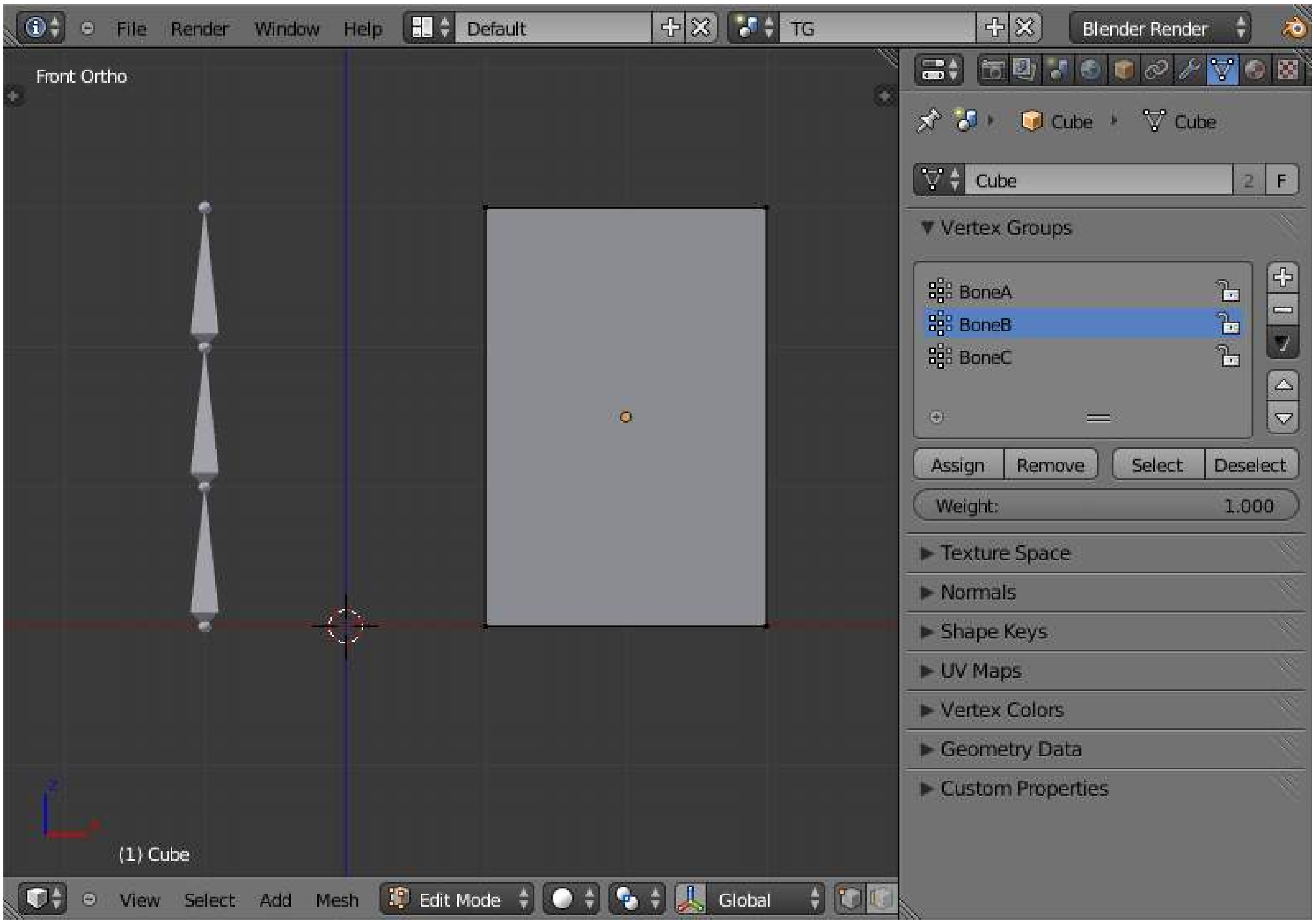


Figure 21 - Cube in Edit Mode showing the 3 created Vertex Groups after it was parented using Armature Deform With Empty Groups to an Armature with 3 Bones named BoneA, BoneB and BoneC with the Vertex Group Panel shown. All the Vertex Groups are empty.

Bones in an Armature can be generally classified into 2 different types:

- Deforming Bones
- Control Bones

Deforming Bones - Are bones which when transformed will result in vertices associated with them also transforming in a similar way. Deforming Bones are directly involved in altering the positions of vertices associated with their bones.

Control Bones - Are Bones which act in a similar way to switches, in that they control how other bones or objects react when they are transformed. A Control Bone could for example act as a sliding switch control, when the bone is in one position to the left it could indicate to other bones that they react in a particular way when transformed, when the Control Bone is positioned to the right, transforming other bones or objects could do something completely different. Control Bones are not directly used to alter the positions of vertices, in fact Control Bones often have no vertices directly associated with themselves.

When using the Armature Deform With Empty Groups parenting method Vertex Groups on the Child Object will only be created for Armature Bones which are setup as Deforming Bone types. If a Bone is a Control Bone no Vertex Group will be created on the Child Object for that bone.

To check weather a particular bone in an armature is a Deforming Bone simply switch to Pose Mode or Edit

Mode on the armature and select the bone you are interested in by RMB it. Once the bone of interest is selected navigate to [Properties Editor > Bone Context > Deform Panel] and check if the Deform tickable option is ticked or not. If it is the selected bone is a Deforming Bone, otherwise it is a Control Bone. See figure 22.

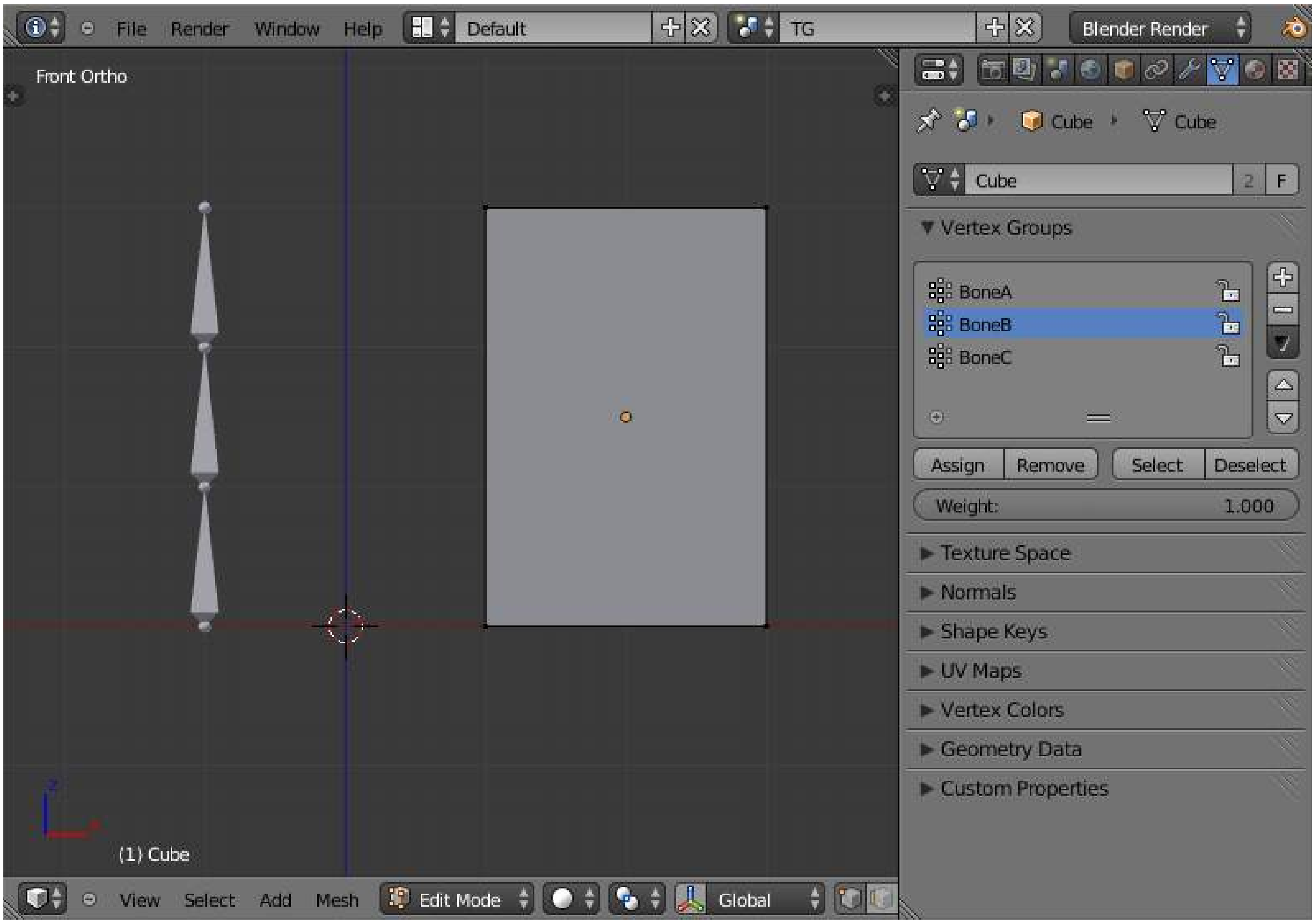


Figure 22 - 3 Bone Armature in Edit Mode with 2nd bone selected with [Properties Editor > Bone Context > Deform Panel] displayed an ticked, indicating the bone is a Deforming Bone.

Armature Deform With Automatic Weights

Armature Deform With Automatic Weights parenting feature does everything Armature Deform With Empty Groups does with one extra thing. That extra thing is that unlike Armature Deform With Empty Groups which leaves the automatically created Vertex Groups empty with no vertices assigned to them; Armature Deform With Automatic Weight will try to calculate how much Influence Weight a particular Armature Bone would have on a certain collection of vertices based on the distance from those vertices to a particular Armature Bone.

Once Bforartists has calculated the Influence Weight vertices should have it will assign that Influence Weight to the Vertex Groups that were previously created automatically by Bforartists on the Child Object when Armature Deform With Automatic Weights parenting command was carried out.

If all went well it should be possible to select the Armature Object switch it into Pose Mode and transform the bones of the Armature and the Child Object should deform in response. Unlike Armature Deform parenting you won’t have to create Vertex Groups on the Child Object, neither will you have to assign Influences Weights to those Vertex Groups, Bforartists will try to do it for you.

To activate Armature Deform With Automatic Weights you must be in Object Mode or Pose Mode, then select all the Child Objects (usually Mesh Object Types) and lastly select the Armature Object; Once done press `Ctrl-P` and select the Armature Deform With Automatic Weights from the Set Parent To pop-up dialog.

This method of parenting is certainly easier setup but it can often lead to Armatures which do not deform Child Objects in ways you would want, as Bforartists can get a little confused when it comes to determining which Bones should influence certain vertices when calculating Influence Weights for more complex armatures and Child Objects. Symptoms of this confusion are that when transforming the Armature Object in Pose Mode parts of the Child Objects don't deform as you expect; If Bforartists does not give you the results you require you will have to manually alter the Influence Weights of vertices in relation to the Vertex Groups they belong to and have influence in.

Armature Deform With Envelope Weights

Works in a similar way to Armature Deform With Automatic Weights in that it will create Vertex Groups on the Child Objects that have names matching those of the Parent Object Armature Bones. The created Vertex Groups will then be assigned Influence Weights. The major difference is in the way those Influence Weights are calculated.

Influence Weights that are calculated when using Armature Deform With Envelope Weights parenting are calculated entirely visually using Bone Envelopes. See figure 28.

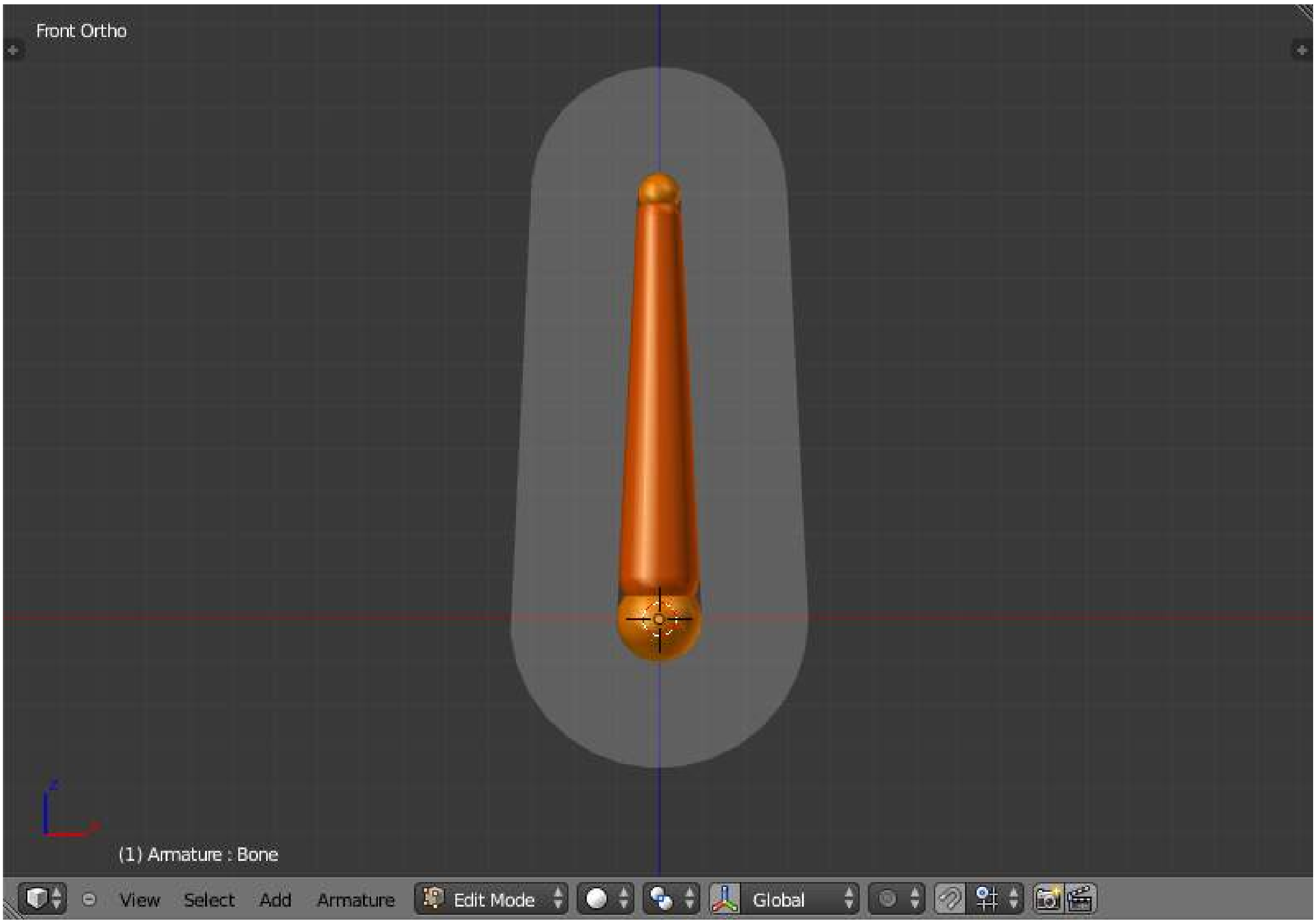


Figure 28 - Single Armature Bone in Edit Mode with Envelope Weight display enabled. The gray volume around the bone is the Bone Envelope.

Figure 28 shows a single Armature Bone in Edit Mode with Envelope Weight activated. The gray semi-transparent volume around the bone is the Bone Envelope.

Any Child Object that has vertices inside the volume of the Bone Envelope will be influenced by the Parent Object Armature when the Armature Deform With Envelope Weights operator is used. Any vertices outside the Bone Evelope volume will not be influenced. See figure 29.

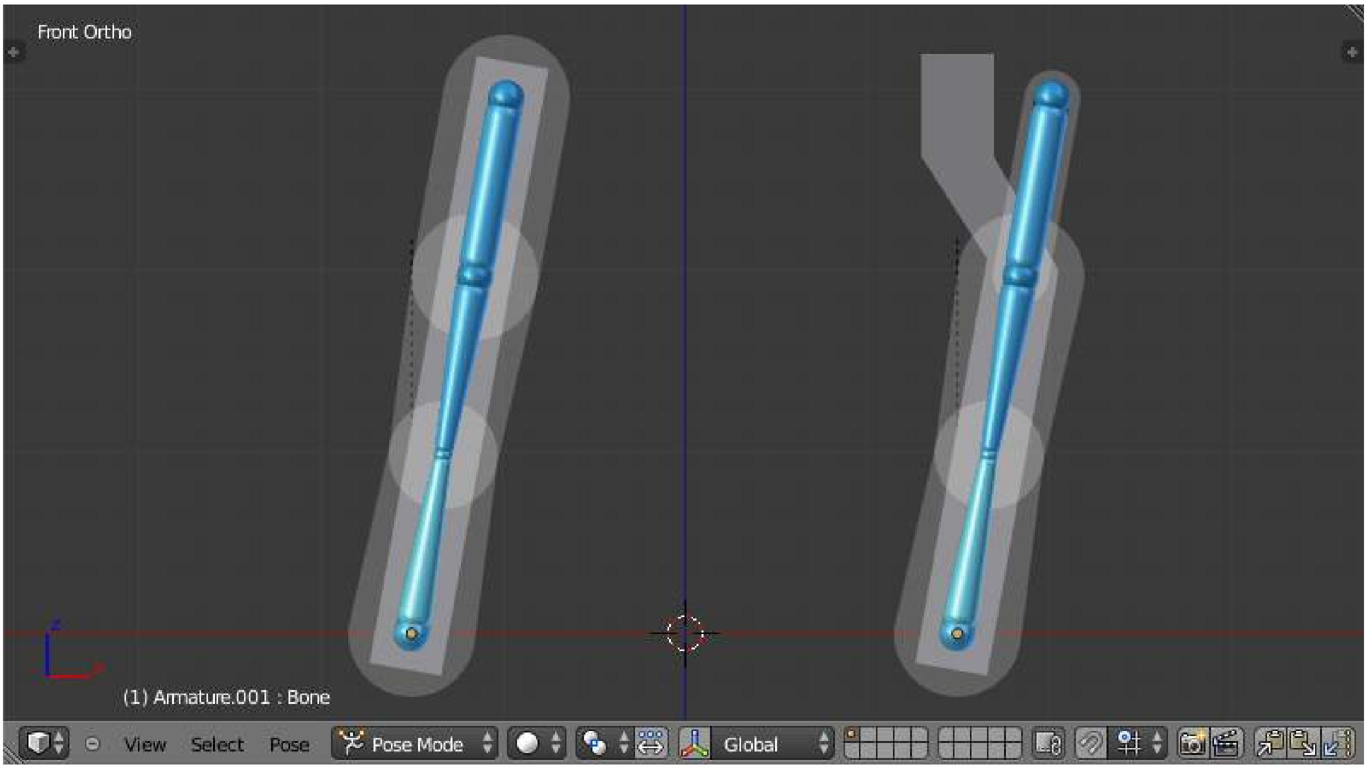
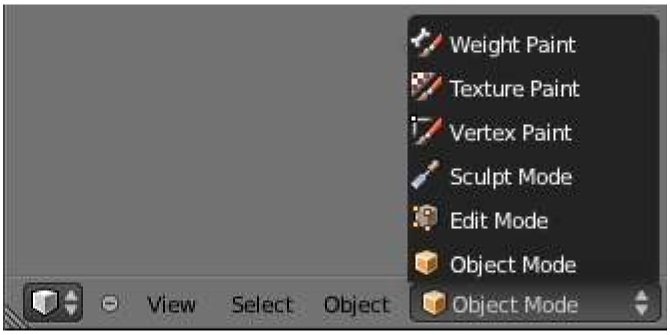


Figure 29 - 2 sets of Armatures each with 3 bones, the first set has all vertices inside the Bone Envelope, the second did not. When the bones are transformed in Pose Mode the results are very different.

The default size of the Bone Envelope volume does not extend very far from the surface of a bone; You can alter the size of the Bone Envelope volume by clicking on the body of the bone you want to alter, switch to Edit Mode or Pose Mode and then pressing `Ctrl-Alt-S` then drag your mouse left or right and the Bone Envelope volume will alter accordingly. See figure 30.

Modes

Modes are a Bforartists-level object-oriented feature, which means that *the whole Bforartists application* is always in *one and only one mode*, and that the available modes vary depending on the selected active object's type - most of them only enable the default *Object* mode (like cameras, lamps, etc.). Each mode is designed to edit an aspect of the selected object. See the *Bforartists's Modes* table below for details.



Mode selection example (mesh object).

You set the current mode in the *Mode* drop-down list of *3D View* header (see *Mode selection example (mesh object)*).

Warning

You can only select objects in *Object* mode. In all others, the current object selection is "locked" (except, to some extent, with an armature's *Pose* mode).

Modes might affect many things in Bforartists:

- They can modify the panels and/or controls available in some *Buttons* windows' contexts.
- They can modify the behavior of whole windows, like e.g. the *UV/Image Editor* window (and obviously, *3D View* s!).
- They can modify the available header tools (menus and/or menu entries, as well as other controls...). For example, in the *3D View* window, the *Object* menu in *Object* mode changes to a *Mesh* menu in *Edit* mode (with an active mesh object!), and a *Paint* menu in *Vertex Paint* mode...

We won't detail further more modes' usages here. Most of them are tackled in the *modeling chapter*, as they are mainly related to this topic. The *Particle* mode is discussed in the *particle section*, and the *Pose* and *Edit* modes for armatures, in the *rigging one*.

Note

If you are reading this manual and some button or menu option is referenced that does not appear on your screen, it may be that you are not in the proper mode for that option to be valid.

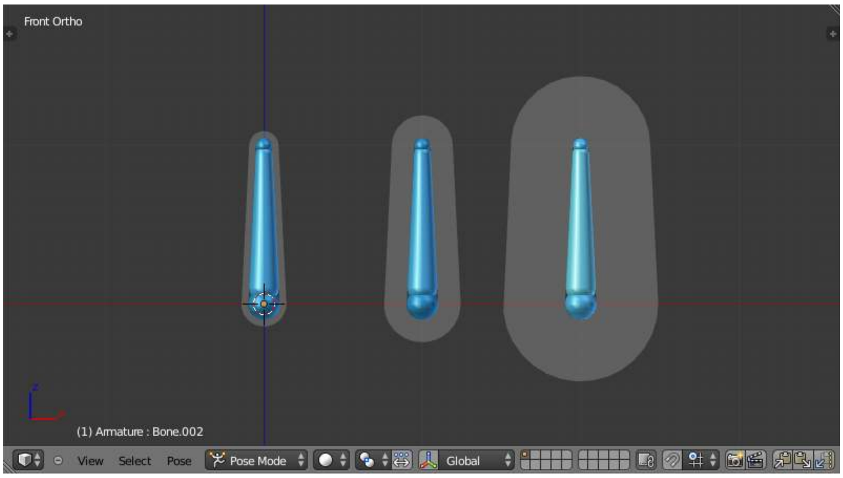


Figure 30 - Single Armature Bone with various different Bone Evelope sizes.

You can also alter the Bone Envelope volume by selecting the Bone you wish to alter and switching to Edit Mode or Pose Mode, then navigate to [Properties Editor > Bone Context > Deform Panel > Envelope Section > Distance field] then enter a new value into it. See figure 31.

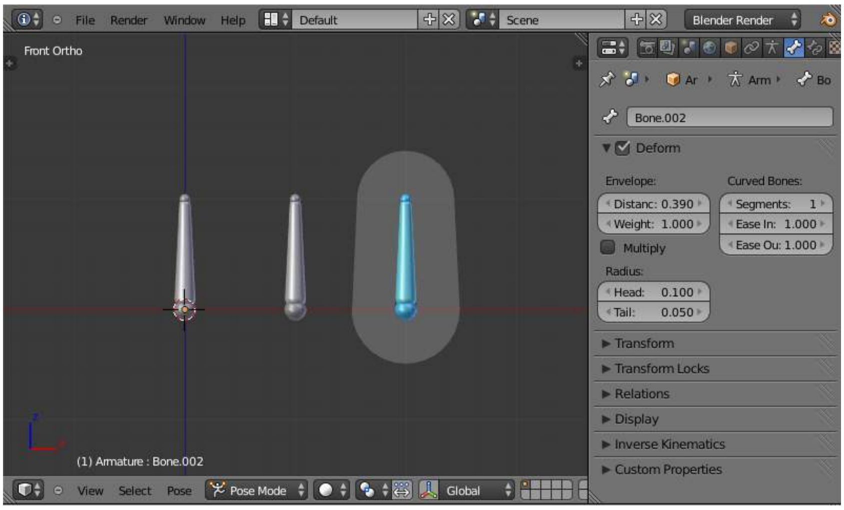


Figure 31 - [Properties Editor > Bone Context > Deform Panel > Envelope Section > Distance field] highlighted.

Altering the Bone Envelope volume does not alter the size of the Armature Bone just the range within which it can influence vertices of Child Objects.

You can alter the radius that a bone has by selecting the head, body or tail parts of a bone while in Edit Mode, and then press `Alt-S` and move the mouse left or right. This will make the selected bone fatter or thinner without altering the thickness of the Bone Envelope volume. See figure 32.

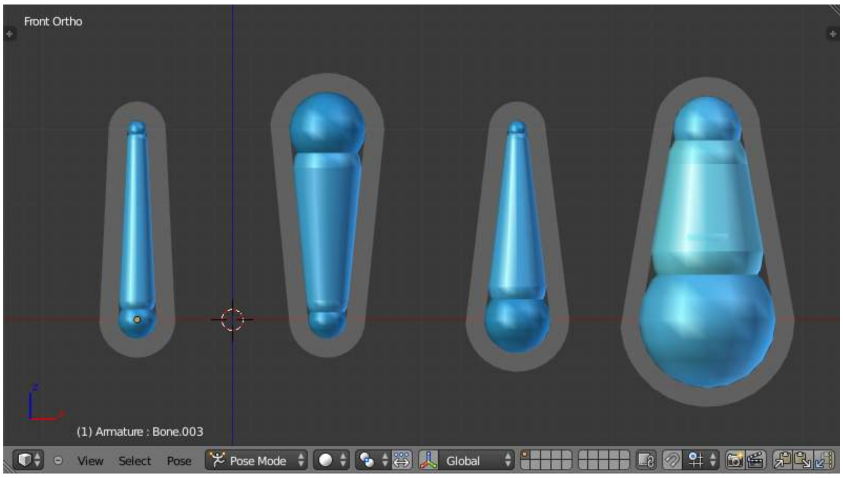


Figure 32 - 4 Armature Bones all using Envelope Weight. The 1st with a default radius value, the 3 others with differing Tail, Head and Body radius values.

You can also alter the bone radius by selecting the tail or head of the bone you wish to alter and switching to Edit Mode, then navigate to [Properties Editor > Bone Context > Deform Panel > Radius Section] and entering new values for the Tail and Head fields. See figure 33.

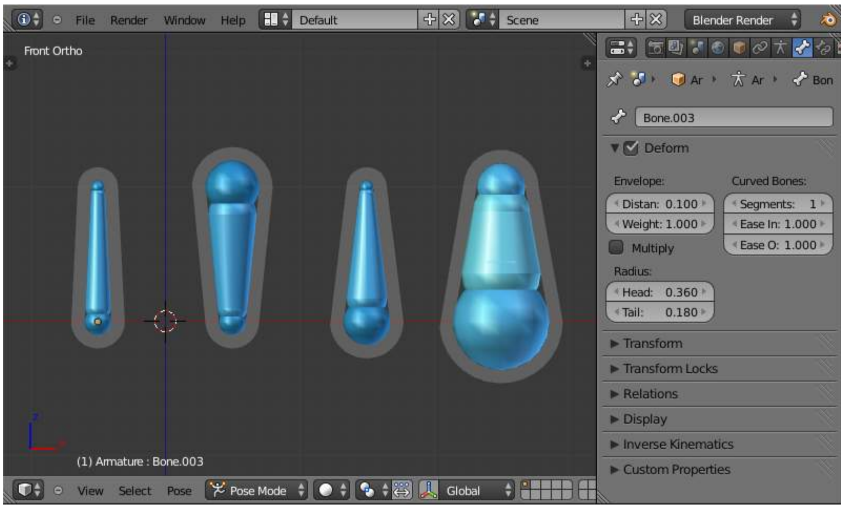


Figure 33 - [Properties Editor > Bone Context > Deform Panel > Radius Section] head and tail fields highlighted.

Note

If you alter the Bone Envelope volume of a bone so that you can have it include/exclude certain vertices after you have already used Armature Deform With Envelope Weights, by default the newly included/excluded vertices won’t be effected by the change. When using Armature Deform With Envelope Weights it only calculates which vertices will be affected by the Bone Envelope volume at the time of parenting, at which point it creates the required named Vertex Groups and assigns vertices to them as required. If you want any vertices to take account of the new Bone Envelope volume size you will have carry out the Armature Deform With Envelope Weights parenting again; In fact all parenting used in the Set Parent To pop-up dialog which tries to automatically assign vertices to Vertex Groups works like this.

Bone Parent

Bone parenting allows you to make a certain bone in an armature the Parent Object of another object. This means that when transforming an armature the Child Object will only move if the specific bone it is the Child

Object of moves. See figure 34.

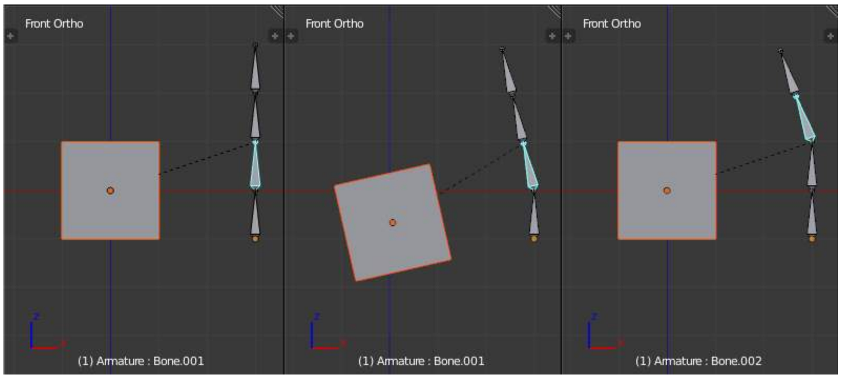


Figure 34 - 3 pictures of Armatures with 4 Bones, with the 2nd bone being the Bone Parent of the Child Object Cube. The Cube is only transformed if the 1st or 2nd bones are. Notice altering the 3rd and 4th bones has no effect on the Cone.

To use Bone Parenting, you must first select all the Child Objects you wish to parent to a specific Armature Bone, then `Shift-RMB` select the Armature Object and switch it into Pose Mode and then select the specific bone you wish to be the Parent Bone by `RMB` selecting it. Once done press `Ctrl-P` and select Bone from the Set Parent To pop-up dialog.

Now transforming that bone in Pose Mode will result in the Child Objects also transforming.

Relative Parenting

Bone Relative parenting is an option you can toggle for each bone. This works in the same way as Bone parenting with one difference.

With Bone parenting if you have parented a bone to some Child Objects and you select that bone and switch it into Edit Mode and then translate that bone; When you switch back into Pose Mode on that bone, the Child Object which is parented to that bone will snap back to the location of the bone in Pose Mode. See figure 37.

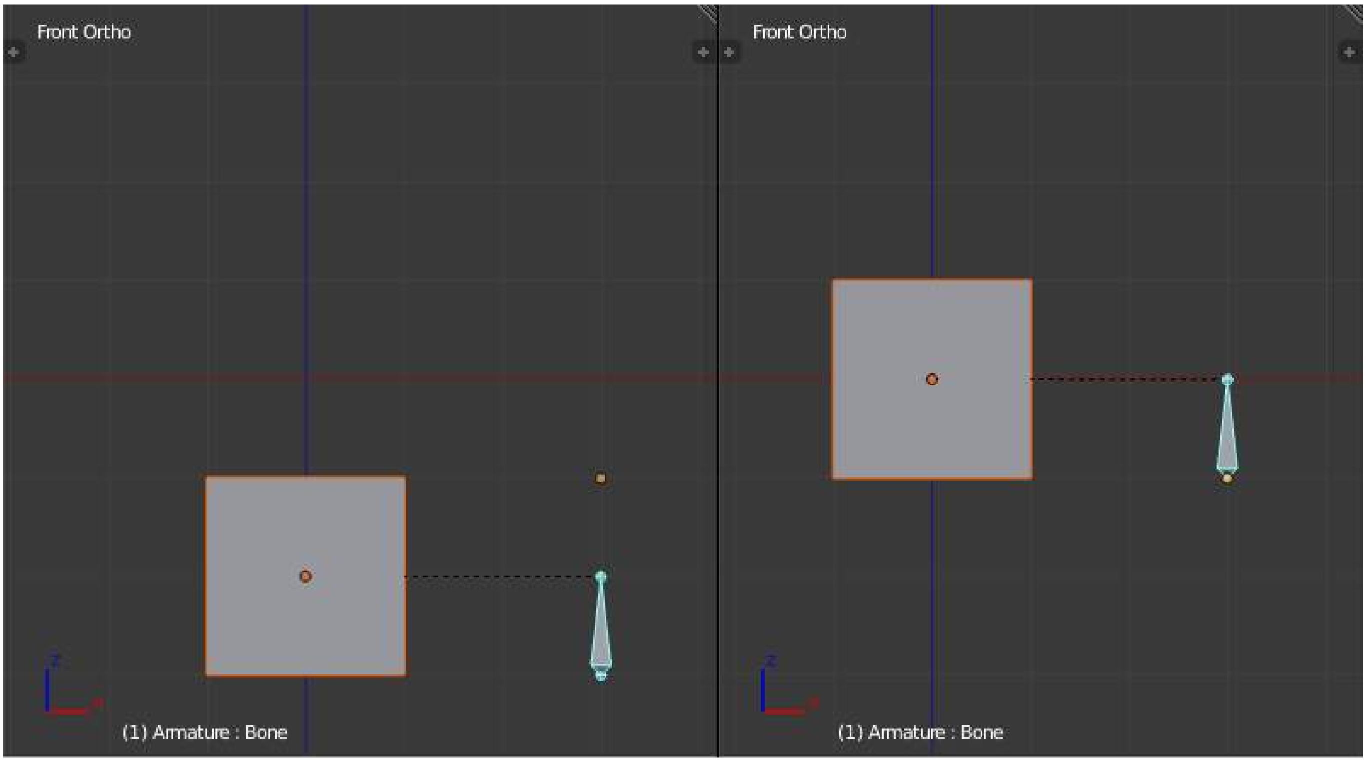


Figure 37 - [Single Armature Bone which has a Child Object cube parented to it using Bone parenting. 1st picture shows the position of the cube and armature before the bone is moved in Edit Mode. 2nd picture shows the position of the cube and armature after the bone was selected in Edit Mode, moved and switched back into Pose Mode. Notice that the Child Object moves to the new location of the Pose Bone.

Bone Relative parenting works differently; If you move a Parent Bone in Edit Mode, when you switch back to Pose Mode, the Child Objects will not move to the new location of the Pose Bone. See figure 38.

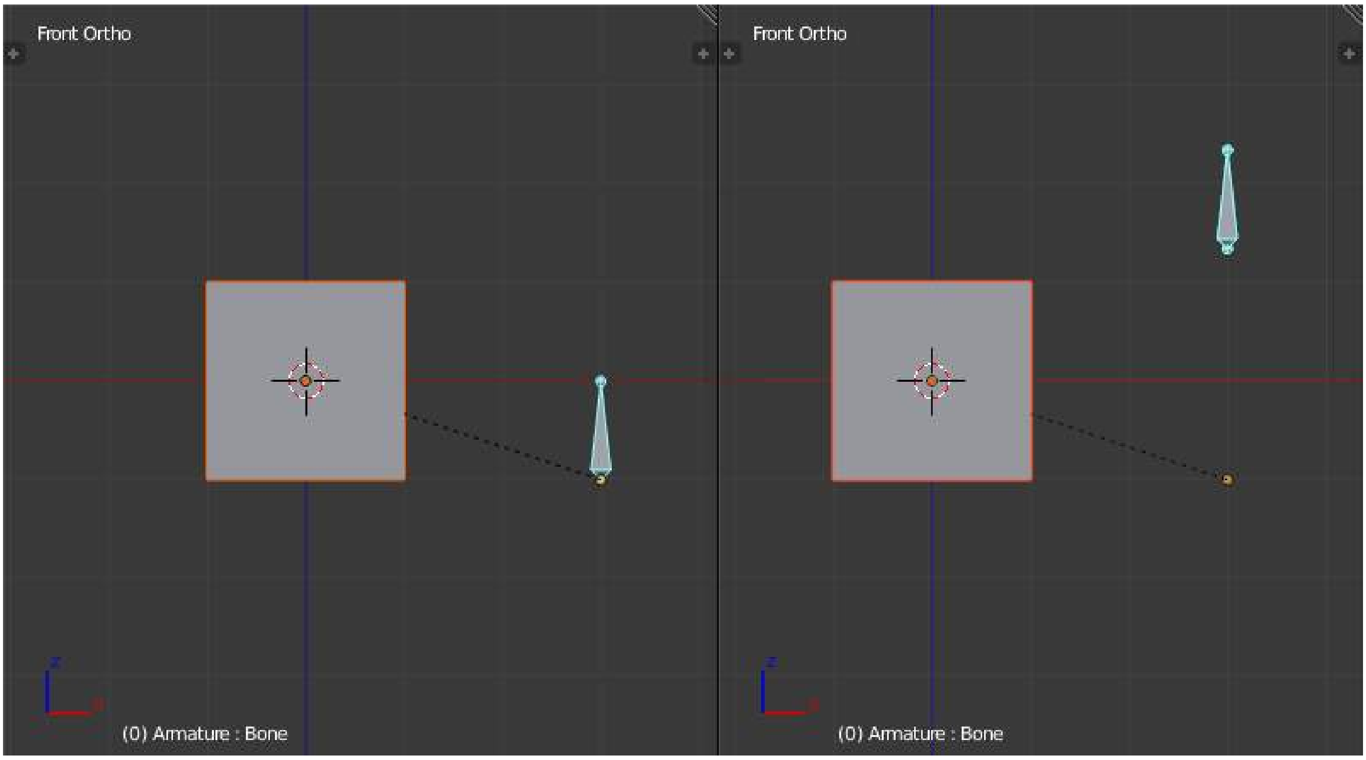


Figure 38 - [Single Armature Bone which has a Child Object cube parented to it using Bone Relative parenting. 1st picture shows the position of the cube and armature before the bone is moved in Edit Mode. 2nd picture shows the position of the cube and armature after the bone was selected in Edit Mode, moved and switched back into Pose Mode. Notice that the Child Object does not move to the new location of the Pose Bone.

Vertex Parent

You can parent an object to a single vertex or a group of three vertices as well; that way the child/children will move when the parent mesh is deformed, like a mosquito on a pulsing artery.

Vertex Parent from Edit Mode

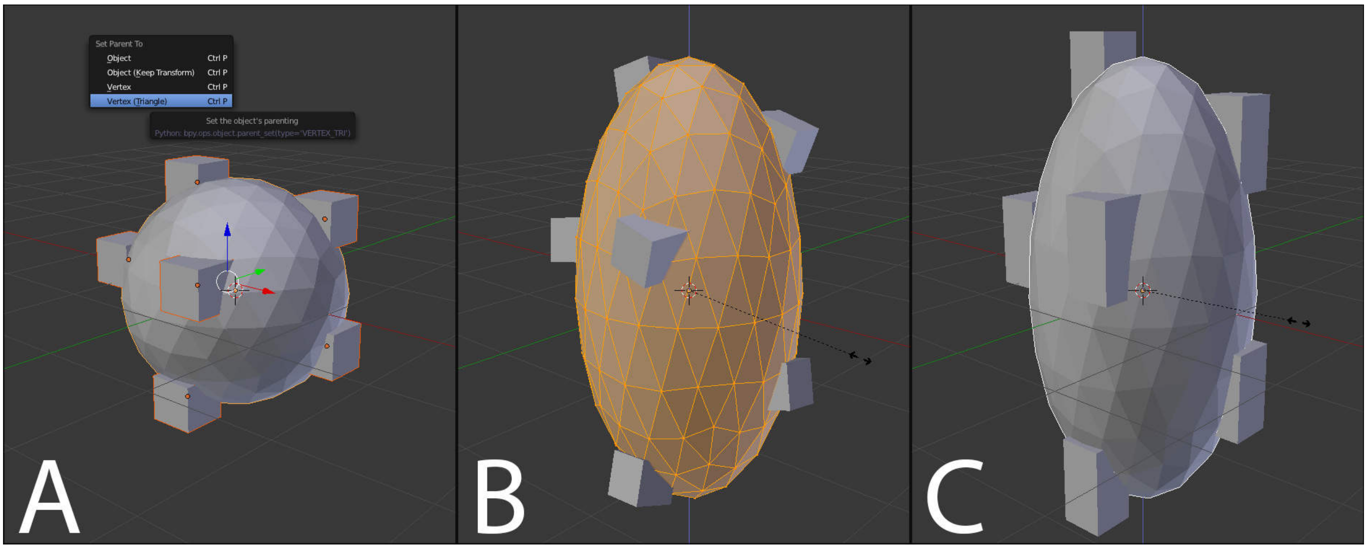
In *Object* mode, select the child/children and then the parent object. `Tab` into *Edit mode* and on the parent object select either one vertex that defines a single point, or select three vertices that define an area (the three vertices do not have to form a complete face; they can be any three vertices of the parent object), and then press `Ctrl-P` and confirm.

At this point, if a single vertex was selected, a relationship/parenting line will be drawn from the vertex to the child/children. If three vertices were selected then a relationship/parenting line is drawn from the averaged center of the three points (of the parent object) to the child/children. Now, as the parent mesh deforms and the chosen parent vertex/vertices move, the child/children will move as well.

Vertex Parent from Object Mode

Vertex parenting can be performed from object mode, This is done like regular object parenting, Press `Ctrl-P` in object mode and select *Vertex* or *Vertex (Triangle)*.

The nearest vertices will be used from each object which is typically what you would want.



See:

1. The small cubes can each be automatically parented to a triad of nearby vertices on the icosphere using the "Vertex (Triangle)" in the set parent context menu.
2. Reshaping the object in edit mode then means each of the cubes follows their vertex triad parent separately.
3. Re-scaling the parent icosphere in object mode means the child cubes are also rescaled as expected.

The parent context menu item means users can rapidly set up a large number of vertex parent relationships, and avoid the tedious effort of establishing each parent-child vertex relationship separately.

Note

It is in fact a sort of "reversed" *hook*

Options

Move child

You can *move* a child object to its parent by clearing its origin. The relationship between the parent and child isn't affected. Select the child object and press `Alt-O`. By confirming the dialog the child object will snap to the parent's location. Use the *Outliner* view to verify that the child object is still parented.

Remove relationship/Clear Parent

You can *remove* a parent-child relationship via `Alt-P`

The menu contains:

Clear Parent

If the parent in the group is selected nothing is done. If a child or children are selected they are disassociated from the parent, or freed, and they return to their *original* location, rotation, and size.

Clear and Keep Transformation
Frees the children from the parent, and *keeps* the location, rotation, and size given to them by the parent.

Clear Parent Inverse
Places the children with respect to the parent as if they were placed in the Global reference. This effectively clears the parent's transformation from the children. For example, if the parent is moved 10 units along the X axis and *Clear Parent Inverse* is invoked, any selected children are freed and moved -10 units back along the X axis. The "Inverse" only uses the last transformation; if the parent moved twice, 10 units each time for a total of 20 units, then the "Inverse" will only move the child back 10 units, not 20.

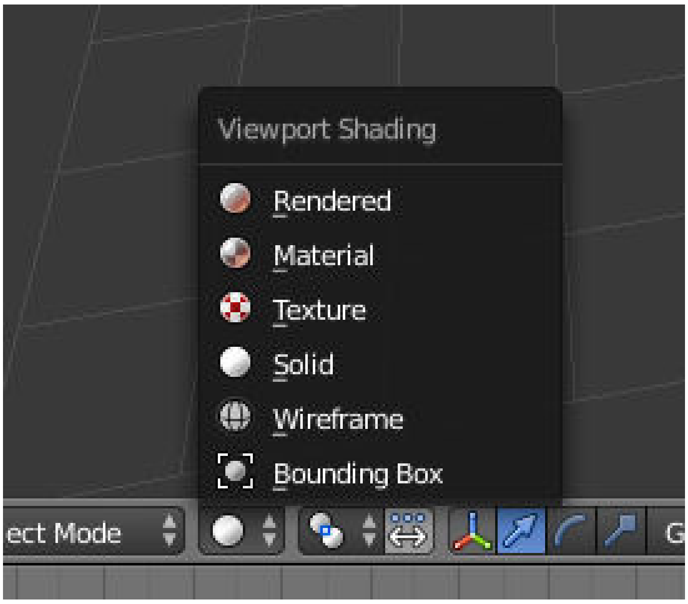
Hints

Outliner view

There is another way to see the parent-child relationship in groups and that is to use the *Outliner* view of the *Outliner window*. Image (*Outliner view*) is an example of what the *Outliner* view looks like for the (*Parenting Example*). Cube `A`'s object name is `Cube_Parent` and cube `B` is `Cube_Child`.

Shading

Shading Modes



Shading refers to the way objects are drawn and lit in the 3D View.

Rendered
An accurate representation using the selected *Render Engine* and lit with the visible scene lights.

Material
A fast approximation of the applied material. Some effects, such as procedural textures may not be shown.

Textured
Shows meshes with an image applied using the mesh's active UV Map. For Cycles materials, the image is the last one selected in the Node Editor. For other render engine's, the UV Map's applied face texture will be shown.

Solid
The default drawing mode using solid colored surfaces and simple lighting.

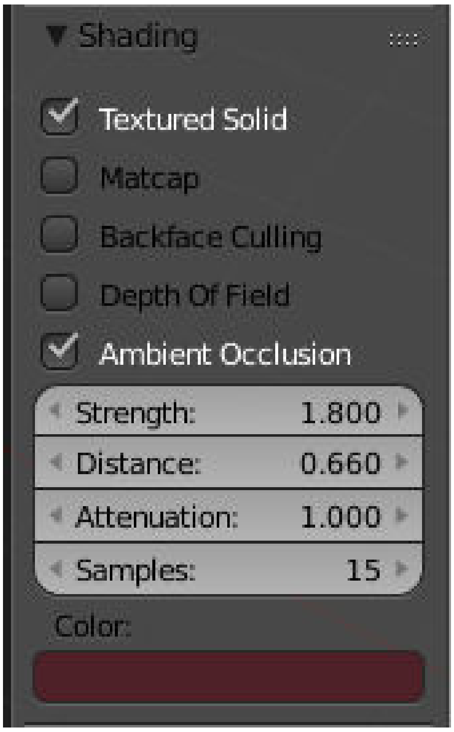
Wireframe
Objects appear as a mesh of lines representing the edges of faces and surfaces.

Bounding Box
Shows only the rectangular boxes that outlines an object's size and shape.

Except for *Rendered*, these shading modes are not dependent on light sources in the scene. Instead they use a simple default lighting adjusted by the *Solid OpenGL Lights* controls on the *System* tab of the *User Preferences* window.

The viewport shading controls the appearance of all objects in a scene, but this can be overridden for individual objects using the Display panel in their Object Properties.

Shading Panel



3D Viewport Shading Panel.

The shading panel in the Properties Region provides additional control over the way objects in the 3D view appear.

Textured Solid
: Display assigned face textures in the *Solid* shading mode. *(Not available in the Cycles Render Engine)*

Matcap
: A selection of preset shader effects, (overriding regular materials) which can help visualize your models while editing or sculpting, without having to set up complex materials first.

Backface Culling
: Only show the front side of faces. Use this to find faces flipped the wrong way, especially when exporting to programs that use single sided drawing.

Depth of Field
: Simulates a camera's focal blur effect in the 3D viewport. *Only visible in a camera view*. Control the effect using these options in the Properties Tab of the active camera: Focal Length, Sensor Size, Focus Object or Focus Distance, and Viewport F-stop.

Ambient Occlusion
: Improves the realism of the viewport image by simulating the darkening effect that occurs in crevices and corners. Typically such effects are rendered at higher quality, but this is a quick real-time preview which can help when modelling or sculpting.

  These settings control the AO effect.

  Strength
  : A higher number makes the corners darker.

  Distance
  : How far out of the corners does the effect extend.

  Attenuation
  : How strongly the effect attenuates with distance. Increasing this makes far away surfaces contribute less to the effect. Use this to get rid of some banding artifacts.

  Samples
  : The number of samples used for the effect. Low numbers produce a grainy effect, but the actual number used is squared so use high numbers with caution.

  Color
  : Color of the effect, can be modified to give a different feel, from ambient lighting to dirt/rust.

Display

Display Panel

Only Render

Displays only items that will be rendered.

This can be is useful to preview how animations look without being distracted by rigs, empties, lights & cameras.

Useful to enable with *OpenGL Render*.

Outline Selected
: If disabled, the pink outline around your selected objects in *Solid* / *Shaded* / *Textured* draw types will no longer be displayed.

All Object Origins
: If enabled, the center dot of objects will always be visible, even for non-selected ones (by default, unselected centers might be hidden by geometry in solid/shaded/textured shadings).

Relationship Lines
: Controls whether the dashed parenting, constraining, hooking, etc., lines are drawn.

3D Cursor

Shows or hides the 3D cursor.

Groundgrid
: Shows or hides the whole grid. This also affects the orthogonal views like Top View

Grid Floor

If disabled, you have no grid in other views than the orthographic top/front/side ones.

X Axis, Y Axis, Z Axis
: Control which axes are shown in other views than the orthographic top/front/side ones.

Lines
: Controls the number of lines that make the grid in non-top/front/side orthographic views, in both directions.

Scale
: Control the scale of the grid floor

Subdivisions
: Controls the number of sub-lines that appear in each cell of the grid when you zoom in, so it is a setting specific to top/front/side orthographic views.

Toggle Quad View
: Toggles the four pane 3D view. *Read more about arranging areas*

View Panel

The *View Properties* panel lets you set other settings regarding the 3D view. You can show it with the View ‣ View Properties... menu entry.

Lens
: Control the focal length of the 3d view camera in millimeters, unlike a *rendering camera*

Lock to Object

By entering the name of an object in the *Object* field, you lock your view to this object, i.e. it will always be at the center of the view (the only exception is the active camera view, `Numpad0`). If the locked object is an armature, you can further center the view on one of its bones by entering its name in the *Bone* field.

Lock to Cursor

Lock the center of the view to the position of the 3D cursor

Lock Camera to View

When in camera view, use this option to move the camera in 3D space, while continuing to remain in camera view.

Clip Start and Clip End

Adjust the minimum and maximum distances to be visible for the view-port.

Note

A large clipping range will allow you to see both near and far objects, but reduces the depth precision.

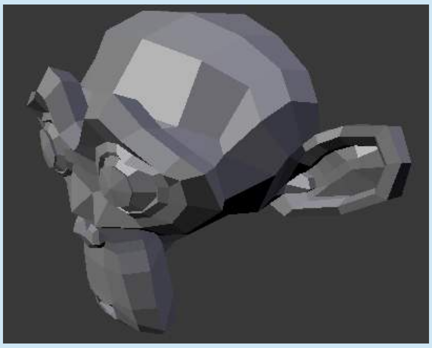
To avoid this:

- increase the near clipping when working on large scenes.
- decrease the far clipping when objects are not viewed at a distance.

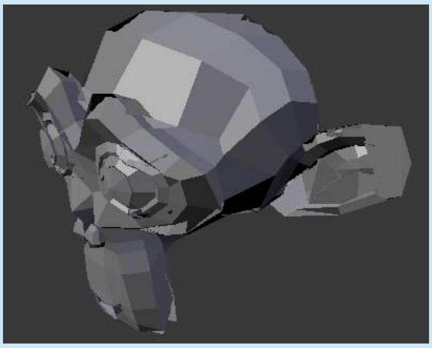
When perspective is disabled only the far Clip-End is used, very high values can still give artifacts.

This is not specific to Bforartists, all OpenGL/DirectX graphics applications have these same limitations.

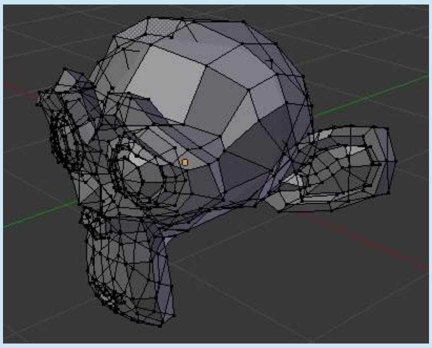
Examples:



Model with no clipping artifacts.



Model with clipping artifacts.



Mesh with artifacts in edit-mode.

Local Camera
: Active camera used in this view

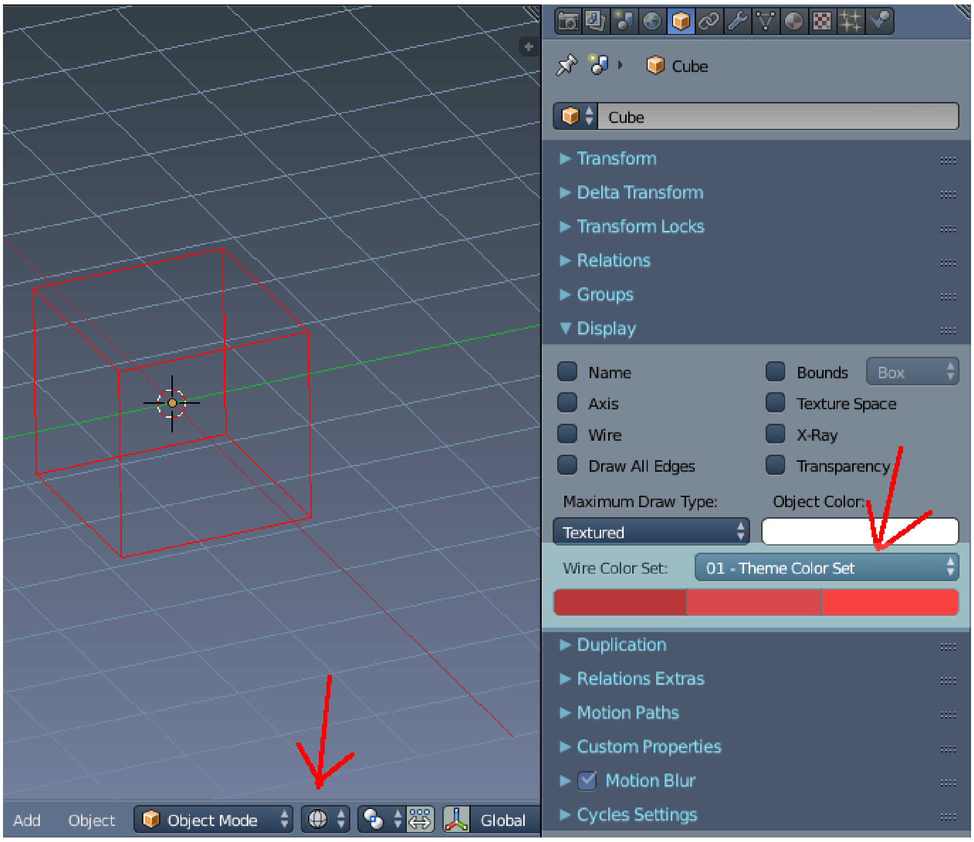
Render Border
: Use a Render Border when not looking through a camera. Draw a border region will automatically enable this option.

Custom Wireframe Colors

Reference
Mode: *Object* mode + Wireframe mode or Solid mode
Menu: Properties Editor > Object tab > Display panel

Sometimes it is useful to give objects in the scene different colors to have a better way to divide them visually. When you have a complex building with different parts for example

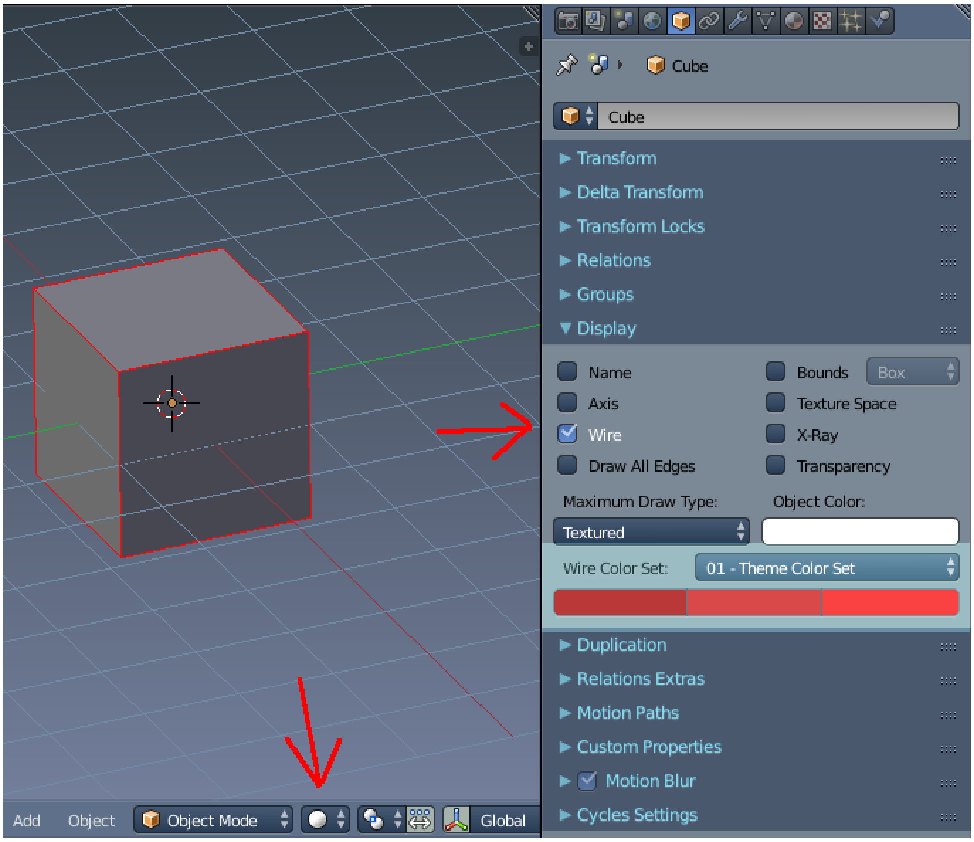
Bforartists comes with the ability to set up custom wireframe colors per mesh object. You can activate them in the Properties Editor in the Object tab in the Display panel.



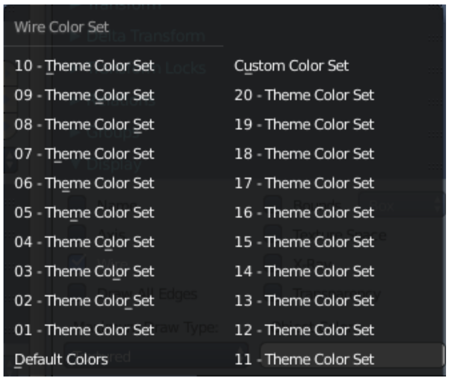
The custom wireframe colors is meant for theWireframe mode. But you can also use it in Solid mode. There just the outline shows in the custom color then.

But you can show the wire at an solid object by ticking the Wire checkbox. Best in conjunction with Draw all Edges. Or not all edges might be drawn.

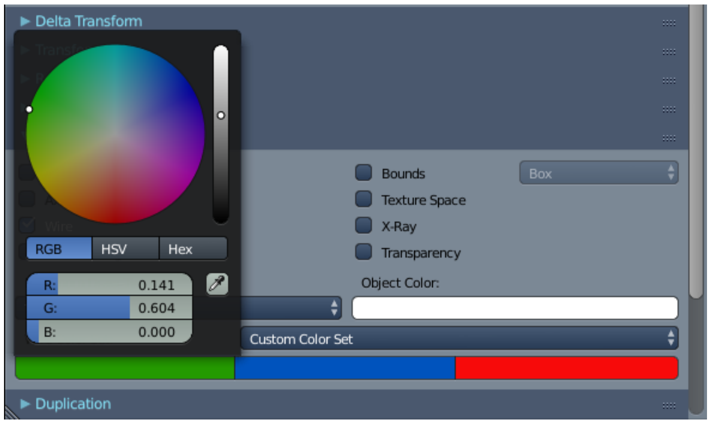
The custom wireframe colors just shows up in Wire mode and in Solid mode. In all other modes it does not show. Even when Wire is ticked.



The wireframe color dropdown box allows you to choose between different pre defined wireframe colour sets.



The custom color set allows you to customize the colors. Switch to Custom Color set. Then click at one of the three colors below to open the color picker.



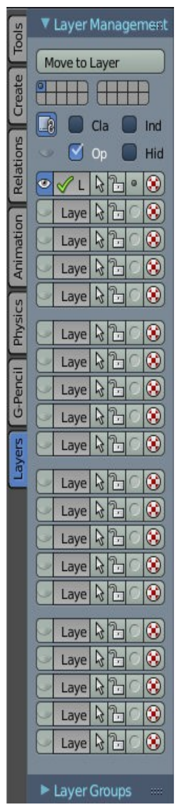
Layers

Reference

Mode: *Object* mode

Panel: *Relations* (*Object* context)

Menu: Object ‣ Move to Layer...



3D scenes often become exponentially more confusing as they grow more complex. Sometimes the artist also needs precise control over how individual objects are lit, and does not want lights for one object to affect nearby objects. For this and other reasons below, objects can be placed into one or more “layers”. Using object layers, you can:

- Selectively display objects from certain layers in your 3D view, by selecting those layers in the *3D View* header bar. This allows you to speed up interface redrawing, reduce virtual-world clutter, and help improve your workflow.
- Control *which lights illuminate an object*, by making a light illuminate only the objects on its own layer(s).

- Control which forces affect which *particle systems*, since particles are only affected by forces and effects on the same layer.
- Control which layers are rendered (and hence, which objects), and which properties/channels are made available for compositing by using *render layers*.

Armatures can also become very complex, with different types of bones, controllers, solvers, custom shapes, and so on. Since armatures are usually located close together, this can quickly become cluttered. Therefore, Bforartists also provides layers just for armatures. Armature layers are very similar to object layers, in that you can divide up an armature (rig) across layers and only display those layers you wish to work on.

Working with Layers

3D layers differ from the layers you may know from 2D graphics applications as they have no influence on the drawing order and are there (except for the special functions listed above) mainly to allow you to organize your scene.

When rendering, Bforartists only renders the selected layers. If all your lights are on a layer that is *not selected*, you won't see anything in your render except for objects lit by ambient lighting.

Groups and *Parents* are other ways to logically group related sets of objects.

Viewing layers

Bforartists provides twenty layers whose visibility can be toggled with the small unlabeled buttons in the Layer Management panel in the Tool Shelf. To select a single layer, click the appropriate button with `LMB`; to select more than one, use `Shift-LMB` - doing this on an already active layer will deselect it.

Locking to the scene

By default, the lock button directly to the right of the layer buttons is enabled. This means that changes to the viewed layers affect all other 3D Views locked to the scene - see the *navigating the 3D view options page* for more information.

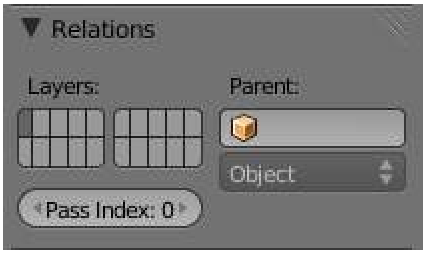
Multiple Layers

An object can exist on multiple layers. For example, a lamp that only lights objects on a shared layer could "be" on layers 1, 2, and 3. An object on layers 3 and 4 would be lit, whereas an object on layers 4 and 5 would not. There are many places where layer-specific effects come into play, especially lights and particles.

Moving objects between layers

Object context selection.

The way to change a selected object layer is via the *Relations* panel, in the *Object* context.



Layers in Object context, Relations panel.

You will then see the layer buttons in the *Relations* panel - as before the object can be displayed on more than one layer by clicking `Shift-LMB`.

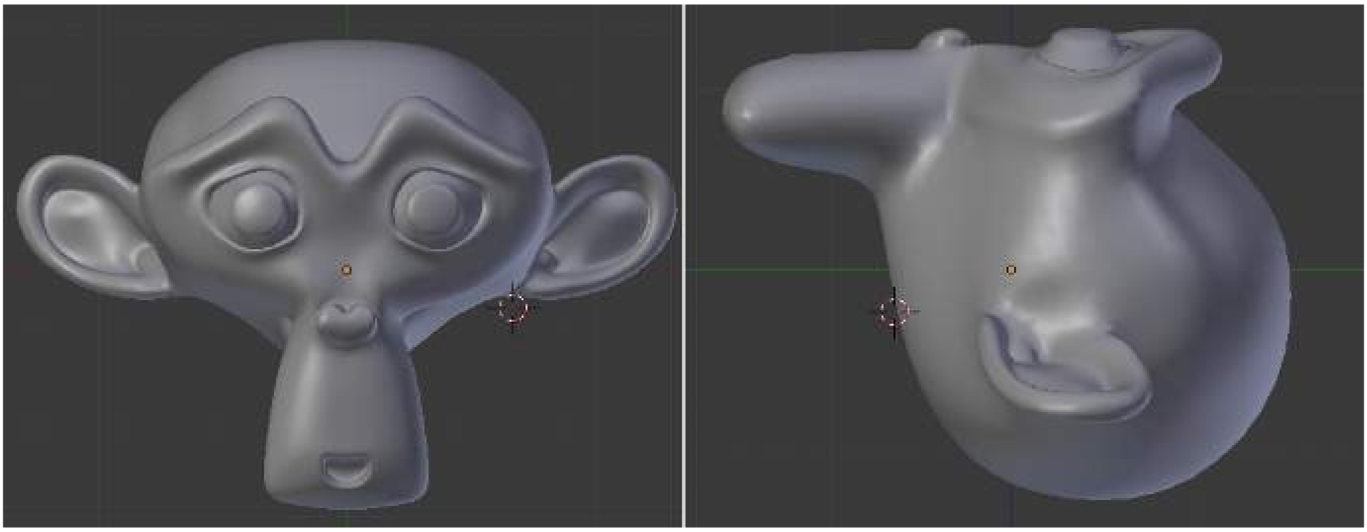
3D Cursor

The 3D Cursor is simply a point in 3D space which can be used for a number of purposes

Placement

There are a few methods to position the 3D cursor.

Direct Placement with the Mouse



Positioning the 3D cursor with two orthogonal views.

Using `LMB` in the 3D area will place the 3D cursor directly under your mouse pointer.

For accuracy you should use two perpendicular orthogonal 3D views, i.e. any combination of top (`Numpad7`), front (`Numpad1`) and side (`Numpad3`). That way you can control the positioning along two axes in one view and determine depth in the second view.

To place the 3D Cursor on the surface of geometry, enable *Cursor Depth* in the *User Preferences*

Using the Snap Menu

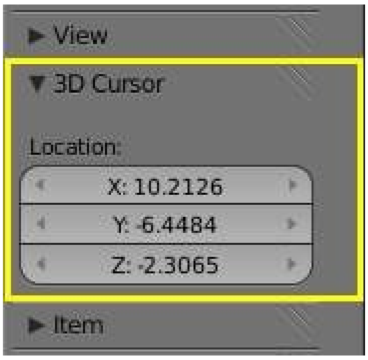
The *Snap* menu (`Shift-S` or Object/Mesh ‣ Snap) will allow you to snap the cursor in the following ways:

Cursor to Selected
    Snaps the cursor to the center of the current selection.
Cursor to Center
    Snaps the cursor to the origin of the scene (location 0,0,0).
Cursor to Grid
    Snaps the cursor to the nearest *visible* grid lines.
Cursor to Active
    Snaps the cursor to the *active* (last selected) object, edge, face or vertex.

The *Cursor to Selected* option is also affected by the current Pivot Point. For example:

- With the *Bounding Box Center* pivot point active, the *Cursor to Selected* option will snap the 3D cursor to the center of the bounding box surrounding the objects' centers.
- When the *Median Point* pivot point is selected, *Cursor to Selected* will snap the 3D cursor to the median of the object centers.

Numeric Input

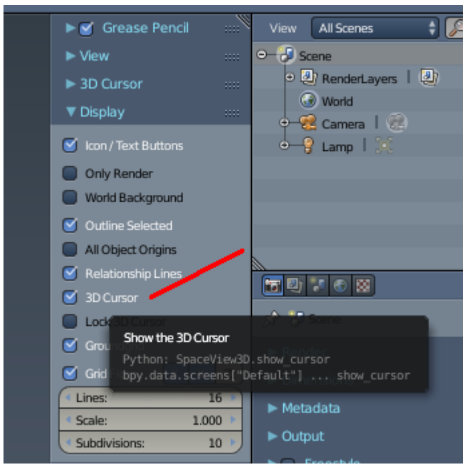


The 3D Cursor panel of the Properties shelf.

Hiding the 3D cursor

The 3D cursor is very handy. Several operations are performed by using the 3D cursor. New objects gets created at the 3D Cursor location. You can place it around and snap elements to it, and so on.

But the visual part is sometimes very disturbing. You can hide it in the Properties sidebar in the Display section.



Background Images

Reference
Editor: *3D View*

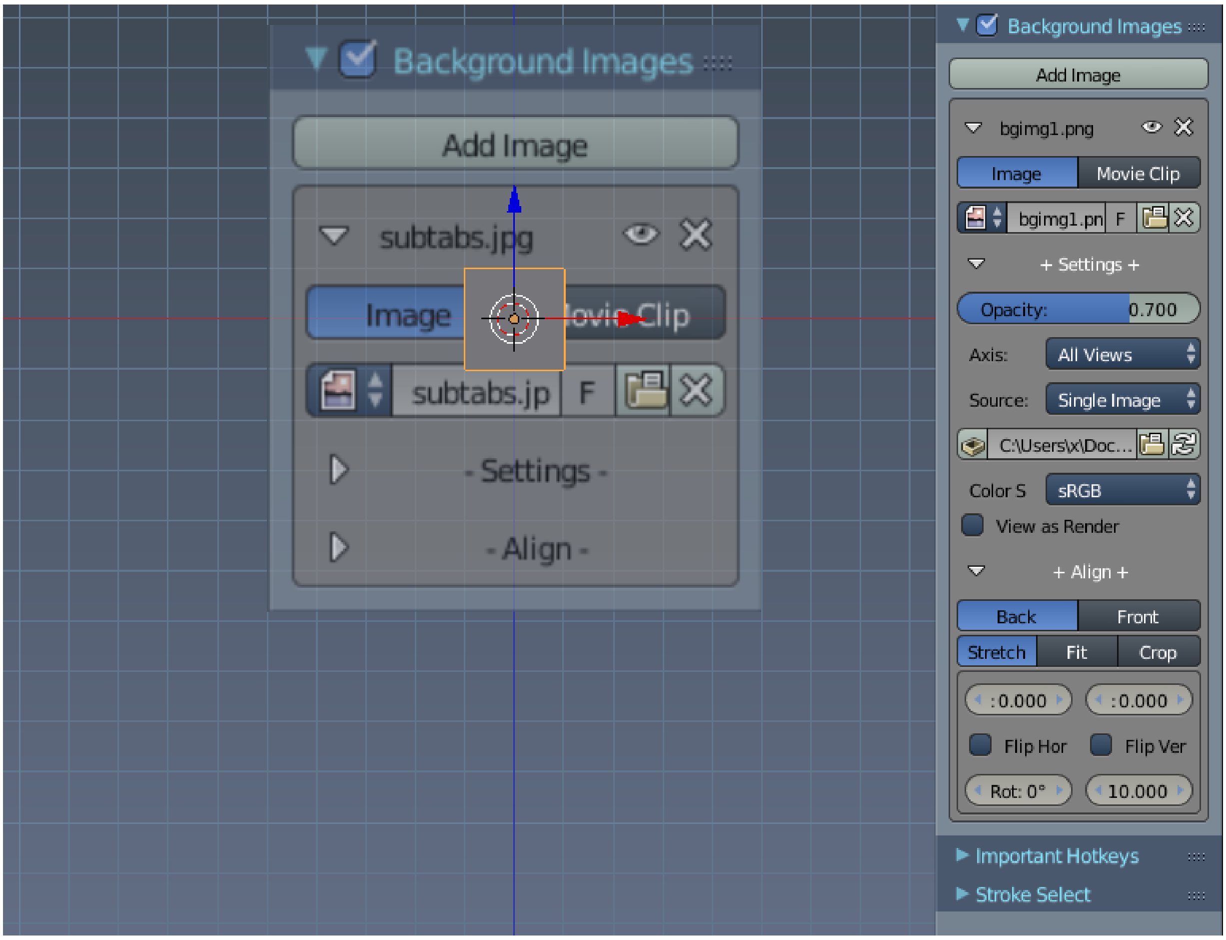
Panel: *Background Image*

A background picture in your 3D view is very helpful in many situations: modeling is obviously one, but it is also useful when painting (e.g. you can have reference pictures of faces when painting textures directly on your model...), or animation (when using a video as background), etc.

Note

Background images are only available for orthographic views.

Settings



The panel has two subtabs. Settings and Align. They are closed by default.

Axis
: Choose which views the image is visible from. This is helpful when you have several reference images from different views (e.g. top, front and side).

Data Source
: The source of the background image.

  Image
  : Use an external image, image sequence, video file or generated texture.

  Movie Clip
  : Use one of the Movie Clip data-blocks.

Opacity

Controls the transparency of the background image.

Front/Back

Choose whether the image is shown behind all objects, or in front of everything.

Stretch/Fit/Crop

Controls how the image is placed in the camera view.

Stretch

Forces the image dimensions to match the camera bounds (may alter the aspect ratio).

Fit

Scales the image down to fit inside the camera view without altering the aspect ratio.

Crop

Scales the image up so that it fills the entire camera view, but without altering the aspect ratio (some of the image will be cropped)

X/Y

Position the background image using these offsets.

In orthographic views, this is measured in the normal scene units. In the camera view, this is measured relative to the camera bounds (`0.1` will offset it by 10% of the view width/height)

Flip Horizontally

Swap the image around, such that the left side is now on the right, and the right now on the left.

Flip Vertically

Swap the image around, such that the top side is now on the bottom, and the bottom now on the top.

Rotation

Rotate the image around its center.

Size

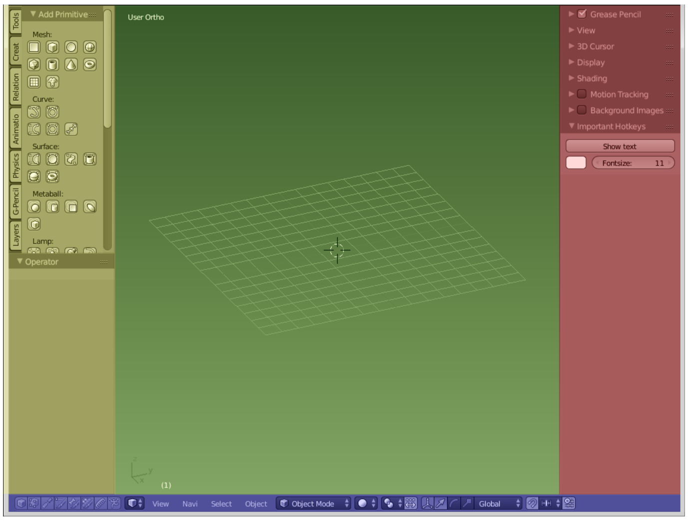
Scale the image up or down from its center.

3D View by tools - Tool Shelf

Detailed Table of content

3D View by tools - Tool Shelf

Introduction



The 3D View is made of several areas.

Yellow is the Tool Shelf.

Blue is the Header or Menu bar. It can be at the top or the bottom.

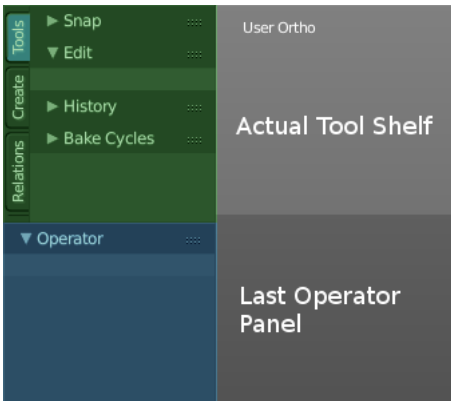
Green is the Viewport. Here you will see and work with your 3D data.

Red is the Properties Sidebar.

The content of the Tool Shelf , the Header and the Properties Sidebar can vary. It depends of the type of the objects and the modes that you are in.

This chapter here is about the Tool Shelf.

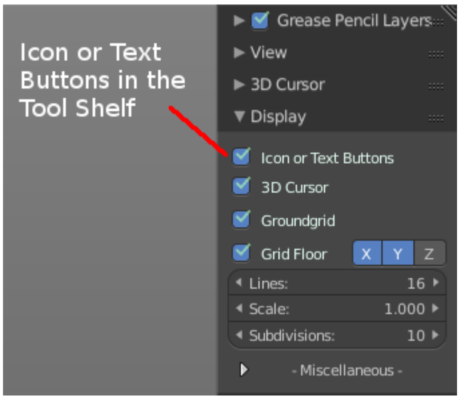
Tool Shelf



The Tool Shelf is split into two areas. The upper area with the tabs is the actual tool shelf where you find your tools. It is also a usual place where add-ons gets installed, and adds their tab too.

The lower area is the so called Last Operator panel. The Last operator Here you will find settings of various types. For example adjustable settings for a new created primitive. In other software you will get this settings before you perform the tool. In Blender you get the settings after you perform the tool.

The tool shelf shelf part is made of several tabs. Tabs and content is varying dependant of what object type you use, and in what object mode you are. We will go through the tools by modes and object types.



The tool shelf itself contains icon buttons by default. The tool tips tells you the name of the tool. But you can also turn the buttons into Text and Icon Buttons. Which makes it easier to recognize what is what at the beginning. Or when you search for a specific tool and cannot remember the icon for it.

To display the buttons as pure icons or as icon and text buttons can be turned on or of in the Display tab in the Properties Sidebar at the right side of the 3D View.

The reference manual will in the following shots provide both, the icon button toolbars and the text and icon toolbars where necessary and available.

Tool Shelf in Object Mode

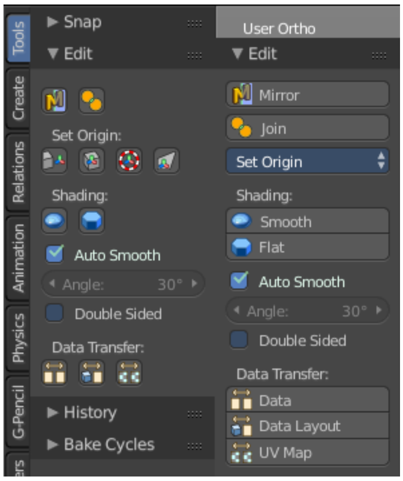
The Tool Shelf in Object Mode provides you the tools to work with the objects at object level. Things like position, rotation, scale, mirror, or join or group etc. .

The Object mode is available for all object types.

Tool Shelf in Object Mode - Tools Tab

Edit Panel

The Edit panel contains tools around editing the selected object(s) at object level. Mirroring, set Origin, etc.



Object Type Mesh, Curve, Surface

Mirror

Mirror mirrors the selected geometry along the defined axis. Click the Mirror button, type in X, Y or Z, then confirm with enter.

Last Operator Mirror

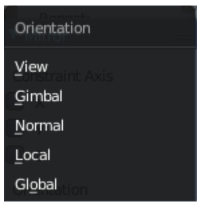
The Last Operator Mirror panel gives you tools to adjust the mirror action.

Constraint Axis

Constraint Axis gives you again the possibility to define the mirror axis. You can choose more than one axis here.

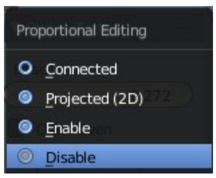
Orientation

Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.



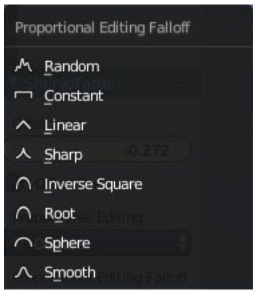
Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.



Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



Proportional size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

Confirm on Release

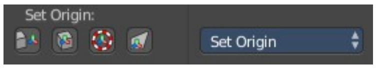
With Confirm on Release checked the action gets performed when you release the mouse button.

Join

The join tool unions the selected mesh parts to one object.

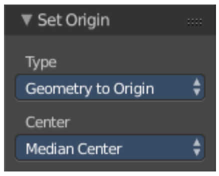
Join has no settings in the Last Operator panel.

Set Origin



- **Geometry to Origin** sets the geometry to the origin.
- **Origin to Geometry** sets the origin to the centre of the object.
- **Origin to 3D Cursor** sets the origin to the 3D cursor.
- **Origin to centre of mass** sets the origin to the centre of the mass of the object.

Last Operator Set Origin



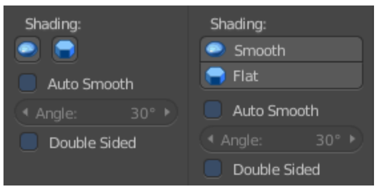
Type

Type is a drop-down box where you can again choose how you want to set the origin.

Centre

Centre is a drop-down box where you can choose to use the Bounding Box centre of the object, or the Median Centre. The two are not necessarily at the same location.

Shading

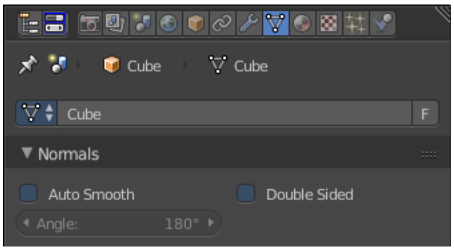


Smooth makes the shading of the object smooth. Last Operator Set Smooth has no settings.

Flat makes the shading of the object faceted. Last Operator Set Flat has no settings.

Auto Smooth

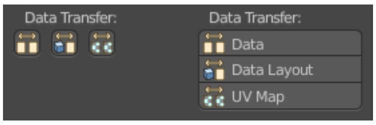
Auto Smooth just appears in the Shading section when you have a Mesh object selected. With Auto smooth you can define the angle after which the shading is set to smooth instead of faceted. It gives you fine control between the two extremes smooth and faceted.



You need to have the Shading set to Smooth. Then tick Auto Smooth. And then you can adjust behind what angle the shading is set to smooth instead of faceted with the angle slider.

Note that the Auto Smooth feature also exists in the Data Properties of the object.

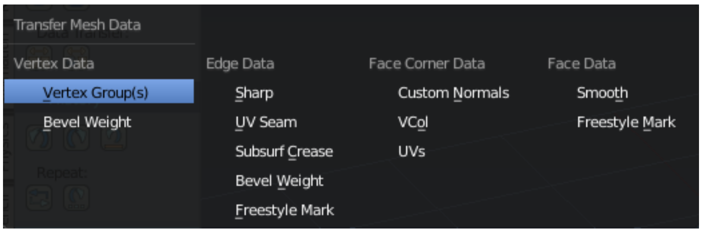
Data Transfer



Contains the data transfer tools Data, Data Layout and UV Map

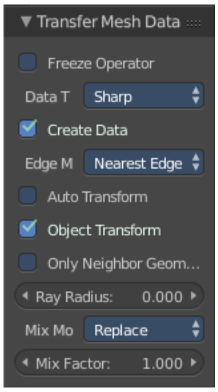
---

Data



Opens a Transfer Mesh data menu where you can choose different methods to transfer data layers from active to selected objects.

Last Operator Transfer Mesh Data



Last Operator Transfer Mesh Data displays different content, dependant of what data you want to transfer. To document all possible combinations would be a manual at its own. So we will just show the content for Edge Data Sharp here.

Freeze Operator

Prevent changes to the settings when rerun the operator.

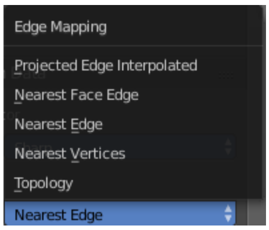
Data Transfer

Opens a Transfer Mesh data menu where you can choose different methods to transfer data layers from active to selected objects.

Create Data

Add Data Layers on Destination Meshes if needed.

Edge Mapping



Edge Mapping is a drop-down box where you can choose the method for Edge Mapping

Auto Transform

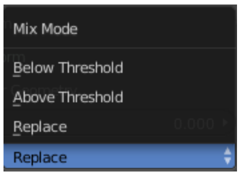
Automatically compute transformation to get the best possible match between Source and Destination Object.

Object Transform

Evaluate Source and Destination object in Global Space.

Only Neighbour Geometry
Source Elements must be closer than given distance. This one reveals a Max Distance slider.

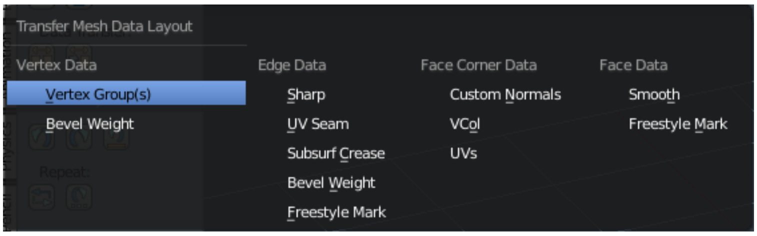
Ray Radius
Width of Rays.



Mix Mode
Mix Mode is a drop-down box where you can choose the Mix Mode.

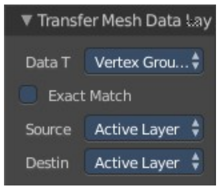
Mix Factor
A slider to adjust the Mix mode.

Data Layout



opens a menu where you can choose different methods to transfer the layout of data from active to selected objects.

Last Operator Transfer Mesh Data Layout



Last Operator Transfer Mesh Data displays different content, dependant of what data you want to transfer. To document all possible combinations would be a manual at

its own. So we will just show the content for Vertex Group here.

Data Type
opens a menu where you can choose different methods to transfer the layout of data from active to selected objects.

Exact Match
Also delete some data layers from destination if necessary. So that it matches exactly the source.

Source Layers Selection
A drop-down box where you can choose which Layers to transfer.

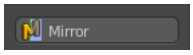
Destination Layers Matching
A drop-down box where you can choose how to match source and destination layers.

Join UV's / UV Map
Transfers the UV map from selected to active object. Requires to have matching geometry and the same vertex order.

Select the target mesh. Hold Shift and click to add the source object to the selection. Then perform the tool. The target mesh will now have the UV map from the source object.

Object Type Meta ball, Lamp, Camera, Speaker, Empties, Force Fields

Mirror



The Mirror tool mirrors the selected geometry.

When activated type in x y or z to define the mirror axis. Then hit enter.

Last Operator Mirror

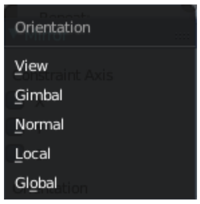
The Last Operator Mirror panel gives you tools to adjust the mirror action.

Constraint Axis

Constraint Axis gives you again the possibility to define the mirror axis. You can choose more than one axis here.

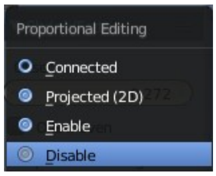
Orientation

Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.



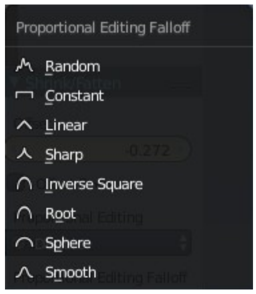
Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.



Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



Proportional size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

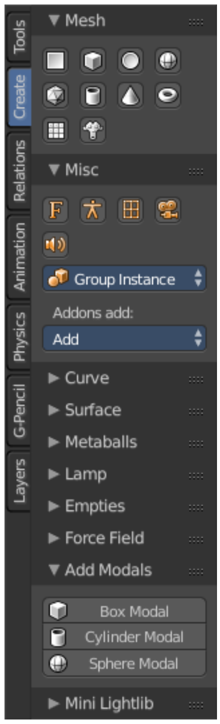
Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

Confirm on Release

With Confirm on Release checked the action gets performed when you release the mouse button.

Tool Shelf in Object Mode - Create Tab



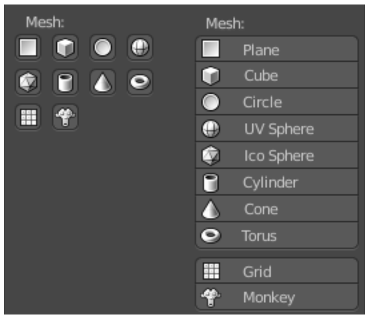
The Create tab provides you with some pre made objects. Mesh Objects, Lamps, Empties, etc. .

When you create a primitive then the Last Operator Panel shows some settings for this primitive.

Note that those settings are not longer available when you perform any operation at the object. And be it to move the primitive. Some of those settings might still be available in the Properties editor. But things like create UV not. So when you want to adjust those settings, then do it immediately after creation.

Several object types can be edited. A Mesh Primitive for example. They have different modes available then. Some not. Like an Empty. There is just the Object mode available for an Empty.

Mesh Panel

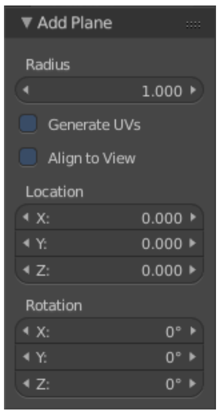


Mesh

The Mesh section contains the primitives that are made of meshes.

Mesh primitives are a good starting point for polygon modelling.

Plane

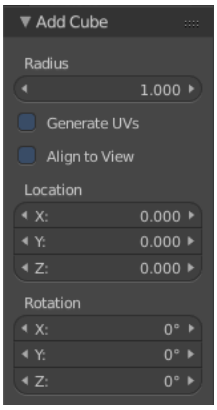


Plane creates a simple quad mesh

Last Operator Add Plane Panel

Radius is in real the size of the plane.
Generate UV's creates UV's for this primitive.
Align to view aligns the Plane to the current view.
Location Here you can adjust the location of the Plane.
Rotation defines the rotation of the Plane.

Cube

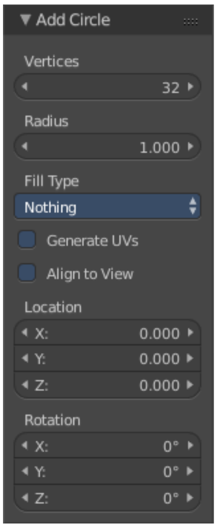


Cube creates a Cube mesh.

Last Operator Add Cube Panel

Radius is in real the size of the Cube.
Generate UV's creates UV's for this primitive.
Align to view aligns the Cube to the current view.
Location defines the location of the Cube.
Rotation defines the rotation of the Cube.

Circle



Circle creates a Circle mesh.

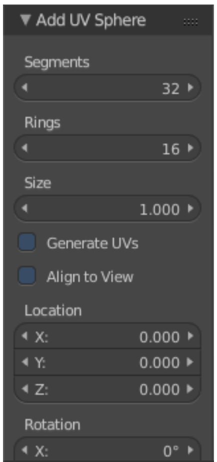
Last Operator Add Circle Panel

Vertices defines of how much vertices the circle is made.
Radius defines the radius of the circle.
Fill Type defines how the Circle mesh is filled.

- Nothing means you have pure edge geometry.
- N-Gon means that the circle face is a N-Gon face.
- Triangle Fan means that the circle face is triangulated.

Generate UV's creates UV's for this primitive.
Align to view aligns the Circle to the current view.
Location defines the location of the Circle.
Rotation defines the rotation of the Circle.

UV Sphere

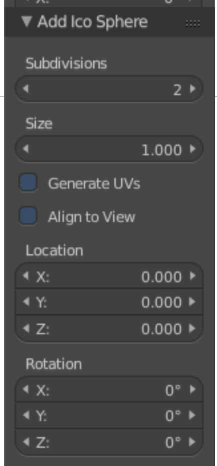


UV Sphere creates a sphere mesh.

Last Operator Add UV Sphere Panel

Segments defines of how much segments the sphere has vertically.
Rings defines how much rings the sphere has horizontally.
Size defines the radius of the UV Sphere.
Generate UV's creates UV's for this primitive.
Align to view aligns the Sphere to the current view.
Location defines the location of the Sphere.
Rotation defines the rotation of the Sphere.

Ico Sphere

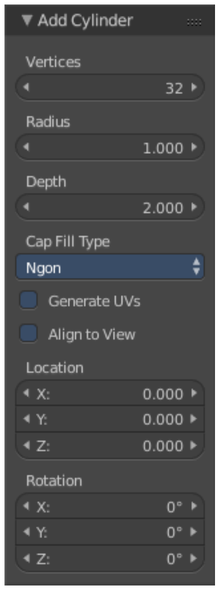


Ico Sphere creates a sphere mesh.

Last Operator Add Ico Sphere Panel

Subdivisions defines the subdivision level of the Ico Sphere.
Size defines the radius of the Ico Sphere.
Generate UV's creates UV's for this primitive.
Align to view aligns the Sphere to the current view.
Location defines the location of the Sphere.
Rotation defines the rotation of the Sphere.

Cylinder



Cylinder creates a Cylinder mesh.

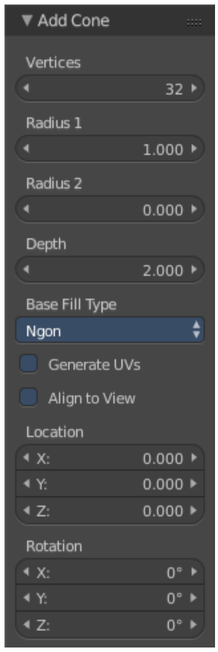
Last Operator Add Circle Panel

Vertices defines of how much vertices the circle is made.
Radius defines the radius of the Cylinder.
Depth defines the length of the Cylinder.
Cap Fill Type defines how the cap face is filled.

- Nothing means you have no face at the top and the bottom of the Cylinder.
- N-Gon means that the cap face is a N-Gon face.
- Triangle Fan means that the cap face is triangulated.

Generate UV's creates UV's for this primitive.
Align to view aligns the Cylinder to the current view.
Location defines the location of the Cylinder.
Rotation defines the rotation of the Cylinder.

Cone



Cone creates a Cone mesh

Last Operator Add Cone Panel

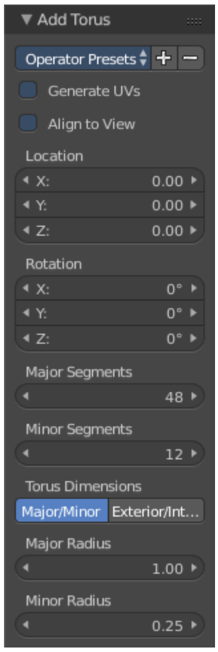
Vertices defines of how much vertices the circle is made.
Radius 1 defines the base radius of the Cone.
Radius 2 defines the top radius of the Cone.
Depth defines the length of the Cone.
Base Fill Type defines how the Base face is filled.

- Nothing means you have no base face.
- N-Gon means that the base face is a N-Gon face.
- Triangle Fan means that the base face is triangulated.

Generate UV's creates UV's for this primitive.
Align to view aligns the Cone to the current view.
Location defines the location of the Cone.
Rotation defines the rotation of the Cone.

Torus

Torus creates a Torus mesh

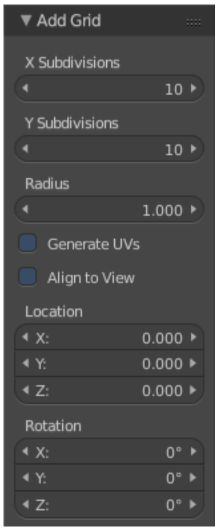


Last Operator Add Torus Panel

Operator Presets allows you to store presets for the Torus. So that you don't have to start from scratch when you need different tori with different setup. This presets are temporary. And cannot be stored between sessions.
Align to view aligns the Cone to the current view.
Location defines the location of the Torus.
Rotation defines the rotation of the Torus.
Major segments defines the segment division of the Torus.
Minor segments defines the circle division of the Torus.
Torus Dimensions defines the method to use when changing Major and Minor Radius.
Major Radius changes the radius of the Torus.
Minor Radius changes the thickness of the Torus.

Grid

Grid creates a subidividable plane mesh

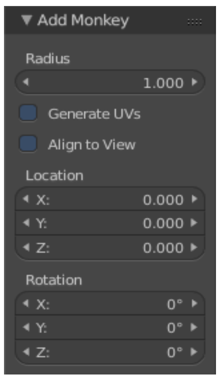


Last Operator Add Grid Panel

X Subdivisions defines the number of subdivisions in x direction.
X **Subdivisions** defines the number of subdivisions in Y direction.
Radius is in real the size of the plane.
Generate UV's creates UV's for this primitive.
Align to view aligns the Plane to the current view.
Location Here you can adjust the location of the Plane.
Rotation defines the rotation of the Plane.

Monkey

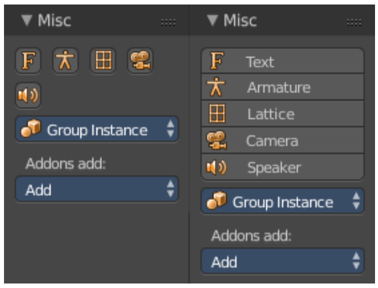
Monkey creates a monkey head mesh.



Last Operator Add Monkey Panel

Radius is in real the size of the Monkey head mesh.
Align to view aligns the Monkey head mesh to the current view.
Location Here you can adjust the location of the Monkey head mesh.
Rotation defines the rotation of the Monkey head mesh.

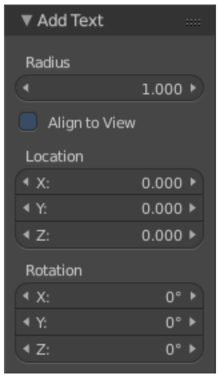
Misc Panel



The Misc Panel provides you with the buttons to create several types of objects. Here you will find mainly the objects that are not for modelling. But everything else. Lights, Bones, Camera, Empties etc.

And it containst the Group Instance menu and the legacy Add menu, which gets used for older addons. Quite a few, like the Sapling addon, places their entries here.

Text



Text creates a text object. Text is not mesh geometry. It is a special curve geometry.

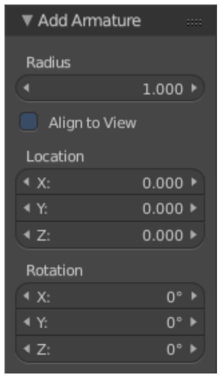
Note

You can enter the Edit mode with the standard hotkey. But you cannot switch back to Object mode with the standard hotkey. Since this hotkey gets count as input for the text object in Edit mode. You have to use the mode drop-down box to leave the Edit mode.

Last Operator Add Text

Radius is in real the size of the Text object.
Align to view aligns the Text object to the current view.
Location Here you can adjust the location of the Text object.
Rotation defines the rotation of the Text object.

Armature

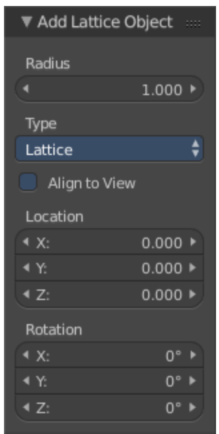


Armature creates a Armature. It adds the first bone of a skeleton.

Last Operator Add Armature

Radius is in real the size of the Armature object.
Align to view aligns the Armature object to the current view.
Location Here you can adjust the location of the Armature object.
Rotation defines the rotation of the Armature object.

Lattice



Lattice creates a Lattice. Which is a control cage to control deforming at another object.

Usage

Create a Lattice object.
Make sure it is bigger than the object that you want to deform, and is around this object.

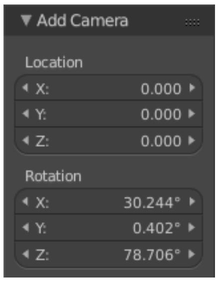
Add a Lattice Modifier to the object that you want to deform.
In the Object box of the Lattice Modifier add our created Lattice object.

Select Lattice Object. Enter Edit mode. And here you can deform the Lattice Object now, and the object to deform will follow.

Last Operator Add Lattice object

Radius is in real the size of the Lattice object.
Type is a drop-down box where you can define the type of Lattice object.
Align to view aligns the Lattice object to the current view.
Location Here you can adjust the location of the Lattice object.
Rotation defines the rotation of the Lattice object.

Camera

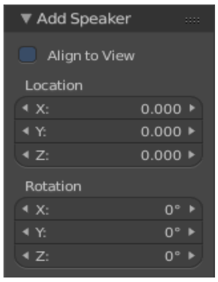


Camera creates a Camera object.

Last Operator Add Camera

Location Here you can adjust the location of the Camera object.
Rotation defines the rotation of the Camera object.

Speaker

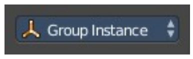


Speaker creates a Speaker object.

Last Operator Add Speaker

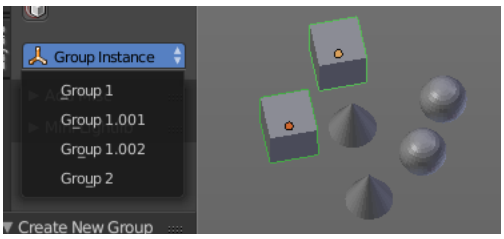
Location Here you can adjust the location of the Speaker object.
Rotation defines the rotation of the Speaker object.

Group Instance

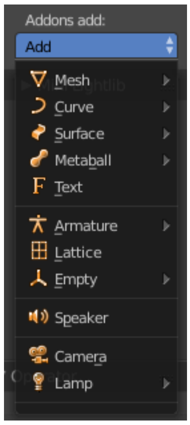


Group Instance is a drop-down box that contains the current groups. And you can add another instance of an existing group by clicking at the group in this drop-down list.

First create a group. It will display in the list.
Then click at one of the list items to add an instance of the group to the scene.



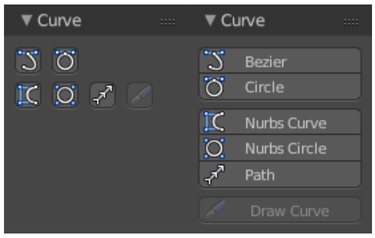
Addons Add



The Addons Add menu exists for historical reasons. Quite a few Blender addons adds their entries into this add menu. And so we have to keep it in Bforartists too. But it is now in the Tool Shelf, and not in the Header menu anymore like in Blender.

There are a handful of double menu entries left that cannot be removed for exact this reason. We would make some addons disfunctional.

Curve Panel



The Curve section contains the Curve primitives. Curves are handy to create curved shapes. Or a camera path.

The curve types are very similar. But do have some small differences. The difference between Bezier and Nurbs is that with Bezier you have handlers at the curve. And with a Nurbs you have a control geometry to influence the curve.

Note that Curves is no mesh data. You have to convert the Curves data to Mesh data when you want to work with it like with a mesh. Note also that you cannot convert it back to curve then.

Bezier

Bezier creates a Bezier type curve.

Circle

Circle creates a Bezier circle type curve.

Nurbs Curve

Nurbs Curve creates a Nurbs type curve.

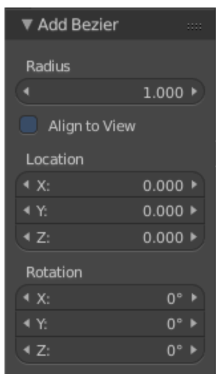
Nurbs Circle

Nurbs Circle creates a Nurbs type circle curve.

Path

Path creates a Nurbs type curve.

Last Operator Add Curve



The Last Operator add panel is for all curves equal.

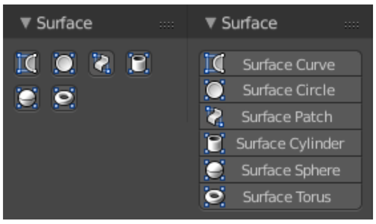
Radius is in real the size of the curve.
Align to view aligns the curve to the current view.

Location Here you can adjust the location of the curve.
Rotation defines the rotation of the curve.

Draw Curve

Draw Curve is just active in Edit mode.

Surface Panel



The Surface section contains the Surface primitives. Surfaces are some kind of curves. But curves with which you can construct surfaces. Surfaces are all of type Nurbs curves.

Surfaces are handy to construct curved surfaces.

Note that Surfaces similar to Curves is no mesh data. You have to convert the Surfaces data to Mesh data when you want to work with it like with a mesh. Note also that you cannot convert it back to Surface then.

Nurbs Curve

Nurbs Curve creates a Nurbs type curve.

Nurbs Circle

Nurbs Circle creates a Nurbs type circle.

Nurbs Surface

Nurbs Surface creates a Nurbs type Surface.

Nurbs Cylinder

Nurbs Cylinder creates a Nurbs type cylinder.

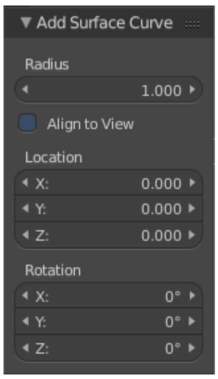
Nurbs Sphere

Nurbs Sphere creates a Nurbs type sphere.

Nurbs Torus

Nurbs Torus creates a Nurbs type Torus.

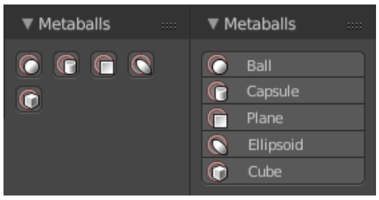
Last Operator Add Surface



The Last Operator add panel is for all curves equal.

Radius is in real the size of the surface.
Align to view aligns the surface to the current view.
Location Here you can adjust the location of the surface.
Rotation defines the rotation of the surface.

Metaballs Panel



Meta-balls are procedural primitives. They are not defined by vertices or curves. The interesting behaviour of meta-balls is that you can stick them into each other. And they have one surface then. Like merging two water drops. And this works in Object mode already.

Ball

Ball creates a meta-ball in Sphere shape.

Capsule

Capsule creates a meta-ball in Capsule shape.

Plane

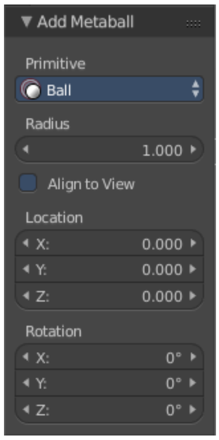
Plane creates a meta-ball in Plane shape.

Ellipsoid

Ellipsoid creates a meta-ball in Ellipsoid shape.

Cube

Cube creates a meta-ball in Cube shape.

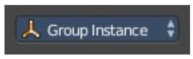


Last Operator Add Meta ball

The Last Operator add panel is for all Meta-balls equal.

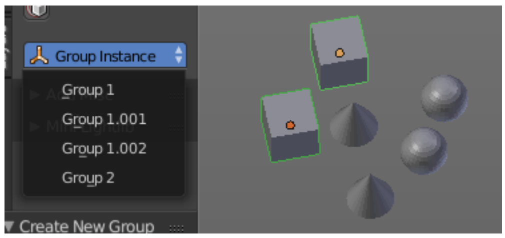
Primitive is a drop-down box where you can change the Meta ball type.
Radius is in real the size of the surface.
Align to view aligns the surface to the current view.
Location Here you can adjust the location of the surface.
Rotation defines the rotation of the surface.

Group Instance



Group Instance is a drop-down box that contains the current groups. And you can add another instance of an existing group by clicking at the group in this drop-down list.

First create a group. It will display in the list.
Then click at one of the list items to add an instance of the group to the scene.



Lamp Panel

The lamps brings light into your scene. There are five different Lamp types.

Point

Point creates a Point Light. A point light shines into all directions.

Sun

Sun creates a light that behaves like a sun. It's a directional light.

Spot

Spot creates a Spot light. It's a directional light.

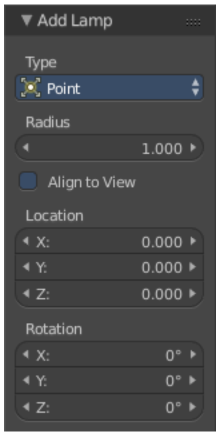
Hemi

Hemi creates a hemi light. It illuminates the whole scene.

Area

Area creates a Area light. It's a directional light.

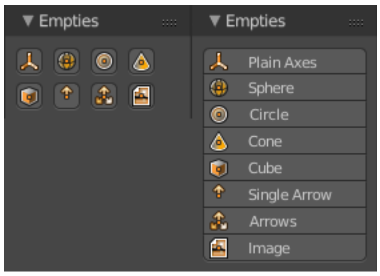
Last Operator Add Lamp



The Last Operator add panel is for all Lamps equal

Type is a drop-down box where you can change the light type.
Radius is in real the size of the surface.
Align to view aligns the surface to the current view.
Location Here you can adjust the location of the surface.
Rotation defines the rotation of the surface.

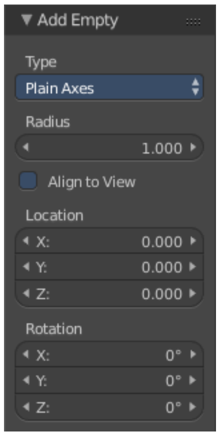
Empties Panel



An Empty is an object without any data attached. It is basically just a container. Empties can be used as anchor objects. Or as visible handlers at a skeleton for example.

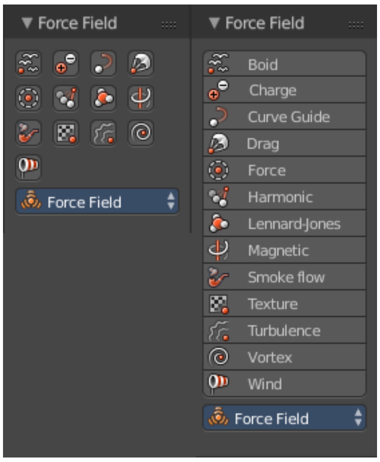
The empty types differs just by how they gets displayed in the viewport.

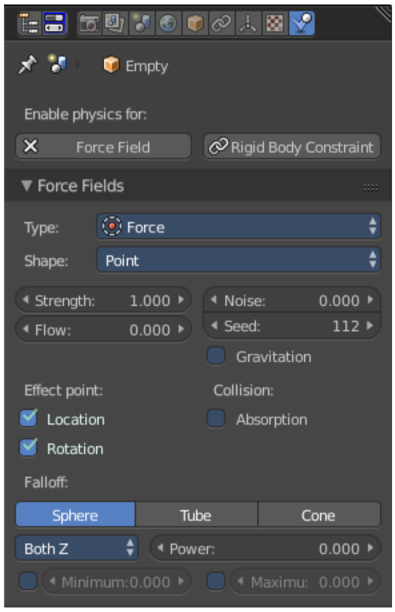
Last Operator Add Empty



Type is a drop-down box where you can define the type of Empty object.
Radius is in real the size of the Empty object.
Align to view aligns the Empty object to the current view.
Location Here you can adjust the location of the Empty object.
Rotation defines the rotation of the Empty object.

Force Field Panel



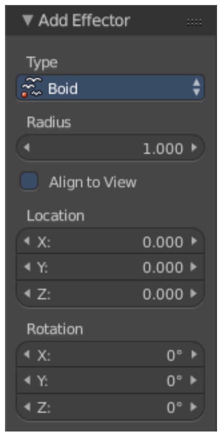


A Force Field is for physical simulations. It provides you with tools to add different forces to objects. Wind, Smoke, Gravity, Magnetic, etc. .
The added Force Fields can be further adjusted in the Properties panel then.

There is also the legacy dropdown menu available. it's a double menu, it contains the same buttons again. But some addons adds their entries here.

A Force Field is internally also called Effector. So our Last Operator panel has the title Add Effector.

Last Operator Add Effector

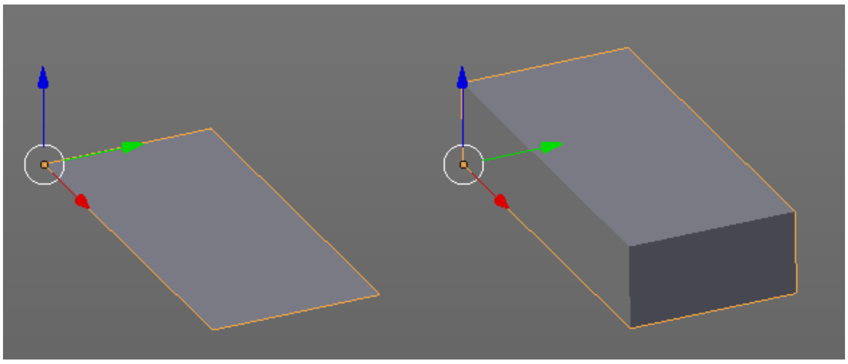


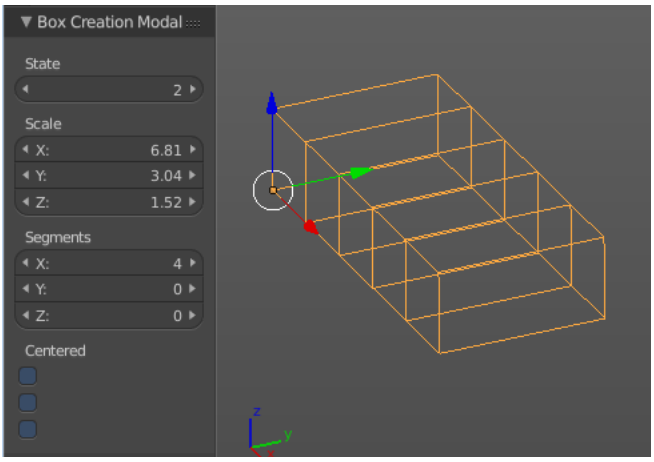
Type is a drop-down box where you can define the type of Effector.
Radius is in real the size of the Effector.
Align to view aligns the Text object to the Effector.
Location Here you can adjust the location of the Effector.
Rotation defines the rotation of the Effector.

Add Modals Panel

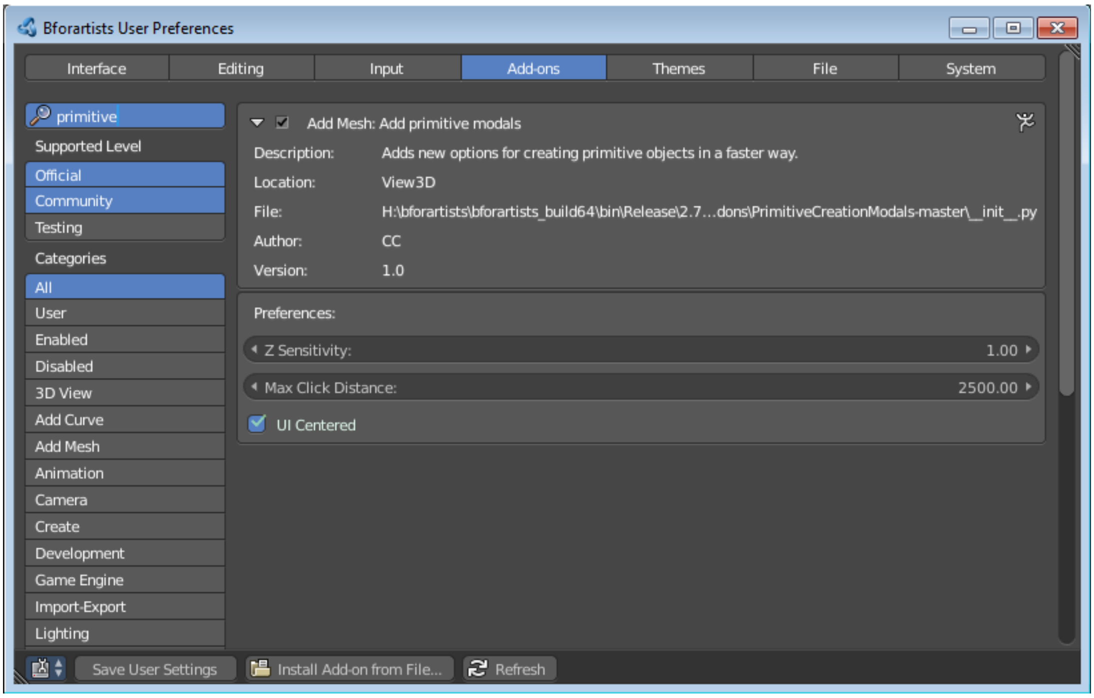
Add Modals allows you to create primitives with adjustable divisions in 3DS Max style.

First you drag a rectangle in the 3D view. Then you drag the height. Then you adjust the divisions in the Last Operator.

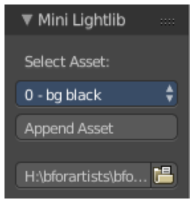




Add Modals is an addon. You can turn it off in the User Preferences when you don't need it.



Mini Lightlib Panel



Mini Lightlib is a little add-on that gives you some standard lighting settings for the Cycles renderer. It contains for example the classical three-point setup. But also some basic volumetrics examples.

It can be turned off in the User Preferences.

Select Asset

The Select Asset drop-down box contains the assets that comes with Mini Lightlib. Here you can select what you want to load.

The assets are grouped by numbers.

0 is everything setup. We have three backgrounds here. And the studio camera that fits to the setup.

1 are the light set-ups for a studio setup. From classical three-point to white.

2 is everything not studio setup.

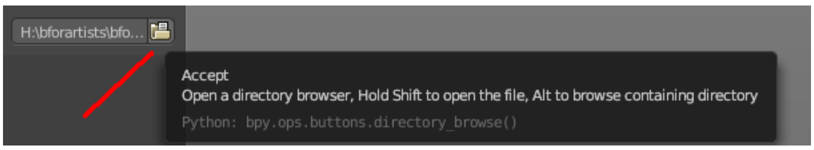
3 are some volumetrics set-ups. Be very careful with this ones. Especially the Musgrave example renders eons.

4 is the included test asset. Some colored spheres.

Append Asset

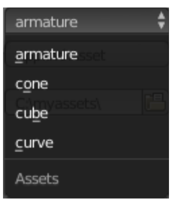
The Append Asset Button appends what is currently selected in the drop-down box to the scene.

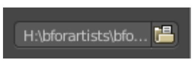
Path Edit box



The Path Edit box shows the path to the library. You will usually not touch this edit box. This edit box gives you a hint where the Mini Lightlib library is located. So that you can add your own assets to that folder. At Windows it's in the Appdata Directory. Which is usually hidden and protected. You might need to adjust your rights to access this folder directly.

But it is also a Path selector. You can select other library folders here if you want, and append the assets from that folder. The Drop-down box will show the content of all blend files in this folder then.





Every blend file is also a library file. The add-on appends the content of this blend file then. To make your own library file is as easy as saving your blend file with your asset. That's already a library. But note that Mini Lightlib will append the whole content from this blend file. There is no filter as in the Blender append feature. So when you plan to create your own libraries, then take care to remove everything except the asset that you want to load.

Note that changes in the Path Edit box are not permanent. The path to the Mini Lightlib is hard-coded. So when you restart Blender then every change is gone. That's also a quick method to get the original path to the light library back. Restart Blender.

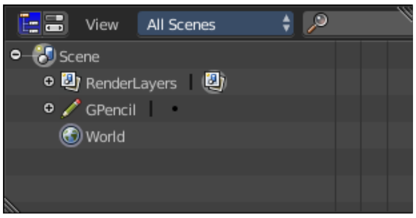
Simple Usage

Preparation

Make sure that you have the Cycles renderer selected!

Mini Lightlib is made for the Cycles renderer. It will not work with the Blender Internal renderer. At least not without adjustments.

Throw out all lights and cameras from the scene.

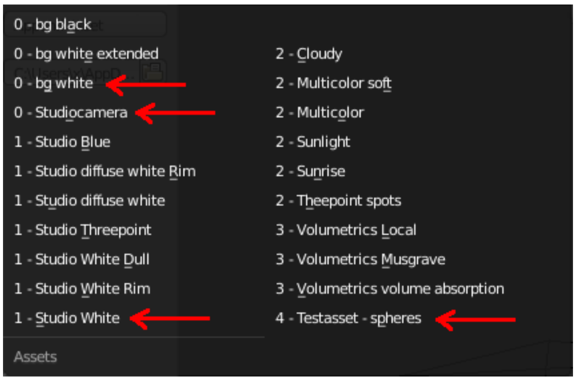


We don't want to have the standard lights ruin the result. Also the standard camera does not fit to our studio setup.

This can be done in the Outliner. Or you select the lights and camera in the viewport and hit delete.

Load Assets

Select in the drop-down box what you want to append. And append it one by one to the scene.



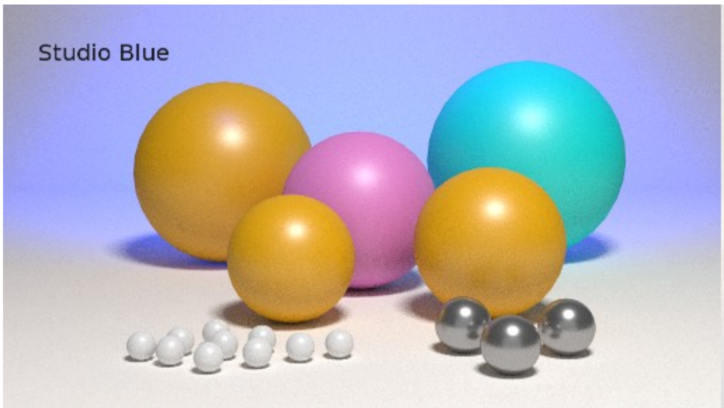
Let's start with a studio setup. I suggest to use the bg white, which is a white background. The camera. One of the studio light set-ups. And finally our test asset to have something to render.

So we select bg white, and click at the Append Asset Button.
Then we select Studiocamera, and click at the Append Asset Button.
Then we select let's say the Studio White, and click at the Append Asset Button.
And then we select the Test asset Spheres, and click at the Append Asset Button. What's left is to click at the render button.

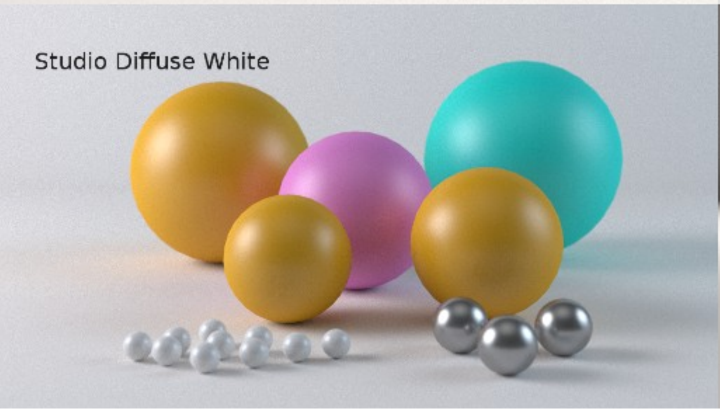
The available light set-ups

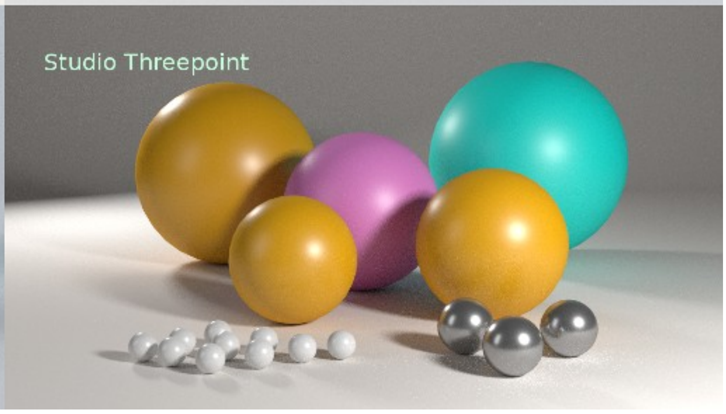
Here you can get an overview how the result looks like for the different lighting set-ups.

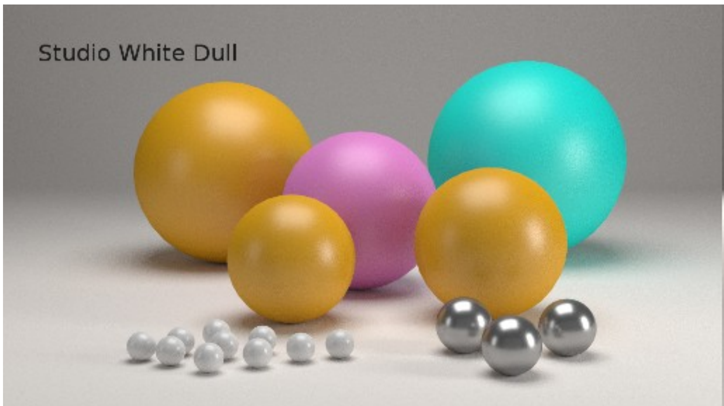
Be careful with the volumetrics examples. Especially the Musgrave example can render eons.

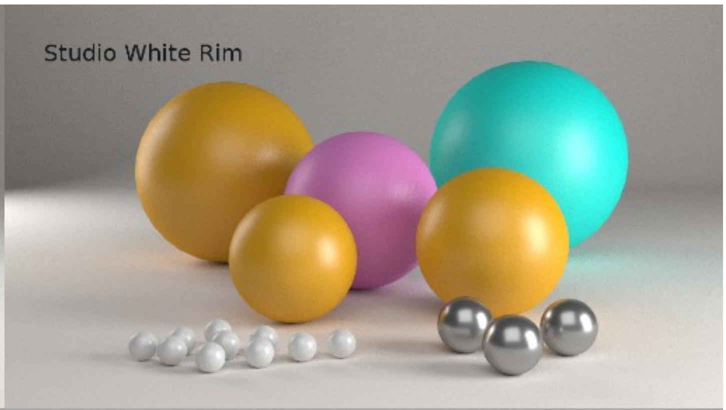

Studio Blue


Studio Diffuse White Rim

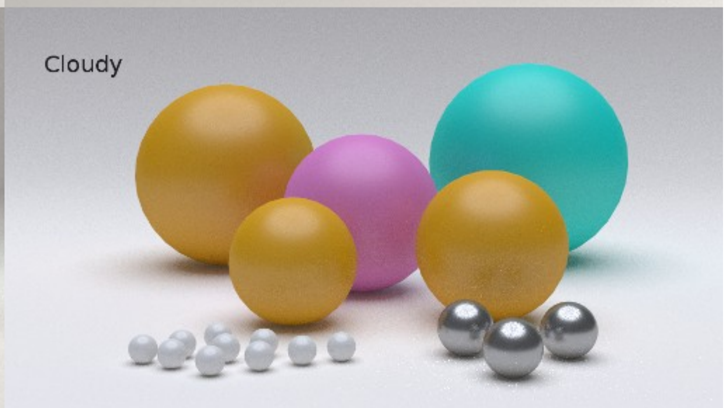

Studio Diffuse White

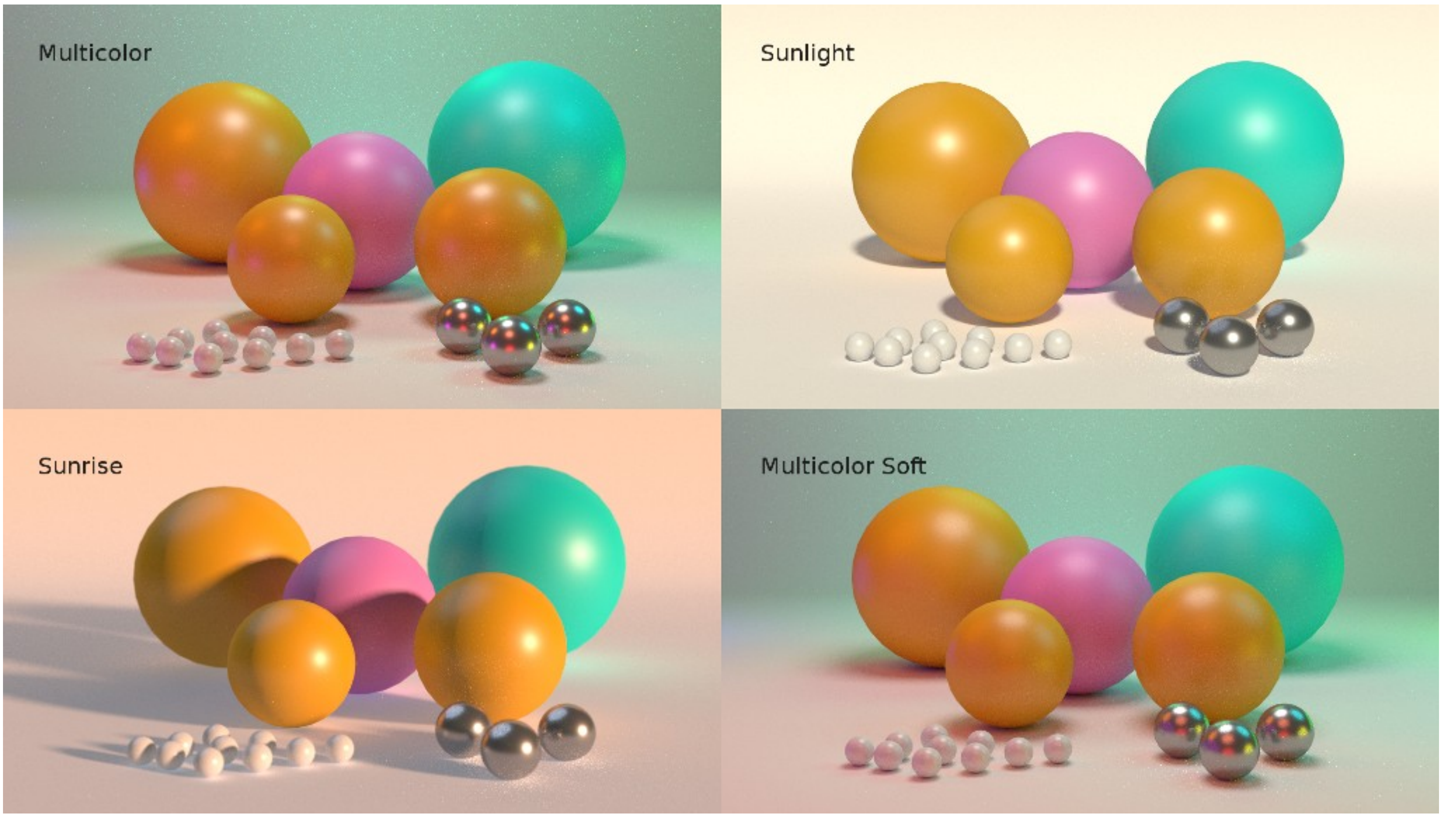

Studio Threepoint

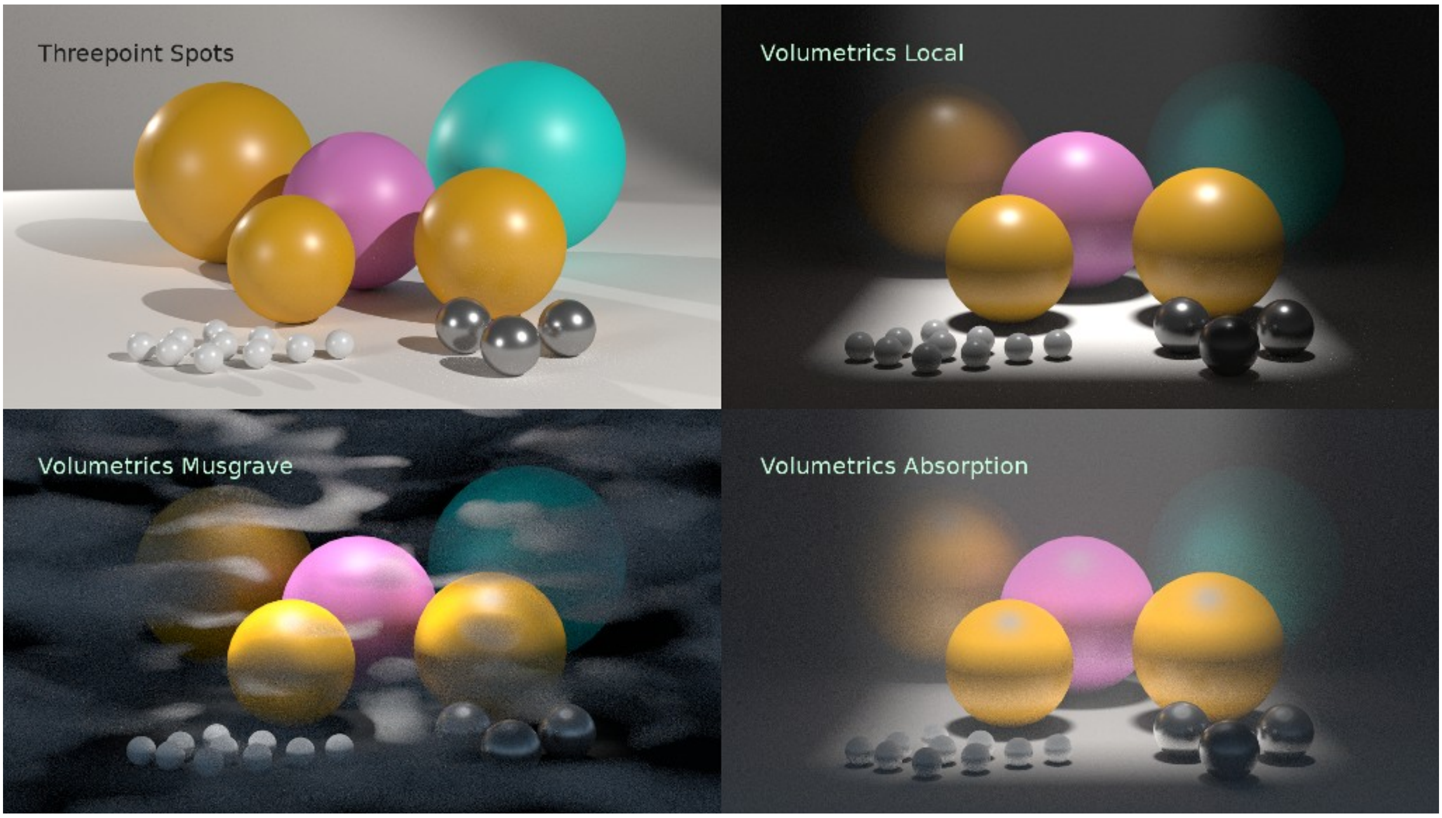

Studio White Dull


Studio White Rim


Studio White


Cloudy


Multicolor
Sunlight
Sunrise
Multicolor Soft

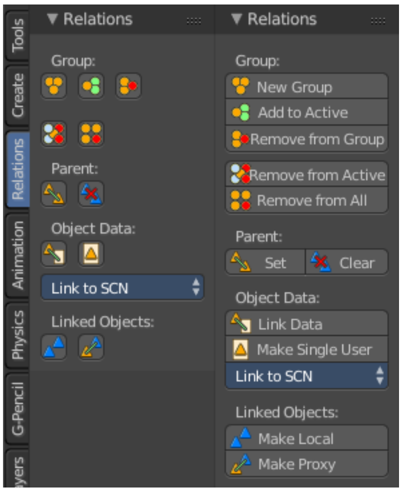

Threepoint Spots
Volumetrics Local
Volumetrics Musgrave
Volumetrics Absorption

Tool Shelf in Object Mode - Relations Tab

The Relations tab contains all tools that has to do with relations between objects. Grouping, Parenting, etc. .

Note that the Relations tab is empty when there is no object in the scene.

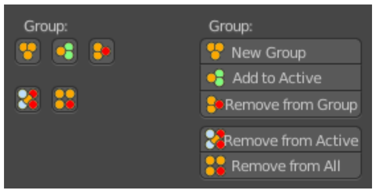
Relation settings also exists for every individual object in the Properties editor.



Group

The Group section contains the group tools. Here you can to add and remove from a group.

Grouped objects are coloured different in the Viewport. They show green instead of orange. They have no difference in the Outliner though.

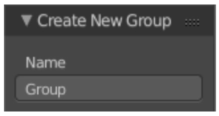


New Group

New Group creates a new group. When you have one or more objects selected, then this object(s) becomes part of the new group. You can name this Group in the Last Operator panel.

Last Operator Create New Group

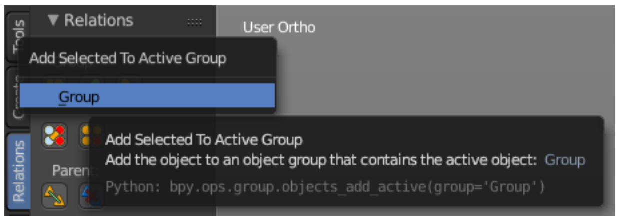
Name is a edit box where you can change the name of the Group.



Add to Active

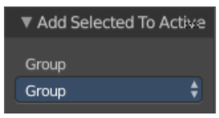
Add to Active adds the selected object to the group of the selected object.

First select the object to add. Then shift select one object of the group where you want to add it. So that both are selected. Then press the Add To Active button, and choose the group name. And the object will be added to this Group.

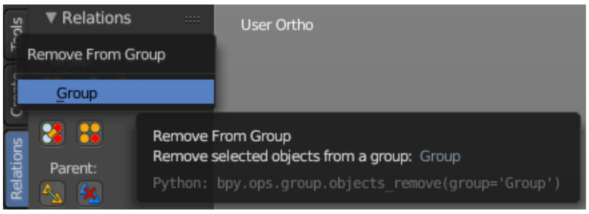


Last Operator Add Selected to Active Group

Name is a edit box where you can change the name of the Group.



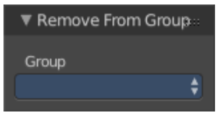
Remove from Group



Remove from Group removes the selected object from the Group.

Select the object, then click the button and choose the Group where you want to remove it from.

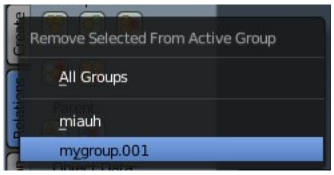
Last Operator Remove from Group



Name is a edit box where you can choose the group to remove from.

Remove from Active

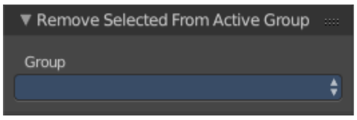
A object can be in more than one group. Remove from Active removes the selected object from the currently active Group.



Select the object, then click the button and choose the group where you want to remove it from.

Last Operator Remove from Group

Name is a edit box where you can choose the group to remove from.

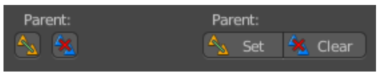


Remove from All

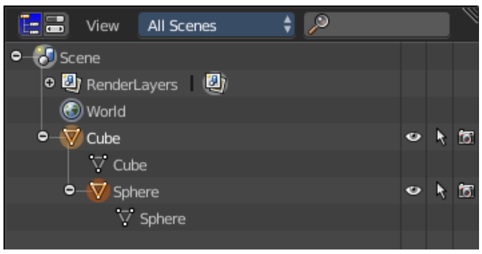
Remove from All removes the selected object from all Groups.

Last Operator Remove from All has no settings.

Parent



The Parent section contains a tool to deal with parent child relationships. This includes things like sending an object along a curve. Or skinning an armature.



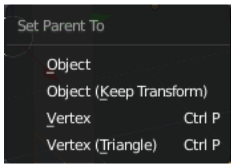
Child objects becomes part of the hierarchy of the parent object. You will see them in the outliner in the hierarchy of the parent object then. See image.

The usual way to parent an object is to select the child object, then shift click add the parent object to the selection, then click the Parent button, and finally choose the parenting method in the upcoming menu.

This menu has different content, dependant of what type the parent object is.

Set Parent to Mesh Object

When your parent object is of type mesh, then you will have the following parent options:



Object

Object simply parents the current object to the target object.

Object (Keep Transform)

Object (Keep Transform) parents the current object to the target object, but keeps the transform intact.

Vertex

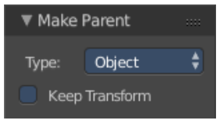
Vertex parents the current object to a vertex of the target object. The vertex will be chosen automatically, it's the closest vertice of the parent object. When you want to assign the object to a specific vertice, then you have to do the vertex parenting in Edit mode.

Vertex (Triangle)

Vertex (Triangle) parents the current object to a face of the target object. The face will be chosen automatically. It's the closest face of the parent object. When you want to assign the object to a specific face, then you have to do the vertex parenting in Edit mode.

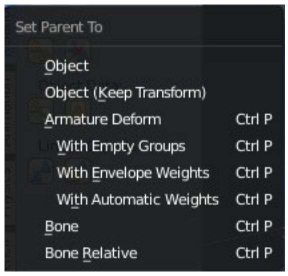
Last Operator Make Parent to mesh object

Type is a drop-down box where you can change the type of parenting. Note that this list also contains items that does not work for this object type parent relation.
Keep Transform applies transformation before parenting.



Set Parent to Armature

This is also known as skinning. When your parent object is of type mesh, then you will have the following parent options:



Object

Object simply parents the current object to the target object.

Object (Keep Transform)

Object (Keep Transform) parents the current object to the target object, but keeps the transform intact.

Armature Deform

Armature Deform parents the current object to the armature. But the mesh has no weighting of the vertices. And no groups.

With Empty Groups

With Empty Groups parents parents the current object to the armature. But the mesh has no weighting of the vertices.

With Envelope Weights

With Envelope Weights parents the current object to the armature. The mesh has weighting from the envelopes. When the mesh has vertices that are outside of the envelope, then this vertices has no weighting.

With Empty Groups

With Empty Groups parents parents the current object to the armature. The mesh gets weighted automatically. All vertices are weighted. Even when vertices are outside of envelopes.

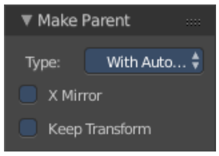
Bone

Bone parents parents the current object to the currently selected bone. The whole object is influenced by this single bone. When you edit the bones position in edit mode and switch to pose mode, then the child object will follow to the new position.

Bone Relative

Bone parents parents the current object to the currently selected bone. The whole object is influenced by this single bone. When you edit the bones position in edit mode and switch to pose mode, then the child object will not follow to the new position.

Last Operator Make Parent to Armature

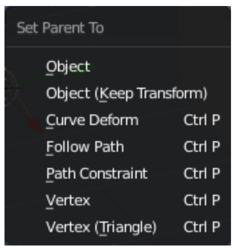


Type is a drop-down box where you can change the type of parenting. Note that this list also contains items that does not work for this object type parent relation.
X Mirror applies weight symmetrically along X axis for Envelope/ Automatic vertex group creation.
Keep Transform applies transformation before parenting

Set Parent to Curve

Curves can be used to define motion paths of objects. Curves can also be used to deform objects.

When your parent object is of type Curve, then you will have the following parent options:



Object

Object simply parents the current object to the target object.

Object (Keep Transform)

Object (Keep Transform) parents the current object to the target object, but keeps the transform intact.

Curve Deform

Curve Deform parents the current object to the target object. It allows you to deform the object by moving it along the curve axis.

Follow path

Follow path parents the current object to the target object. The object becomes animated. The number of key frames can be adjusted in the Properties editor. Select the curve, click the Data tab, and in the Path Animation tab adjust the number of frames to your needs.

Path Constraint

No idea. Seriously, no idea what this should do and how it should work.

Vertex

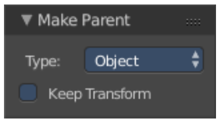
Vertex parents the current object to a vertex of the target object. The vertex will be chosen automatically, it's the closest vertice of the parent object. When you want to assign the object to a specific vertice, then you have to do the vertex parenting in Edit mode.

Vertex (Triangle)

Vertex (Triangle) parents the current object to a face of the target object. Problem is, a path has no faces. And so the operation will fail. Just ignore. It's a bug.

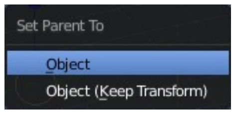
Last Operator Make Parent to Curve

Type is a drop-down box where you can change the type of parenting. Note that this list also contains items that does not work for this object type parent relation.
Keep Transform applies transformation before parenting.



Set Parent to other object types

You can parent an object also to objects like lamps or an empty.



Object

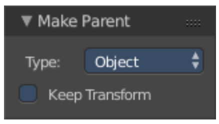
Object simply parents the current object to the target object.

Object (Keep Transform)

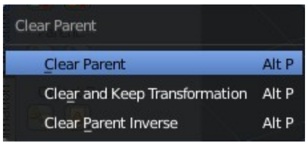
Object (Keep Transform) parents the current object to the target object, but keeps the transform intact.

Last Operator Make Parent to other object types

Type is a drop-down box where you can change the type of parenting. Note that this list also contains items that does not work for this object type parent relation.
Keep Transform applies transformation before parenting.



Clear Parent



Clear Parent

Clear Parent clears the parent relation completely, including involved modifiers.

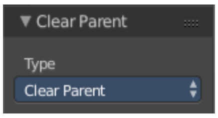
Clear and Keep Transformation

Clear Parent clears the parent relation completely, including involved modifiers. But keeps the current visual transformation.

Clear Parent Inverse

Clear Parent Inverse resets the transform corrections applied to the parenting relationship. It does not remove the parenting itself.

Last Operator Clear Parent



Type is a drop-down box where you can change the type of clearing. Same as the clear parent menu.

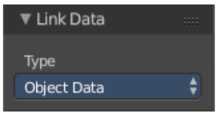
Object Data

The Object data section gives you tools to handle object data.

Link Data

Link Data links the data from the selected to the active object.

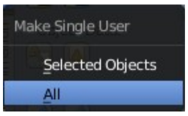
Last Operator Link Data



Type is a drop-down box where you can choose what data type you want to link

---

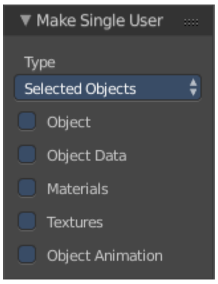
Make Single User



Selected Objects makes the linked data local to each selected objects.

All makes the linked data local to all objects.

Last Operator Make Single User

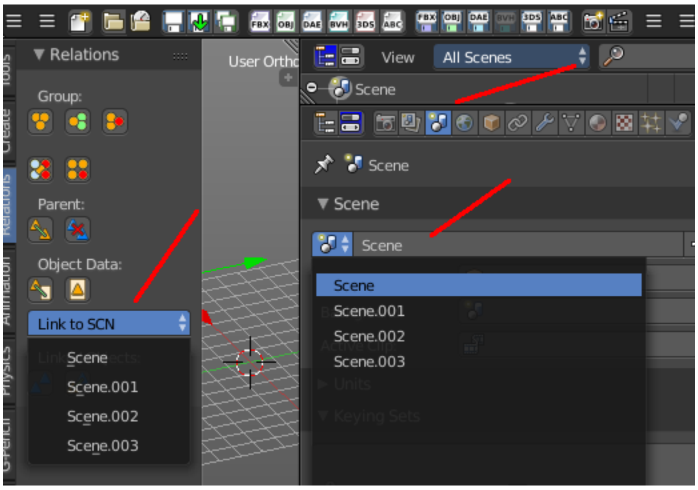


Type is a drop-down box where you can choose if you want to handle selected objects or all objects.

The checkboxes defines what data type you want to make local.

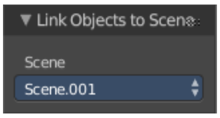
Link to SCN

Link to SCN is a dropdown box where you can link to a specific scene. Obvioiusly you need to have more than one scene to be able to do so. But Blender just supports to load one scene at a time. You can however create more than one scene data block in such a single scene. And that's the scene that you can link to.



To create a new scene data block see Properties Editor, Scene Tab, Scene Panel.

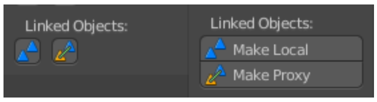
Last Operator Link Objects to Scene



Scene

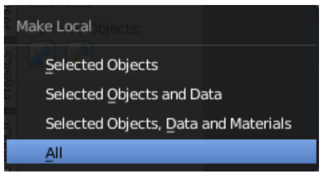
Scene is the same dropdown box like in the Relations panel. Here you can again adjust to which scene you want to link.

Linked Objects



Linked objects means the objects that you might have linked from other blend files. When you don't have linked data in your scene then this buttons are of no use.

Make Local



Make Local copies the object data from the original blend file to the new file. And removes the link to the blend file. It calls a menu where you can choose a method.

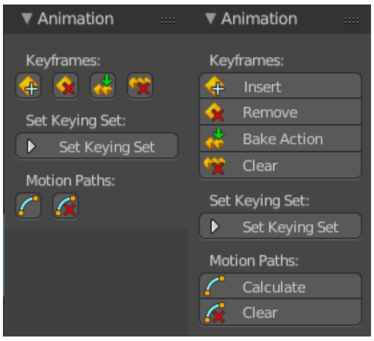
Selected Objects makes the selected objects local.
Selected Objects and Data makes the selected objects and its data local.
Selected Objects, Data and Materials makes the selected objects, its data and its material local.

Make Proxy

Make Proxy adds a new object and sets it as the parent of the linked data. This allows you to transform the empty while still retaining the link to the original blend file. The mesh is not editable though. The Object data block is cloned, but the Mesh data block is not.

Tool Shelf in Object Mode - Animation Tab

The animation tab gives you tools to work with animation. Here you can handle key frames, set keying set, etc.



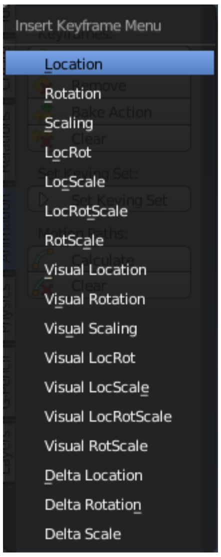
Keyframes

The Keyframes section allows you to insert and remove key frames, bake actions and clear all animation.

Insert

Insert inserts a keyframe.

When your object does have a active keying set, then a click at the button inserts the keyframe directly.



Insert Keyframe Menu

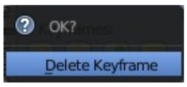
The keying set defines what kind of key frames gets recorded. When you start with an animation, and your object does not have a keying set yet, then you will be prompted with a menu where you can choose the proper keying set. The Insert Keyframe menu.

For the meaning of the single items see Set Keying Set below. It's the same items.

Insert has no settings in the Last Operator panel.

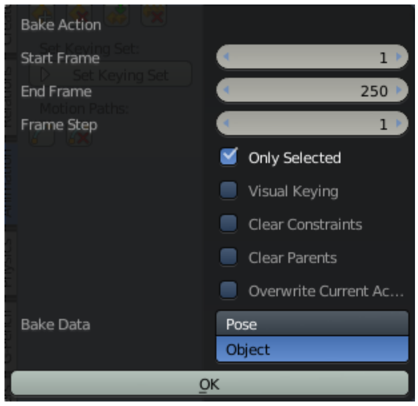
Remove

Removes the current active keyframe for the selected object. You will get a confirmation dialogue here.



Remove has no settings in the Last Operator panel.

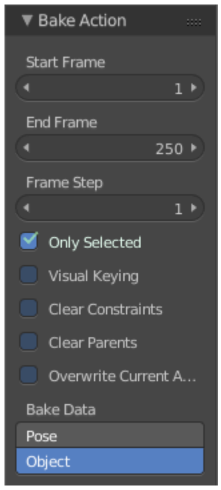
Bake Action



Bake Action bakes the object animation to a new action.

Bake action calls a panel where you can adjust the settings for the new action.

Last Operator Bake Action



Start Frame

Defines the start frame for baking.

End Frame

Defines the end frame for baking.

Frame Step

Defines the frame step for baking.

Only Selected

Pose Baking only.

Visual Keying

Keyframe from the final transform.

Clear Constraints

Remove all constraints from keyed objects / bones, and do visual keying.

Clear Parents

Bake animation onto the object, then clear parents (objects only)

Overwrite current Action

Bake Action into current action instead of creating a new one.

Bake Data

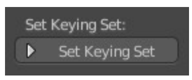
Which data transformations to bake to. You have the choice between Pose and Object here.

Clear

Clears all animation, and removes all key frames for the selected object.

Clear has no settings in the Last Operator panel.

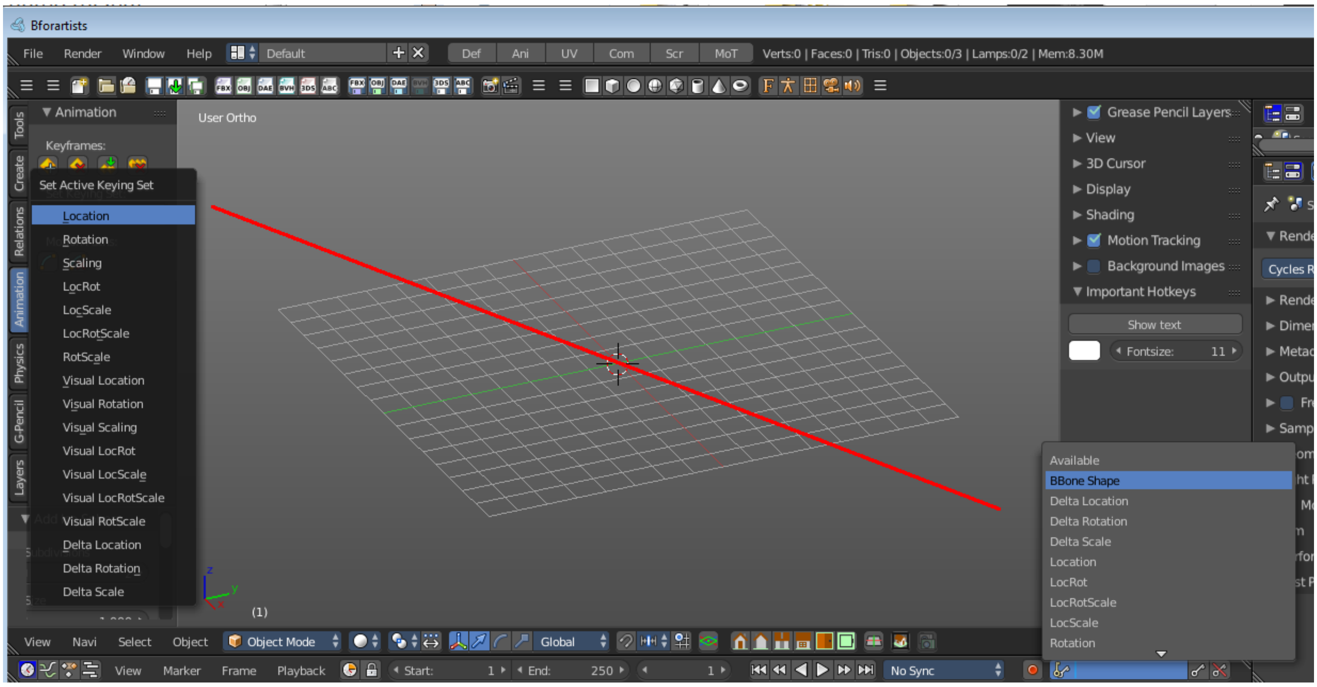
Set Keying Set



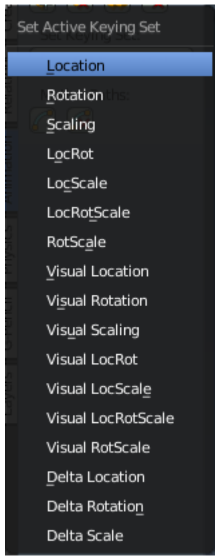
The keying set defines what kind of key frames gets recorded. Some keying sets have a specific purpose, and works just in specific context and with specific kind of objects.

A click at the set keying set button brings up a menu where you can choose the keying set. It is nearly the same menu as in the keying set drop-down box, and has the same functionality. With small differences. For example, the two items Whole Character and Available.

Available is context sensitive. So when you cannot see it in the list, then you can't use it yet. And Whole Character is just available in Pose Mode.



Keying Set in detail:



Location

Location records key frames for the location of the object, absolute in the world.

Rotation

Rotation records key frames for the rotation of the object, absolute in the world.

Scale

Scale records key frames for the scale of the object, absolute in the world.

LocRot

LocRot records key frames for the location and rotation of the object, absolute in the world.

LocScale

LocScale records key frames for the location and scale of the object, absolute in the world.

LocRotScale

LocRotScale records key frames for the location rotation and scale of the object, absolute in the world.

RotScale

RotScale records key frames for the rotation and scale of the object, absolute in the world.

Visual Location

Location records key frames for the location of the object, at 0/0/0 of the world.

Visual Rotation

Visual Rotation records key frames for the rotation of the object, at 0/0/0 of the world.

4Visual Scale

Visual Scale records key frames for the scale of the object, at 0/0/0 of the world.

Visual LocRot

Visual LocRot records key frames for the location and rotation of the object, at 0/0/0 of the world.

Visual LocScale

Visual LocScale records key frames for the location and scale of the object, at 0/0/0 of the world.

Visual LocRotScale

Visual LocRotScale records key frames for the location rotation and scale of the object, at 0/0/0 of the world.

Visual RotScale

Visual RotScale records key frames for the rotation and scale of the object, at 0/0/0 of the world.

Delta Location

Delta Location records key frames for the location of the object. It records the difference to the current location. Means local.

Delta Rotation

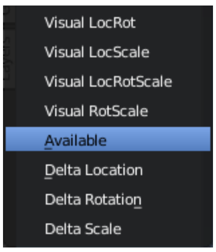
Delta Rotation records key frames for the rotation of the object. It records the difference to the current rotation. Means local.

Delta Scale

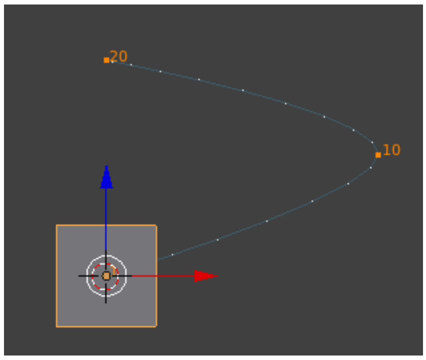
Delta Scale records key frames for the scale of the object. It records the difference to the current scale. Means local.

Available

Available records the keyframe in the current active keying set. This means that you need to have an active keying set already. The menu item is not available when you don't have an active keying set.



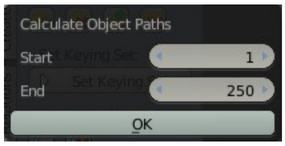
Motion Paths



Objects can be animated. Let's say you send them from a to b to c. The object will move to b, then to c. Some kind of a path. This path is not visible by default.

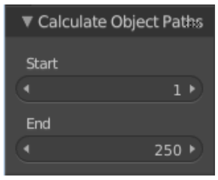
With motion paths you can calculate this path, and make it visible.

Calculate



Calculate calculates the motion path of the selected object. It opens a panel where you can define the start and end frame of the calculation.

Last Operator Calculate Object Path



Start defines the start frame of the calculation.

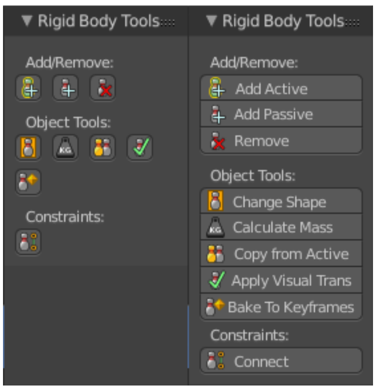
End defines the end frame of the calculation.

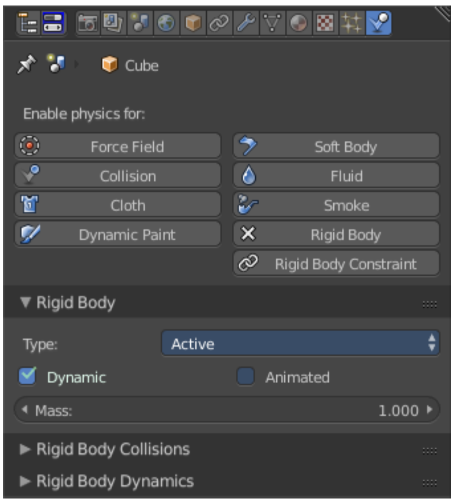
Clear

Clear remove the motion path from the object.

Tool Shelf in Object Mode - Physics Tab

The Physics panel contains physics tools. It contains just one panel. Rigid Body Tools. You can do basic operations here. The setup has to happen in the Properties editor then.





Add / Remove

Here you can add and remove rigid bodys. Rigid bodies are needed for physics in Bforartists. Think of it as invisible colliders for your object where the forces can work at.

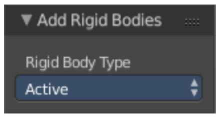
Add Active

Add Active adds a rigid body to the selected object. The type of this rigid body is active. This is useful for any actively moving object. Characters, bullets, etc.

Add Passive

Add Active adds a rigid body to the selected object. The type of this rigid body is passive. This is useful for any static object, like ground for example.

Last Operator Add Rigid bodies



The rigid body type is a drop-down box where you can choose if the type of the rigid body is active or passive.

Remove

Remove simply removes the rigid body from the current object. It has no Last Operator settings

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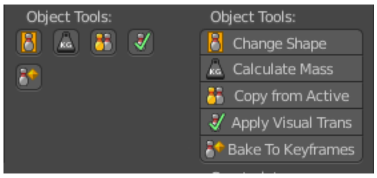
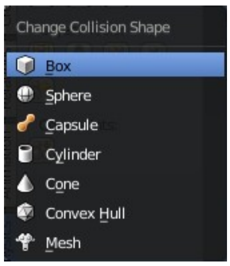
Object Tools



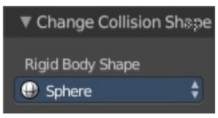
The Object tools gives you some tools for your rigid body.

Change shape



Change Shape opens a pop-up menu where you can change the shape of your rigid body.

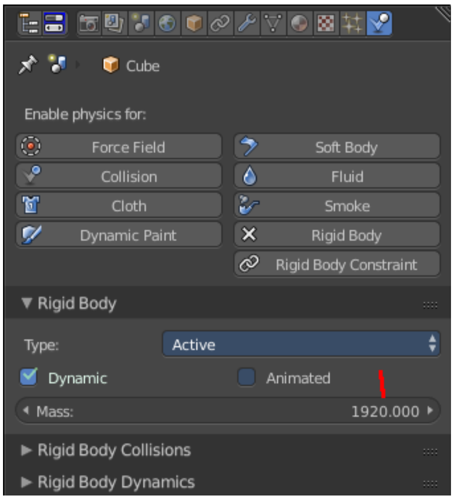
Last Operator Change Collision shape

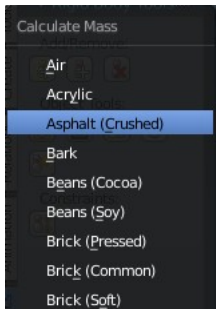


Rigid Body Shape is a pop-up menu where you can change the shape of your rigid body again.

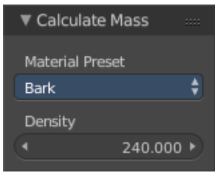
Calculate Mass

Calculate Mass does NOT calculate the mass. But gives you a pop-up menu where you can choose between different predefined mass set-ups. The corresponding value will then be set in the physics settings in the Rigid Body settings.





Last Operator Calculate Mass



Material Preset is a pop-up menu where you can choose the type of preset again.

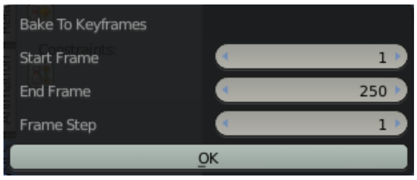
Density is the mass value from the Rigid Body panel.

Copy from Active

Copy from Active allows you to copy all the physics settings from the active object and apply it at the selected. First select the object that contains the physics settings. Then add the target object to the selection. Then press the button.

Apply visual transform

Apply visual transform applies the visual transform to the object.

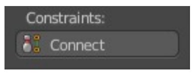


Bake to Keyframe

Bake to Keyframe bakes the whole physics animation to key frames. A click at the button brings up a menu where you can set the range and the number of frame steps.

Constraints

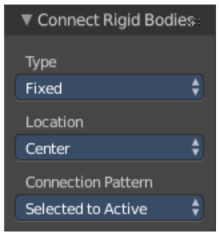
Constraints allows objects and rigid bodys to interact with each other. It can act as a joint. Or limit the movement along one axis, etc. .



Connect

Connect connects rigid bodies. It creates a new *Empty* object named “Constraint”, which has a physics constraint already attached. And is pointing at the two selected objects. The setup has to happen in the Properties editor then.

Last Operator Connect Rigid Bodies



Type is a drop-down box where you can choose the type of the constraint.

Location is a drop-down box where you can choose the location of the constraint empty.

Connection is a drop-down box where you can choose the type of connection pattern.

Tool Shelf in Edit Mode

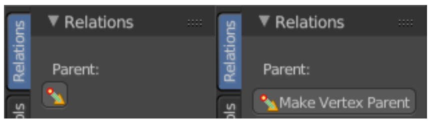
The Tool Shelf in Edit Mode provides you the tools to edit the objects. Things like modifying geometry, modify an armature, modify Curves or 3D text, etc. .

Not all object types are editable. Editable object types are all object types in the Add Primitive panel. Mesh, Curve, Surface, Meta ball. In the Add Misc panel it's Text, Armature and Lattice from the Other category.

The tools differs from object type to object type. Even the available tabs differs. So in Edit mode we have to come from the Object type to explain the tabs and panels.

Tool Shelf in Edit Mode - Mesh Object, Relations Tab

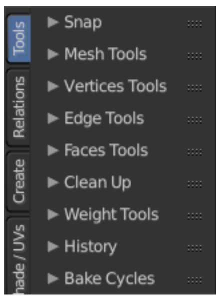
Relations Panel



The Relation panel contains tools around relations. In Edit Mode it's just Make Vertex Parent.

In Object mode select the object that you want to parent to a vertex. Shift select the parent object so that both are selected. Enter Edit mode. Then select one vertex for a single point. Or three for an area. Then click the Make Vertex Parent button to make the relation.

Tool Shelf in Edit Mode - Mesh Object, Tools Tab



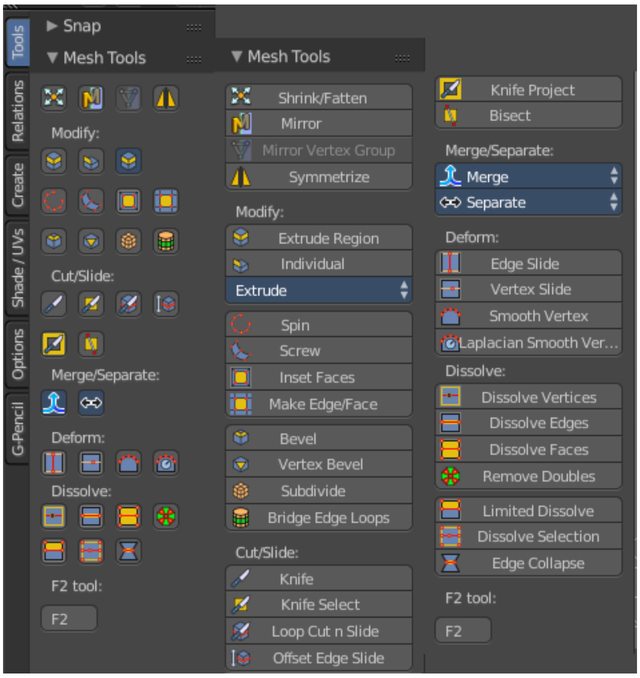
The Tools tab contains the tools to edit the mesh object. It contains the panels Mesh Tools, Vertices Tools, Edge Tools, Faces Tools, Clean Up, Weight Tools, History and Bake.

Which Bake panel is active is dependant of what render engine is selected. When it's cycles then you have the Cycles bake tools. When it's the Blender Render, then you have the Blender Render bake tools.

Mesh Tools Panel

The Mesh Tools Panel contains the tools to edit and manipulate the geometry of a mesh object.

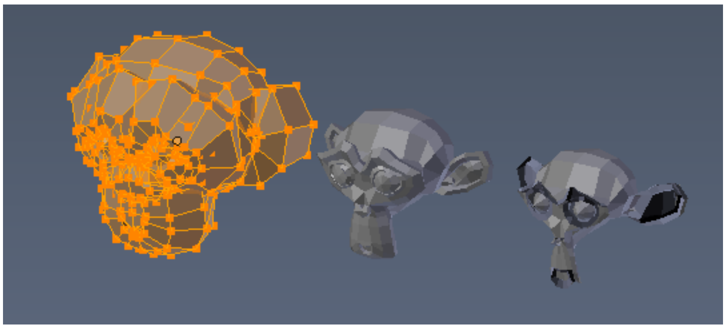
There are four main tool groups in the Mesh Tools panel. Transform tools, Deform tools, Add tools, and Dissolve tools. The Transform tools at the top doesn't have a label.



Shrink/Fatten

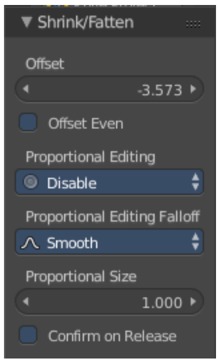
Shrink/Fatten scales the selected geometry along its normals. Transform orientation and Pivot point gets ignored.

A positive value pushes the vertices outwards. A negative value pushes the vertices inwards.



Last Operator Shrink/Fatten

The Last Operator Shrink/Fatten panel gives you tools to adjust the Shrink/Fatten operation. Here you have numeric input for the strength and a few more options.



Offset

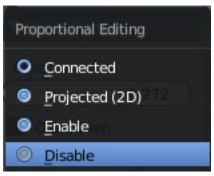
Offset is the strength of the offset for Shrink/Fatten.

Offset Even

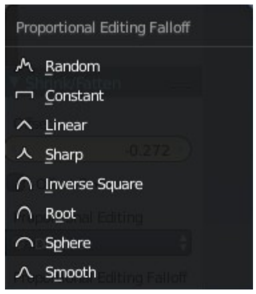
Offset Even scales the selection to give more thickness in even areas.

Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.



Proportional Editing Falloff



Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

Proportional size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff

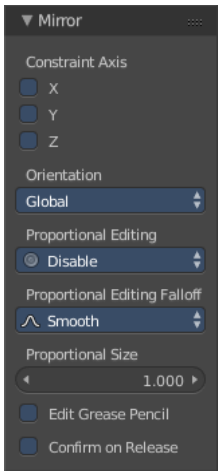
Confirm on Release

With Confirm on Release checked the action gets performed when you release the mouse button.

Mirror

Mirror mirrors the selected geometry along the defined axis. Click the Mirror button, type in X, Y or Z, then confirm with enter.

Last Operator Mirror



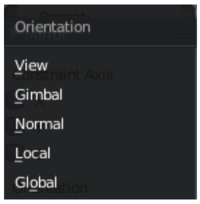
The Last Operator Mirror panel gives you tools to adjust the mirror action.

The Last Operator Mirror panel gives you tools to adjust the mirror action.

Constraint Axis

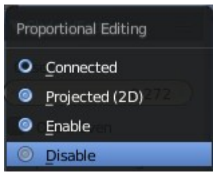
Constraint Axis gives you again the possibility to define the mirror axis. You can choose more than one axis here.

Orientation



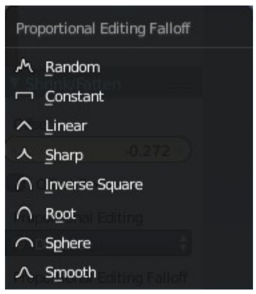
Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.

Proportional Editing



Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.

Proportional Editing Falloff



Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

Proportional size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

Confirm on Release

With Confirm on Release checked the action gets performed when you release the mouse button.

Mirror Vertex Group

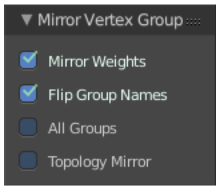
This tool requires to have a vertex group assigned. It tries to mirror for example existing Weight Painting from one side to the other.

This tool works only with a perfectly symmetrical mesh along the local X axis. Vertices that have no corresponding vertex on the other side will not be affected.

Use case:

Let's say you have a rigged character, and do Weight Paint at one side of the mesh. Now you would have to repeat the Weight Painting at the other side. Instead, go to the vertex group panel in the Properties editor, and choose Copy Vertex Group (from the drop down menu) for each group you want to mirror. Then select the copy and choose Mirror Vertex Group.

Last Operator Mirror Vertex Group



Mirror Weights

Mirrors the Weight Painting informations from the symmetrical counterpart. When both are selected it will become a group and weight information exchange. If only one is selected, then the information from the unselected vertice will go to the selected vertice.

Flip Group Names

Flip selected group names. This works with vertex groups with symmetrical name conventions. Like .L , .R, right, left.

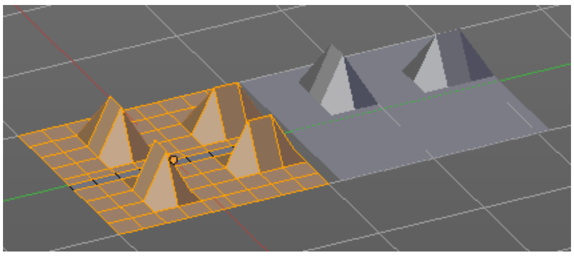
All Groups

Pass information to all groups instead of the active one.

Topology Mirror

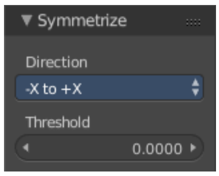
Use topology based mirroring.

Symmetrize



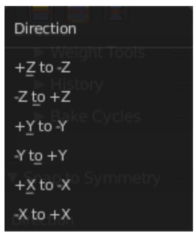
The Symmetrize tool mirrors the selected geometry symmetrical along a world axis.

Last Operator Symmetrize



Direction

Direction is a drop down box where you can define the mirroring direction.

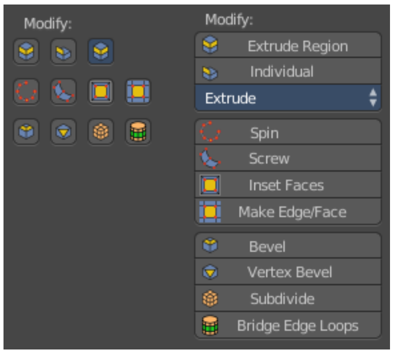


Threshold

Here you can adjust a distance after which the mirroring should happen, relative to the mirror axis. 0 means it mirrors the geometry directly at the axis.

Modify section

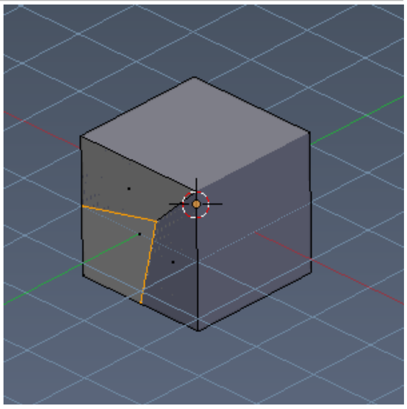
This section contains tools for general mesh modifications.



Extrude Region

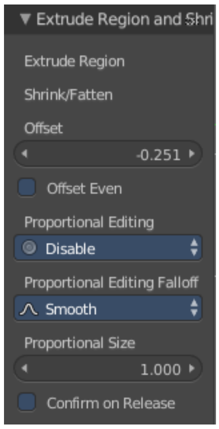
The Extrude Region tool extrudes along the vertex normals. This leads at our standard cube with two selected faces and with a value of 1 to a extrude that goes inside of the mesh.

The method works the same in all Mesh select modes.



Last Operator Extrude Region and Shrink/Fatten

The Last Operator Extrude Region and Shrink/Fatten contains the tools to adjust the Extrude settings for the extrude method Region (Vertex Normals)



Extrude Individual Faces

Just ignore, it's a bug. It's the title of the panel when you call this menu by a hotkey. Shrink/ Fatten Offset

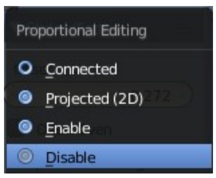
You have to read the two parts Shrink Fatten and Offset as one. Shrink Fatten Offset is a edit box where you can adjust the strength of the extrude offset numerically.

Offset Even

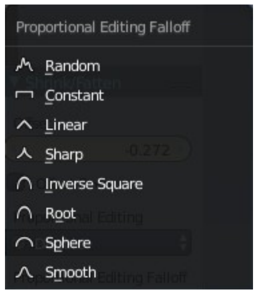
Scale the offset to give more even thickness.

Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.



Proportional Editing Falloff



Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

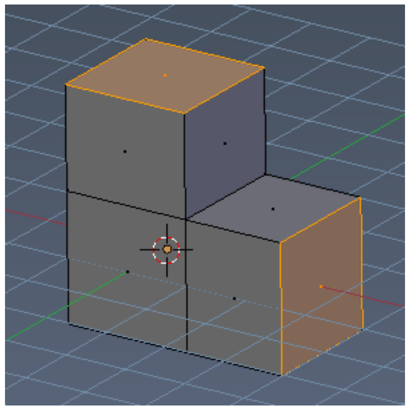
Proportional size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Confirm on Release

With Confirm on Release checked the action gets performed when you release the mouse button.

Individual Faces



The extrude method Individual Faces is the exact same method than the method Individual - In Face mode

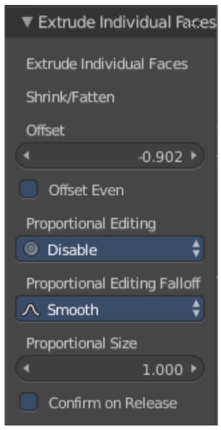
Individual Faces extrudes the faces individually. When you for example select two faces at a cube, then the extrusion happens at both faces in their own direction, which is defined by the normals of the faces. And not as a whole in one shared direction.

Individual Faces works in all mesh select methods the same. It needs selected faces. Stand-alone vertices or edges gets ignored.

Last Operator Extrude Individual Faces and Move

The Last operator Extrude Individual Faces and Move contains the tools to adjust the Extrude Individual Faces settings. It shows when you use the Individual tool in Face mode.

Extrude Individual Faces



Just ignore, it's a bug. It's the title of the panel when you call this menu by a hotkey.

Shrink/Fatten Offset

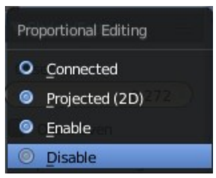
You have to read the two parts Shrink Fatten and Offset as one. Shrink Fatten Offset is a edit box where you can adjust the strength of the extrude offset numerically.

Offset Even

Scale the offset to give more even thickness.

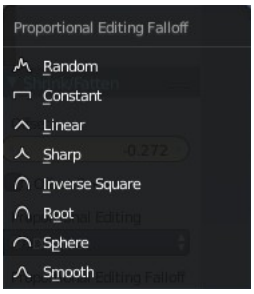
Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.



Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



Proportional size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Confirm on Release

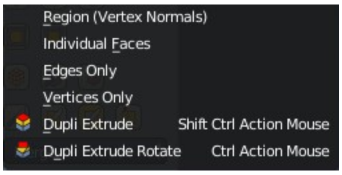
With Confirm on Release checked the action gets performed when you release the mouse button.

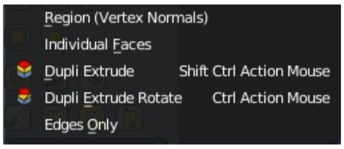
Extrude Drop-down box

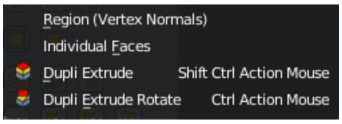
The Extrude drop-down box contains the special Extrude methods. The methods that you don't use this often.

The available Extrude tools depends of the Mesh select mode. Edge, Vertice and Face select. And the tool works then of course for the current mode. Means when you are vertice select mode, then the extrude will extrude the vertices. But it also depends of what you have selected. And so you see different content in the drop-down box.

From left to right, with a whole cube selected: Vertices select mode, Edge select mode, Face select mode.



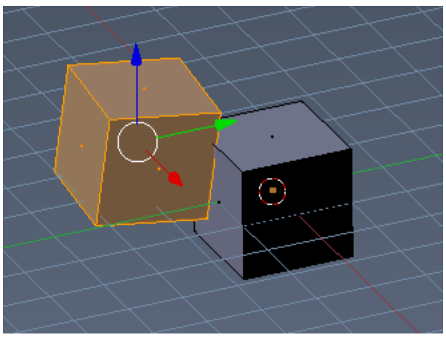




Dupli Extrude

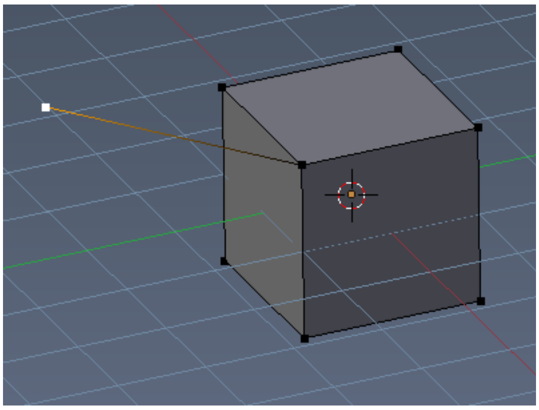
Dupli Extrude is a two trick tool. With faces selected it creates a rotated copy of the geometry. With edges or vertices selected it extrudes to the mouse position. That's why it is a good idea to use this tool with the hotkey.

Dupli Extrude - with selected Faces



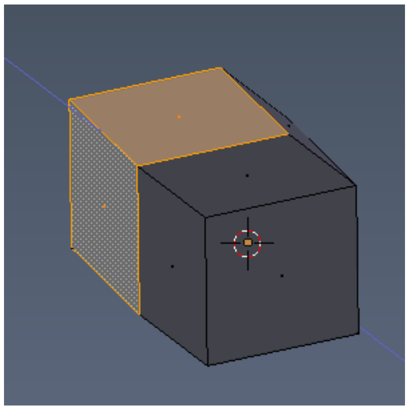
Dupli Extrude with selected faces creates a copy of the selection and rotates it slightly.

Dupli Extrude - with selected Vertices



Dupli Extrude with selected vertices extrudes the vertice to the mouse position.

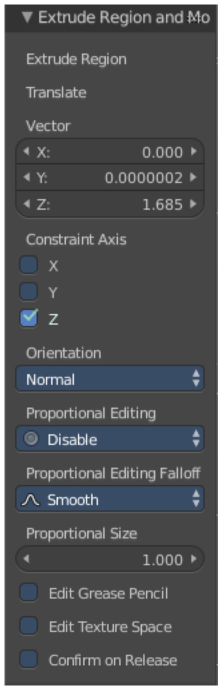
Extrude Region



Extrude region is the most common and most used extrude method. That's why it has a default hotkey. Shortcut S. It extrudes the whole selection into the direction of the middled normals of the selection.

Last Operator Region and Move

The Last operator Extrude Individual Faces and Move contains the tools to adjust the Extrude Individual Faces settings. It shows when you use the Individual tool in Face mode.



Extrude Region label

Just ignore, it's a bug. It's the title of the panel when you call this menu by a hotkey.

Translate Vector

You have to read the two parts Translate and Vector as one. Here you can adjust the extrude amount by a vector.

Constraint Axis

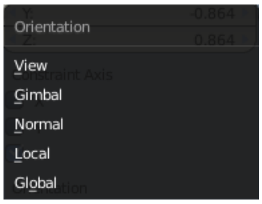
Tick or untick X, Y Z to limit the extrusion to one or more axis.

Orientation

Here you can adjust the orientation of the extrusion. It usually starts with Normal.

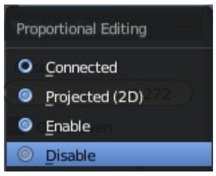
Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.



Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

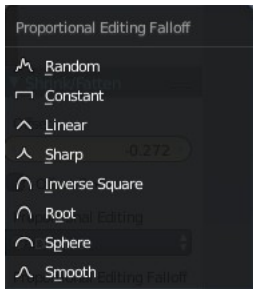


Proportional size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Edit Grease Pencil

Edit Grease pencil ticked allows you to edit the grease pencil stroke.

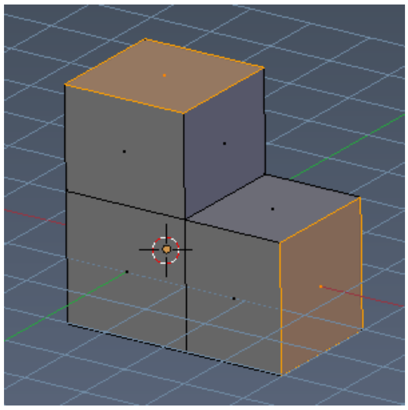


Edit Texture Space

By default extrusion will not modify the UV mapping. With Edit texture Space ticked the UV mapping updates with the extrusion.

Confirm on Release

With Confirm on Release checked the action gets performed when you release the mouse button.

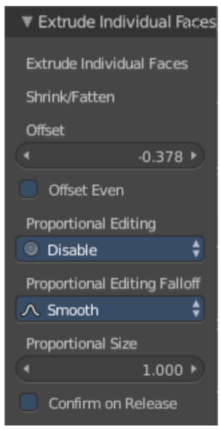


Extrude Individual - In Face mode

Individual in Face mode extrudes the elements individually. When you for example select two faces at a cube, then the extrusion happens at both faces in their own direction, which is defined by the normals of the faces. And not as a whole in one shared direction.

Last Operator Extrude Individual Faces and Move

The Last operator Extrude Individual Faces and Move contains the tools to adjust the Extrude Individual Faces settings. It shows when you use the Individual tool in Face mode.



Extrude Individual Faces

Just ignore, it's a bug. It's the title of the panel when you call this menu by a hotkey.

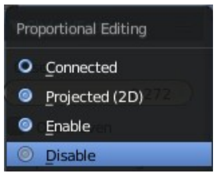
Shrink/Fatten Offset

You have to read the two parts Shrink Fatten and Offset as one. Shrink Fatten Offset is a edit box where you can adjust the strength of the extrude offset numerically.

Offset Even

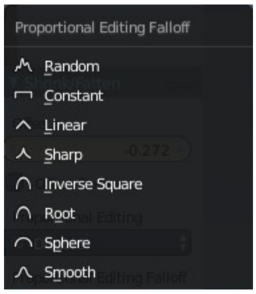
Scale the offset to give more even thickness.

Proportional Editing



Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.

Proportional Editing Falloff



Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

Proportional size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

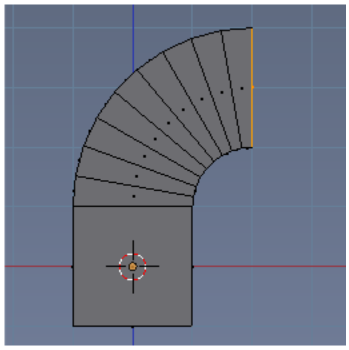
Confirm on Release

With Confirm on Release checked the action gets performed when you release the mouse button.

Extrude Individual in Edge and Vertice Mode

For Individual in Edge and Vertice Mode see the extrude methods Edges only and Vertices only. It's the same functionality.

Spin



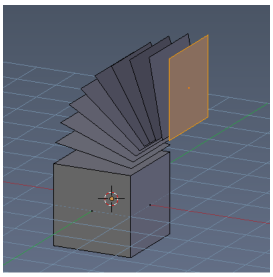
The Spin tool extrudes the selection and spins it by a defined amount and segments. This amount and number of segments can be adjusted in the Last operator. It is best performed in a orthographic view from side. It depends of the view orientation when extruding out.

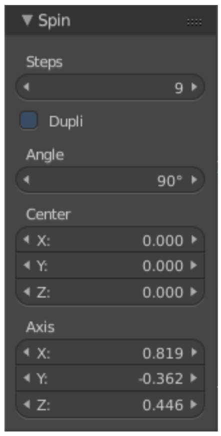
Last Operator Spin

Steps

Steps is the number of segments.

Dupli





With dupli checked the geometry gets duplicated instead of extruded. Angle

Angle defines the angle of the spin.

Centre

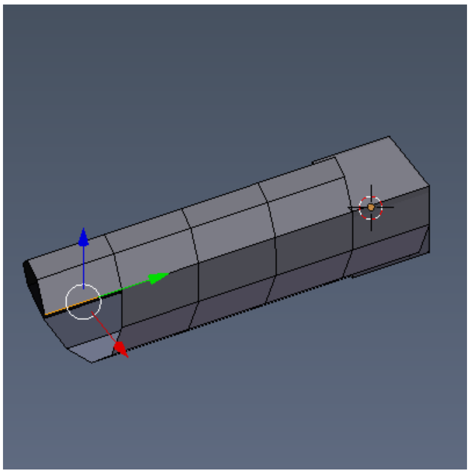
The Centre edit boxes defines the centre of the radius for the spin operation. In our example the X value is set to 2, and the Z value is set to 1.

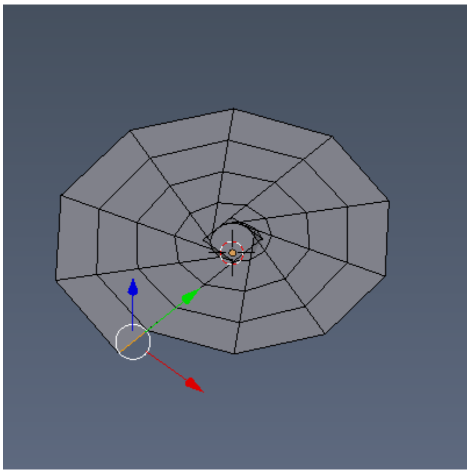
Axis

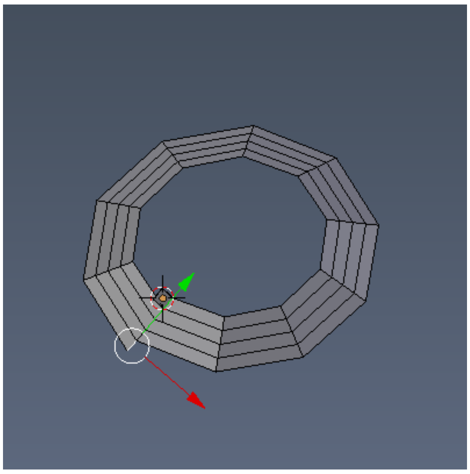
Axis defines the extrude direction. With X and Z values you can twist the result.

Screw

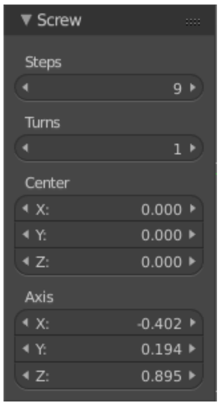
With the Screw tool you can extrude edges to a screw shape. Examples:







Last Operator Screw



Steps

Steps is the number of segments.

Turns

Turns defines the repeating of the screw.

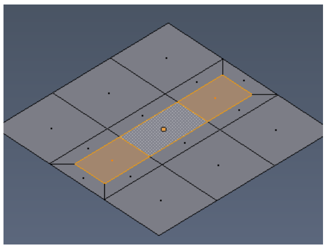
Centre

The Centre edit boxes defines the centre of the radius for the screw operation.

Axis

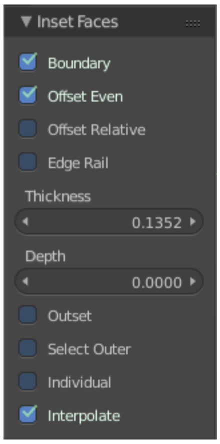
Axis defines the extrude direction.

Inset



Inset insets edges into the selected faces. Think of it as a extrude inwards the face.

Last Operator Inset



Boundary

With Boundary ticked you will get the connect edges in the corners.

Offset Even

Scales the offset to give more even thickness.

Offset Relative

Scales the offset by surrounding geometry.

Edge Rail

Inset the region along existing edges.

Thickness

Thickness adjusts the thickness of the inset geometry.

Depth

With depth you can bevel the inset geometry. It is then not longer coplanar to the initial face.

Outset

With outset ticked the Inset will not extrude inwards but outwards.

Select Outer

With Select Outer the outer ring will be selected after the Inset.

Individual

Inset every face individually.

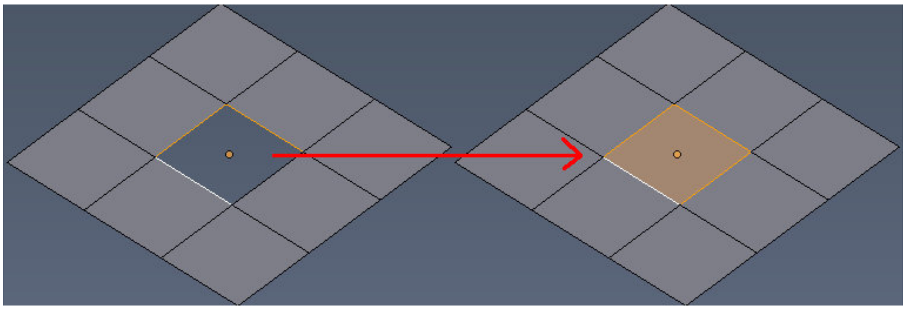
Interpolate

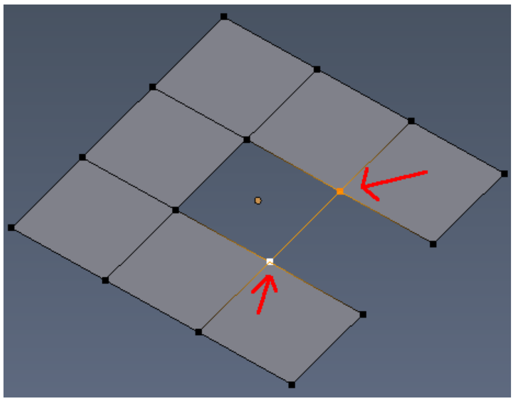
Blend Face Data across the inset.

Make Edge/Face

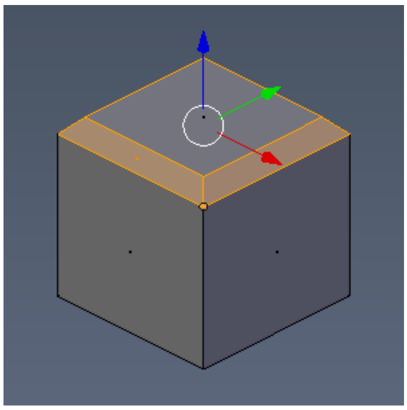
The Make Edge/Face tool adds a face when you have edges selected. And Edges when you have Vertices selected. It's a Bridge tool.

First select the edges or Vertices that you want to bridge. Then click the Make Edge/Face Button.





The Last Operator Make Edge/Face has no further options.



Bevel

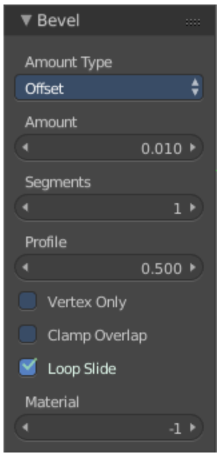
The Bevel Tool adds a bevel to the selected geometry.

Usage: first select the geometry that you want to bevel. Then activate the tool. Don't wonder that the mouse movement does nothing. That's by design. Adjust the amount in the Last Operator Bevel panel.

Last Operator Bevel

Amount type

Amount Type is a drop-down box where you can choose the Amount type for the bevel action.



Amount

The Bevel amount

Segments

How many segments gets created

Profile

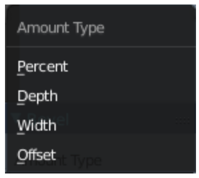
Controls the Profile shape. 0.5 means round.

Vertex only

Bevel Vertices only.

Clamp Overlap

Do not allow bevelled geometry to overlap each other.



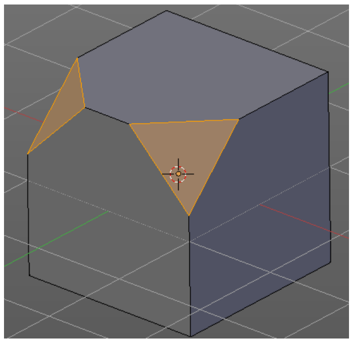
Loop Slide

Prefer slide along edge to even widths.

Material

Material for bevelled faces. -1 is the surrounding material.

Vertex Bevel



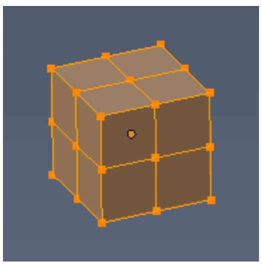
Vertex Bevel is nothing else than Bevel. But with some pre adjustments to perform a vertex bevel directly. This saves some clicks.

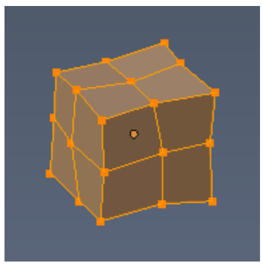
This means that the Last Operator is of course the same than the one from Bevel since it is Bevel.

Subdivide

Subdivide divides the selected edges. It subdivides the involved faces too, and can create new vertices.

A more unknown functionality is that it can also randomize the result with the Fractal slider in the Last operator panel.

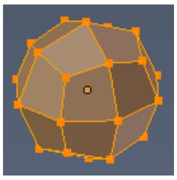


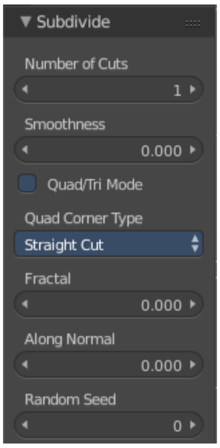


Last Operator Subdivide

Number of Cuts

The number of cuts defines the amount of subdivisions.





Smoothness.

This value defines how smooth the subdivision result is. From flat to bent.

Quad/Tri Mode

With this tool ticked it tries to prevent N-Gons while subdivision.

Quad Corner Type

Here you can adjust the corner type.

Fractal

Randomize the selected vertices.

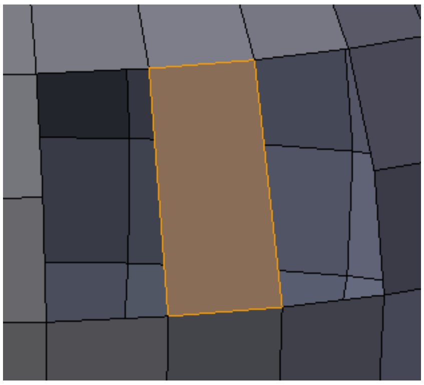
Along Normal

When randomized, this value defines how strong the subdivision follows the normals of the initial vertices.

Random Seed

Randomizing value for fractal randomizing.

Bridge Edgeloops

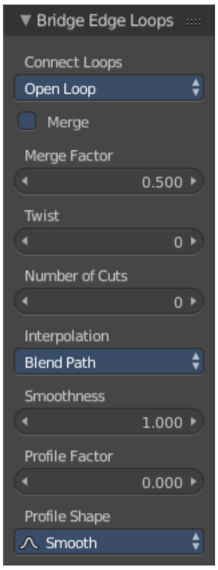


The Bridge edgeloops tool bridges selected edges, and adds a polygon between them. You need to have at least two edges selected.

Last Operator Bridge Edgeloops

Connect Loops

Here you can choose the method how to deal with bridging multiple loops



Merge

With merge ticked it will not create a bridge face, but merge the selected edges.

Merge Factor

The merge factor determines at which distance between the selected edges the merge happens. 0.5 is the middle of the selected edges.

Twist

The twist offset for closed loops.

Number of Cuts

Adds cuts to the bridge face.

Interpolation

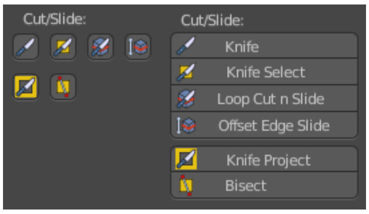
Here you can choose the interpolation mode for the cuts.

Smoothness
Here you can adjust the smoothness for the cuts.

Profile Factor
Here you can adjust the profile factor for the cuts.

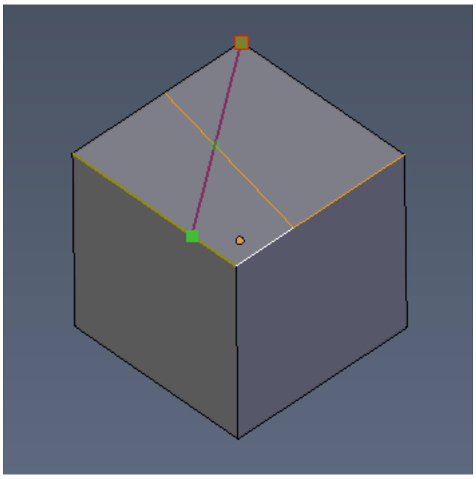
Profile shape
Here you can adjust the profile shape for the cuts.

Cut Slide panel



This section contains tools around cut functionality.

Knife tool

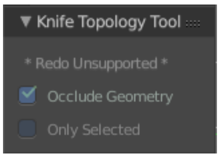


The Knife tool cuts the geometry, and adds edges. When it crosses existing geometry then it adds a vertice at the crossing point.

The Knife tool cuts across every geometry, selected or not.

Usage: activate the tool, left click to define the starting point. This can also be a point in the middle of a face. But ideally you choose an existing vertice or an edge as the start and endpoints. When done press Space bar to confirm.

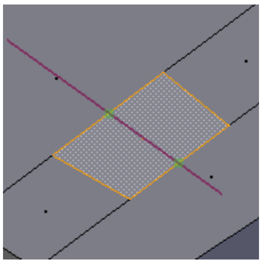
Last Operator Knife Topology Tool



There is no adjustable setting in the Last Operator Knife Topology Tool.

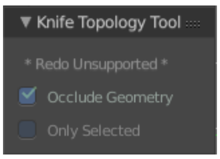
Just a hint that Redo is not supported for this operator. And the states of the checkboxes are displayed.

Knife Select Tool



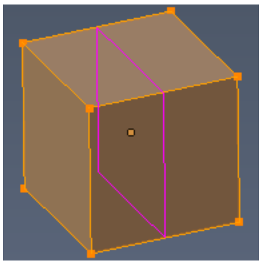
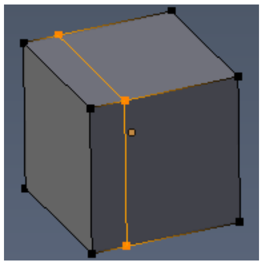
Knife Select tool works similar to the Knife tool. But it cuts just selected faces.

Last Operator Knife Topology Tool



There is no adjustable setting in the Last Operator Knife Topology Tool.

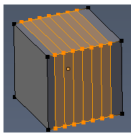
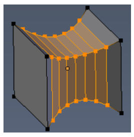
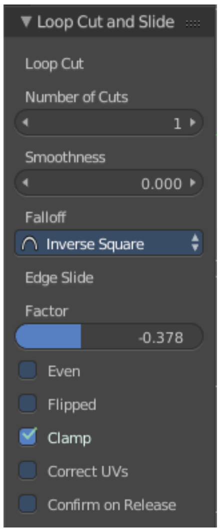
Just a hint that Redo is not supported for this operator. And the states of the checkboxes are displayed. For Knife Select this checkboxes are checked different than for the normal knife tool.

Loop Cut and Slide

Loop Cut and Slide is a tool that works in two steps. In the first step you divide the selected geometry by a loop. When you left click, then the added loop becomes moveable along the edges.

Last Operator Loop Cut and Slide

Number of Cuts

The number of cuts that gets added. It can be more than one loop at once.

Smoothness

This value defines how smooth the loop cut gets added. From flat to bent.

Falloff

Here you can adjust the Falloff type for smoothness.

Edge Slide Factor

Where the loop is centred.

Even

Make the edge loop match the shape of the adjacent edge loop

Flipped

When Even mode is active, flips between the two adjacent edge loops.

Clamp

Clamp within the edge extend.

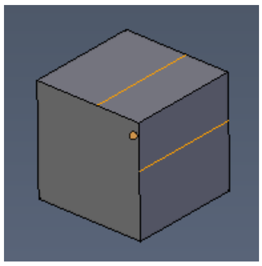
Correct UV's

Corrects the UV's when modifying the geometry.

Confirm on Release

With Confirm on Release checked the action gets performed when you release the mouse button.

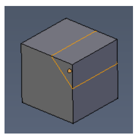
Offset Edge Slide



Edge slide slides the selected edge(s)

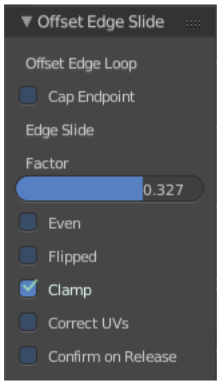
Usage: select the edges that you want to slide. Click to confirm. Then adjust the sliding amount in the Last Operator Offset Edge Slide.

Last Operator Offset Edge Slide



Cap Endpoint

Cap Endpoint caps the loose edges.



Edge Slide Factor

Here you can adjust the slide amount.

Even

Make the edge loop match the shape of the adjacent edge loop

Flipped

When Even mode is active, flips between the two adjacent edge loops.

Clamp

Clamp within the edge extend.

Correct UV's

Corrects the UV's when modifying the geometry.

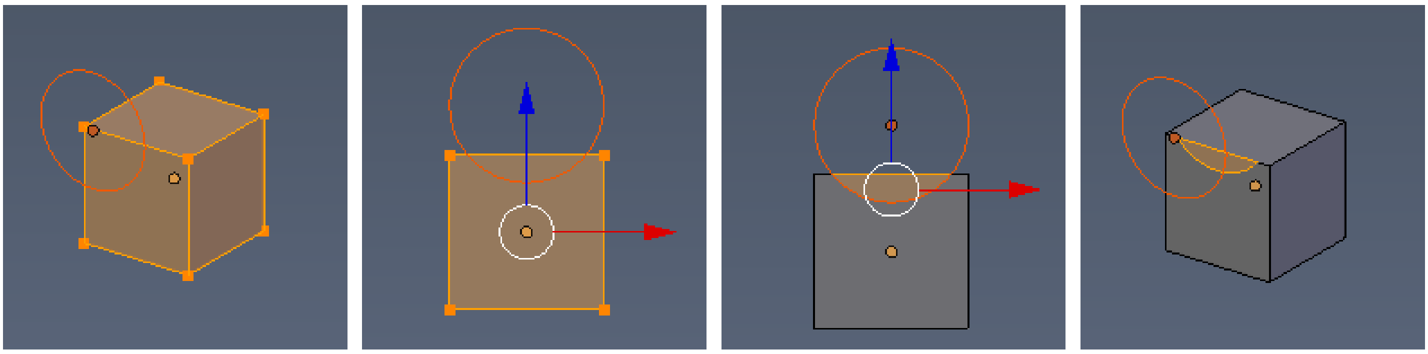
Confirm on Release

With Confirm on Release checked the action gets performed when you release the mouse button.

Knife Project

Knife Project uses an object as a knife to cut edges into a mesh.

Usage: Create a cube. Create a circle. Rotate the circle by 90 degrees, and move it in front of the cube so that it does not overlap the cube. Now go into front view. Select circle, hold down shift, select Cube. Enter Edit Mode. Click the Knife Project tool.

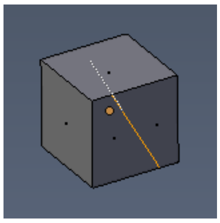


Last Operator Knife Project

Cut through

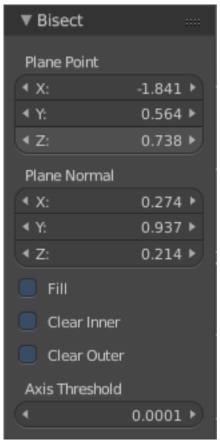
The cut goes through the whole object when the Cut through checkbox is ticked.

Bisect



Bisect cuts geometry along a plane. This description is a bit misleading though. You simply cut through the whole geometry by defining a line. And the cut goes through the geometry from the current view.

Last Operator Bisect



Plane Point

Defines the start point of the Bisect cut.

Plane Normal

The direction in which the bisect points.

Fill

Fills the cut

Clear Inner

Removes the inner part of the face to cut.

Clear Outer

Removes the outer part of the face to cut.

Axis threshold

Axis threshold.

Merge / Separate

This section contains the merge and separate tools.

Merge

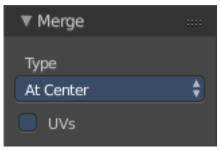
Merge merges the vertices of the selected geometry. There are three methods available. At centre, At Cursor and Collapse.

At Centre merges the geometry at the centre of the selected vertices.

At Cursor merges the geometry at the 3D Cursor.

Collapse merges the geometry at the centre of the selected vertices.

Last Operator Merge



Type

Type is the drop-down box again where you can choose what method to use for merge.

UV's

With UV's ticked the UV mapping will update with changes at the geometry.

Separate

Separate separates the selected geometry, and creates a new object. The geometry becomes uneditable, since it is now a new object. You will have to leave the Edit mode, select the new object, and re-enter Edit mode when you want to edit it.

Selection separates the current selection.

By Material separates all geometry that has the same material than the current selection.

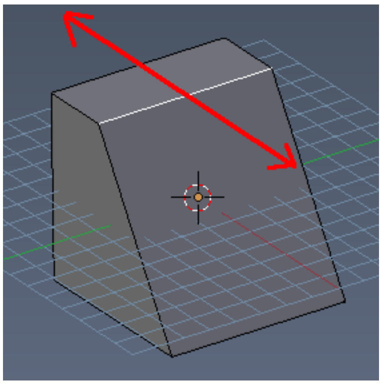
By Loose parts separates all geometry that is connected by edges to the current selection.

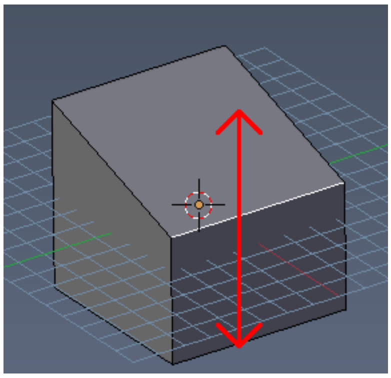
Separate has no Last Operator.

Deform section

The Deform section contains tools to deform the existing geometry.

Edge Slide



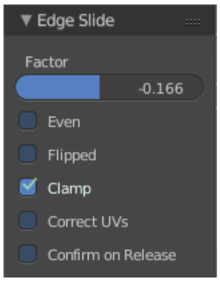


Edge Slide slides the selected edge along the face that it is part of. This is for the edge at a cube into two possible directions.

Last Operator Edge Slide

Factor

Factor is a sliding box Here you can adjust the slide strength numerically. The width of the face is the 0-1 range.



Even

Make the Edge loop match the shape of the adjacent edge loop.

Flipped

When Even Mode is active, flips between the two adjacent edge loops.

Clamp

Clamp within the edge extend.

Correct UV's

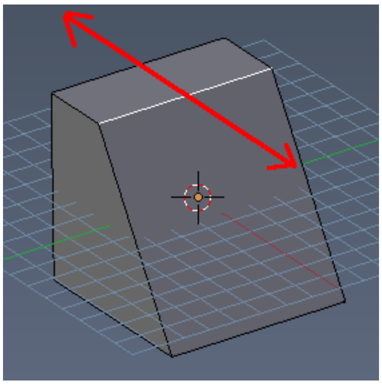
Correct UV's corrects the UV's while editing the geometry.

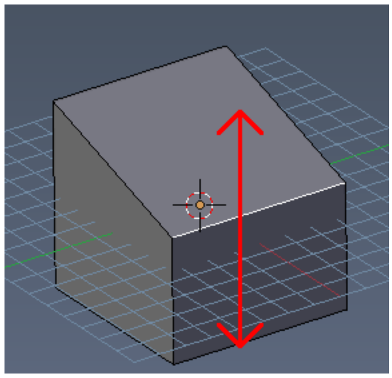
Confirm on Release

With Confirm on Release checked the action gets performed when you release the mouse button.

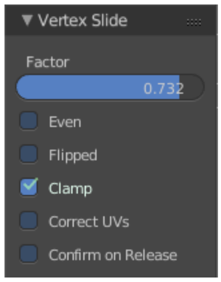
Vertex Slide

Vertex Slide slides the selected vertice along the edge that it is part of. This is for the corner vertice at a cube into three possible directions.





Last Operator Vertex Slide



Factor

Factor is a sliding box Here you can adjust the slide strength numerically. The width of the face is the 0-1 range.

Even

Make the Edge loop match the shape of the adjacent edge loop.

Flipped

When Even Mode is active, flips between the two adjacent edge loops.

Clamp

Clamp within the edge extend.

Correct UV's

Correct UV's corrects the UV's while editing the geometry.

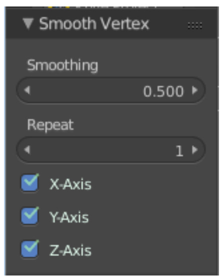
Confirm on Release

With Confirm on Release checked the action gets performed when you release the mouse button.

Smooth Vertex

Smooth Vertex smooths the selected vertices. It is a tool to reduce noise at the mesh.

Last Operator Smooth Vertex



Smoothing

Smoothing is the strength of the smoothing

Repeat

Repeat is the number of iterations that the smoothing action gets repeated. With 1 the smoothing is just performed once. With 10 it is performed ten times.

Axis

The Axis checkboxes lets you limit the smoothing to specific world axis.

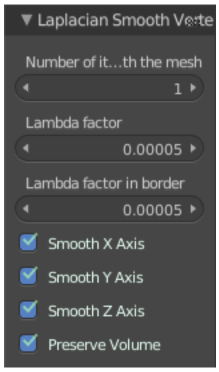
Laplacian Smooth Vertex

Laplacian Smooth Vertex smooths the selected vertices. It is a tool to reduce noise at the mesh. It works a bit different than the normal Smooth Vertex tool. And gives a different result. The Laplacian method allows you to preserve the volume, and to adjust border smoothing.

Last Operator Laplacian Smooth Vertex

Number of Iterations

Number of Iterations is the number of iterations that the smoothing action gets repeated. With 1 the smoothing is just performed once. With 10 it is performed ten times.



Lambda Factor

Lambda Factor is the strength of the smoothing.

Lambda Factor in border

Lambda Factor is the strength of the smoothing in border areas.

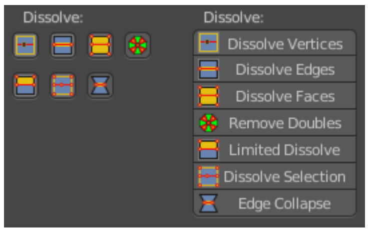
Smooth Axis

The Smooth Axis checkboxes allows you to limit the smoothing to specific world axis.

Preserve Volume

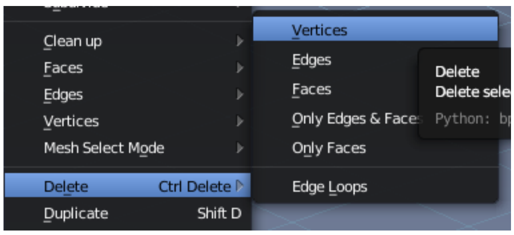
Preserve Volume preserves the volume of the object.

Dissolve Section



Dissolve operations removes for examples selected vertices, edges and faces. But they are not delete operations. It's not simply removing the selected element. Dissolve can behave different than delete. And offers some options.

When you for example choose Delete vertices from the mesh menu, then the involved faces can get deleted too. When you choose Dissolve vertices, then the vertices gets removed, and the faces stays intact.

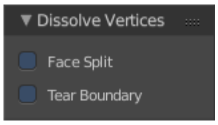


Dissolve Vertices

Dissolve Vertices dissolves the selected Vertices.

Note that pressing DEL in Vertice select mode calls Dissolve Vertices already. It's the same operator. But you don't get the Last operator that way.

Last Operator Dissolve Vertices



Face Split

Split off Face corners to maintain surrounding geometry

Tear Boundary

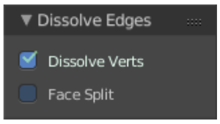
Split off Face corners instead of merging faces

Dissolve Edges

Dissolve Edges dissolves the selected Edges.

Note that pressing DEL in Edge select mode calls Dissolve Edges already. It's the same operator. But you don't get the Last operator that way.

Last Operator Dissolve Edges



Dissolve Verts

When the dissolve operation leaves vertices behind, then this vertices will be dissolved too.

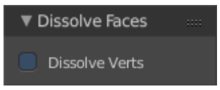
Face Split

Split off Face corners to maintain surrounding geometry

Dissolve Faces

Dissolve Faces removes the inlaying edges of the selected faces. This faces becomes one big N-Gon.

Last Operator Dissolve Faces



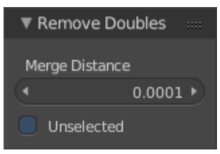
Dissolve Verts

When the dissolve operation leaves vertices behind, then this vertices will be dissolved too.

Remove Doubles

Remove doubles merges vertices that are close to each other or overlapping each other. This is sometimes necessary to remove vertices that overlaps each other, and cannot even be seen therefore.

Last Operator Remove Doubles



Merge Distance

The distance in which the vertices gets catched and merged.

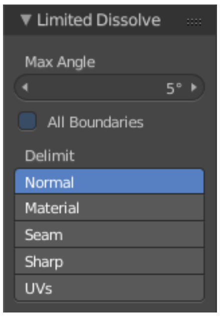
Unselected

With Unselected ticked all surrounding vertices will be calculated.

Limited Dissolve

Limited Dissolve dissolves the selected Edges and Vertices, limited by the surrounding geometry.

Last Operator Limited Dissolve



Max Angle

The limiting angle.

All Boundaries

All Boundaries dissolves in-between face boundaries.

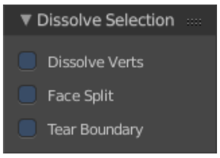
Delimit

You can also delimit by other methods than normals.

Dissolve Selection

Dissolve Selection dissolves the geometry based at the selection mode.

Last Operator Dissolve Selection



Dissolve Verts

When the dissolve operation leaves vertices behind, then this vertices will be dissolved too.

Face Split

Split off Face corners to maintain surrounding geometry.

Tear Boundary

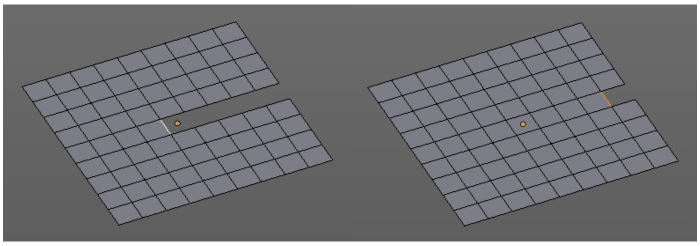
Split off Face corners instead of merging faces.

Edge Collapse

Edge Collapse collapses the selected edges to a vertice at the centre of the selection.

Edge Collapse has no adjustable settings in the Last Operator panel.

F2 Tool

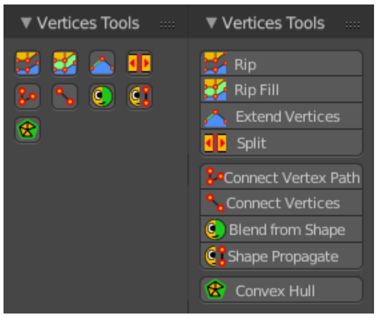


The F2 Tool is an addon that speeds up modeling process. It allows you to quickly fill gaps in a mesh.

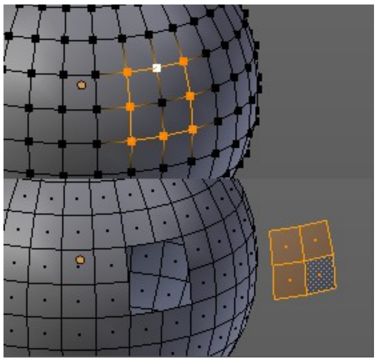
This addon can be disabled in the addon section of the user preferences.

Vertices Tools Panel

Vertices Tools is a panel that contains vertices related tools.



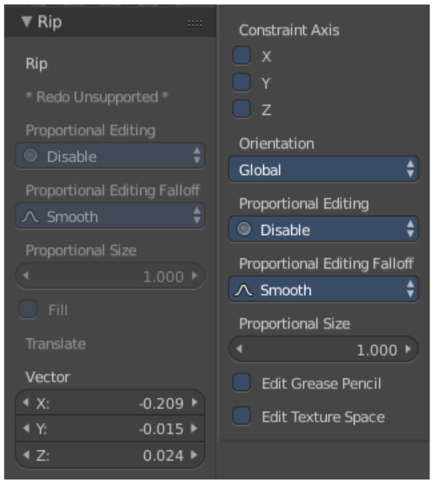
Rip



Rip splits the edges between the selected vertices. It creates two edges out of one.

This tool works similar to the Edge Split tool. But with selected edges instead of selected vertices. It also selects the outer edges so that you immediately move them. And it provides some options in the Last operator.

Last Operator Rip



There are some greyed out parts. We will ignore them since it is most probably a bug, and we cannot edit them anyway.

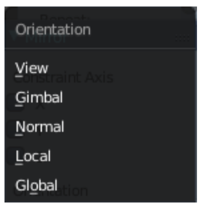
Vector

Here you can adjust the position values for the three values

Constraint Axis

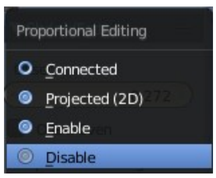
Here you can limit the position relative to the source object.

Orientation



Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.

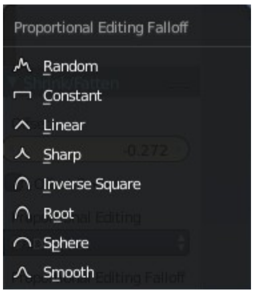
Proportional Editing



Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.

Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



Proportional Size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

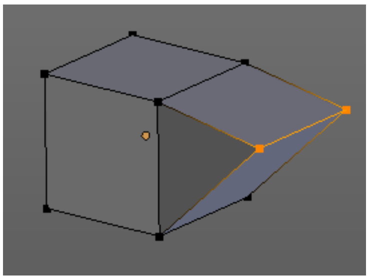
Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

Edit Texture Space

With Confirm on Release checked the action gets performed when you release the mouse button.

Rip Fill

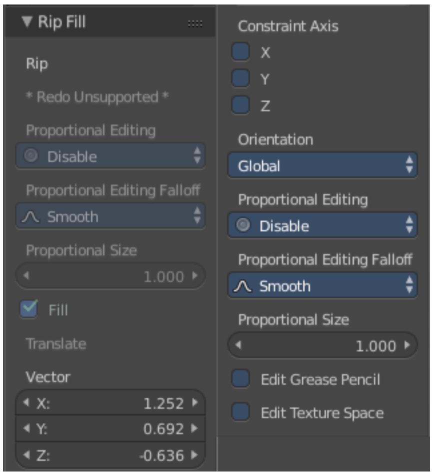


Rip Fill works similar to the Rip tool. It splits the edges between the selected vertices. It creates two edges out of one. But it fills the gap between the new edges when you move the geometry.

This tool works similar to the Edge Split tool. But with selected edges instead of selected vertices. It also selects the outer edges so that you immediately move them. And it provides some options in the Last operator.

Last Operator Rip Fill

There are some greyed out parts. We will ignore them since it is most probably a bug, and we cannot edit them anyway.



Vector

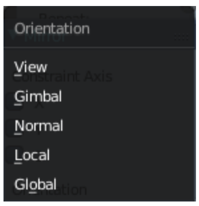
Here you can adjust the position values for the three values

Constraint Axis

Here you can limit the position relative to the source object.

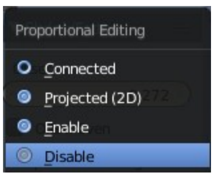
Orientation

Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.



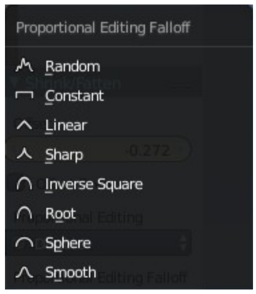
Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.



Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



Proportional Size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Edit Grease Pencil

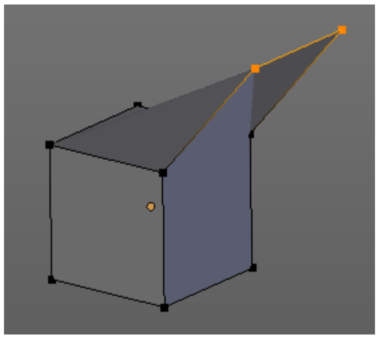
Edit Grease Pencil edits the selected Grease Pencil strokes.

Edit Texture Space

With Confirm on Release checked the action gets performed when you release the mouse button.

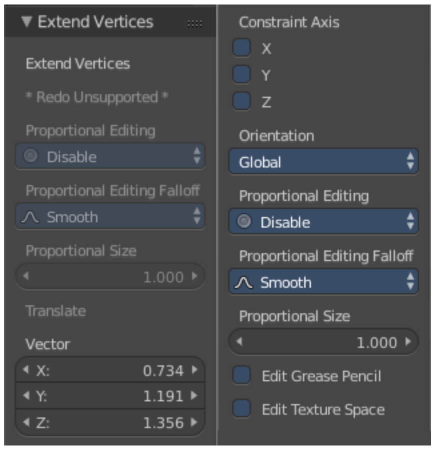
Extend Vertices

Extend vertices extrudes out the selected vertices. When you do this operation at an edge then you will create N-Gons that way.



Last Operator Extend Vertices

There are some greyed out parts. We will ignore them since it is most probably a bug, and we cannot edit them anyway.



Vector

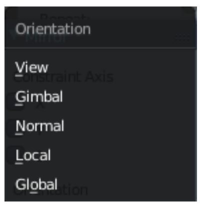
Here you can adjust the position values for the three values

Constraint Axis

Here you can limit the position relative to the source object.

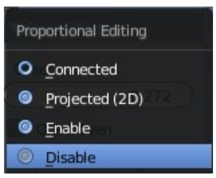
Orientation

Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.



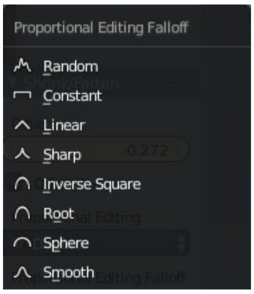
Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.



Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



Proportional Size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

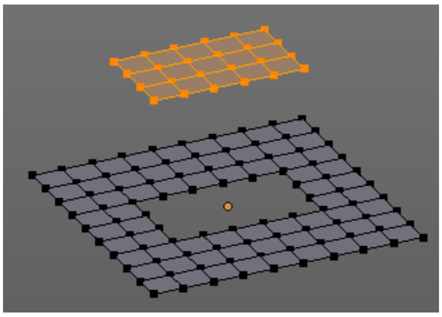
Edit Texture Space

With Confirm on Release checked the action gets performed when you release the mouse button.

Split

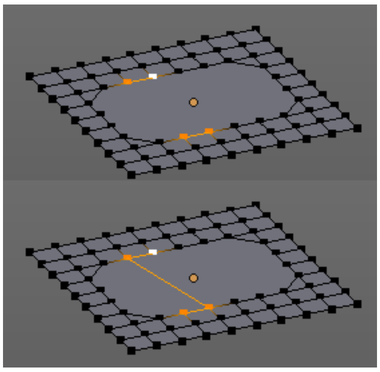
Split works similar to the Rip tool. It splits the edges between the selected vertices. It creates two edges out of one.

This tool works similar to the Edge Split tool. But with selected edges instead of selected vertices.



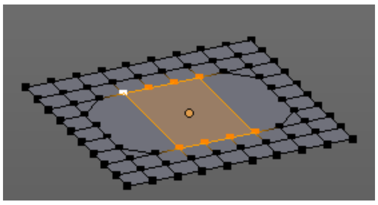
Connect Vertex Path

Connect Vertex path connects selected vertices, but takes the vertex order into account. It just creates edges between vertices that are not connected in this order.

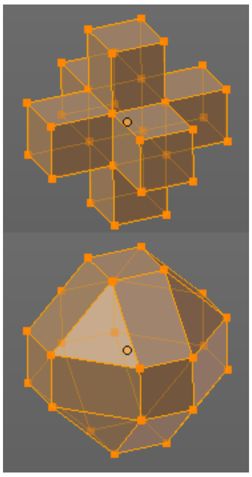


Connect Vertices

Connect Vertices connects the selected vertices. It does not fill the selection with edges though, but creates just the edges for the outside of a polygon.

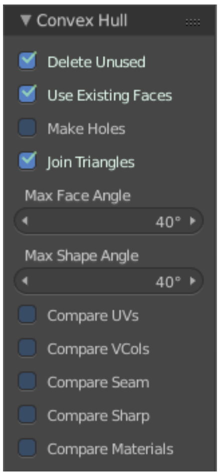


Convex Hull



Creates a convex hull around the selected vertices.

Last Operator Convex Hull



Delete Unused

Removes vertices that are not part of the convex geometry.

Use existing Faces

Use existing input faces that lies on the hull where possible. This option allows to have N-Gons in the convex hull.

Make Holes

Deletes edges and faces in the hull that were part of the input. This allows to delete faces between the existing mesh and the convex hull.

Join Triangles

Joins adjacent triangles into quads

Max Face Angle

Max Face Angle belongs to the Join Triangles setting. Here you can set the maximum face angle.

Max Shape Angle

Max Face Angle belongs to the Join Triangles setting. Here you can set the maximum shape angle.

Compare UV's

Takes existing UV patches for the calculation into account.

Compare Vcols

Takes existing Vertex colors for the calculation into account.

Compare Seam

Takes existing seams for the calculation into account.

Compare Sharp

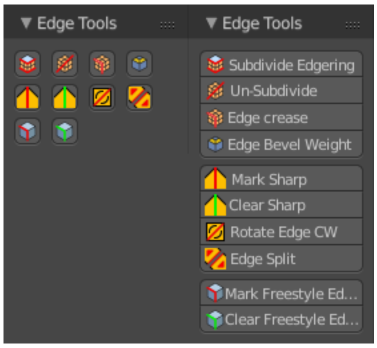
Takes existing sharp edges for the calculation into account.

Compare Materials

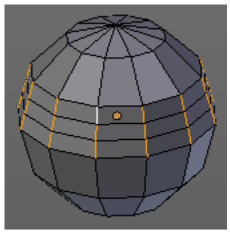
Takes existing materials for the calculation into account.

Edges Tools Panel

Edges Tools is a panel where you can find some Edges related tools.

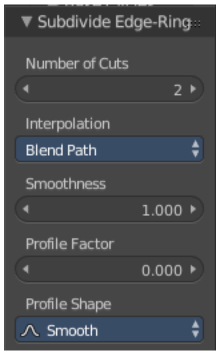


Subdivide Edge ring



Subdivides the selected edge ring(s).

Last Operator Subdivide Edge ring



Number of Cuts

Here you can adjust the number of cuts for the subdivision.

Interpolation

Here you can chose a interpolation method for the new geometry.

Linear ends in a equal division and a flat result. Blend Surface interpolates the surrounding geometry. And can end in a curvy result.

Smoothness

The Smoothness factor for the interpolation.

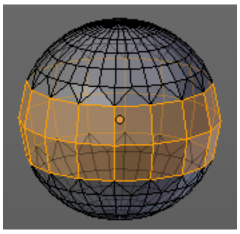
Profile Factor

The profile strength

Profile Shape

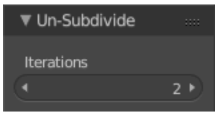
A drop-down box where you can define a profile for the generated geometry.

Un-Subdivide



Decimates the geometry by trying to make one quad out of four quads. But can also end in Tris where this is not possible.

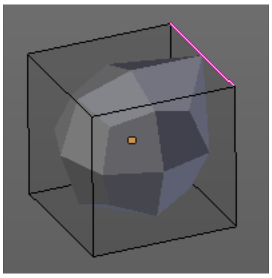
Last Operator Un-Subdivide



Iterations

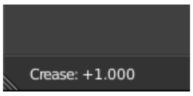
Number of iterations. This means how deep the calculation should go. One level of SDS, two levels, three levels, etc. . Down to the point where you cannot decimate any geometry anymore.

Edge Crease



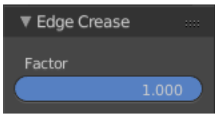
When you use a Subdivision Surface Modifier, then you can define the sharpness of selected edges with this tool. Crease edges will be marked colored in edit mode.

You will see a value in the header that indicates the current strength when you activate the tool. Move with the mouse to increase or decrease the value. Or type in a value while you are in this mode. You can also scale into negative range.



A negative crease value will subtract from the current active crease value in case it exists already from a former crease operation. A Crease value of -1 removes the crease from this edge.

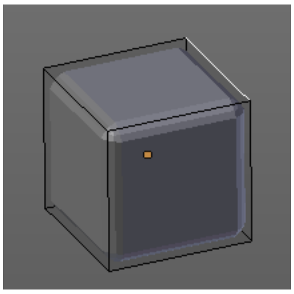
Last Operator Edge Crease



Factor

Here you can adjust the crease factor.

Edge Bevel Weight



This tool adjusts the edge bevel weight for selected edges when you use the Bevel modifier at the mesh.

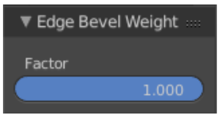
You will see a value in the header that indicates the current strength when you activate the tool. Move with the mouse to increase or decrease the value. Or type in a value while you are in this mode. You can also scale into negative range.

A negative Edge Bevel Weight value will subtract from the current active crease value in case it exists already from a former crease operation. A Edge Bevel Weight value of -1 removes the weight from this edge.

Last Operator Edge Bevel Weight

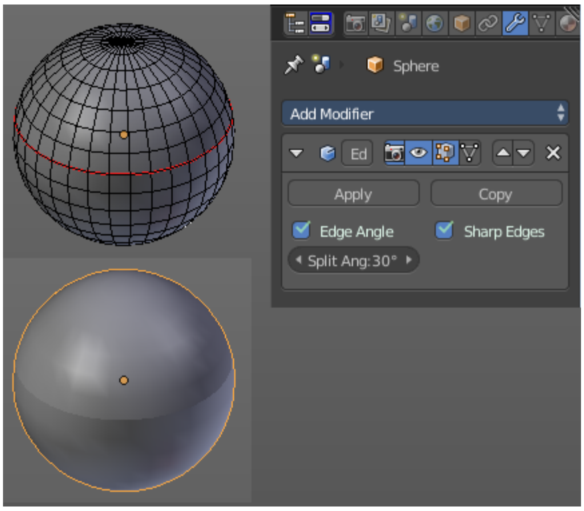
Factor

Here you can adjust the Edge Bevel Weight factor.

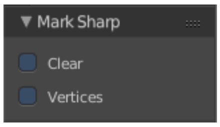


Mark Sharp

Mark Sharp is a tool that you need for the Edge Split modifier. Marked edges are displayed and rendered as sharp edges.



Last Operator Mark Sharp



Clear

Clears selected edges instead of marking it

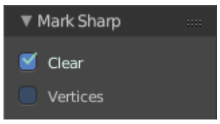
Vertices

Calculate by the selected vertices instead of edges to mark the edges.

Clear Sharp

Clears formerly as sharp marked selected edges

Last Operator Mark Sharp



Clear

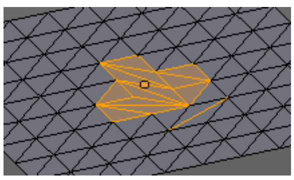
Clears selected edges instead of marking it.

Vertices

Calculate by the selected vertices instead of edges to mark the edges.

Rotate Edge CW

Rotate Edge rotates the selected edge clockwise.

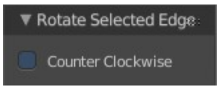


This feature is useful when you have a triangulated quad mesh, and need to have some edges point into another direction as they currently do.

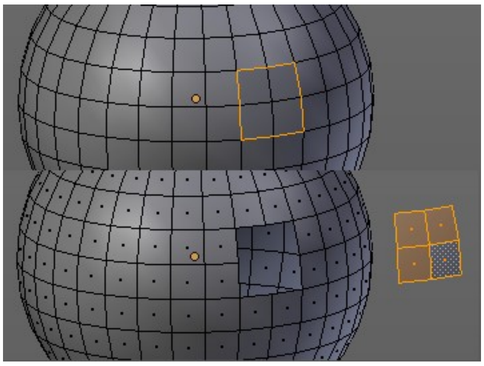
Rotate Edge CW rotates clockwise by default. But you can also rotate counter clockwise.

Last Operator Rotate Selected Edge

Counter Clockwise
Rotate selected edges counter clockwise



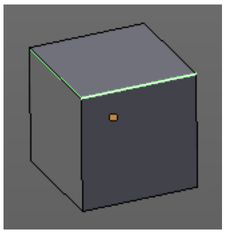
Edge Split



Edge split splits the selected edges. It creates two edges out of one.

This tool works similar to the Rip tool. But with selected edges instead of selected vertices. And this tool has no further settings.

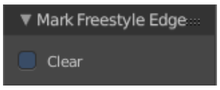
Mark Freestyle Edge



Freestyle is a comic renderer that is included in Bforartists. Mark Freestyle Edges marks the selected edges as Freestyle feature edges.

Last Operator Mark Freestyle Edge

Clear
Unmarks the selected edges as Freestyle feature edges.

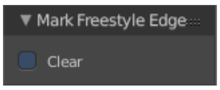


Clear Freestyle Edge

Freestyle is a comic renderer that is included in Bforartists. Clear Freestyle Edges unmarks the selected edges as Freestyle feature edges.

Last Operator Mark Freestyle Edge

Clear
Unmarks the selected edges as Freestyle feature edges.



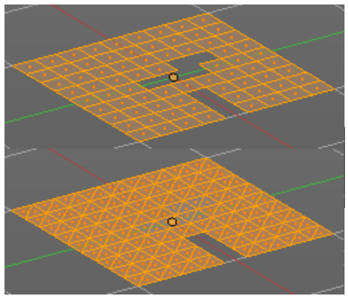
Faces Tools Panel

Faces

Faces is a menu where you can find some Faces related tools.

Fill

Fills holes and triangulates the geometry.



Last Operator Fill

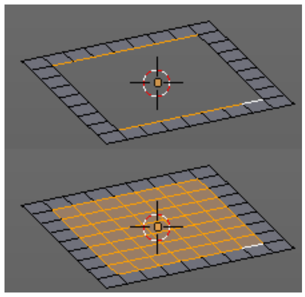
Beauty

Use best triangulation division.

Grid Fill

Grid Fill allows you to fill two edge loops with quad geometry that follows the surrounding geometry.

Usage: select two opposite edge loops. Then perform the tool.



Last Operator Grid Fill

Span

Number of sides.

Offset

Here you can define a offset.

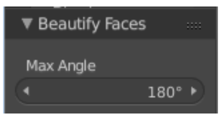
Simple Blending

Uses a simple interpolation. Faster but less accurate.

Beautify Faces

Beautify faces tries to optimize triangulations.

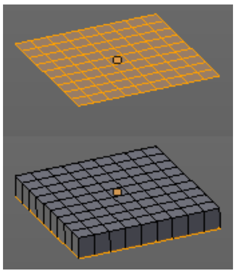
Last Operator Beautify Faces



Max Angle

Here you can set an angle limit.

Solidify

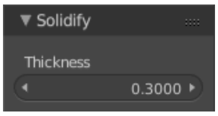


Gives the selected faces a thickness, and makes it solid.

There is also a Solidify modifier available.

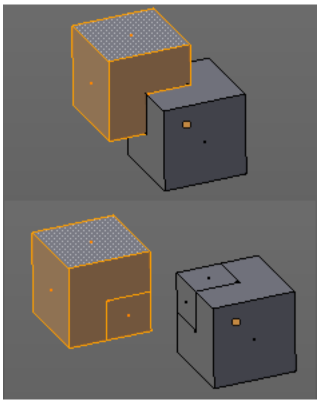
Last Operator Solidify

Thickness



Here you can adjust the thickness. You can scale also into the negative range.

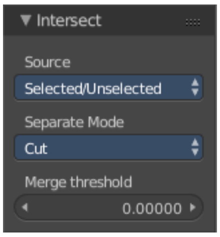
Intersect



Intersect creates edges where geometry intersects.

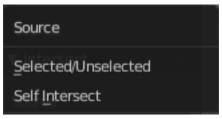
This operation happens in Edit mode, and so all parts must be in the same mesh.

Last Operator Intersect



Source

Source is a drop-down box where you can choose at which mesh part you want to operate.



Selected/Unselected works between the selected and unselected geometry.

Self Intersect works on the overlapping geometry of the mesh.

Separate Mode

Separate mode is a drop-down box where you can choose the separation mode.

All splits the geometry at the new edge.

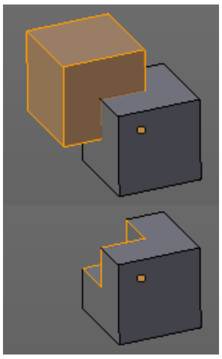
Cut keeps each side of the intersection separate without splitting the faces in half.

Merge merges all the geometry from the intersection.

Merge Threshold

Here you can adjust the merge threshold. Increase it when some geometry is not calculated. But keep it small for fast calculation.

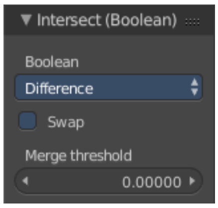
Intersect (Boolean)



Intersect (Boolean) performs a boolean operation between the selected and unselected mesh parts.

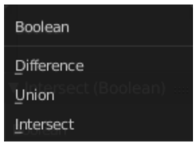
This operation happens in Edit mode, and so all parts must be in the same mesh.

Last Operator Intersect (Boolean)

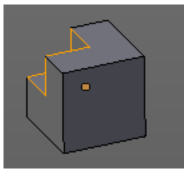


Boolean

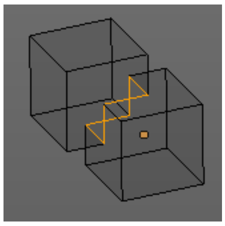
Here you can choose the boolean method.



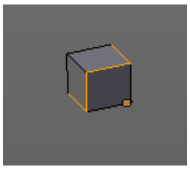
Difference subtracts the source geometry from the target geometry.



Union unions the source geometry with the target geometry. Geometry inside the source and target geometry gets removed.



Intersect removes all geometry but the overlapping geometry.



Swap

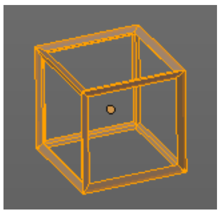
Inverts source and target geometry.

Merge Threshold

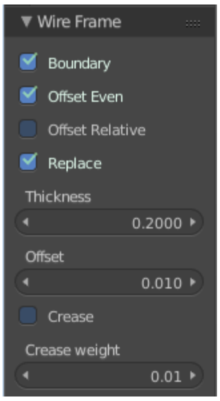
Here you can adjust the tolerance for the boolean operation. Increase it when some geometry is not calculated. But keep it small for fast calculation.

Wire Frame

Wireframe grabs the edges of the faces and turns them into tubes.



Last Operator Wire Frame



Boundary
Inset Face Boundaries.

Offset Even
Scales the offset to give more even thickness.

Offset Relative
Scales the offset by surrounding geometry.

Replace
Removes the source geometry.

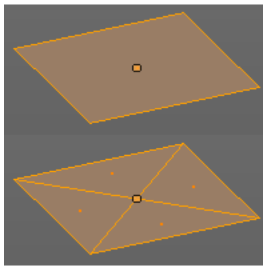
Thickness
Here you can adjust he thickness of the tubes.

Offset
Here you can adjust the offset of the tubes.

Crease
Crease adds close edges so that you have sharp corners when you use Subdivision Surface.

Crease Weight
Here you can adjust the crease weight.

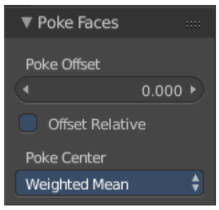
Poke Faces



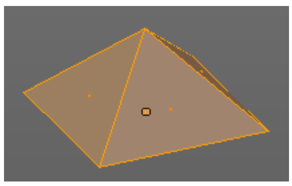
Splits the selected faces to create a triangulated geometry.

Last Operator Poke Faces

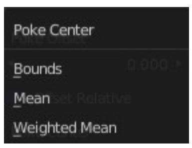
Poke Offset
Normally the center vertice of the poke operation is planar with the rest. Here you can adjust an offset.



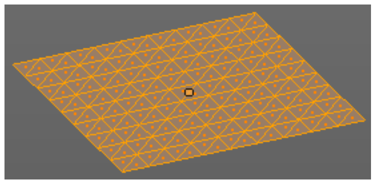
Offset Relative
Scale the offset by surrounding geometry.



Poke Center
Poke Center is a drop-down box where you can choose what the center of the poke operation should be. You can choose between weighted mean, mean and bounds.

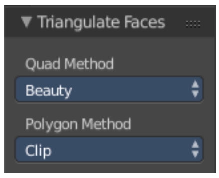


Triangulate Faces



Triangulate Faces triangulates the faces of the selected geometry.

Last Operator Triangulate Faces



Quad Method

Here you can choose how quads should be triangulated.

Shortest diagonal

Splits the quads based on their distance between vertices.

Fixed Alternate

Splits the quads on the second and fourth vertice.

Fixed

Splits the quads on the first and third vertice.

Beauty

Tries to optimize the triangulation.

Polygon Method

Here you can choose how N-Gons should be triangulated.

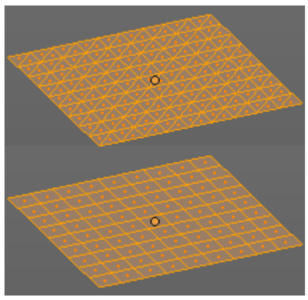
Clip

Splits the polygons with an ear clipping algorithm.

Beauty

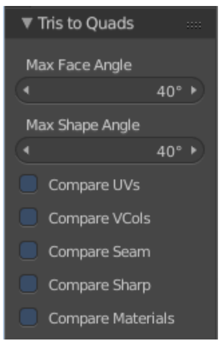
Tries to optimize the triangulation.

Tris to Quads



Tris to quads tries to convert triangulated geometry back to a quad geometry by removing the edges inside of the quads.

Last Operator Tris to Quads



Max Face Angle

Here you can adjust the threshold to adjacent triangles.

Max Shape Angle

Here you can adjust the shape angle limit.

Compare UV's
Takes the UV patches for the calculation into account. Border geometry will not be calculated.

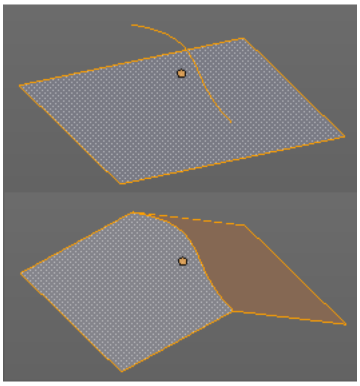
Compare VCols
Takes the Vertex colors for the calculation into account. Border geometry will not be calculated.

Compare Seam
Takes the Vertex colors for the calculation into account. Border geometry will not be calculated.

Compare Sharp
Takes the as sharp marked edges for the calculation into account. Border geometry will not be calculated.

Compare Materials
Takes the Materials colors for the calculation into account. Border geometry will not be calculated.

Split by Edges

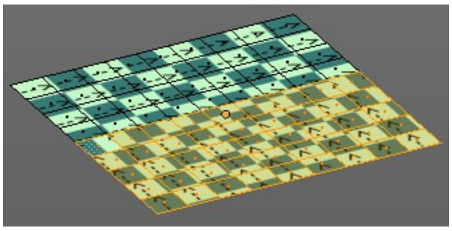


This tool incorporates loose wire edges into selected faces.

You need a loose edge geometry to get it to work. By converting a curve to a Mesh geometry for example. You need to join the edge into the mesh where you want to use it. The operation happens in Edit mode.

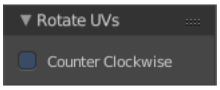
In edit mode select the edge and the face where you want it to join. And then perform the tool.

Rotate UV's



Rotates the UV space for the selected geometry by 90 degrees. This tool requires to have a working UV mapping.

Last Operator Rotate UV's

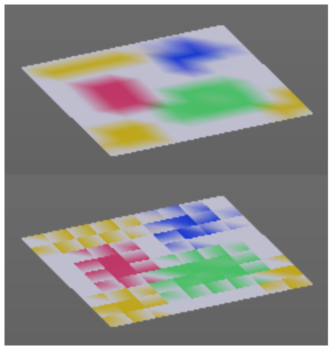


The tool rotates clockwise by default. With this option ticked the rotation happens counter clockwise.

Reverse UV's

Reverses the UV Space for the selected geometry. This tool requires to have a working UV mapping.

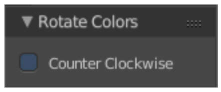
Rotate Colors



Rotates the vertex colors for the selected geometry. This tool requires to have vertex colors painted at the mesh.

Note that there is no way to display vertex colors in Edit mode. So you need to switch to Vertex paint mode to see the result.

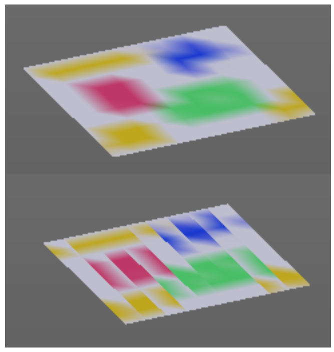
Last Operator Rotate Colors



Counter Clockwise

The tool rotates clockwise by default. With this option ticked the rotation happens counter clockwise.

Reverse Colors



Reverses the vertex colors.

Note that there is no way to display vertex colors in Edit mode. So you need to switch to Vertex paint mode to see the result.

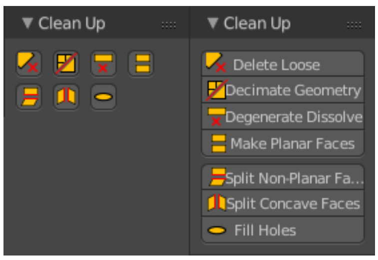
Mark Freestyle Face

Mark selected Faces for exclusion from Freestyle Feature edge detection. Freestyle is a cartoon renderer that is also included in Bforartists.

Clear Freestyle Face

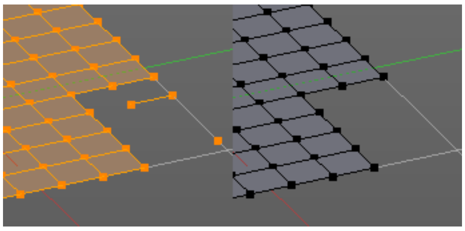
Unmark selected Faces for exclusion from Freestyle Feature edge detection. Freestyle is a cartoon renderer that is also included in Bforartists.

Clean Up Panel



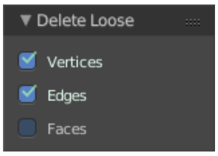
Clean Up is a menu that contains various functionality to clean up your geometry.

Delete Loose



Delete loose deletes not connected geometry. Vertices, Edges, and Faces. The tool starts with deleting Vertices and Edges. But you can tick Faces in the Last Operator too, and then it also removes not connected Faces.

Last Operator Delete Loose



Vertices

Delete Vertices

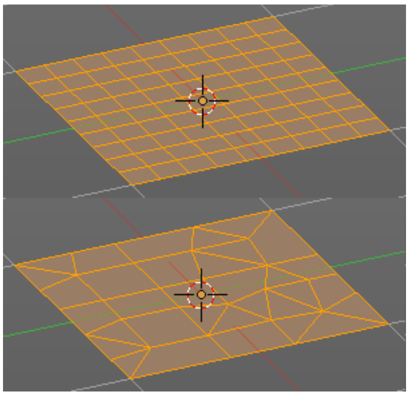
Edges

Delete Edges

Faces

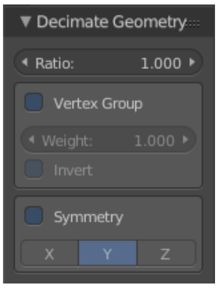
Delete Faces

Decimate Geometry



Decimate Geometry decimates the currently selected geometry. It starts with a Ratio of 1. Which means no decimation. The lower the ratio the more decimation you will get. The Decimate Modifier works with Tris!

Last Operator Decimate Geometry



Ratio

Here you can adjust the strength of decimation

Vertex Group

Use active Vertex Group as an influence. You need to have a Vertex Group.

Weight

Here you can adjust the Vertex Group Strength.

Invert

Invert Vertex Group Influence

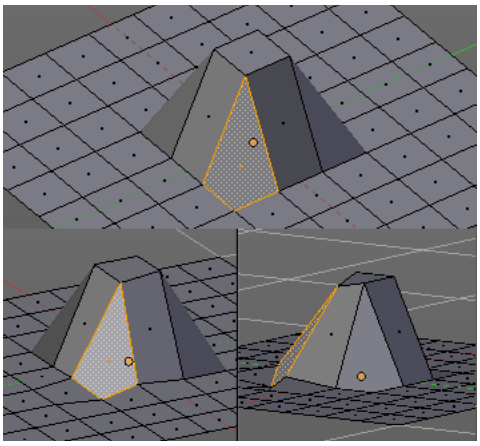
Symmetry

Here you can make the decimation geometry symmetric along a chosen world axis.

Degenerate Dissolve

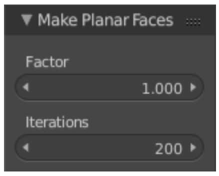
Removes zero size Faces and Edges.

Make Planar Faces



Make Planar Faces tries to make the selected faces planar. Quads or N-Gons for example can have vertices that are not planar.

Last Operator Make Planar Faces



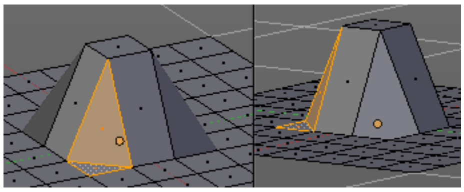
Factor

Here you adjust how strong the influence should be.

Iterations

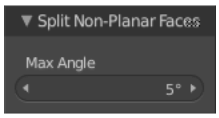
Here you adjust how often it should repeat in the try to find a solution.

Split Non-Planar Faces



Split Non Planar Faces splits up non planar Quads and N-Gons to end in planar faces.

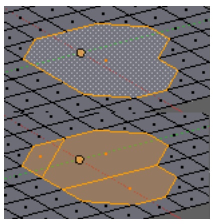
Last Operator Split Non-Planar Faces



Max Angle

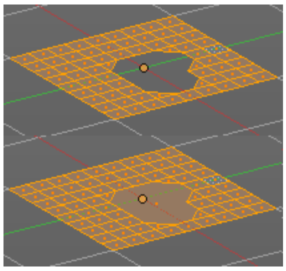
Here you can limit the action to a maximum angle.

Split Concave Faces



Splits concave faces to make the geometry more stable. This tool is thought for N-Gons.

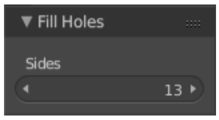
Fill Holes



Fill holes closes holes in the mesh geometry.

Fill holes can just calculate one face size at one time. So when you have several holes in the mesh, let's say one is a tri, and one is a quad, then you need to calculate twice.

Last Operator Fill Holes

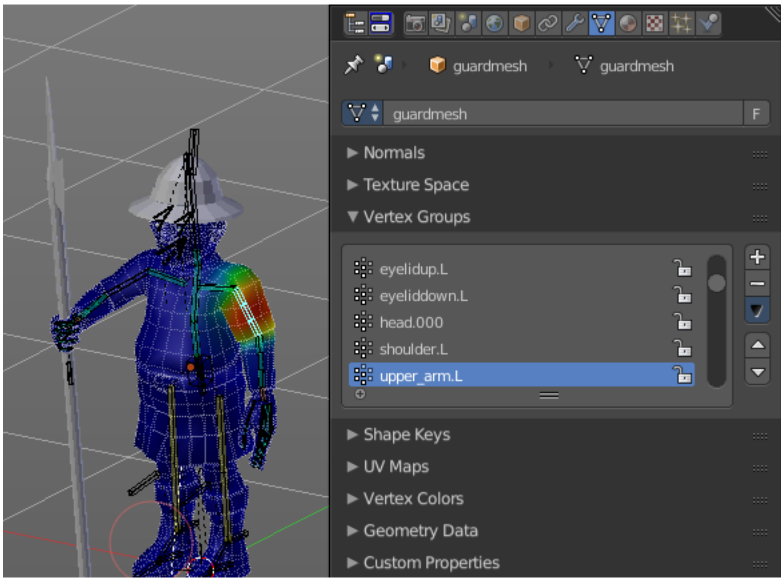


Sides

Here you can define what face size will be filled.

Weight Tools panel

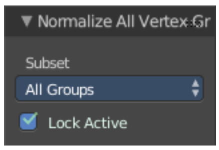
The Weight Tools panel contains Weight tools. Those tools are meant to modify the weight mapping. At characters for example. The Weight Tools requires Vertex Groups to work with. Such Vertex groups gets created when you do weight painting at a character for example. Here is defined what bone is connected to what vertice.



This Panel also exists in Weight Paint mode. Minus the Weight Gradient and Transfer Weight tools.

Normalize All

Normalize all normalizes the weight of all Vertex groups so that the values for the single vertices in the sum is 1.



Last Operator Normalize all

Subset

Subset is a drop-down menu where you can choose the Subset method.

Lock Active

Keep the values of the active group while normalizing others.

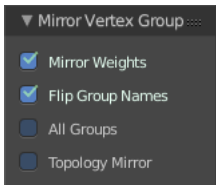
Normalize

Normalize normalizes the weight of the current selected Vertex group so that the values for the single vertices in the sum is 1. Means when there is influence from other groups, then those values are kept, but the one for the current group gets lowered so that the sum is 1.

The Last Operator Normalize panel has no adjustable settings.

Mirror

Mirror Vertex Group mirrors Vertex Groups and flips weights and/or names. It only edits selected Vertices. It flips when both sides are selected. Otherwise it copies from Unselected.



Last Operator Mirror Vertex Group

Mirror Weights

With Mirror Weights ticked it mirrors the weights.

Flip Group Names

With Flip Group Names ticked it flips the Group names

All Groups

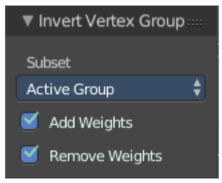
Mirrors all Vertex Groups

Topology Mirror

Uses topology based mirroring. This requires matching mirrored topology.

Invert

Invert inverts the weight painting for the selected vertex group.



Last Operator Invert Vertex Group

Subset

Subset is a drop-down menu where you can choose the Subset method.

Add Weights

Add Vertices from Groups that have zero Weighting before inverting.

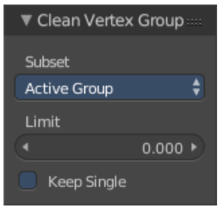
Remove Weights

Remove Vertices from Groups that have zero weight after inverting.

Clean

Removes Vertex group assignments that are not required from the active vertex group.

Last Operator Clean Vertex Group



Subset

Subset is a drop-down menu where you can choose the Subset method.

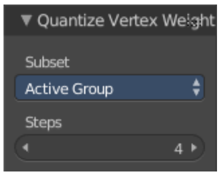
Limit

Remove weights that are below or equal to the limit value.

Keep Single

Keep Vertices assigned to at least one vertex group when cleaning.

Quantize



Quantize quantizes the weight paint values. It starts with 4 steps. With a step of 1 you have a single vertex color, no matter how you have painted it before.

Last Operator Quantize

Subset

Subset is a drop-down menu where you can choose the Subset method.

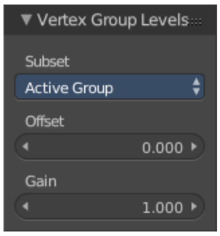
Steps

Here you adjust in how many steps the weight paint colors should be divided.

Levels

Adds some offset to the Weight paint, and multiplys it with some gain.

Last Operator Levels



Subset

Subset is a drop-down menu where you can choose the Subset method.

Offset

Here you adjust the offset.

Gain

Here you adjust the gain.

Smooth

Smooths the weight for selected vertices.

Last Operator Smooth Vertex Weights

Subset

Subset is a drop-down menu where you can choose the Subset method.

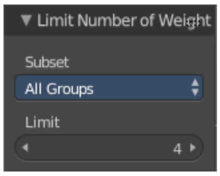
Factor
Here you adjust the factor.

Iterations
Here you adjust how many iterations you use.

Expand/Contract
Expand or contract the weights.

Source
A drop-down box where you can choose what should be affected by Smooth.

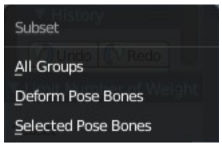
Limit Total
Limit number of Weights per vertex. The lowest weights gets removed.



This is of interest when you have for example five bones associated with a vertice. But your game engine just allows four ...

Last Operator Limit Total

Subset
Subset is a drop-down menu where you can choose the Subset method.



Limit
Here you adjust how many weights are allowed.

Fix Deforms
Modify the position of selected vertices by changing only their respective group weights.

This tool may operate slow at too many vertices.

Last Operator Fix Deforms

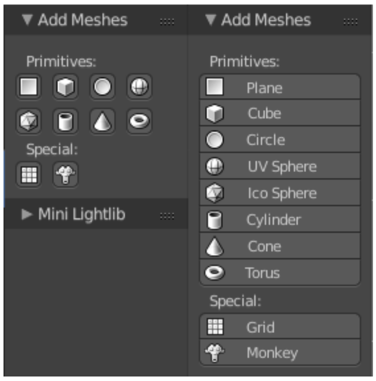
Distance
Adjust the distance.

Strength
Adjust the strength.

Change Sensitivity
Adjust the sensitivity.

Tool Shelf in Edit Mode - Mesh Object, Create Tab

Add Meshes Panel

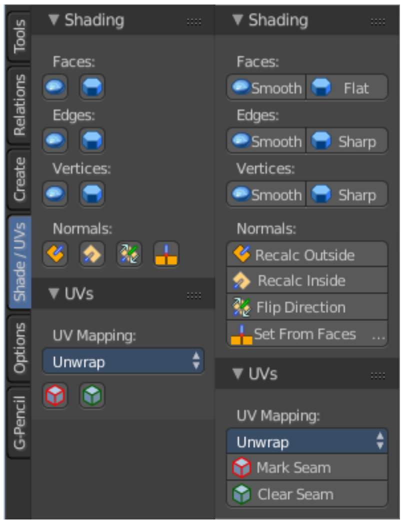


The create tab in edit mode contains an Add Meshes panel with the object types that can be added in Edit mode. That way you can add mesh primitives geometry in edit mode to the current object.

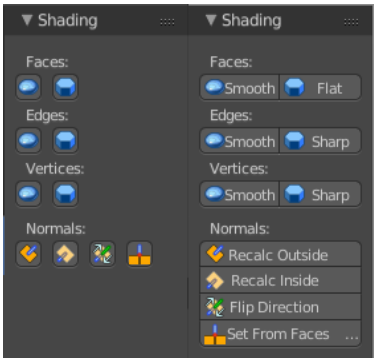
For detailed information and the Last Operator panels for the single buttons see chapter Tool Shelf in Object Mode - Create Tab .

Tool Shelf in Edit Mode - Mesh Object, Shade/UV's Tab

The Shade / UV's tab contains two panels. Shading and UV's.

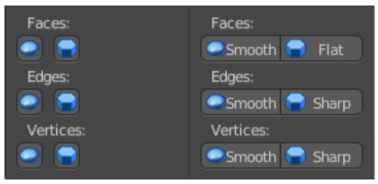


Shading Panel



The Shading panel contains shading relevant settings like smooth and flat shading and recalculate normals.

Faces, Edges and Vertices



Faces, Edges and Vertices can have either smooth or flat shading.

Faces, Edges and Vertices does not have content in the Last operator panel.

Faces

Smooth

Sets the shading for the selected faces to Smooth.

Flat

Sets the shading for the selected faces to Flat.

Edges

Smooth
Sets the shading for the selected edges to Smooth.

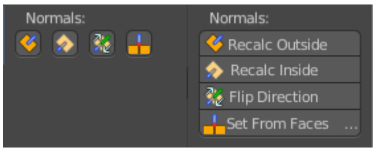
Sharp
Sets the shading for the selected edges to sharp.

Vertices

Smooth
Sets the shading for the selected vertices to Smooth.

Sharp
Sets the shading for the selected vertices to sharp.

Normals

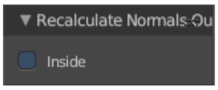


Normals influences the shading and the direction of a face. They can point inwards or outwards.

Recalc Outside

Recalculates the normals of the selected geometry so that everything points outwards.

Last Operator Recalc Outside



Inside
Inside recalculates the normals of the selected geometry so that everything points inwards.

Recalc Inside

Recalculates the normals of the selected geometry so that everything points inwards.

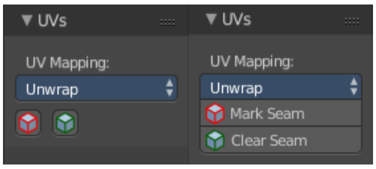
Flip

Flips the direction of the normals of the selected geometry.

Set from Faces

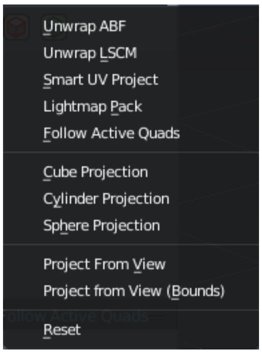
Sets the vertex normals from the selected faces. This tool requires to have Autosmooth activated!

UVs Panel



The UVs Panel contains the Tools for UV Mapping. A drop-down box for the different methods. And a button to mark and to clear seam for the two Unwrap algorithms Angle Based (ABF) and Conformal (LSCM).

UV Mapping



Unwrap is a drop-down box that contains all the UV Mapping methods that are available in Blender. UV Mapping is best done in the UV Editing Layout. So that you can see what you produce.

Unwrap ABF

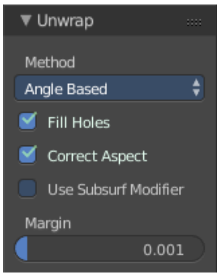
Unwrap ABF unwraps the selected geometry with the method Angle based. ABF stands for Angle Based Flattening. ABF can give a bit better result than LSCM when unwrapping organic shapes.

Unwrap LSCM

Unwrap ABF unwraps the selected geometry with the method Angle based. ABF stands for Angle Based Flattening. LSCM can give a bit better results than ABF with geometric shapes.

Last Operator Unwrap

Unwrap ABF and Unwrap LSCM shares the same Last Operator.



Method

Method is a drop down box where you can choose between Unwrap method Angle Based and Conformal.

Fill Holes

Fill holes in the mesh before unwrapping.

Correct Aspect

Take the Image Aspect Ratio into account.

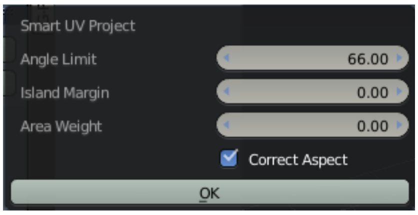
Use Subsurf Modifier

Unwraps an existing Subsurf Modifier. You need to add a Subsurf Modifier first.

Margin

The distance between the single UV patches.

Smart UV Project



Smart UV Project projects the UV mapping from different angles.

Smart UV Project Settings dialogue

Angle Limit

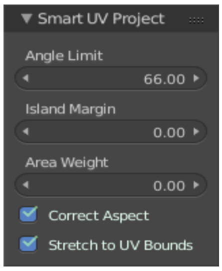
The Angle Limit defines after which angle the mapping happens from the next side. With an angle of 66 you have around six sides to map from. The calculation is 360/66.

Island Margin
Island Margin defines the distance between the UV patches.

Area Weight
Weight Projection Vector by faces with larger areas.

Correct Aspect
Take the Image Aspect Ratio into account.

Last Operator Smart UV Project



The Last Operator for Smart UV Project contains the same settings than the Smart UV Project Settings dialogue.

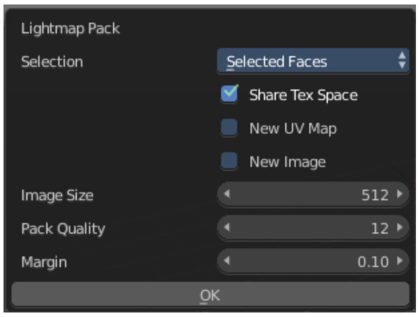
Angle Limit
The Angle Limit defines after which angle the mapping happens from the next side. With an angle of 66 you have around six sides to map from. The calculation is 360/66.

Island Margin
Island Margin defines the distance between the UV patches.

Area Weight
Weight Projection Vector by faces with larger areas.

Correct Aspect
Take the Image Aspect Ratio into account.

Lightmap Pack



Lightmap Pack maps each face individually, and puts the result into the UV space. Without margin.

Lightmap Pack has no Last Operator.

Settings

Selection
Selection is a drop-down box where you can choose what will be packed.

Share Tex Space
Map all objects into one lightmap.

New UV Map
Create a new UV map for every new mesh.

New Image
Assign new Image to every new mesh.

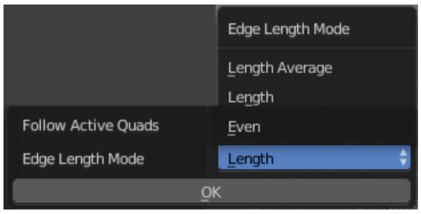
Image Size
The size for new images.

Pack Quality
The pack quality.

Margin
The distance between the single UV patches.

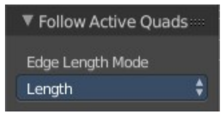
Follow Active Quads
Follow Active quads maps UV coordinates starting from an active face, and maps all adjacent faces in quad shape then. This way you can for example unwrap a pipe or a road. You first need to have a face selected. Then select everything. And then click at Follow Active Quads.

Settings



Edge Length Mode
Edge Length Mode is a drop-down box where you can choose the Length method.

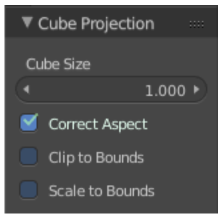
Last Operator Follow Active Quads
The Last Operator contains the same settings than the Settings dialogue.



Edge Length Mode
Edge Length Mode is a drop-down box where you can choose the Length method.

Cube Projection
Cube Projection maps the mesh from six sides, means cubic.

Last Operator Cube Projection



Cube Size
Cube Size defines the size of the UV mesh in the UV space.

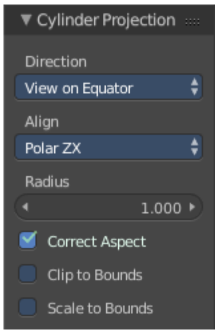
Correct Aspect
Take Image Aspect ratio into account.

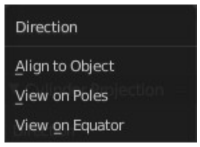
Clip to Bounds
Clip UV Coordinates to bounds after unwrapping.

Scale to Bounds
Scale UV Coordinates to bounds after unwrapping.

Cylinder Projection
Cylinder Projection tries to map cylindric.

Last Operator Cylinder Projection





Direction

Direction is a drop-down box where you can choose in which direction the cylindric projection will be mapped.

Align

Align is a drop-down box where you can choose the Align method.

Radius

Radius defines the Polar size of the UV mesh in the UV space.

Correct Aspect

Take Image Aspect ratio into account.

Clip to Bounds

Clip UV Coordinates to bounds after unwrapping.

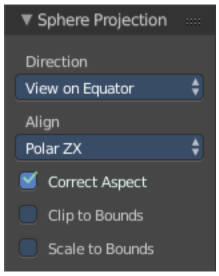
Scale to Bounds

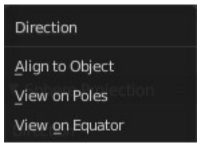
Scale UV Coordinates to bounds after unwrapping.

Sphere Projection

Sphere Projection tries to map spherical.

Last Operator Sphere Projection





Direction

Direction is a drop-down box where you can choose in which direction the spherical projection will be mapped.

Align

Align is a drop-down box where you can choose the Align method.

Correct Aspect

Take Image Aspect ratio into account.

Clip to Bounds

Clip UV Coordinates to bounds after unwrapping.

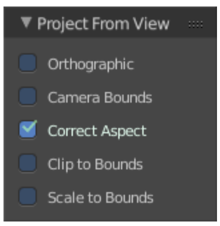
Scale to Bounds

Scale UV Coordinates to bounds after unwrapping.

Project from View

Project from View projects the UV from the current 3D view.

Last Operator Project from View



Orthographic

User orthographic projection

Camera Bounds

Map UV's to the camera region taking resolution and aspect into account.

Correct Aspect

Take Image Aspect ratio into account.

Clip to Bounds

Clip UV Coordinates to bounds after unwrapping.

Scale to Bounds

Scale UV Coordinates to bounds after unwrapping.

Project from View (Bounds)

Project from View projects the UV from the current 3D view.

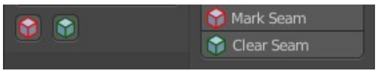
Same as Project from View, but with Scale to Bounds ticked in the Last operator.

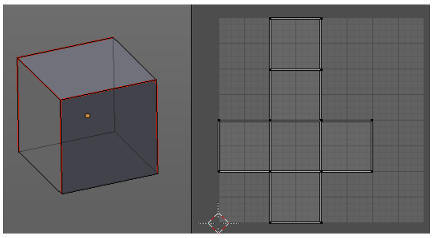
Reset

Resets the UV Projection

Reset has no Last Operator.

Mark Seam





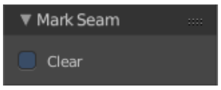
The unwrap algorithms Angle based and Conformal requires to have edges marked as seams. Think of it as a cutting pattern for a trouser for example. Such a trouser is also made of fabric patterns.

Same goes for the UV patches when you use Angle based or conformal unwrapping. You need to cut your mesh into parts and mark edges as seams, so that the algorithm knows where the seams are.

Mark seam marks the currently selected edge(s) as a seam. Seam edges will be displayed as red in the 3D viewport.

You need to unwrap the mesh again when you want to apply changes.

Last Operator Mark Seam



Clear

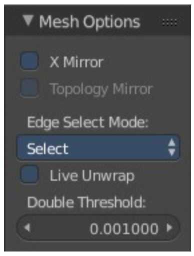
Clears the seam instead of marking it.

Clear Seam

Clear seam removes the seam from the currently selected edge(s)

Tool Shelf in Edit Mode - Mesh Object, Options Tab

The Options tab provides you with some Mesh Object options.



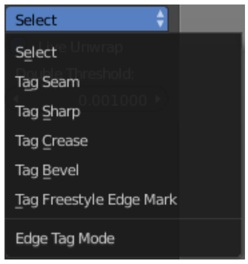
Mesh Options Panel

X Mirror

X Axis Mirror Editing.

Topology Mirror

Use Topology based mirroring.



Edge Select Mode

Edge Select Mode is a drop-down box where you can choose the select method for edges.

Live Unwrap

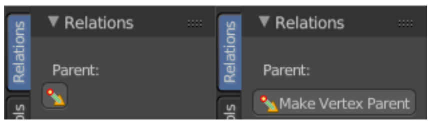
Changing edges seam recalculates UV Unwrap.

Double Threshold

Limit for removing duplicates and 'Auto Merge'.

Tool Shelf in Edit Mode - Curve Object, Relations Tab

Relations Panel

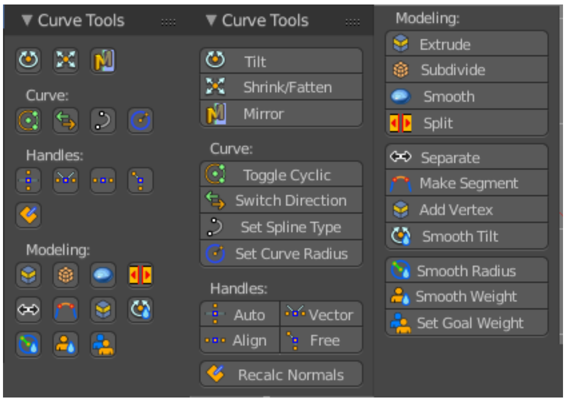


The Relation panel contains tools around relations. In Edit Mode it's just Make Vertex Parent.

In Object mode select the object that you want to parent to a vertex. Shift select the parent object so that both are selected. Enter Edit mode. Then select one vertex for a single point. Or three for an area. Then click the Make Vertex Parent button to make the relation.

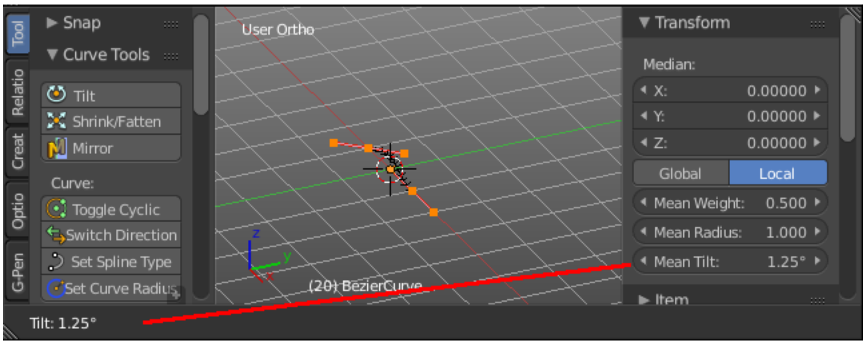
Tool Shelf in Edit Mode - Curve Object, Tools Tab

Curve Tools Panel



The Curve Tools panel contains the tools to modify the curve object in Edit Mode .

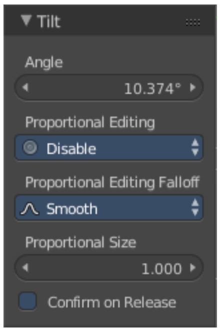
Tilt



Modifies the Mean Tilt.

Activate the tool, and drag the mouse. You will see a value in the header now. The selected curve path will rotate by dragging the mouse.

The Tilt angle always starts at zero. It is relative. To modify the Mean Tilt use the edit box in the Transform panel.



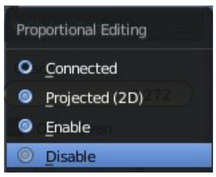
Last Operator Tilt

Angle

The Tilt angle.

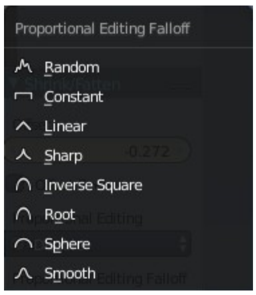
Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.



Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

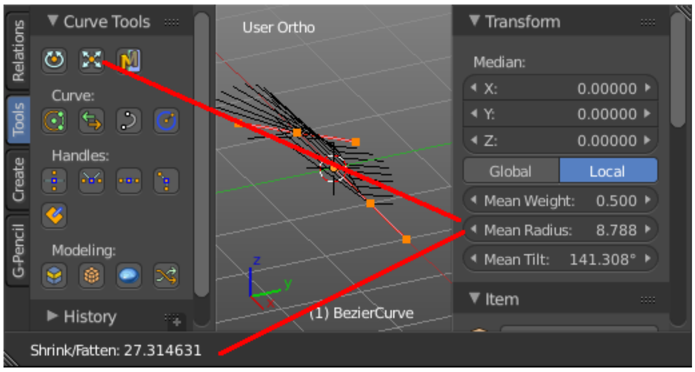


Proportional Size

The proportional size in case you have Proportional editing activated.

Confirm on Release

Always confirm operation when releasing button.

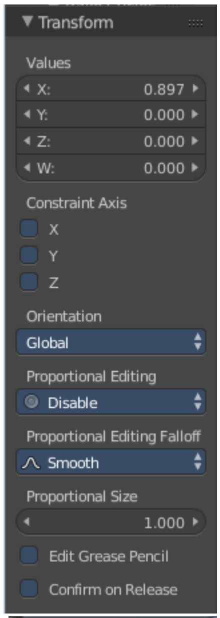


Shrink/ Fatten

Modifies the Mean Radius.

Activate the tool, and drag the mouse. You will see a value in the header now. The selected curve radius will increase / decrease.

The Radius angle always starts at zero. It is relative. To modify the Mean Radius use the edit box in the Transform panel.



Last Operator Transform

Values

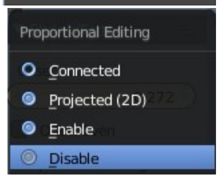
Transform values for Shrink Fatten.

Constraint Axis

Here you can constraint the operation to specific axis.

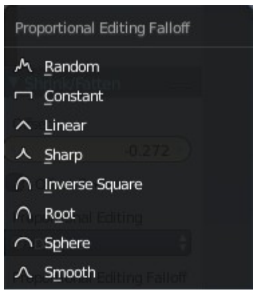
Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.



Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



Proportional Size

The proportional size in case you have Proportional editing activated.

Edit Grease Pencil

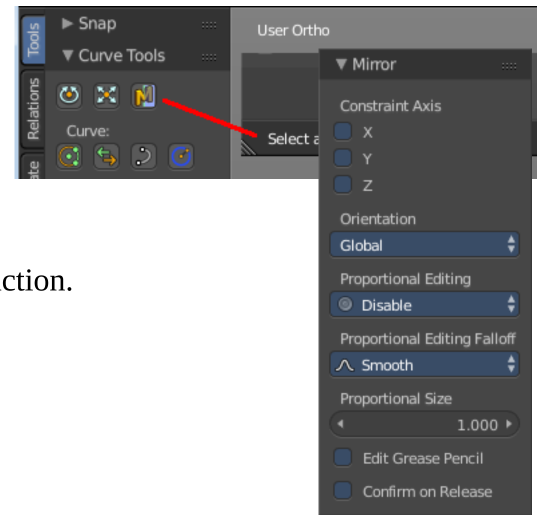
Edit selected Grease Pencil strokes.

Confirm on Release

Always confirm operation when releasing button.

Mirror

Mirror mirrors the selected geometry along the defined axis. Click the Mirror button, type in X, Y or Z, then confirm with enter.



Last Operator Mirror

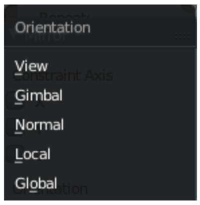
The Last Operator Mirror panel gives you tools to adjust the mirror action.

Constraint Axis

Constraint Axis gives you again the possibility to define the mirror axis. You can choose more than one axis here.

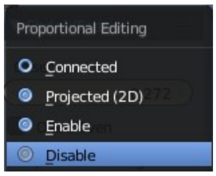
Orientation

Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.



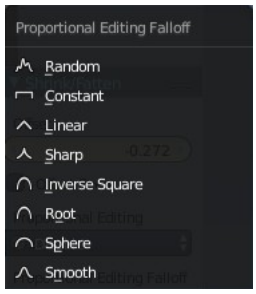
Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.



Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



Proportional size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

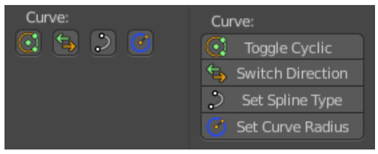
Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

Confirm on Release

With Confirm on Release checked the action gets performed when you release the mouse button.

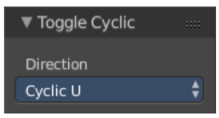
Curve



The Curve Tools contains the tools to modify the curves.

Toggle Cyclic

Toggle Cyclic closes or opens the curve.



Last Operator Toggle Cyclic

Direction

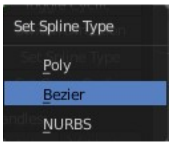
Direction is a drop-down box where you can choose the direction in which the curve gets closed.

Switch Direction

Switch Direction inverts the direction of the selected curve.

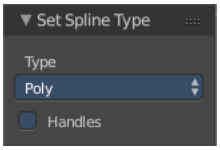
Switch Direction has no settings in the Last Operator panel.

Set Spline Type



With set Spline Type you can set the type of the curve.

Last Operator Set Spline Type



Type

Type is a drop-down box where you can choose the spline type

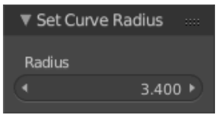
Handles

Use Handles when converting Bezier curves into polygons.

Set Curve Radius

Set the Point radius which is used for bevel tapering

Last Operator Set Radius



Radius

Set the Point radius which is used for bevel tapering

Handles

Handles defines the type of handle for the knots of the curve. You have the choice between Auto, Vector, Align and Free. And the Last Operator gives you a fifth possibility to toggle between Free and Align.

Auto

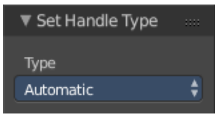
Auto aligns the handles automatically.

Vector

Set Handle type to Vector.

Align

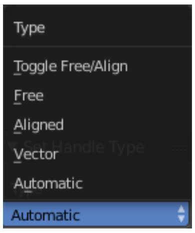
Set Handle type to Align.



Free

Set Handle type to Free.

Last Operator Set Handle Type



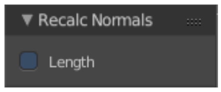
Type

Type is a drop-down box where you can set the handle type. You have the choice between Auto, Vector, Align, Free. And the fifth possibility toggles between Free and Align.

Recalc Normals

Recalculates the normals of the selected curve.

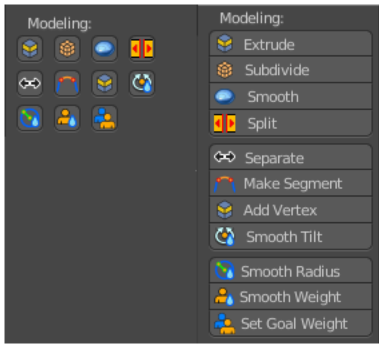
Last Operator Recalc Normals



Length

Recalculates the handle length too.

Modelling

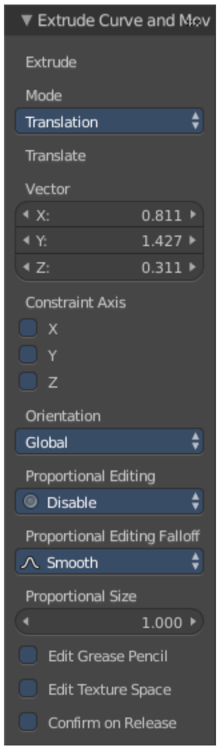


The Modelling Section contains some modelling tools to modify the curve object.

Extrude

Extrudes the selected curve point(s).

Last operator Extrude Curve and Move



Extrude

Confusing label. Just ignore

Mode

A drop-down box where you can choose between different extrude modes.

Translate

Confusing label. Just ignore

Vector

The position of the extruded point(s)

Constraint Axis

Here you can limit the extrusion to specific axes.

Orientation

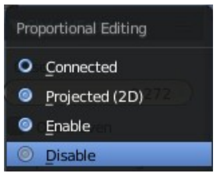
Here you can adjust the orientation of the extrusion. It usually starts with Normal.

Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way. Proportional Editing Falloff

Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

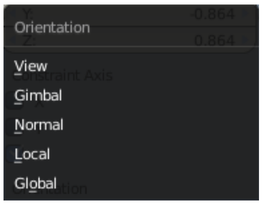


Proportional size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Edit Grease Pencil

Edit Grease pencil ticked allows you to edit the grease pencil stroke.

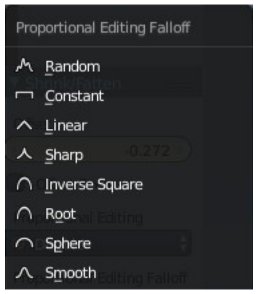


Edit Texture Space

By default extrusion will not modify the UV mapping. With Edit texture Space ticked the UV mapping updates with the extrusion.

Confirm on Release

With Confirm on Release checked the action gets performed when you release the mouse button.



Subdivide

Subdivide subdivides the selected curve part. You need to have at least two curve points selected.

Subdivide has no Last Operator panel.

Smooth

Smooth smooths the selected curve part. You need to have at least two curve points selected.

Smooth has no Last Operator panel.

Split

Splits the curve at the selected control point(s). You need to select two control points to select the segment between it.

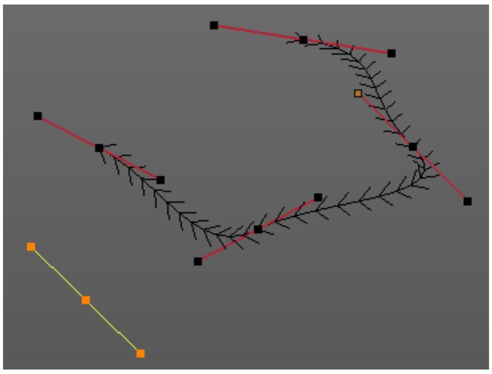
Separate

Separates the selected control points, and creates a new curve object out of it. You need to select two control points to select the segment between it.

Make Segment

Joins two curves by adding a segment between the end of the one and the beginning of the other. You can also create a closed curve that way.

Add Vertex

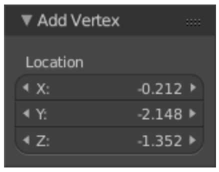


Add Vertex adds a control point under the mouse, extruding from the selected endpoint(s). In case that you don't have an endpoint of your curve selected you will create a not connected control point.

The tool provides similar functionality to the extrude tool. But here you define the end point with the mouse position already.

Note!
Add Vertex is a hotkey only tool. Since it requires to have the mouse at the right position in the viewport.

Last Operator Add Vertex



Location

Here you can change the position of the new created control point.

Smooth Curve Tilt

Smooths the curve tilt of the selected control point(s).

Smooth Curve Radius

Smooths the curve radius of the selected control point(s).

Smooth Curve Weight

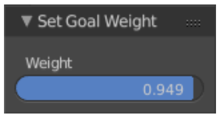
Interpolates the weight of the selected control point(s).

Set Goal Weight

This tool requires to have a Soft Body physics applied to the curve. With this tool you can adjust the goal weight of the selected control points. A setting of zero allows to pin this control point vertice(s).

When you activate the tool then you will see a dialogue where you can adjust the weight.

Last Operator Set Goal Weight

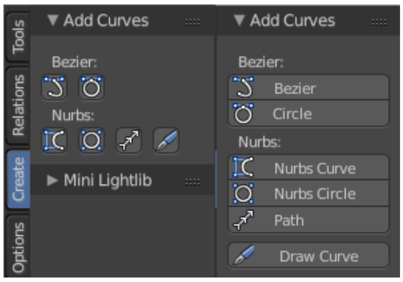


Weight

Here you can again adjust the weight strength.

Tool Shelf in Edit Mode - Curve Object, Create Tab

Add Curves Panel



The create tab in edit mode contains an Add Curves panel with the object types that can be added in Edit mode. That way you can add other curves edit mode to the current curve.

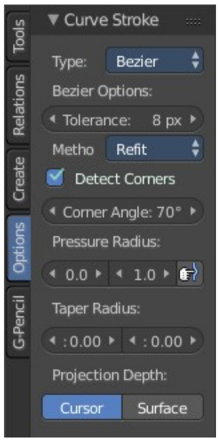
For detailed information and the Last Operator panels for the single buttons see chapter Tool Shelf in Object Mode - Create Tab

Tool Shelf in Edit Mode - Curve Object, Options Tab

Curve Stroke Panel

The Curve Stroke Panel provides you with some options to draw and modify the curves. It is divided into two parts. The curve type Bezier. And the curve type Poly.

Curve Stroke Panel type Bezier



Type

Here you switch between the curve type Bezier and Poly.

Bezier Options

Tolerance

Allow deviation for a smoother but less precise line

Method

The curve fitting method. Here you can choose between Refit and Split.

Detect Corners

Detect corners and use non aligned angles.

Corner Angle

Corners above this angle are considered as corners.

Pressure Radius

Pressure radius is interesting when you use a tablet. Here you can adjust the Minimum and Maximum pressure radius. When you don't use a tablet then the maximum pressure value will be used.

Taper Radius

Taper factor for the radius of each point along the curve.

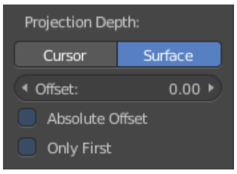
Projection depth

Here you can set the method of projection depth.

Cursor

Sets the projection depth to 3D Cursor.

Surface



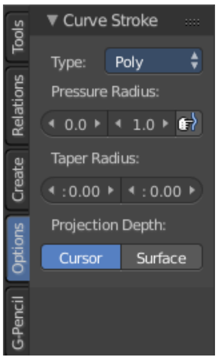
Sets the projection depth to Surface. Then the curve paints at a surface that is placed under the stroke. It also reveals some more settings for Projection Depth method Surface

Offset
Offset the stroke from the surface

Absolute Offset
Apply a fixed offset

Only First
Use the start of the stroke for depth.

Curve Stroke Panel type Poly



Type

Here you switch between the curve type Bezier and Poly.

Pressure Radius

Pressure radius is interesting when you use a tablet. Here you can adjust the Minimum and Maximum pressure radius. When you don't use a tablet then the maximum pressure value will be used.

Taper Radius

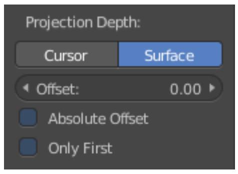
Taper factor for the radius of each point along the curve.

Projection depth

Here you can set the method of projection depth.

Cursor

Sets the projection depth to 3D Cursor.



Surface

Sets the projection depth to Surface. Then the curve paints at a surface that is placed under the stroke. It also reveals some more settings for Projection Depth method Surface

Offset

Offset the stroke from the surface

Absolute Offset

Apply a fixed offset

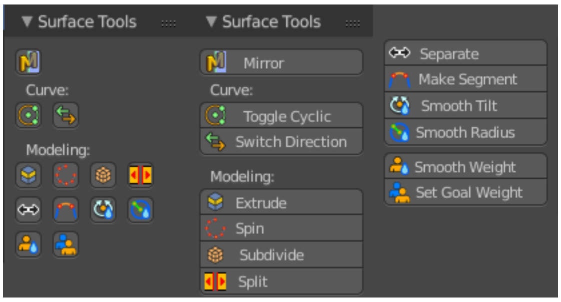
Only First

Use the start of the stroke for depth.

Tool Shelf in Edit Mode - Surface Object, Tools Tab

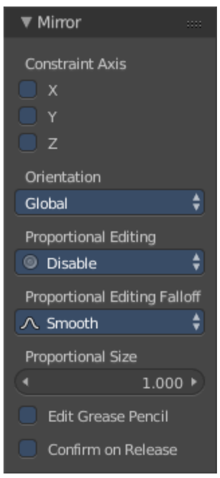
Surface Tools Panel

The Surface Tools panel contains the tools to modify the Surface object in Edit Mode.



Mirror

Mirror mirrors the selected geometry along the defined axis. Click the Mirror button, type in X, Y or Z, then confirm with enter.



Last Operator Mirror

The Last Operator Mirror panel gives you tools to adjust the mirror action.

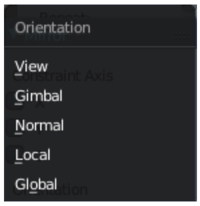
Constraint Axis

Constraint Axis gives you again the possibility to define the mirror axis. You can choose more than one axis here.

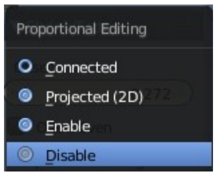
Orientation

Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.

Proportional Editing



Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.

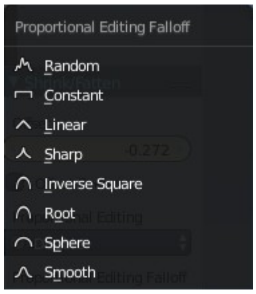


Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

Proportional size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.



Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

Confirm on Release

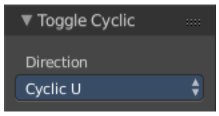
With Confirm on Release checked the action gets performed when you release the mouse button.

Curve

The Curve Tools contains the tools to modify the curves.

Toggle Cyclic

Toggle Cyclic closes or opens the curve.



Last Operator Toggle Cyclic

Direction

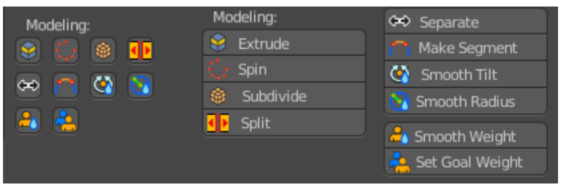
Direction is a drop-down box where you can choose the direction in which the curve gets closed.

Switch Direction

Switch Direction inverts the direction of the selected curve.

Switch Direction has no settings in the Last Operator panel.

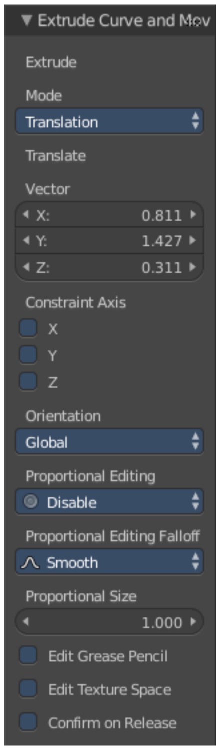
Modelling



The Modelling Section contains some modelling tools to influence the curve object.

Extrude

Extrudes the selected curve point(s).



Last operator Extrude Curve and Move

Extrude

Confusing label. Just ignore

Mode

A drop-down box where you can choose between different extrude modes.

Translate

Confusing label. Just ignore

Vector

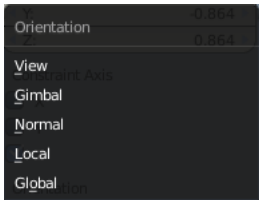
The position of the extruded point(s)

Constraint Axis

Here you can limit the extrusion to specific axes.

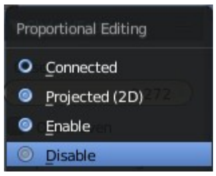
Orientation

Here you can adjust the orientation of the extrusion. It usually starts with Normal.



Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.

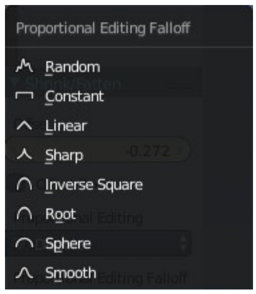


Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

Proportional size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.



Edit Grease Pencil

Edit Grease pencil ticked allows you to edit the grease pencil stroke.

Edit Texture Space

By default extrusion will not modify the UV mapping. With Edit texture Space ticked the UV mapping updates with the extrusion.

Confirm on Release

With Confirm on Release checked the action gets performed when you release the mouse button.

Spin

Extrudes the selected curve part around the pivot point. You need to have at least two curve points selected.

Last Operator Spin

Centre

Edit boxes to set the position of the Centre point

Axis

The rotation of the extrusion

Subdivide

Subdivide subdivides the selected curve part. You need to have at least two curve points selected.

Subdivide has no Last Operator panel.

Split

Splits the curve at the selected control point(s). You need to select two control points to select the segment between it.

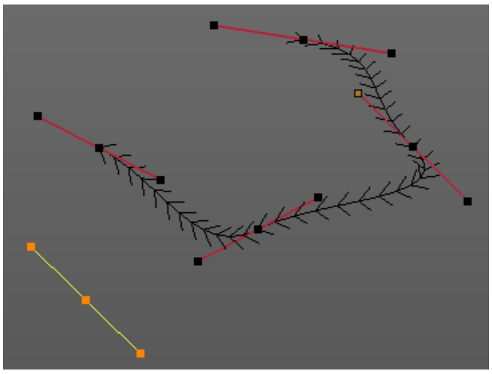
Separate

Separates the selected control points, and creates a new curve object out of it. You need to select two control points to select the segment between it.

Make Segment

Joins two curves by adding a segment between the end of the one and the beginning of the other. You can also create a closed curve that way.

Add Vertex



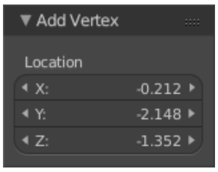
Add Vertex adds a control point under the mouse, extruding from the selected endpoint(s). In case that you don't have an endpoint of your curve selected you will create a not connected control point.

The tool provides similar functionality to the extrude tool. But here you define the end point with the mouse position already.

Note!

Add Vertex is a hotkey only tool. Since it requires to have the mouse at the right position in the viewport.

Last Operator Add Vertex



Location

Here you can change the position of the new created control point.

Smooth Curve Tilt

Smooths the curve tilt of the selected control point(s).

Smooth Curve Radius

Smooths the curve radius of the selected control point(s).

Smooth Curve Weight

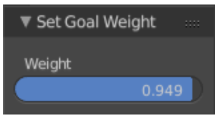
Interpolates the weight of the selected control point(s).

Set Goal Weight

This tool requires to have a Soft Body physics applied to the curve. With this tool you can adjust the goal weight of the selected control points. A setting of zero allows to pin this control point vertice(s).

When you activate the tool then you will see a dialogue where you can adjust the weight.

Last Operator Set Goal Weight

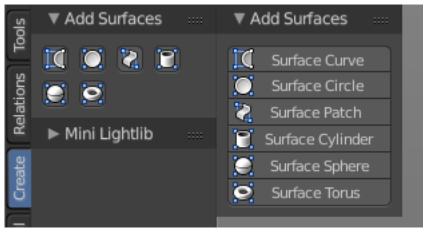


Weight

Here you can again adjust the weight strength.

Tool Shelf in Edit Mode - Surface Object, Create Tab

Add Surfaces Panel

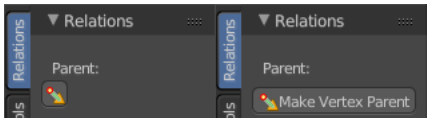


The create tab in edit mode contains an Add Surfaces panel with the object types that can be added in Edit mode. That way you can add other Surfaces edit mode to the current Surface object.

For detailed information and the Last Operator panels for the single buttons see chapter Tool Shelf in Object Mode - Create Tab

Tool Shelf in Edit Mode - Surface Object, Relations Tab

Relations Panel

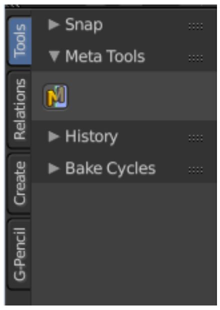


The Relation panel contains tools around relations. In Edit Mode it's just Make Vertex Parent.

In Object mode select the object that you want to parent to a vertex. Shift select the parent object so that both are selected. Enter Edit mode. Then select one vertex for a single point. Or three for an area. Then click the Make Vertex Parent button to make the relation.

Tool Shelf in Edit Mode - Metaball Object, Tools Tab

Meta Tools Panel

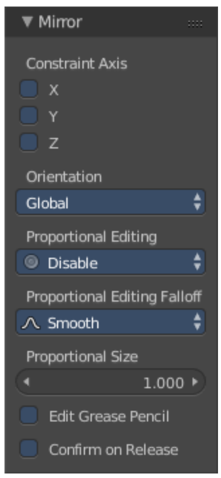


The Meta Tools panel contains the tools to modify the Metaball object in Edit Mode.

Mirror

Mirror mirrors the selected geometry along the defined axis. Click the Mirror button, type in X, Y or Z, then confirm with enter.

Last Operator Mirror



The Last Operator Mirror panel gives you tools to adjust the mirror action.

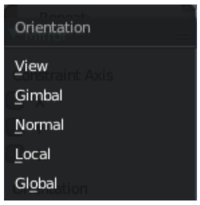
Constraint Axis

Constraint Axis gives you again the possibility to define the mirror axis. You can choose more than one axis here.

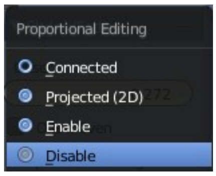
Orientation

Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.

Proportional Editing

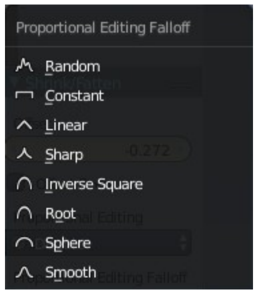


Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.



Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



Proportional size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Edit Grease Pencil

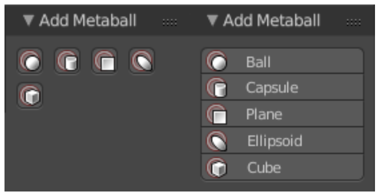
Edit Grease Pencil edits the selected Grease Pencil strokes.

Confirm on Release

With Confirm on Release checked the action gets performed when you release the mouse button.

Tool Shelf in Edit Mode - Metaball Object, Create Tab

Add Metaball Panel

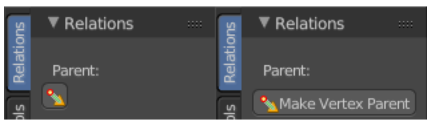


The create tab in edit mode contains an Add Metaball panel with the object types that can be added in Edit mode. That way you can add other Metaballs in edit mode to the current Metaball object.

For detailed information and the Last Operator panels for the single buttons see chapter Tool Shelf in Object Mode - Create Tab

Tool Shelf in Edit Mode - Metaball Object, Relations Tab

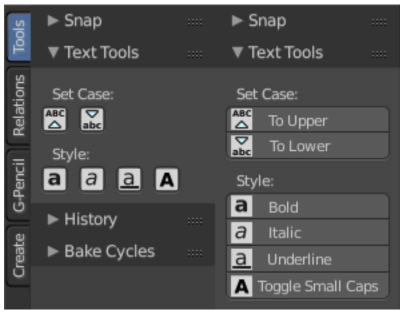
Relations Panel



The Relation panel contains tools around relations. In Edit Mode it's just Make Vertex Parent.

In Object mode select the object that you want to parent to a vertex. Shift select the parent object so that both are selected. Enter Edit mode. Then select one vertex for a single point. Or three for an area. Then click the Make Vertex Parent button to make the relation.

Tool Shelf in Edit Mode - Text Object, Tools Tab



Text Tools Panel

The Text tools panel contains the tools to adjust the created text object.

Select the text part that you want to modify, then click at the tools.

Set Case

Set case sets selected the letters to be uppercase or lower case.

Last Operator Set Case

Set Case has one Last Operator for all items.

Case

Case is a drop-down box where you can choose to set the selected letters to be uppercase or lower case.

To Upper

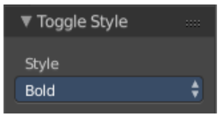
To Upper sets the selected text to be uppercase letters.

To Lower

To Lower sets the selected text to be lowercase letters.

Style

Style sets the selected letters to some styles.



Last Operator Toggle Style

Style has one Last Operator for all items.

Style is a drop-down box where you can choose to set the selected letters to be displayed in some styles.

Bold

Bold sets the selected letters to be displayed as bold letters.

Italic

Italic sets the selected letters to be displayed as italic letters.

Underline

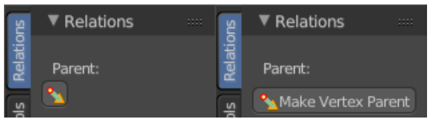
Underline sets the selected letters to be displayed as underlined letters.

Toggle Small Caps

Toggle small caps sets the selected letters to be displayed as if they were upper case letters, but with lower case size.

Tool Shelf in Edit Mode - Text Object, Relations Tab

Relations Panel

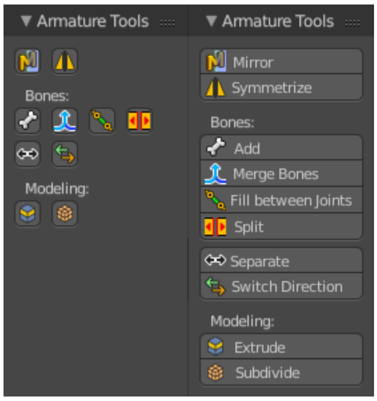


The Relation panel contains tools around relations. In Edit Mode it's just Make Vertex Parent.

In Object mode select the object that you want to parent to a vertex. Shift select the parent object so that both are selected. Enter Edit mode. Then select one vertex for a single point. Or three for an area. Then click the Make Vertex Parent button to make the relation.

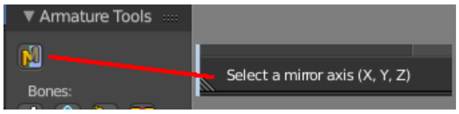
Tool Shelf in Edit Mode - Armature Object, Tools Tab

Armature Tools Panel



The Armature Tools panel contains the tools to modify the selected armature in Edit mode.

Mirror



Mirror mirrors the selected geometry along the defined axis. Click the Mirror button, type in X, Y or Z, then confirm with enter.

Last Operator Mirror

The Last Operator Mirror panel gives you tools to adjust the mirror action.

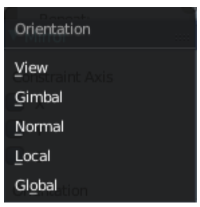
Constraint Axis

Constraint Axis gives you again the possibility to define the mirror axis. You can choose more than one axis here.

Orientation

Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.

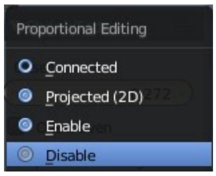
Proportional Editing



Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.

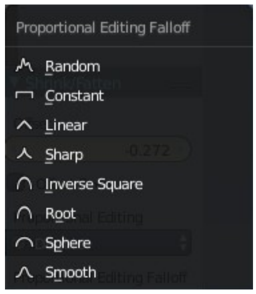
Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



Proportional size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.



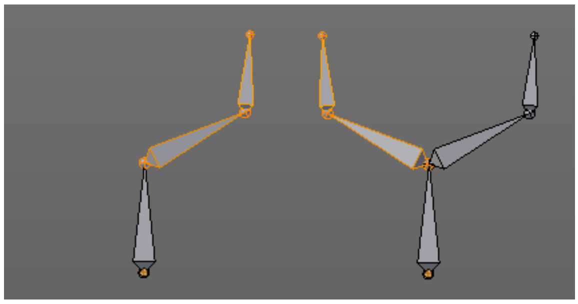
Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

Confirm on Release

With Confirm on Release checked the action gets performed when you release the mouse button.

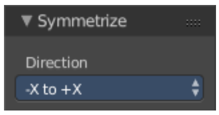
Symmetrize



Creates a symmetrical mirrored copy of the currently selected bones along the X axis. The mirror center is the pivot of the armature.

Symmetrize follows the name conventions for bones. If there is a lower or upper case “L”, “R”, “left” or “right” with a separating dot in the bone name, then this tool renames the bones names to its counter part. Bone.L becomes Bone.R.

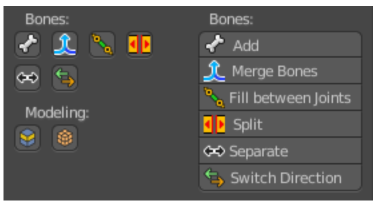
Last Operator Symmetrize



Direction

Here you can define the calculation direction. From -X to + X or from +X to -X

Bones section

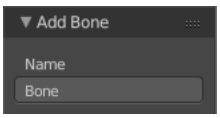


The Bones section contains tools around the bones of the armature.

Add

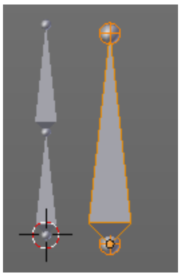
Adds a new bone to the armature. This new created bone is not connected to other bones of the armature.

Last Operator Add Bone



Name

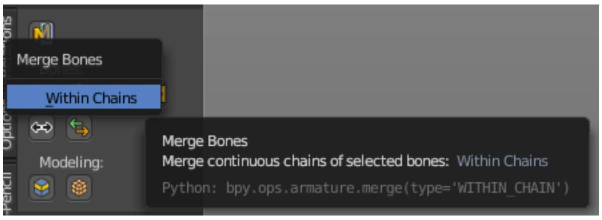
Name is an edit field where you can rename the created bone

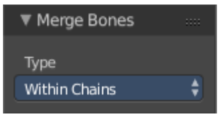


Merge Bones

Merges two connected bones in a chain into one bone.

When you click the Merge Bones button then you will get a pop-up where you can choose between exactly nothing since there is one choice. Within chains.

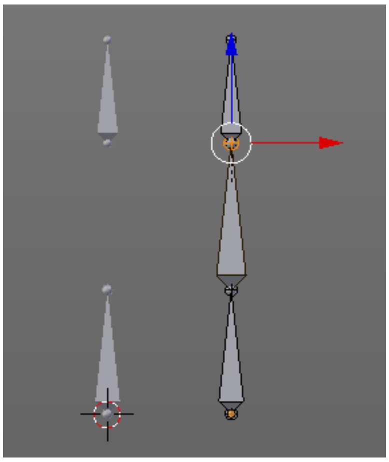




Last Operator Merge Bones

Type

Type is a drop-down box where you can choose between exactly nothing since there is one choice. Within chains.



Fill between Joints

Fill between joints fills a bone between two selected joints.

When there is just one joint selected, then the bone is created between this selected joint and the 3D cursor.

The Last operator for Fill Between Joints has no content.

Split

Split splits the selected bone(s) from connected bones. They are still part of the armature. But the bone is now floating. And you can pull this bone(s) around without pulling the rest of the armature around.

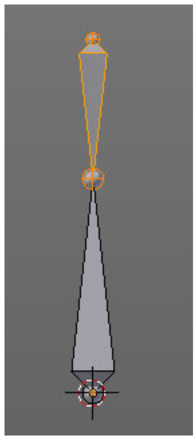
The Last operator for Split has no content.

Separate

Separate separates the selected bone(s) from the armature. And creates a new, independent, armature.

The Last operator for Separate has no content.

Switch Direction

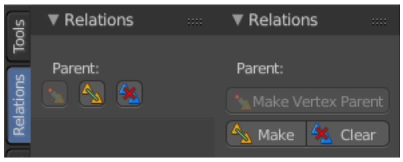


Switches the direction in which the bone points at. The head becomes the tail, and the tail becomes the head.

The Last operator for Switch Direction has no content.

Tool Shelf in Edit Mode - Armature Object, Relations Tab

Relations Panel



The Relation panel contains tools around relations inside the currently edited armature.

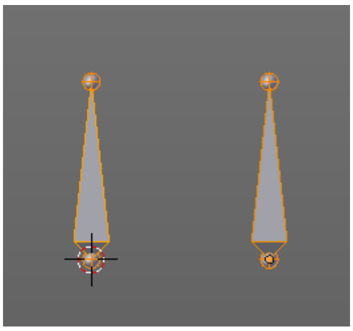
Make Vertex Parent

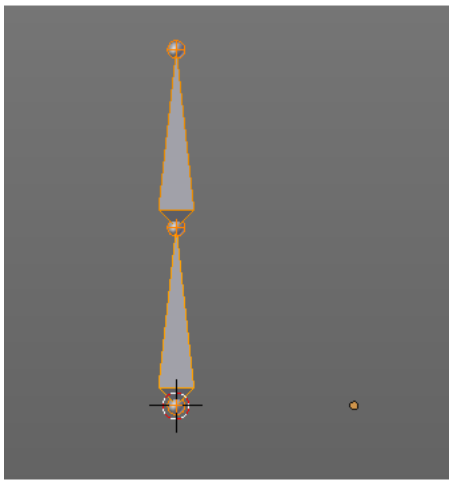
In Object mode select the object that you want to parent to a vertex. Shift select the parent object so that both are selected. Enter Edit mode. Then select one vertex for a single point. Or three for an area. Then click the Make Vertex Parent button to make the relation.

Make

Make calls a sub menu. When you have one bone selected then you get just the Connected menu part. But this doesn't make much sense since then there is nothing to parent.

Make requires to have at least two bones selected that are not parented to each other already. Select first bone, hold down shift, select second bone. The first selected bone will be the child, the second selected bone the parent.

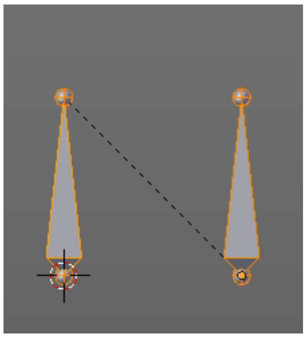




Connected

Connected connects the Head joint of the one bone with the Tail joint of the other. The child bone will be placed at the position of the head joint of the parent bone. And the joints will be merged.

Keep Offset

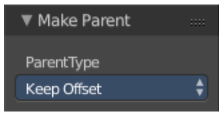


Keep Offset connects the Head joint of the one bone with the Tail joint of the other. The target bone will remain in its position. The joints are not merged. The relationship is indicated by the black dotted line. The child bone will move with the parent bone.

Last Operator Make Parent

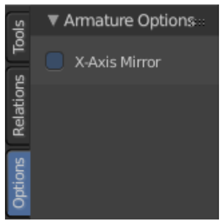
Parent Type

Parent Type is a drop-down box where you can again choose to use the method Connected or the method Keep Offset.



Tool Shelf in Edit Mode - Armature Object, Options Tab

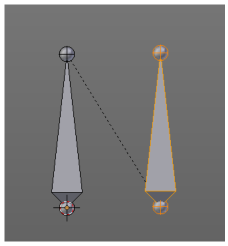
Armature Options Panel



The Armature Options panel contains some options.

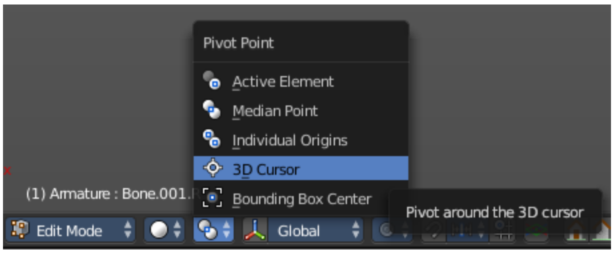
X Axis Mirror

X Axis Mirror is made to sync the right side of a symmetrical armature with the left side of a symmetrical armature. Means you can create just one half of a skeleton. And then simply mirror it over to the other half. And any further changes that you do at the one side will also apply to the other side of the armature. This includes the whole FK IK setup. And can save you lots of work therefore.



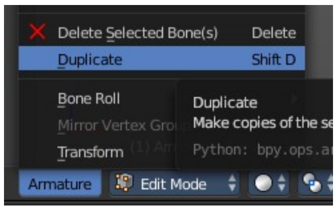
To get X Axis mirror to work requires a bit preparation work.

Create a armature, with some bones at the one side. Like this. The 3D cursor needs to be at 0/0/0. The left bone is in the middle. Think of it as the backbone. The right bone has an offset, and shall represent our right side of the armature.



Change the Pivot Point in the Header to 3D Cursor. Important step. We want to mirror around the 3D Cursor.

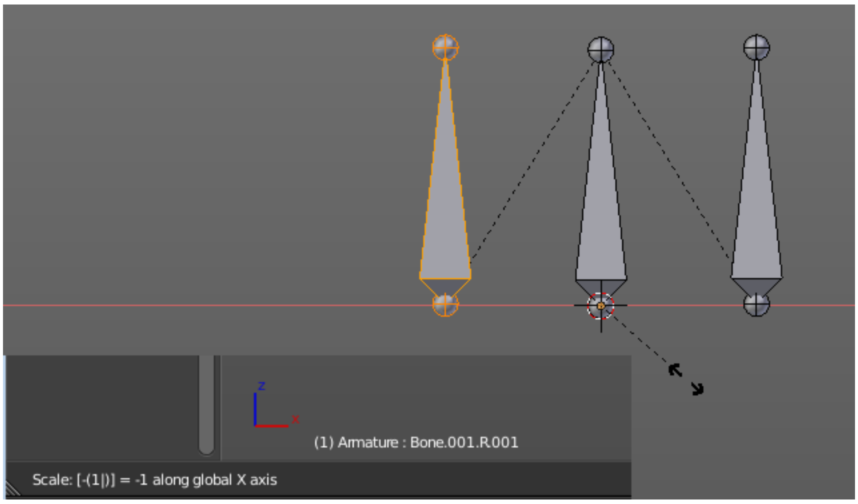
Now select the right side of the armature. Border select is one fast way. But NOT the bone in the middle, which is our backbone. We don't want to mirror this one too.

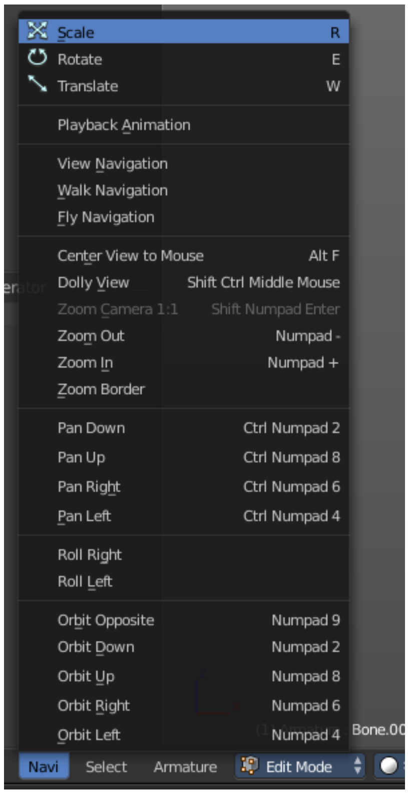


Duplicate what we have selected. And click immediately to leave the duplicate mode. Or you will pull the duplicated part around. Which is not what we want.

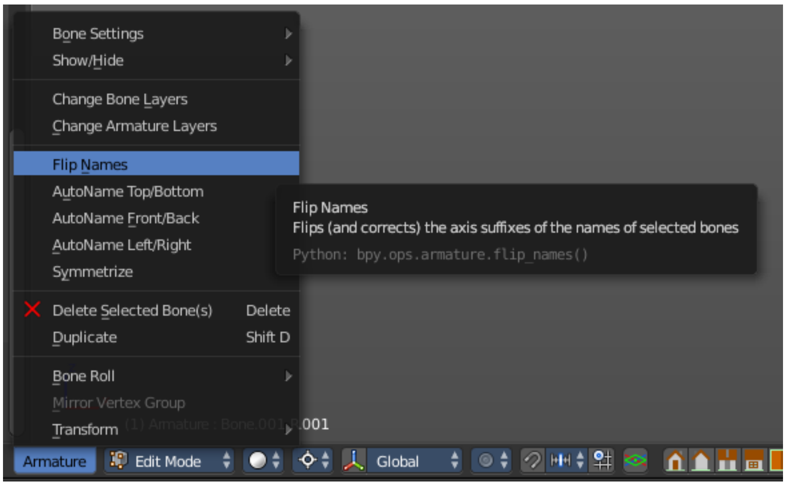
Next we will scale our new created armature part by -1 to mirror it over to the other side. Activate Scale, don't move the mouse, but type immediately in X for the axis and -1 for the scale factor.

This will create our mirrored armature part.

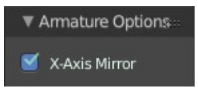




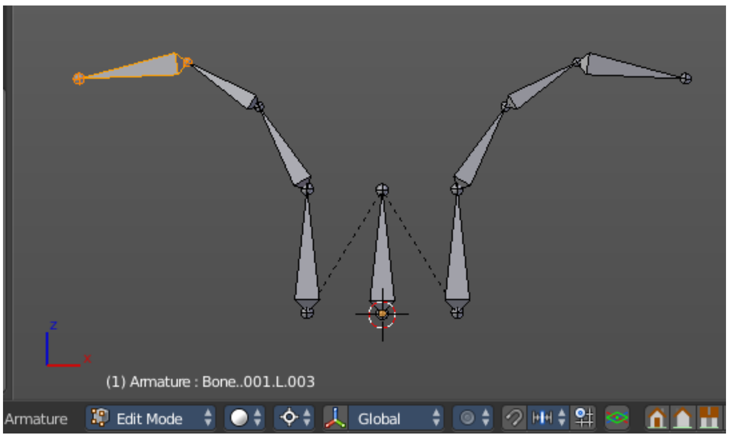
Next important step is to Flip Names. This renames the mirrored bones. Bone.001.R becomes without this step Bone.001.R.001. With rename we get Bone.001.L



And now we are finally arrived at X Axis Mirror. Tick it.



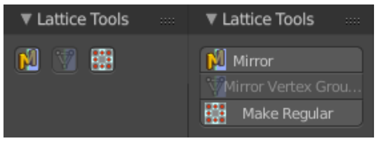
Now you should be able to modify the one side of the armature, and the other side will be modified too. This includes as told above also FK IK set-ups that you do in Pose mode.



Tool Shelf in Edit Mode - Lattice Object, Tools Tab

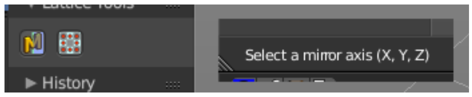
Lattice Tools Panel

Lattice is a deform cage. You can use it to deform other objects.



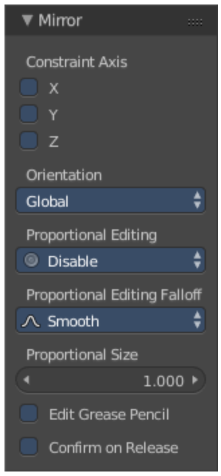
Mirror

Mirror mirrors the selected geometry along the defined axis. Click the Mirror button, type in X, Y or Z, then confirm with enter.



Last Operator Mirror

The Last Operator Mirror panel gives you tools to adjust the mirror action.



Constraint Axis

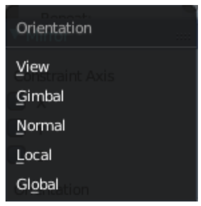
Constraint Axis gives you again the possibility to define the mirror axis. You can choose more than one axis here.

Orientation

Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.

Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.

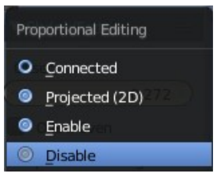


Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

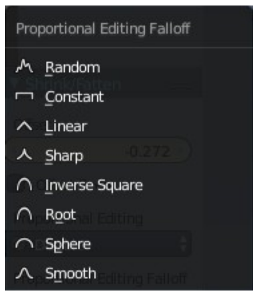
Proportional size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.



Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.



Confirm on Release

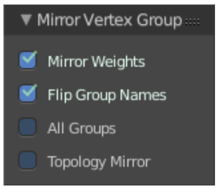
With Confirm on Release checked the action gets performed when you release the mouse button.

Mirror Vertex Group

This tool requires to have a vertex group assigned. It mirrors the selected vertex group.

This tool works only with a perfectly symmetrical mesh along the local X axis. Vertices that have no corresponding vertex on the other side will not be affected.

Last Operator Mirror Vertex Group



Mirror Weights

Mirrors the Weight Painting informations from the symmetrical counterpart. When both are selected it will become a group and weight information exchange. If only one is selected, then the information from the unselected vertice will go to the selected vertice.

Flip Group Names

Flip selected group names. This works with vertex groups with symmetrical name conventions. Like .L , .R, right, left.

All Groups

Pass information to all groups instead of the active one.

Topology Mirror

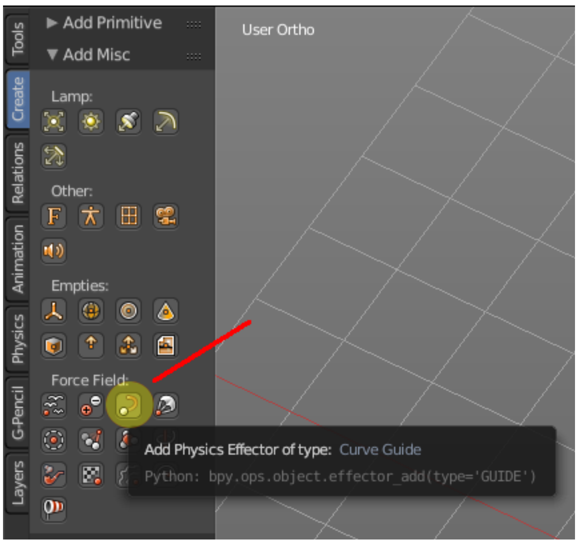
Use topology based mirroring.

Make Regular

Make regular sets the shape of the Lattice cage back to a regular cube.

The Last operator Make Regular has no settings.

Tool Shelf in Edit Mode - Force Field, Curve Guide Force



Normally the Force Fields does not have any edit mode. With one exception. The force Curve Guide. It is not only a force object, but also a curve object. And so you need a way to modify the curve.

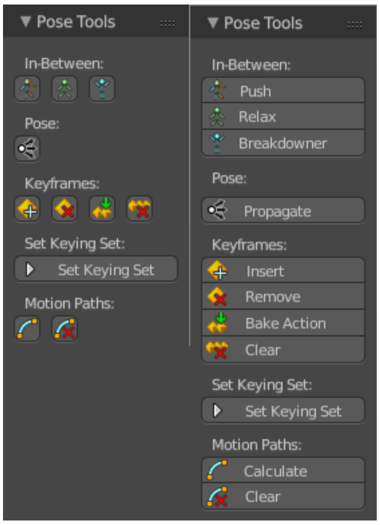
When you enter the edit mode with the force object "Curve Guide", then you will find yourself in the same panels in the tool shelf like if you would edit a normal curve object. And in fact that's what you do here.

Please have a look at the Curve Object chapters to find out more about the functionality.

Tool Shelf in Pose Mode

The Pose Mode is a mode especially for armatures. Other object types have no Pose mode. In Pose mode you can pose and animate your armature. This is best done in the Animation layout.

Tool Shelf in Pose Mode - Armature Object, Tools Tab



Pose Tools Panel

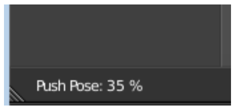
The Pose Tools Panel contains the tools that are needed to pose the armature.

In Between

In Between are tools to influence the look of the pose between the keyframes.

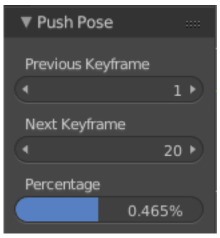
For example, record a keyframe at frame 1, then record a keyframe at frame 20. Then go to frame 10, and activate one of the tools. Now you can play around with the settings. And when you are satisfied with the result then you can record a keyframe at this position.

Push



Push exxagerrates the current pose. When you activate it then you will see a percentage value in the header.

Last Operator Push Pose



Previous Keyframe

The keyframe position before the current frame.

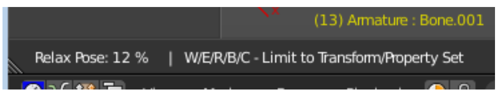
Next Keyframe

The keyframe position after the current frame.

Percentage

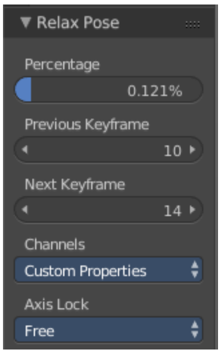
The percentage of exxageration. Interestingly the value in the Last operator differs from the value in the header.

Relax



Relax relaxes the current pose. When you activate it then you will see a percentage value in the header. And some hotkeys. The hotkeys W

E and R allows you just to move, rotate or scale. Hotkey B stands for Bendy Bones. And C is for a custom property. This hotkeys are hard coded, and cannot be changed in the input manager.



Last Operator Relax Pose

Previous Keyframe

The keyframe position before the current frame.

Next Keyframe

The keyframe position after the current frame.

Percentage

The percentage of exxageration. Interestingly the value in the Last operator differs from the value in the header.

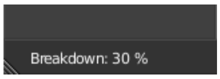
Channels

Here you can again choose if you just want to limit a specific channel.

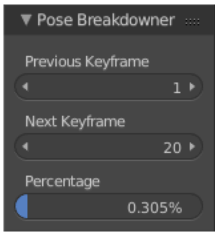
Axis Lock

Allows you to lock a specific axis.

Breakdowner



Creates a suitable breakdowner pose on the current frame. When you activate it then you will see a percentage value in the header.



Last Operator Pose Breakdowner

Previous Keyframe

The keyframe position before the current frame.

Next Keyframe

The keyframe position after the current frame.

Percentage

The percentage of exxageration. Interestingly the value in the Last operator differs from the value in the header.

Pose

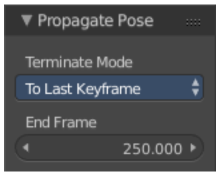
The Pose section contains the Propagate tool. The Propagate tool automates the process of copying and pasting between keyframes. It copies the pose of the selected bones on the current frame over to the keyframes by the chosen Termination mode in the Last Operator Propagate Pose.

The different Propagate methods can be adjustetd in the Last operator.

Usage example with Termination mode "On Selected Keyframes".

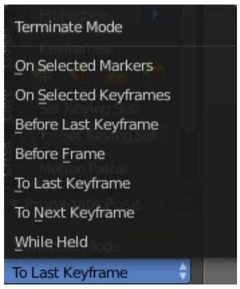
Create a little armature.
Set a keyframe at frame 0.
Set a keyframe at frame 20.
Pose frame 20.
Set a keyframe at frame 40. It will most probably be identical with Frame 20.
Now select those Keyframes at position 40 in the Dope Sheet Editor.
Set position to Frame 0.
Press Propagate, and in the Last operator Propagate Pose choose On Selected Keyframes.
The selected keyframes at frame 40 will now turn into the corresponding keyframes from position 0.

Last Operator Propagate Pose



Terminate Mode

A dropdown box where you can choose between different termination modes for Propagate.



While Held

While held it tries to guess when to stop propagating by examining the pauses in the animation curves per control (This means all F-Curves for a bone instead of per F-Curve).

To Next Keyframe

Copies the pose to the first keyframe after the current frame.

To Last Keyframe

Replaces the last keyframe.

Before Frame

Copies to all keyframes between current frame and the End frame option.

Before Last Keyframe

To all keyframes from current frame until no more are found.

On Selected Keyframes

Applies the pose of the selected bones to all selected keyframes.

On Selected Markers

Copies to all keyframes on frames with Scene Markers after the current frame.

End Frame

Defines the end frame for the Propagate.

Keyframes

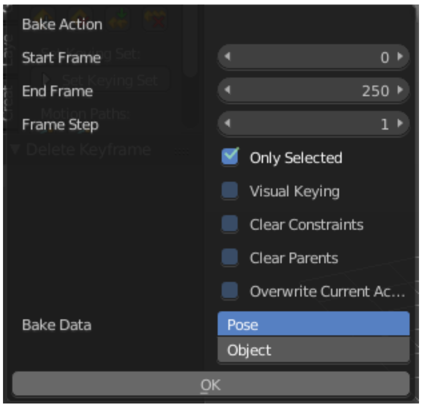
Contains some keyframing tools.

Insert

Inserts keyframes for the specified keying set. Insert has no settings in the Last Operator.

Remove

Removes the keyframes at the current frame. Remove has no settings in the Last Operator.



Bake Action

Calls a popup where you can adjust the bake settings to bake the action. Bake Action bakes the current action into a clip for the NLA editor.

Last Operator Bake Action

The Last Operator Bake Action contains the same settings from the Popup.

Start Frame

Defines the start frame.

End Frame

Defines the end frame.

Frame Step

Defines the number of keyframes per step.

Only Selected

Only key selected bones.

Visual Keying

Keyframe from the final transformations.

Clear Constraints

Remove all constraints and do visual keying.

Clear Parents

Bake animation onto teh object, then clear parents. This is for objects only.

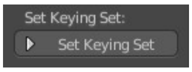
Overwrite current Action

Bake animation into current action.

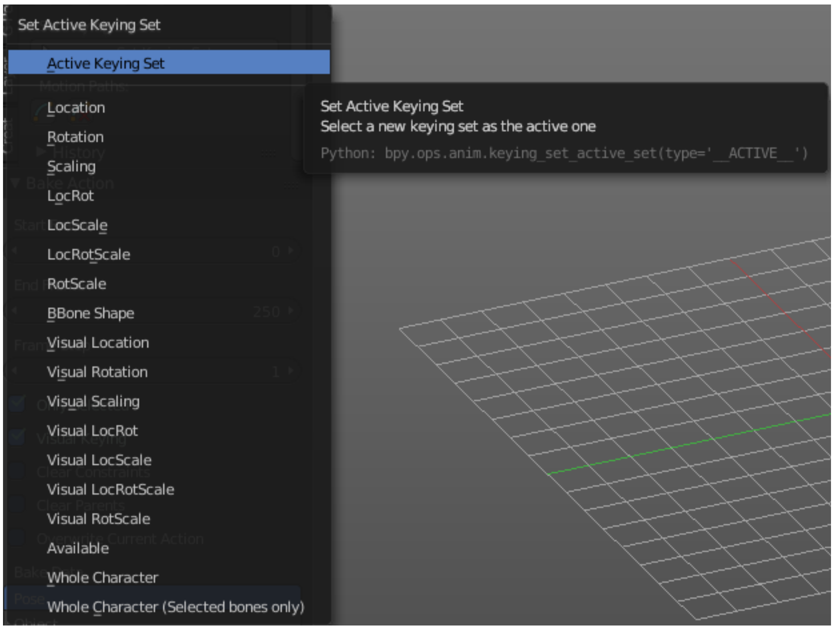
Bake Data

You can either bake to pose, or bake to object.

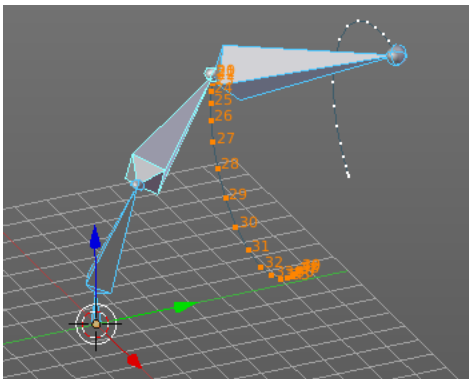
Set keying set



Set keying set is a dropdown box where you can choose between the different available keying sets.

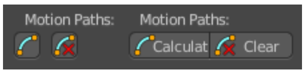


Motion Paths

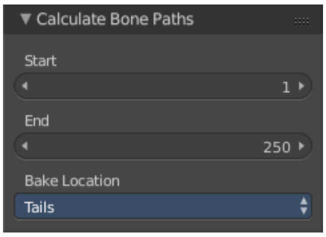


Calculate Bone Paths

Calculate Bone Paths calculates the paths of the bones. And displays them visually in the 3D space.



Last Operator Calculate Bone Paths



Start

Defines the start frame

End

Defines the end frame

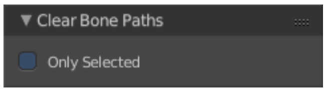
Bake Locaton

Here you can adjust if the motion path gets displayed at the tail of the bone(s) or the head of the bone(s).

Clear Bone Path

Clears the calculated Bone paths.

Last Operator Clear Bone Paths



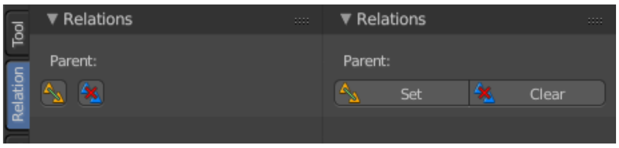
Only Selected

Only clear paths from selected bones.

Tool Shelf in Pose Mode - Armature Object, Relations Tab

Relations Panel

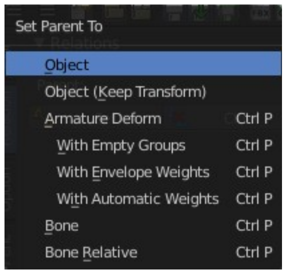
The Relation panel contains tools around relations.



Parent

Set

Set calls a menu where you can choose between different parenting methods.



Object

Sets the parent to selected object.

Object (Keep Transform)

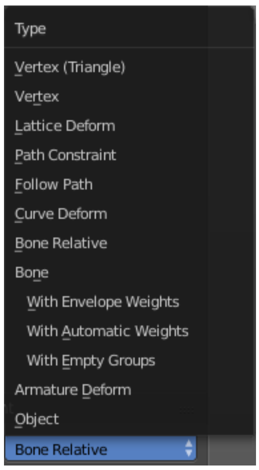
Sets the parent to selected object, but keeps the transform position / rotation

Armature Deform

Sets the parent to selected Armature.

With empty Groups

Sets the parent to selected Armature, using empty groups.



With Envelope Weights

Sets the parent to selected Armature, using envelope weights

With automatic Weights

Sets the parent to selected Armature, with automatic weights.

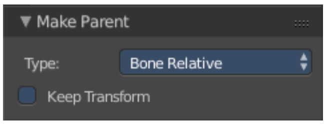
Bone

Sets the parent absolute to selected Bone.

Bone Relative

Sets the parent relative to selected Bone.

Last Operator Make Parent



Type

is a dropdown box where you can choose between different parenting methods. The working methods are the same than from the Parent popup. The other methods doesn't belong to Armature.

Keep Transform

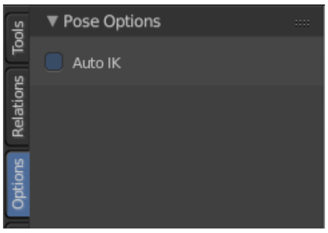
Apply transformation before parenting.

Clear

Clears the parenting.

Tool Shelf in Pose Mode - Armature Object, Options Tab

Pose Options Panel



Auto IK

Add temporary IK constraints while grabbing bones in Pose mode.

Tool Shelf in Sculpt Mode

The Tool Shelf in Sculpt Mode provides you the tools to sculpt a mesh. The high poly version of a game character for example, where you bake the normal map from.

The Sculpt mode is just available for mesh objects. And requires a tesselated mesh to have useful results.

Tool Shelf in Sculpt Mode - Mesh Object, Tools Tab

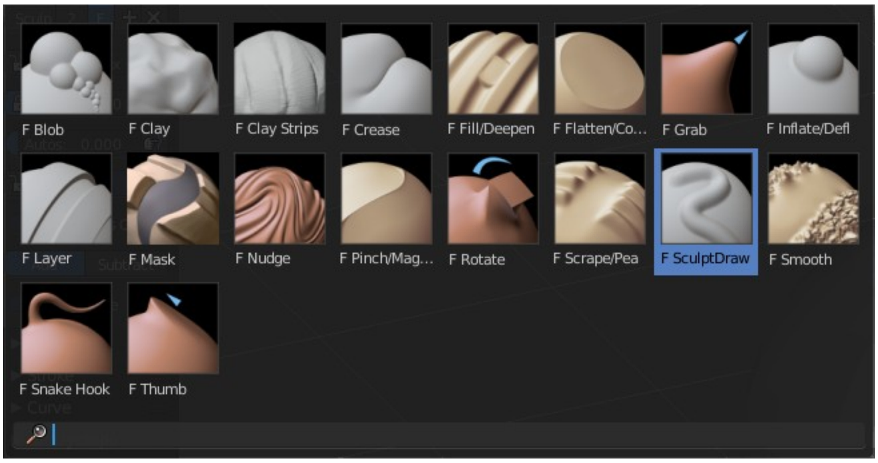
Brush Panel

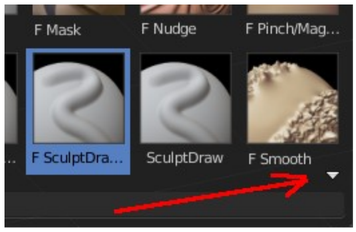
The Brush Panel contains the different Sculpt Brushes and some Brush settings.

Browse Brush

The big image at the top is a dropdown box where you can choose a brush. Click at it, and you will see the different brushes. A click at one of the images will choose this brush then.

Persistent and Set Persistent Base is just available with the brush type Layer.





When you have added a few more brushes then the dropdown box may be more than full. You will see some little white arrows then. Either in the top left or in the bottom right corner. They indicate that some brushes are hidden before or after the current display.

To scroll to this hidden content use the mouse wheel, or the arrow up and down buttons at the keyboard.

The edit box below the Image shows you the name of the current active brush.

The number right of it, **in this case 2**, indicates how much number of users (internally) this brush uses. This means that this data block (the brush) shares currently settings with at least one other object. Most probably the parent brush where we have created it from. Click at the value to make this brush a single user. The button will vanish then.

F set the brush to have a fake user. Zero user data-blocks are normally not saved. But sometimes you want to force the data to be kept even when the data block has no user.

The + button allows you to add a new pencil with the current settings. Note that the brushes are NOT saved when you close Bforartists. You can save them into the current blend file. Or you can save the startup file. But be careful here. This saves everything else of the current state of Bforartists too.

The X button deletes the brush as the active one. It does NOT delete it from the brushes list.

Radius

The Radius edit box allows you to adjust the radius of the brush. When the Lock symbol at the front is ticked, then the pencil keeps its size relative to the object when zooming in and out. The button behind the edit box enables tablet pressure sensitivity for radius.

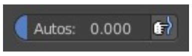
And the button at the end allows you to set the radius of the pencil by hotkey. A click at this button works of course too. But this is a hotkey tool. The button is just a visible reminder.

Strength

The Strength edit box allows you to adjust the strength of the brush. When the Lock symbol at the front is ticked, then the pencil keeps its strength relative to the object when zooming in and out. The button behind the edit box enables tablet pressure sensitivity for strength.

And the button at the end allows you to set the strength by hotkey. A click at this button works of course too. But this is a hotkey tool. The button is just a visible reminder.

Autosmooth



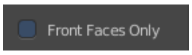
The autosmooth edit box allows you to adjust the amout of smoothing that gets automatically applied to each stroke. The button behind the edit box enables tablet pressure sensitivity for autosmooth.

Sculpt Plane

The sculpt plane defines how the sculpting is aligned. It is a dropdown box where you can choose different methods. By default the Area Plane gets used.

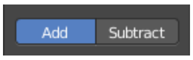
When the Lock symbol at the front is ticked, then it keeps using the normal of the surface where the stroke was initiated.

Front Faces Only



Front Faces only means that the stroke just affects the vertices that are pointing forwards to the camera.

Add / Subtract

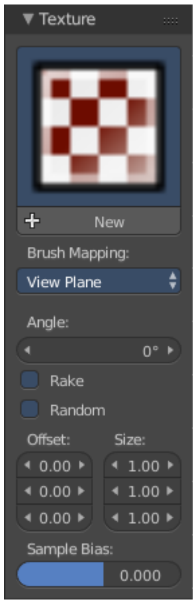


Add means the stroke adds to the geometry. Subtract means the stroke subtracts from the geometry.

Accumulate, Persistent, etc.

In this area you will find the brush related settings. They differ from brush to brush.

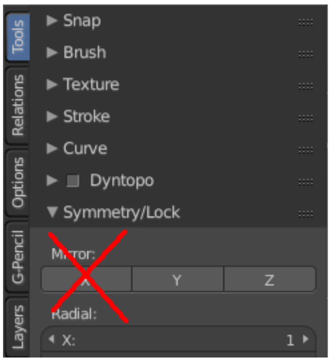
Texture Panel



The Texture panel allows you to sculpt with textures. This allows you for example to grab a foto from some fish scales, and simply sculpt them into the surface of your object by using this image as a pencil. Or as a blueprint where you calk through (Stencil method).

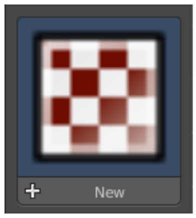
Note that the following shots are made with Symmetry off and without Brush falloff. Since they disturbed.

Symmetry can be turned off here:



And the brush falloff can be adjusted here. Choose the last method here to have no falloff towards the borders of the brush.

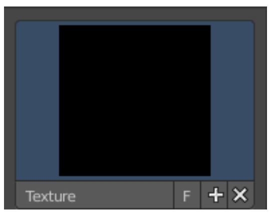
Browse Texture to be linked



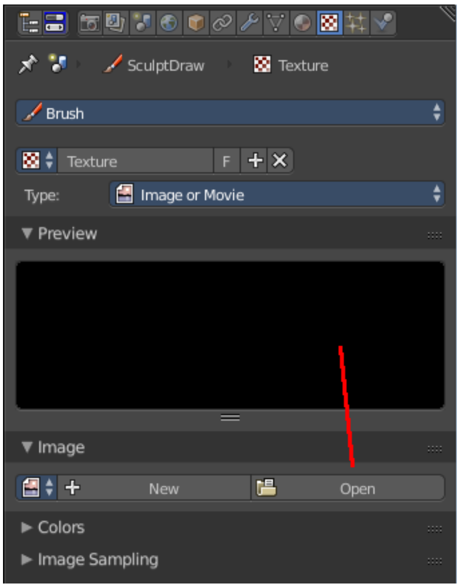
The image at the top of the panel is a image browser. Here you can choose a texture that you can choose for sculpting then. You can also have more than one image loaded at once.

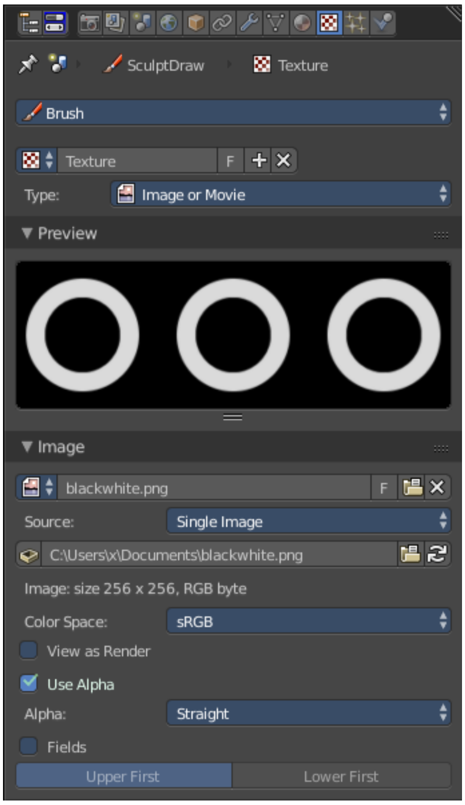
In this shot there is already a texture added. The way to add the texture here is a bit more complicated. And not done with clicking at the New button.

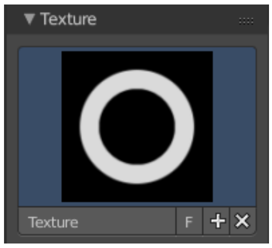
First click at the New button below the image. This will create a new texture slot. This slot is still empty, it displays black.



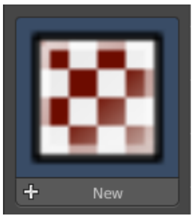
We need to load the texture in this slot. This must be done in the Properties editor in the Textures tab. And then the texture finally shows in the Texture panel in the Tool Shelf.

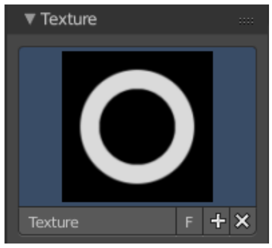






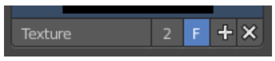
Texture Edit box





The Texture edit box is the edit box below the Image browser. When there's no image loaded then it displays the New button. When there's a image (or more) loaded, then you will see the name of the current texture.

The F button turns this texture into a data block with a fake user. Means it will exists even when there is no data connected to it anymore.



When you activate Fake User, then you may get a value in front of it, which displays how much users this data block (our texture slot) currently has.

The + Button adds another texture slot. Note that you will have to load a texture too, as explained above.

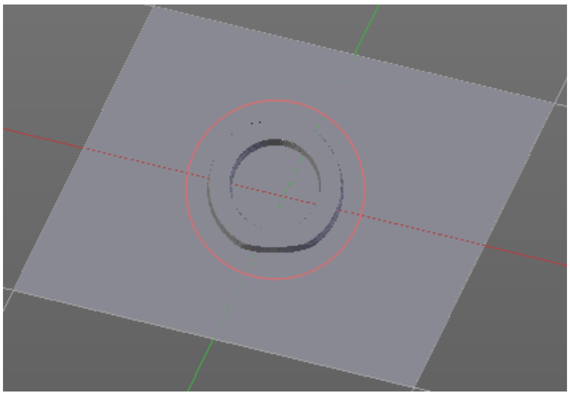
The X button deletes the texture slot.

Brush Mapping

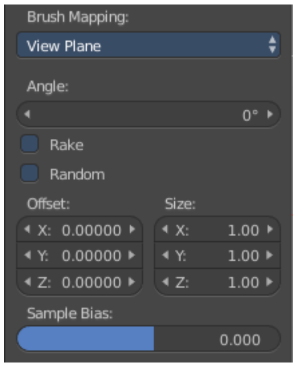
Our texture can be mapped in different methods. The Brush mapping is a dropdown box where you can choose this different brush mapping methods.

The settings vary. So we will go through them by the different brush mapping methods.

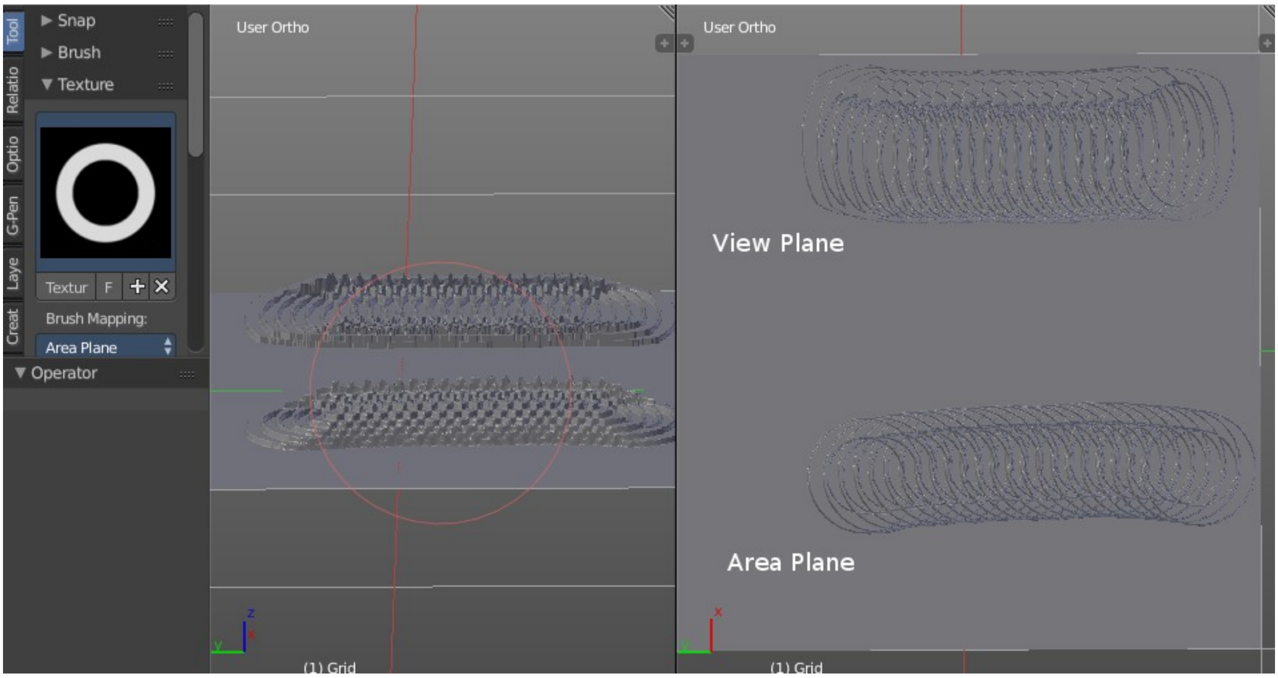
Brush Mapping with mapping method View Plane and Area Plane



The brush mapping method View Plane maps the brush onto the surface of the object, calculating the mapping from the current view. The result may be distorted when the view does not align with the surface of the object.



The brush mapping method Area Plane maps the brush onto the surface of the object, calculating the mapping from the current view. The result is not distorted.



Angle edit box

Here you can adjust the angle of the brush.

Rake

The angle follows the direction of the brush stroke.

Random

The brush angle gets set random.

Random edit box

Becomes visible when you tick Random. Here you can adjust the maximum value of the random angle.

Offset

Fine tune the offset of the texture in the brush.

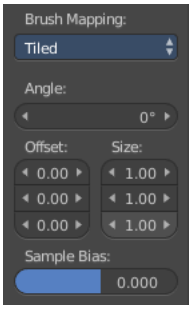
Size

Fine tune the size of the texture in the brush.

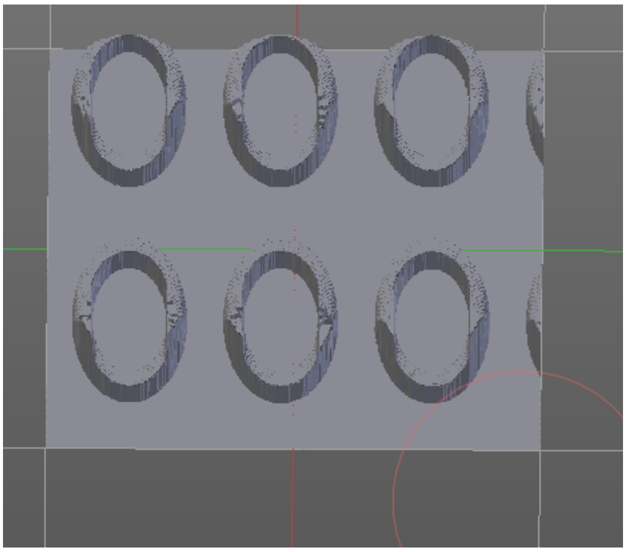
Sample Bias

Here you can add to or subtract from the amount that gets added by the brush texture.

Brush Mapping with mapping method Tiled



The brush mapping method View Plane maps the brush onto the surface of the object, and tiles the pencil onto the surface. The mapping happens from the View plane. Means you get distortions when you sculpt from an angle.



Angle edit box

Here you can adjust the angle of the brush.

Offset

Fine tune the offset of the texture in the brush.

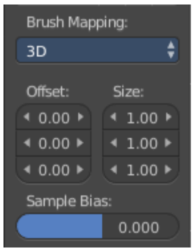
Size

Fine tune the size of the texture in the brush.

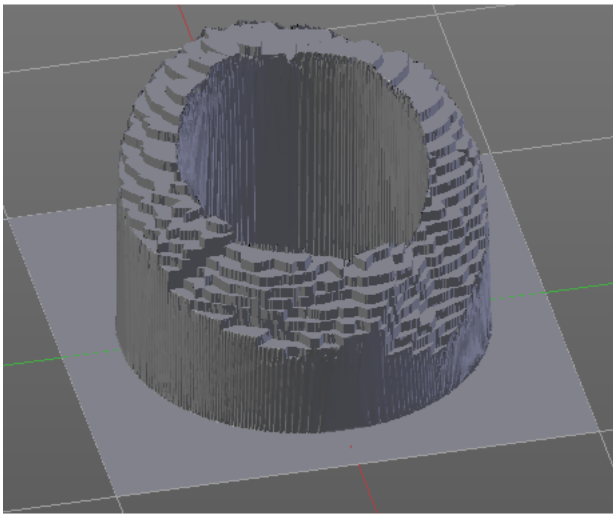
Sample Bias

Here you can add to or subtract from the amount that gets added by the brush texture.

Brush Mapping with mapping method 3D



The brush mapping method View Plane and Area Plane sculpts where the pencil is. The method 3D sculpts at the initial position of the pencil, as long as you don't release the mouse. The mapping happens from the View plane. Means you get distortions when you sculpt from an angle.



Offset

Fine tune the offset of the texture in the brush.

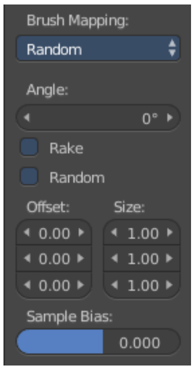
Size

Fine tune the size of the texture in the brush.

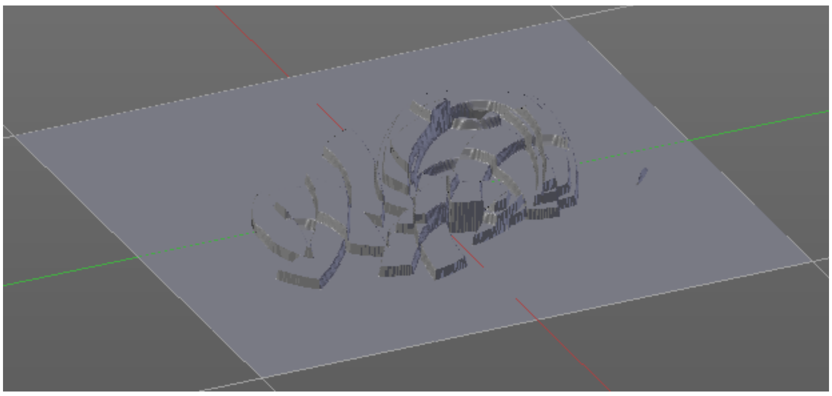
Sample Bias

Here you can add to or subtract from the amount that gets added by the brush texture.

Brush Mapping with mapping method Random



The brush mapping method Random randomizes the texture position of the pencil texture. And so it sculpts random fragments of the pencil.



Angle edit box

Here you can adjust the angle of the brush.

Rake

The angle follows the direction of the brush stroke.

Random

The brush angle gets set random.

Random edit box

Becomes visible when you tick Random. Here you can adjust the maximum value of the random angle.

Offset

Fine tune the offset of the texture in the brush.

Size

Fine tune the size of the texture in the brush.

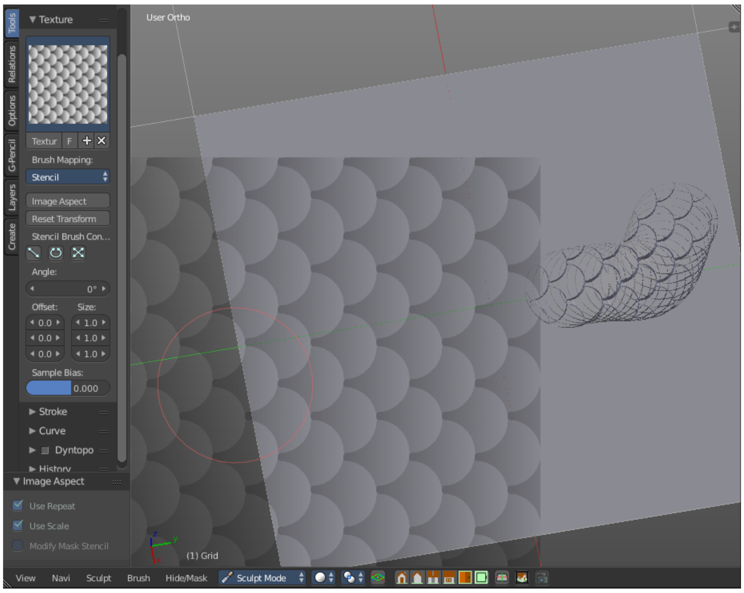
Sample Bias

Here you can add to or subtract from the amount that gets added by the brush texture.

Brush Mapping with mapping method Stencil

The former methods uses the textures for the brush. The method Stencil works different. You have your texture displayed in the workspace above the object, and you paint this texture onto your object with your pencil strokes.

Note that the texture in the 3d space is just visible when you are with the mouse over the viewport.



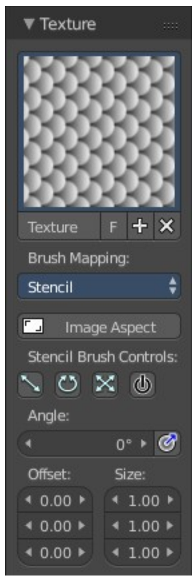
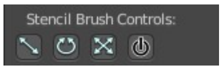


Image Aspect

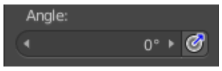
Adjust the stencil size to fit to the image aspect ratio

Stencil Brush controls



Here you can move, rotate and scale the stencil image in the 3D viewport. And reset the transform. You better use the hotkeys here that gets displayed in the tool tips, since the image is not displayed when the mouse is not over the 3D viewport.

Angle edit box



Here you can adjust the angle of the brush. The button at the end allows you to set the radius by dragging the mouse. This should be done in the viewport and with the hotkey. This button is just a visible reminder.

Offset

Fine tune the offset of the texture in the brush.

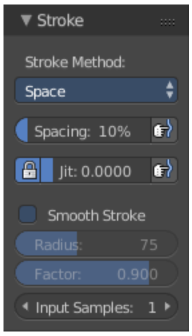
Size

Fine tune the size of the texture in the brush.

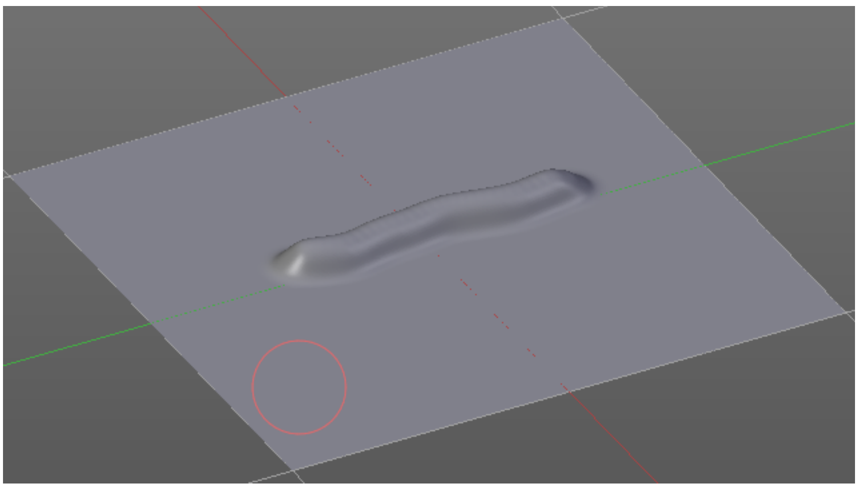
Stroke Panel

The Stroke panel contains settings to influence the behaviour of the brush stroke. There are various stroke methods available. We will go through them one by one.

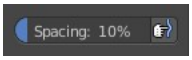
Stroke Panel with Stroke method Space

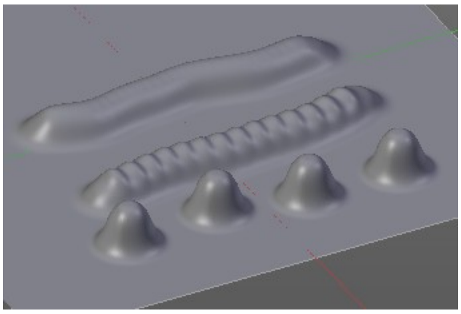


This is the default Stroke method. The sculpt stroke gets added continuously with given settings.



Spacing Edit Box





The sculpt drawing happens by mapping the pencil onto the mouse position. And when you move the mouse then the next mapping happens. Here you can adjust the spacing after what mouse movement the next mapping should happen. The lower the value, the lower the distance between the single dots.

The icon behind the edit box enables tablet pressure sensitivity for tablets.

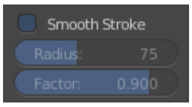
Jitter Edit Box

Here you can add Jitter to the brush while painting.

The icon in front of the edit box toggles between jittering in screen space and relative to brush size.

The icon behind the edit box enables tablet pressure sensitivity for tablets.

Smooth Stroke



The brush lags behind the mouse position, and produces a much smoother stroke by that.

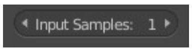
Smooth Stroke Radius Edit Box

Is just active when Smooth Stroke is activated. Here you can adjust the radius of the smoothing.

Smooth Stroke Factor Edit Box

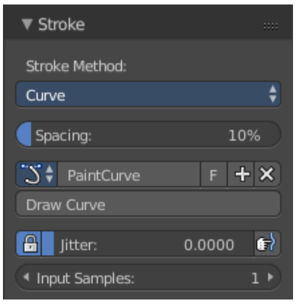
Is just active when Smooth Stroke is activated. Here you can adjust the factor of the smoothing.

Input Samples Edit Box



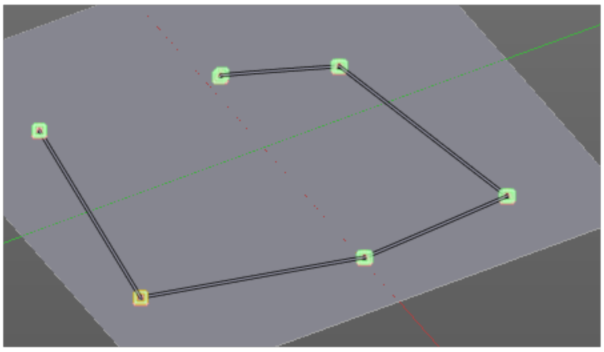
Average multiple input samples together to smooth the brush stroke.

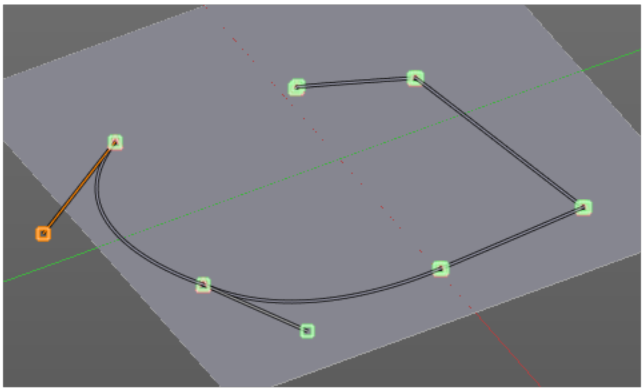
Stroke Panel with Stroke method Curve

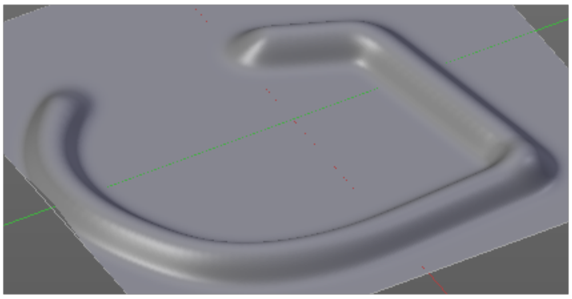


The Stroke method curve doesn't simply influence the way how the stroke is painted. It is a special method. First you draw a curve object by holding down ctrl and clicking with left mouse button. Then you tweak the curve. You can click at the curve point, and drag out handlers to make the curve points smoooth

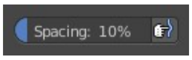
Then you hit the Draw Curve button. And the curve gets sculpted.



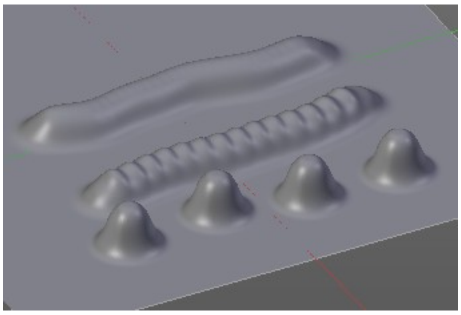




Spacing Edit Box



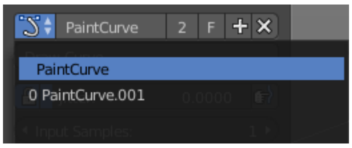
The sculpt drawing happens by mapping the pencil onto the mouse position. And when you move the mouse then the next mapping happens. Here you can adjust the spacing after what mouse movement the next mapping should happen. The lower the value, the lower the distance between the single dots.



The icon behind the edit box enables tablet pressure sensitivity for tablets.

Paint Curve edit box

Here you set the active curve.



The first element is a dropdown box where you will find your curves objects. You can have more than one.

The second element is the edit box that displays the active curve.

The number right of it, **in this case 2**, indicates how much number of users (internally) this brush uses. This means that this data block (the brush) shares currently settings with at least one other object. Most probably the parent brush where we have created it from. Click at the value to make this brush a single user. The button will vanish then.

F set the brush to have a fake user. Zero user data-blocks are normally not saved. But sometimes you want to force the data to be kept even when the data block has no user.

The + button allows you to add a new pencil with the current settings. Note that the brushes are NOT saved when you close Bforartists. You can save them into the current blend file. Or you can save the startup file. But be careful here. This saves everything else of the current state of Bforartists too.

The X button deletes the brush as the active one. It does NOT delete it from the brushes list.

Draw Curve Button

A click at it to turns the curve into a sculpt stroke.

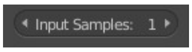
Jitter Edit Box

Here you can add Jitter to the brush while painting.

The icon in front of the edit box toggles between jittering in screen space and relative to brush size.

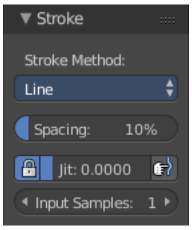
The icon behind the edit box enables tablet pressure sensitivity for tablets.

Input Samples Edit Box

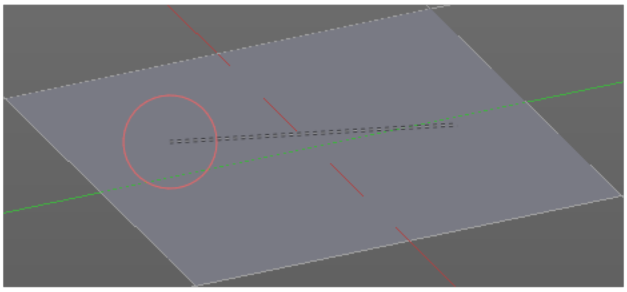


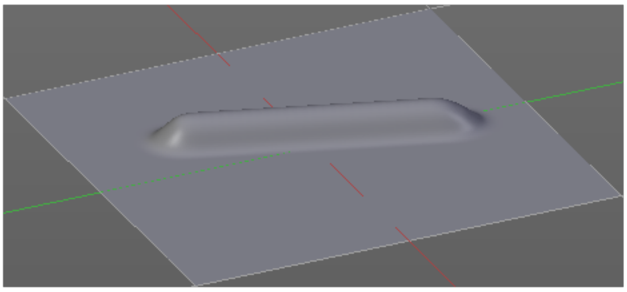
Average multiple input samples together to smooth the brush stroke.

Stroke Panel with Stroke method Line

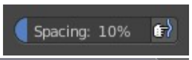


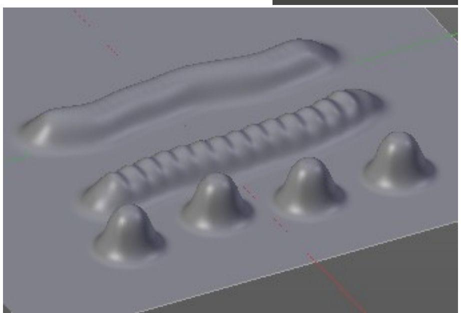
With Stroke method line you draw a line between a starting point and a endpoint. And when you release the mouse then the line gets sculpted.





Spacing Edit Box





The sculpt drawing happens by mapping the pencil onto the mouse position. And when you move the mouse then the next mapping happens. Here you can adjust the spacing after what mouse movement the next mapping should happen. The lower the value, the lower the distance between the single dots.

The icon behind the edit box enables tablet pressure sensitivity for tablets.

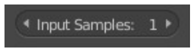
Jitter Edit Box

Here you can add Jitter to the brush while painting.

The icon in front of the edit box toggles between jittering in screen space and relative to brush size.

The icon behind the edit box enables tablet pressure sensitivity for tablets.

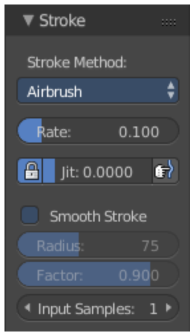
Input Samples Edit Box

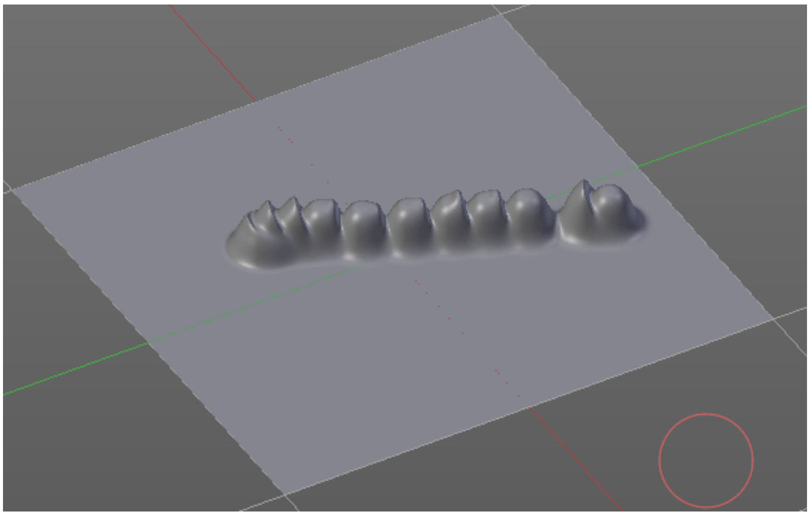


Average multiple input samples together to smooth the brush stroke.

Stroke Panel with Stroke method Airbrush

The sculpt stroke acts like an airbrush pencil. The dots gets placed randomly.





Rate Edit Box

Here you can define the rate of the drawing.

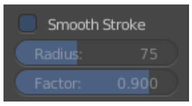
Jitter Edit Box

Here you can add Jitter to the brush while painting.

The icon in front of the edit box toggles between jittering in screen space and relative to brush size.

The icon behind the edit box enables tablet pressure sensitivity for tablets.

Smooth Stroke



The brush lags behind the mouse position, and produces a much smoother stroke by that.

Smooth Stroke Radius Edit Box

Is just active when Smooth Stroke is activated. Here you can adjust the radius of the smoothing.

Smooth Stroke Factor Edit Box

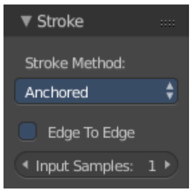
Is just active when Smooth Stroke is activated. Here you can adjust the factor of the smoothing.

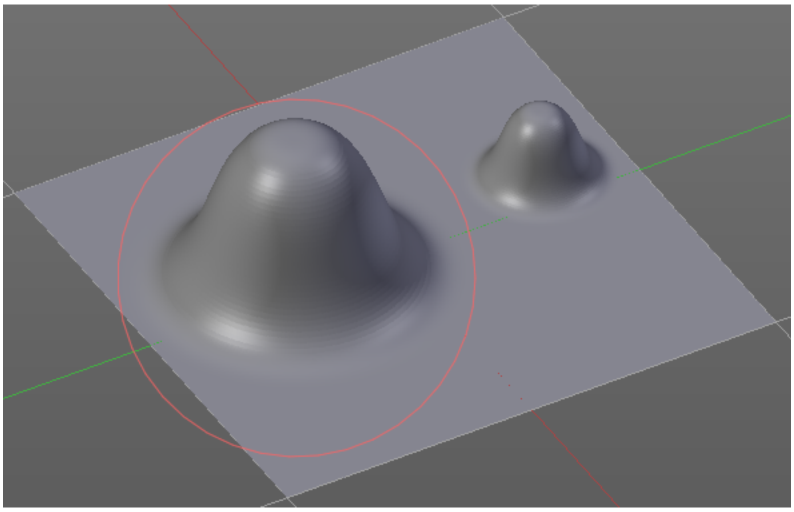
Input Samples Edit Box

Average multiple input samples together to smooth the brush stroke.

Stroke Panel with Stroke method Anchored

Click and drag to place a dot and to scale it.

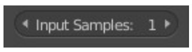




Edge to Edge

Without Edge to Edge the scaling happens from the center of the brush. With edge to edge the scaling happesn from the edge of the brush.

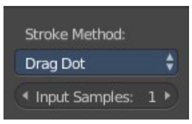
Input Samples Edit Box

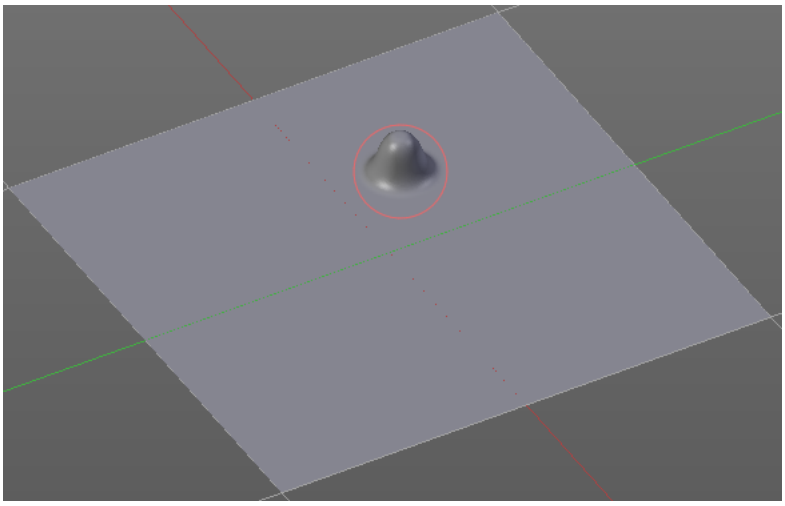


Average multiple input samples together to smooth the brush stroke.

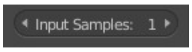
Stroke Panel with Stroke method Drag dot

Click and drag to place a dot.



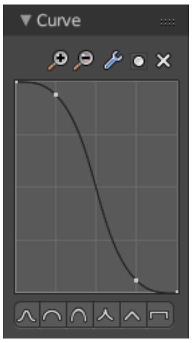


Input Samples Edit Box



Average multiple input samples together to smooth the brush stroke.

Curve Panel



The curve panel allows you to define different fallofs methods for the border of the brush.

Navigation elements

The navigation elements at the top are described from left to right

Zoom in and out

The two buttons with the magnifying glass at it zooms in and out in the curve window.

Tools

Tools is a menu where you can find some cuve related tools.

Reset View
Resets the curve windows zoom

Vector Handle
Set handle type to Vector

Auto Handle
Set handle type to Auto

Auto Clamped Handle
Set handle type to Auto Clamped

Reset Curve

Resets the curve to the initial shape.

Curve Presets

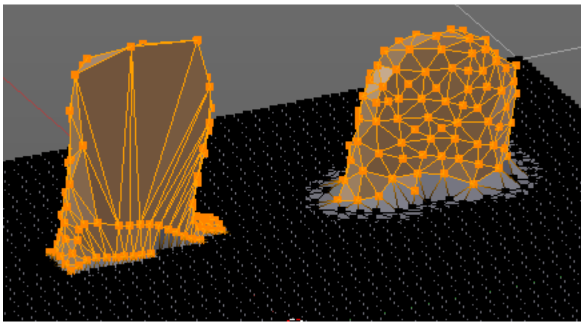
Here you can find some predefined curve presets.

Dyntopo Panel

Dyntopo stands for Dynamic Topology Sculpting.

Without dyntopo you just deform the existing geometry. With Dyntopo geometry gets subdivided when needed. This makes it possible to sculpt complex shapes out of a block.

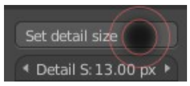
Left without Dyntopo, right with Dyntopo.



Note that some brushes does not work with Dyntopo. They are Grab brush, Rotate brush, Thumb brush, Layer brush, Smooth brush (including alt-key smoothing with a different brush) and Mask brush.

The topology will also not be updated if the stroke mode is Anchored or Drag Dot.

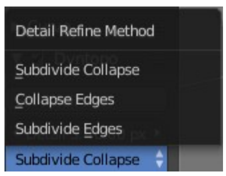
Detail Size



The Detail size defines how fine the subdivision will be. When you click at the upper button then a widget appears where you can set the detail size by dragging. This button contains also the hotkey to change the detail size in the viewport so that you don't have to grab the slider all the time when working.

The edit box below does the same. But with a slider, and without visible feedback in form of a widget.

Detail Refine method



Here you can define the Detail refine method.

Subdivide Collapse

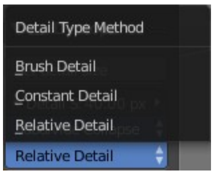
Both methods in one. Subdivide long edges to add mesh detail where needed. And collapse short edges to remove mesh detail where possible.

Collapse Edges

Collapse short edges to remove mesh detail where possible.

Subdivide Edges

Subdivide long edges to add mesh detail where needed.



Detail Type Method

Here you can define the Detail Type method.

Brush Detail

Mesh Detail is relative to brush radius.

Constant Detail

Mesh detail is constant in object space according to detail size.

Relative Detail

Mesh Detail is relative to brush size and detail size

Smooth shading

Show faces in smooth shading instead of flat shading.

Optimize

Recalculate the sculpt BVH to improve performance.

Detail Floodfill

Flood fill the mesh with the selected detail settings.

Direction

Source and Destination for Symmetrize operator. This has to do with the symmetrize button below.

Symmetrize

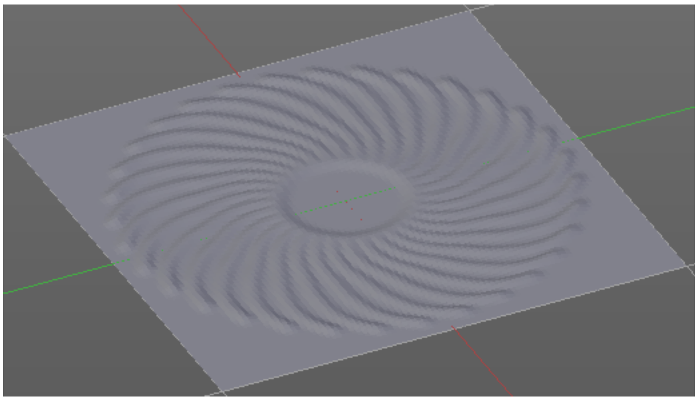
Symmetrize the topology modifications.

Symmetry / Lock

The Symmetry Lock panel contains tools around symmetry and lock features. Here you can turn on or off mirroring along axis, etc.

Mirror

Mirror sculpt along activated axis. By default the mirroring is activated around X axis.



Radial

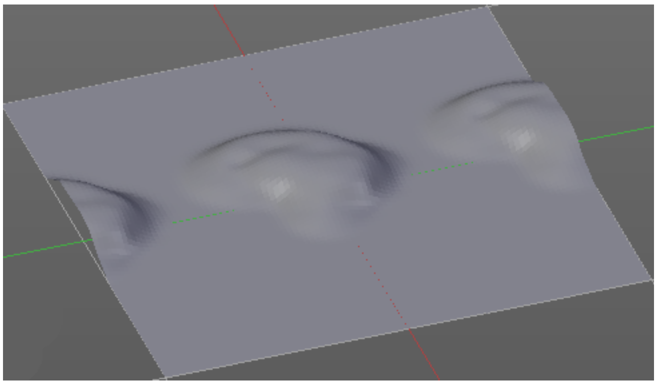
Adjust the repeatings across some axis. For example, when you change Z to 32, then you can draw 32 segments simultaneously around the Z axis instead of just one, distributed around the Z axis.

Feather

Reduce the strength of the brush where it overlaps symmetrical daubs

Lock

Disallow vertices movement in locked axis direction.



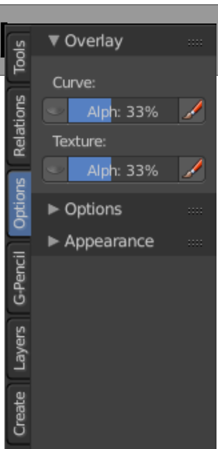
Tiling

Produces a mesh that is tilable in the activated directions.

Tile Offset

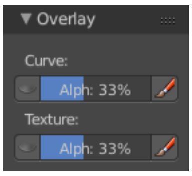
Here you can adjust the offset of the tiling.

Tool Shelf in Sculpt Mode - Mesh Object, Options ta



The Options tab for sculpting provides you with some settings and options for sculpting.

Overlay Panel



Curve

This setting is interesting for the Stroke method Curve. Here you can adjust how transparent the curve is.

The eye icon button in front of the slider is to show the curve object in viewport. The brush icon button behind the slider is to hide the overlay during a stroke.

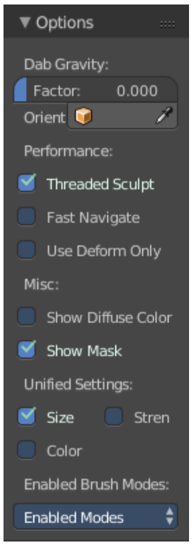
Texture

This setting is interesting for Texture painting. Here you can adjust how transparent the texture is.

The eye icon button in front of the slider is to show the texture in the viewport. The brush icon button behind the slider is to hide the overlay during a stroke.

The Stencil map texture has no eye icon button since it gets shown in the viewport anyways.

Options Panel



Dab Gravity

Here you can add gravity after each stroke.

Factor

The factor silder defines the amount.

Orientation

Here you define an object that gets used to determine the gravity from. The Z axis of this object gets used.

Threaded Sculpt

Use multiple CPU cores for sculpting.

Fast Navigate

For Multires, show Low Res mesh when navigating.

Use Deform only

Use only deformation modifiers (The other constructive modifiers except multi-resolution gets temporary disabled)

Show Diffuse Color

Show the diffuse color of the object while sculpting.

Unified Settings

Size

Instead of per Brush radius, the radius is shared across brushes.

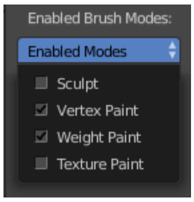
Strength

Instead of per Brush strength, the strength is shared across brushes.

Color

Instead of per Brush color, the color is shared across brushes.

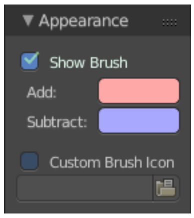
Enabled Brush Modes



Enabled Modes

Enabled modes is a dropdown menu where you can adjust in which modes the brushes shows.

Appearance Panel



The Appearance panel provides you with some settings to adjust the appearance of the brush.

Show Brush

Show the brush in 3D view.

Add

The color that the brush cursor has when adding to geometry.

Subtract

The color of the brush cursor when subtracting from the geometry.

Custom Brush Icon

Here you can define a custom icon for the brush.

Tool Shelf in Vertex Paint Mode

The Tool Shelf in Vertex Paint Mode provides you the tools to paint vertices.

Vertex painting assigns colors to single vertices. And this color gets interpolated between the different vertices then. This is what makes the faces colored. And this means that you can NOT paint in the middle of a face with this method. You just paint the vertices from the mesh.

The Vertex Paint mode is just available for mesh objects.

Tool Shelf in Vertex Paint Mode - Mesh Object, Tools Tab

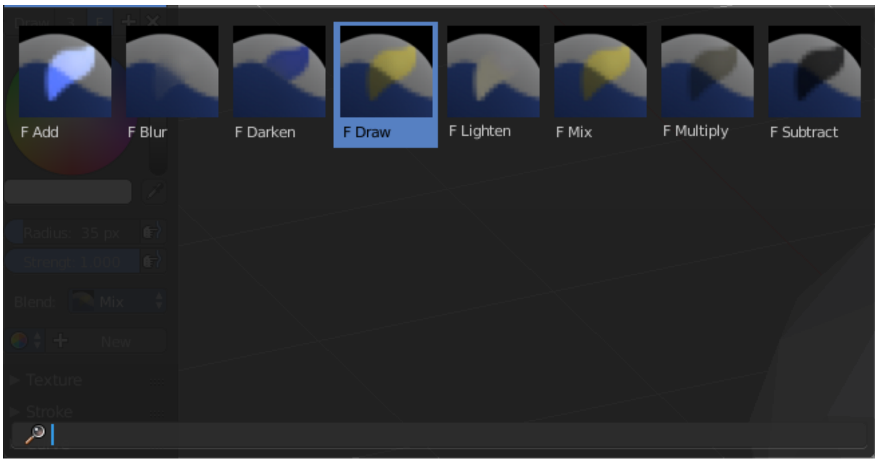
Brush Panel

The Brush Panel contains the different Brushes and some Brush settings. Here you can choose and adjust your current active brush.

At down left you can find the display options. The button with the gear symbol at it. Here you will find two toggles to hide away the color picker and the palette edit box.

Browse Brush

The big image at the top is a dropdown box where you can choose a brush. Click at it, and you will see the different brushes. A click at one of the images will choose this brush then.



When you have added a few more brushes then the dropdown box may be more than full. You will see some little white arrows then. Either in the top left or in the bottom right corner. They indicate that some brushes are hidden before or after the current display.

To scroll to this hidden content use the mouse wheel, or the arrow up and down buttons at the keyboard.

The edit box below the Image shows you the name of the current active brush.

The number right of it, **in this case 2**, indicates how much number of users (internally) this brush uses. This means that this data block (the brush) shares currently settings with at least one other object. Most probably the parent brush where we have created it from. Click at the value to make this brush a single user. The button will vanish then.

F set the brush to have a fake user. Zero user data-blocks are normally not saved. But sometimes you want to force the data to be kept even when the data block has no user.

The + button allows you to add a new pencil with the current settings. Note that the brushes are NOT saved when you close Bforartists. You can save them into the current blend file. Or you can save the startup file. But be careful here. This saves everything else of the current state of Bforartists too.

The X button deletes the brush as the active one. It does NOT delete it from the brushes list.

Color dialog

The color dialog is hidden by default. See display options at the bottom of the panel. You can define the color in the color element below the brush browser. It will also open a color dialog then.

When you set it to visible, then you can set the color for painting by a click with the mouse in the color wheel. The slider at the right defines the brightness.

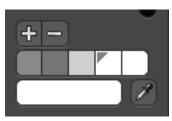
The button below shows you the active color.

A click at the color button will open a more detailed color dialog, where you can set up rgb, hsv and hex colors and with sliders.

Color Element

Here you can set a primary and a secondary color. The button with the arrows at it switches the active and the secondary color. And with the pipette you can pick a color from the screen. This will reveal some more elements, and create a palette. Here you can choose now the color to use it for painting. You can add and remove colors here too.

This color picker can just pick a color in the 3D view. It does not work elsewhere.



Radius

The Radius edit box allows you to adjust the radius of the brush. The button behind the edit box enables tablet pressure sensitivity for radius.

And the button at the end allows you to set the radius of the pencil by hotkey. A click at this button works of course too. But this is a hotkey tool. The button is just a visible reminder.

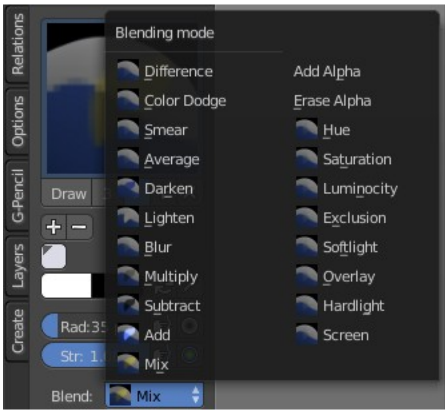
Strength

The Strength edit box allows you to adjust the strength of the brush. The button behind the edit box enables tablet pressure sensitivity for strength.

And the button at the end allows you to set the strength by hotkey. A click at this button works of course too. But this is a hotkey tool. The button is just a visible reminder.

Blending Modes

Here you can define how the stroke will blend.



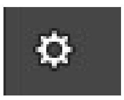
Accumulate, Alpha, etc.

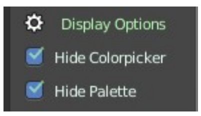
This are brush specific settings. They change with the brush.

Palette Editbox

Palette Edit box is hidden by default.

Here you can give your palette a name, create another palette, remove palette, and give it a fake user.

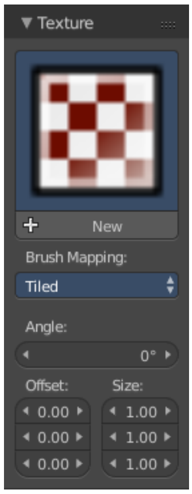




Display options

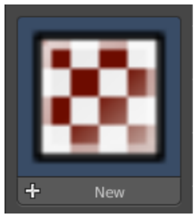
Here you can show or hide the Colorpicker and the Palette Editbox.

Texture Panel



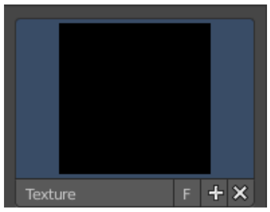
The Texture panel allows you to paint with textures. This allows you for example to grab a foto from some fish scales, and simply paint them onto the vertices by using this image as a pencil. Or as a blueprint where you calk through (Stencil method).

Browse Texture to be linked



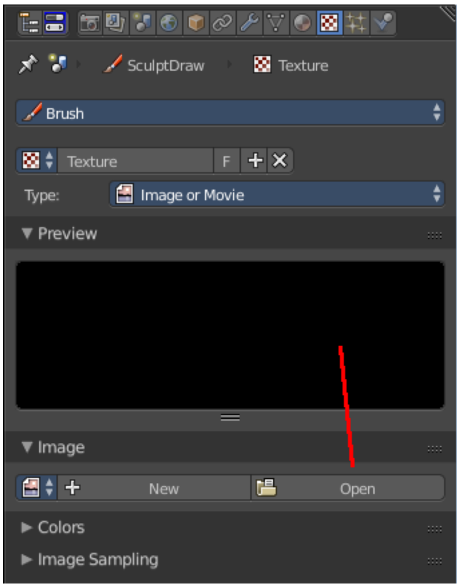
The image at the top of the panel is a image browser. Here you can choose a texture that you can choose for sculpting then. You can also have more than one image loaded at once.

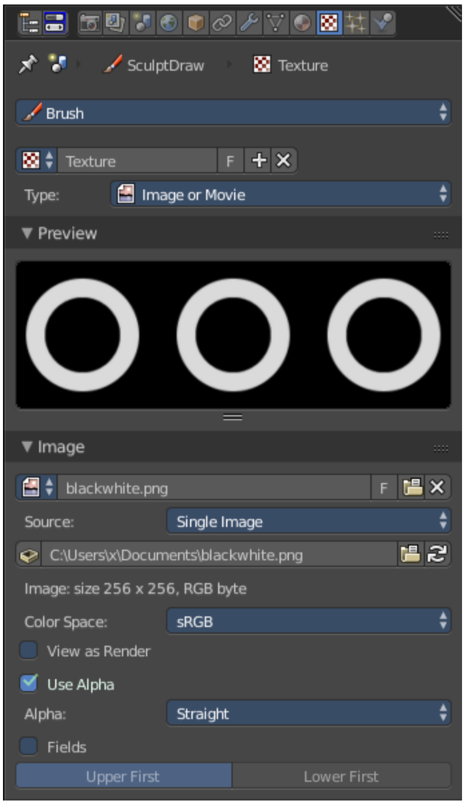
In this shot there is already a texture added. The way to add the texture here is a bit more complicated. And not done with clicking at the New button.

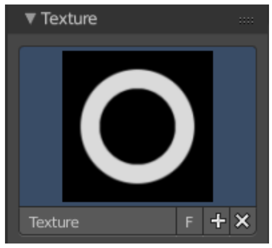


First click at the New button below the image. This will create a new texture slot. This slot is still empty, it displays black.

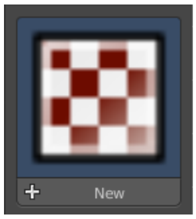
We need to load the texture in this slot. This must be done in the Properties editor in the Textures tab. And then the texture finally shows in the Texture panel in the Tool Shelf.

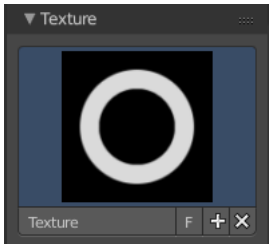






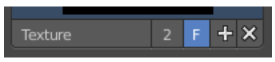
Texture Edit box





The Texture edit box is the edit box below the Image browser. When there's no image loaded then it displays the New button. When there's a image (or more) loaded, then you will see the name of the current texture.

The F button turns this texture into a data block with a fake user. Means it will exists even when there is no data connected to it anymore.

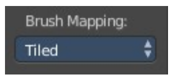


When you activate Fake User, then you may get a value in front of it, which displays how much users this data block (our texture slot) currently has.

The + Button adds another texture slot. Note that you will have to load a texture too, as explained above.

The X button deletes the texture slot.

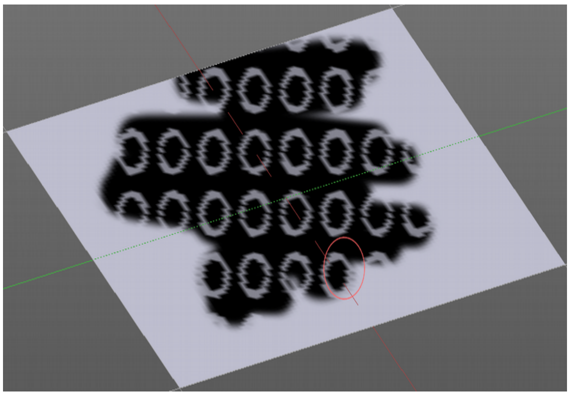
Brush Mapping



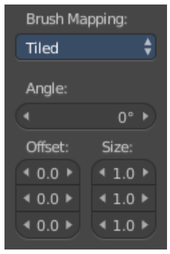
Our texture can be mapped in different methods. The Brush mapping is a dropdown box where you can choose this different brush mapping methods.

The settings vary. So we will go through them by the different brush mapping methods.

Brush Mapping with mapping method Tiled



The brush mapping method Tiled tiles the brush stroke at the surface. The mapping happens from the current view. The result may be distorted when the view does not align with the surface of the object.



Angle

The angle of the brush.

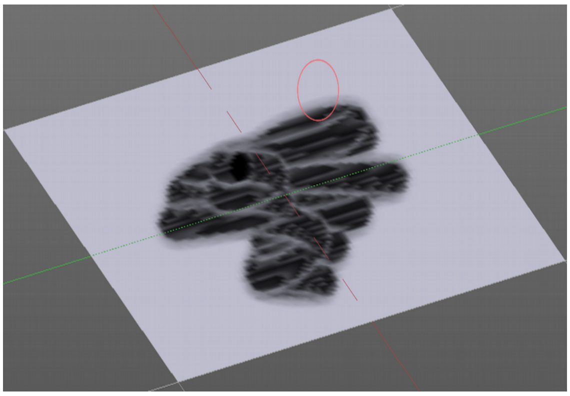
Offset

The offset of the texture in the brush.

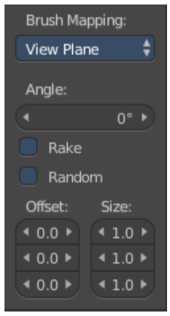
Size

The size of the texture in the brush.

Brush Mapping with mapping method View Plane



The brush mapping method View Plane simply paints onto the surface. The mapping happens from the current view. The result may be distorted when the view does not align with the surface of the object.



Angle

The angle of the brush.

Rake

The angle follows the direction of the brush stroke.

Random

The brush angle gets set random.

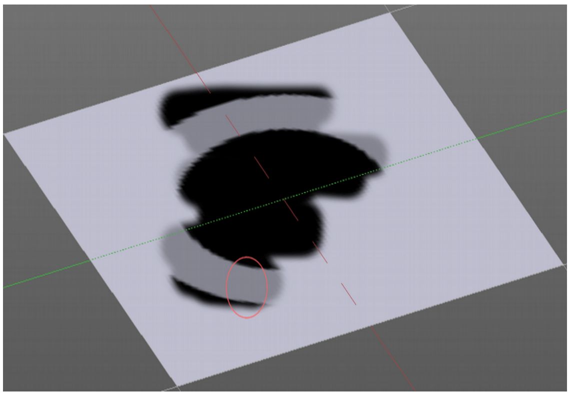
Offset

The offset of the texture in the brush.

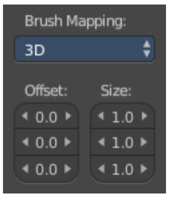
Size

The size of the texture in the brush.

Brush Mapping with mapping method 3D



The brush mapping method 3D paints the texture at the surface, by tiling it 1/1 at the object surface.



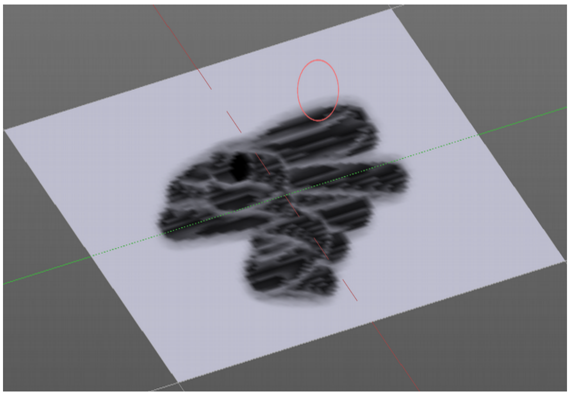
Offset

The offset of the texture in the brush.

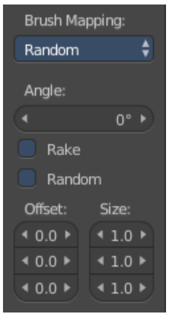
Size

The size of the texture in the brush.

Brush Mapping with mapping method Random



The brush mapping method Random paints onto the surface, and randomizes the texture position in the brush while that. The mapping happens from the current view. The result may be distorted when the view does not align with the surface of the object.



Angle

The angle of the brush.

Rake

The angle follows the direction of the brush stroke.

Random

The brush angle gets set random.

Offset

The offset of the texture in the brush.

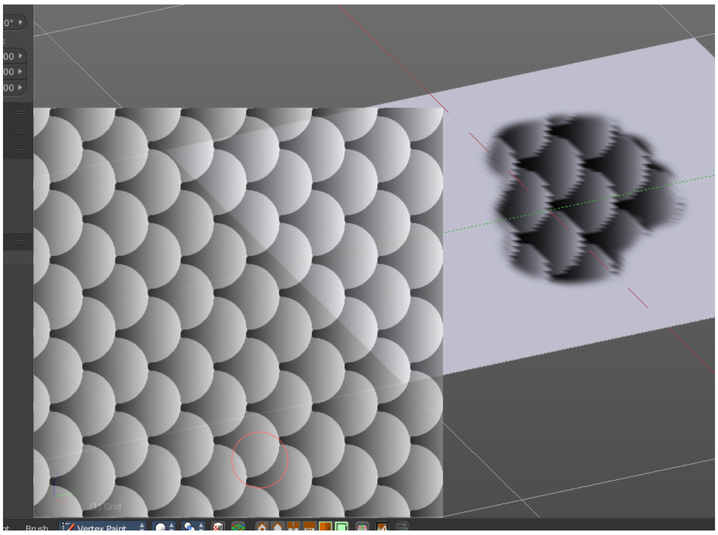
Size

The size of the texture in the brush.

Brush Mapping with mapping method Stencil

The former methods uses the textures for the brush. The method Stencil works different. You have your texture displayed in the workspace above the object, and you paint this texture onto your object with your pencil strokes.

Note that the texture in the 3d space is just visible when you are with the mouse over the viewport.



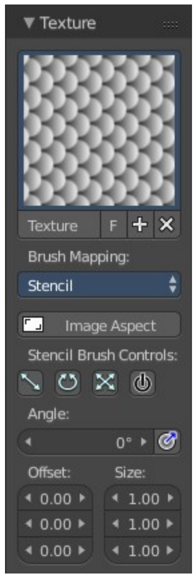
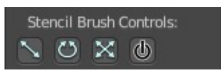


Image Aspect

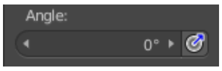
Adjust the stencil size to fit to the image aspect ratio

Stencil Brush controls

Here you can move, rotate and scale the stencil image in the 3D viewport. And reset the transform. You better use the hotkeys here that gets displayed in the tool tips, since the image is not displayed when the mouse is not over the 3D viewport.



Angle edit box



Here you can adjust the angle of the brush. The button at the end allows you to set the radius by dragging the mouse. This should be done in the viewport and with the hotkey. This button is just a visible reminder.

Offset

Fine tune the offset of the texture in the brush.

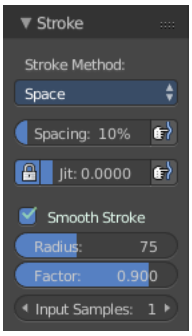
Size

Fine tune the size of the texture in the brush.

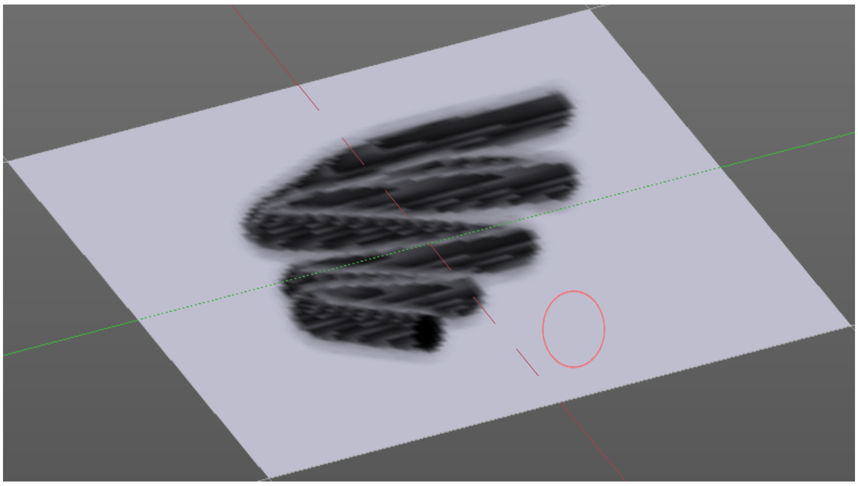
Stroke Panel

The Stroke panel contains settings to influence the behaviour of the brush stroke. There are various stroke methods available. We will go through them one by one.

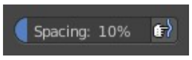
Stroke Panel with Stroke method Space

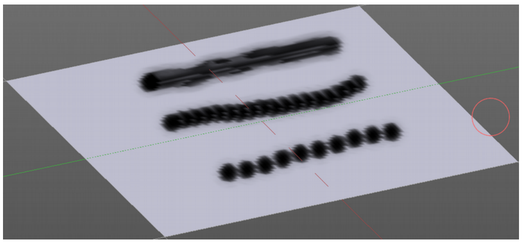


This is the default Stroke method. The sculpt stroke gets added continuously with given settings.



Spacing Edit Box





The sculpt drawing happens by mapping the pencil onto the mouse position. And when you move the mouse then the next mapping happens. Here you can adjust the spacing after what mouse movement the next mapping should happen. The lower the value, the lower the distance between the single dots.

The icon behind the edit box enables tablet pressure sensitivity for tablets.

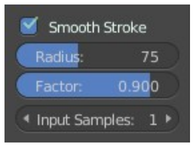
Jitter Edit Box

Here you can add Jitter to the brush while painting.

The icon in front of the edit box toggles between jittering in screen space and relative to brush size.

The icon behind the edit box enables tablet pressure sensitivity for tablets.

Smooth Stroke



The brush lags behind the mouse position, and produces a much smoother stroke by that. The Smooth Stroke relatet settings are hidden as long as Smooth Stroke is not activated.

Smooth Stroke Radius Edit Box

Is just active when Smooth Stroke is activated. Here you can adjust the radius of the smoothing.

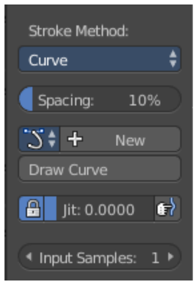
Smooth Stroke Factor Edit Box

Is just active when Smooth Stroke is activated. Here you can adjust the factor of the smoothing.

Input Samples Edit Box

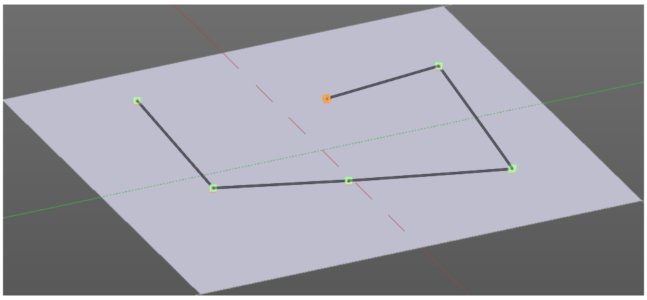
Is just active when Smooth Stroke is activated. Average multiple input samples together to smooth the brush stroke.

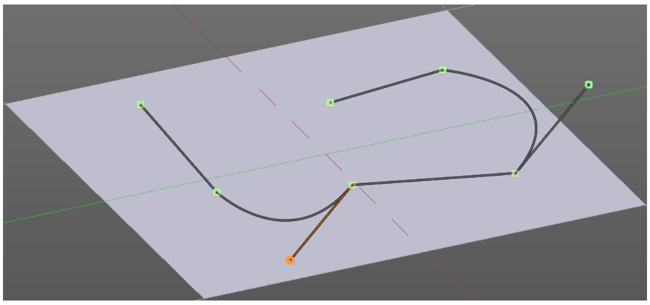
Stroke Panel with Stroke method Curve

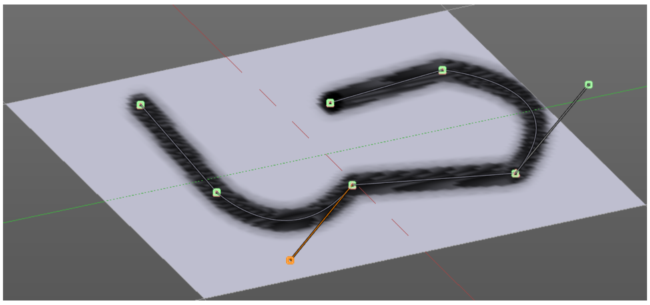


The Stroke method curve doesn't simply influence the way how the stroke is painted. It is a special method. First you draw a curve object by holding down ctrl and clicking with left mouse button. Then you tweak the curve. You can click at the curve point, and drag out handlers to make the curve points smoooth.

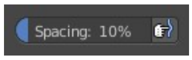
Then you hit the Draw Curve button. And the curve gets drawn onto the surface.

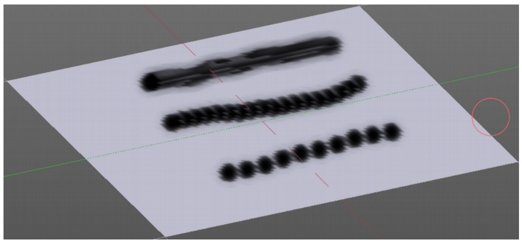






Spacing Edit Box



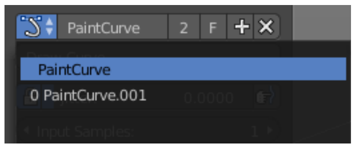


The drawing happens by mapping the pencil onto the mouse position. And when you move the mouse then the next mapping happens. Here you can adjust the spacing after what mouse movement the next mapping should happen. The lower the value, the lower the distance between the single dots.

The icon behind the edit box enables tablet pressure sensitivity for tablets.

Paint Curve edit box

Here you set the active curve.



The first element is a dropdown box where you will find your curves objects. You can have more than one.

The second element is the edit box that displays the active curve.

The number right of it, **in this case 2**, indicates how much number of users (internally) this brush uses. This means that this data block (the brush) shares currently settings with at least one other object. Most probably the parent brush where we have created it from. Click at the value to make this brush a single user. The button will vanish then.

F set the brush to have a fake user. Zero user data-blocks are normally not saved. But sometimes you want to force the data to be kept even when the data block has no user.

The + button allows you to add a new pencil with the current settings. Note that the brushes are NOT saved when you close Bforartists. You can save them into the current blend file. Or you can save the startup file. But be careful here. This saves everything else of the current state of Bforartists too.

The X button deletes the brush as the active one. It does NOT delete it from the brushes list.

Draw Curve Button

A click at it to turns the curve into a sculpt stroke.

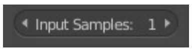
Jitter Edit Box

Here you can add Jitter to the brush while painting.

The icon in front of the edit box toggles between jittering in screen space and relative to brush size.

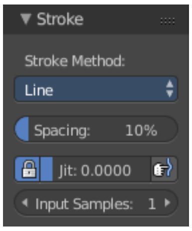
The icon behind the edit box enables tablet pressure sensitivity for tablets.

Input Samples Edit Box

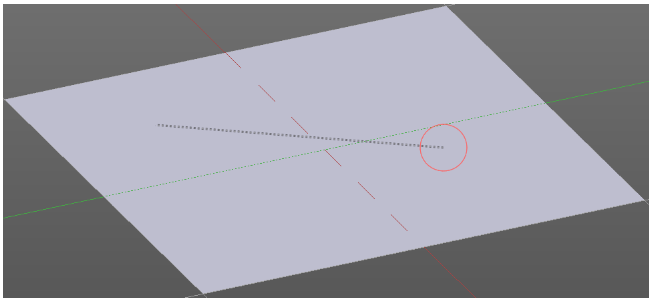


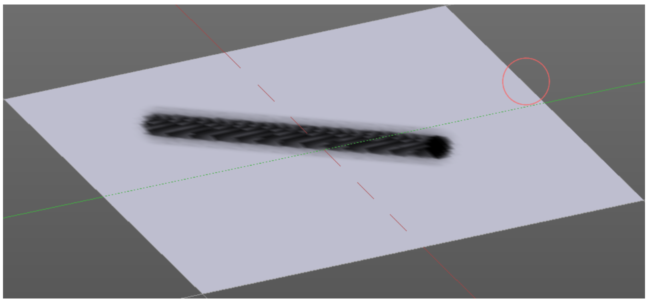
Average multiple input samples together to smooth the brush stroke.

Stroke Panel with Stroke method Line

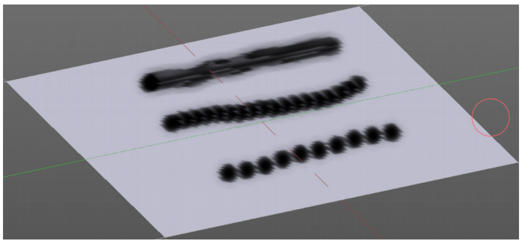


With Stroke method line you draw a line between a starting point and a endpoint. And when you release the mouse then the line gets sculpted.





Spacing Edit Box



The sculpt drawing happens by mapping the pencil onto the mouse position. And when you move the mouse then the next mapping happens. Here you can adjust the spacing after what mouse movement the next mapping should happen. The lower the value, the lower the distance between the single dots.

The icon behind the edit box enables tablet pressure sensitivity for tablets.

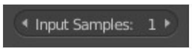
Jitter Edit Box

Here you can add Jitter to the brush while painting.

The icon in front of the edit box toggles between jittering in screen space and relative to brush size.

The icon behind the edit box enables tablet pressure sensitivity for tablets.

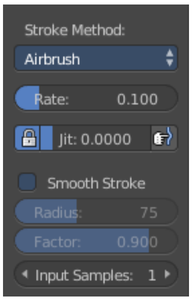
Input Samples Edit Box

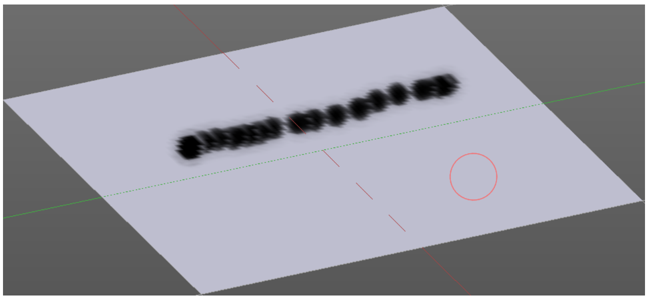


Average multiple input samples together to smooth the brush stroke.

Stroke Panel with Stroke method Airbrush

The stroke acts like an airbrush pencil. The dots gets placed randomly.





Rate Edit Box

Here you can define the rate of the drawing.

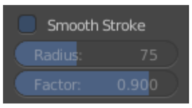
Jitter Edit Box

Here you can add Jitter to the brush while painting.

The icon in front of the edit box toggles between jittering in screen space and relative to brush size.

The icon behind the edit box enables tablet pressure sensitivity for tablets.

Smooth Stroke



The brush lags behind the mouse position, and produces a much smoother stroke by that.

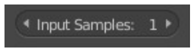
Smooth Stroke Radius Edit Box

Is just active when Smooth Stroke is activated. Here you can adjust the radius of the smoothing.

Smooth Stroke Factor Edit Box

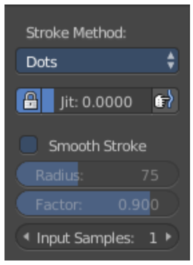
Is just active when Smooth Stroke is activated. Here you can adjust the factor of the smoothing.

Input Samples Edit Box

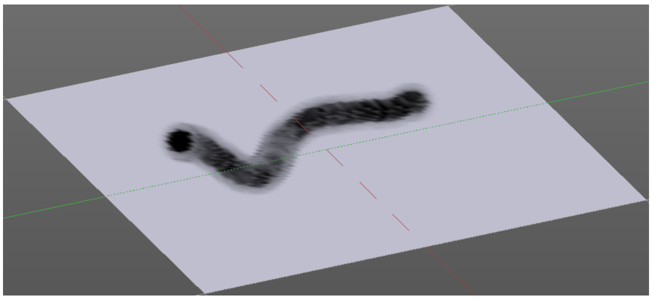


Average multiple input samples together to smooth the brush stroke.

Stroke Panel with Stroke method Dots



The stroke method Dots draws dots of the pencil onto the surface. The mapping happens from the current view. Means you will get distortions when your view is not aligned with the surface of the object.



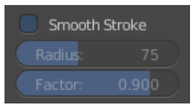
Jitter Edit Box

Here you can add Jitter to the brush while painting.

The icon in front of the edit box toggles between jittering in screen space and relative to brush size.

The icon behind the edit box enables tablet pressure sensitivity for tablets.

Smooth Stroke



The brush lags behind the mouse position, and produces a much smoother stroke by that.

Smooth Stroke Radius Edit Box

Is just active when Smooth Stroke is activated. Here you can adjust the radius of the smoothing.

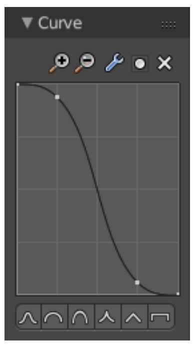
Smooth Stroke Factor Edit Box

Is just active when Smooth Stroke is activated. Here you can adjust the factor of the smoothing.

Input Samples Edit Box

Average multiple input samples together to smooth the brush stroke.

Curve Panel



The curve panel allows you to define different fallofs methods for the border of the brush.

Navigation elements

The navigation elements at the top are described from left to right

Zoom in and out

The two buttons with the magnifying glass at it zooms in and out in the curve window.

Tools

Tools is a menu where you can find some cuve related tools.

Reset View

Resets the curve windows zoom

Vector Handle

Set handle type to Vector

Auto Handle

Set handle type to Auto

Auto Clamped Handle

Set handle type to Auto Clamped

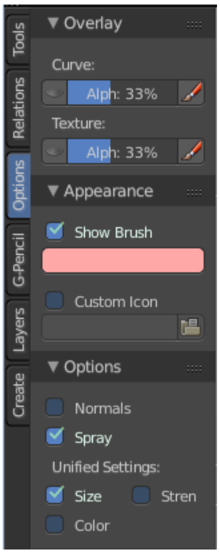
Reset Curve

Resets the curve to the initial shape.

Curve Presets

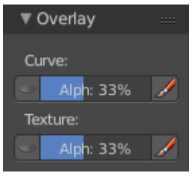
Here you can find some predefined curve presets.

Tool Shelf in Vertex paint Mode - Mesh Object, Options tab



The Options tab for sculpting provides you with some settings and options for vertex painting.

Overlay Panel



Curve

This setting is interesting for the Stroke method Curve. Here you can adjust how transparent the curve is.

The eye icon button in front of the slider is to show the curve object in viewport. The brush icon button behind the slider is to hide the overlay during a stroke.

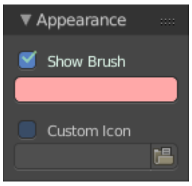
Texture

This setting is interesting for Texture painting. Here you can adjust how transparent the texture is.

The eye icon button in front of the slider is to show the texture in the viewport. The brush icon button behind the slider is to hide the overlay during a stroke.

The Stencil map texture has no eye icon button since it gets shown in the viewport anyways.

Appearance Panel



The Appearance panel provides you with some settings to adjust the appearance of the brush.

Show Brush

Show the brush in 3D view.

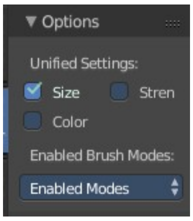
Color of cursor when adding

The color that the brush cursor has when painting

Custom Icon

Here you can define a custom icon for the brush.

Options Panel



Unified Settings

Size

Instead of per Brush radius, the radius is shared across brushes.

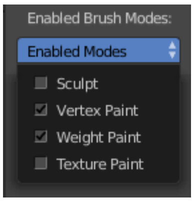
Strength

Instead of per Brush strength, the strength is shared across brushes.

Color

Instead of per Brush color, the color is shared across brushes.

Enabled Brush Modes

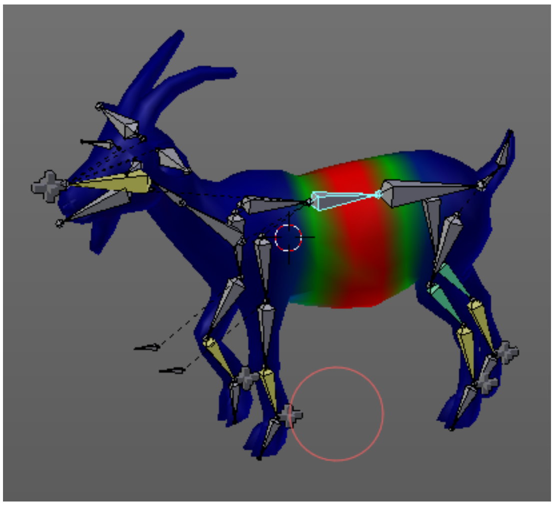


Enabled Modes

Enabled modes is a dropdown menu where you can adjust in which modes the brushes shows.

Tool Shelf in Weight Paint Mode

Weight painting general



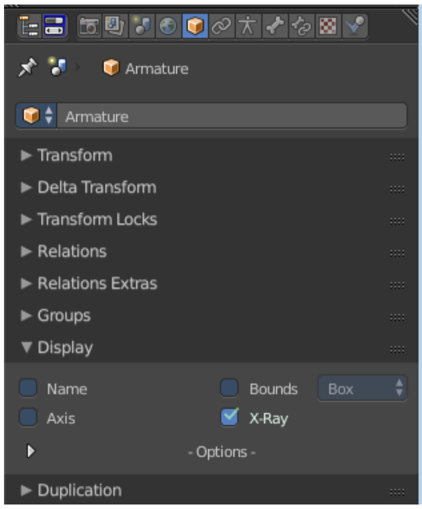
The Tool Shelf in Weight Paint Mode provides you the tools to do weight painting at a mesh. Skinned characters for example.

The vertices becomes a "weighting" assigned in this process. Means a per centage influence of the bone to a vertice. And under the hood you create vertex groups with the vertices that are assigned to the bones.

The amount of influence is defined by the weight paint color. Pure red has an influence value of 1. Pure blue has an influence value of 0. And the gradients between red and blue defines the inbetween steps in the 0-1 range. This is needed since there can be more than one bone influence and deform a vertice. Usually at the transition areas between two bones. The green areas in this shot.

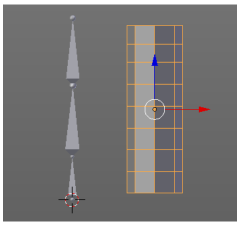
The Weight Paint mode is just available for mesh objects.

Weight painting at characters



The main purpose for Weightpainting is to weight the skin for characters. So that they deform proper when you pose your armature.

Skinning



To do weightpainting at a character you first have to assign the skin to the armature. So we need a mesh and a armature here.

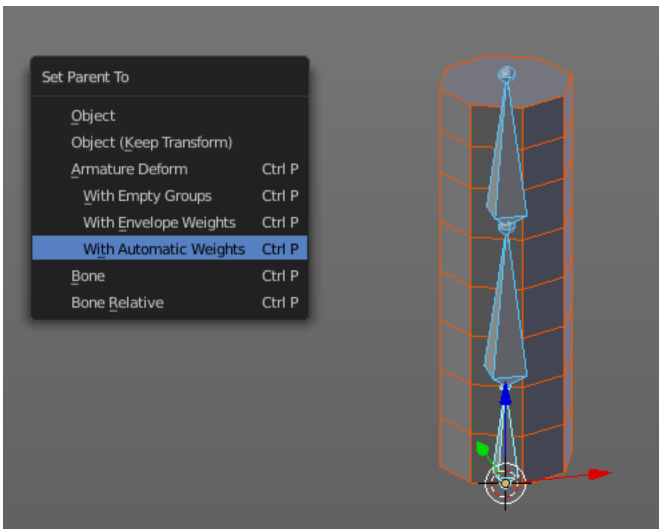
Let's do a quick run through skinning. This method works in Object mode, but also in Pose mode.

First we activate X Ray at the armature. So that we can still see the armature inside of the mesh.

Position the mesh at its final location.

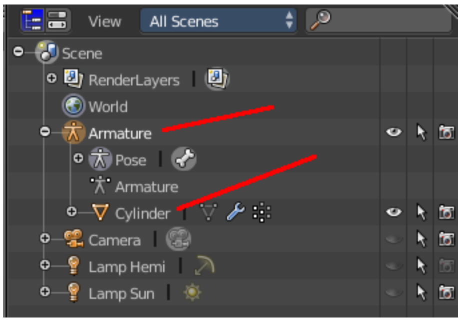
Now select the Mesh, hold down Shift key, and select the Armature. Both should be selected now.

In the Tool Shelf switch to the Relations tab and click at the Parent button. You can also press the hotkey Ctrl P. This calls the parenting menu under the mouse position.

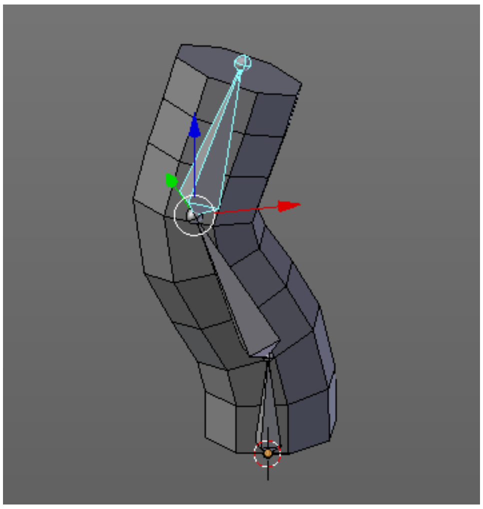


Here we choose "With Automatic Weights". Automatic weighting means that the bones grabs the nearest vertices within a given radius, and assignes them to this bone.

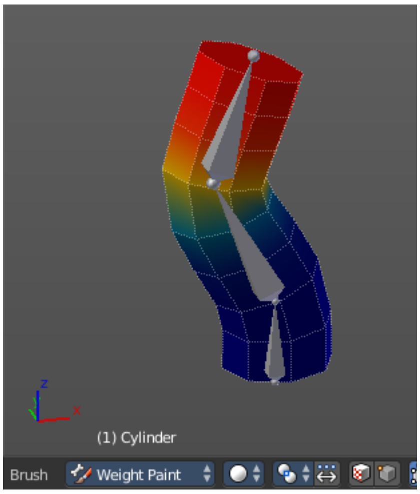
When everything went well then the mesh, in our case the Cylinder, is now part of the hierarchy of the armature. Which can be seen in the outliner.



And when you select the armature, and switch to Pose mode now, then you can already deform the mesh by posing the armature.



Enter and leave Weight painting

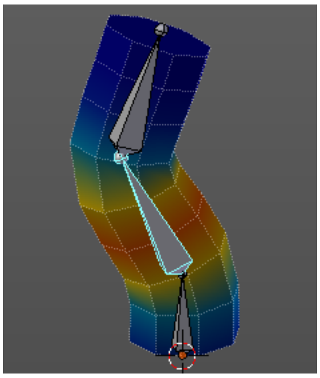


You can enter Weight Painting for the mesh in any state of the armature. But weight painting should happen in Pose mode so that you can pose your mesh to see the resulting deformings.

So with the armature in Pose mode, select the mesh by clicking at it. Then enter Weight Paint mode. You can now do weight painting at the mesh.

To leave Weight painting, simply switch back to Object mode.

Switch bones

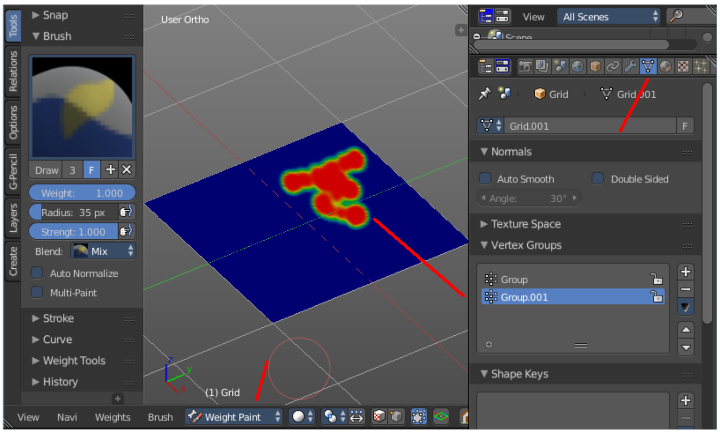


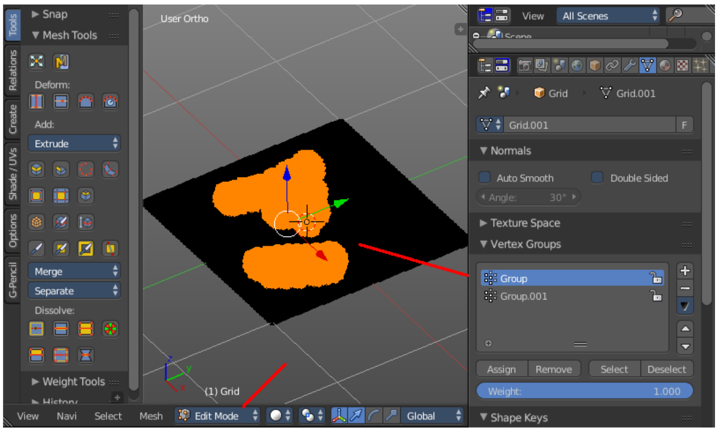
The weighting that gets displayed when you enter Weight Paint mode is from the last active bone. You might want to do weight painting for another bone. So we need to switch the bone.

Hold down Ctrl, and click at the bone that you want to set active. Then the weighting for this bone gets displayed.

Weight painting without any further combination

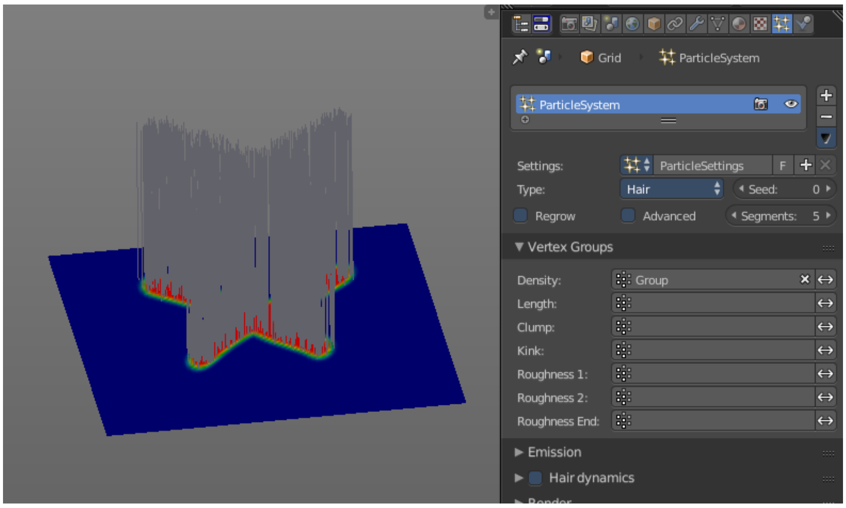
You can also do weightpainting without an armature. Just at the pure mesh. In this case you just create the vertex groups for the mesh. And those vertex groups can be accessed in edit mode then for further useage. As shown in the shots below.





Weight painting in combination with particles

You can also combine weight painting with particles. To influence the length of hair for example. The weightmap can be assigned in the Vertex Groups panel in the Particles tab.



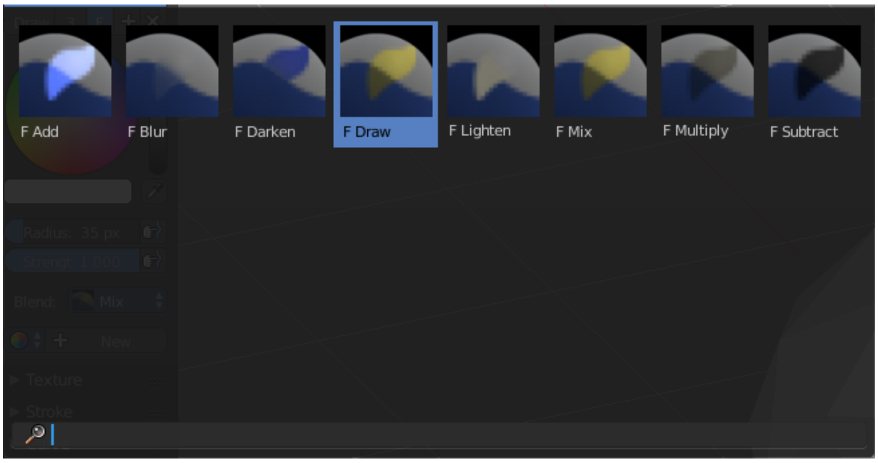
Tool Shelf in Weight Paint Mode - Mesh Object, Tools Tab

Brush Panel

The Brush Panel contains the different Brushes and some Brush settings. Here you can choose and adjust your current active brush.

Browse Brush

The big image at the top is a dropdown box where you can choose a brush. Click at it, and you will see the different brushes. A click at one of the images will choose this brush then.



When you have added a few more brushes then the dropdown box may be more than full. You will see some little white arrows then. Either in the top left or in the bottom right corner. They indicate that some brushes are hidden before or after the current display.

To scroll to this hidden content use the mouse wheel, or the arrow up and down buttons at the keyboard.

The edit box below the Image shows you the name of the current active brush.

The number right of it, **in this case 2**, indicates how much number of users (internally) this brush uses. This means that this data block (the brush) shares currently settings with at least one other object. Most probably the parent brush where we have created it from. Click at the value to make this brush a single user. The button will vanish then.

F set the brush to have a fake user. Zero user data-blocks are normally not saved. But sometimes you want to force the data to be kept even when the data block has no user.

The + button allows you to add a new pencil with the current settings. Note that the brushes are NOT saved when you close Bforartists. You can save them into the current blend file. Or you can save the startup file. But be careful here. This saves everything else of the current state of Bforartists too.

The X button deletes the brush as the active one. It does NOT delete it from the brushes list.

Weight edit box

Here you can adjust the strength of the weight painting.

Radius

The Radius edit box allows you to adjust the radius of the brush. The button behind the edit box enables tablet pressure sensitivity for radius.

And the button at the end allows you to set the radius of the pencil by hotkey. A click at this button works of course too. But this is a hotkey tool. The button is just a visible reminder.

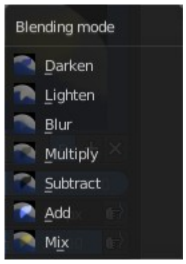
Strength

The Strength edit box allows you to adjust the strength of the brush. The button behind the edit box enables tablet pressure sensitivity for strength.

And the button at the end allows you to set the strength by hotkey. A click at this button works of course too. But this is a hotkey tool. The button is just a visible reminder.

Blend

Blend is a dropdown box where you can choose between different blend modes for the color that you paint.



Darken

Darkens the color under the brush.

Lighten

Brightens the color under the brush.

Blur

Blurs the color under the brush.

Multiply

Multiplys with the color under the brush.

Subtract

Subtract from the color under the brush.

Add

Adds to the color under the brush.

Mix

Mixes with the color under the brush.

Auto Normalize

Auto normalizes the weighting so that in the sum all vertex groups does not go over 1.0

Multipaint

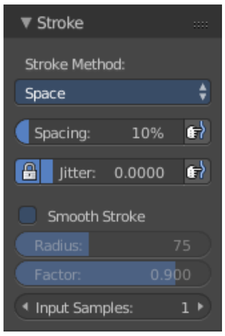
Paint across the weights of all selected bones, maintaining their relative influence.

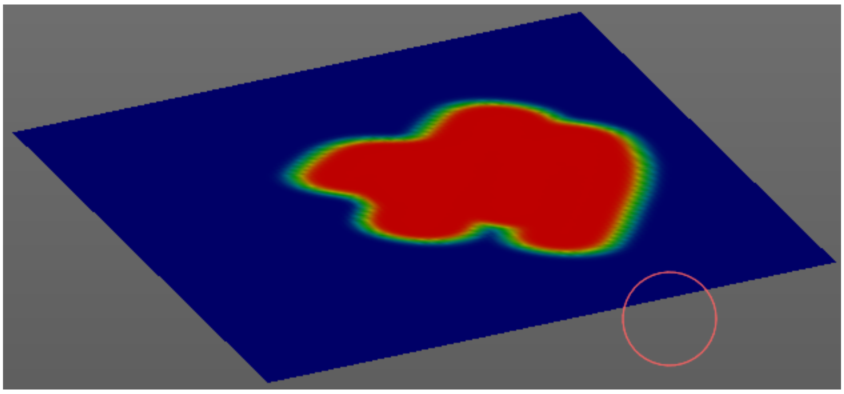
Stroke Panel

The Stroke panel contains settings to influence the behaviour of the brush stroke. There are various stroke methods available. We will go through them one by one.

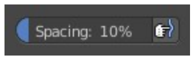
Stroke Panel with Stroke method Space

This is the default Stroke method. The sculpt stroke gets added continuously with given settings.

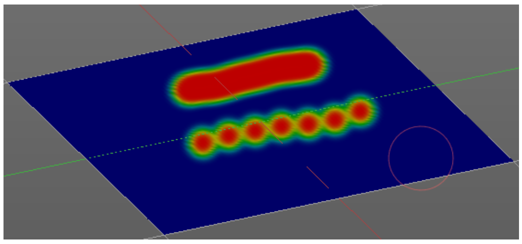




Spacing Edit Box



The drawing happens by mapping the pencil onto the mouse position. And when you move the mouse then the next mapping happens. Here you can adjust the spacing after what mouse movement the next mapping should happen. The lower the value, the lower the distance between the single dots.



The icon behind the edit box enables tablet pressure sensitivity for tablets.

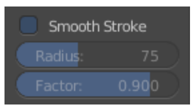
Jitter Edit Box

Here you can add Jitter to the brush while painting.

The icon in front of the edit box toggles between jittering in screen space and relative to brush size.

The icon behind the edit box enables tablet pressure sensitivity for tablets.

Smooth Stroke



The brush lags behind the mouse position, and produces a much smoother stroke by that.

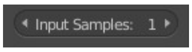
Smooth Stroke Radius Edit Box

Is just active when Smooth Stroke is activated. Here you can adjust the radius of the smoothing.

Smooth Stroke Factor Edit Box

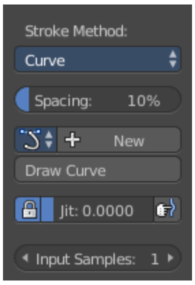
Is just active when Smooth Stroke is activated. Here you can adjust the factor of the smoothing.

Input Samples Edit Box



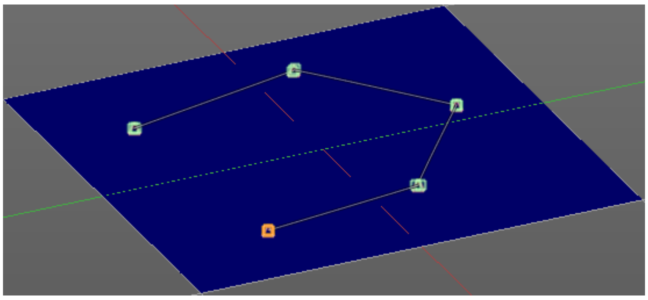
Average multiple input samples together to smooth the brush stroke.

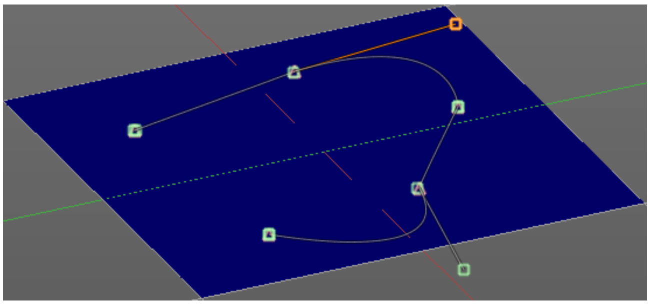
Stroke Panel with Stroke method Curve

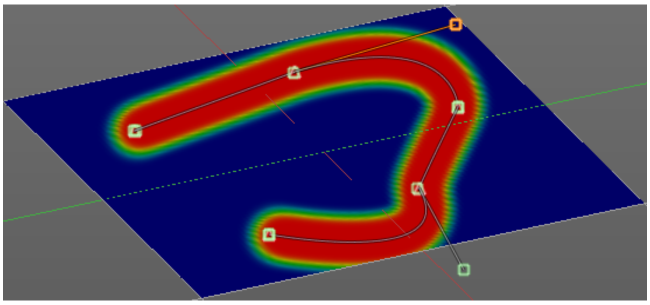


The Stroke method curve doesn't simply influence the way how the stroke is painted. It is a special method. First you draw a curve object by holding down ctrl and clicking with left mouse button. Then you tweak the curve. You can click at the curve point, and drag out handlers to make the curve points smoooth.

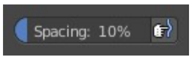
Then you hit the Draw Curve button. And the curve gets drawn onto the surface.



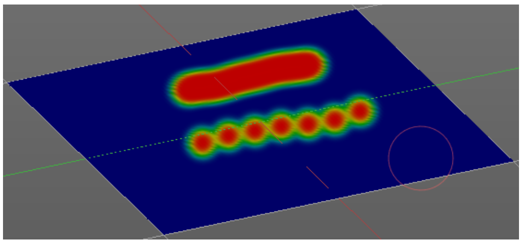




Spacing Edit Box

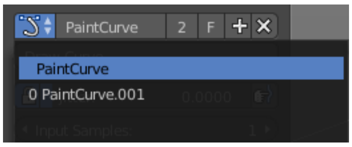


The drawing happens by mapping the pencil onto the mouse position. And when you move the mouse then the next mapping happens. Here you can adjust the spacing after what mouse movement the next mapping should happen. The lower the value, the lower the distance between the single dots.



The icon behind the edit box enables tablet pressure sensitivity for tablets.

Paint Curve edit box



Here you set the active curve.

The first element is a dropdown box where you will find your curves objects. You can have more than one.

The second element is the edit box that displays the active curve.

The number right of it, **in this case 2**, indicates how much number of users (internally) this brush uses. This means that this data block (the brush) shares currently settings with at least one other object. Most probably the parent brush where we have created it from. Click at the value to make this brush a single user. The button will vanish then.

F set the brush to have a fake user. Zero user data-blocks are normally not saved. But sometimes you want to force the data to be kept even when the data block has no user.

The + button allows you to add a new pencil with the current settings. Note that the brushes are NOT saved when you close Bforartists. You can save them into the current blend file. Or you can save the startup file. But be careful here. This saves everything else of the current state of Bforartists too.

The X button deletes the brush as the active one. It does NOT delete it from the brushes list.

Draw Curve Button

A click at it to turns the curve into a sculpt stroke.

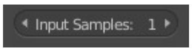
Jitter Edit Box

Here you can add Jitter to the brush while painting.

The icon in front of the edit box toggles between jittering in screen space and relative to brush size.

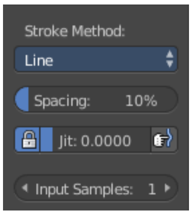
The icon behind the edit box enables tablet pressure sensitivity for tablets.

Input Samples Edit Box

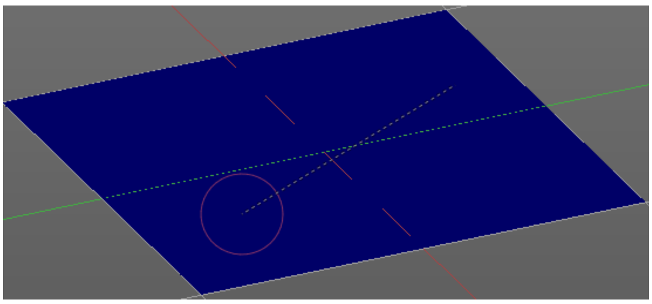


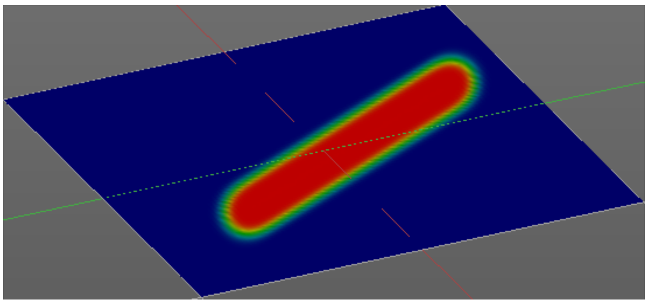
Average multiple input samples together to smooth the brush stroke.

Stroke Panel with Stroke method Line

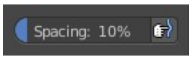


With Stroke method line you draw a line between a starting point and a endpoint. And when you release the mouse then the line gets sculpted.

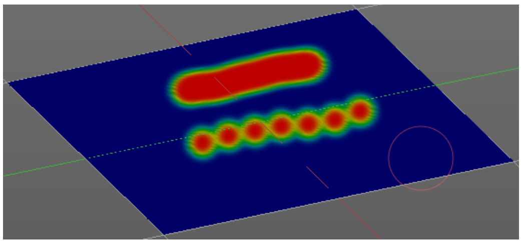




Spacing Edit Box



The sculpt drawing happens by mapping the pencil onto the mouse position. And when you move the mouse then the next mapping happens. Here you can adjust the spacing after what mouse movement the next mapping should happen. The lower the value, the lower the distance between the single dots.



The icon behind the edit box enables tablet pressure sensitivity for tablets.

Jitter Edit Box

Here you can add Jitter to the brush while painting.

The icon in front of the edit box toggles between jittering in screen space and relative to brush size.

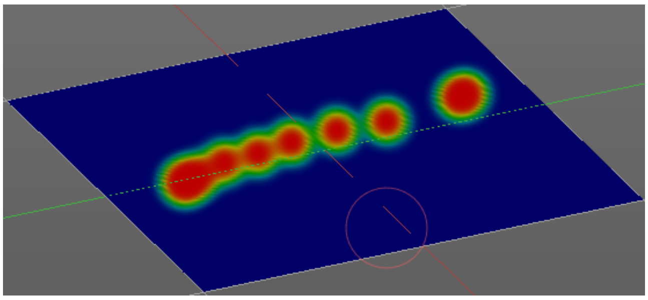
The icon behind the edit box enables tablet pressure sensitivity for tablets.

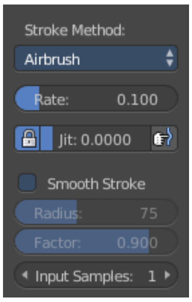
Input Samples Edit Box

Average multiple input samples together to smooth the brush stroke.

Stroke Panel with Stroke method Airbrush

The stroke acts like an airbrush pencil. The dots gets sprayed randomly.





Rate Edit Box

Here you can define the rate of the drawing.

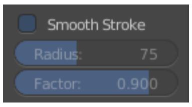
Jitter Edit Box

Here you can add Jitter to the brush while painting.

The icon in front of the edit box toggles between jittering in screen space and relative to brush size.

The icon behind the edit box enables tablet pressure sensitivity for tablets.

Smooth Stroke



The brush lags behind the mouse position, and produces a much smoother stroke by that.

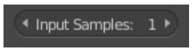
Smooth Stroke Radius Edit Box

Is just active when Smooth Stroke is activated. Here you can adjust the radius of the smoothing.

Smooth Stroke Factor Edit Box

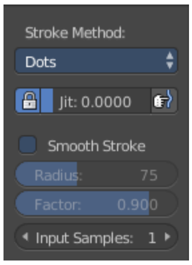
Is just active when Smooth Stroke is activated. Here you can adjust the factor of the smoothing.

Input Samples Edit Box

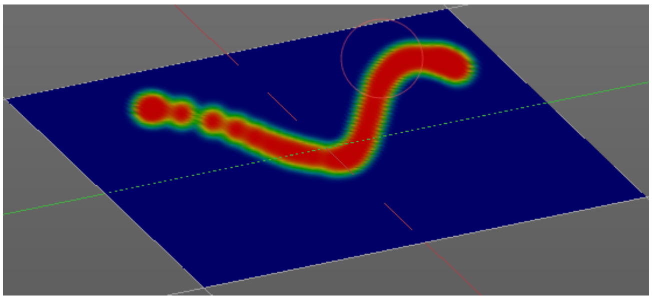


Average multiple input samples together to smooth the brush stroke.

Stroke Panel with Stroke method Dots



The stroke method Dots draws dots of the pencil onto the surface. The mapping happens from the current view. Means you will get distortions when your view is not aligned with the surface of the object.



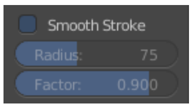
Jitter Edit Box

Here you can add Jitter to the brush while painting.

The icon in front of the edit box toggles between jittering in screen space and relative to brush size.

The icon behind the edit box enables tablet pressure sensitivity for tablets.

Smooth Stroke



The brush lags behind the mouse position, and produces a much smoother stroke by that.

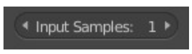
Smooth Stroke Radius Edit Box

Is just active when Smooth Stroke is activated. Here you can adjust the radius of the smoothing.

Smooth Stroke Factor Edit Box

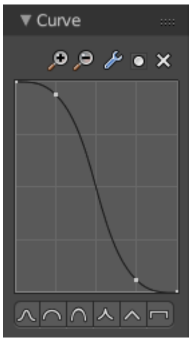
Is just active when Smooth Stroke is activated. Here you can adjust the factor of the smoothing.

Input Samples Edit Box



Average multiple input samples together to smooth the brush stroke.

Curve Panel



The curve panel allows you to define different fallofs methods for the border of the brush.

Navigation elements

The navigation elements at the top are described from left to right

Zoom in and out

The two buttons with the magnifying glass at it zooms in and out in the curve window.

Tools

Tools is a menu where you can find some cuve related tools.

Reset View

Resets the curve windows zoom

Vector Handle

Set handle type to Vector

Auto Handle

Set handle type to Auto

Auto Clamped Handle

Set handle type to Auto Clamped

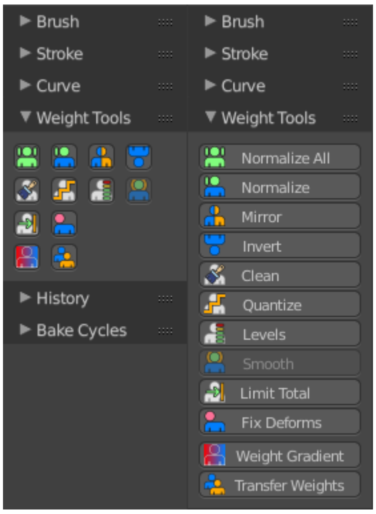
Reset Curve

Resets the curve to the initial shape.

Curve Presets

Here you can find some predefined curve presets.

Weight Tools

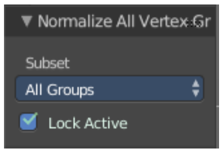


The Weight Tools provides you with tools to manipulate the existing weight painting and its vertex groups in various ways.

Normalize All

Normalize all vertex groups. So that for each vertex the sum of all weights is 1.0

Last Operator Normalize All Vertex Groups



Subset

Defines which group of subset shall be used. There is just one in the dropdown list. So nothing really to choose here.

Lock Active

Keep the values of the active groupd while normalizing the others.

Normalize

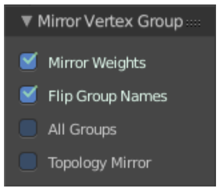
Normalize the current active vertex group.

Normalize has no settings in the Last operator.

Mirror

Mirrors the weighting of the current active vertex group.

Last Operator Mirror Vertex Group



Mirror Weights

Mirror the weights

Flip Group Names

Flip the vertex group names

All Groups

Mirror all groups, not just the current active one.

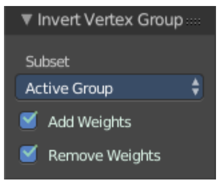
Topology Mirror

Use topology based mirroring (for when both sides of th emesh have matching, unique topology)

Invert

Inverts the colors of the weight painting.

Last Operator Invert Vertex Groups



Subset

A dropdown box where you can choose to work with the Active Group or All Groups.

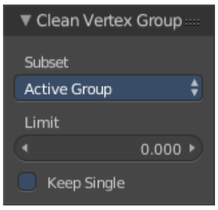
Add Weights
Add Vertices to groups that has zero weighting before inverting.

Remove Weights
Remove Vertices from groups that have zero weighting after inverting.

Clean

Remove Vertex Group assignments that are below a defined limit. This limit can be set in the Last Operator panel.

Last Operator Clean Vertex Groups



Subset
A dropdown box where you can choose to work with the Active Group or All Groups.

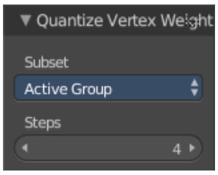
Limit
Here you can define the limit. Every vertice with a weighting below this value will be removed from the current vertex group.

Keep Single
Keep vertices assigned to at least one vertex group when cleaning.

Quantize

Reduces the number of colours that are used for weight painting. A smooth gradient reduces to a few colors.

Last Operator Quantize Vertex Weights



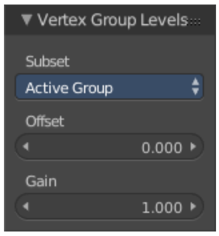
Subset
A dropdown box where you can choose to work with the Active Group or All Groups.

Steps
The number of colors after quantize.

Levels

Here you can manipulate the colors of the weight painting similar to contrast and brightness. The tool adds an offset and a scale to all weights of the selected Weight Groups.

Last Operator Vertex Group Levels



Subset

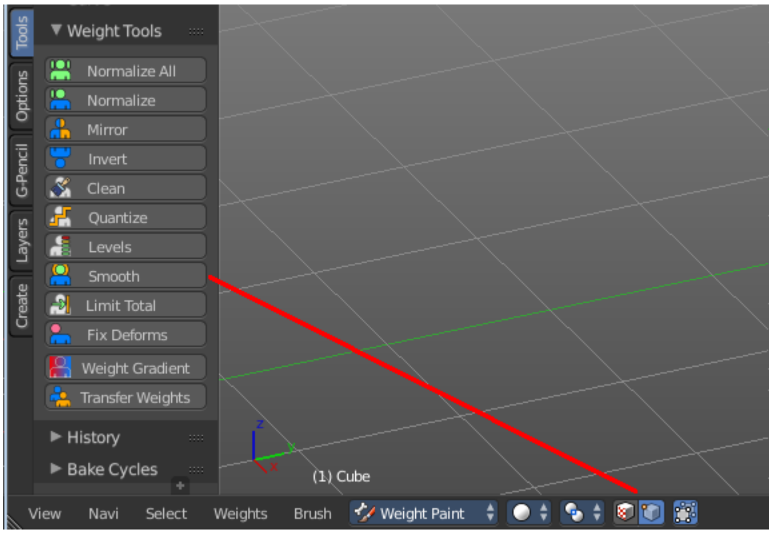
A dropdown box where you can choose to work with the Active Group or All Groups.

Offset

Adjust the brightness of the color.

Gain

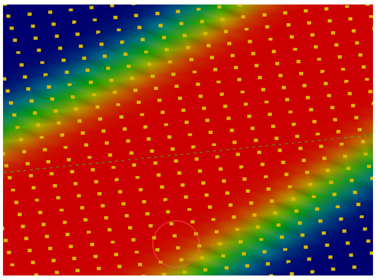
Adjust the contrast of the color.

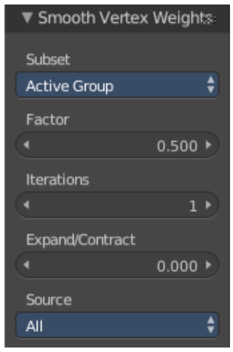


Smooth

Smooth smoothens the weight painting by blending the weights of selected vertices with adjacent unselected vertices.

You need to have Vertex Selection masking set to active to set this tool active. Then every vertice of the mesh gets displayed as a dot. And then you can select the vertices that you want to smooth.





Last Operator Smooth Vertex Weights

Subset

A dropdown box where you can choose to work with the Active Group or All Groups.

Factor

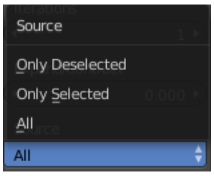
The smoothing factor.

Iterations

The number of iterations to smooth.

Expand/Contract

With positive values it expands the smoothing. With negative values it contracts the smoothing.

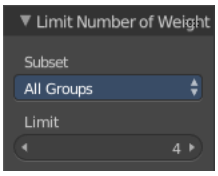


Source
A dropdown box where you can choose with what vertices you want to work.

Limit Total

Limit the number of deform weights for a vertex by removing the lowest weights. For example when five vertex groups are assigned to one vertice, and you set the limit to 4, then the vertice will just be assigned to the four vertex groups with the highest weight. This is useful for game content where the game engine has a limit for how much bones can be connected to one vertice.

Last Operator Limit Number of Weights



Subset
A dropdown box where you can choose to work with the Active Group or All Groups.

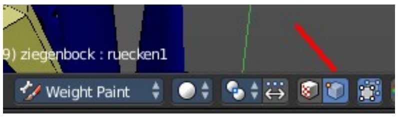
Limit
Here you can set the limit.

Fix Deforms

When complex models are deformed to their most extreme poses, they often show visibly incorrect deformations. Shoulder or elbow for example. Fix Deforms tries to fix this incorrect deformations by modifying the positions of the selected vertices to fit better into the positions of the surrounding vertices.

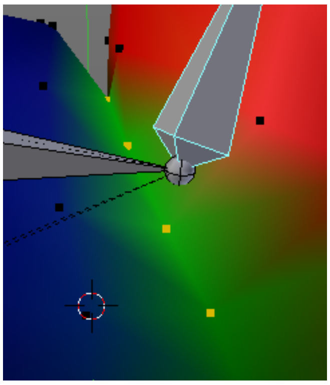
The problem with this tool is that it is meant for complex models, but doesn't play well with complex models at all. More than a handful selected vertices slows even strong PC's down to a crawl. So you might be better suited to fix the incorrect deformations by simply doing manual weight painting at the trouble makers. Or by adding a shape key in the extreme pose to clean up the incorrect deformations.

Usage



Make sure that there is no mirroring applied. The tool does not work with mirroring.

In Pose mode pose your mesh into the extreme pose.



Select the mesh, switch to Weigth Paint.

In Weight Paint mode turn on Vertex Selection Masking.

Then select the trouble vertices. By Border select for example. Or by Shift LMB click.

Then click at Fix Deforms. You might or might not get a visible result.

Play around with the Distance in the Last Operator to get other results.

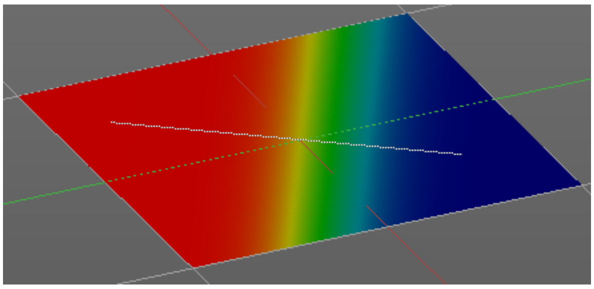
Last Operator Fix Vertex Group Deform

Distance
The distance to move to.

Strength
A modifier for the Distance.

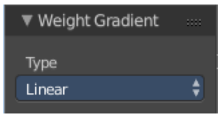
Change Sensitivity
Change the amount that the weights are altered with each iteration. The lower the value the slower the calculation.

Weight Gradient



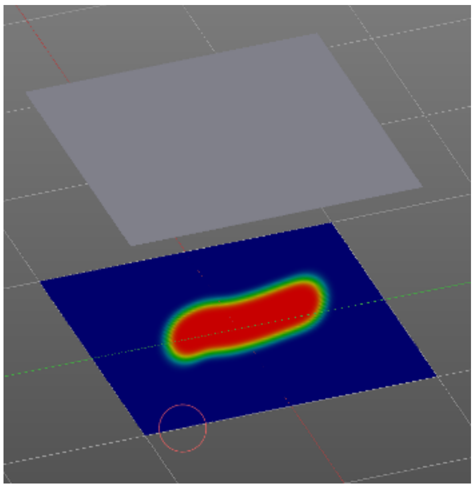
Weight gradient allows you to draw a gradient by defining the start point and the end point.

Last Operator Weight Gradient



Type
A dropdown box where you can choose between a linear gradient and a radial gradient.

Transfer Weights



Transfer weights allows you to transfer weights from one object to another object in the same space. For example to copy the weight of a body shape to a covering cloth.

Usage

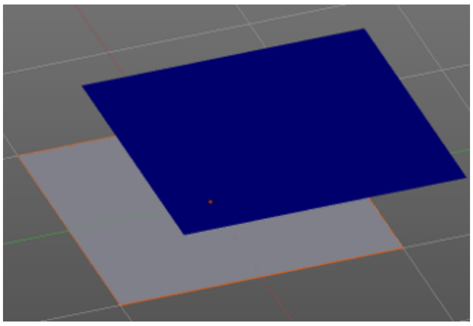
Make sure the target part is at its location.

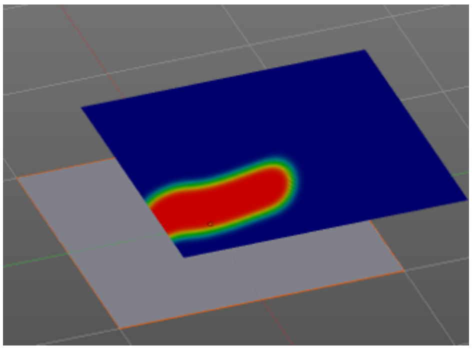
In Object mode Select the source object(s). Then shift click to select the target object too. This makes the target object the active object

Switch to Weight Paint mode.

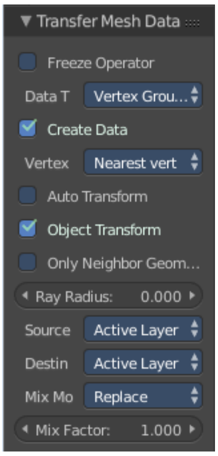
Click the Transfer Weight Button, and the weighting should be transfered to the target object.

You can adjust the result in the Last Operator Transfer Mesh Data panel.





Last Operator Transfer Mesh Data

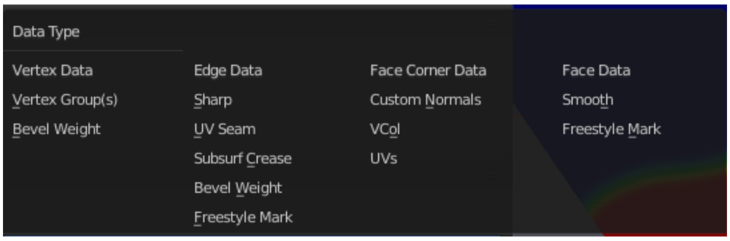


Freeze Operator

Prevent the operator to rerun when you tweak the settings. So that you can tweak many settings at once, then untick to run the operator again.

Data Type

A dropdown box where you can choose the data type to work with.

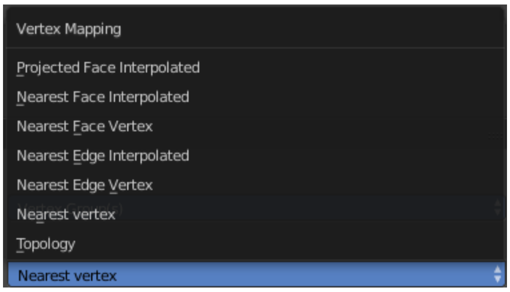


Create Data

Add Data layers on target object if needed.

Vertex Mapping

A dropdown box where you can choose the vertex mapping method.



Auto Transform

Automatically compute transformation to get the best possible match between source and target object.

Object Transform

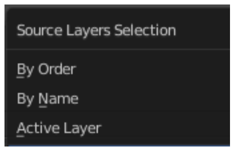
Calculate the objects in Global space. Unticked means the transfer happens from and to the origin of the objects.

Only Neighbour Geometry

Source Objects must be closer than given distance to the target objects.

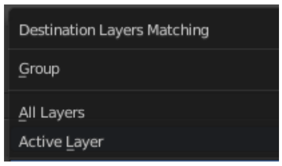
Ray Radius

The ray distance for Only Neighbour Geometry.



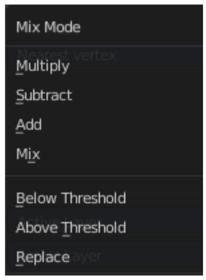
Source Layers Selection

A dropdown box where you can choose the Source Layer selection method.



Destination Layers Matching

A dropdown box where you can choose the Destination Layers matching.



Mix Mode

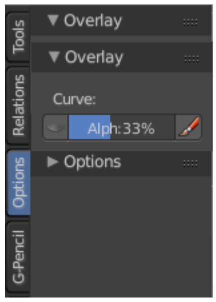
A dropdown box where you can choose the mix mode. That's how the mapping gets transfered into the target object.

Mix Factor

The strength of the chosen mix mode.

Tool Shelf in Weight Paint Mode - Options Tab

The Options tab provides you with some options for the weight painting tools.



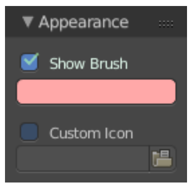
Overlay Panel

Curve

This item is for the Stroke method Curve. Here you can adjust how transparent the curve itself gets drawn.

The eye icon in front of the edit box shows or hides the cursor while drawing a curve.

The pencil icon behind the edit box is for don't show overlay during a stroke.



Appearance Panel

Show Brush

Show or hide the brush in the viewport.

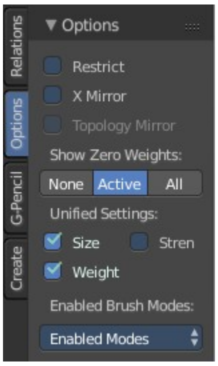
Brush color

The color of the brush icon.

Custom Icon

Here you can define a custom brush icon.

Options Panel



Normals

Apply the vertex normals before painting.

Spray

Keep applying paint effect while holding down mouse button.

Restrict

Restrict painting to vertices in the group.

X Mirror

X Axis Mirror Editing.

Topology Mirror

Needs X Mirror ticked. Use topology based mirroring. For when both sides of the mesh have matching, unique topology.

Show Zero Weights

None

Doesn't show zero weights. Not weighted vertices gets displayed as blue. Which is also the color for very low weighted vertices.

Active

Displays the not weighted vertices for the active vertex group as black.

All

Displays the not weighted vertices for all vertex groups as black.

Unified Settings

Size

The radius of the brush is shared across brushes.

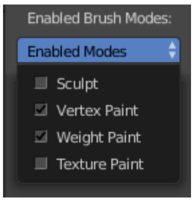
Strength

The strength is shared across brushes.

Weight

The weight is shared across brushes.

Enabled Brush Modes



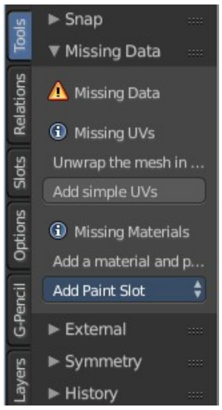
Enabled Modes

Enabled modes is a dropdown menu where you can adjust in which modes the brushes shows.

Tool Shelf in Texture Paint Mode

The Tool Shelf in Texture Paint Mode provides you the tools to paint directly at the texture of your mesh in the viewport. To fix visible seams for example.

The Texture Paint mode is just available for mesh objects.



Requirements

Texture Painting requires to have a working UV mapping and a texture applied. When there is no UV mapping and no assigned texture, then you will get a warning about missing data. In this warning dialog you can fix the problem to some degree. The simple UV's is no substitute for real UV mapping though. It is simple cubic mapping. And also the material might need some tweaking to get it rendered.

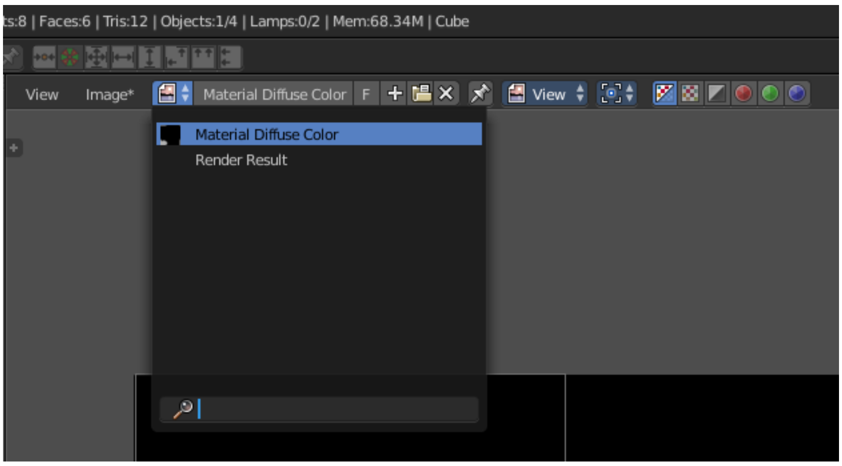
Available Renderers

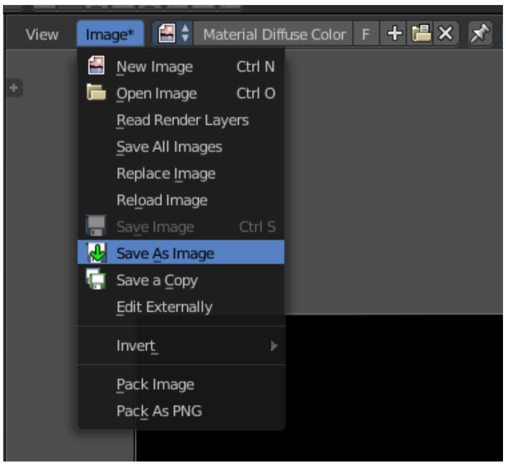
Currently you can choose between two render engines for texture painting. Blender Internal and Cycles. This means that you end in two possible materials.

Save Texture

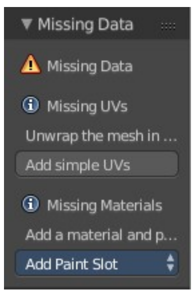
The result of texture painting can be found in the UV Image Editor. You can also paint in the UV editor.

The modified texture does NOT save with the scene. You have to save out the image when you want to save the changes at the texture. There is no warning. So DON'T FORGET TO SAVE THE TEXTURE.





Tool Shelf in Texture Paint Mode - Mesh Object, Tools Tab



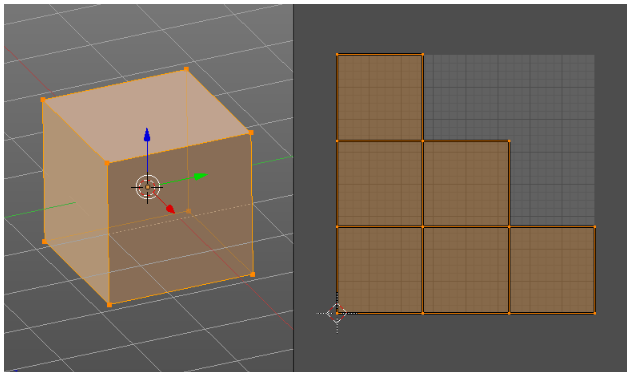
Missing Data Panel

Texture Painting requires to have a working UV mapping and a texture applied. When your mesh already has UV mapping and a texture applied then you won't see this warning. When there is no UV mapping and no assigned texture, then you will see the warning about missing data. You have to add those two missing elements to get texture painting to work.

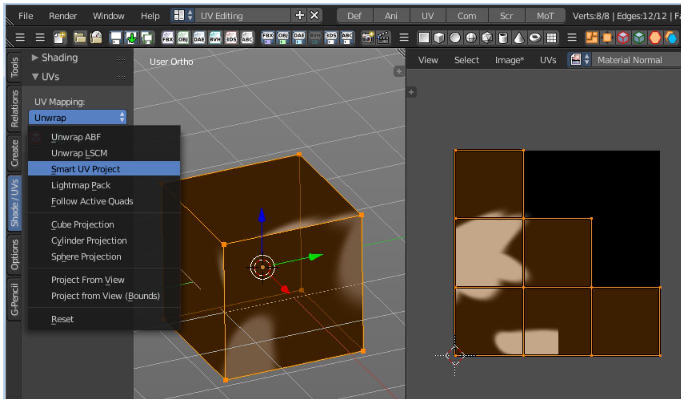
Add Simple UV's

Add Simple UV's adds a simple cubic UV Mapping.

The shot from the simple UV mapping is taken in Edit mode to make the UV patches more visible. Left 3D View, right UV Image Editor.



In case you need better UV mapping, then the recommended method is to unwrap it with Angle Based or Conformal method. Or any other method that doesn't produce overlapping geometry in the UV's. LikeSmart UV project. This is done in Edit mode. When done switch back to Texture Paint mode.



Add Paint Slot

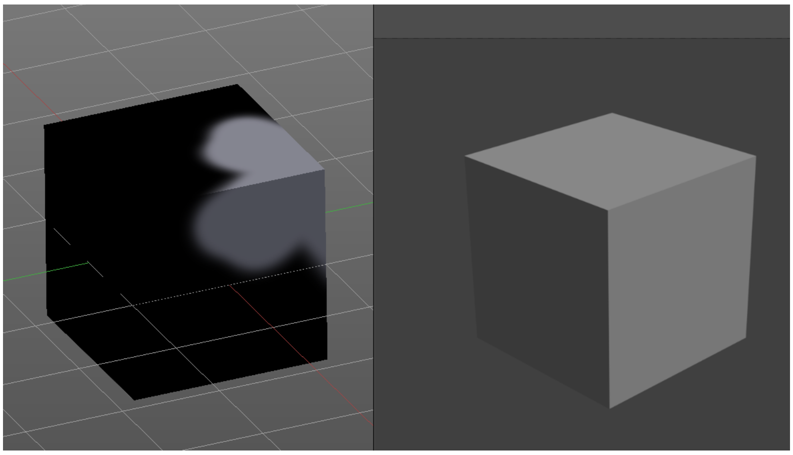
Here you can add a paint slot, and choose what texture type you want to paint. This creates a material with a blank texture. When unsure start with a Diffuse Color. You can at a later point use any texture for any purpose. It's the useage that defines if a texture is the normal map or the diffuse, not the name.

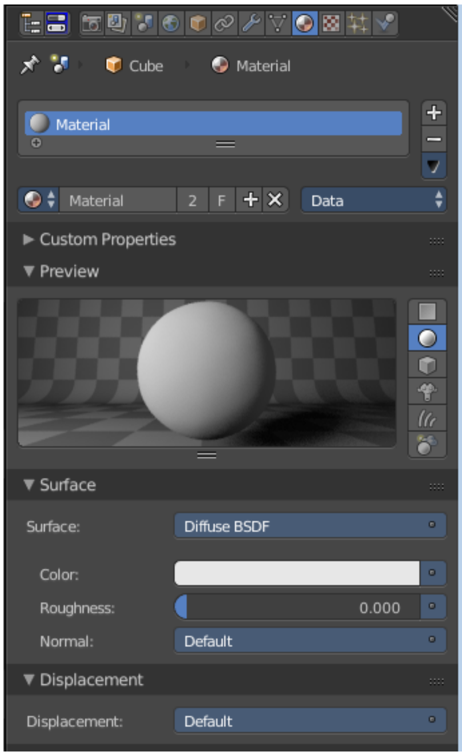
We have two integrated render engines in Bforartists, and so we have two possible materials that can be created. Bforartists has Cycles as the default renderer. When you use the Cycles renderer then it will create a Cycles material. When you switch to Blender Internal then it will create a BI Material.

Add Paint Slot with Cycles

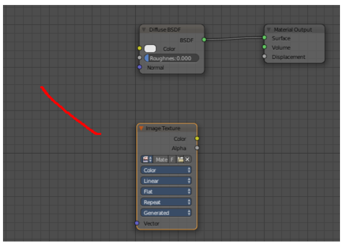
When you add a Paint slot with Cycles then a Cycles material will be created.

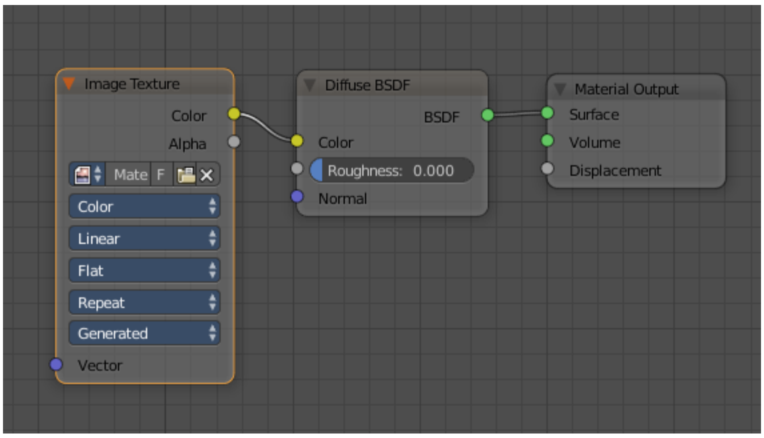
The texture of this material will not render yet. We have to fix one thing here.

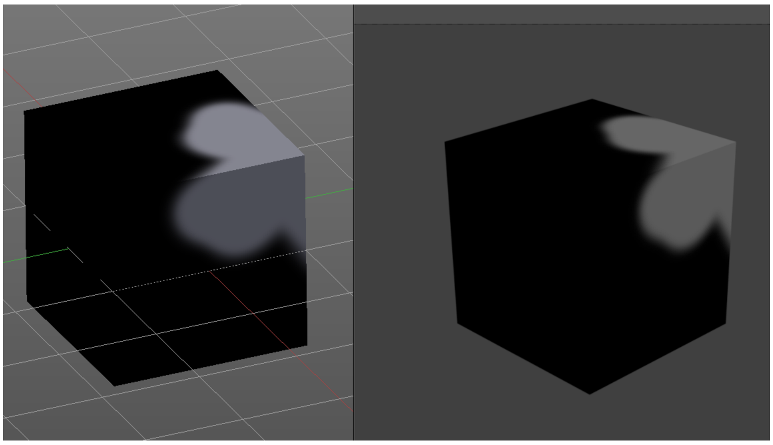




Switch to Compositing layout. Have a look at the nodes. You will notice that the Texture node is not connected. Connect Color output with Color input as shown in the image.





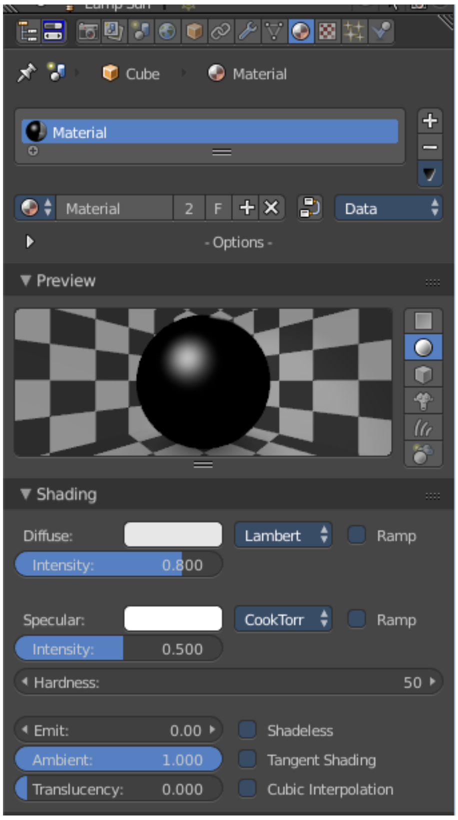


And the texture will now render too.

Add Paint Slot with Blender Internal

When you add a Paint slot with Cycles then a BI material will be created.

The texture of this material will immediately render.



Brush Panel

The Brush Panel contains the different paint brushes, a color dialog, and some brush settings.

At down left you can find the display options. The button with the gear symbol at it. Here you will find two toggles to hide away the color picker and the palette edit box.

Browse Brush

The big image at the top is a dropdown box where you can choose a brush. Click at it, and you will see the different brushes. A click at one of the images will choose this brush then.

When you have added a few more brushes then the dropdown box may be more than full. You will see some little white arrows then. Either in the top left or in the bottom right corner. They indicate that some brushes are hidden before or after the current display.

To scroll to this hidden content use the mouse wheel, or the arrow up and down buttons at the keyboard.

The edit box below the Image shows you the name of the current active brush.

The number right of it, **in this case 2**, indicates how much number of users (internally) this brush uses. This means that this data block (the brush) shares currently settings with at least one other object. Most probably the parent brush where we have created it from. Click at the value to make this brush a single user. The button will vanish then.

F set the brush to have a fake user. Zero user data-blocks are normally not saved. But sometimes you want to force the data to be kept even when the data block has no user.

The + button allows you to add a new pencil with the current settings. Note that the brushes are NOT saved when you close Bforartists. You can save them into the current blend file. Or you can save the startup file. But be careful here. This saves everything else of the current state of Bforartists too.

The X button deletes the brush as the active one. It does NOT delete it from the brushes list.

Color dialog

The color dialog is hidden by default. See display options at the bottom of the panel. You can define the color in the color element below the brush browser. It will also open a color dialog then.

When you set it to visible, then you can set the color for painting by a click with the mouse in the color wheel. The slider at the right defines the brightness.

The button below shows you the active color.

A click at the color button will open a more detailed color dialog, where you can set up rgb, hsv and hex colors and with sliders.

Color Element

Here you can set a primary and a secondary color. The button with the arrows at it switches the active and the secondary color. And with the pipette you can pick a color from the screen. This will reveal some more elements, and create a palette. Here you can choose now the color to use it for painting. You can add and remove colors here too.

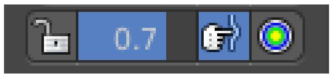
This color picker can just pick a color in the 3D view. It does not work elsewhere.

Radius

The Radius edit box allows you to adjust the radius of the brush. The button behind the edit box enables tablet pressure sensitivity for radius.

And the button at the end allows you to set the radius of the pencil by hotkey. A click at this button works of course too. But this is a hotkey tool. The button is just a visible reminder.

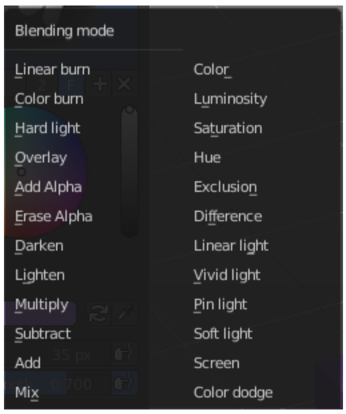
Strength



The Strength edit box allows you to adjust the strength of the brush. When the Lock symbol at the front is ticked, then the pencil keeps its strength relative to the object when zooming in and out. The button behind the edit box enables tablet pressure sensitivity for strength.

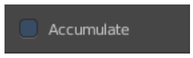
And the button at the end allows you to set the strength by hotkey. A click at this button works of course too. But this is a hotkey tool. The button is just a visible reminder.

Blend



A dropdown box where you can adjust the blend mode of the paint stroke. Default method is Mix.

Accumulate



Accumulates stroke daubs on top of each other.

Alpha

When unchecked, lock Alpha while painting.

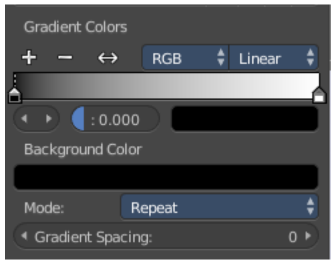
Use Gradient

When you tick Use Gradient then you reveal a Gradient dialog. Here you can set up a gradient.

Important!

Painting a gradient requires to have the Fill pencil chosen. It will not work with the other pencil types.

Gradient Colors dialog

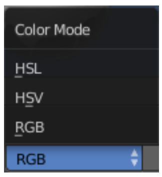


The + Button adds a color ramp point. That way you can have more than one color in the gradient.

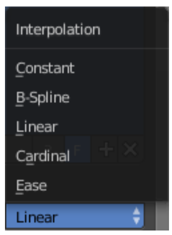
The - Button removes the currently selected color ramp point.

The <> Element flips the color ramp

Color Mode is a dropdown box where you can choose the color mode for the gradient.

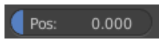


Interpolation is a dropdown box where you can choose the interpolation mode for the gradient.



In the **Color Ramp element** you will see the color ramp with the single color points.

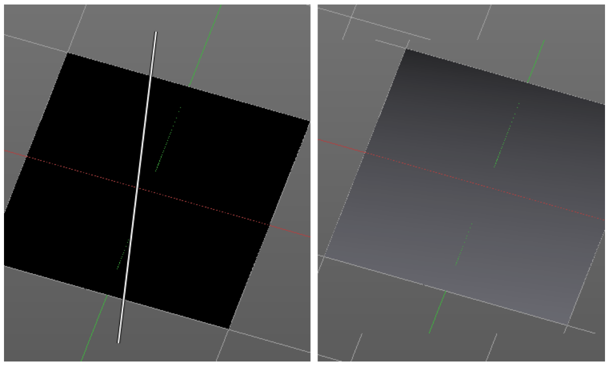
Choose Active Color Stop is the stop point of the gradient.



Position is a edit box where you can fine tune the position of the currently selected color point

Set Color of selected color stop is the color of the currently selected color point. When you click at it then you will get a color dialog that allows you to setup the color.

Usage



Set up the gradient in the Gradient dialog.

Choose the Fill pencil. Gradient will not work with other pencils.

Click at the start point of the gradient.

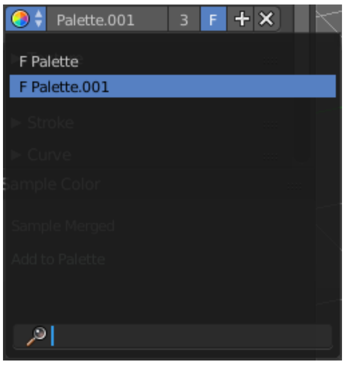
Drag the mouse to the end point of the gradient. This will draw a line that defines the gradient direction.

Release the mouse.

Palette

When you pick up a color with the color picker then a palette of colors gets created. This color palette is stored here. You can have more than one palette.

Palettes saves with the scene.



The icon with the color wheel is a dropdown box where you can choose the active palette.

The Palette edit box shows you the current active palette. Here you can also rename it.

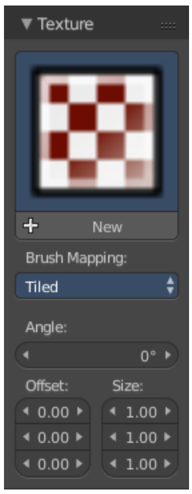
The number right of it, **in this case 2**, indicates how much number of users (internally) this palette uses. This means that this data block (the palette) shares currently settings with at least one other object. Most probably the parent palette where we have created it from. Click at the value to make this palette a single user. The button will vanish then.

F set the item to have a fake user. Zero user data-blocks are normally not saved. But sometimes you want to force the data to be kept even when the data block has no user.

The + button allows you to add a new palette with the current settings.

The X button deletes the palette as the active one. You will see the "New" button then. It does NOT delete it from the palette list.

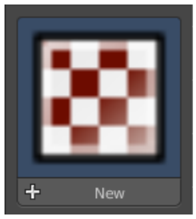
Texture Panel



The Texture panel allows you to paint with textures. This allows you for example to grab a foto from some fish scales, and simply paint them onto the mesh by using this image as a pencil. Or as a blueprint where you calk through (Stencil method).

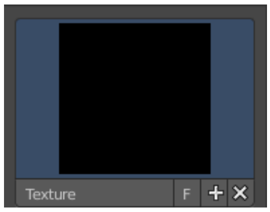
Browse Texture to be linked

The image at the top of the panel is a image browser. Here you can choose a texture that you can choose for painting then. You can also have more than one image loaded at once.



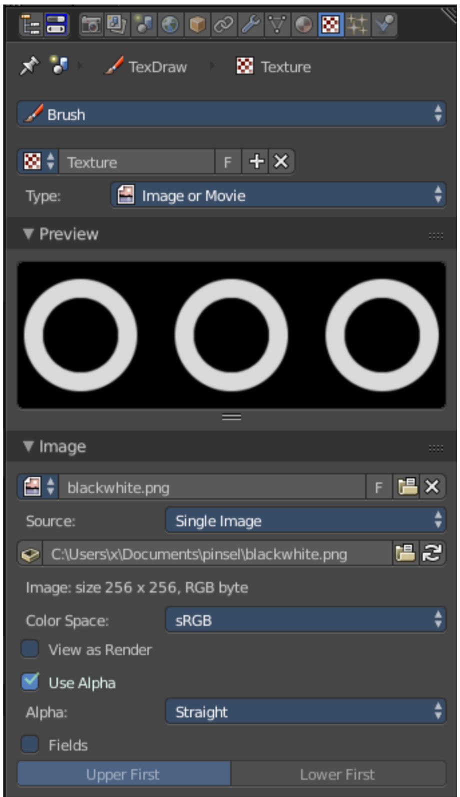
In this shot there is already a texture added. The way to add the texture here is a bit more complicated. And not done with clicking at the New button.

First click at the New button below the image. This will create a new texture slot. This slot is still empty, it displays black.

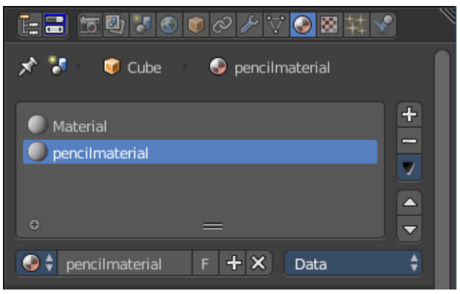


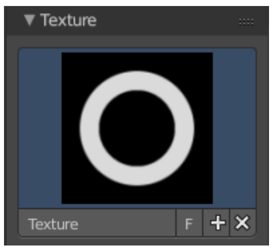
We need to load a texture in this slot. This must be done in the Properties editor in the Textures tab.

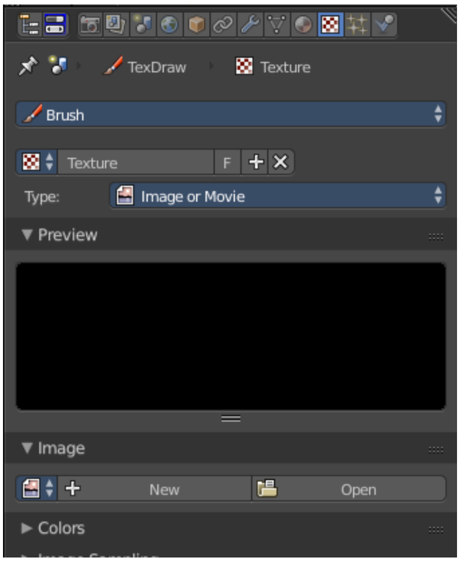
The problem is, we have an object with a material and a texture already selected. And when we change this texture , then we don't get the pencil texture loaded. But we change the texture at our mesh.



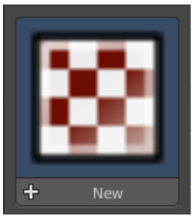
What we need to do is to create a material first. And in this material we load our pencil texture then. And then this texture becomes available in the image browser of the Texture panel.

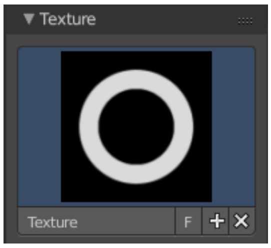






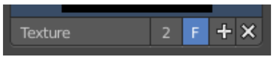
Texture Edit box





The Texture edit box is the edit box below the Image browser. When there's no image loaded then it displays the New button. When there's a image (or more) loaded, then you will see the name of the current texture.

The F button turns this texture into a data block with a fake user. Means it will exists even when there is no data connected to it anymore.

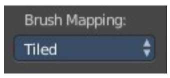


When you activate Fake User, then you may get a value in front of it, which displays how much users this data block (our texture slot) currently has.

The + Button adds another texture slot. Note that you will have to load a texture too, as explained above.

The X button deletes the texture slot.

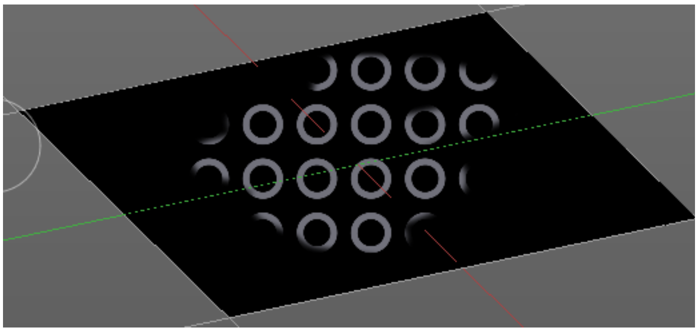
Brush Mapping



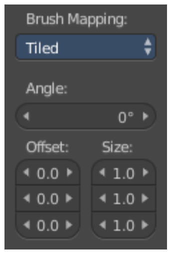
Our texture can be mapped in different methods. The Brush mapping is a dropdown box where you can choose this different brush mapping methods.

The settings vary. So we will go through them by the different brush mapping methods.

Brush Mapping with mapping method Tiled



The brush mapping method Tiled tiles the brush stroke at the surface. The mapping happens from the current view. The result may be distorted when the view does not align with the surface of the object.



Angle

The angle of the brush.

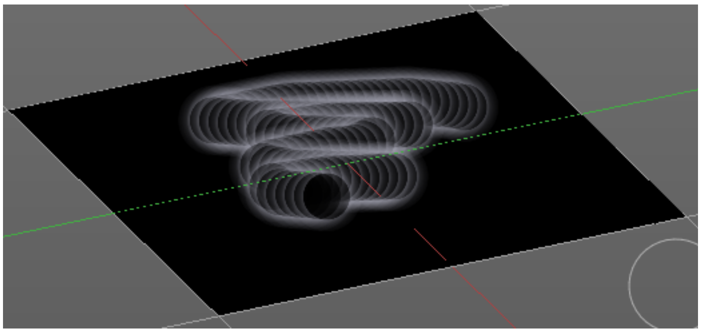
Offset

The offset of the texture in the brush.

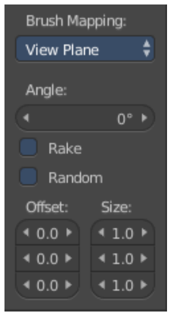
Size

The size of the texture in the brush.

Brush Mapping with mapping method View Plane



The brush mapping method View Plane simply paints onto the surface. The mapping happens from the current view. The result may be distorted when the view does not align with the surface of the object.



Angle

The angle of the brush.

Rake

The angle follows the direction of the brush stroke.

Random

The brush angle gets set random.

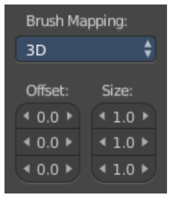
Offset

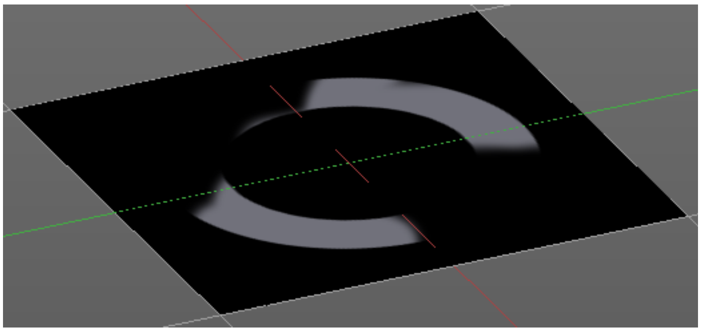
The offset of the texture in the brush.

Size

The size of the texture in the brush.

Brush Mapping with mapping method 3D





The brush mapping method 3D paints the texture at the surface, by tiling it 1/1 at the object surface.

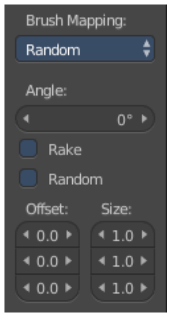
Offset

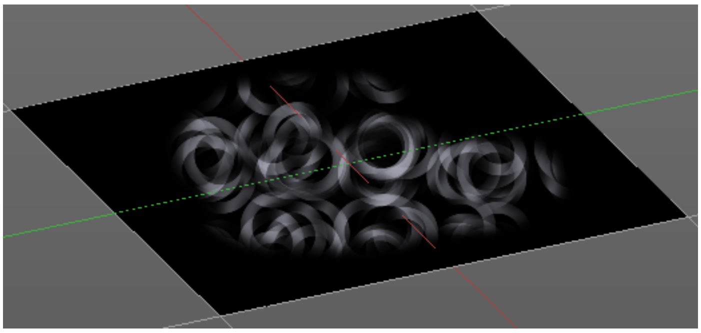
The offset of the texture in the brush.

Size

The size of the texture in the brush.

Brush Mapping with mapping method Random





The brush mapping method Random paints onto the surface, and randomizes the texture position in the brush while that. The mapping happens from the current view. The result may be distorted when the view does not align with the surface of the object.

Angle

The angle of the brush.

Rake

The angle follows the direction of the brush stroke.

Random

The brush angle gets set random.

Offset

The offset of the texture in the brush.

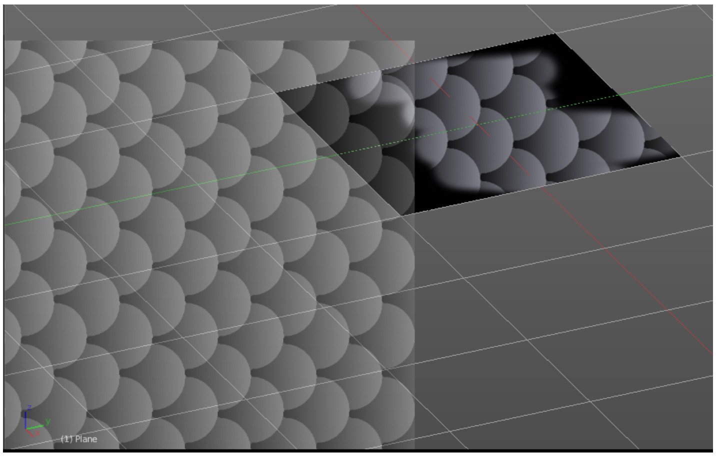
Size

The size of the texture in the brush.

Brush Mapping with mapping method Stencil

The former methods uses the textures for the brush. The method Stencil works different. You have your texture displayed in the workspace above the object, and you paint this texture onto your object with your pencil strokes.

Note that the texture in the 3d space is just visible when you are with the mouse over the viewport.



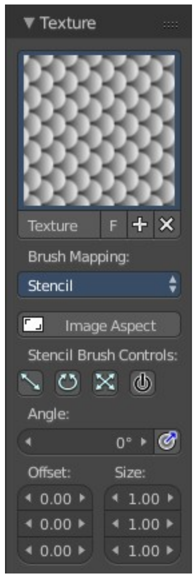
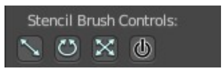


Image Aspect

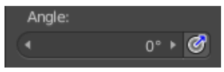
Adjust the stencil size to fit to the image aspect ratio

Stencil Brush controls



Here you can move, rotate and scale the stencil image in the 3D viewport. And reset the transform. You better use the hotkeys here that gets displayed in the tool tips, since the image is not displayed when the mouse is not over the 3D viewport.

Angle edit box



Here you can adjust the angle of the brush. The button at the end allows you to set the radius by dragging the mouse. This should be done in the viewport and with the hotkey. This button is just a visible reminder.

Offset

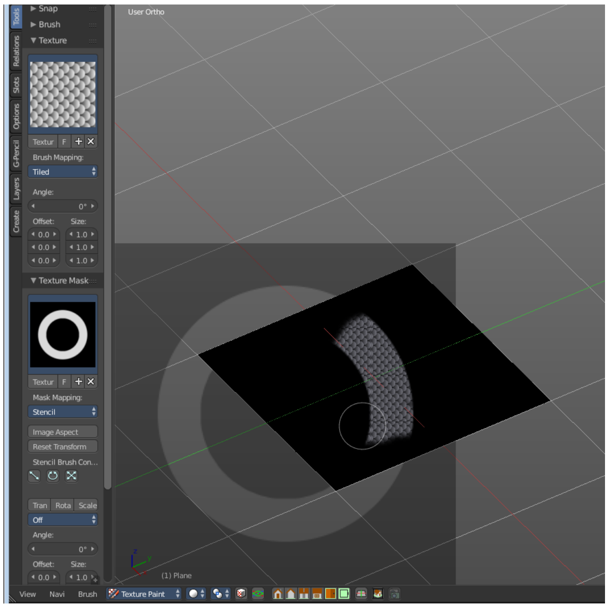
Fine tune the offset of the texture in the brush.

Size

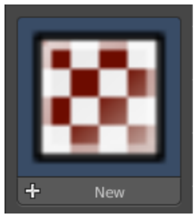
Fine tune the size of the texture in the brush.

Texture Mask Panel

The texture mask panel allows you to use a texture as a mask to define the strength of painting. In the shot example we use a tiled Texture as a pencil, and a stencil map as our texture mask. And it paints just where the mask texture is bright. You can of course use gradients here to define the paint strength.



Browse Texture to be linked

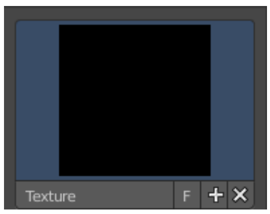


The image at the top of the panel is a image browser. Here you can choose a texture that you

can choose for painting then. You can also have more than one image loaded at once.

In this shot there is already a texture added. The way to add the texture here is a bit more complicated. And not done with clicking at the New button.

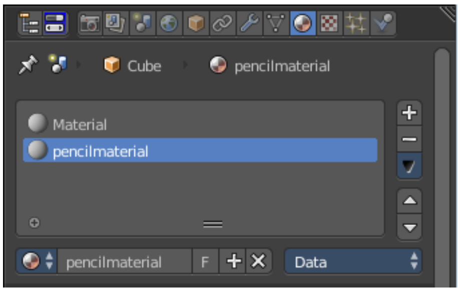
First click at the New button below the image. This will create a new texture slot. This slot is still empty, it displays black.

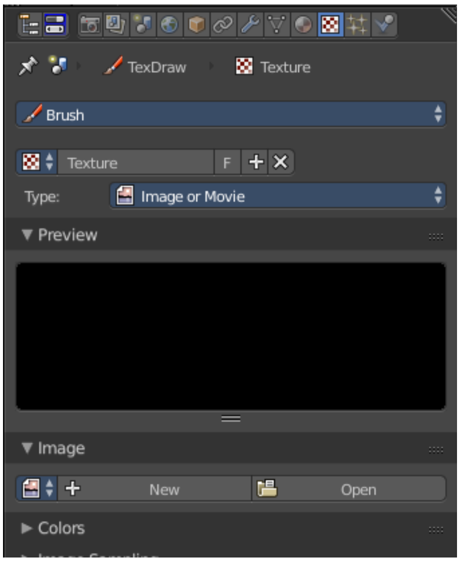


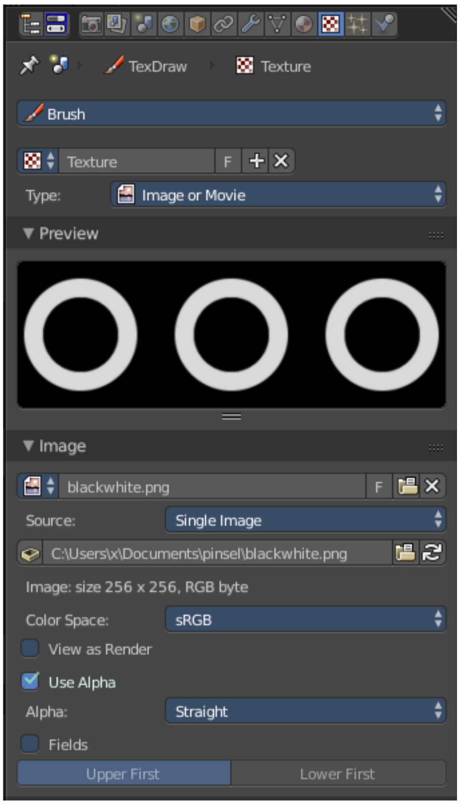
We need to load a texture in this slot. This must be done in the Properties editor in the Textures tab.

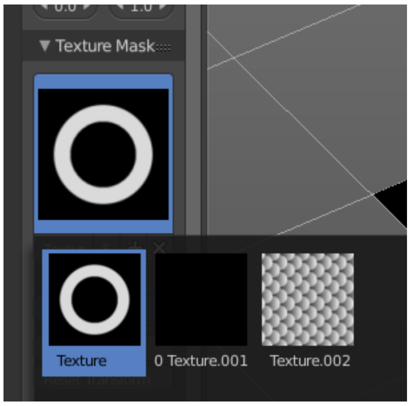
The problem is, we have an object with a material and a texture already selected. And when we change this texture , then we don't get the pencil texture loaded. But we change the texture at our mesh.

What we need to do is to create a material first. And in this material we load our pencil texture then. And then we can choose this texture in the image browser of the texture.

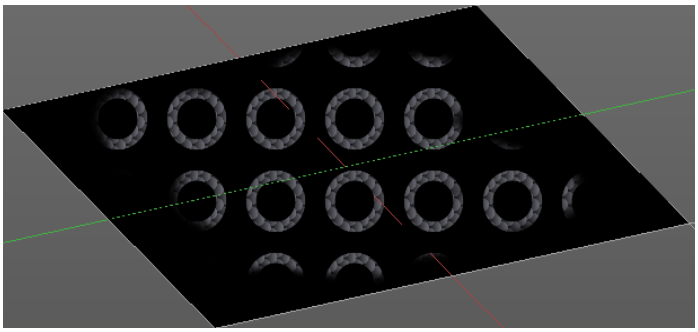




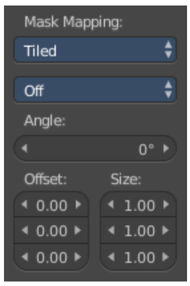




Brush Mapping with mapping method Tiled



The brush mapping method Tiled tiles the brush stroke at the surface. The mapping happens from the current view. The result may be distorted when the view does not align with the surface of the object.



Mask Pressure Mode

A dropdown box where you can choose the mask pressure mode for tablets.

Angle

The angle of the brush.

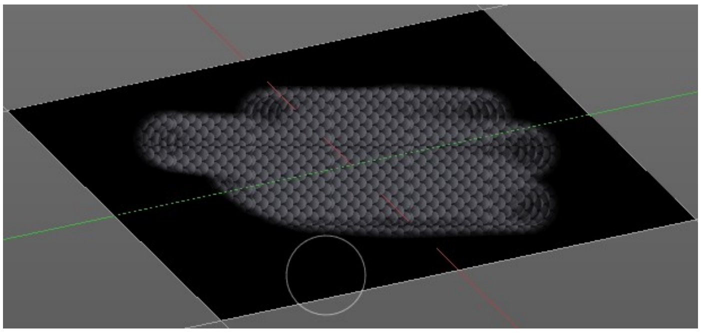
Offset

The offset of the texture in the brush.

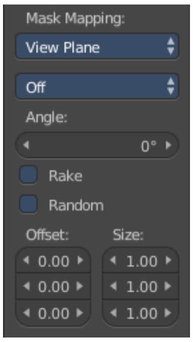
Size

The size of the texture in the brush.

Brush Mapping with mapping method View Plane



The brush mapping method View Plane simply paints onto the surface. The mapping happens from the current view. The result may be distorted when the view does not align with the surface of the object.



Mask Pressure Mode

A dropdown box where you can choose the mask pressure mode for tablets.

Angle

The angle of the brush.

Rake

The angle follows the direction of the brush stroke.

Random

The brush angle gets set random.

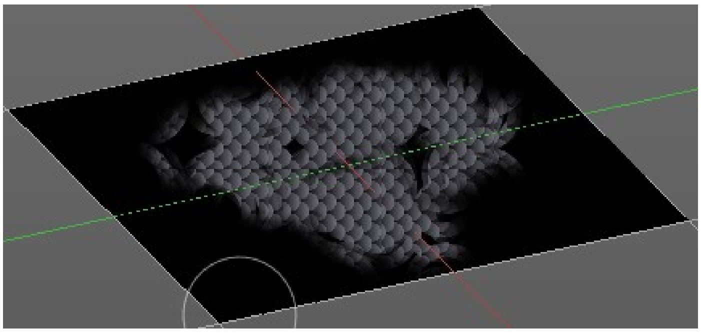
Offset

The offset of the texture in the brush.

Size

The size of the texture in the brush.

Brush Mapping with mapping method Random



The brush mapping method Random paints onto the surface, and randomizes the texture position in the brush while that. The mapping happens from the current view. The result may be distorted when the view does not align with the surface of the object.

Mask Pressure Mode

A dropdown box where you can choose the mask pressure mode for tablets.

Angle

The angle of the brush.

Rake

The angle follows the direction of the brush stroke.

Random

The brush angle gets set random.

Offset

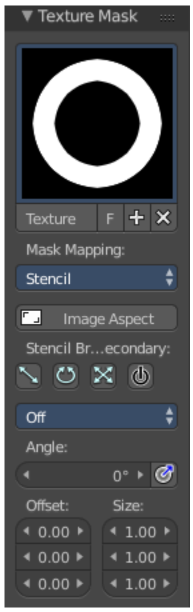
The offset of the texture in the brush.

Size

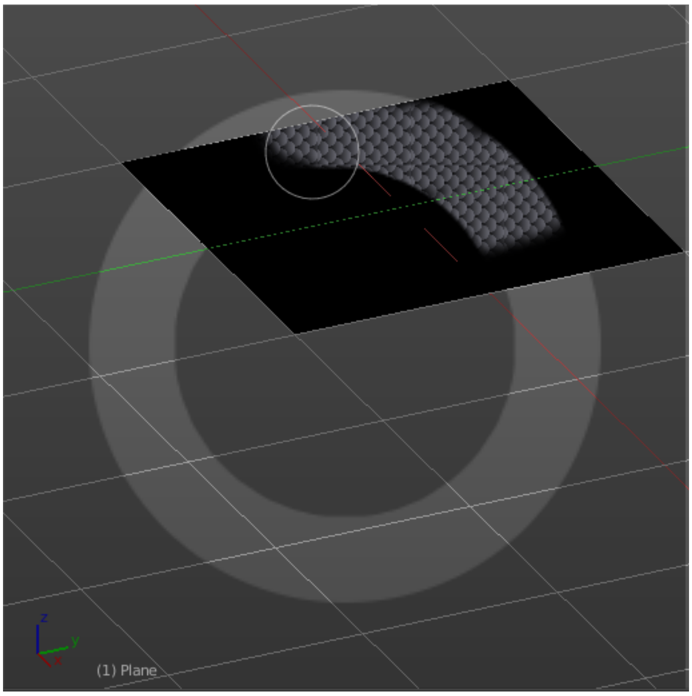
The size of the texture in the brush.

Brush Mapping with mapping method Stencil

The former methods uses the textures for the brush. The method Stencil works different. You have your texture displayed in the workspace above the object, and you paint this texture onto your object with your pencil strokes.



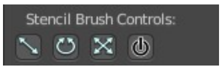
Note that the texture in the 3d space is just visible when you are with the mouse over the viewport.



Mask Pressure Mode

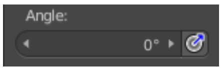
A dropdown box where you can choose the mask pressure mode for tablets.

Stencil Brush controls Secondary



Here you can move, rotate and scale the stencil image from the **TEXTURE MASK panel**, And reset the transform. You better use the hotkeys here that gets displayed in the tool tips, since the image is not displayed when the mouse is not over the 3D viewport.

Angle edit box



Here you can adjust the angle of the brush. The button at the end allows you to set the radius by dragging the mouse. This should be done in the viewport and with the hotkey. This button is just a visible reminder.

Offset

Fine tune the offset of the texture in the brush.

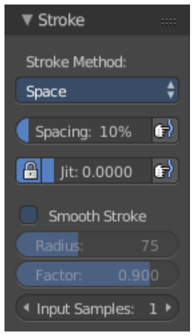
Size

Fine tune the size of the texture in the brush.

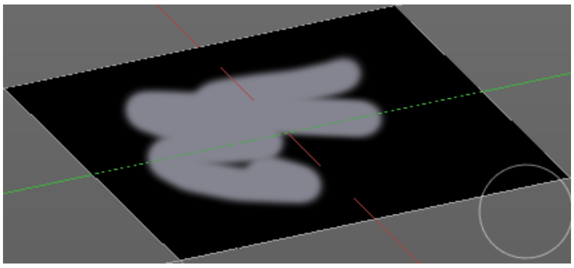
Stroke Panel

The Stroke panel contains settings to influence the behaviour of the brush stroke. There are various stroke methods available. We will go through them one by one.

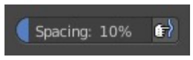
Stroke Panel with Stroke method Space



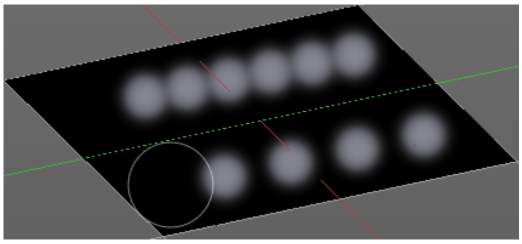
This is the default Stroke method. The sculpt stroke gets added continuously with given settings.



Spacing Edit Box



The sculpt drawing happens by mapping the pencil onto the mouse position. And when you move the mouse then the next mapping happens. Here you can adjust the spacing after what mouse movement the next mapping should happen. The lower the value, the lower the distance between the single dots.



The icon behind the edit box enables tablet pressure sensitivity for tablets.

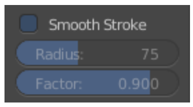
Jitter Edit Box

Here you can add Jitter to the brush while painting.

The icon in front of the edit box toggles between jittering in screen space and relative to brush size.

The icon behind the edit box enables tablet pressure sensitivity for tablets.

Smooth Stroke



The brush lags behind the mouse position, and produces a much smoother stroke by that.

Smooth Stroke Radius Edit Box

Is just active when Smooth Stroke is activated. Here you can adjust the radius of the smoothing.

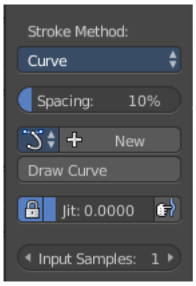
Smooth Stroke Factor Edit Box

Is just active when Smooth Stroke is activated. Here you can adjust the factor of the smoothing.

Input Samples Edit Box

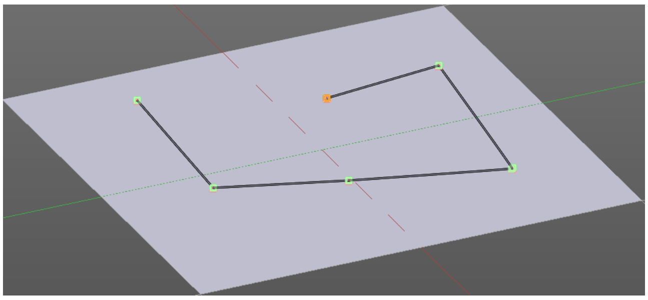
Average multiple input samples together to smooth the brush stroke.

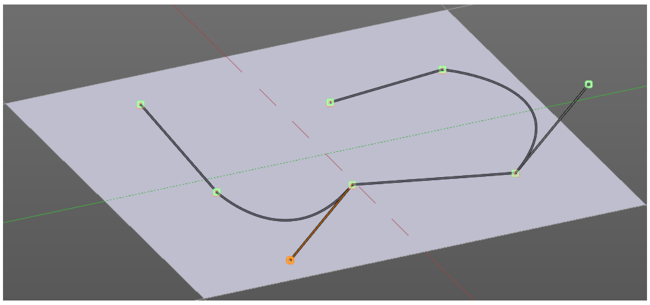
Stroke Panel with Stroke method Curve

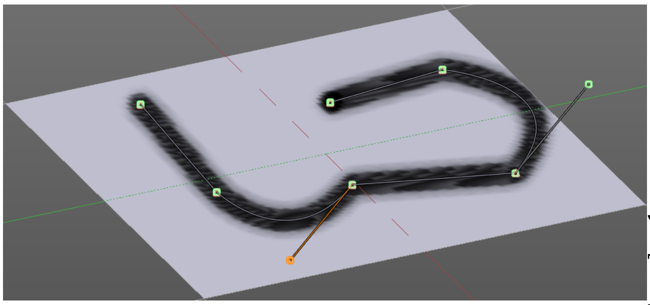


The Stroke method curve doesn't simply influence the way how the stroke is painted. It is a special method. First you draw a curve object by holding down ctrl and clicking with left mouse button. Then you tweak the curve. You can click at the curve point, and drag out handlers to make the curve points smoooth.

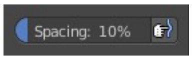
Then you hit the Draw Curve button. And the curve gets drawn onto the surface.



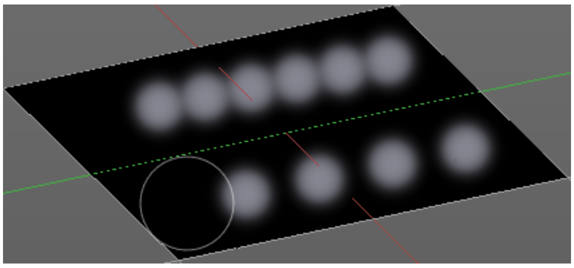




Spacing Edit Box



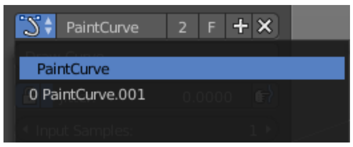
The drawing happens by mapping the pencil onto the mouse position. And when you move the mouse then the next mapping happens. Here you can adjust the spacing after what mouse movement the next mapping should happen. The lower the value, the lower the distance between the single dots.



The icon behind the edit box enables tablet pressure sensitivity for tablets.

Paint Curve edit box

Here you set the active curve.



The first element is a dropdown box where you will find your curves objects. You can have more than one.

The second element is the edit box that displays the active curve.

The number right of it, **in this case 2**, indicates how much number of users (internally) this brush uses. This means that this data block (the brush) shares currently settings with at least one other object. Most probably the parent brush where we have created it from. Click at the value to make this brush a single user. The button will vanish then.

F set the brush to have a fake user. Zero user data-blocks are normally not saved. But sometimes you want to force the data to be kept even when the data block has no user.

The + button allows you to add a new pencil with the current settings. Note that the brushes are NOT saved when you close Bforartists. You can save them into the current blend file. Or you can save the startup file. But be careful here. This saves everything else of the current state of Bforartists too.

The X button deletes the brush as the active one. It does NOT delete it from the brushes list.

Draw Curve Button

A click at it to turns the curve into a sculpt stroke.

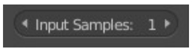
Jitter Edit Box

Here you can add Jitter to the brush while painting.

The icon in front of the edit box toggles between jittering in screen space and relative to brush size.

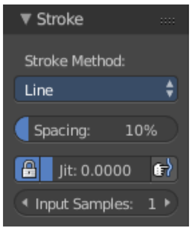
The icon behind the edit box enables tablet pressure sensitivity for tablets.

Input Samples Edit Box

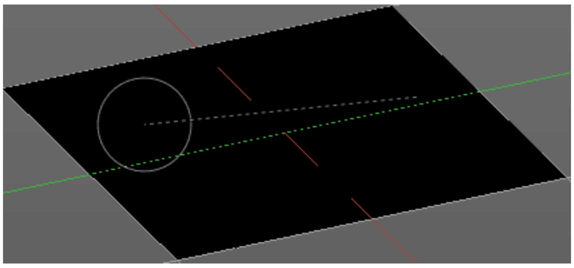


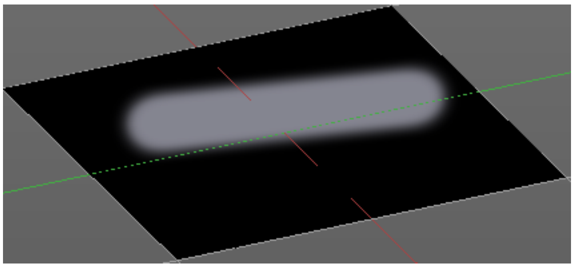
Average multiple input samples together to smooth the brush stroke.

Stroke Panel with Stroke method Line

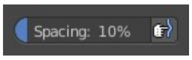


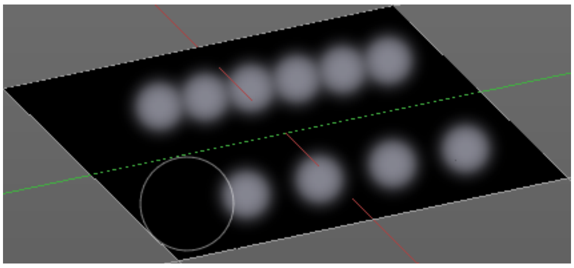
With Stroke method line you draw a line between a starting point and a endpoint. And when you release the mouse then the line gets sculpted.





Spacing Edit Box





The drawing happens by mapping the pencil onto the mouse position. And when you move the mouse then the next mapping happens. Here you can adjust the spacing after what mouse movement the next mapping should happen. The lower the value, the lower the distance between the single dots.

The icon behind the edit box enables tablet pressure sensitivity for tablets.

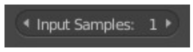
Jitter Edit Box

Here you can add Jitter to the brush while painting.

The icon in front of the edit box toggles between jittering in screen space and relative to brush size.

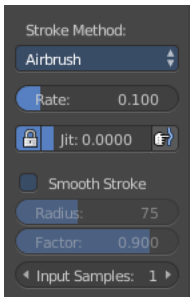
The icon behind the edit box enables tablet pressure sensitivity for tablets.

Input Samples Edit Box

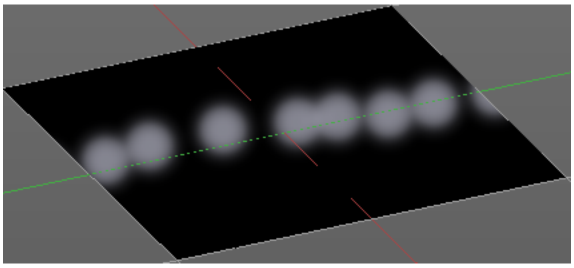


Average multiple input samples together to smooth the brush stroke.

Stroke Panel with Stroke method Airbrush



The stroke acts like an airbrush pencil. The dots gets placed randomly.



Rate Edit Box

Here you can define the rate of the drawing.

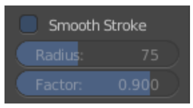
Jitter Edit Box

Here you can add Jitter to the brush while painting.

The icon in front of the edit box toggles between jittering in screen space and relative to brush size.

The icon behind the edit box enables tablet pressure sensitivity for tablets.

Smooth Stroke



The brush lags behind the mouse position, and produces a much smoother stroke by that.

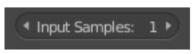
Smooth Stroke Radius Edit Box

Is just active when Smooth Stroke is activated. Here you can adjust the radius of the smoothing.

Smooth Stroke Factor Edit Box

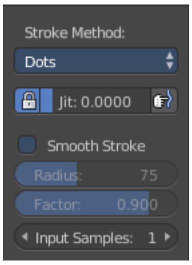
Is just active when Smooth Stroke is activated. Here you can adjust the factor of the smoothing.

Input Samples Edit Box

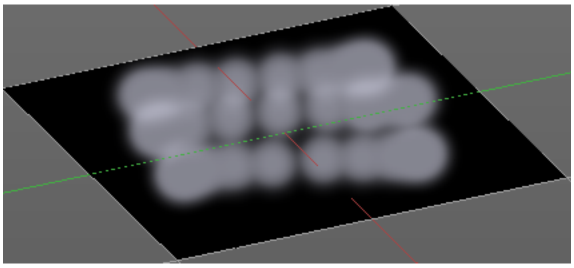


Average multiple input samples together to smooth the brush stroke.

Stroke Panel with Stroke method Dots



The stroke method Dots draws dots of the pencil onto the surface. The mapping happens from the current view. Means you will get distortions when your view is not aligned with the surface of the object.



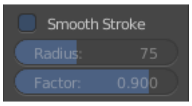
Jitter Edit Box

Here you can add Jitter to the brush while painting.

The icon in front of the edit box toggles between jittering in screen space and relative to brush size.

The icon behind the edit box enables tablet pressure sensitivity for tablets.

Smooth Stroke



The brush lags behind the mouse position, and produces a much smoother stroke by that.

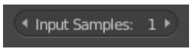
Smooth Stroke Radius Edit Box

Is just active when Smooth Stroke is activated. Here you can adjust the radius of the smoothing.

Smooth Stroke Factor Edit Box

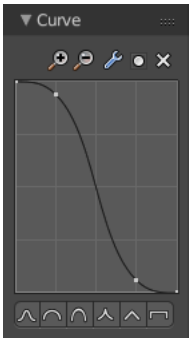
Is just active when Smooth Stroke is activated. Here you can adjust the factor of the smoothing.

Input Samples Edit Box



Average multiple input samples together to smooth the brush stroke.

Curve Panel



The curve panel allows you to define different fallofs methods for the border of the brush.

Navigation elements

The navigation elements at the top are described from left to right

Zoom in and out

The two buttons with the magnifying glass at it zooms in and out in the curve window.

Tools

Tools is a menu where you can find some cuve related tools.

Reset View

Resets the curve windows zoom

Vector Handle

Set handle type to Vector

Auto Handle

Set handle type to Auto

Auto Clamped Handle

Set handle type to Auto Clamped

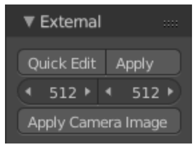
Reset Curve

Resets the curve to the initial shape.

Curve Presets

Here you can find some predefined curve presets.

External Panel



The external panel allows you to do projection painting by using an external 2d image editor. The projection happens from the current view. So this can lead to distortions.

Quick Edit

Opens a shot of the current view in your 2D Image Editor.

Apply

Applies the changes that you made and saved in your 2D Image Editor.

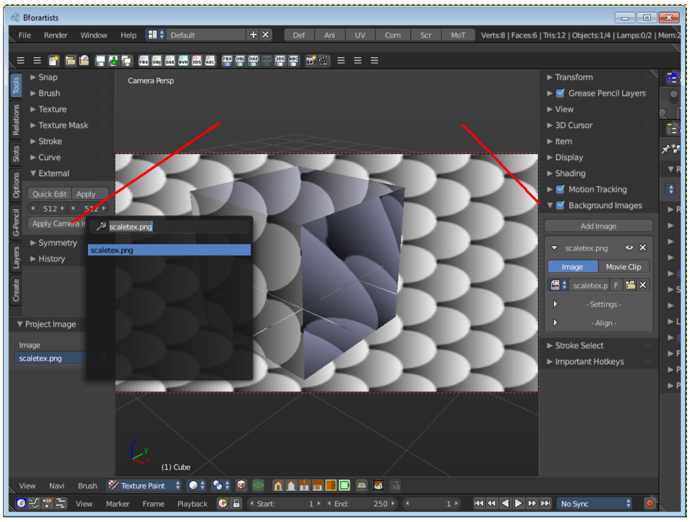
Resolution

Here you can set the resolution of the shot.

Apply Camera Image

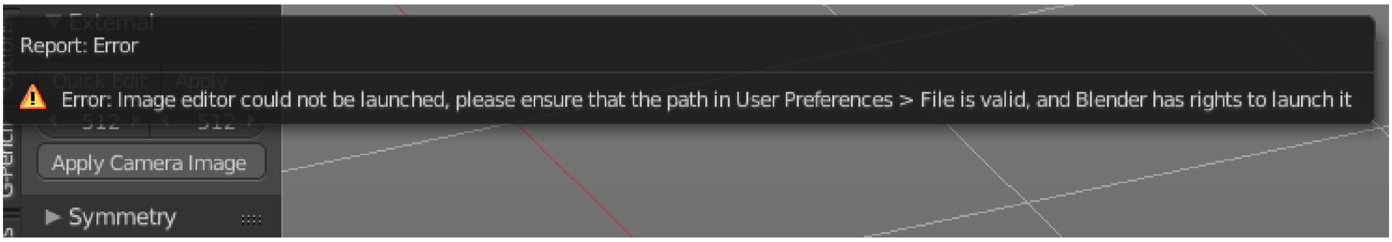
Project an edited render from the active camera back onto the object.

This feature requires to have a background image loaded. Then this background image can be projected onto the object from the camera view.

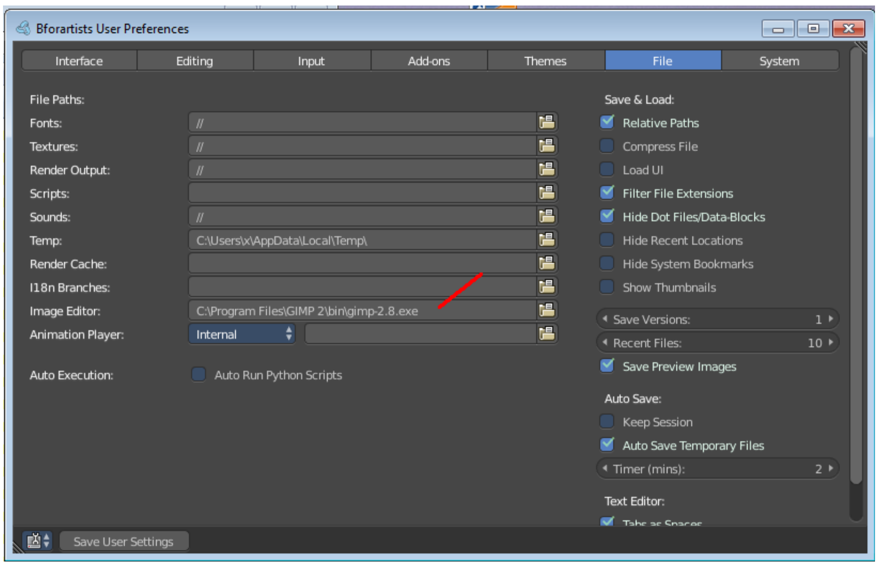


Preparations

You first have to link your software that you want to use here. When there is no image editor linked then you will get a warning.



Open the User Preferences, go to the File tab. Here choose the Image Editor section, and browse for your image editor. I have chosen Gimp here at Windows 7.

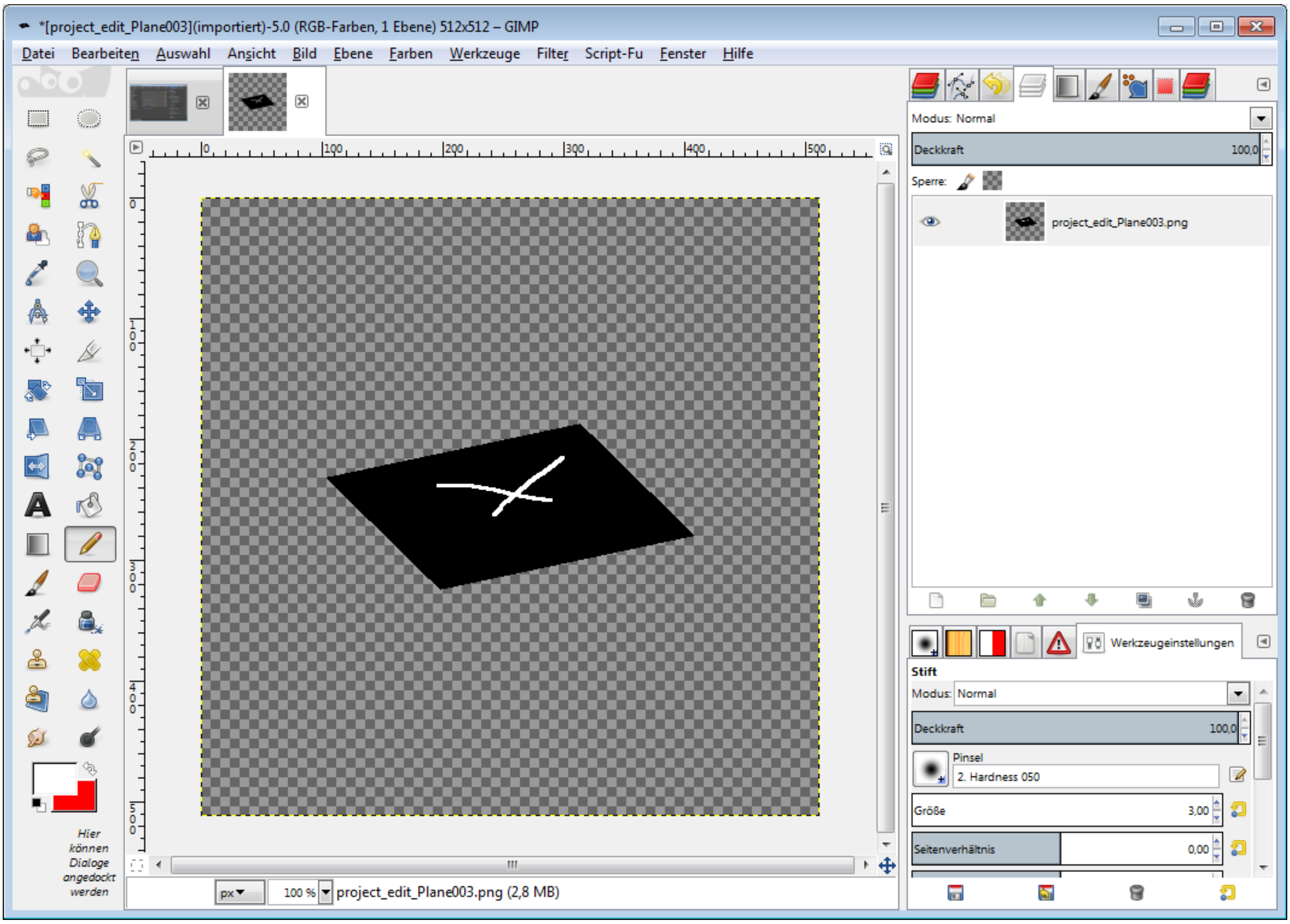


Save User Settings.

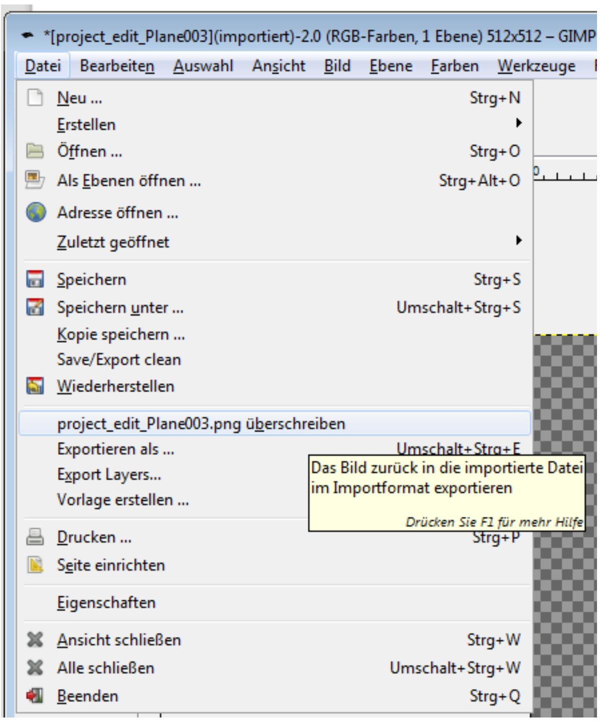
For further options have a look in the Project Paint panel in the Options tab in Weight paint mode. There can be quite a few things adjusted.

Usage

Click at the Quick Edit Button. And your image editor will open up with a shot from the current view. Modify your image.

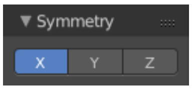


Then overwrite the image. Sorry for the german shot ...

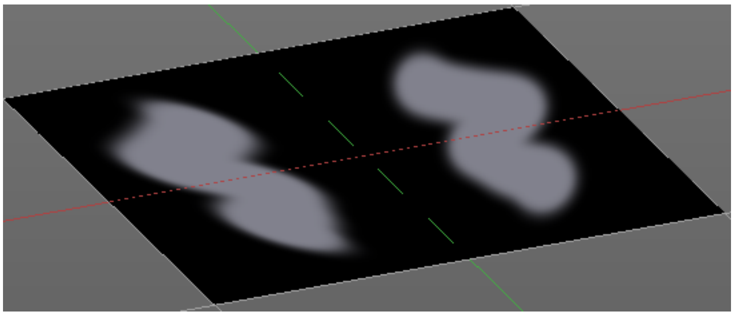


Back in Bforartists click at the Apply button. And the result gets mapped onto your object.

Symmetry Panel

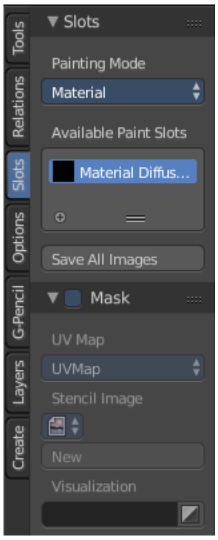


Here you can turn on/off symmetry painting along X, Y and Z axis. The mirroring happens along the world axis.



Tool Shelf in Texture Paint Mode - Slots Tab

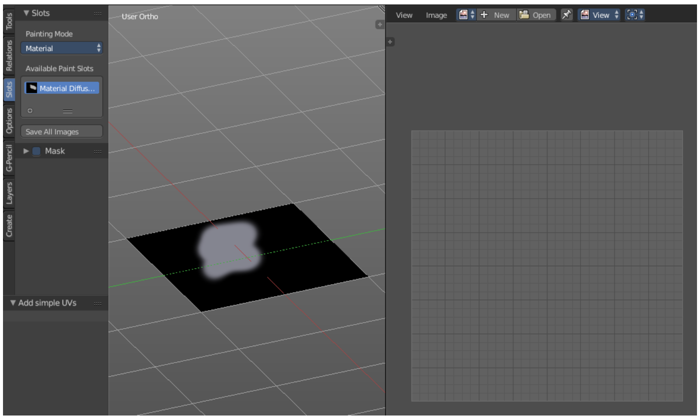
The slots tab contains some settings around the paint slots.

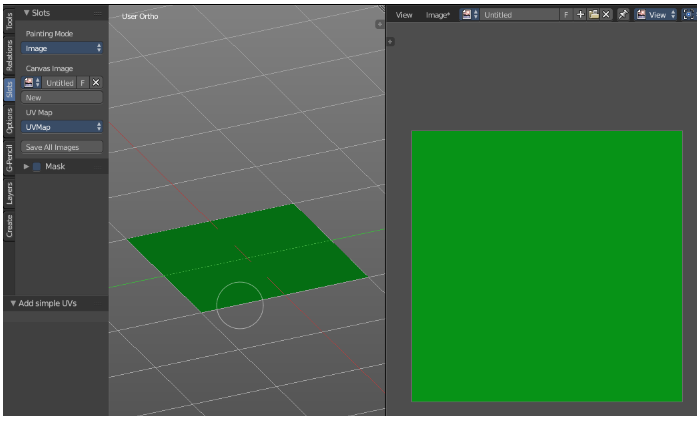


Slots Panel

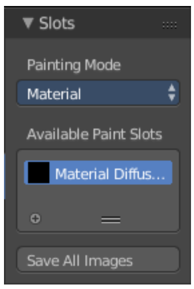
Here you can choose to paint by using the textures in a material. Those textures gets auto detected. Material is the standard settings.

Or directly onto an image that you choose or create. This image is not part of the material then. But uses the UV mapping from the mesh.





With painting mode Material



Painting Mode

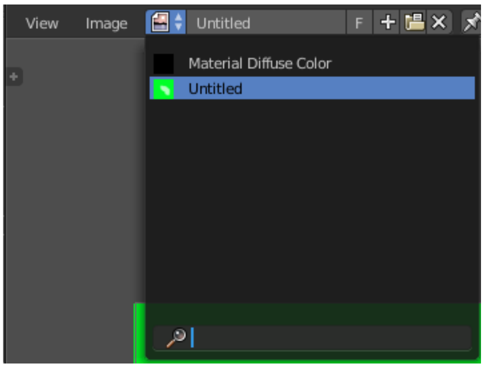
The dropdown box where you can choose between Material and Image.

Available Paint Slots

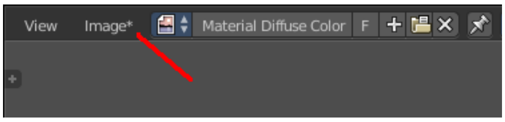
The list of available materials. A mesh can have more than one material applied.

Save all Images

Saves all images at once. This feature requires valid texture paths, means that the images are already saved somewhere at your pc. It throws a "Invalid Path" warning when one or more images does not have a valid texture path. This is for example the case when you create a texture in Blender. And you haven't saved it yet.

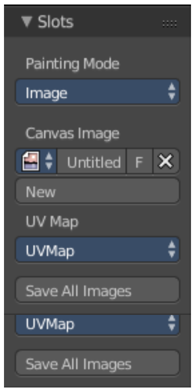


So when you get this warning, switch to the UV Image Editor and check which image in the list isn't saved yet. The ones that aren't saved yet shows an asterisk in the Header when you choose them.



With painting mode Image

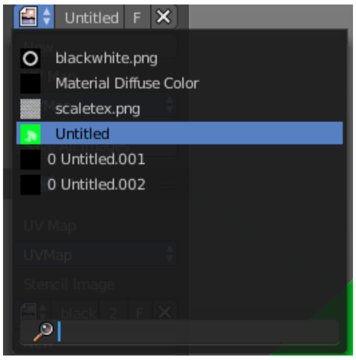
Painting Mode



The dropdown box where you can choose between Material and Image.

Canvas Image

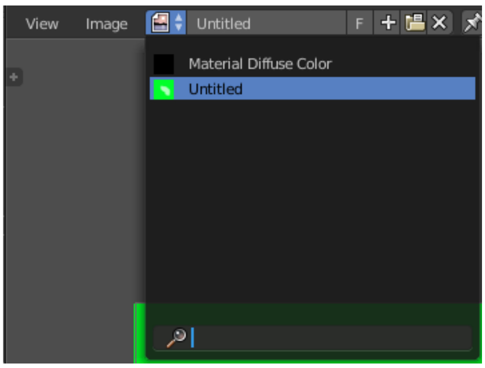
Here you can choose or create a Image that gets used for the texture painting. You can choose any image that is loaded.



UV Map

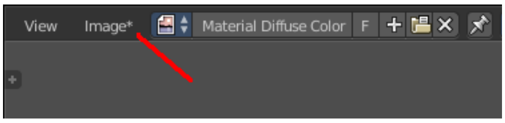
A dropdown box with the UV map to use for image painting. A mesh can have more than one material and more than one UV Map applied.

Save all Images

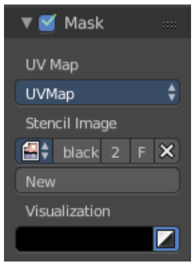


Saves all images at once. This feature requires valid texture paths, means that the images are already saved somewhere at your pc. It throws a "Invalid Path" warning when one or more images does not have a valid texture path. This is for example the case when you create a image in Blender's UV Image Editor. And you haven't saved it to file yet.

So when you get this warning, switch to the UV Image Editor and check which image in the list isn't saved yet. The ones that aren't saved yet shows an asterisk in the Header when you choose them. Unfortunately not in the list itself. So you have to go through one by one.



Mask Panel

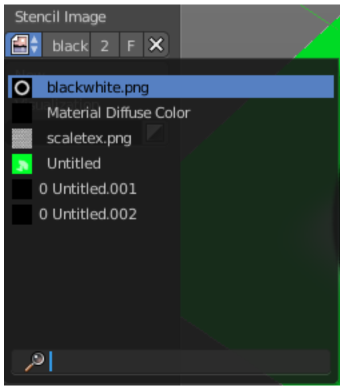


Here you can load a stencil map to mask out parts of the texture. You have to activate it in the panel header.

UV Map

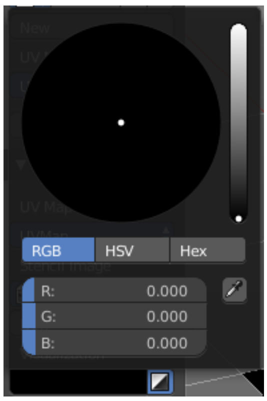
A dropdown box with the UV map to use for image painting. A mesh can have more than one material and more than one UV Map applied.

Stencil Image



Here you can choose or create a Image that gets used for the masking. You can choose any image that is loaded.

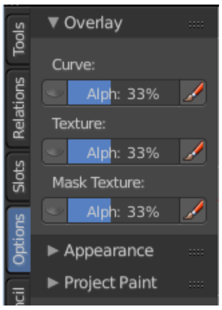
Visualization



You usually want a black n white image for masking. But here you can set up the color for the stencil map. A click at the button opens a color dialog. The button at the right flips the colors.

Tool Shelf in Texture Paint Mode - Options Tab

Here you can find some more options and settings for texture painting tools.



Overlay Panel

Curve

This setting is interesting for the Stroke method Curve. Here you can adjust how transparent the curve is.

The eye icon button in front of the slider is to show the curve object in viewport. The brush icon button behind the slider is to hide the overlay during a stroke.

Texture

This setting is interesting for Texture painting. Here you can adjust how transparent the texture is.

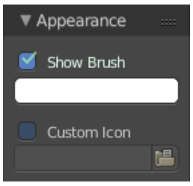
The eye icon button in front of the slider is to show the texture in the viewport. The brush icon button behind the slider is to hide the overlay during a stroke.

Mask Texture

This setting is interesting for Texture painting. Here you can adjust how transparent the Mask texture is.

The eye icon button in front of the slider is to show the texture in the viewport. The brush icon button behind the slider is to hide the overlay during a stroke.

Appearance panel



The Appearance panel provides you with some settings to adjust the appearance of the brush.

Show Brush

Show the brush in 3D view.

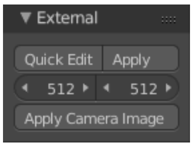
Color Button

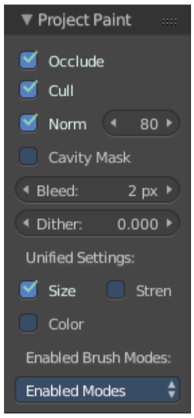
The color that the brush cursor has when adding to geometry.

Custom Icon

Here you can define a custom icon for the brush.

Project Paint panel





The Project Paint panel contains the settings for the External painting panel from the Tools tab.

Occlude

Only paint the faces directly under the mouse

Cull

Ingore faces that points away from the current view.

Normal

This defines the angle after which the painting is not applied anymore. That way you can avoid heavy distortions at higher angles since it projects from the current view.

Cavity Mask

Mask painting according to mesh geometry cavity

Bleed

An edit box to adjust the amount of bleeding into the areas outside of the faces uv.

Dither

An Edit box to adjust the amount of dither when painting on byte images

Unified Settings

Size

Instead of per Brush radius, the radius is shared across brushes.

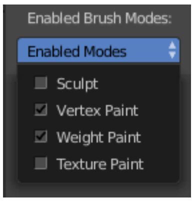
Strength

Instead of per Brush strength, the strength is shared across brushes.

Color

Instead of per Brush color, the color is shared across brushes.

Enabled Brush Modes



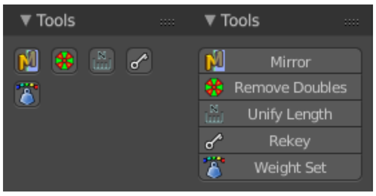
Enabled Modes

Enabled modes is a dropdown menu where you can adjust in which modes the brushes shows.

Tool shelf in Particle edit mode - Tools Tab

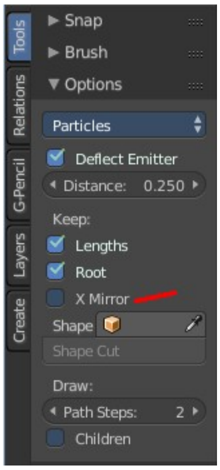
The particle edit mode requires to have a particle system at the object.

Tools Panel



This panel contains tools to modify the particles.

Mirror



Mirrors the selected particles.

If you want a symmetrical haircut, first select all particles, then mirror the particles, then tick X Mirror in the Particle panel.

Remove Doubles

Remove double vertices that are very close to each other. This can for example happen when you mirror the particles.

Unify Length

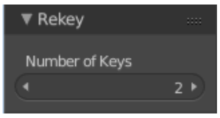
Unifies the length of the selected hair particles. The length is calculated by the average length of the selection.

Rekey

You need to have some hair particles selected.

Rekey changes the number of keys for the selected particles, including root and tip keys. This tool brings up a popup where you can adjust the number of keys. Two means you have only a root and a tip key. Everything more subdivides the selected hair particle with more keys.

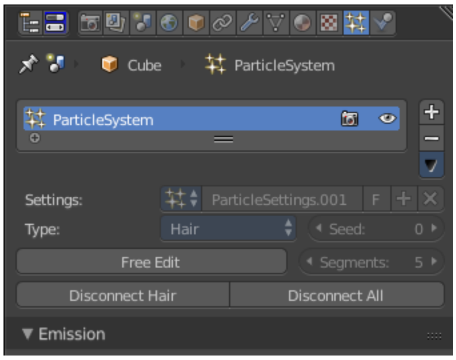
Last Operator Rekey



Number of keys

Here you can again adjust the number of keys.

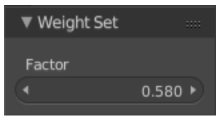
Weight Set



Here you can manually set a weight for the selected keys to interpolate between the current key weight and the brushes weight.

Using this tool activates and reveals Free Edit in the particle system settings.

Last Operator Weight Set



Factor

The strength of the keys weighting.

Brush Panel

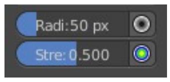
The Brush panel contains brushes to modify the particles in various ways. Dependant of what brush is selected you will also see some settings below the brush buttons.

The brushes are meant for the particle system type Hair.

None

No Brush is selected

Comb



Allows you to comb the strands of the particle system.

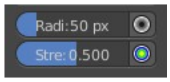
Radius

The brush radius. The button behind the edit box allows you to set the radius by mouse move. This is a hotkey tool, and should be performed in the viewport.

Strength

The brush strength. The button behind the edit box allows you to set the radius by mouse move. This is a hotkey tool, and should be performed in the viewport.

Smooth



Allows you to smooth the strands of the particle system.

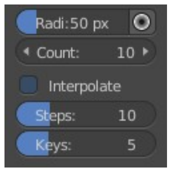
Radius

The brush radius. The button behind the edit box allows you to set the radius by mouse move. This is a hotkey tool, and should be performed in the viewport.

Strength

The brush strength. The button behind the edit box allows you to set the radius by mouse move. This is a hotkey tool, and should be performed in the viewport.

Add



Allows you to add strands to the particle system.

Radius

The brush radius. The button behind the edit box allows you to set the radius by mouse move. This is a hotkey tool, and should be performed in the viewport.

Count

The amount of strands.

Interpolate

Interpolate new particles from the existing ones.

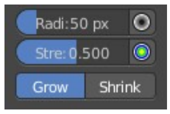
Steps

Brush steps. Steps is connected with Interpolate.

Keys

How many keys to make new particles with

Length



Manipulate the length of the strands

Radius

The brush radius. The button behind the edit box allows you to set the radius by mouse move. This is a hotkey tool, and should be performed in the viewport.

Strength

The brush strength. The button behind the edit box allows you to set the radius by mouse move. This is a hotkey tool, and should be performed in the viewport.

Grow/ Shrink

Grow or shrink the particles.

Puff

Manipulate the volume of the strands.

Radius

The brush radius. The button behind the edit box allows you to set the radius by mouse move. This is a hotkey tool, and should be performed in the viewport.

Strength

The brush strength. The button behind the edit box allows you to set the radius by mouse move. This is a hotkey tool, and should be performed in the viewport.

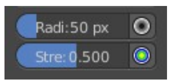
Add / Sub

Add or subtract to the current volume.

Puff Volume

Apply Puff to unselected end points.

Cut



Cut away particles.

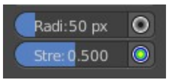
Radius

The brush radius. The button behind the edit box allows you to set the radius by mouse move. This is a hotkey tool, and should be performed in the viewport.

Strength

The brush strength. The button behind the edit box allows you to set the radius by mouse move. This is a hotkey tool, and should be performed in the viewport.

Weight



Manipulate the weight of the strands

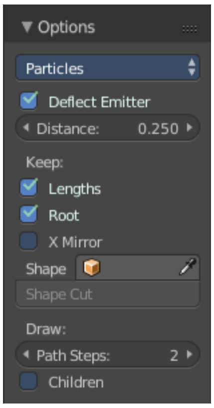
Radius

The brush radius. The button behind the edit box allows you to set the radius by mouse move. This is a hotkey tool, and should be performed in the viewport.

Strength

The brush strength. The button behind the edit box allows you to set the radius by mouse move. This is a hotkey tool, and should be performed in the viewport.

Options Panel



The Options panel provides you some options and settings for particle editing.

Particle Edit Type

Particle Edit Type Dropdown box.

Honestly, i don't have the slightest idea what this is good for. Thanks Blender Devs for your "fabulous" documentation.

Most obviously you can switch to other editing modes here. But it is not to find out under what circumstances.

Deflect Emitter

Keep Paths from intersecting the emitter

Distance

Is connected with the Deflect Emitter. The distance to the emitter.

Keep Lengths

Keep Path Lengths constant.

Keep Root

Keep Root keys unmodified.

X Mirror

X Axis Mirror Editing

Shape

Define a outer shape object to use for tools.

Shape Cut

Is connected with Shape, Cut hair to conform to the defined shape object.

Draw Path Steps

How many steps a path should draw.

Children

Draw actual particles.

Tool Shelf in all Modes but Edit Mode

There are a few panels that are visible in all modes and with all object types. Snapping for example. Or layers. To list them again and again in all modes with all available combinations would just blow up the manual. So we list them in the following chapters instead.

Tool Shelf in all Modes but Edit Mode - Layers Tab

Layers are a way to organize the scene. With Object layers you can display objects from a layer, and hide others. Physics and particles is also layer dependant. Means you can exclude objects from physics by simply putting them onto another layer. You can also in- or exclude complete layers from rendering. For compositing you can use render layers. And for armatures you can use Armature layers.

A object does not necessarily have to be at one layer only. You can place it at multiple layers.

Bforartists offers currently 20 layers. Which can be named in the Layers tab.

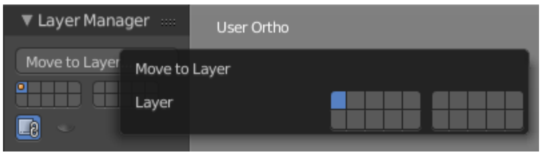
The layers tab is available in all modes but the Edit mode. And shows for all object types the same content.

Layer Manager Panel

The layer manager panel gives you the tools to manage the layers in a quick way.

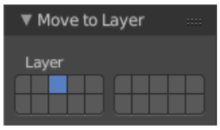
Move to Layer

The move to Layer button opens a pop-up where you can move the currently selected object to a new layer.



Shift click to add the selected object(s) to more than one layer.

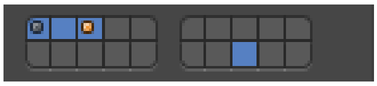
Last Operator Move to Layer



The last operator Move to Layer gives you again the possibility to move your selected object(s) to a new layer.

Visible Layers

Visible layers is a quick access element to manage the layers and to have an overview if the layer has any content. A orange or grey dot in the button means there is content in this layer.



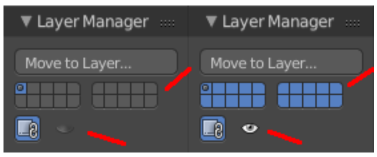
Visible is what is activated. Active layers gets indicated as blue. To select more than one layer hold down shift, and select the other elements that you want to select.

Lock Camera and Layers

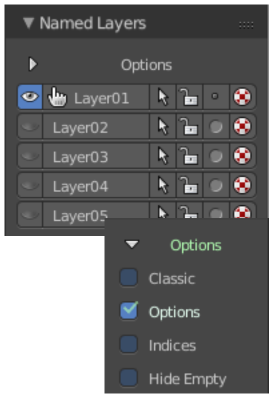
With Lock camera and layers activated the active camera and layers in this view gets used instead local layers. Means the camera renders all layers then.

Show Hide all Layers

Show Hide all Layers shows or hides all layers at once.



Named Layers Panel

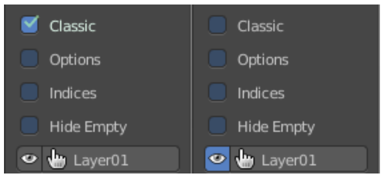


The named layers panel gives you an extended overview of the layers, with the possibility to give the layers a name.

Options

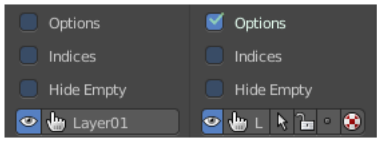
The options are hidden at first. Click at the Options title to reveal them.

Classic



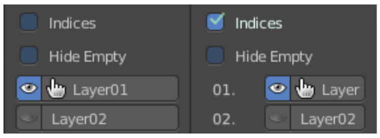
The classic option shows the eye icon for the layer visibility grey instead blue.

Options



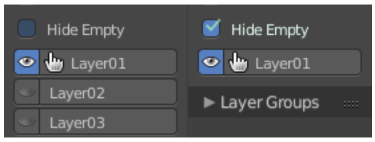
The Options option shows the option buttons at the layers. Select, Lock, Move to Layer, Show as Wire.

Indices



The Indices option shows numbers before the layers.

Hide Empty



The Hide Empty option hides all not active layers.

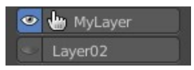
Layer Bar

The layer bar in the Named Layers tab is made of some sub elements.

Eye icon at the left

You can show or hide the layer with this button.

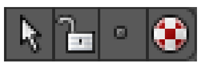
Edit box



The edit box is where you can name a layer. Click with the left mouse into the edit box to make it editable. Type in your text. Then press enter to confirm the change.

The green check icon tells you that this is the currently active layer.

The option buttons



When you have Options ticked then you will see the options buttons at the right of the edit box. They are from left to right: Select, Lock, Move to Layer, Render as Wire

Select

Clicking at the Select icon button will select all objects in this layer.

Lock

Clicking at the Lock icon button will lock all objects in this layer. They become unelectable.

Move to Layer

With this button you can move objects to other layers. Select the object, click at the Move to Layer button. Shift click to attach the object to several layers.

Render as Wire

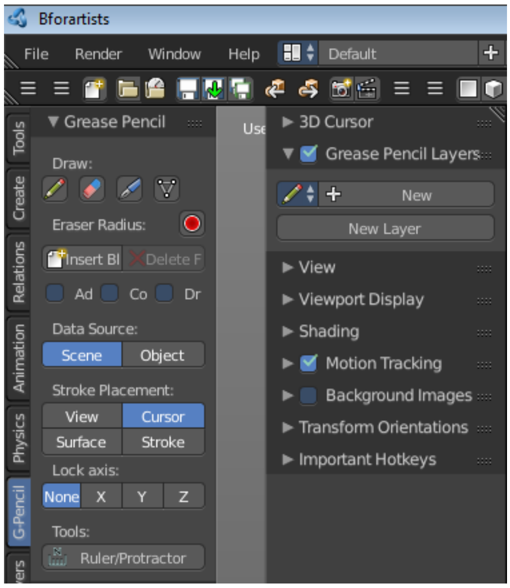
Render as wire will toggle the display for all objects between chosen state and wireframe.

Layer Groups Panel

The Layer groups panel enables you to create groups of layers. It is pretty self explaining. Create a group with the + button. Name it. And activate which layers are affected by this group by clicking at the corresponding fields in the layers widget.

To remove a layer group select the group and click at the - Button

Tool Shelf in all Modes - Grease Pencil Tab

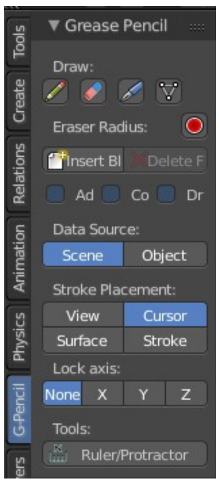


The Grease Pencil tool is a tool with which you can paint strokes in editors like the 3D view. They can be converted into polygons. The Grease Pencil tool is available in all modes.

It is unfortunately cluttered across two shelves. The Tool Shelf and the Properties Editor. Means you have to adjust settings at two places.

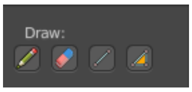
The first thing that you have to do is to create a new Grease pencil. This can either be done in the Properties Editor by clicking at New. Or in the Grease Pencil Tab in the Tool Shelf by simply clicking at the Draw button. Then all Grease Pencil tools becomes visible. And a Grease Pencil layer gets created.

Grease Pencil Panel



The Grease Pencil panel contains the general Grease Pencil tools. The Draw tool, eraser, some settings and tools.

Draw



The Draw section contains the draw tools.

Draw

Draw activates the freehand draw mode.

Erase

Erase is the eraser tool with which you can delete strokes.

Line

Line paints a straight line between start and end point.

Poly

Poly allows you to paint polygon shapes.

Eraser Radius

Here you can adjust the radius of the eraser tool. Have a look at the hotkey, it's a hotkey only tool for proper functionality.

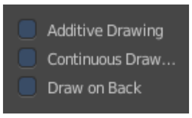
Insert Blank Frame

Insert a blank frame on the current frame.

Delete all active frames

Delete the active frame(s) of all editable grease pencil layers.

Draw Settings



The draw settings are placed besides each other, to save space.

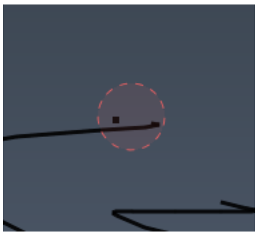
Additive Drawing

When you create new frames then the strokes from the previous active frame are included as the base for the current frame.

Continuous Draw

The Continuous Draw checkbox enables and disables the continuous draw mode. Normally the draw mode ends when you stop drawing the current line. And you have to activate the draw tool again when you want to continue with painting. With continuous draw you can immediately paint the second stroke without to enable the draw tool again.

Eraser in Continuous Draw



The draw tools are disabled as long as you are in continuous draw. To erase a stroke use the right mouse button. The pencil turns into a red circle. With which you can erase strokes now.

End Continuous Draw

The draw tools are disabled as long as you are in continuous draw. To end the continuous draw mode click outside of the viewport. In the tool shelf for example.

Draw on Back

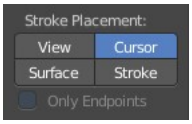
New strokes will be drawn behind all other strokes in the layer

---

Data Source

Data source defines if the paint stroke is placed in the data block of the scene or the data block of the currently selected object.

Stroke Placement



Stroke Placement defines where the Grease Pencil stroke is placed.

View

View will place the stroke at the top of the viewport. It is not drawn in the 3D view.

Cursor

Cursor will place the stroke aligned with the 3d cursor, and aligned with the current camera view. It is drawn in the 3D view.

Surface

Surface will place the stroke aligned to the surface of the underlying object. It is drawn in the 3D View.

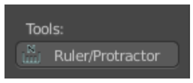
Stroke

New strokes will align to existing visible strokes. Does not work with View strokes. It is drawn in the 3D View.

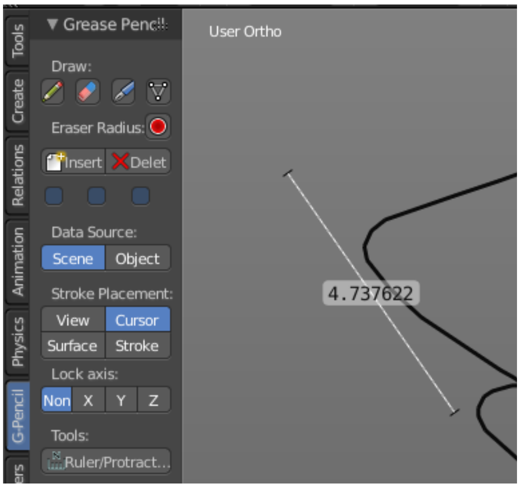
Only Endpoints

The only Endpoints checkbox is connected to the Stroke setting. And just shows when Stroke is selected. With Only Endpoints enabled the alignment of the stroke is just applied to the endpoints.

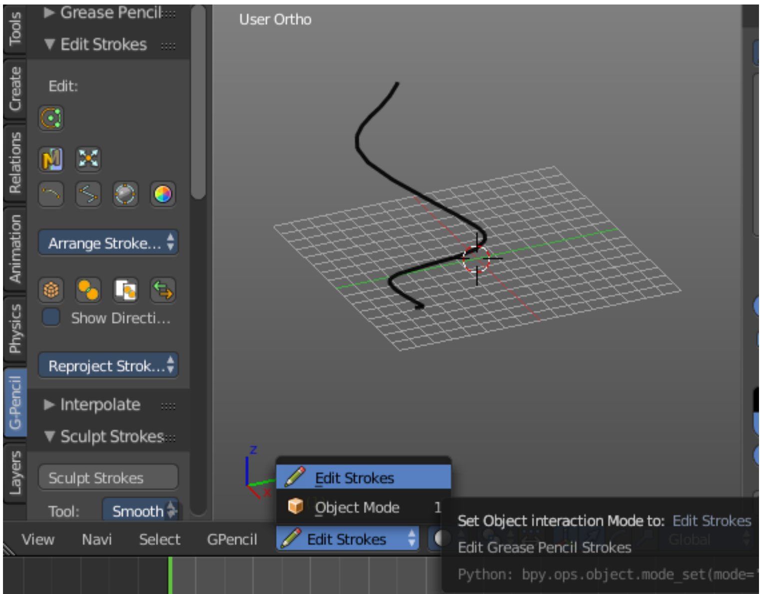
Tools



The Tools section contains one tool. Ruler/Protractor. It activates a ruler protractor tool with which you can measure distances.



Edit Strokes

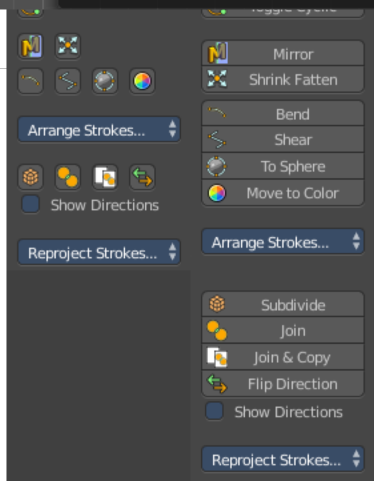


Sometimes you want to edit the strokes that you have placed. Edit Strokes is a mode of the 3D view. And can be entered in the header of the 3d view in the modes drop-down box.

When you are in Edit Strokes mode, then you will see the Edit Strokes Panel. Where you will find the tools to edit the Grease Pencil strokes.

Edit Strokes Panel

The Edit Strokes Panel contains the tools to edit the Grease Pencil strokes. Most of the tools are pretty self explaining.



Note!

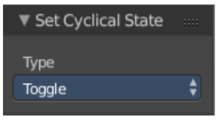
The Edit Strokes Panel is just visible in Edit Strokes Mode!

Toggle Cyclic

Toggle Cyclic closes a stroke to become a loop.

Last operator Set Cyclical State

The Last operator for Toggle cyclic contains a drop-down box where you can adjust the cyclic state.



Mirror

Mirror mirrors the selection.

Last Operator Mirror

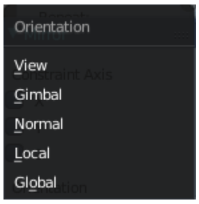
The Last Operator Mirror panel gives you tools to adjust the mirror action.

Constraint Axis

Constraint Axis gives you again the possibility to define the mirror axis. You can choose more than one axis here.

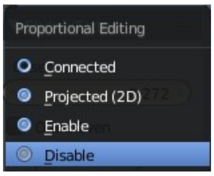
Orientation

Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.



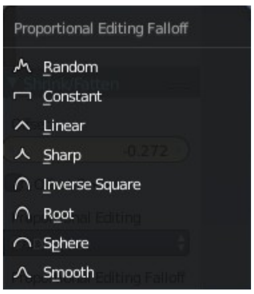
Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.



Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



Proportional size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

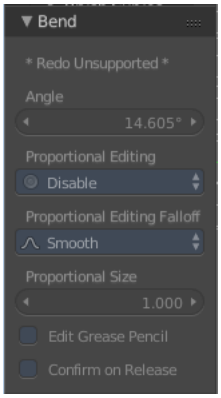
Confirm on Release

With Confirm on Release checked the action gets performed when you release the mouse button.

Shrink / Fatten

Shrink / Fatten shrink fattens the selection.

Bend

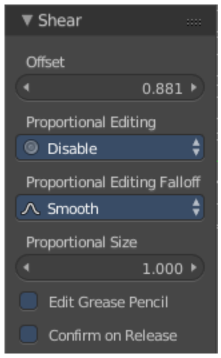


Bend bends the selection.

Last Operator Bend

The last operator Bend is disabled for Grease Pencil.

Shear



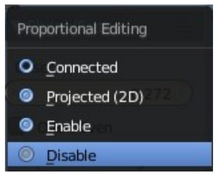
Shear shears the selection.

Last Operator Shear

Offset

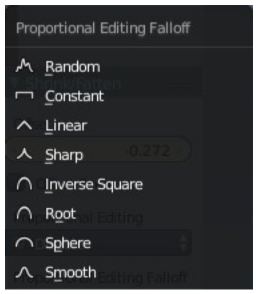
Adjust the offset

Proportional Editing



Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.

Proportional Editing Falloff



Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

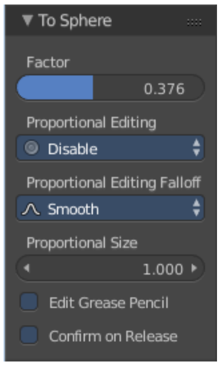
Confirm on Release

With Confirm on Release checked the action gets performed when you release the mouse button.

To Sphere

To Sphere transforms the selection into a spherical form.

Last Operator To Sphere

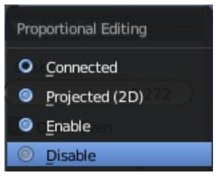


Factor

Adjust the rounding factor

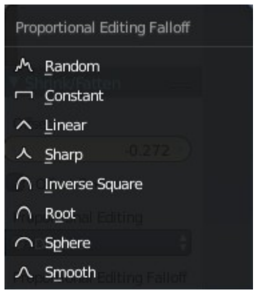
Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.



Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



Proportional Size

Adjust the proportional size

Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

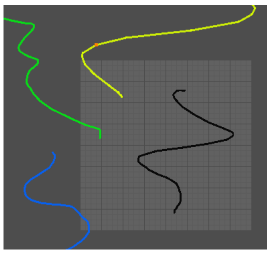
Confirm on Release

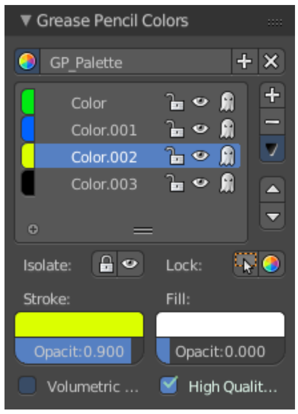
With Confirm on Release checked the action gets performed when you release the mouse button.

Move to Color

Recolors the currently selected grease pencil stroke with the active color in the Grease Pencil Colors color.

The grease pencil colors can be found in the properties sidebar at the right.





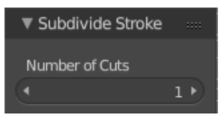
Arrange Strokes drop-down box

Arrange the layering of the current stroke.

Subdivide

Subdivide subdivides the current selection.

Last Operator Subdivide Stroke



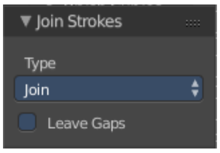
Number of Cuts

Adjust the number of subdivisions

Join

Joins strokes.

Last Operator Join Strokes



Type

Here you can choose if it should only join, or join and also copy the strokes.

Leave Gaps

Leave Gaps between joined strokes instead of linking them.

Join & Copy

Joins strokes and copies it.

For last operator see above.

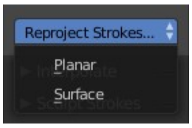
Flip Direction

Change the direction of the stroke.

Show Directions

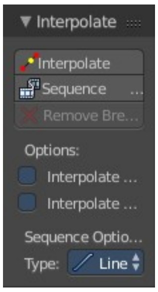
Shows the direction of the stroke by displaying a green dot at the beginning, and a red dot at the end of the stroke.

Re project Strokes Drop-down Box



Here you can re project the stroke(s) planar or across the surface of the target object as if you would have drawn it new to the current viewport.

Interpolate Panel



The Interpolate Panel provides some tools for interpolation between different animation frames.

Note!
The Interpolate Panel is just visible in Edit Strokes Mode!

Interpolate

Interpolate Grease Pencil Strokes between frames.

Sequence

Generate In-Betweens for smooth interpolation between Grease Pencil Frames.

Remove Breakdowns

Remove Breakdown Frames generated by interpolation between two Grease Pencil frames.

Interpolate all Layers

Interpolate all layers, not only active

Interpolate selected Strokes

Interpolate only selected strokes in the original frame

Sequence Options, Type

Sequence Options, Type is a drop-down box where you can choose between three different effect types. Interpolation, Easing and Dynamic Effects. You can get even more options, depending of the type you choose here.

Sculpt Strokes Panel

The Sculpt Strokes Panel provides tools to sculpt the Grease pencil strokes.

> **Note!**
>
> The Sculpt Strokes Panel is just visible in Edit Strokes Mode!

Sculpt Strokes Button

The Sculpt Strokes Button activates the Sculpt brush. Now you can sculpt the Grease Pencil stroke with left mouse button. Clicking with right mouse button ends the sculpt mode.

Radius

The radius of the sculpt brush.

The button behind the edit box allows you to set the radius by moving the mouse. This should be done in the viewport and with the hotkey. This button is just a visible reminder.

Strength

The strength of the sculpt brush.

The button behind the edit box allows you to set the strength by moving the mouse. This should be done in the viewport and with the hotkey. This button is just a visible reminder.

Use Falloff

Defines if the brush has a falloff from the centre to the border of the pencil.

Position

The Brush affects the position of the point.

Strength

The Brush affects the strength of the point.

Thickness

The Brush affects the thickness of the point.

Selection Mask

Only sculpt the selected points.

Alpha

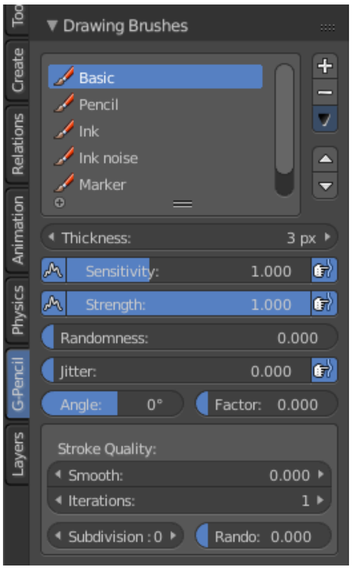
Alpha value for selected vertices.

Affect Pressure

Affect pressure values as well when smoothing strokes.

Drawing Brushes panel

The Drawing Brushes panel contains everything around the Brushes and their settings. It is visible in all modes. But the content just shows when you have activated the draw tool already.



Brushes selection box

Here you can choose different brush types. At the right you can add and remove brushes. And you can sort the brushes order.

Thickness

Defines the thickness of the stroke.

Sensitivity

Pressure sensitivity for new strokes.

Strength

Color strength for new strokes. The alpha factor of the color is affected.

Randomness

Randomness factor for pressure and strength of new strokes.

Jitter

Jitter factor for new strokes.

Angle

Direction of the stroke at which the brush gives the maximum thickness.

Factor

Reduce Brush thickness by this factor when stroke is perpendicular to angle direction

Smooth

Amount of smoothing to apply to newly created strokes to reduce jitter / noise.

Iterations

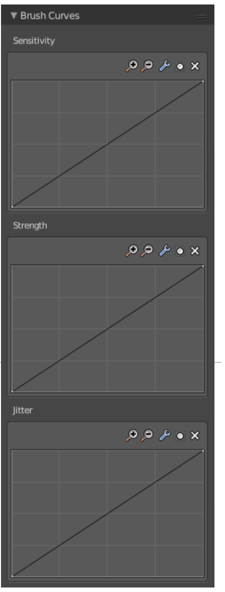
Number of times to smooth newly created strokes.

Subdivision

Number of times to subdivide newly created strokes, for less jagged strokes.

Randomness

Randomness factor for new strokes after subdivision.



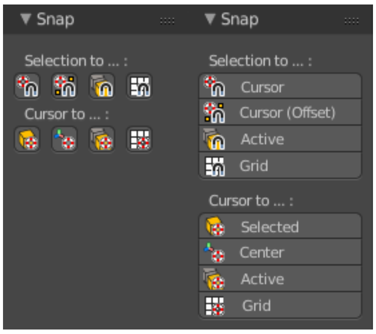
Brush Curves Panel

The Brush curves panel is meant for usage with tablets. Here you can manipulate the curves for Sensitivity, Strength and Jitter.

Tool Shelf in all Modes - Tools Tab - Snap panel

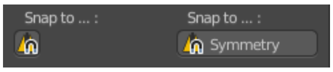
Snap Panel

The Snap panel contains the snapping tools.



The one half snaps a selected element to ...
The other half snaps the 3D cursor to ...

In Edit Mode with Mesh object you will also have the Snap to Symmetry tool here.



Selection to Grid

Selection to Grid snaps the selected element(s) to the closest Grid point.

Selection to Cursor

Selection to Grid snaps the selected element(s) to the 3D cursor. ALL selected elements will end at cursor position. For example all selected vertices.

Selection to Cursor (Offset)

Selection to Grid snaps the selected element(s) to the 3D cursor. The centre of the selected elements will snap to the 3D cursor. A group of vertices for example will remain its shape.

Selection to Active

Selection to Active snaps the selected element(s) to the current active element.

Cursor to Selected

Cursor to Selected snaps the 3D cursor to the selected element.

Cursor to Centre

Cursor to Centre snaps the 3D cursor to the centre of the world.

Cursor to Grid

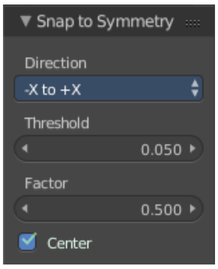
Cursor to Grid snaps the 3D cursor to the closest Grid point.

Cursor to Active

Cursor to Grid snaps the 3D cursor to the current active element.

Snap to Symmetry

Tries to snap the selected vertices symmetrical along the chosen world orientation.



Last Operator Snap to Symmetry

Direction

The calculation direction.

Threshold

The threshold defines the radius in which matching vertices gets located. When you get a warning that snapping failed try increasing the threshold value.

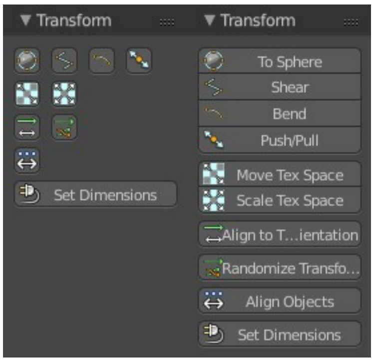
Factor

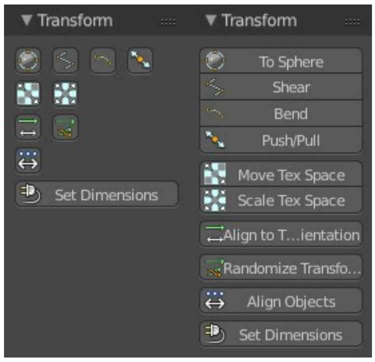
The snapping factor. Blend mirrored locations from one side to the other. 0.5 is blending both sides equal.

Center

Snap vertices in the center axis to zero.

Tool Shelf in all Modes - Tools Tab - Transform panel





Transform is a menu that contains some special transform functionality. It exists in all modes. But is not functional in all modes.

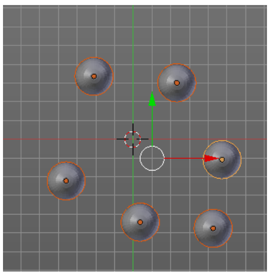
In Edit Mode with a mesh object we have a few more options. For armatures we have some tools fewer, and one more. Align Bones.

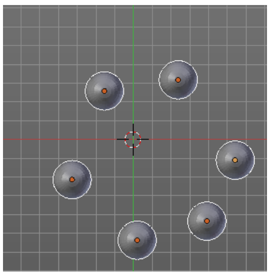
Set dimensions is an addon meant for Mesh Objects in Edit Mode. Using it will lead you to Edit mode.

In Object mode some tools requires to have more than one object selected. To Sphere for example.

To Sphere

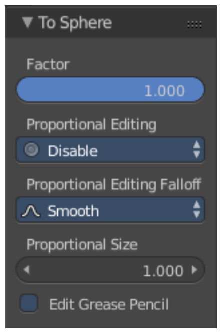
To Sphere tries to transform the selection to a sphere shape, using the center of the selected objects as a center point for the operation.





While the operation you will see in the header the strength value for the spherical shape.

Last Operator To Sphere

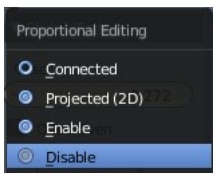


Factor

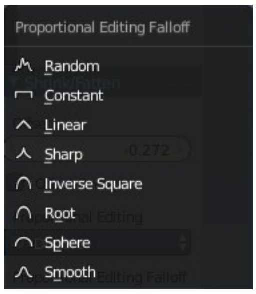
A edit box where you can adjust the strength of influence of the tool.

Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.



Proportional Editing Falloff



Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

Proportional Size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

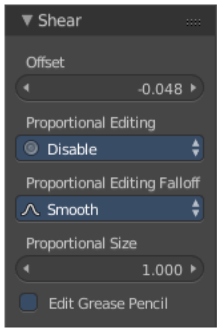
Shear

Shear shears the object positions relative to the center of the selection.

While the operation you can press x or y to change the direction of shearing.

While the operation you will see the strength value in the header.

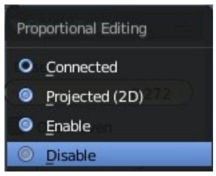
Last Operator Shear



Factor

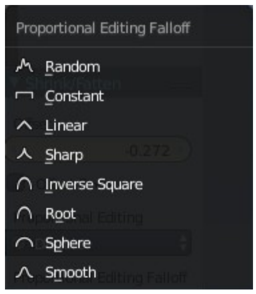
A edit box where you can adjust the strength of influence of the tool.

Proportional Editing



Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.

Proportional Editing Falloff



Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

Proportional Size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

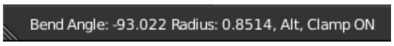
Bend

Bends the selected objects between 3D cursor and mouse.

HOTKEY ONLY TOOL!

You might want to add/use a hotkey here, since the operation calculates from the mouse position starting point. And the menu item might not be at the wanted position.

While the operation you will see in the header the strength value for the bend. Holding down Alt turns off Clamp.

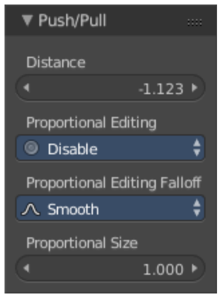


The Last operator for Bend is greyed out. Undo is not supported.

Push/Pull

In Object mode this tool requires to have more than one object selected. It pushes or pulls the object positions relative to the center of the selection.

Last Operator Shear

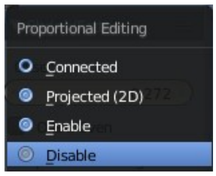


Factor

A edit box where you can adjust the strength of influence of the tool.

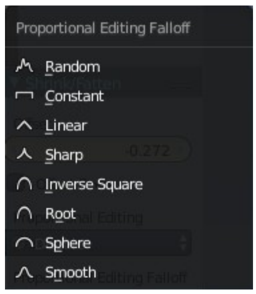
Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.



Proportional Editing Falloff

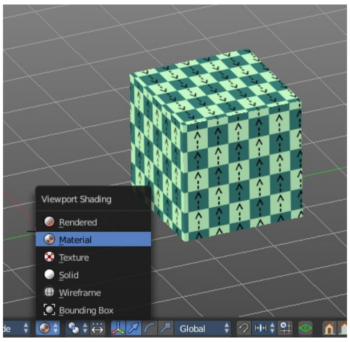
Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



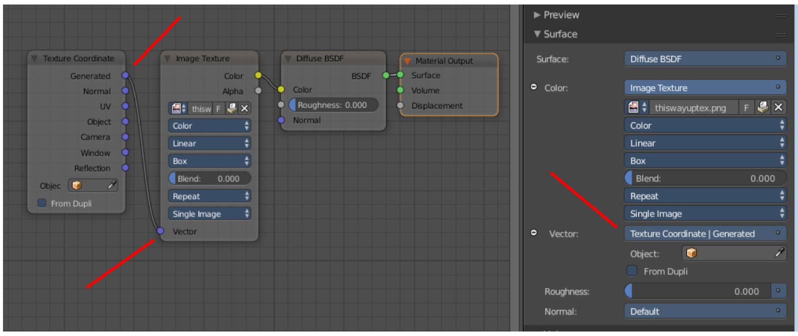
Proportional Size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

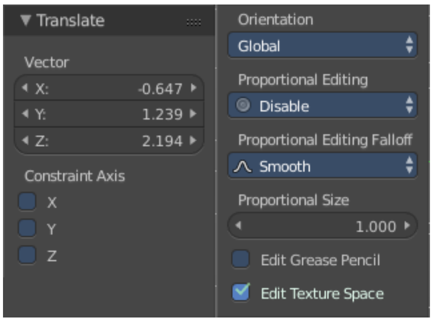
Move Texture Space



This tool relies at the move tool. With the difference that it moves the texture space instead of the object. It has also a very special use case, and just works with a material with a Texture Coordinate / Generated node. And requires to have the shading at Material or Rendered to see a result in the viewport.



Last Operator Translate



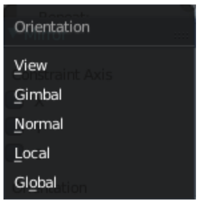
Vector

Here you can adjust the position values for the three axis.

Constraint Axis

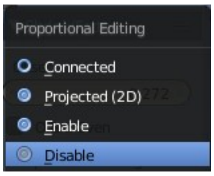
Here you can limit the position relative to the source object.

Orientation



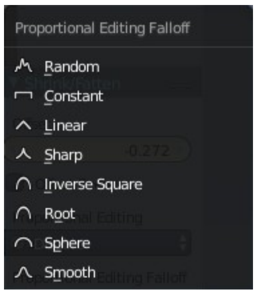
Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.

Proportional Editing



Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.

Proportional Editing Falloff



Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

Proportional Size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

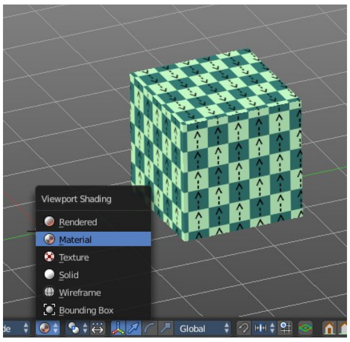
Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

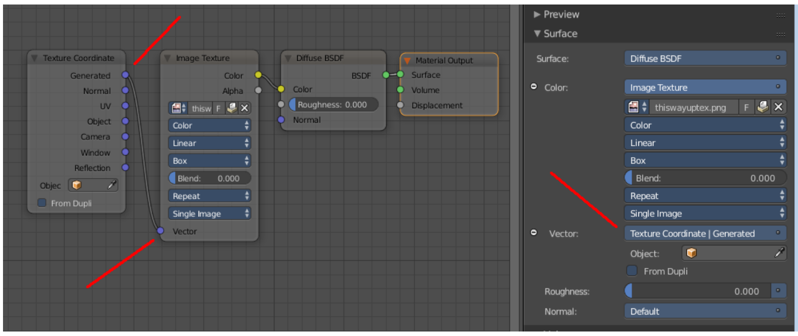
Edit Texture Space

With Confirm on Release checked the action gets performed when you release the mouse button.

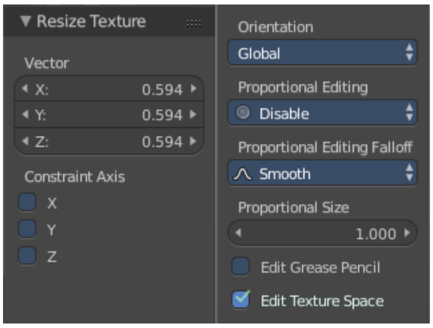
Scale Texture Space



This tool relies at the scale tool. With the difference that it scales the texture space instead of the object. It has also a very special use case, and just works with a material with a Texture Coordinate / Generated node. And requires to have the shading at Material or Rendered to see a result in the viewport.



Last Operator Resize Texture



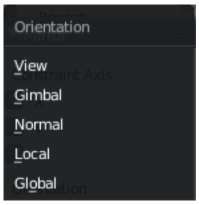
Vector

Here you can adjust the position values for the three values

Constraint Axis

Here you can limit the position relative to the source object.

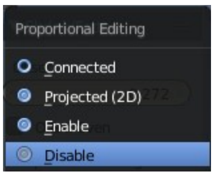
Orientation



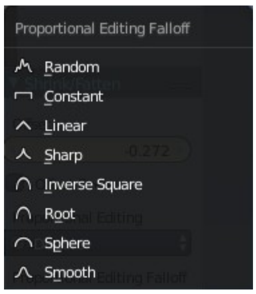
Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.

Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.



Proportional Editing Falloff



Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

Proportional Size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

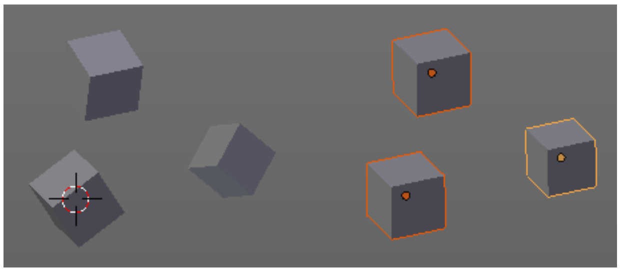
Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

Edit Texture Space

With Confirm on Release checked the action gets performed when you release the mouse button.

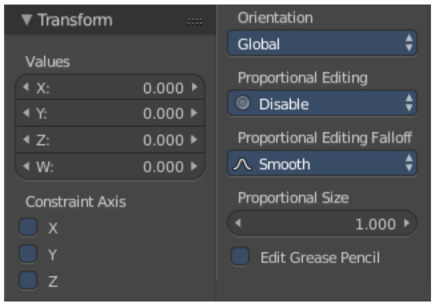
Align to Transform Orientation



Rotates the selected objects so that their local orientation matches the active transform orientation in the Transform orientation panel or the *Orientation* selection in the Transform Operator panels.

For example when you have a few cubes that are rotated differently, then perform align to transform orientation with Global coordinates, then the cubes rotations gets set back to 0/0/0

Last Operator Transform



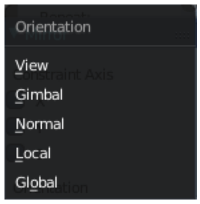
Align Transform Orientation is a subset of the Transform tool. And so it comes with the full set.

Values

The transform values for the single axis.

Constraint Axis

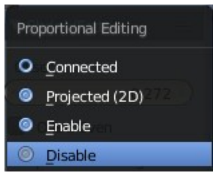
Here you can limit the transform of single axis.



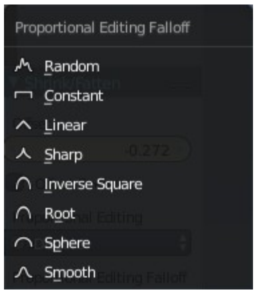
Orientation

Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.

Proportional Editing



Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.



Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

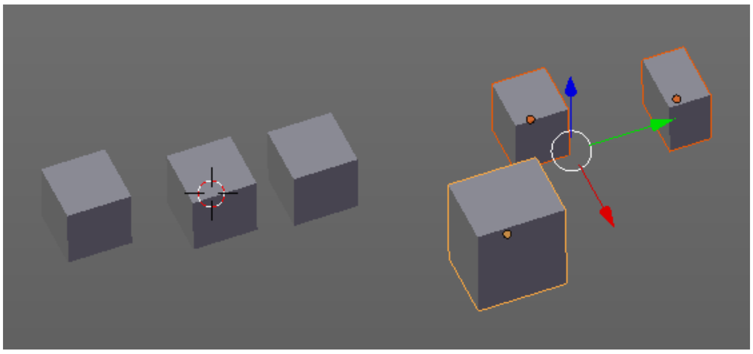
Proportional Size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

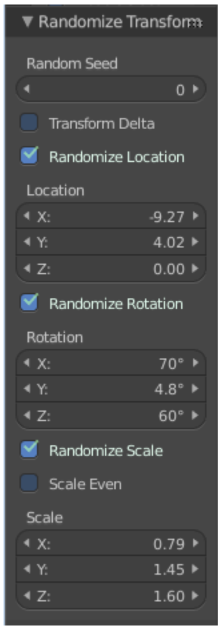
Randomize Transform



This tool allows to randomize position rotation and scale of selected objects. Each object gets threaten individually by a random value.

It starts with zeroed values. You need to adjust the values in the last operator.

Last Operator Randomize Transform



Random Seed

Here you can adjust the random seed value.

Transform Delta

Randomize Delta transform values instead of the regular transform values.

Randomize Location checkbox

With this checkbox ticked the location of the selected objects gets randomized.

Location edit boxes

Here you can adjust the strength of the transform for the single axis.

Randomize Rotation checkbox

With this checkbox ticked the rotation of the selected objects gets randomized.

Rotation edit boxes

Here you can adjust the strength of the transform for the single axis.

Randomize Scale checkbox

With this checkbox ticked the scale of the selected objects gets randomized.

Scale Even

Use the same scale values for all axis.

Scale edit boxes

Here you can adjust the strength of the transform for the single axis.

Align Objects

Align Objects allows you to align the selected objects in various ways. You need to adjust the settings in the Last operator panel. The align operation happens in world coordinates.

Last Operator Align Objects

High Quality

When ticked the calculation gets performed in a higher precision.

Align Mode

Align Mode is a drop-down box where you can choose between different align modes.

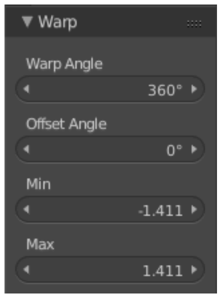
Relative To

Relative to is a drop-down box. Here you adjust in what method the alignment happens. Relative to the active object, to the center of selection, to the 3D cursor or to the scene origin.

Align

Here you can turn on or off the single axis for the align operation.

Warp



Edit Mode only! Warps the selected vertices around the 3D cursor.

Last Operator Warp

Warp Angle

The amount to wrap around the 3D cursor.

Offset Angle

Angle to use as the basis for warping

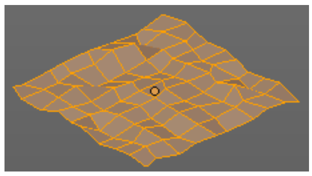
Min

The minimum amount

Max

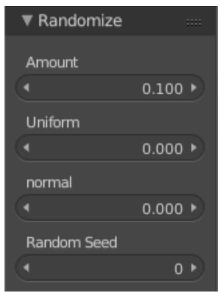
The maximum amount

Randomize



Edit Mode Only! Randomizes the positions of the selected vertices.

Last Operator Randomize



Amount

The distance to offset.

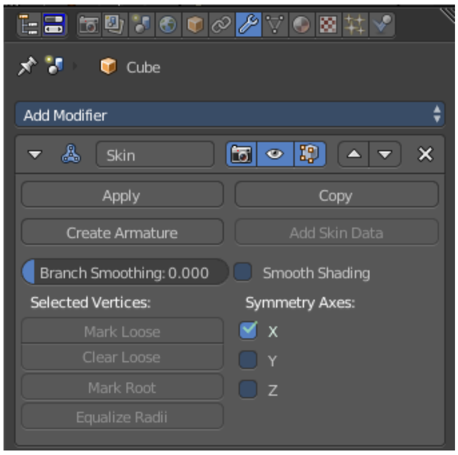
Uniform

Increase for uniform offset distance.

Normal
Align Offset direction to normals.

Random Seed
The seed for the random number generator.

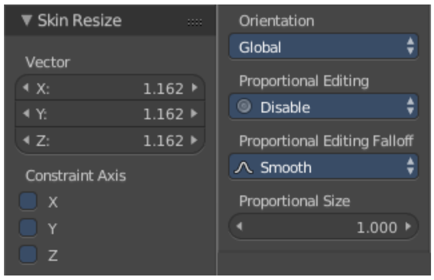
Skin Resize



This tool requires to have a skin modifier at the mesh. It scales the thickness of the skin.

While the operation you will see in the header the strength value for the skin.

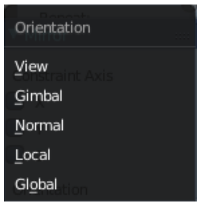
Last Operator Skin Resize



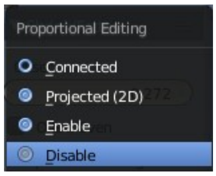
Vector
Here you can adjust the position values for the three values.

Constraint Axis
Here you can limit the position relative to the source object.

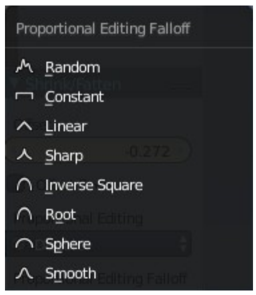
Orientation
Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.



Proportional Editing
Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.



Proportional Editing Falloff
Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



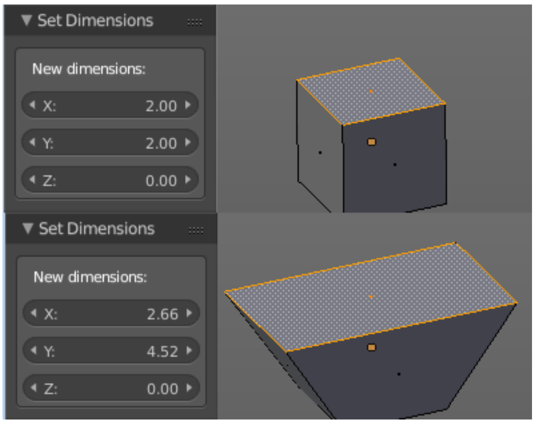
Proportional Size
Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Align Bones

Armature only.

Align bones aligns the selected bones.

Set Dimensions



Edit Mode Only!

Normally all scale operations in Bforartists are relative to the current selection and dimensions. Set dimensions allows to scale mesh selections in absolute world values. No matter how the initial values are. The new values gets set in the Last Operator.

Set dimensions is an add-on. You can turn it off in the add-ons section of the user preferences when you want.

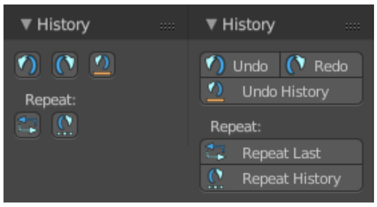
Last Operator Set Dimensions

New Dimensions

When you activate the tool then you will see the world coordinates of the selection. Here you can change the values to other world coordinates.

Tool Shelf in all Modes - Tools Tab - History Panel

History Panel



The History Panel contains the tools around undo , redo and repeat. It is in the Tools tab.

Undo

Undo undoes the previous action.

Redo

Redo redoes the previous action.

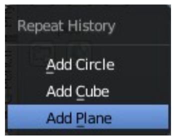
Undo History

Undo History opens a menu where you can redo a last action in history.

Repeat last

Repeat last repeats the last operation. For example, when you have moved a object by 5 in x, then it moves the object by 5 in x with every new repeat last step.

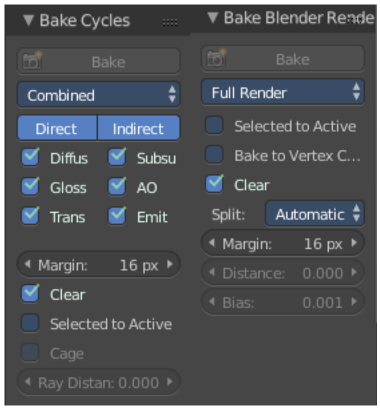
Repeat History



Repeat History calls a menu with the last actions where yon can choose an action to be repeated.

Tool Shelf in all Modes - Tools Tab - Bake Panel general

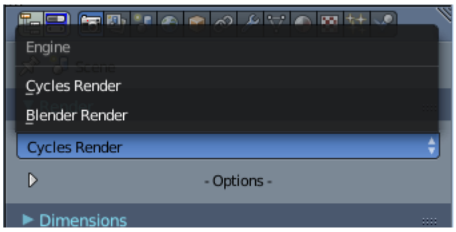
Bake Panel



Texture baking is the process to bake specific informations from one object into the texture or the vertex colors of another object. Ambient Occlusion. Or a Normal Map for example.

NOTE
Baking requires to have a working UV mapping and a texture at the target object!

How to use: Select the source object where you want to bake from, hold down Shift, select the target object where you want to bake to, so that both objects are selected. Adjust the settings to your needs. Then hit the Bake button.



Texture baking can be done with two available render engines. Blender Internal. And Cycles. The list of available bake types differs a bit, even when some of the texture types are similar.

Which renderer gets used for baking can be adjusted in the Properties Editor.

When you have the Blender Render selected then the Bake Panel is called Bake Blender Render. When you have the Cycles Render selected then the Bake Panel is called Bake Cycles.

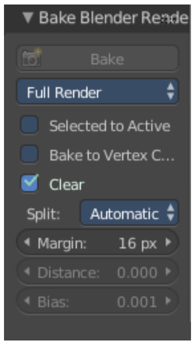
NOTE
The Bake panel is visible in all Modes. But you have to bake in Object Mode.

Tool Shelf in all Modes - Tools Tab - Bake Blender Render

When you have Blender Renderer selected then the Bake panel will show the settings to bake with Blender Render.

Texture baking uses the settings of the chosen renderer. This includes Antialias, Global Illumination, Ambient Occlusion, etc.

Settings for all Texture types



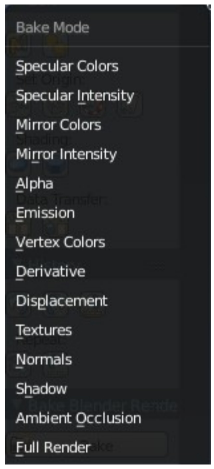
Most settings in the Bake panel are available for all texture types.

Bake

The Bake Button will start the baking process.

Bake Mode

Bake Mode is a drop-down box where you can choose what type of information you want to bake from the source object into the texture or the vertex colors of the target object.



You can bake Specular Colors, Specular Intensity, Mirror Colors, Mirror Intensity, Alpha, Emission, Vertex Colors, Derivate, Displacement, Textures, Normals, Shadow, Ambient Occlusion and Full Render.

Specular Colors

Bakes the specular colors of a material into the texture of the target object.

Specular Intensity

Bakes the specular intensity of a material into the texture of the target object.

Mirror Colors

Bakes the Mirror colors into the texture of the target object.

Mirror Intensity

Bakes the Mirror Intensity of a material into the texture of the target object.

Alpha

Bakes the Alpha channel colors of a material into the texture of the target object.

Emission

Bakes the Emission colors of a material into the texture of the target object.

Vertex Colors

Bakes the Vertex colors of the source object into the texture of the target object.

Derivate

Bakes the Derivate colors of a material into the texture of the target object.

Displacement

Creates a displacement map by using the vertex positions of the source object, and baking them as greyscale colors into the texture of the target object.

Textures

Bakes the texture colors of the source object into the texture of the target object.

Normals

Creates a Normal map by using the normals of the source object, and baking them as colors into the texture of the target object.

Shadow

Bakes the Shadow into the texture of the target object.

Ambient Occlusion

Bakes the Vertex colors of the source object into the texture of the target object.

Full Render

Bakes the full rendering, means materials, textures, lightning, into the texture of the target object.

Selected to Active

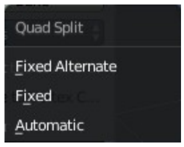
The usual way to bake is first select the Source Object, where you want to bake from, hold down Shift, select the target object where you want to bake to, so that both objects are selected. Then hit the Bake button. That's Selected to Active.

Bake to Vertex Color

Usually bake bakes into the texture of the target object. Bake to Vertex Color bakes the information into the Vertex colors of the mesh instead into the texture.

Clear

Clear clears the target image before baking.



Split

Here you can adjust the Quad Split method for baking.

Margin

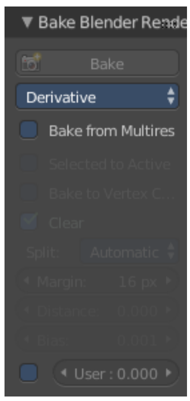
Adjust the margin width.

Distance

Maximum Distance in Blender Units from source object to target object(s).

Bias

Bias in Blender Units towards faces further away from the object(s).



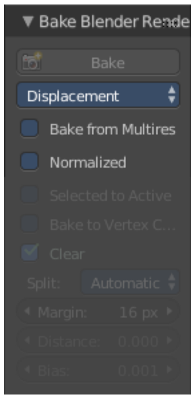
Settings for specific Texture types

Derivative

Bake from Multires

Bake directly from Multires mesh.

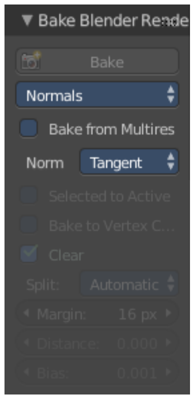
User
Here you can apply a user scale to the derivate map instead of automatically normalizing to 0-1.



Displacement

Bake from Multires
Bake directly from Multires mesh.

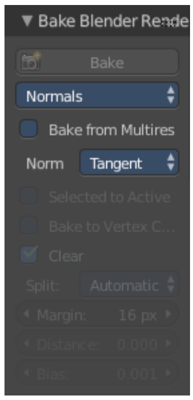
Normalized
Normalizes to the Distance.



Normals

Bake from Multires
Bake directly from Multires mesh.

Normal Space
Normal Space is a drop-down box where you can choose what normals to calculate.



Ambient Occlusion

Bake from Multires
Bake directly from Multires mesh.

Normalized
Normalizes without using material settings.

Tool Shelf in all Modes - Tools Tab - Bake Cycles

When you have Cycles as the Renderer selected then the Bake panel will show the settings to bake with Cycles Render.

Texture baking uses the settings of the chosen renderer. This includes Antialias, Global Illumination, Ambient Occlusion, etc.

Settings for all Texture types

Most settings in the Bake panel are available for all texture types.

Bake

The Bake Button will start the baking process.

Bake Type

Bake Mode is a drop-down box where you can choose what type of information you want to bake from the source object into the texture or the vertex colors of the target object.

You can bake Subsurface, Transmission, Glossy, Diffuse, Environment, Emit, UV, Normal, Shadow, Ambient Occlusion and Combined.

Subsurface

Bakes the Subsurface Passes of a material into the texture of the target object.

Transmission

Bakes the transmission Passes of a material into the texture of the target object.

Glossy

Bakes the Glossy Passes of a material into the texture of the target object.

Environment

Bakes the Environment texture into the texture of the target object. As seen from the center of the object.

Emit

Bakes the Emission or the glow color of a material into the texture of the target object.

UV

Bakes colors of materials and textures only, without shading.

Normals

Creates a Normal map by using the normals of the source object, and baking them as colors into the texture of the target object.

Shadow

Bakes the Shadow into the texture of the target object.

Ambient Occlusion

Bakes ambient occlusion as specified in the World panels. Ignores all lights in the scene.

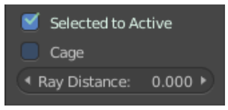
Combined

Bakes the full rendering, means materials, textures, lightning, into the texture of the target object. Except Specularity.

Margin
Adjust the margin width.

Clear
Clear clears the target image before baking.

Selected to Active
The usual way to bake is first select the Source Object, where you want to bake from, hold down Shift, select the target object where you want to bake to, so that both objects are selected. Then hit the Bake button. That's Selected to Active.

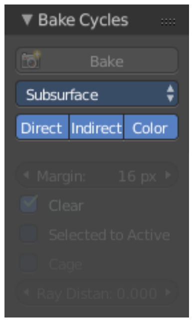
Cage


This setting is hidden as long as Selected to active is not ticked.

Cast Rays to active object from a cage.

Ray Distance
Distance to use for the inward ray cast when using Selected to Active.

Settings for specific Texture types



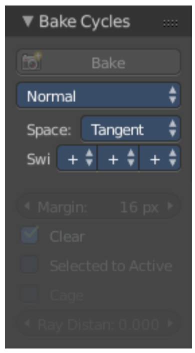
Subsurface, Transmission, Glossy, Diffuse

Direct
Add direct Light.

Indirect
Add indirect Light.

Color
Add Color.

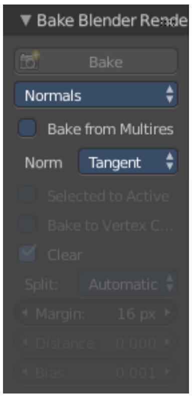
Normal



Space
A drop-down box where you can chooses the Normal Space to use.

Swizzle
Axis to bake in red, green and blue channels.

Normals



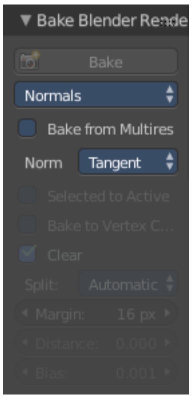
Bake from Multires

Bake directly from Multires mesh.

Normal Space

Normal Space is a drop-down box where you can choose what normals to calculate.

Ambient Occlusion



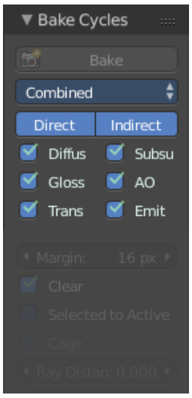
Bake from Multires

Bake directly from Multires mesh.

Normalized

Normalizes without using material settings.

Combined



Direct

Bake directly from Multires mesh.

Indirect

Normalizes without using material settings.

Diffuse

Bake with Diffuse.

Glossy

Bake with Glossy.

Transmission

Bake with Transmission.

Subsurface

Bake with Subsurface.

AO

Bake with Ambient Occlusion.

Emit

Bake with Emit.

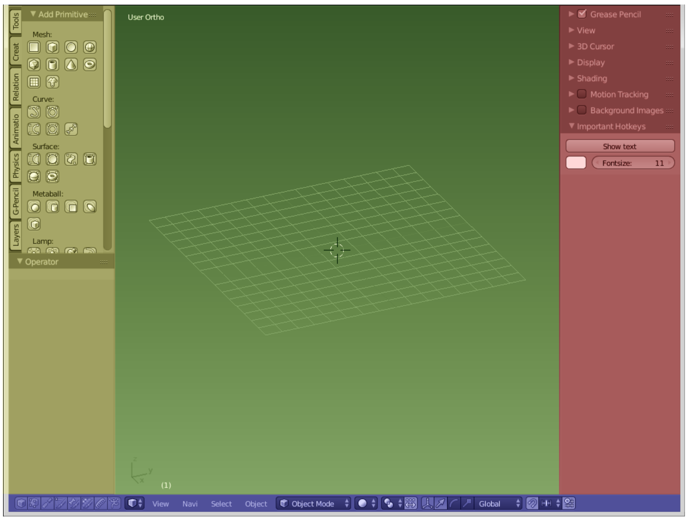
3D View by tools - Header

Detailed Table of content

3D View by tools - Header detailed

Introduction

The 3D View is made of several areas.



Yellow is the Tool Shelf.

Blue is the Header or Menu bar. It can be at the top or the bottom.

Green is the Viewport. Here you will see and work with your 3D data.

Red is the Properties Sidebar.

The content of the Tool Shelf , the Header and the Properties Sidebar can vary. It depends of the type of the objects and the modes that you are in.

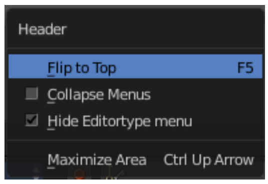
This chapter here is about the Header.

Header

The Header contains various menus, navigation elements and tools for the 3d view. This content vary, dependant of mode and object type. The navigation widget for example is not available in Sculpt Mode. The Object menu just in Object mode and so on.

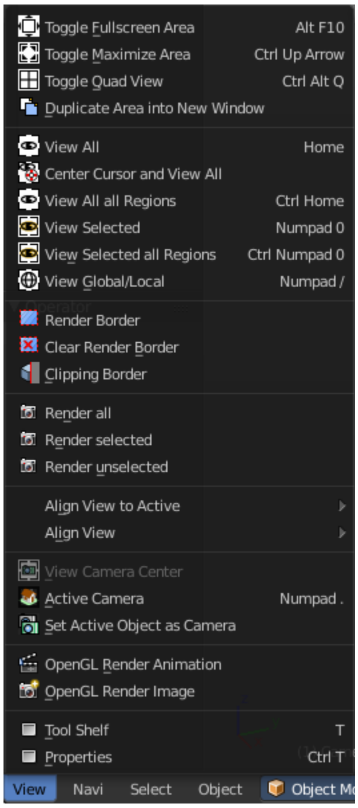
The header not only provides tools and menus. It is also the place where you will see specific informations when you perform an operation. When you move an object for example, then the menus hides, and you will see the actual transformation values in the header in real time.

The header has also some right click functionality. Or that you can show or hide a editor type menu where you can switch to other editor types. For this general header functionality, like to show the editor type menu, collapse menus, etc. please have a look at the chapter 2.2 Layouts.



All Modes - View Menu

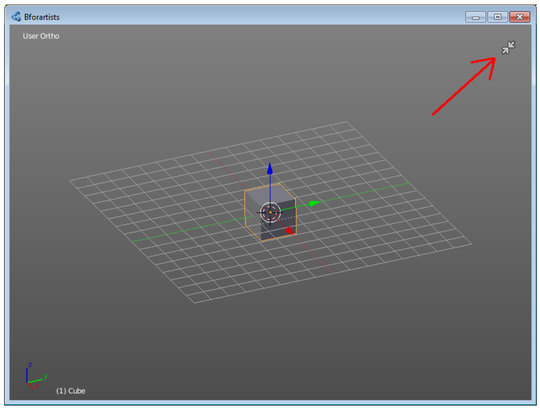
The View menu contains all View related tools. The range goes from tools to maximize the current window across align view tools up to rendering related tools for the viewport like Render Border.



Toggle Full screen Area

Displays the editor maximized without menus.

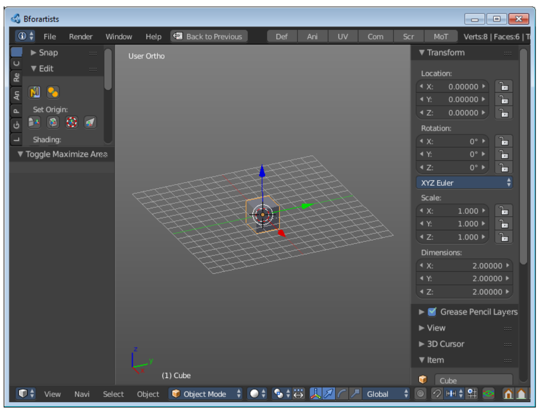
To return from the full screen view press hotkey Alt F10, or use the little button that appears up right when you move the mouse in this corner.



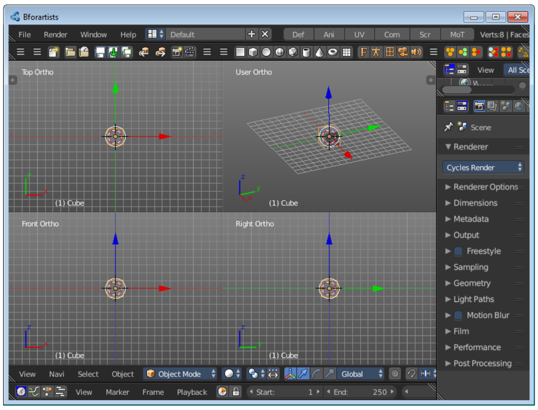
Toggle Maximize Area

Displays the editor maximized with menus.

To return to split view press hotkey Ctrl Up Arrow, or reuse the menu item in the View menu.



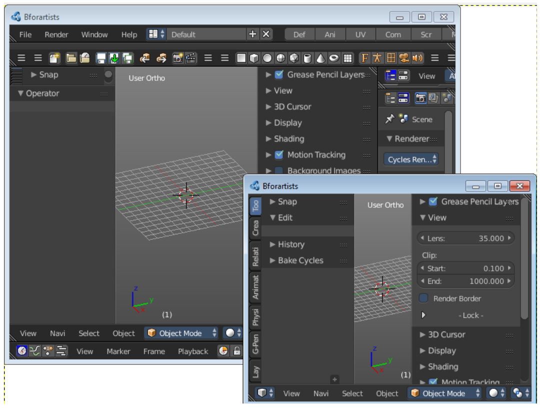
Toggle Quad view



Displays the 3D View divided into four screen parts.

To return to single view reuse the menu item in the View menu.

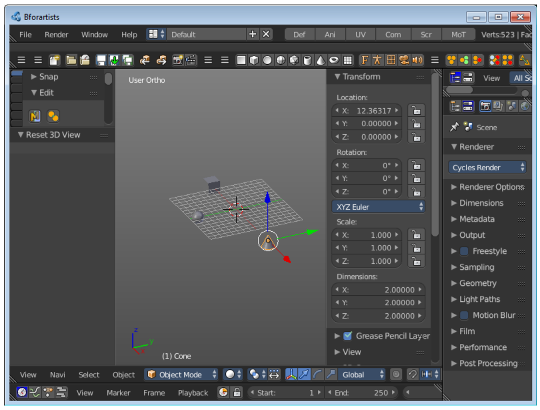
Duplicate Area into New Window



Duplicate Area into New Window makes the selected editor window floating. You can then drag it around at the monitor.

A separated window cannot be merged into the main window again. You have to close it when not longer needed.

View All

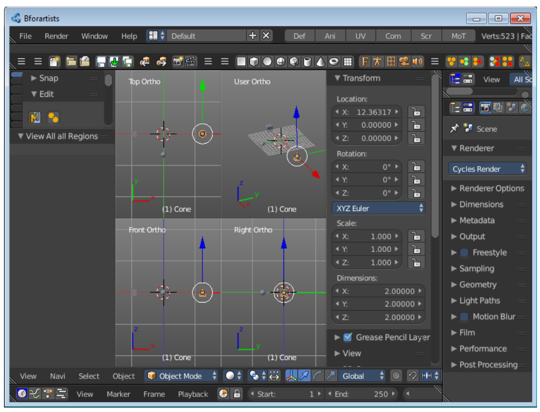


View all zooms in or out until all objects in the scene are displayed fitting in the viewport.

Center Cursor and View All

Center Cursor and View all centres the 3D Cursor at 0/0/0, and zooms in or out until all objects in the scene are displayed fitting in the viewport.

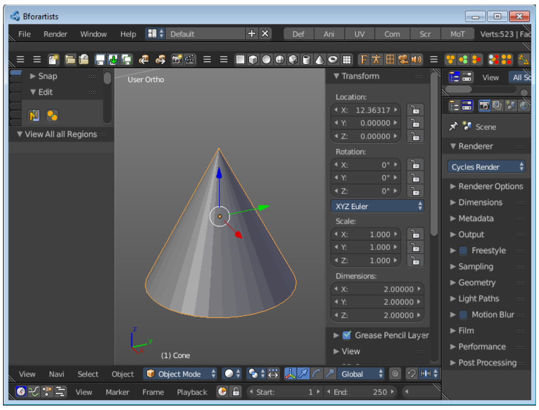
View All all Regions



View All all Regions works just in Quad View. It zooms in or out until all objects in the scene are displayed fitting in the four divided parts of the viewport.

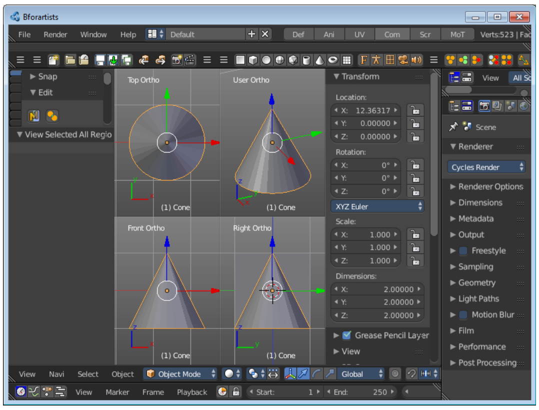
View Selected

View Selected zooms in or out until the Selection is displayed fitting in the viewport.



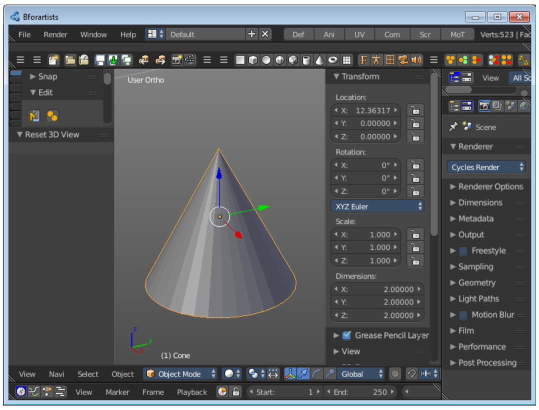
View Selected All Regions

View Selected all Regions works just in Quad View. It zooms in or out until the Selection in the scene are displayed fitting in the four divided parts of the viewport.



View Global / Local

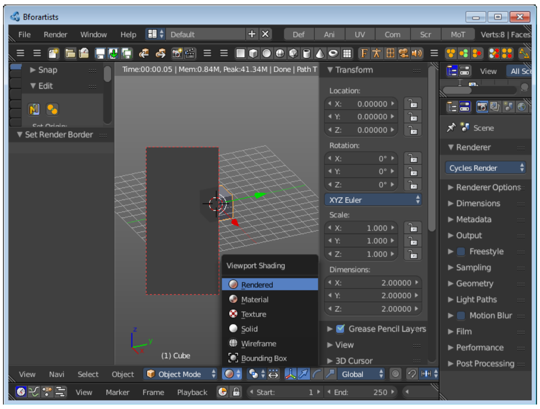
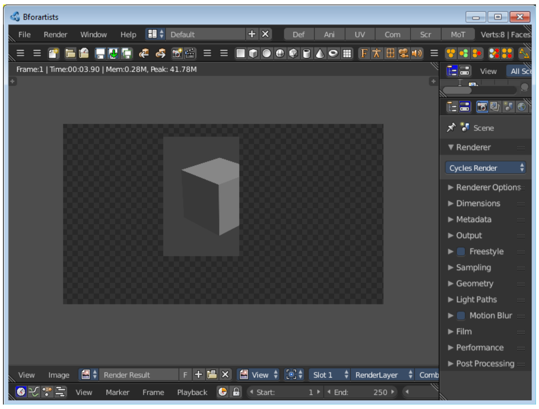
View Global / Local zooms in or out until the Selection is displayed fitting in the viewport. And hides all other objects but the Selection.



Render Border

With the Render Border you can drag a rectangle at the viewport to define a portion of the screen to render. The benefit here is to have much faster preview renderings. You just render what you want to judge, and not the whole image.

It has two use cases. The one is with the rendering through the camera. Just what is marked gets rendered. The other is directly in the viewport, with the Viewport shading method Rendered.

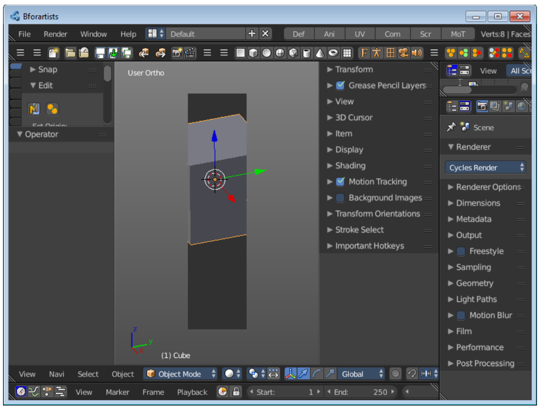
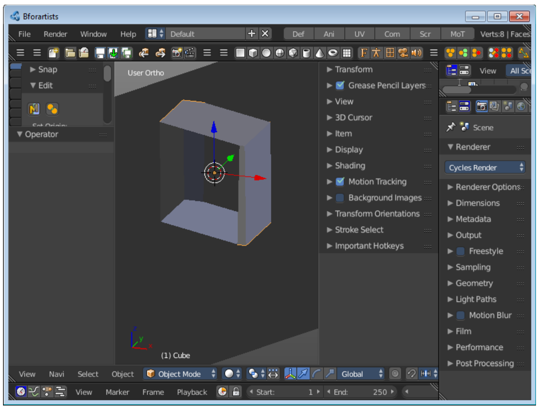



Clear Render Border

Removes the Render Border from the viewport.

Clipping

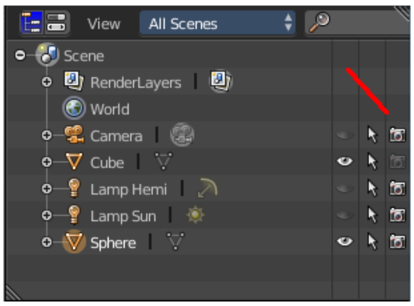
With clipping you can draw a rectangle that excludes the display of everything outside of this rectangle. That way you can look inside the geometry when you rotate the viewport. To clear the clipping use the tool again.

Clear All Restrict Render

Sets all Objects in the scene to be rendered. Have a look in the outliner, the camera row at the right.

This menu option just appears when there is a render able object in the viewport.



Restrict Render Unselected

Sets all unselected Objects in the scene to be rendered. The selected object(s) will be excluded from rendering now. Have a look in the outliner, the camera row at the right.

This menu option just appears when there is a render able object in the viewport

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Set Restrict Render

Sets the selected Objects in the scene to be rendered. The unselected objects will be excluded from rendering now. Have a look in the outliner, the camera row at the right.

This menu option just appears when there is a render able object in the viewport

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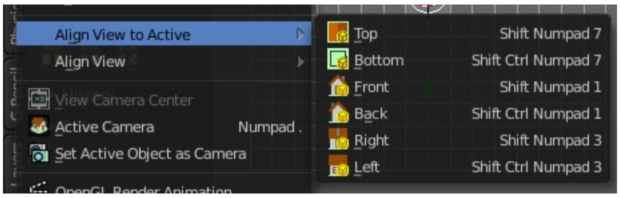
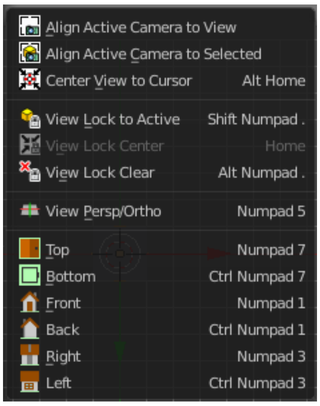
Align View to Active



Align View to Active is a menu where you can choose between different view align methods. The view gets aligned relative to the rotation of the currently active object. Not in World coordinates. The menu items should be self explaining. So we won't list them one by one.

Align View



Align View is a menu where you can choose between different view align methods. The view gets aligned at the world coordinates. Here we also find a few more align methods.

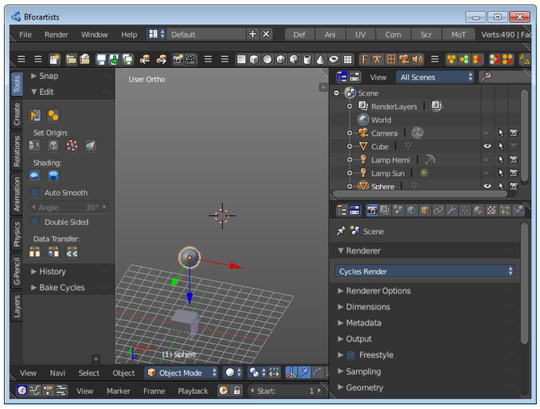
Align Active Camera to View

Aligns the active camera to the current view. This means you can navigate with the viewport camera, select the render camera, and align it with this tool, so that the render camera has the same position and angle than the viewport camera.

Align Active Camera to Selected

Aligns the active camera to the current selected object. This means you can navigate with the viewport camera, select the render camera, and align it with this tool, so that the render camera has the same position and angle than the selected object.

Center View to Cursor



Centres the view at the 3D cursor position.

View Lock to Active

Locks the view to the currently active object.

View Lock Center

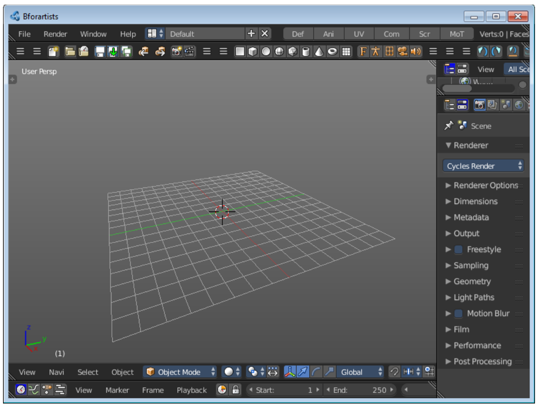
Centres the view to the currently active and locked object. This tool is just active when you have performed a View Lock to Active before.

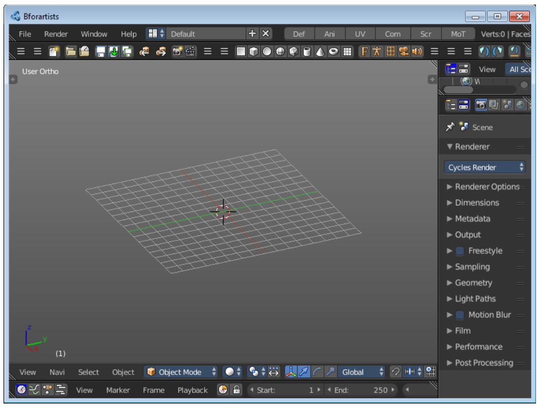
View Lock Clear

Removes the View Lock to Active from the object.

View Persp/Ortho

Toggles between perspectivic and orthographic view. Perspectivic view acts like a real camera with the perspectivic distortions. Orthographic view acts like a mathematical display of an object, without distortions.





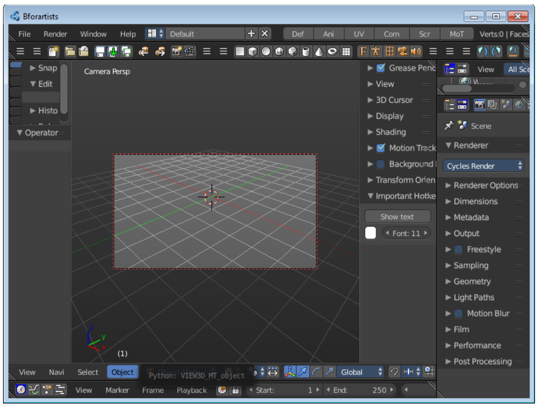
Top, Bottom, etc.

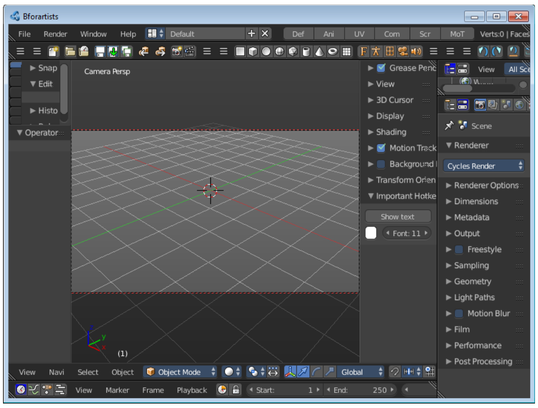
Switches to Top view, Bottom View, etc.

View Camera Center

This tool is of use when you are in camera view. It can be that the passepartout around the actual camera view field does not fit into the viewport. It can be too big or too small. It's already enough to resize the Tool shelf at the left or the Properties Sidebar at the right. And then it doesn't fit anymore.

View Camera center fits the camera view into the viewport.





Active Camera

Switches to Camera view and back to Viewport Camera.

Set Active Object as Camera

With this tool you can set any object to be the active camera where you render from.

OpenGL Render Animation

Renders an animation, using the Viewport OpenGL renderer. This can be useful for preview renderings.

Note
Note that this menu item is a double menu entry. The same menu item exists in the Render menu in the Info Header. But this is required when you work with more than one 3D view. When you use the entry in the Render menu, then it picks an arbitrary 3D view. When you use the menu entry in the 3D view, then it renders from this 3D view.

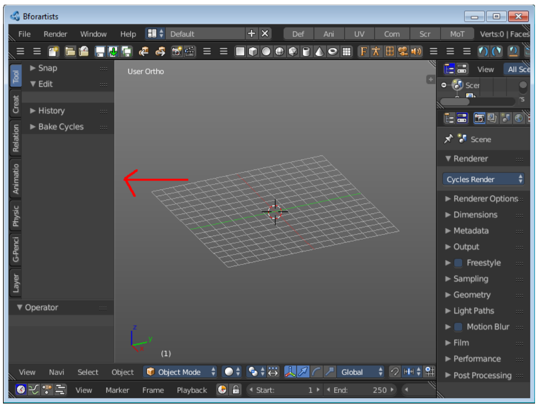
OpenGL Render Image

Renders an Image, using the Viewport OpenGL renderer. This can be useful for preview renderings.

Note
Note that this menu item is a double menu entry. The same menu item exists in the Render menu in the Info Header. But this is required when you work with more than one 3D view. When you use the entry in the Render menu, then it picks an arbitrary 3D view. When you use the menu entry in the 3D view, then it renders from this 3D view.

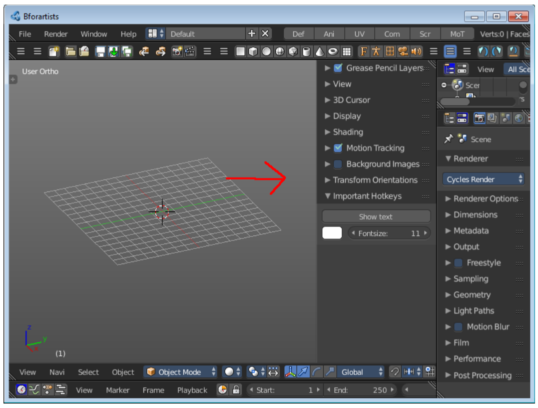
Tool Shelf

Opens or closes the Tool Shelf at the left side of the 3D Viewport.



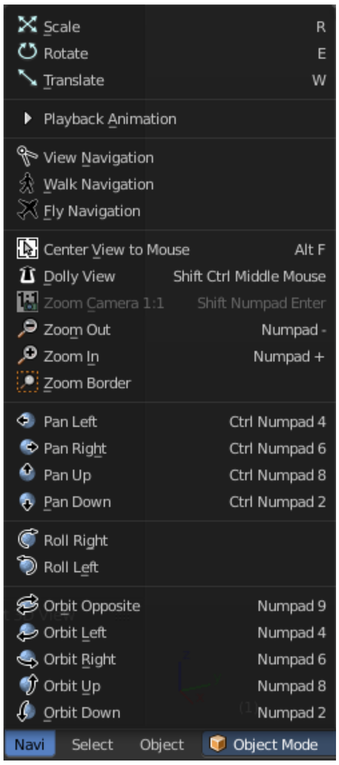
Properties

Opens or closes the Properties sidebar at the right side of the 3D Viewport.



All Modes - Navigation Menu

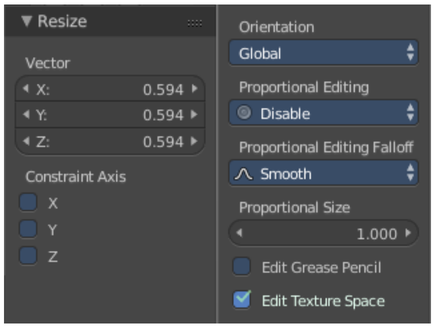
The Navigation menu provides you with all tools around viewport navigation.



Scale

Scales the selected object in the viewport by moving the mouse.

Last Operator Resize



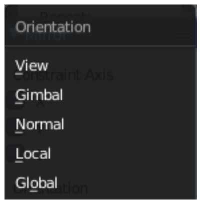
Vector

Here you can adjust the position values for the three values

Constraint Axis

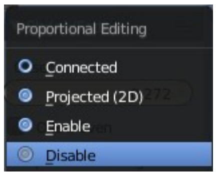
Here you can limit the position relative to the source object.

Orientation



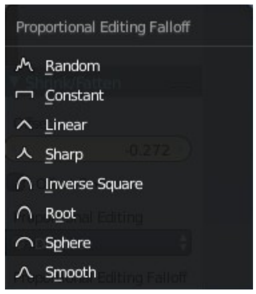
Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.

Proportional Editing



Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.

Proportional Editing Falloff



Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

Proportional Size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

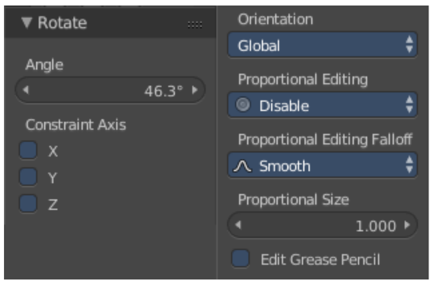
Edit Texture Space

With Confirm on Release checked the action gets performed when you release the mouse button.

Rotate

Rotates the selected object in the viewport by moving the mouse.

Last Operator Translate



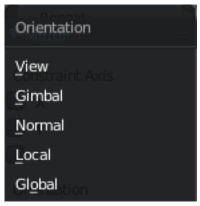
Angle

Here you can adjust the rotation angle.

Constraint Axis

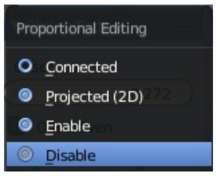
Here you can limit the position relative to the source object.

Orientation



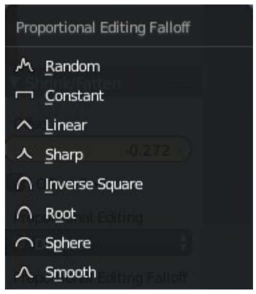
Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.

Proportional Editing



Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.

Proportional Editing Falloff



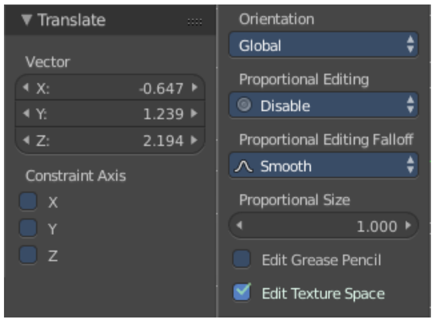
Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

Proportional Size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.



Translate

Moves the selected object in the viewport by moving the mouse.

Last Operator Translate

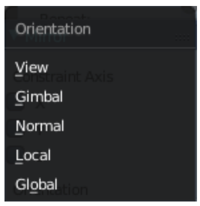
Vector

Here you can adjust the position values for the three values

Constraint Axis

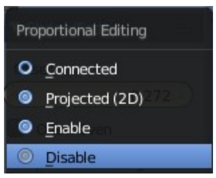
Here you can limit the position relative to the source object.

Orientation



Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.

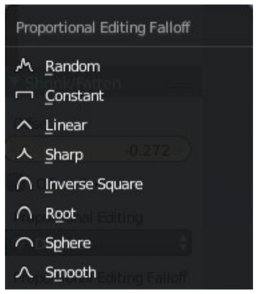
Proportional Editing



Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.

Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



Proportional Size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

Edit Texture Space

With Confirm on Release checked the action gets performed when you release the mouse button.

Playback Animation

Plays back an existing animation.

View Navigation

Switches to View Navigation Mode. In this view mode the view gets rotated moved and scaled from the Camera view point.

Walk Navigation

Switches to Walk Navigation. In this view mode the camera acts like a player in a first person shooter. Gravity will pull you down, The ground grid is the ground. And you can move around with wasd keys.

Fly Navigation

Switches to Fly navigation. In this view mode the camera acts like an air plane.

Center View to Mouse

Centres the view to the current mouse position.

Dolly View

Dolly View is a special zoom mode.

Be careful with this navigation method, you can easily trap yourself to not zoom able anymore!

Zoom Camera 1:1

Zooms the camera fitting to match the render output size by factor 1:1

Zoom In

Zooms into the viewport. Works also in camera view.

Zoom Out

Zooms out of the viewport. Works also in camera view.

Zoom Border

Draws a rectangle and zooms then to fit the size of this rectangle.

Zooming in is done with drawing the rectangle with left mouse button. Zooming out is done with drawing the rectangle with middle mouse button.

Pan Left

Pans the viewpoint to the left. The scene moves to the right.

Pan Right

Pans the viewpoint to the right. The scene moves to the left.

Pan Up

Pans the viewpoint upwards. The scene moves down.

Pan Down

Pans the viewpoint downwards. The scene moves up.

Roll Right

Rolls the viewport clockwise.

Roll Left

Rolls the viewport counter clockwise.

Orbit Opposite

Rotates the view by 180 degree.

Orbit Left

Orbits to the left.

Orbit Right

Orbits to the right.

Orbit Up

Orbits upwards.

Orbit Down

Orbits downwards.

All Modes, all Object types - Show / Hide

The Show/Hide menu is available for all object types and in all modes. It is usually in the object related menu to find. In Object mode it's the Object menu, for a curve object in edit mode it is the Curve menu. It always contains three menu items. Show Hidden, Hide Selected and Hide Unselected.

Show Hidden

Makes all objects in the scene visible again.

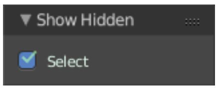
Hide Selected

Hides the selected objects.

Hide Unselected

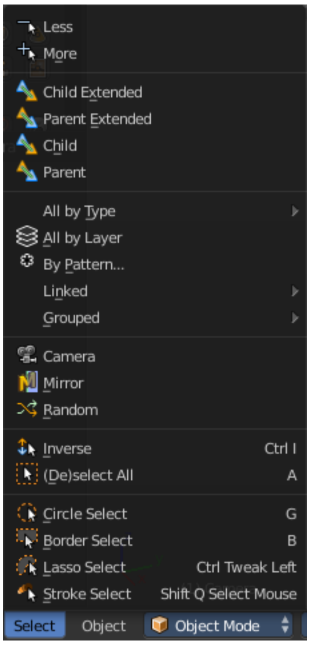
Hides the not selected objects. The selected object stays visible.

Last Operator Show Hidden



Here you can define if the selected or the unselected objects gets hidden.

Object Mode - Select menu



The select menu in Object mode is for all object types equal. It provides you with several selection methods.

Less

Less requires to have a parent or child relationship. It reduces the selection.

More

More requires to have a parent or child relationship. It expands the selection.

Child Extended

Child Extended requires to have a parent or child relationship. It selects the child object(s) of the currently selected object(s). But keeps the active object in the selection, even when it's not currently selected.

Parent extended

Parent extended requires to have a parent or child relationship. It selects the parent object of the currently selected object(s). But keeps the active object in the selection, even when it's not currently selected.

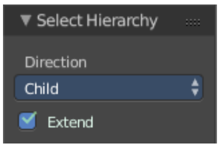
Child

Child requires to have a parent or child relationship. It selects the child object(s) of the currently selected object(s).

Parent

Parent requires to have a parent or child relationship. It selects the parent object of the currently selected object(s).

Last Operator Select Hierarchy



Child Extended, Parent Extended, Child and Parent share the same Last Operator. Called Select Hierarchy.

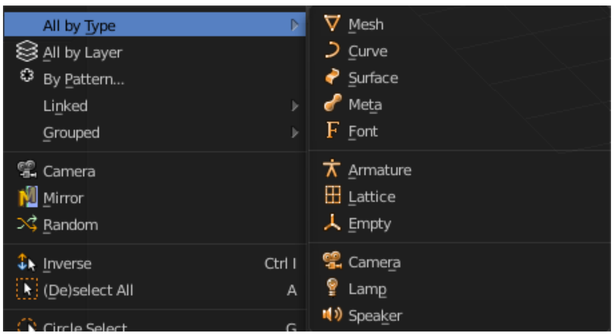
Direction

Direction is a drop-down box where you can adjust if child or parent objects gets selected.

Extended

This checkbox defines if the selection is extended or not. Extended means that it keeps the active object in the selection, even when it's not currently selected.

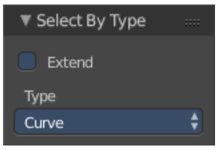
All by Type



All by Type is a menu where you can choose between the different object types to select.

The menu items are pretty self explaining. So we won't cover every single menu item here.

Last Operator Select By Type



Extend

With this option activated the selection does not clear before performing the selection operation, but extends. This means when you have a mesh object selected, and want to select all objects by type curve, then the mesh object is still selected. Without Extend just the curve objects are selected. The mesh object gets deselected.

Type

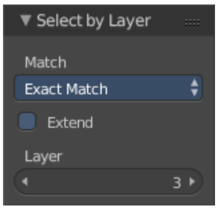
Type is a drop-down box where you can choose the object type to select again.

All by Layer

Selects all object in the defined layer.

You need to define the layer in the last operator panel. It's not enough to switch to let's say layer three, then perform the tool. The default value is Layer 1.

Last Operator Select by Layer



Match

Match is a drop-down box where you can choose if you want to select the objects that just exists at the current layer only. This is the option **Exact Match**. Or if you want to select objects too that exists at more than one layer. This is the option **Shared Layers.**

Extend

Extends existing selection instead of deselecting everything first.

Layer

The edit box where you can define the layer where you want to select the objects at.

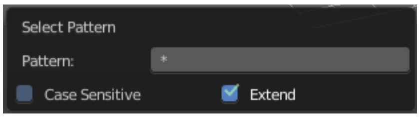
By Pattern

Selects all objects whose name matches the entered string. For missing parts you need to add an asterix.

For example, you have four cubes in the scene. Cube, Cube.001, Cube.002 and mycube3. Then the term " Cube " will just select the first cube. While the term " Cube* " will select the first three. And " *cube* " will select all four.

Supported wild-cards:

* matches everything
? matches any single character



[abc] matches characters in "abc"
[!abc] match any character not in "abc"

The tool operates immediately at entering the string.

Pattern

Here you can type in your string.

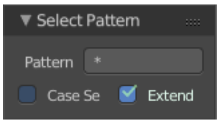
Case Sensitive

When ticked then the string comparison happens by taking upper and lower letters into account.

Extend

Extends existing selection instead of deselecting everything first.

Last Operator Select Pattern



The Last Operator Select Pattern contains the same menu items than the pop-up.

Pattern

Here you can type in your string.

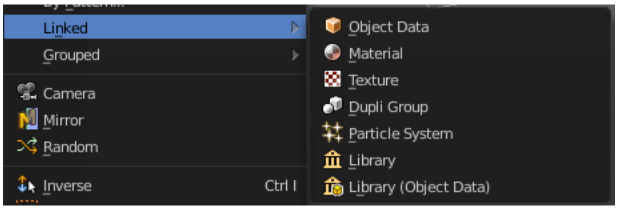
Case Sensitive

When ticked then the string comparison happens by taking upper and lower letters into account.

Extend

Extends existing selection instead of deselecting everything first.

Linked



Linked is a menu where you can select different types.

Here you can select all objects that shares a common data-block with the active object. *Select Linked* uses the active object as a basis to select all others.

Object Data

Selects every object that is linked to the same Object Data.

Material

Selects every object that is linked to the same material data-block.

Texture

Selects every object that is linked to the same texture data-block.

Dupligroup

Selects all objects that use the same Group for duplication.

Particle System

Selects all objects that use the same Particle System.

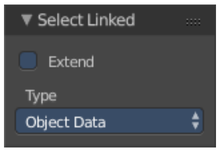
Library

Selects all objects that are in the same Library

Library (Object Data)

Selects all objects that are in the same Library and limited to object data.

Last Operator Select Linked



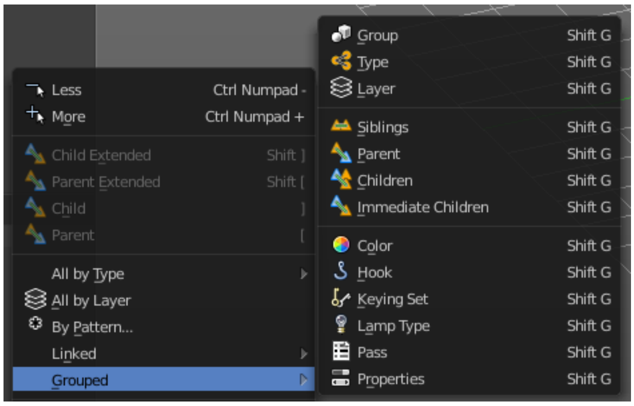
Extend

Extends existing selection instead of deselecting everything first.

Type

Type is a drop-down list where you can choose the Linked type again.

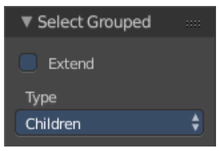
Grouped



Grouped is a menu where you can select different types of objects within the group. It requires to have a group selected.

The menu items are pretty self explaining. So we won't go into detail here.

Last Operator Select Grouped



Extend

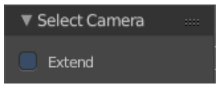
Extends existing selection instead of deselecting everything first.

Type

Type is a drop-down list where you can choose the Linked type again.

Camera

Selects the active camera.



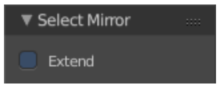
Last Operator Select Camera

Extend

Extends existing selection instead of deselecting everything first.

Mirror

Select the mirrored parts of an object. For example for L.Sword it selects R.Sword.



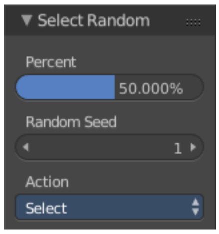
Last Operator Select Mirror

Extend

Extends existing selection instead of deselecting everything first.

Random

Selects random objects.



Last Operator Select Random

Percent

The Percentage of objects that should be selected randomly.

Random Seed

The Seed for the random number generator.

Action

Action is a drop-down box where you can choose if you want to select or to deselect random.

Inverse

Inverts the current selection.

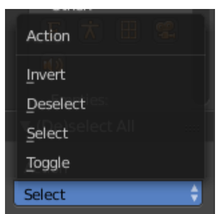
(De)Select All

Toggles between select all and deselect all.

Last Operator (De)Select All

Action

Action is a drop-down box where you can choose between different methods.



Invert

Inverts the selection.

Deselect

Deselects all.

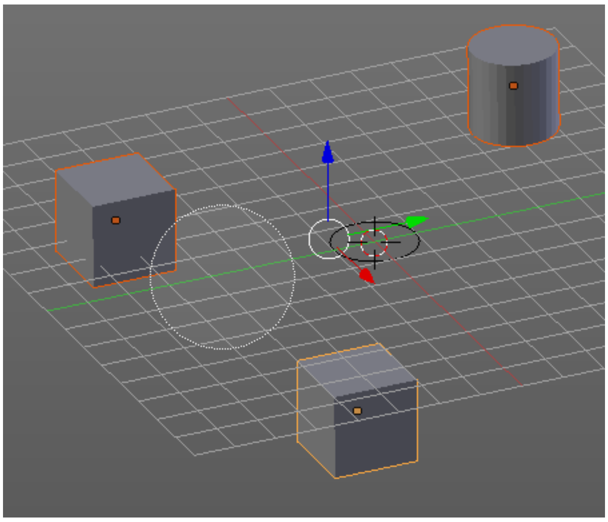
Select

Selects all.

Toggle

Toggles between select all and deselect all.

Circle Select



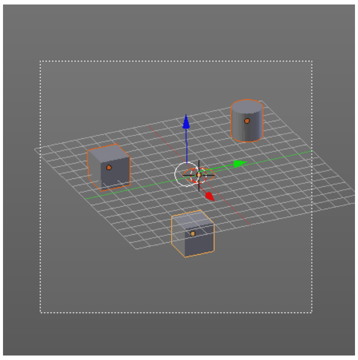
Circle select enters the Circle Select mode. This is a special select mode where you can select elements by moving with the mouse over it. It adds to selection by default.

To subtract from selection hold down Shift key. To exit the Circle select click with the right mouse button.

The pencil radius of the circle select tool can be adjusted with the scroll wheel.

Note
You cannot navigate while you are in Circle Select mode. You have to leave the Circle Select mode, do the navigation, then re-enter the Circle Select mode.

Border Select



Border select enters the Border Select mode. This is a special select mode where you can select elements by dragging a rectangle. And what's inside of the rectangle gets selected then. It adds to selection by default.

To subtract from selection hold down Shift key.

The selection gets applied when you release the mouse. You leave the mode automatically when you release the mouse.

Lasso Select

Lasso select enters the Lasso Select mode. This is a special select mode where you can select elements by dragging a form around what you want to select. And what's inside of the rectangle gets selected then. It adds to selection by default.

To subtract from selection hold down Shift key.

The selection gets applied when you release the mouse. You leave the mode automatically when you release the mouse.

Note

You can of course also start with clicking at the menu item. But this tool is by design a hotkey only tool. Hold down Ctrl , and select with left mouse button.

Stroke Select

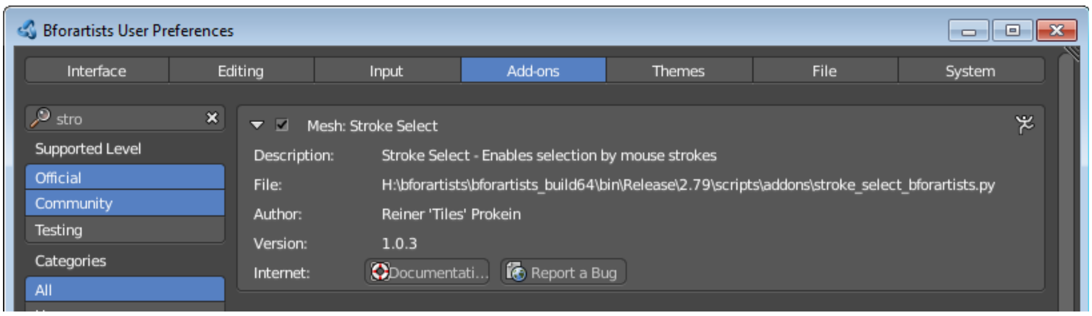
Stroke select enters the Stroke Select mode. This is a special select mode where you can select elements by moving with the mouse over it. It is somehow similar to the Circle select tool. But has no pencil size. At the contrary, here you can navigate while you are in stroke select mode.

It adds to selection by default. To subtract from selection right click to change to deselect mode. This can also be done in the Properties sidebar in the Stroke Select panel. To return to add to selection right click again. Or untick the menu item in the Stroke Select Panel.

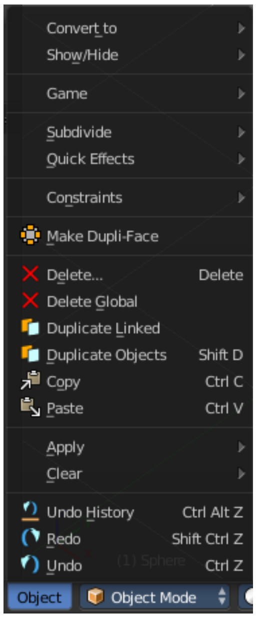
Note

This tool is by design a hotkey only tool. Hold down the key combo Shift Q, and paint with left mouse button.

Stroke Select is an add-on, and can be uninstalled if wanted. But note that the functionality is not longer available then.



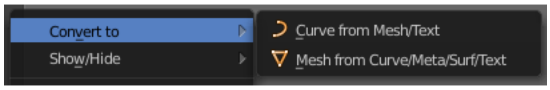
Object Mode - Object menu



The object menu in Object mode provides you with tools to work at Object level.

It contains things like undo redo, copy and paste, delete and other general tools. But also some object specific tools, like the Convert to menu.

Convert to



Convert to is a menu to convert curves object types to mesh objects, and mesh object types to curves.

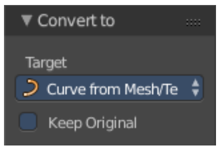
Curve from Mesh/Text

Converts a selected Mesh or Text Object to a Curve Object.

Mesh from Curve/Meta/Surf/Text

Converts a selected Curve, Metaball, Surface or Text Object to a Mesh Object.

Last Operator Convert to

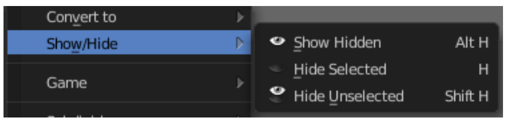


Target is a drop-down box where you can again choose between the two convert methods.

Keep Original

With this option ticked the original object gets kept. And a new object gets created.

Show/Hide



Show/Hide is a menu. Here you can show or hide objects in the viewport. See chapter All Modes, all Object types - Show / Hide

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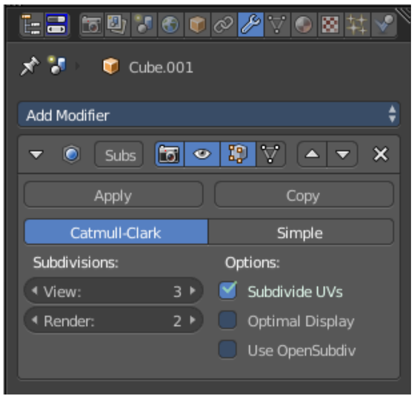
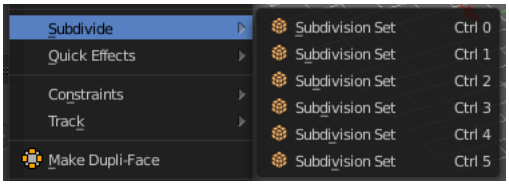
Game

Game is a menu that is related to the Blender Game Engine. Bforartists does not give any support for the Game Engine. Please head over to the Blender Manual when you want to learn more about this menu.

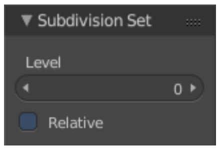
Subdivide



Subdivide is a menu where you can quickly add and change a subdivision surface modifier with a predefined resolution in a quick way. Especially when you use the hotkey for it. The subdivision surface modifier panel can then as usual be found in the Properties editor in the Modifier tab.



Last Operator Subdivision Set



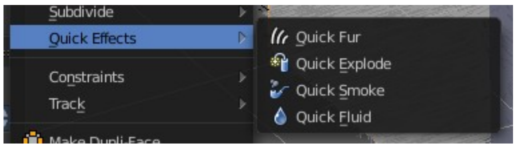
Level

Here you can set the level of subdivisions

Relative

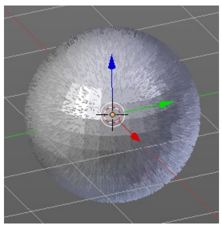
Applies the sub surf level as an offset to the already existing sub surf level.

Quick Effects



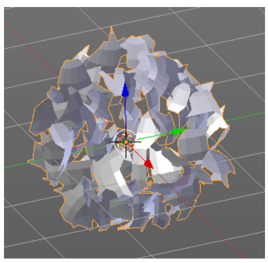
Quick effects is a menu with some predefined basic Particle effects. You need to have a mesh object selected.

Quick Fur



Adds a particle system with Fur settings.

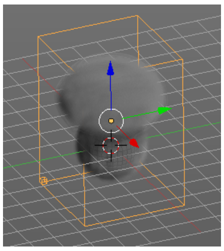
Quick Explode



Adds a particle system that lets the selected object explode into pieces.

Hit play to play the animation.

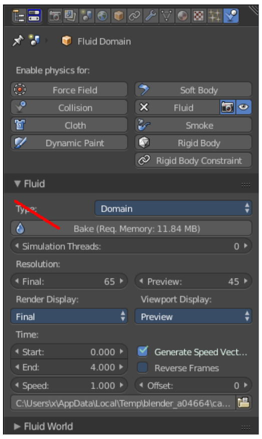
Quick Smoke



Adds a particle system with a simple smoke.

Hit play to play the animation.

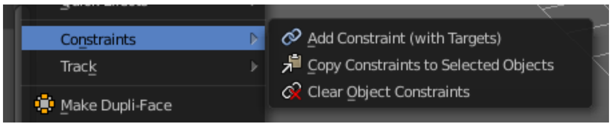
Quick Fluid



Adds a particle system with Fluid settings.

This feature does not completely work out of the box. You need to bake the animation first. This can be done in the Properties Editor, Particles Tab, Fluid Panel.

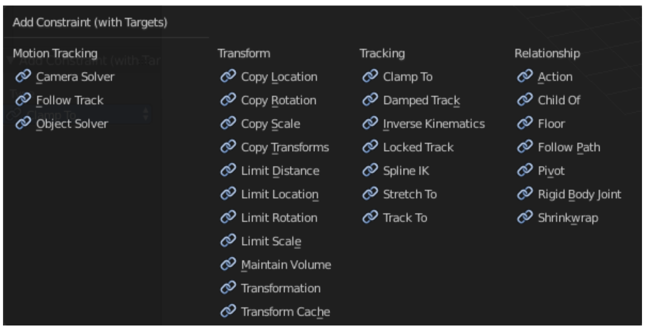
Constraints

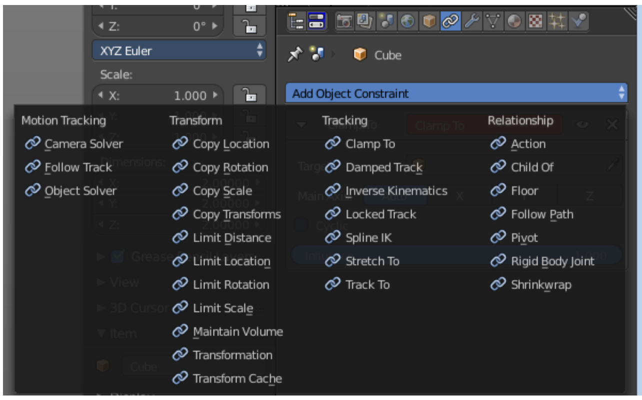


Constraints is a menu around Constraints functionality. Constraints provides you with various limitation methods connected to a target object. For example, you can limit the X position of an object to the X position of the target object. And when you move the target object, then the object will change its X position too.

Add Constraints (With Targets)

Add Constraints (With Targets) calls a menu where you can choose the constraints type. It's the same content than in the Constraints tab in the Properties editor.





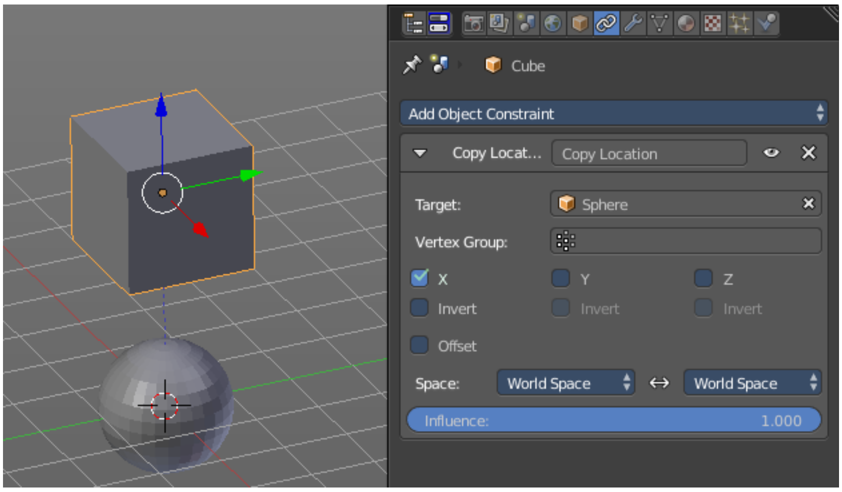
We will not explain every single constraint type here. Please have a look at the constraint types in the manual part for the Properties editor.

Usage:

Select the target object. Hold down Shift key. Now select the object where you want to add the constraints to. Both should be selected. Then choose the constraints type in the menu that you want to add.

As a result a constraints panel gets created in the Constraints tab in the Properties editor. Here you can tweak the settings then further if required. In our example we wanted to limit the X axis. So we added a Copy Location constraint, and unticked Y and Z axis.

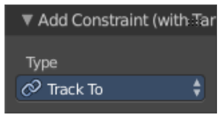
In the 3D view a black dotted line indicates the relationship.



Last Operator Add Constraints (with Target)

Type

Type is a drop-down box where you can choose the constraints type again.



Copy Constraints to Selected Objects

Copy Constraints to Selected Objects copies a constraint from one object to another.

Usage:

Select the object where you want to copy the constraint to. Hold down Shift and select the object with the constraint. Both should be selected. Then click at Copy Constraints to Selected Objects. This copies the constraint to the object.

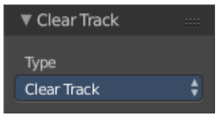
Clear Object Constraints

Removes all constraints from the object.

Clear Track

This menu item is just relevant when you have a Track constraint applied. It removes the track constraint.

Last Operator Clear track



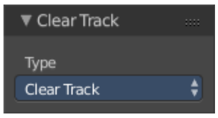
Type

Type is a drop-down box where you can choose between Clear Track and Clear Track Keep Transformation.

Clear Track - Keep Transformation

This menu item is just relevant when you have a Track constraint applied. Removes the track constraint. But keeps the current position.

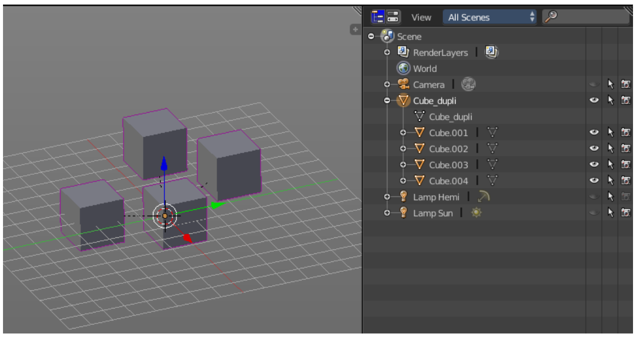
Last Operator Clear track



Type

Type is a drop-down box where you can choose between Clear Track and Clear Track Keep Transformation.

Make Dupli Face

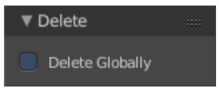


Make Dupli Face is a relict from the past, when there was no instancing or parenting feature available in Blender. When you turn an object into a Dupli Face object, then this object becomes an instancing container for this object. All objects in this container just exists once in ram when you duplicate it. No matter how often you duplicate it. This allows to plant whole forests without to run into a memory problem. Since the tree object just loads once into ram. And gets just drawn at different screen positions then.

Delete

Delete deletes the selected object(s)

Last Operator Delete

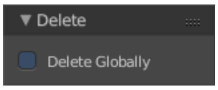


Delete Globally

When ticked then the delete operation deletes global, in all scenes.

Delete Global

It can be that you have more than one scene open. Delete deletes the selected object(s) in all scenes.

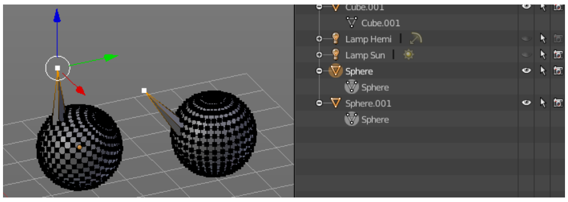


Last Operator Delete

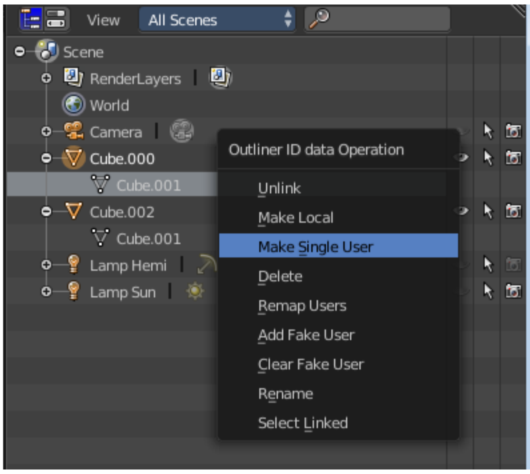
Delete Globally

When ticked then the delete operation deletes global, in all scenes.

Duplicate Linked

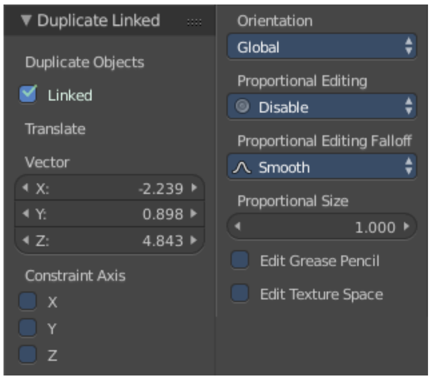


Duplicates selected objects. The instance has its own transforms. But the duplicate shares some data with the first instance. This means when you for example edit the mesh of one of the instances, then the other instance gets modified too. As you can see this in the screen shot. Here you can also see that the mesh name is the same.



If you want to make changes to an object in the new linked duplicate independently of the original object, then you will have to manually make the object a “single-user” . This can be done for example in the Outliner, in the right click menu of the object.

You are automatically in grab mode, and so you can easily move the object out of position. which is sometimes wanted, since you can position the duplicate then. But sometimes this is unwanted. A right click after releasing the mouse lets the object snap back into its creation position.



Last Operator Duplicate Linked

Duplicate Objects

Linked

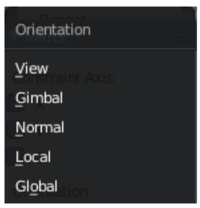
With this option ticked the duplication happens with linked data.

Translate

The Position of the duplicated object

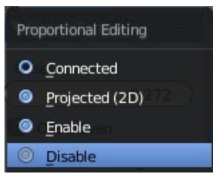
Constraint Axis

Here you can limit the position relative to the source object.



Orientation

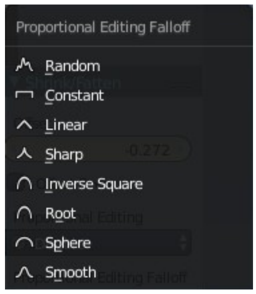
Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.



Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.

Proportional Editing Falloff



Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

Proportional Size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

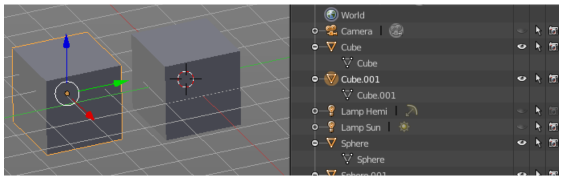
Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

Edit Texture Space

With Confirm on Release checked the action gets performed when you release the mouse button.

Duplicate Objects

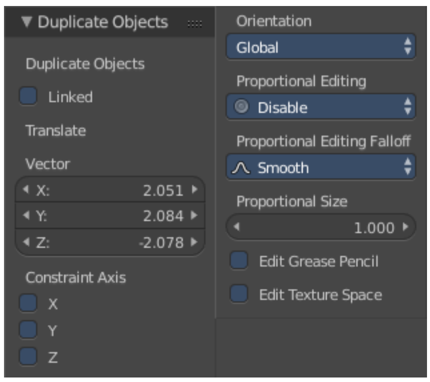


Duplicates selected objects. The copy is completely independent. All containing data gets duplicated too. And you can edit the object instances completely independent. then.

You are automatically in grab mode, and so you can easily move the object out of position. Which is sometimes wanted, since you can position the duplicate then. But sometimes this is unwanted. A right click after releasing the mouse lets the object snap back into its creation position.

When you drag the duplicate around you will see the position values in the header.

Last Operator Duplicate



Duplicate Objects

Linked

With this option ticked the duplication happens with linked data.

Translate

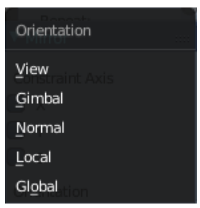
The Position of the duplicated object.

Constraint Axis

Here you can limit the position relative to the source object.

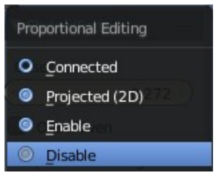
Orientation

Orientation is a drop-down box where you can choose the type of orientation for the



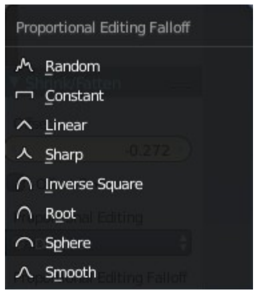
mirroring action.

Proportional Editing



Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.

Proportional Editing Falloff



Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

Proportional Size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

Edit Texture Space

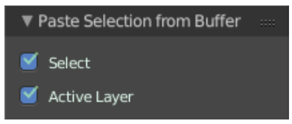
With Confirm on Release checked the action gets performed when you release the mouse button.

Copy

Copies the selected object(s)

Paste

Pastes copied object(s).



Last Operator Paste Selection from Buffer

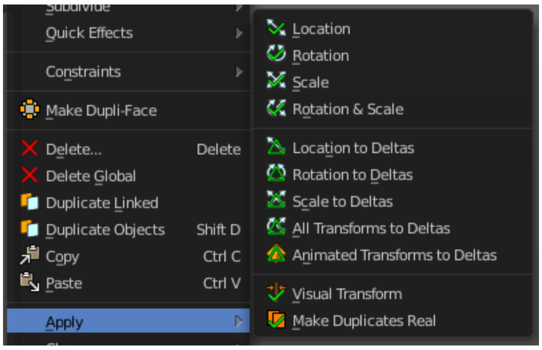
Select

Select pasted object(s).

Active Layer

Paste the object into the active layer.

Apply



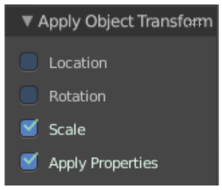
Apply is a menu where you can apply transforms in various combinations. For example, when you create a cube, then move it to let's say 3, then apply the location, then the origin gets set to 0. The position is "applied". Of special Interest is apply scale, since it resets the scale factor to 1.

Apply just works with single user objects. And it does **not** apply to pose position, animation curves or constraints. These tools should be used before rigging and animation.

Location, Rotation, Scale and Rotation&Scale

This applies the location, rotation and scale of the object.

Last Operator Apply Object Transform.



Location

Applies the position, and resets origin to 0

Rotation

Applies the rotation.

Scale

Applies the Scale.

Apply Properties

Properties such as Curve Vertex Radius. Font Size and bone envelope gets applied.

Location, Rotation, Scale and All Transforms to Deltas

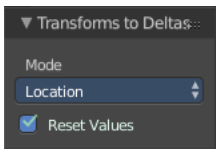
Transforms are absolute to the world coordinates. Delta Transforms are relative to the current transformation.

The delta transform values can be found in the Object properties, in the Delta Transform Panel.

Example use case:

Keyframe a object rotation from 0 to 90 degrees. Rotate the object by 45 degrees. When you play the animation it will still rotate from 0 to 90 degrees.
Now keyframe a delta rotation from 0 to 90 degrees and rotate the object by 45 degrees. When you playback the animation it will rotate from 45 to 135 degrees now. (a 90 degree difference from the current state)

Last Operator Transforms to Deltas



Mode

Mode is a drop-down box where you can choose the transform mode again.

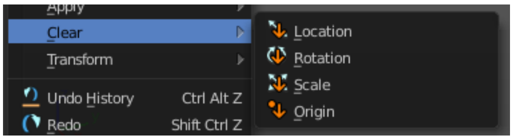
Reset Values

Clears the transform values after transferring to Deltas.

Animated Transform to Deltas

Converts the “normal” transformation animations to Delta transforms. This tool requires to have key frames at the object.

Clear

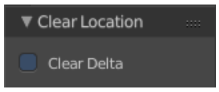


Clear Transform is a menu where you can clear the transform for location, rotation, scale and Origin. Clear means in this conjunction that the values gets reset. When you have for example a cube at X 5, and clear the location, then the cube gets positioned at position X 0.

Location

Resets the location of the selected object(s).

Last Operator Clear Location



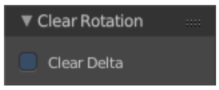
Clear Delta

With Clear Delta ticked it clears the delta transform instead of the transform.

Rotation

Resets the rotation of the selected object(s).

Last Operator Clear Rotation



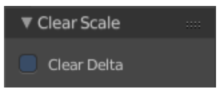
Clear Delta

With Clear Delta ticked it clears the delta transform instead of the transform.

Scale

Resets the scaling of the selected object(s).

Last Operator Clear Scale



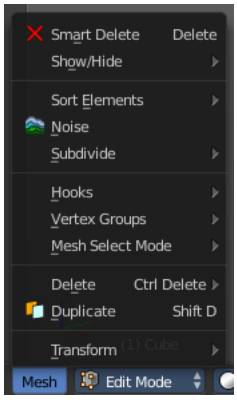
Clear Delta

With Clear Delta ticked it clears the delta transform instead of the transform.

Origin

Clear Origin requires to have a parent child relationship selected. It sets the child object to the position of the parent object.

Edit Mode - Mesh Object - Mesh Menu

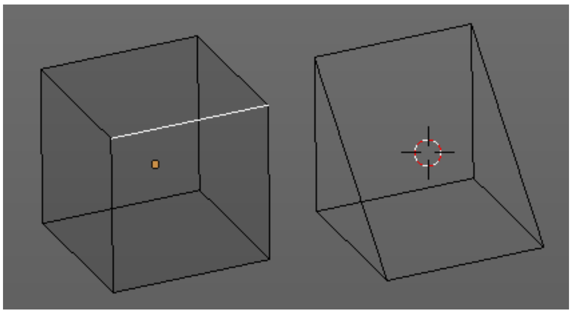


The Mesh Menu in Edit Mode contains the tools to manipulate the mesh geometry in Edit mode. It just exists for Mesh Objects.

Lots of functionality that could also belong here can also be found in the Tool Shelf. The difference is that the tools in the tool shelf are easier to access. And so it contains the most used tools for the daily work. While the Mesh menu contains the not so often used tools. Or tools where you use the hotkey anyway. Delete for example.

Smart Delete

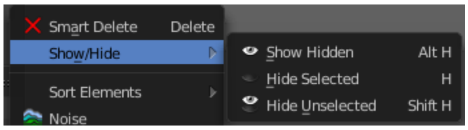
Smart delete deletes what is selected in an intelligent way. When you for example delete an edge then the edge gets deleted. But it also deletes the vertices connected to this edge. It performs a Dissolve operation under the hood.



There is a bit below a Delete menu where you can choose different methods for deleting if required. And the Dissolve tools can be found in the Tool Shelf in the Tools tab.

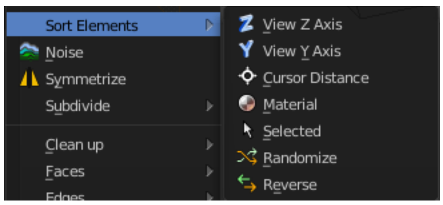
Show / Hide

Show / hide is a menu that contains the Show Hide tools. Here you can show or hide your current selection in the viewport. See chapter All Modes, all Object types - Show / Hide



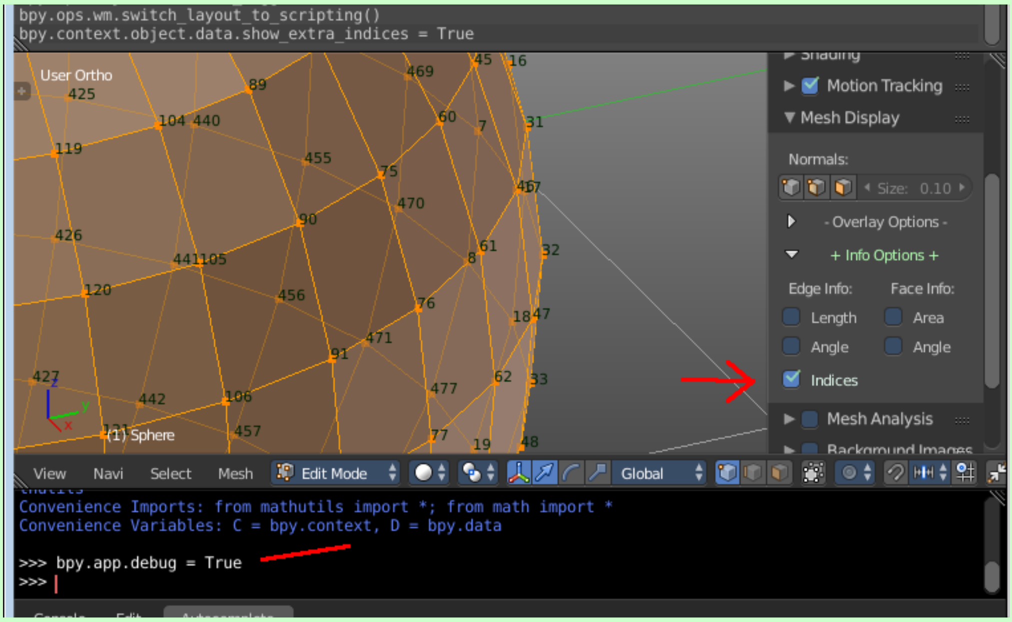
Sort Elements

Sort Elements is a menu with different sorting methods. It allows you to reorder the mesh indices of the selected mesh elements by various methods.



Hint

You can enable the viewing of mesh indices by typing in `bpy.app.debug = True` in the Python console in the scripting layout. This reveals a checkbox in the Mesh Display panel in the Info Options subsection. And when you tick this checkbox, then the vertices or edges or faces gets displayed with their indices value.



View Z Axis

Sorts along the active view's Z axis, from farthest to nearest. You can use Reverse if you want it the other way.

View Y Axis

Sorts along the active view's Y axis, from farthest to nearest. You can use Reverse if you want it the other way.

Cursor Distance

Sorts from nearest to farthest away from the 3D cursor position.

Material

Faces only! Sorts faces by their lowest material index up to highest material index. Order of faces inside each of those material groups remains unchanged.

Note that the Reverse option only reverses the order of the materials. And the order of the faces inside them.

Selected

Moves all selected elements to the beginning without affecting their relative orders. Attention, this option will also affect unselected element indices!

Randomize

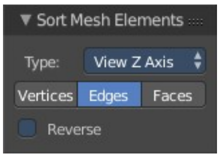
Randomizes the indices of selected elements. This option does not affect the unselected elements.

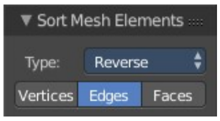
Reverse

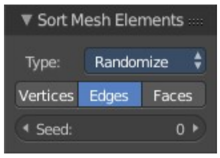
Reverses the order of the selected elements.

Last Operator Sort Mesh Elements

Sort Elements always brings up the same last operator. But with a small difference for Randomize and Reverse. Reverse has no checkbox. And Randomize has a Seed checkbox.







Type

This is a drop-down box where you can choose the sort method again.

Vertices, Edges or Faces

Here you can adjust if the sort will affect the vertices, edges or faces.

Reverse Checkbox

Reverses the sorting.

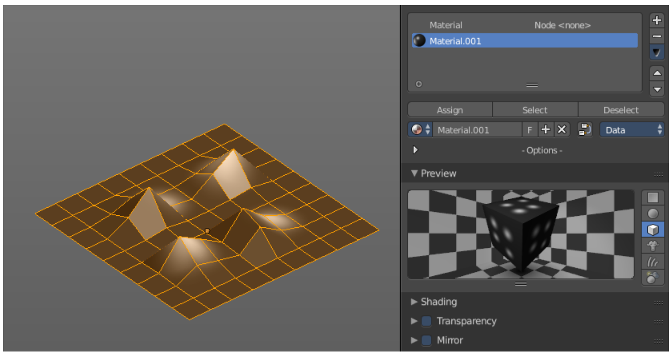
Seed Edit box (Randomize only)

The seed option allows you to get another randomization – the same seed over the same mesh/set of selected elements will always give the same result!

Noise

Noise is a displacement tool where you can use a texture to displace the geometry. It just works with the Blender Internal renderer, and you need to have a texture and a material assigned.

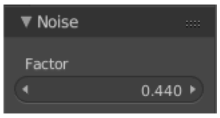
The strength can be adjusted in the Last Operator.



Last Operator Noise

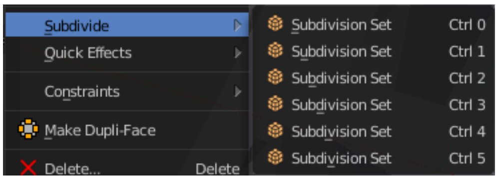
Factor

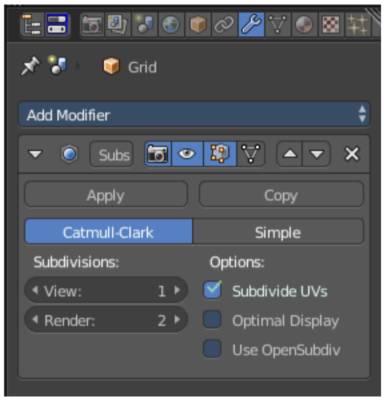
Here you can adjust the strength of the displacement.



Subdivide

Subdivide is a menu where you can quickly set the subdivision level of the selection.





What it does is to add a SDS modifier in the Properties Editor if required. And set the SDS level to the needed value.

Crtrl 0 sets SDS to level 0. Ctrl 1 sets SDS level to 1 , and so on.

SDS happens at Object mode level. Even when you apply it in the Edit Mode! And it happens at the whole object.

Last Operator Subdivision Set

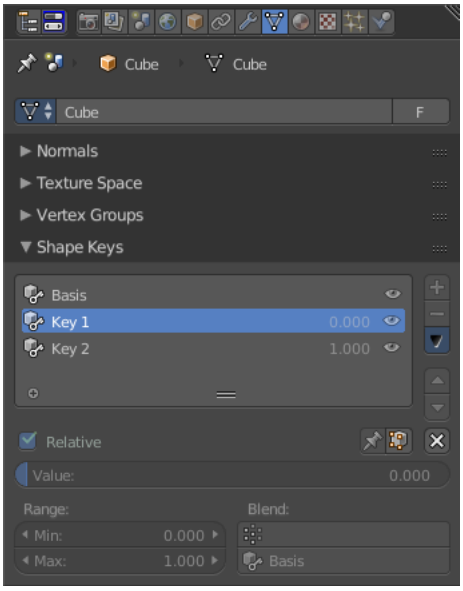
Level

Here you can adjust the SDS level.

Relative

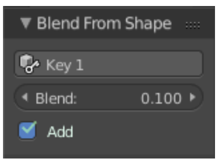
Applies the Subsurf Level as an offset relative to the current level.

Blend from Shape



This tool requires to have a shape key at the mesh. It blends the selected shape key into the mesh.

Last Operator Blend from Shape



Drop-down box

Here you can define which shape key should be used.

Blend edit box

Here you can adjust the blend factor

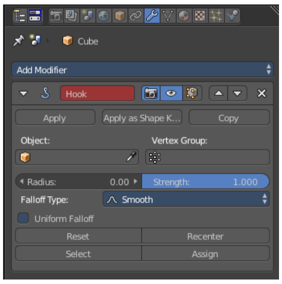
Add

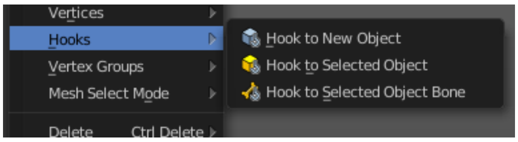
Add to blend shape instead of blending in.

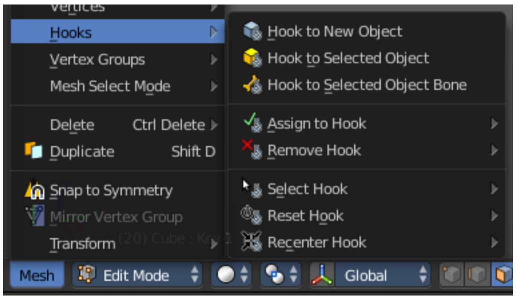
Shape Propagate

This tool requires to have a shape key at the mesh. It applies the current vertex locations to all other shape keys at the mesh.

Hooks







Hooks is a menu with tools around the hook modifier. You could also adjust the hook modifier from the Properties editor. But the menu items are more accessible.

When there is no hook modifier at the mesh then you just see three menu items. When there is minimum one hook modifier applied, then you will see an extended menu.

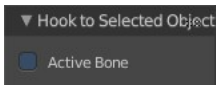
Hook to New Object

Creates a new Hook Modifier for the active object and assigns it to the selected vertices. It also creates an empty at the center of those vertices, which are hooked to it.

Hook to Selected Object

Does the same as *Hook to New Object*, but instead of hooking the vertices to a new empty, it hooks them to the selected object (if it exists). There should be only one selected object (besides the mesh being edited).

Last Operator Hook to Selected Object



Active Bone

Hook to the object(s) of the active bone.

Hook to Selected Object Bone

Does the same as Hook to New Object. But it sets the last selected bone in the also selected armature as a target.

Assign to Hook

Here you can assign the selected vertices to the chosen hook modifier. Existing hooks gets overwritten. One vertex can be assigned to more than one hook.

Remove Hook

Removes the chosen Hook Modifier from the object.

Select Hook

Selects all vertices assigned to the chosen Hook Modifier.

Reset Hook

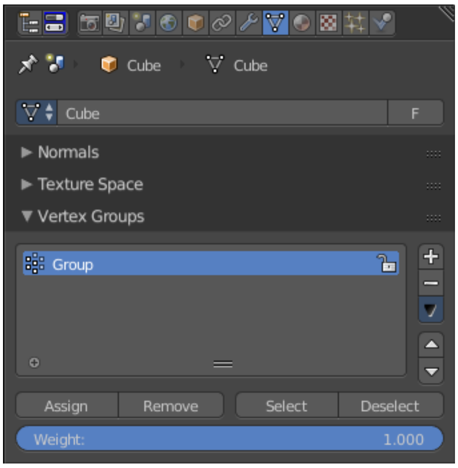
Resets the chosen Hook Modifier.

Recenter Hook

Recenter the Hook Modifier.

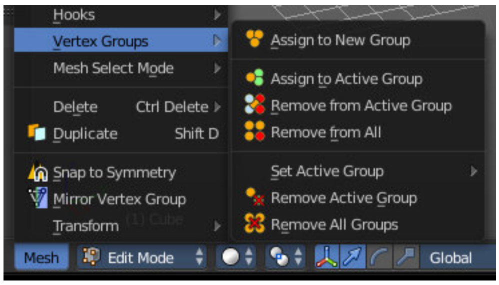
Vertex Groups

Vertex groups is a menu around vertex group functionality. The vertex groups can be found in the Object data tab in the Properties editor.



When there is no vertex group assigned yet then you can only see one menu item. The assign to new group button.

Once you have a vertex group assigned you will see the full functionality.



Assign to New Group

Assigns the mesh selection to a new vertex group.

Assign to active Group

Assigns the mesh selection to the currently active vertex group.

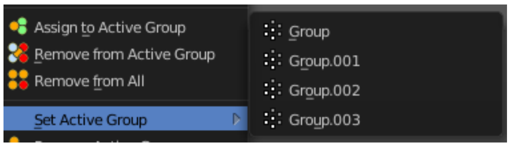
Remove from Active Group

Removes the mesh selection from the currently active vertex group.

Remove from All

Removes the mesh selection from all vertex groups.

Set Active Group



Here you can select a vertex group to be the active one.

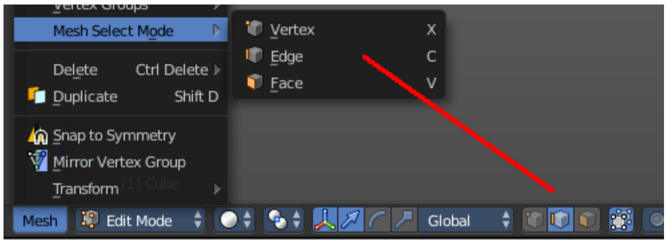
Remove Active Group

Removes the currently active vertex group.

Remove All Groups

Removes all vertex groups from the mesh.

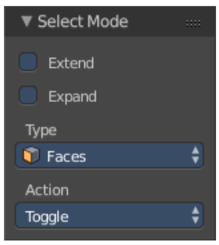
Mesh Select Mode



Mesh Select mode is a sub menu where you can set the current mesh select mode. Its functionality is equal to the mesh select mode buttons in the header. Just that you can't select more than one mode directly here. This menu exists to show and to edit the hotkeys. Not to work with it.

Interestingly the menu items have a last operator. Again, it is not meant to work this way. So this is just listed for documentation reasons.

Last Operator Select Mode



Extend

Adds to the current selection mode

Expand

Not documented, not to find out, sorry.

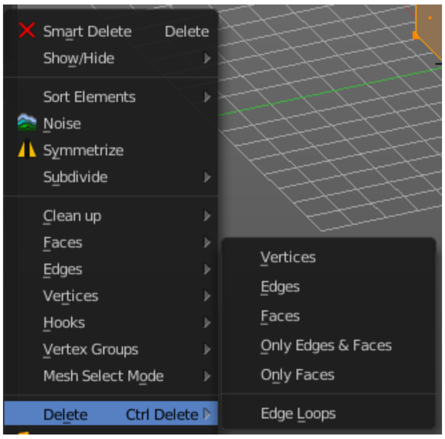
Type

Here you can again adjust what select mode you want to activate

Action

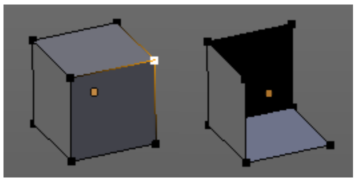
How to work with the operator. Toggle means when you click at the button and it is disabled, then it enables. And vice versa. Enable and disable should be self explaining.

Delete



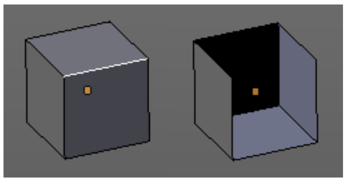
The smart delete works dependant of the selection and the mode. Which is fine for most cases. This delete menu gives you some more control over what exactly you want to delete. And how you want to delete it.

Vertices



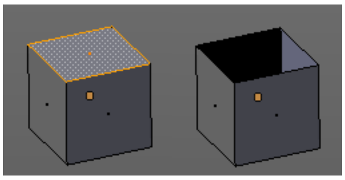
Deletes the selected vertices, and all with it connected edges and faces.

Edges



Deletes the selected edges and the connected faces.

Faces



This one works similar to the smart delete. It deletes the selected faces.

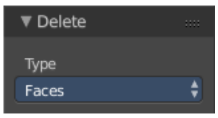
Only Edges and Faces

This mode is of interest when you have more than one selection mode activated. It deletes then just the selected edges and faces. And not single vertices.

Only Faces

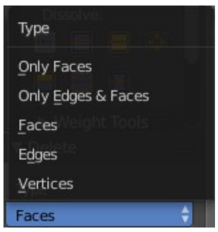
This mode is of interest when you have more than one selection mode activated. Just selected faces gets deleted. Not single edges or vertices.

Last Operator Delete



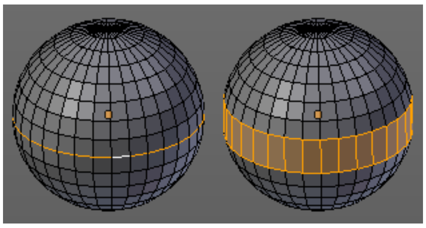
The Last Operator Delete is the same for the above menu items.

Type

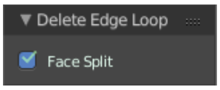


Here you can choose the delete method again.

Edge Loops



This method works similar to the smart delete tool. It deletes the edge loop. But it selects the faces of the edge ring. And the Last operator offers you the option to split off face corners.



Last Operator Delete Edge Loop

Face Split

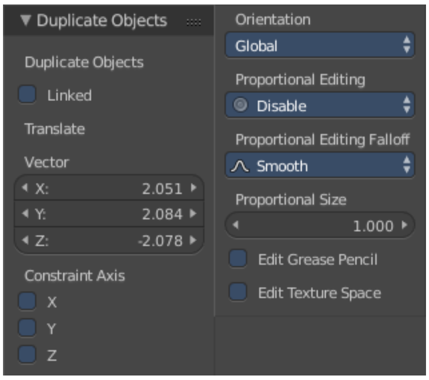
Split off face corners to maintain surrounding geometry.

Duplicate

Duplicates the current selection. The copy sticks to the mouse until you release it. A Right click while moving will reset the position of the duplicate. The duplicated part will be part of the same object.

When you drag the duplicate around you will see the position values in the header.

Last Operator Duplicate



Duplicate Objects

Linked

With this option ticked the duplication happens with linked data.

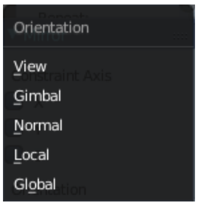
Translate

The Position of the duplicated object

Constraint Axis

Here you can limit the position relative to the source object.

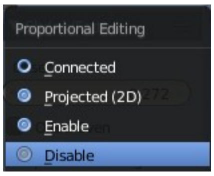
Orientation



Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.

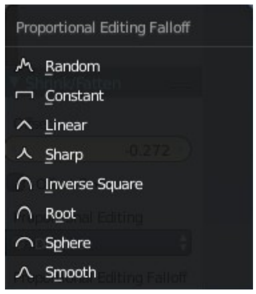
Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing.



When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.

Proportional Editing Falloff



Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

Proportional Size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

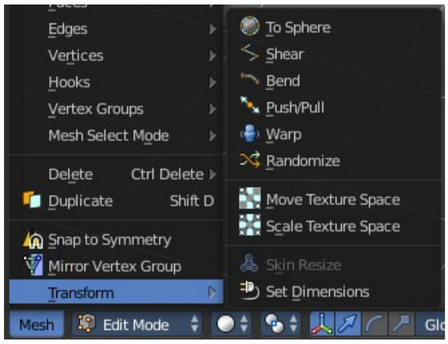
Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

Edit Texture Space

With Confirm on Release checked the action gets performed when you release the mouse button.

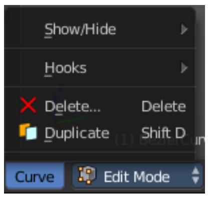
Transform

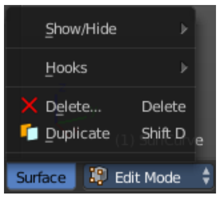


Transform is a menu that contains some special transform functionality.

See chapter Edit Mode - Transform Menu

Edit Mode - Curve + Surface Object - Curve + Surface Menu





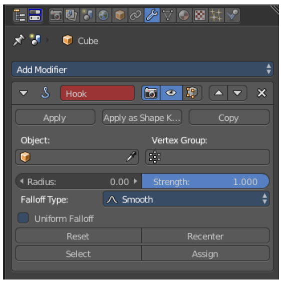
The Curve Menu in Edit Mode contains the tools to manipulate the curve geometry in Edit mode. It just exists for Curve Objects.

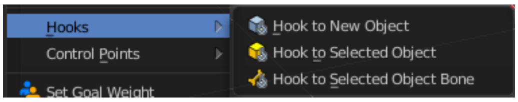
Same counts for the Surface Menu in Edit mode. The menus are identical since both object types are a curve type. So we handle both menus here.

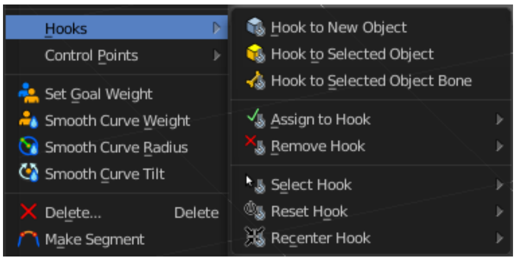
Show/Hide

Show/Hide is a menu. Here you can show or hide objects in the viewport. See chapter All Modes, all Object types - Show / Hide

Hooks







Hooks is a menu with tools around the hook modifier. You could also adjust the hook modifier from the Properties editor. But the menu items are more accessible.

When there is no hook modifier at the mesh then you just see three menu items. When there is minimum one hook modifier applied, then you will see an extended menu.

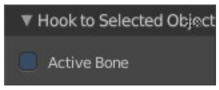
Hook to New Object

Creates a new Hook Modifier for the active object and assigns it to the selected vertices. It also creates an empty at the center of those vertices, which are hooked to it.

Hook to Selected Object

Does the same as *Hook to New Object*, but instead of hooking the vertices to a new empty, it hooks them to the selected object (if it exists). There should be only one selected object (besides the mesh being edited).

Last Operator Hook to Selected Object



Active Bone

Hook to the object(s) of the active bone.

Hook to Selected Object Bone

Does the same as Hook to New Object. But it sets the last selected bone in the also selected armature as a target.

Assign to Hook

Here you can assign the selected vertices to the chosen hook modifier. Existing hooks gets overwritten. One vertex can be assigned to more than one hook.

Remove Hook

Removes the chosen Hook Modifier from the object.

Select Hook

Selects all vertices assigned to the chosen Hook Modifier.

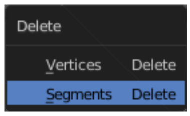
Reset Hook

Resets the chosen Hook Modifier.

Recenter Hook

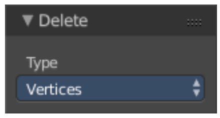
Recenter the Hook Modifier.

Delete



Delete calls a pop-up where you can choose if you want to delete vertices or segments.

Last Operator Delete



Type

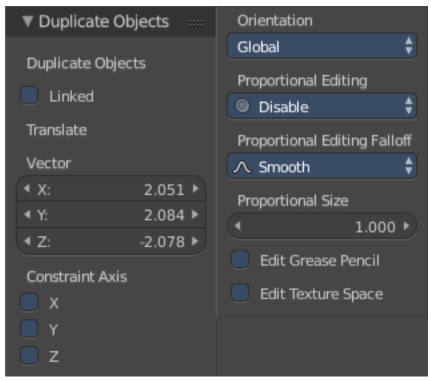
Here you can again choose if you want to delete vertices or segments.

Duplicate

Duplicates the current selection. The copy sticks to the mouse until you release it. A Right click while moving will reset the position of the duplicate. The duplicated part will be part of the same object.

When you drag the duplicate around you will see the position values in the header.

Last Operator Duplicate



Duplicate Objects

Linked

With this option ticked the duplication happens with linked data.

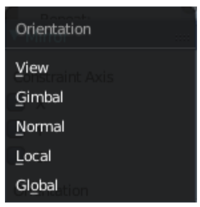
Translate

The Position of the duplicated object

Constraint Axis

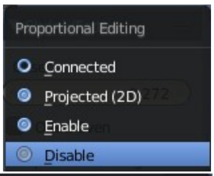
Here you can limit the position relative to the source object.

Orientation



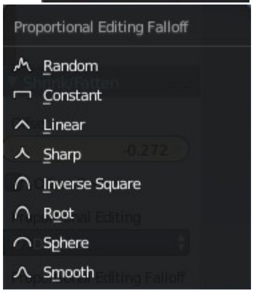
Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.

Proportional Editing



Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.

Proportional Editing Falloff



Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

Proportional Size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

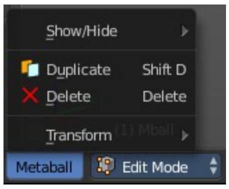
Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

Edit Texture Space

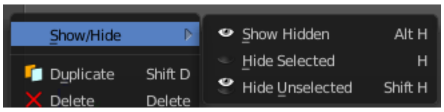
With Confirm on Release checked the action gets performed when you release the mouse button.

Edit Mode - Metaball Object - Metaball Menu



The Metaball menu in Edit mode contains the tools to work with Meta elements in Edit Mode.

Show/Hide



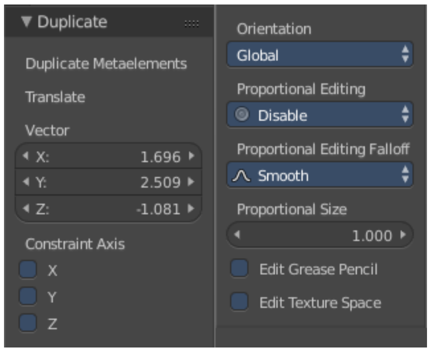
Show/Hide is a menu. Here you can show or hide objects in the viewport.
See chapter All Modes, all Object types - Show / Hide

Duplicate

Duplicates the current selection. The copy sticks to the mouse until you release it. A Right click while moving will reset the position of the duplicate. The duplicated part will be part of the same object.

When you drag the duplicate around you will see the position values in the header.

Last Operator Duplicate



Duplicate Meta elements

Just ignore this label.

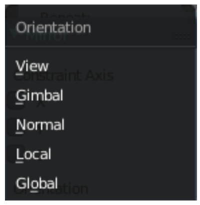
Translate

The Position of the duplicated object.

Constraint Axis

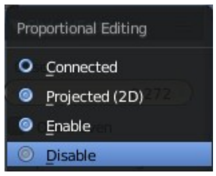
Here you can limit the position relative to the source object.

Orientation



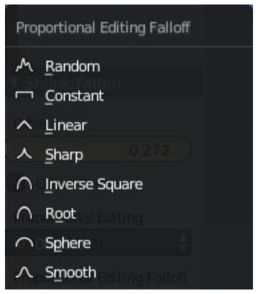
Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.

Proportional Editing



Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.

Proportional Editing Falloff



Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

Proportional Size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

Edit Texture Space

With Confirm on Release checked the action gets performed when you release the mouse button.

Delete

Deletes the selected element(s).

Edit Mode - Text Object - Text Menu

The Text menu contains the tools to work with text in edit mode.

Note that you have to use the Object mode box to escape the Edit mode with a text object. The hotkey to change the mode will be counted as text input for the text object.

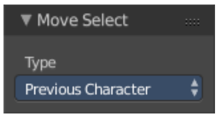
Delete

Delete deletes the selected text.

To select parts of the text, move the cursor with the arrow buttons to the needed location, then hold down Shift, and select the letters by pressing the arrow buttons left or right. And then you can delete this selected text part.

Selecting text parts with the arrows brings up the Last Operator for Move Select.

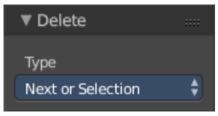
Last Operator Move Select



Type

Type is a drop-down box where you can change the selection method.

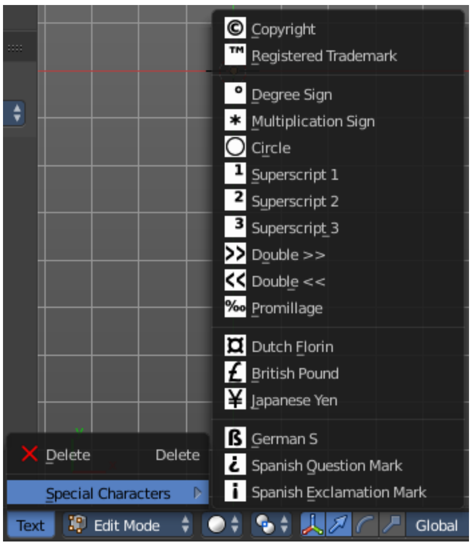
Last Operator Delete



Type

Type is a drop-down box where you can change the delete method.

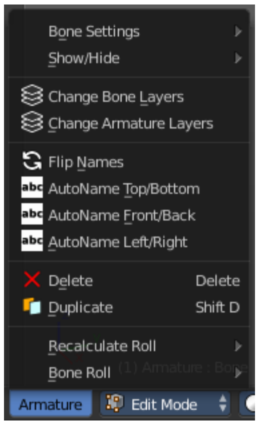
Special Characters



Special characters is a menu that contains some special text characters, like copyright, which you can insert into the text.

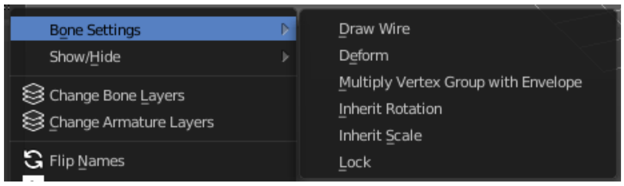
Edit Mode - Armature Object - Armature Menu

The armature menu provides you the tools to work with armatures and its bones in edit mode.



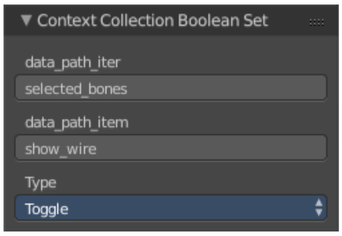
Bone Settings

Bone Settings is a menu with menu items to toggle special checkboxes in the Properties editor. But here you can do it for a selection too, and not just one object.



Last Operator Collection Boolean Set

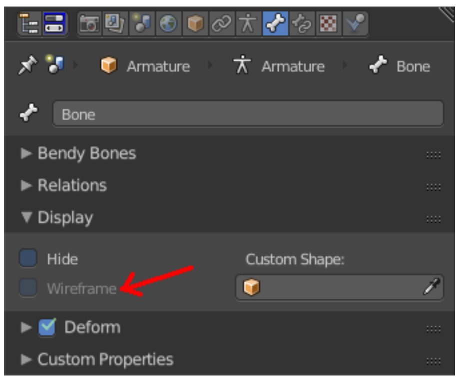
Each of the menu items uses the same Last Operator. With different strings for the booleans.

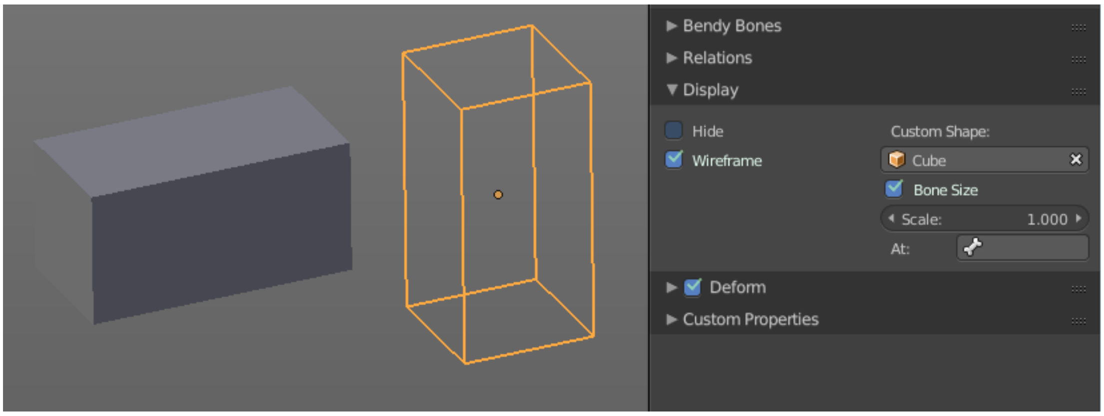


Draw Wire

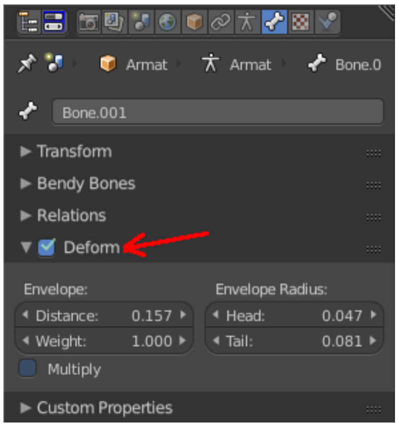
Turns on or off the Wireframe checkbox, and so its functionality, in the Bones tab in the Display Panel Properties editor.

This checkbox requires to have a custom bone shape. It will not work at a normal bone shape. When you have a custom bone shape defined, then this custom bone object gets always displayed as Wireframe, regardless of viewport draw mode.



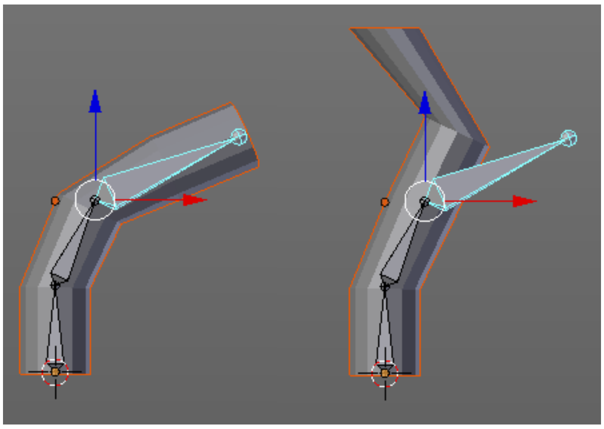


Deform

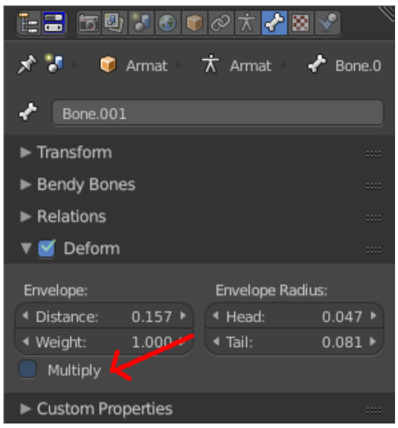


Turns on or off the Deform panel, and so its functionality, in the Bones tab in the Properties editor.

With Deform enabled the chosen bone deforms the connected mesh. The Deform panel also contains some Envelope settings.



Multiply Vertex Group with Envelope



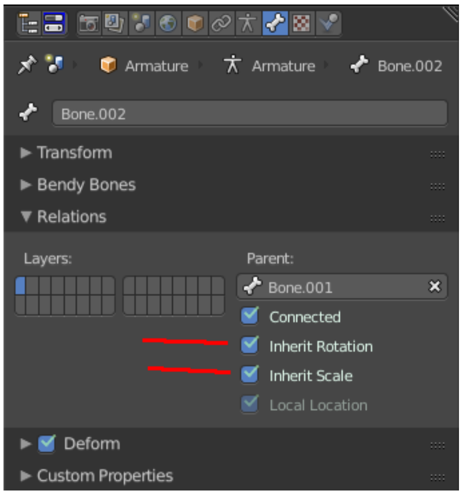
Turns on or off the Multiply checkbox in the Deform panel, and so its functionality, in the Bones tab in the Properties editor.

Multiply the effects of vertex group weights with envelope influence.

Inherit Rotation

Turns on or off the Inherit Rotation checkbox in the Relations panel, and so its functionality, in the Bones tab in the Properties editor.

The bone inherits rotation from the parent bone.



Inherit Scale

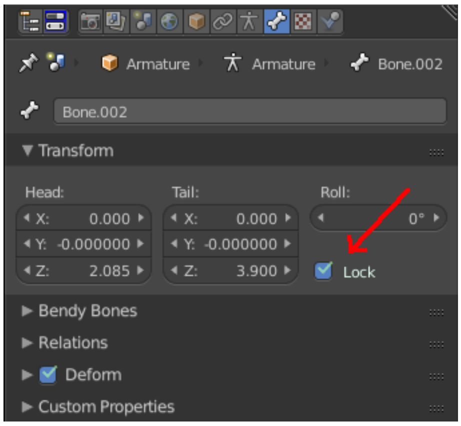
Turns on or off the Inherit Scale checkbox in the Relations panel, and so its functionality, in the Bones tab in the Properties editor.

The bone inherits scale from the parent bone.

Lock

Turns on or off the Lock checkbox in the Transform panel, and so its functionality, in the Bones tab in the Properties editor.

Locked bones cannot be edited in edit mode anymore. They are locked.

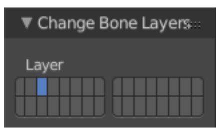


Show/Hide

Show/Hide is a menu. Here you can show or hide objects in the viewport. See chapter All Modes, all Object types - Show / Hide

Change Bone Layers

This menu item opens a popup where you can put single selected bone(s) onto another layer.



Last Operator Change Bone Layers

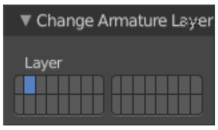
Layer

Here you can again put the selected bones onto another layer.

Change Armature Layers

This menu item opens a popup where you can put the whole armature onto another layer.

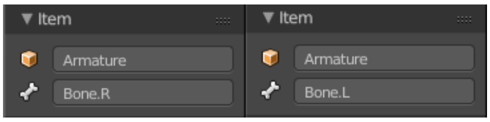
Last Operator Change Armature Layers



Layer

Here you can again put the armature onto another layer.

Flip Names



This tool requires to follow some name conventions. If there is a lower or upper case “L”, “R”, “left” or “right” with a separating dot in the bone name, then this tool renames the bones names to its counter part. Bone.L becomes Bone.R.

This tool is useful when you mirror parts of the armature, and don't want to rename all the bones one by one.

AutoName Top/Bottom

This tool automatically adds a suffix to all selected bones, based on their local position relative to the armature center.

Bones with a positive Z Coordinate will receive a .Top suffix. Bones with a negative Z coordinate will receive a .Bot suffix.

AutoName Front/Back

This tool automatically adds a suffix to all selected bones, based on their local position relative to the armature center.

Bones with a positive Y Coordinate will receive a .Fr suffix. Bones with a negative Y coordinate will receive a .Bk suffix.

AutoName Left/Right

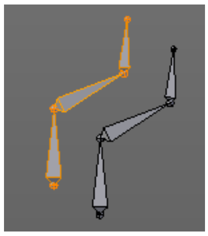
This tool automatically adds a suffix to all selected bones, based on their local position relative to the armature center.

Bones with a positive X Coordinate will receive a .L suffix. Bones with a negative X coordinate will receive a .R suffix.

Delete Selected Bone(s)

Deletes the currently selected bones.

Duplicate

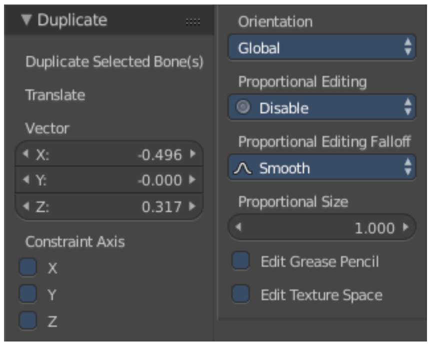


Duplicates selected bones. The duplicate is still part of the armature. The name number at the bones increases.

You are automatically in grab mode, and so you can easily move the object out of position. Which is sometimes wanted, since you can position the duplicate then. But sometimes this is unwanted. A right click after releasing the mouse lets the object snap back into its creation position.

When you drag the duplicate around you will see the position values in the header.

Last Operator Duplicate



Duplicate Selected Bone(s)

Just ignore this label.

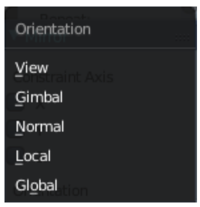
Translate

Just ignore this label.

Constraint Axis

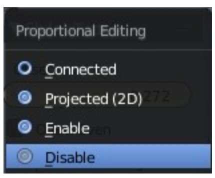
Here you can limit the position relative to the source object.

Orientation



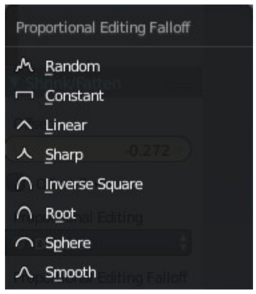
Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.

Proportional Editing



Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.

Proportional Editing Falloff



Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

Proportional Size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

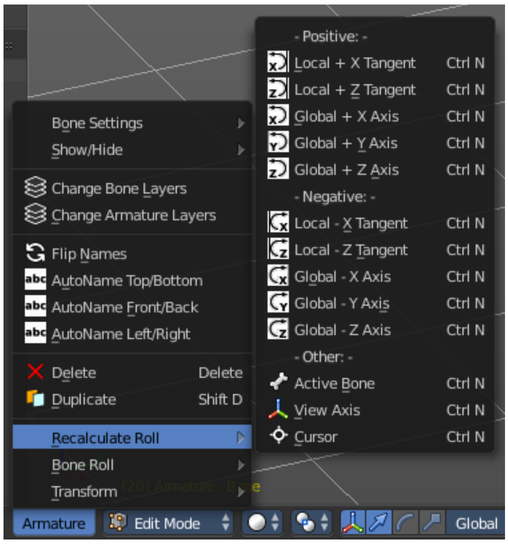
Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

Edit Texture Space

With Confirm on Release checked the action gets performed when you release the mouse button.

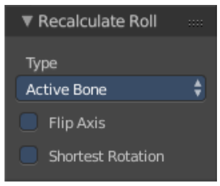
Recalculate Roll



Recalculate Roll is a menu where you can recalculate the bone roll in various ways.

The menu items are pretty self explaining. So we will not repeat the descriptions here.

Last Operator Recalculate Roll



Type

Type is a drop-down box where you can choose the recalculation method again.

Flip Axis

Negates the alignment axis.

Shortest Rotation

Ignore the axis direction, and use the shortest rotation to align the bone(s)

Bone Roll

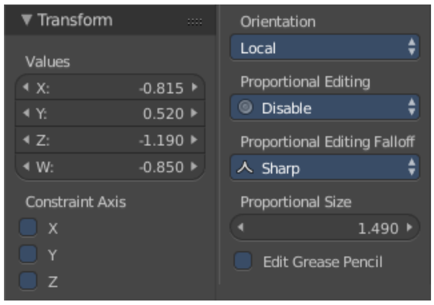
Bone Roll is a menu where you can directly set the bone roll, or reset the bone roll to zero.

Set Roll

This operation is relative to the starting value, and starts always with zero. It does not display the Bone Roll value from the Transform panel. It adds or subtracts the amount of the operation to/from the Roll value then.

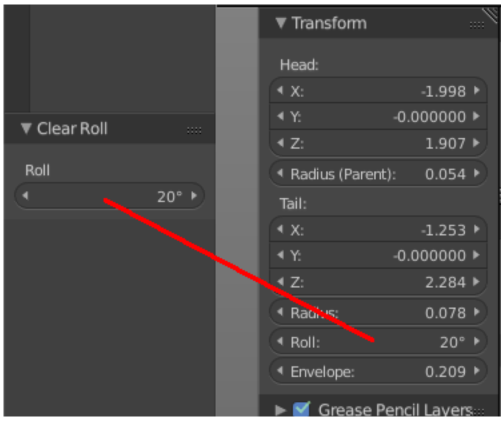
While operating you will see the current relative Roll value in the header.

Last Operator Transform



The only interesting value is the X value right at the top. The other settings here are simply dysfunctional. You cannot turn on proportional editing, there is nothing to constraint, etc. . And so we will not go into detail here.

Unfortunately even the X value to display the amount of the roll is broken. It displays the amount in Radians, while the Bone roll is in degrees.



Clear Roll

Here you can set the bone roll value directly.

Last Operator Clear Roll

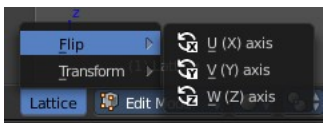
Roll

Here you can set the bone roll.

Edit Mode - Lattice Object - Lattice Menu

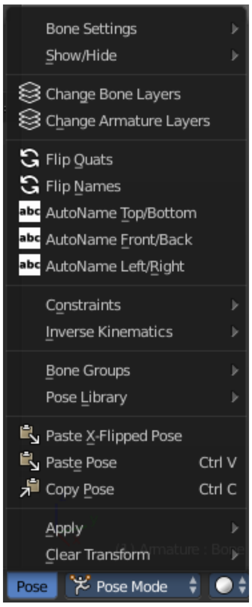
The Lattice menu provides you with tools to edit the Lattice object in edit mode.

Flip



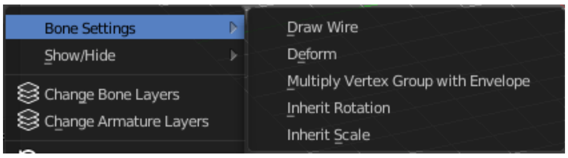
Flip is a menu where you can flip the lattice object along the world axis X, Y or Z

Pose Mode - Armature Object - Pose Menu



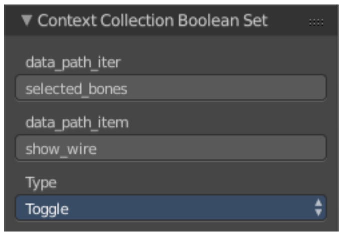
The Pose menu contains the tools to work with Armature objects in Pose mode. This means here you find all the tools that you need to pose and animate your armature.

Bone Settings



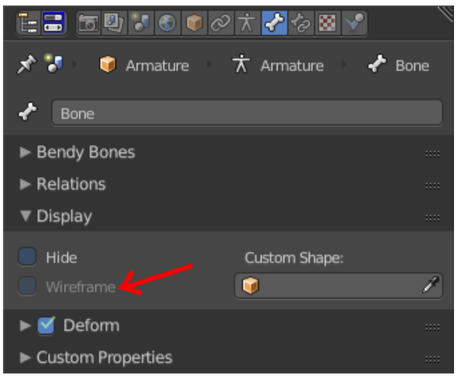
Bone Settings is a menu with menu items to toggle special checkboxes in the Properties editor. But here you can do it for a selection too, and not just one object.

Last Operator Collection Boolean Set



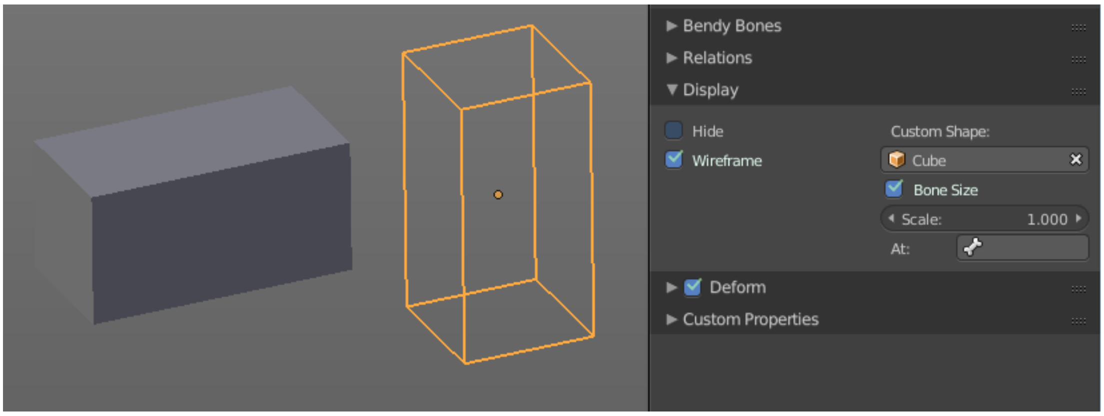
Each of the menu items uses the same Last Operator. With different strings for the booleans.

Draw Wire

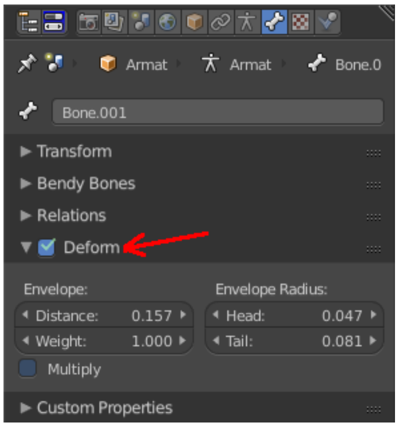


Turns on or off the Wireframe checkbox, and so its functionality, in the Bones tab in the Display Panel Properties editor.

This checkbox requires to have a custom bone shape. It will not work at a normal bone shape. When you have a custom bone shape defined, then this custom bone object gets always displayed as Wireframe, regardless of viewport draw mode.

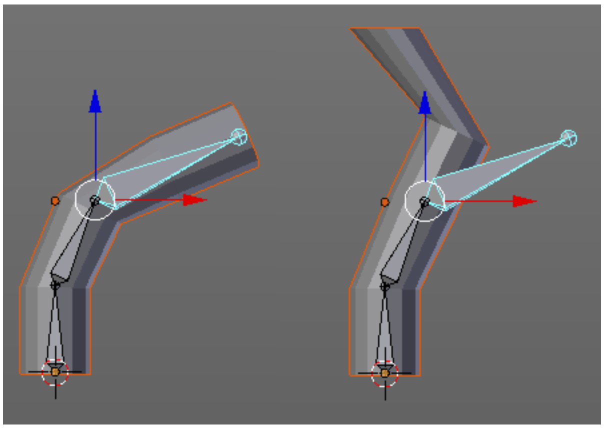


Deform

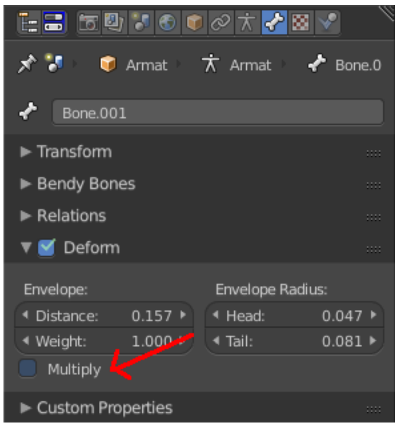


Turns on or off the Deform panel, and so its functionality, in the Bones tab in the Properties editor.

With Deform enabled the chosen bone deforms the connected mesh. The Deform panel also contains some Envelope settings.



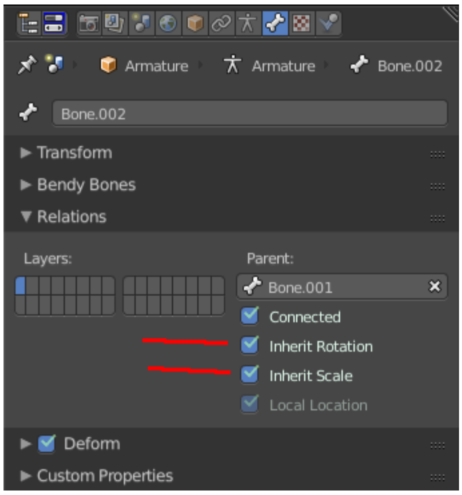
Multiply Vertex Group with Envelope



Turns on or off the Multiply checkbox in the Deform panel, and so its functionality, in the Bones tab in the Properties editor.

Multiply the effects of vertex group weights with envelope influence.

Inherit Rotation



Turns on or off the Inherit Rotation checkbox in the Relations panel, and so its functionality, in the Bones tab in the Properties editor.

The bone inherits rotation from the parent bone.

Inherit Scale

Turns on or off the Inherit Scale checkbox in the Relations panel, and so its functionality, in the Bones tab in the Properties editor.

The bone inherits scale from the parent bone.

Show/Hide

Show/Hide is a menu. Here you can show or hide objects in the viewport. See chapter All Modes, all Object types - Show / Hide

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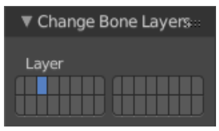
Change Bone Layers

This menu item opens a popup where you can put single selected bone(s) onto another layer.

Last Operator Change Bone Layers



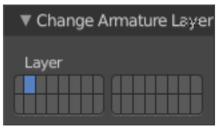
Layer

Here you can again put the selected bones onto another layer.

Change Armature Layers

This menu item opens a popup where you can put the whole armature onto another layer.

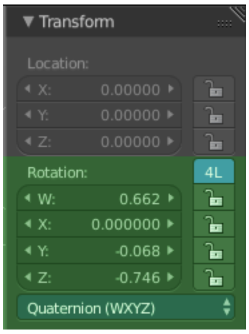
Last Operator Change Armature Layers



Layer

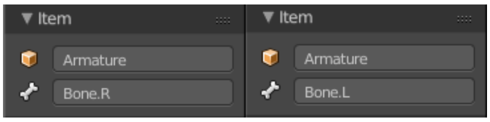
Here you can again put the armature onto another layer.

Flip Quats



This feature flips the quaternion rotation values of the currently selected bone(s). Positive values becomes negative, and negative values becomes positive.

Flip Names



This tool requires to follow some name conventions. If there is a lower or upper case “L”, “R”, “left” or “right” with a separating dot in the bone name, then this tool renames the bones names to its counter part. Bone.L becomes Bone.R.

This tool is useful when you mirror parts of the armature, and don't want to rename all the bones one by one.

AutoName Top/Bottom

This tool automatically adds a suffix to all selected bones, based on their local position relative to the armature center.

Bones with a positive Z Coordinate will receive a .Top suffix. Bones with a negative Z coordinate will receive a .Bot suffix.

AutoName Front/Back

This tool automatically adds a suffix to all selected bones, based on their local position relative to the armature center.

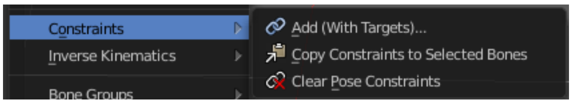
Bones with a positive Y Coordinate will receive a .Fr suffix. Bones with a negative Y coordinate will receive a .Bk suffix.

AutoName Left/Right

This tool automatically adds a suffix to all selected bones, based on their local position relative to the armature center.

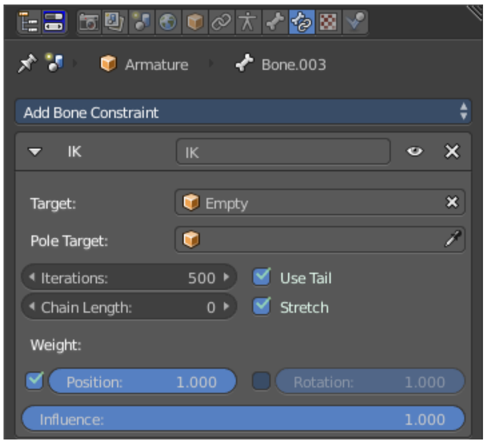
Bones with a positive X Coordinate will receive a .L suffix. Bones with a negative X coordinate will receive a .R suffix.

Constraints

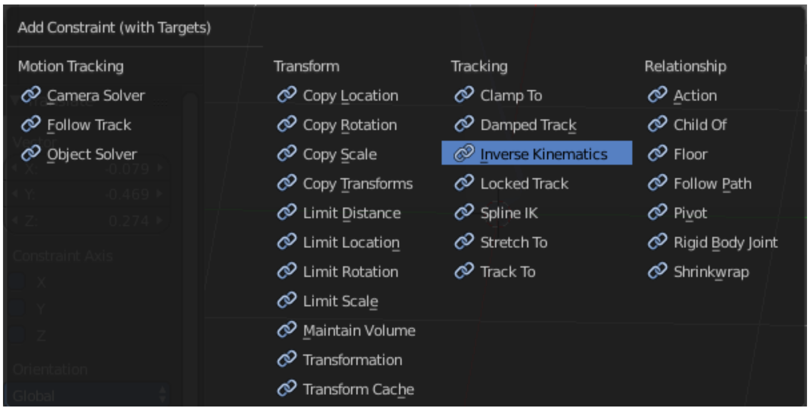


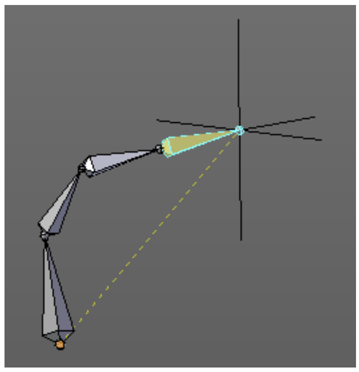
Constraints is a menu that contains some tools around constraints.

Add (With Targets)



Add (With Targets) calls the Constraints menu where you can choose the constraint that you want to add. When you add an IK constraints with just the bone selected, then it adds an empty as a handler too, and fills it in as a target.





You can define a own target object too. The armature needs to be in pose mode. Let's create a cube or another primitive. Select it. Now hold down Shift, and click at the bone where you want to add the constraint too. Then choose Add (with Targets), and choose your constraint method. The cube will now be chosen as the target object.

Copy Constraints to selected Bones

Copies the constraints with all its settings to the selected bone.

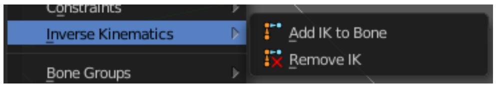
Usage:

Select the bone where you want to copy the constraints to. Hold down shift, then select the bone that contains the constraints. Then perform the tool. The constraints will be copied.

Clear Pose Constraints

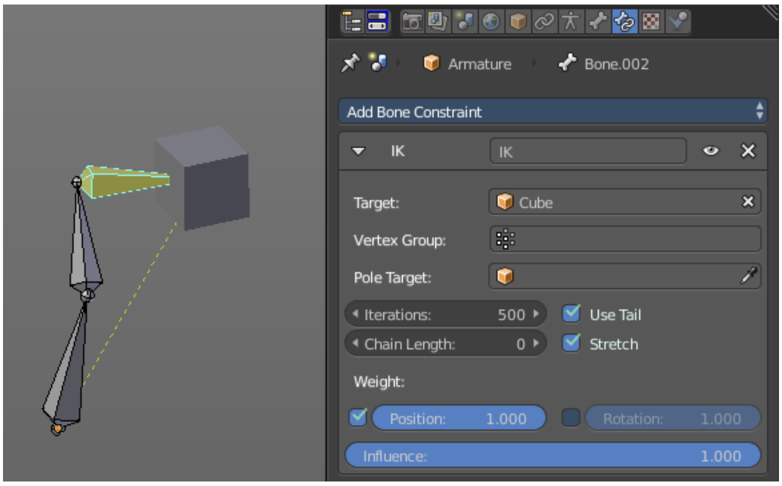
Removes all bone constraints modifiers from the bone.

Inverse Kinematics



Inverse Kinematics is a menu with two isolated items from the whole bone constraints menu. The Inverse Kinematics. You could also add an Inverse Kinematics bone constraint by the Constraints / Add (With Targets) menu item from above. It is in the list. But this menu allows quick access without big search.

Add IK to Bone

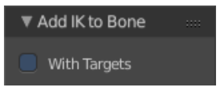


Add IK to bone adds an IK bone constraint to the selected bone. When you add an IK constraints with just the bone selected, then it adds an empty as a handler too, and fills it in as a target.

You can define a own target object too. The armature needs to be in pose mode. Let's create a cube or another primitive. Select it. Now hold down Shift, and click at the bone where you want to add the constraint too. Then choose Add (with Targets), and choose your constraint method. The cube will now be chosen as the target object.

Last Operator Add IK to Bone

With Targets

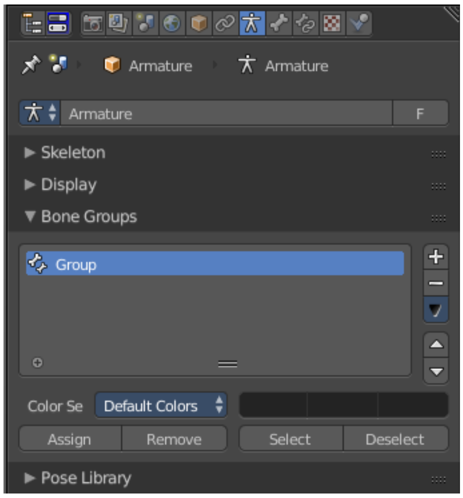


Here you can define if you want to add the IK constraints with or without a target.

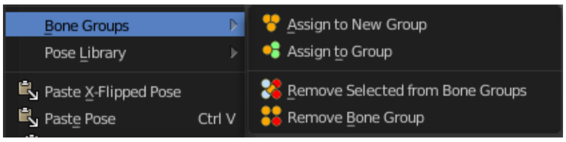
Remove IK

Removes all IK bone constraint(s) at the selected bone(s).

Bone Groups



Bone Groups is a menu to handle bone group functionality from within a menu in the 3D view. The bone groups themselves can be found in the Properties editor.



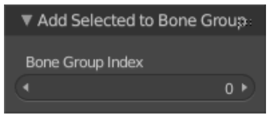
Assign to New Group

Assigns the selected bone(s) to a new group.

Assign to Group

Assigns the selected bone(s) to a existing group.

Last operator Add Selected to Bone Group



This last operator belongs to both tools. Assign to New Group, and Assign to Group.

Bone Group Index

Here you can adjust the Bone Group Index. An Index of 0 creates a new bone group. Higher values tries to assign the bone to existing bone groups instead.

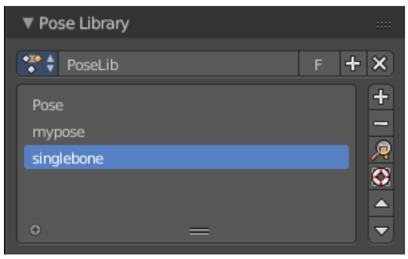
Remove selected from Bone Groups

Removes the selected bone(s) from the assigned bone groups.

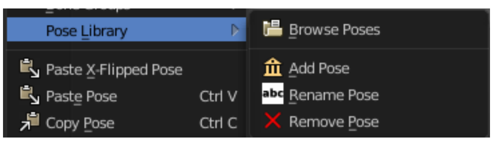
Remove Bone Group

Removes the currently active bone group.

Pose Library



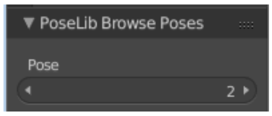
The content of this menu belongs to the Pose library. Which can be found in the Properties editor.



Browse Poses

With this feature you can browse through the available poses in the 3D view. While operation you will see informations in the header. It shows you what the current pose is, and how to navigate to the next or previous pose.

Note that you need to have the bones selected for which you want to display the poses. When in doubt, select all bones.

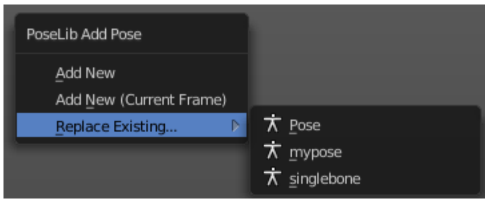


Last Operator Pose lib Browse Poses

Pose

Here you can scroll through the poses

Add Pose



Here you can add a new pose for your armature to the pose library.

Note that you need to have the bones selected for which you want to add the pose. It just records the pose for the selected bones.

Calling the tool opens a popup where you can choose how you want to add the current pose.

Add New

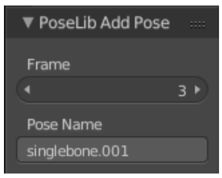
Adds a new pose.

Add New (Current Frame)

Adds a new pose at the current frame. It does NOT record a keyframe.

Replace Existing

Here you can replace an existing pose.



Last Operator Pose Lib Add Pose

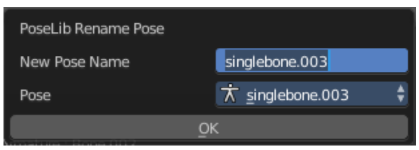
Frame

The frame at which this pose should be created

Pose Name

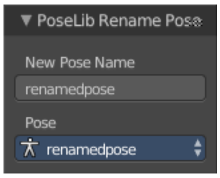
Here you can rename the pose while creation.

Rename Pose



Here you can rename a pose. It opens a popup menu where you can choose the pose to rename, and where you can rename it. One pose at a time.

Last Operator Pose Lib Rename Pose



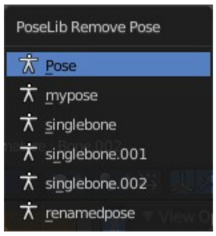
New Pose Name

Here you can enter the new pose name.

Pose

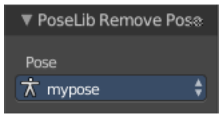
Here you can choose the pose that you want to rename.

Remove Pose



Removes the currently active pose. The tool opens a popup where you can choose the pose to remove.

Last Operator Pose Lib Remove Pose



Pose

Here you can again choose which pose to remove.

Paste X-Flipped Pose

Pastes a formerly copied pose, and flips it around the X axis of the object. Local.

Paste Pose

Pastes a formerly copied pose.

Last Operator Paste Pose

This Last Operator belongs to both paste actions. Paste Pose and Paste X-Flipped Pose

Flipped on X-Axis

Flips the pasted pose around the X axis of the object.

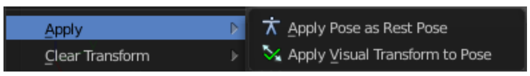
On Selected Only

Pastes just to the currently selected bones. Not to the whole armature.

Copy Pose

Copies the current pose.

Apply



Apply is a menu with some Apply functionality.

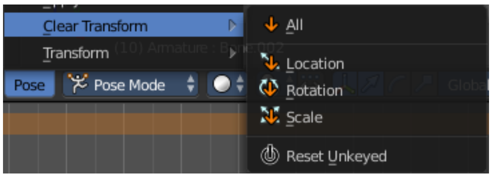
Apply Pose as Rest Pose

You need a rest pose where you can reset the pose back to. With this tool you can set the current pose to be the new Rest pose.

Apply Visual Transform to Pose

Apply final constrained position of posed bones to their transform.

Clear Transform



Clear transform is a menu with some Clear functionality. You need to have the bones selected where you want to perform the operation. Unselected bones will not be calculated.

All

Resets location, rotation and scale back to the Rest pose.

Location

Resets location back to the Rest pose.

Rotation

Resets rotation back to the Rest pose.

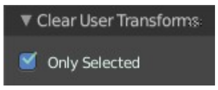
Scale

Resets scale back to the Rest pose.

Reset Unkeyed

Resets the pose for the selected bones back to the state of the latest keyframe.

Last Operator Clear User Transforms



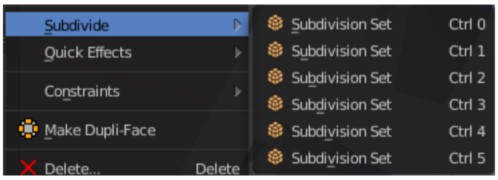
Only Selected

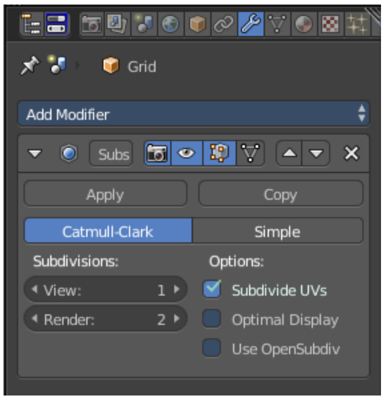
Clear User transform for selected armature part, or for the whole armature.

Sculpt Mode - Sculpt Menu

The Sculpt menu contains just one menu item at the moment. Subdivide.

Subdivide





Subdivide is a menu where you can quickly set the subdivision level of the selection.

What it does is to add a SDS modifier in the Properties Editor if required. And set the SDS level to the needed value.

Crtrl 0 sets SDS to level 0. Ctrl 1 sets SDS level to 1 , and so on.

SDS happens at Object mode level. Even when you apply it in the Sculpt Mode! And it happens at the whole object.

Last Operator Subdivision Set

The last operator Subdivision Set is greyed out in Sculpt mode.

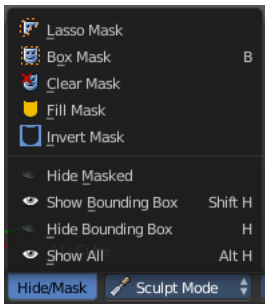
Sculpt Mode - Brush Menu

This menu contains brush related tools.

Reset Brush

Resets the current brush size to default size.

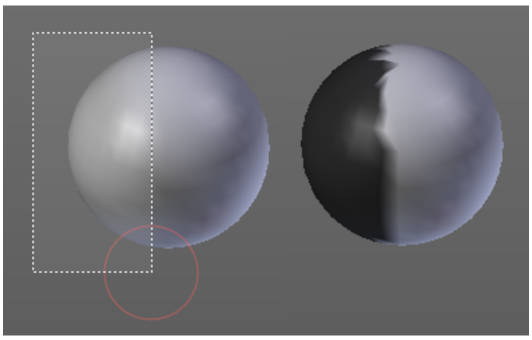
Sculpt Mode - Hide/Mask Menu

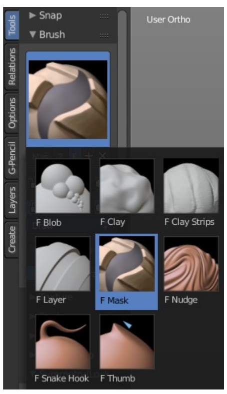


This menu contains some masking functionality.

Masking is a way to control which areas of the mesh are influenced by sculpting. To edit a mask manually, select the *Mask Brush* from the Brush panel.

Masked parts turns black.





Lasso Mask

Select part of the mesh with a lasso tool.

Hotkey only tool, since the menu item is a bad starting point.

Box Mask

Select part of the mesh with a Rectangle tool.

Clear Mask

Clears the mask.

Fill Mask

Fills the mask with a given value, or inverts its values.

Invert Mask

Inverts the mask.

Hide Masked

Hides the masked mesh part.

Show Bounding Box

Lets you rectangle select a screen area to make hidden masked parts visible again.

Hide Bounding Box

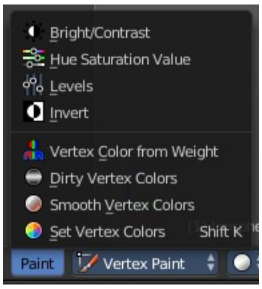
Lets you rectangle select a screen area to hide mesh parts.

Show All

Makes all invisible mesh parts visible again.

Vertex paint Mode - Paint Menu

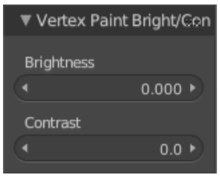
The Paint menu contains tools for vertex painting in Vertex paint mode.



Bright / Contrast

This tool allows you to adjust the brightness and the contrast of the vertex painting. You adjust the settings in the last operator.

Last Operator Vertex Paint Bright/Contrast



Brightness

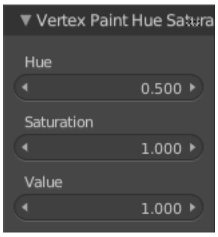
Adjust the brightness of the vertex colors.

Contrast

Adjust the contrast of the vertex colors.

Hue Saturation Value

This tool allows you to adjust the hue, saturation and value values of the vertex painting. You adjust the settings in the last operator.



Last Operator Vertex Paint Hue Saturation Value

Hue

Adjust the Hue of the vertex colors.

Saturation

Adjust the Saturation of the vertex colors.

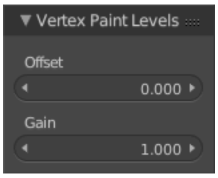
Value

Adjust the Value of the vertex colors.

Levels

This tool allows you to level the values of the vertex painting. You adjust the settings in the last operator.

Last Operator Vertex Paint Levels



Offset

Adjust the Offset of the vertex colors.

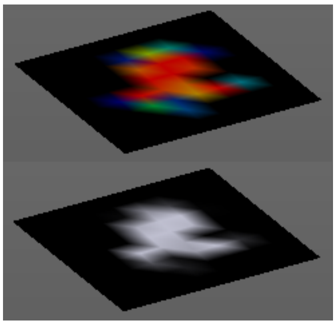
Gain

Adjust the Gain of the vertex colors.

Invert

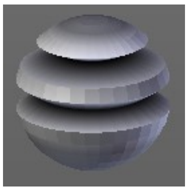
Inverts the vertex colors.

Vertex Color from Weight



This tool requires to have Weight Painting at the mesh. It converts the weight paint colors into greyscale vertex colors.

Dirty Vertex Colors

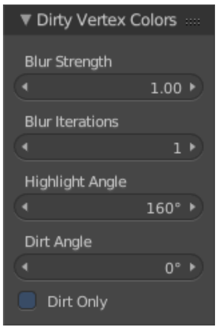


Dirty vertex colors is a special tool for ageing meshes. Let's for example imagine we have a relief. Edges that are outstanding are often touched, and tends to become brighter. While areas in the inner side of a relief are not so often touched. And here the relief collects dirt too. So this areas becomes darker.

And that's what the tool simulates. It makes the outer edges brighter, and the inner edges darker. This calculation is somehow similar to Ambient Occlusion. Ambient Occlusion makes corners darker. The dirty tool makes edges brighter too. And it calculates with the vertices. Not Texel positions like AO.

You need to convert this result to a texture to use it in your texturing, as a mask for example. This conversion can be done by baking.

The tessellation of the mesh should not be too high for this operation. Since it calculates the angles of the mesh edges.



Last Operator Dirty Vertex Colors

Blur strength

How strong the result should be blurred

Blur Iterations

The number of iterations for the blur.

Highlight Angle

The angle for the bright areas. Angles higher as this value will not be recognized as a edge to highlight.

Dirt Angle

The angle for the dark areas. Angles lower as this value will not be recognized as a corner to darken.

Dirt only

Ignore the highlight areas, just calculate the dirt angles.

Smooth Vertex Colors

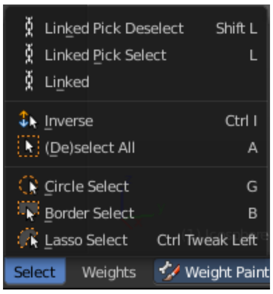
Smooths out the vertex colors.

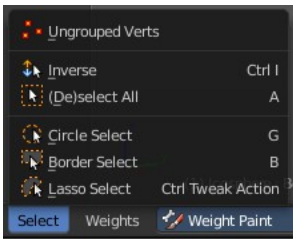
Set Vertex Colors

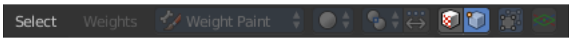
Flood fills the vertex colors with the current vertex color value.

Weight Paint Mode - Select Menu

The Select menu in Weight Paint mode provides you with some selection tools for masking. This menu is just visible when you have either Face selection masking or vertex selection masking activated. The content differs between those two modes. Ungrouped Verts is just visible with Vertex Selection masking. The three "Linked" menu items just with Face Selection masking.







Linked

Just active with Face selection masking. Select linked faces.

Linked Pick Select

Just active with Face selection masking. Hotkey Only Functionality! This entry exists so that you know the tool is there and that you can edit the hotkey.

Linked Pick Select selects the linked faces under the cursor.

Linked Pick Deselect

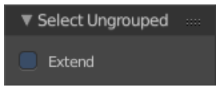
Just active with Face selection masking. Hotkey Only Functionality! This entry exists so that you know the tool is there and that you can edit the hotkey.

Linked Pick Select deselects the linked faces under the cursor.

Ungrouped Verts

Just active with Vertex selection masking. Selects ungrouped Vertices.

Last Operator Select Ungrouped



Extend

Extends the selection.

Inverse

Inverts the current selection.

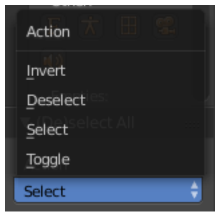
(De)Select All

Toggles between select all and deselect all.

Last Operator (De)Select All

Action

Action is a drop-down box where you can choose between different methods.



Invert

Inverts the selection.

Deselect

Deselects all.

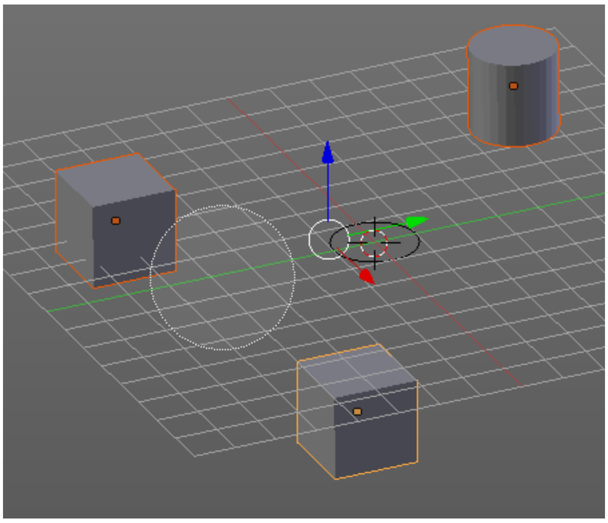
Select

Selects all.

Toggle

Toggles between select all and deselect all.

Circle Select



Circle select enters the Circle Select mode. This is a special select mode where you can select elements by moving with the mouse over it. It adds to selection by default.

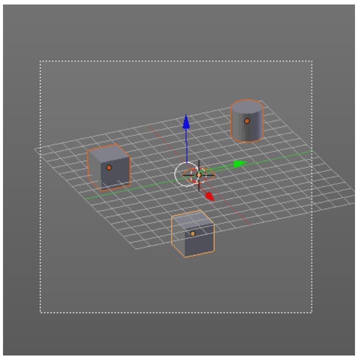
To subtract from selection hold down Shift key. To exit the Circle select click with the right mouse button.

The pencil radius of the circle select tool can be adjusted with the scroll wheel.

Note

You cannot navigate while you are in Circle Select mode. You have to leave the Circle Select mode, do the navigation, then re enter the Circle Select mode.

Border Select



Border select enters the Border Select mode. This is a special select mode where you can select elements by dragging a rectangle. And what's inside of the rectangle gets selected then. It adds to selection by default.

To subtract from selection hold down Shift key.

The selection gets applied when you release the mouse. You leave the mode automatically when you release the mouse.

Lasso Select

Lasso select enters the Lasso Select mode. This is a special select mode where you can select elements by dragging a form around what you want to select. And what's inside of the rectangle gets selected then. It adds to selection by default.

To subtract from selection hold down Shift key.

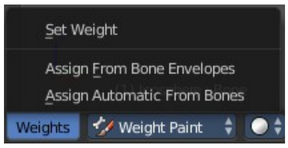
The selection gets applied when you release the mouse. You leave the mode automatically when you release the mouse.

Note

You can of course also start with clicking at the menu item. But this tool is by design a hotkey only tool. Hold down Ctrl , and select with left mouse button.

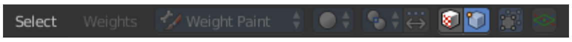
Weight Paint Mode - Weights Menu

The weights menu contains some tools around Weight Painting.



Set Weight

This tool is just active when you have either Face selection masking or vertex selection masking activated.



The tool fills the selection with the current active Weight color that you have adjusted in the Brush panel in the Tools tab in the Tool shelf.

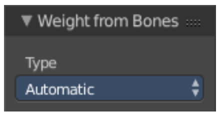
Assign from Bone Envelopes

Weights the vertices from the connected bone envelopes. And takes the distance to the bone envelope into account.

Assign Automatic from Bones

Weights the vertices connected with the bone. And takes the distance to the bone into account.

Last Operator Weight from Bones



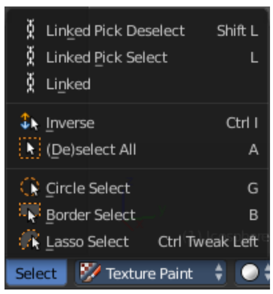
This last operator is the same for both tools. Assign Automatic from Bones, and Assign from Bone Envelopes.

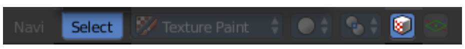
Type

Here you can choose if you want to Assign from Bone Envelopes, or from Bones.

Texture Paint Mode - Select Menu

The Select menu in Weight Paint mode provides you with some selection tools for masking. This menu is just visible when you have either Face selection masking or vertex selection masking activated.





Linked

Select linked faces.

Linked Pick Select

Hotkey Only Functionality! This entry exists so that you know the tool is there and that you can edit the hotkey.

Linked Pick Select selects the linked faces under the cursor.

Linked Pick Deselect

Hotkey Only Functionality! This entry exists so that you know the tool is there and that you can edit the hotkey.

Linked Pick Select deselects the linked faces under the cursor.

Inverse

Inverts the current selection.

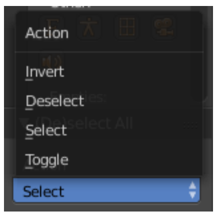
(De)Select All

Toggles between select all and deselect all.

Last Operator (De)Select All

Action

Action is a drop-down box where you can choose between different methods.



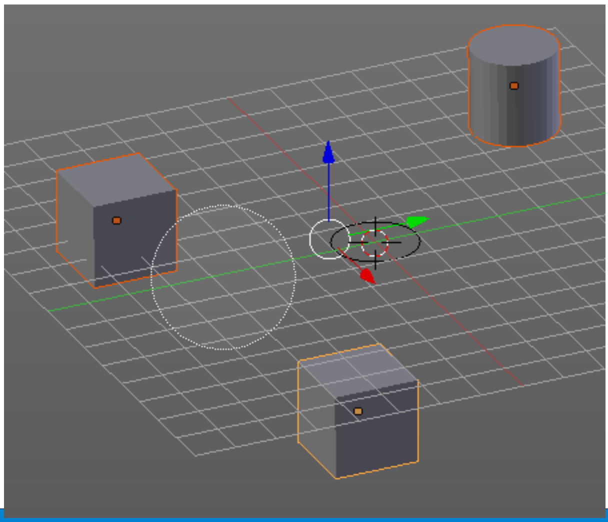
Invert
Inverts the selection.

Deselect
Deselects all.

Select
Selects all.

Toggle
Toggles between select all and deselect all.

Circle Select



Circle select enters the Circle Select mode. This is a special select mode where you can select elements by moving with the mouse over it. It adds to selection by default.

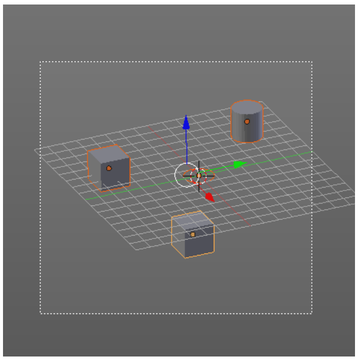
To subtract from selection hold down Shift key. To exit the Circle select click with the right mouse button.

The pencil radius of the circle select tool can be adjusted with the scroll wheel.

Note

You cannot navigate while you are in Circle Select mode. You have to leave the Circle Select mode, do the navigation, then re enter the Circle Select mode.

Border Select



Border select enters the Border Select mode. This is a special select mode where you can select elements by dragging a rectangle. And what's inside of the rectangle gets selected then. It adds to selection by default.

To subtract from selection hold down Shift key.

The selection gets applied when you release the mouse. You leave the mode automatically when you release the mouse.

Lasso Select

Lasso select enters the Lasso Select mode. This is a special select mode where you can select elements by dragging a form around what you want to select. And what's inside of the rectangle gets selected then. It adds to selection by default.

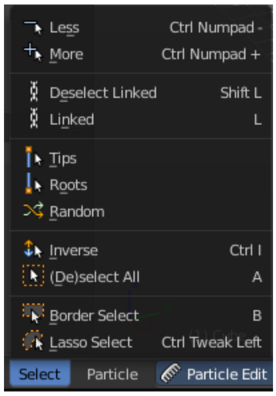
To subtract from selection hold down Shift key.

The selection gets applied when you release the mouse. You leave the mode automatically when you release the mouse.

Note

You can of course also start with clicking at the menu item. But this tool is by design a hotkey only tool. Hold down Ctrl , and select with left mouse button.

Particle Mode - Select Menu



The Select menu in Particle mode provides you with some selection tools to edit the particles.

When you are in Emitter mode then most of the menu items are greyed out. This menu items are for Hair particles.

Less

Select less.

More

Select more.

Linked

Select linked geometry.

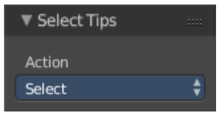
Deselect Linked

Deselect linked geometry.

Select Tips

Selects the end vertices of hair particles.

Last Operator Select Tips



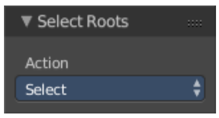
Action

A dropdown box where you can choose what you want to do.

Select Roots

Selects the start vertices of hair particles.

Last Operator Select Roots



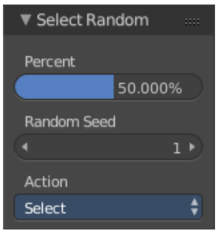
Action

A dropdown box where you can choose what you want to do.

Random

Selects random objects.

Last Operator Select Random



Percent

The Percentage of objects that should be selected randomly.

Random Seed

The Seed for the random number generator.

Action

Action is a drop-down box where you can choose if you want to select or to deselect random.

Inverse

Inverts the current selection.

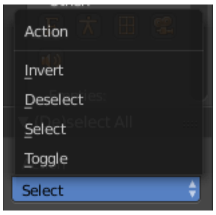
(De)Select All

Toggles between select all and deselect all.

Last Operator (De)Select All

Action

Action is a drop-down box where you can choose between different methods.



Invert

Inverts the selection.

Deselect

Deselects all.

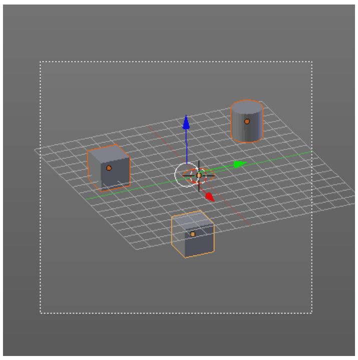
Select

Selects all.

Toggle

Toggles between select all and deselect all.

Border Select



Border select enters the Border Select mode. This is a special select mode where you can select elements by dragging a rectangle. And what's inside of the rectangle gets selected then. It adds to selection by default.

To subtract from selection hold down Shift key.

The selection gets applied when you release the mouse. You leave the mode automatically when you release the mouse.

Lasso Select

Lasso select enters the Lasso Select mode. This is a special select mode where you can select elements by dragging a form around what you want to select. And what's inside of the rectangle gets selected then. It adds to selection by default.

To subtract from selection hold down Shift key.

The selection gets applied when you release the mouse. You leave the mode automatically when you release the mouse.

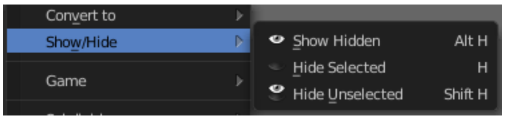
Note

You can of course also start with clicking at the menu item. But this tool is by design a hotkey only tool. Hold down Ctrl , and select with left mouse button.

Particle Mode - Particle Menu

The Particle menu contains some tools to modify the particles.

Show/Hide



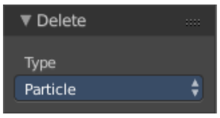
Show/Hide is a menu. Here you can show or hide objects in the viewport. See chapter All Modes, all Object types - Show / Hide

Delete

Brings up a popup where you can choose to delete either the selected particle(s) or the selected key(s).

Last Operator Delete

Type

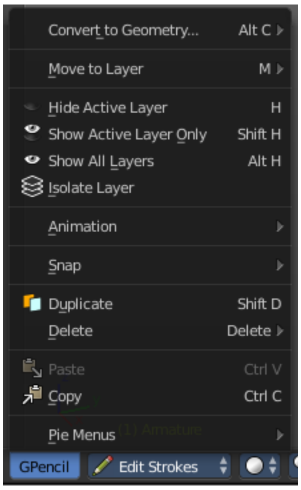


Here you can again choose what type to delete. Particle or Key.

Grease Pencil - Edit Strokes Mode

The Edit strokes mode allows you to edit your grease pencil strokes. The Select menu contains the usual select methods. The GPencil menu contains some further functionality.

Gpencil Menu



Convert to Geometry

Convert to Geometry is a sub menu with thee menu items.

Path

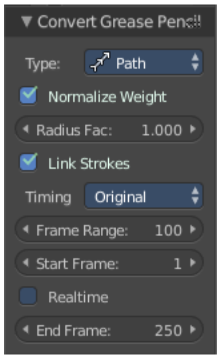
Convert selected Grease pencil stroke into a Path.

Bezier Curve

Convert selected Grease pencil stroke into a Bezier Curve.

Polygon Curve

Convert selected Grease pencil stroke into a Polygon Curve.



Last Operator Convert Grease Pencil

Type

Here you can again choose the conversion method again.

Normalize Weight

Normalize weight, set from stroke width

Radius Multiplier

Multiplier for the points radii, set from stroke width

Link Strokes

Link strokes with zero radius sections of curves.

Timing

For animation - the timing method

Frame Range

For animation - the frame range

Start Frame

For animation - the start frame

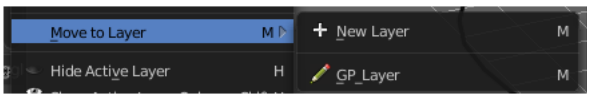
Realtime

For animation - Realtime update or not

End Frame

For animation - the end frame

Move to Layer

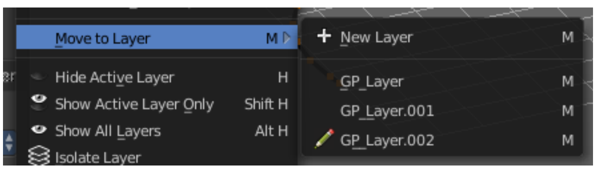


Grease pencil strokes gets created at layers. Here you can move the strokes to a new layer

New Layer

Creates a new layer, and moves the selection to this layer.

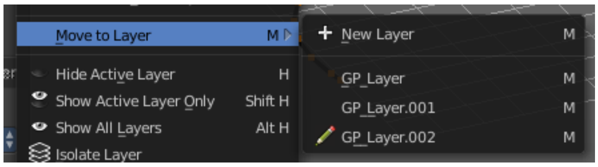
GP Layer



Choose an existing layer and move the selection to this layer.

Last Operator Move Strokes to Layer

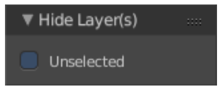
Here you can again decide if you want to create a new layer, or if you want to move the selection to an existing layer.



Hide active layer

Hides the active layer.

Last operator Hide Layer(s)



Unselected

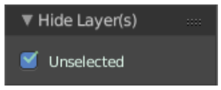
Hides the unselected layers. See next point.

Show Active Layer only

Should be called Hide unselected! Show active layers, and hide all others.

Last operator Hide Layer(s)

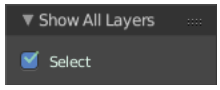
Unselected



Hides the unselected layers.

Show all Layers

Makes all hidden layers visible.



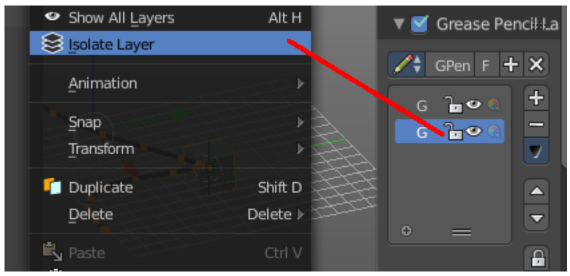
Last Operator Show All Layers

Select

Selects all geometry in the layer.

Isolate Layer

Locks the active layer. This corresponds with the lock symbol in the Grease Pencil Layers panel.



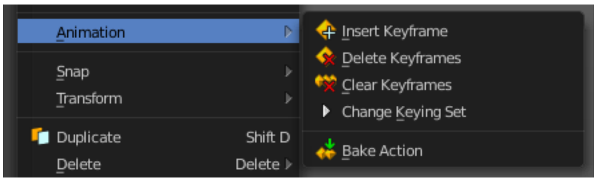
Last Operator Isolate Layer

Affect Visibility

Make the layer invisible too.

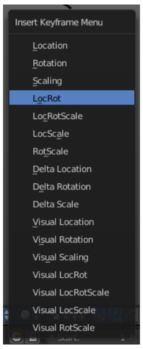
Animation

Animation is a sub menu around animation functionality. You need to have an object in the scene.



Insert Keyframe

Opens a menu where you can insert a keyframe with a defined keying set.



Delete Keyframes

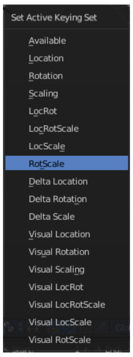
Deletes keyframes at the current frame.

Clear Keyframes

Deletes all keyframes.

Change Keying Set

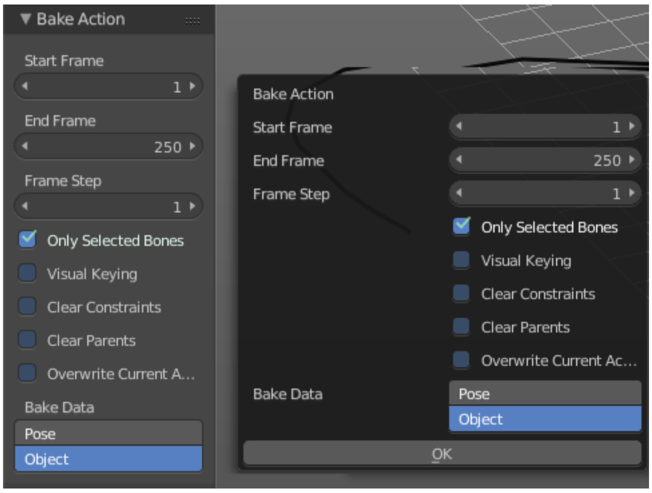
Opens a menu where you can change the keying set.



Bake Action

Bake the keyframes into an action.

This tool calls a dialog with the bake settings. They are identical with the last operator.



Start Frame

Defines the start frame.

End Frame

Defines the end frame.

Frame Step

Defines the number of keyframes per step

Only Selected

Only key selected bones.

Visual Keying
Keyframe from the final transformations.

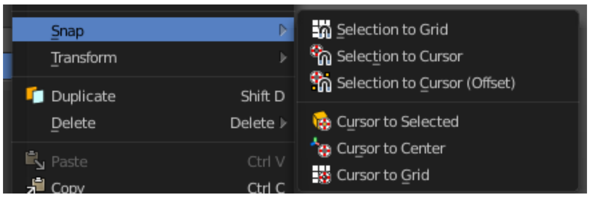
Clear Constraints
Remove all constraints and do visual keying.

Clear Parents
Bake animation onto teh object, then clear parents. This is for objects only.

Overwrite current Action
Bake animation into current action.

Bake Data
You can either bake to pose, or bake to object.

Snap



Snap is a sub menu with snapping functionality.

Selection to Grid

Selection to Grid snaps the selected element(s) to the closest Grid point.

Selection to Cursor

Selection to Grid snaps the selected element(s) to the 3D cursor. ALL selected elements will end at cursor position. For example all selected vertices.

Selection to Cursor (Offset)

Selection to Grid snaps the selected element(s) to the 3D cursor. The centre of the selected elements will snap to the 3D cursor. A group of vertices for example will remain its shape.

Cursor to Selected

Cursor to Selected snaps the 3D cursor to the selected element.

Cursor to Centre

Cursor to Centre snaps the 3D cursor to the centre of the world.

Cursor to Grid

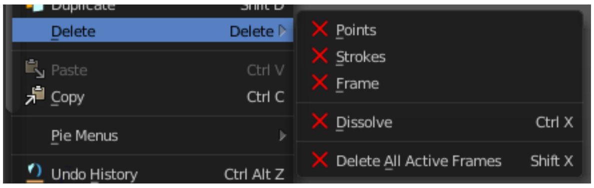
Cursor to Grid snaps the 3D cursor to the closest Grid point.

Duplicate

Duplicates the current selection. The copy sticks to the mouse until you release it. A Right click while moving will reset the position of the duplicate. The duplicated part will be part of the same object.

When you drag the duplicate around you will see the position values in the

Delete



Delete is a sub menu where you can define what exactly you want to delete.

Points

Delete the vertices of the selection. The strokes gets split at this point.

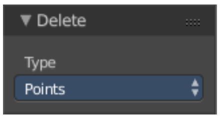
Strokes

Delete the whole stroke(s).

Frames

Delete the grease pencil frames.

Last Operator Delete



Type

Type is a dropdown box where you can choose the delete method again.´

Dissolve

Delete selected points without splitting strokes.

Delete all active frames

Delete all active frames of all editable grease pencil layers.

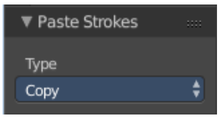
Copy

Copies the selected selection(s).

Paste

Pastes copied selection(s).

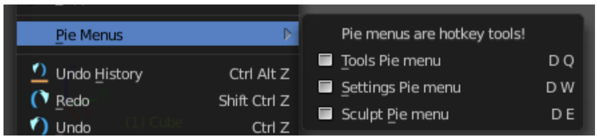
Last Operator Paste Strokes



Select

Select pasted object(s).

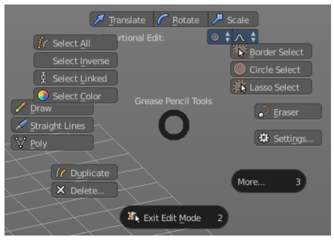
Pie menus



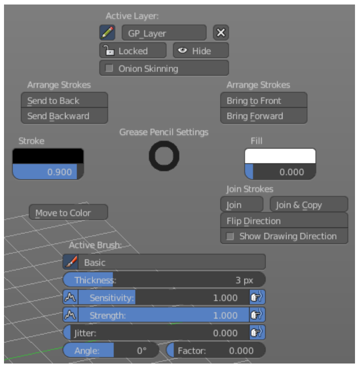
Pie menus is a sub menu that contains operators to call pie menus. This pie menus contains the tools from the tool shelf, and provides an easier access, since the menu appears directly under the mouse.

This pie menus are hotkey tools! They are meant to be used with hotkeys in the 3D viewport. The menu entries are fully functional. They call the pie menus. But are meant as a visual hint.

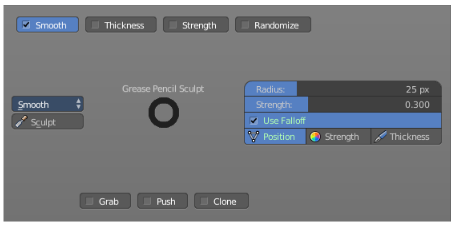
Tools Pie menu



Settings Pie menu



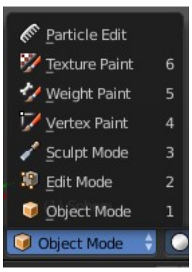
Sculpt Pie menu

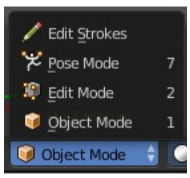


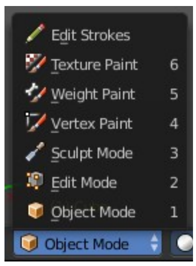
Header Tool - Mode Drop-down Box

The Mode drop-down box allows you to switch between the different modes.

Modes are object states that allows you to edit and







manipulate objects at different levels with different tool sets and goals. The sculpt mode for example allows you to sculpt a mesh object. Edit Mode allows to manipulate the mesh of the object, and so on.

The available modes can differ from object to object. A armature for example has an additional pose mode. And when you work with the grease pencil, then the Edit Strokes mode becomes available.

Object Mode

This mode allows to manipulate objects at Object level. Like move it around, rotate it, etc. This mode is available for all object types.

Edit Mode

The edit mode allows to edit the object. With a mesh object this means that you are able to modify and to change the geometry. With an armature you build your skeleton. And with a text object you can type in text, and choose the font etc.

Not all objects has an edit mode.

Sculpt Mode

Sculpt mode is a mesh object only mode. In this mode you can sculpt the mesh.

Vertex Paint

Vertex Paint is a mesh object only mode. In this mode you can paint vertices with colors.

Weight Paint

Weight Paint is a mesh object only mode. In this mode you can adjust weight painting for an armature for example. But Weight Painted mesh objects can also be used in conjunction with particles.

Texture Paint

Weight Paint is a mesh object only mode. In this mode you can paint at the texture of a mesh directly. This mode requires to have a working UV mapping and a texture at the mesh object.

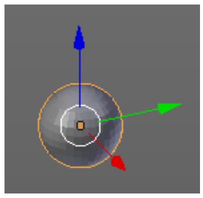
Edit Strokes

Edit Strokes is a Grease Pencil only mode. It allows to manipulate the curves at a mesh level.

Particle Edit

Particle edit is a Particle System mode only. When you apply a particle system to a mesh object then this mode becomes available. It allows you to manipulate the particle system at a mesh level. You can comb hair particles for example.

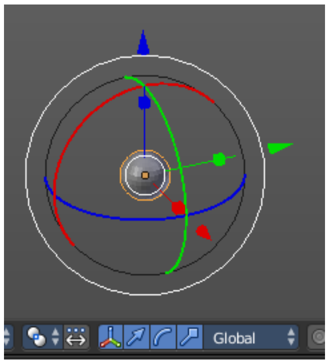
Header Tool - 3D Manipulator Widget



The 3D Manipulator widget tool allows you to enable and to disable a 3D Manipulator widget in the viewport. It is made of several sub elements.

This element exists in most modes. But in Sculpting mode for example the 3D Manipulator is not available.

3D Manipulator

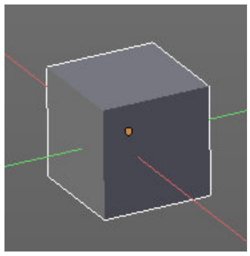


This button activates or deactivates the widget. Have a look at the shortcut here.

Transformation manipulator Translate, Rotate and Scale

Here you can activate or deactivate three different types of widgets. One for Translate, one for Rotate, one for Scale.

You can also activate more than one widget at a time. Hold down shift while clicking at one of the buttons adds to the selection.



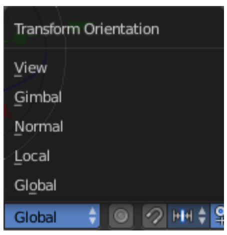
When you use the translate and scale widget, then you can transform in two directions by holding down shift. For example when you use translate widget and pull at the blue handler for upwards in Z direction, then you don't pull upwards, but sidewards in X and Y direction. The green and red line indicates the movement freedom.

When you use the Translate widget and hold down Ctrl, then you move the object with a snapping of one unit.

Last Operator Translate, Rotate and Resize

For the last Operator Translate, Rotate and Resize please have a look in the chapter Navigation Menu. They are identical.

Transform Orientation



Transform Orientation is a drop-down box where you can choose between different orientation methods for the transform operation. The widget points into this direction then.

View

The transform orientation aligns to the current view.

Gimbal

Aligns each axis to the Euler rotation axis as used for input.

Normal

This is of interest for bones for example. Aligns the transformation axis to average normal of the selected elements. Bone Y axis for Pose mode.

Local

Uses the local orientation of the selected elements.

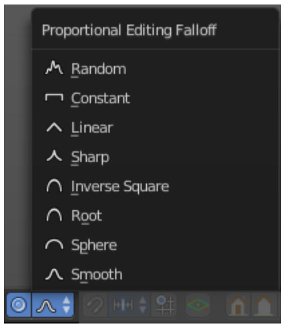
Global

Uses the global orientation for the selected elements.

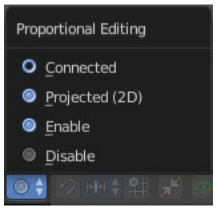
Header Tool - Proportional Editing

Proportional editing is a way to transform selected elements with some kind of a falloff. So when you for example pull a vertice upwards in Edit mode, the neighbour vertices will also pull upwards, but not so strong. The neighbours gets influenced proportional.

Proportional Editing is not available in all modes.



Proportional editing in Object mode is made of two elements. The on off switch. And a drop-down box where you can choose the falloff method.



In Edit Mode with a mesh object you just have the on off switch. But here you can choose between three different falloff modes.

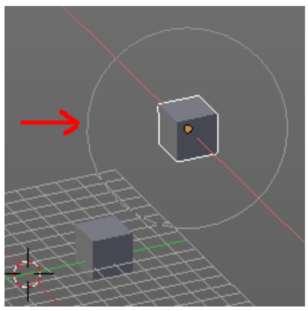
Both settings can be found in the Last Operator panel, when you for example move or scale an object or selection.

Changing the Proportional influence radius

You can change the influence radius for proportional editing with the mouse wheel or the Page up Page down arrows **while keeping the mouse button pressed down** for translate, rotate or scale. Or at the widget.

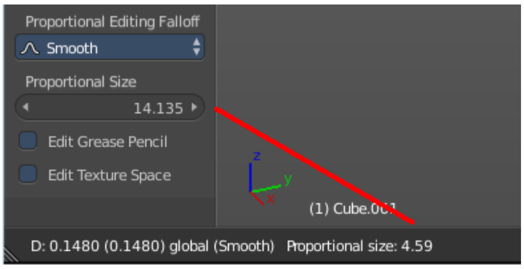
Usage:

Create for example two cubes. Now move one of it around. Enable proportional editing. Choose your favourite falloff method if you want.



When you click at the widget you will see a white circle around the Pivot point. That's the influence radius for the proportional editing.

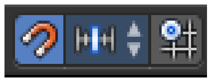
Now increase the radius for falloff. So that the second cube is in the influence radius. You will see it moving at one point.



In the last operator Translate there is also a Proportional Size edit box that shows you the size of the radius. Here you can adjust the value too. But note that it will not update the visible influence radius in the 3D view. And when you change the radius in the viewport with the scroll wheel, then it will use the old value, and not the value that you have typed in here. So you better adjust the radius in the viewport. And use this edit box as a visual feedback.

Header Tool - Transform Snapping

Transform Snapping



This element is for snapping while transformation. Not to mix with the snapping tools in the Tools tab in the Tool Shelf. The Transform Snapping tool includes for example grid snapping.

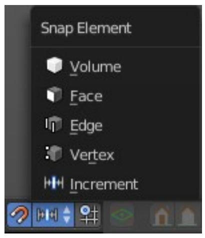
Transform Snapping is not available in all modes.

The Transform Snapping tool is made of three elements.

Transform Snapping

Here you enable or disable snapping.

Snap Element



Snap Element is a drop-down box where you can choose between different snapping methods.

Volume

Snapping happens to the volume of another object.

Snapping

Snapping happens to the face of another object.

Edge

Snapping happens to the Edge of another object.

Vertex

Snapping happens to the Edge of another object.

Increment

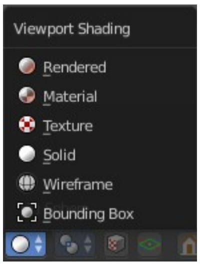
Snapping happens relative to the ground grid.

Absolute Grid alignment while translating

With this feature on the selection snaps to the grid points. Without this feature it snaps increasing by unit size. When you have a grid snapping of 1, and an element at 0.56, then without absolute grid alignment it will snap at 1.56, 2.56 etc. With absolute grid snapping it will snap at 0, 1, 2 etc.

Header Tool - Viewport Shading

The Viewport shading drop-down box contains the different shading modes for the viewport. It exists in all modes.



Rendered

Displays the content in the viewport like you would have rendered it. This mode is dependant of what render engine you have currently active. And is available for Blender Render and Cycles.

Material

Displays the content in the viewport with all material settings and with OpenGL rendering.

Texture

Displays the content in the viewport textured. You need of course a working UV mapping and a texture at the mesh to see it.

Solid

Displays the content in the viewport with a solid white color.

Wireframe

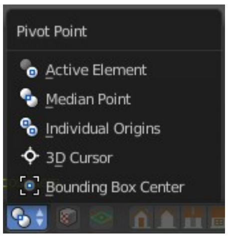
Displays the content in the viewport as Wireframe.

Bounding Box

Displays the content in the viewport as Bounding box. The mesh content is not displayed.

Header Tool - Pivot Point

The Pivot Point is the point around which the object manipulation happens. Rotation, mirroring, and so on. Normally this happens around the pivot of the active object. In this menu you can set the pivot point to other locations. Like the position of the 3D cursor.



It exists in all modes.

Active Element

With this setting the manipulation happens relative to the center of the selected active elements. With more than one element is involved, then in Object mode this center gets calculated from the elements pivots. In edit mode the pivot is also the median point.

Median Point

With this setting the manipulation happens relative to the median point of the selected elements. This can be another point than calculating the center of the pivots. The median gets calculated from the geometry, not from the pivot point of the geometry.

Individual Origins

With this setting the manipulation happens relative to the origins of the selected elements. The origin is the little orange dot in every element.

3D Cursor

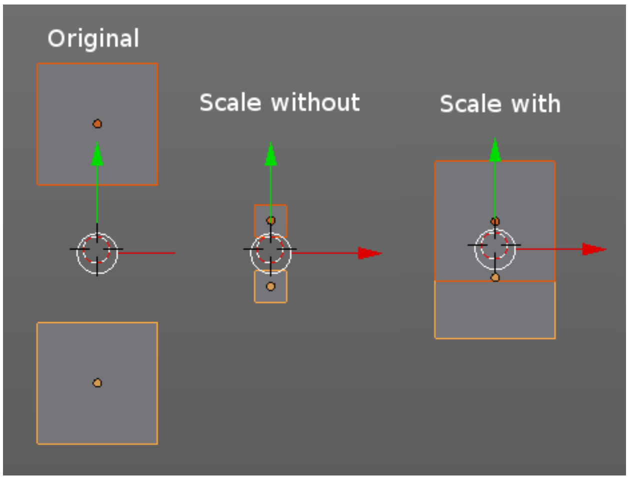
With this setting the manipulation happens relative to the 3D cursor.

Bounding Box Center

With this setting the manipulation happens relative to the Bounding Box Center.

Header Tool - Manipulate Center Points

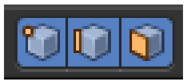
This option is of interest when you have more than one object selected. With this option enabled a transformation will change the positions of the object's origins, but will not affect the object itself.
For example, when you want to scale a group of selected cubes. Without the option enabled the cubes will scale also down when you scale the selection. With this option enabled, the cubes will keep their size. But they will scale closer together. The Pivot points gets scaled.



Header Tool - Mesh Object - Edit Mode - Mesh Select Mode

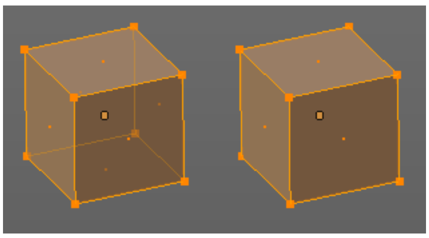
The mesh select mode in Edit Mode with a Mesh object allows you to switch between the three available selection modes Vertice select, Edge Select and Face Select.

You can have more than one mode active by shift clicking at the other mesh select modes.



Header Tool - Mesh Object - Edit Mode - Limit Selection to Visible

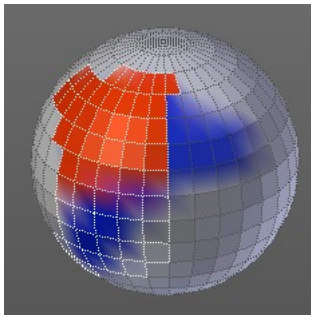
Limit selection to visible limits the view to what you can see from the front. By default the back geometry shines a bit through.



Header Tool - Mesh Object - Face selection masking for Painting

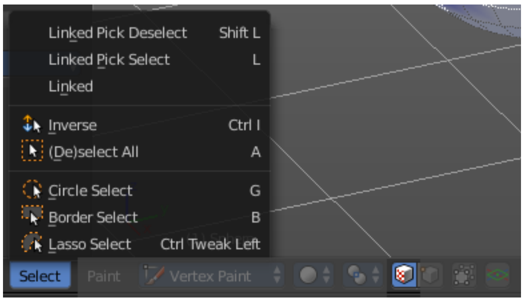
Painting at a Mesh object has two header tools that just belongs to the painting operations. One of it is Face selection masking for Painting. It is visible in Vertex Paint Weight Paint and Texture Paint.

Face selection masking for Painting



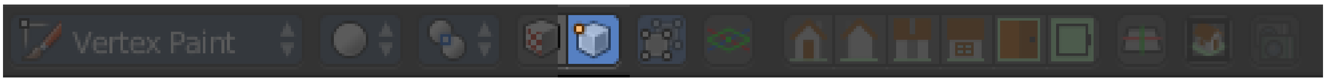
When you activate this tool then you reveal a Select menu in the header. And you can select the mesh parts that you want to manipulate.

Note that you may first want to deselect all. By default everything is selected ...



The select menu is explained in the chapter Vertex Painting - Select Menu.

Header Tool - Mesh Object - Vertex selection masking for Painting

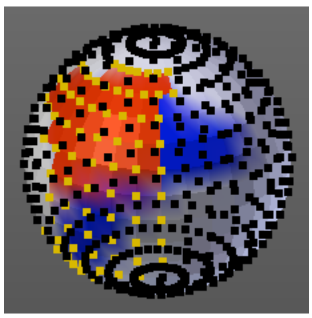


Painting at a Mesh object has two header tools that just belongs to the painting operations. One of it is Face selection masking for Painting. It is visible in Vertex Paint and Weight Paint.

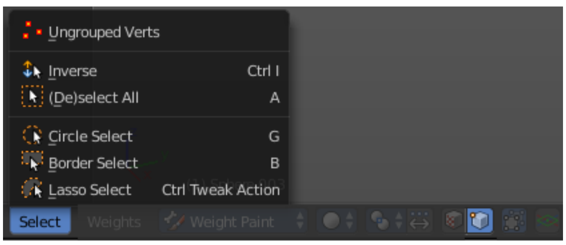
Vertex selection masking for Painting

When you activate this tool then you reveal a Select menu in the header. And you can select the mesh parts that you want to manipulate.

This tool is meant for Weight Painting. And so the mesh displays the vertices too.



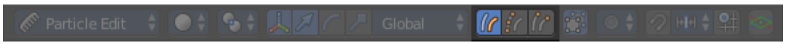
Note that you may first want to deselect all. By default everything is selected ...



The select menu is explained in the chapter Vertex Painting - Select Menu.

Header Tool - Particle Edit - Select modes

The Select modes allows you to change the display and the editability of the particle vertices.



Path

No keypoints are visible. You can only select or deselect all keypoints at once.

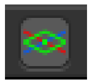
Point

You see all keypoints. And all keypoints are editable

Tip

You can only see and edit the tip keypoints.

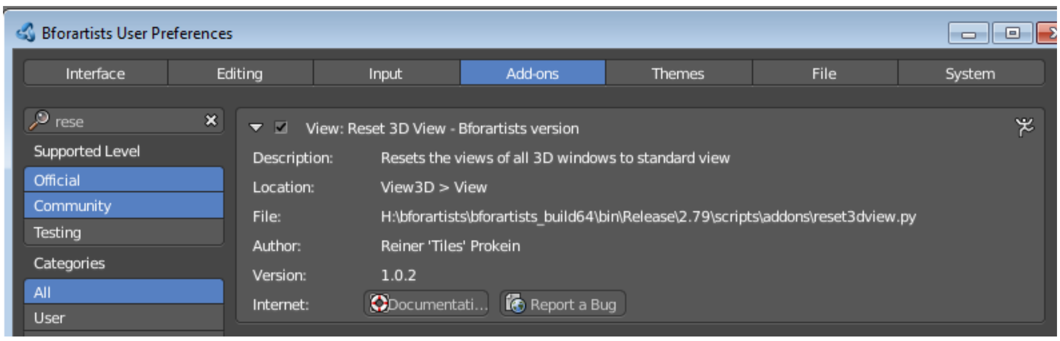
Header Tool - Reset 3D View



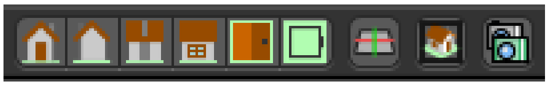
Reset 3D View is a navigation element. It resets the 3D view to a predefined setting.

It exists in all modes.

Reset 3D View is an add-on, and can be uninstalled when wanted. But note that the functionality is missing then.



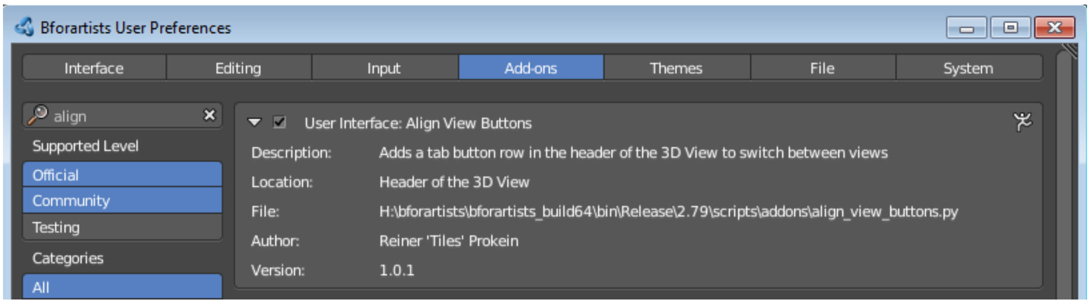
Header Tool - Align View Buttons



The Align View buttons contains some quick navigation elements to navigate in the viewport. You can switch between the different views, switch between orthographic and perspectivic view, switch to camera view and back to viewport view, and set the active camera.

It exists in all modes.

Align View Buttons is an add-on, and can be uninstalled when wanted. But note that the functionality is missing then.

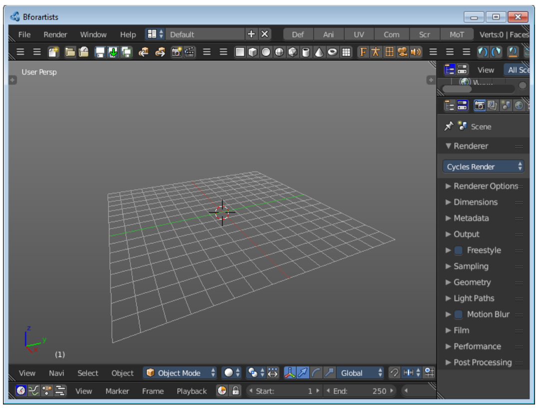


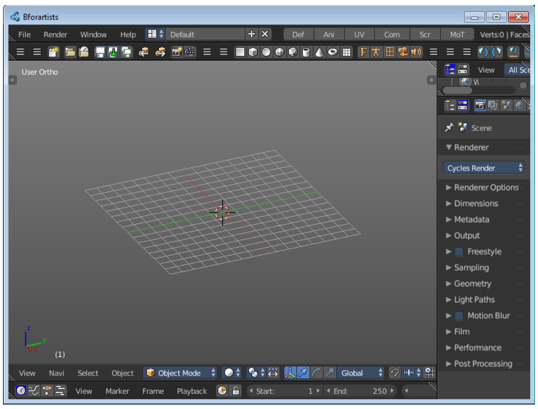
Top, Bottom, etc.

Switches to Top view, Bottom View, etc.

View Persp/Ortho

Toggles between perspectivic and orthographic view. Perspectivic view acts like a real camera with the perspectivic distortions. Orthographic view acts like a mathematical display of an object, without distortions.





Align View to active Camera

Switches to Camera view and back to Viewport Camera.

Set Active Camera

Sets the currently selected camera as the active camera. The active camera is the camera that gets used for rendering.

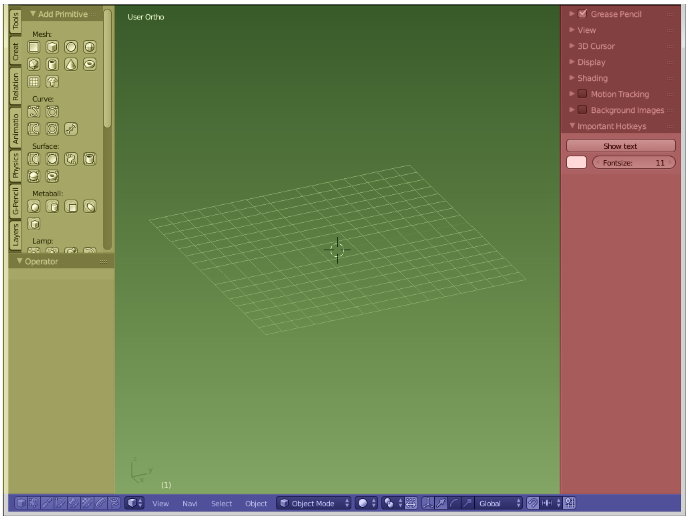
You need to have a camera object selected to activate the tool. Unlike the tool in the View menu, this tool here just works for camera objects.

3D View by tools - Properties Sidebar

Detailed Table of content

3D View by tools - Properties Sidebar

Introduction



The 3D View is made of several areas.

Yellow is the Tool Shelf.

Blue is the Header or Menu bar. It can be at the top or the bottom.

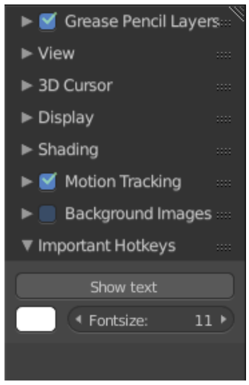
Green is the Viewport. Here you will see and work with your 3D data.

Red is the Properties Sidebar.

The content of the Tool Shelf , the Header and the Properties Sidebar can vary. It depends of the type of the objects and the modes that you are in.

This chapter here is about the Properties Sidebar.

Properties Sidebar



The Properties Sidebar contains various settings for the 3d view.

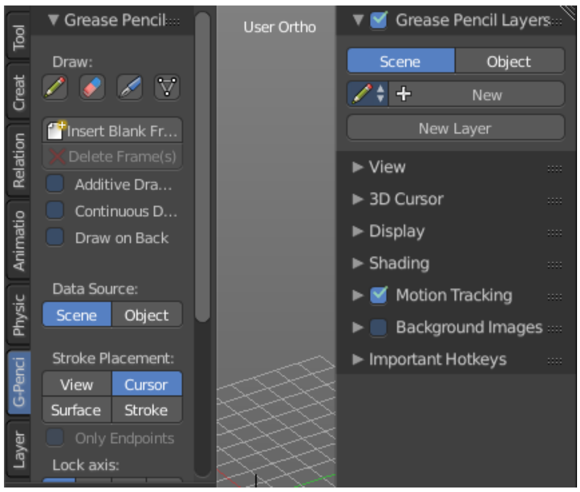
The Properties Sidebar is made of several panels. The range goes from object related settings, Grease Pencil settings, across things like Motion Tracking settings, Background Image settings, up to to Viewport related settings.

Most panels shows in all modes and with all content. Some Panels and its content is varying dependant of what object type you use, and in what object mode you are.

Grease Pencil Layers Panel

The Grease Pencil Layers are connected with the Grease Pencil panel in the Tool Shelf. And provides you with the layer settings for the Grease Pencil.

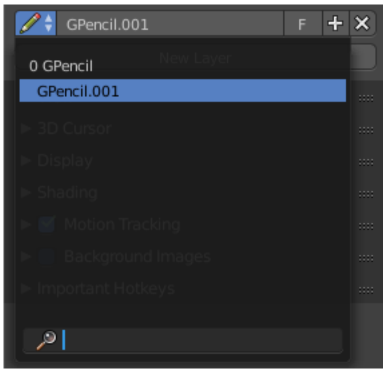
When no layer exists then there are just a few buttons available.



Scene / Object

Here you can adjust if the Grease Pencil stroke is relative to the selected object, or relative to the Screen.

Grease Pencil Prop



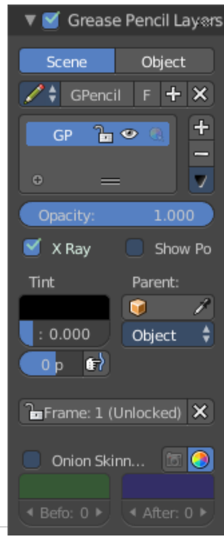
Here you can add a new grease pencil to work with. Or choose an existing grease pencil.

The **edit box** allows you to rename the current grease pencil.

The **F Button** adds a fake user to the grease pencil. So that it does not get deleted when you delete the connected object and close the scene.

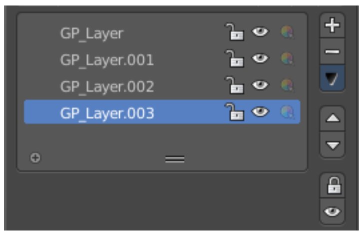
When you add a fake user, then a number field will appear that shows how much users are connected with the current pencil.

New Layer



Here you can create a new layer for your grease pencil. Doing so will reveal several layer settings. And another panel with some color settings.

Layer list



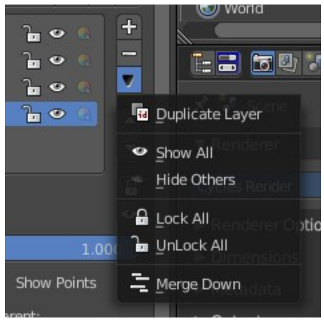
Here you can see a list of the current layers. And here you can select the current active layers.

Grease Pencil Layers can be locked (lock icon) and hidden (eye icon). The third symbol is to unprotect selected colors from further modifications.

Add / Delete

Right besides the layer list box there is a add button and a delete button. The plus button adds a new layer, The minus button removes the current layer.

Layer Specials menu



Below the add and delete buttons there is a text menu with some further options.

Duplicate Layer

Duplicates the currently selected layer.

Show All

Unhides all hidden layers.

Hide Others

Hides all layers but the selected.

Lock All

Locks all layers.

Unlock All

Unlocks all layers.

Merge Down

Merges all layers into one.

Move Up / Move down

Moves the currently selected Grease pencil layer one up or down the list.

Lock Unlock unselected / Show Hide unselected

Lock Unlock unselected toggles the lock for the unselected layers.

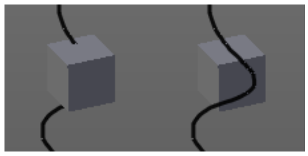
Show Hide unselected toggles the visibility for the unselected layers.

Opacity

Opacity sets the opacity of the current grease pencil stroke.

X Ray

X Ray makes the grease pencil stroke appear in front of objects. Without X Ray the stroke will be invisible behind objects.



Show Points

Shows the points in the current grease pencil stroke.

Tint

Tint tints the color of the current grease pencil stroke with the tint color.

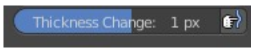
The upper field is a color picker where you can select a color. The fac slider defines the blending factor between the grease pencil stroke color and the tint color.

Parent

Here you can set the parent object for the current grease pencil layer

Thickness Change

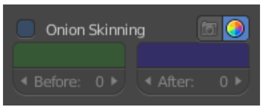
Increase or decrease the thickness of the grease pencil stroke.

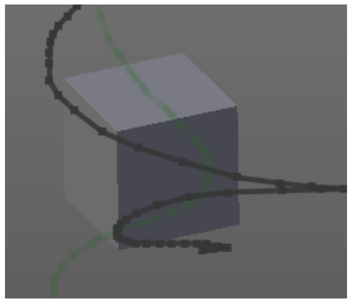


Lock Frame

You can draw grease pencil strokes in different frames. Here you can lock those frames from further editing.

Onion Skinning





You can draw grease pencil strokes in different frames. With onion skinning you can display the strokes from the previous and following frames as ghost drawings.

Onion Skinning checkbox

Activates / deactivates the onion skinning.

Use always ghosts

When activated the ghost images will also show in rendering.

Use custom colors

Here you can choose to display the ghost drawing in predefined colors, or in their original colors. Default is to display the predefined colors.

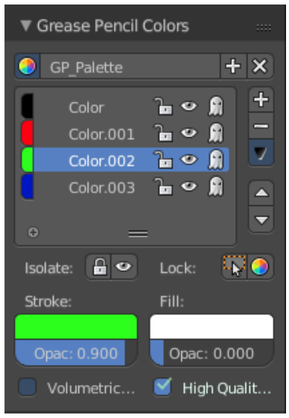
Before

Here you can choose in which color the previous frame gets displayed. And how many frames gets displayed before the current frame.

After

Here you can choose in which color the following frame gets displayed. And how many frames gets displayed after the current frame.

Grease Pencil Colors Panel



The grease pencil colors panel contains all the settings to set up and define the colors that you use for your grease pencil drawings.

It activates when you start to draw a grease pencil stroke. And shows its content then.

GP Palette

Here you can select, create and delete a color palette for the grease pencil colors. Define some colors in the Color list, then create a new palette with it.

Color List

Here you can add custom colors.

The color field at the beginning of the edit box reveals a color picker when you click at it. Which allows you to define a color.

The string “Color”, “Color 002” and “Color 003” is an edit box which allows you to rename the color. Click into the field to activate it.

The **Lock** symbol allows you to lock the current color.

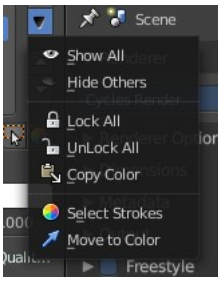
The **eye** symbol allows you to show or hide the current layer.

The **ghost** symbol allows you to display this color with onion skinning.

Add / Delete

Right besides the layer list box there is a add button and a delete button. The plus button adds a new layer, The minus button removes the current layer.

Palette color Specials menu



Below the add and delete buttons there is a text menu with some further options.

Show All

Unhides all hidden colors.

Hide Others

Hides all colors but the selected.

Lock All

Locks all colors.

Unlock All

Unlocks all colors.

Copy color

Copys the color.

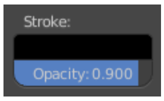
Select strokes

Selects all grease pencil strokes that uses the curent color.

Move to color

Move selected strokes to active color.

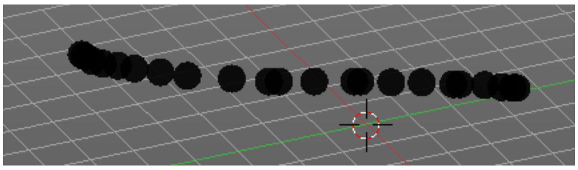
Strokecolor



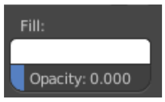
Here you can define the stroke color and set its opacity.

Volumetric Strokes

With Volumetric strokes the grease pencil stroke does not draw as a stroke, but a line of dotted points.

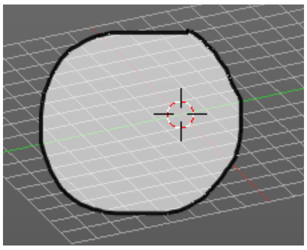


Fill



Fill fills the space between the grease pencil strokes.

The opacity is by default at zero. The fill color shows when you increase the opacity.

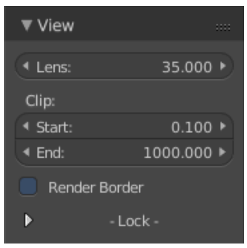


High Quality Fill

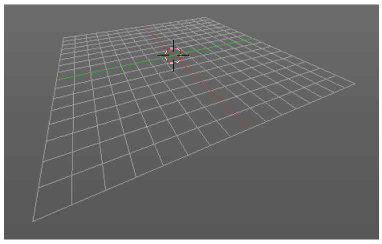
Fill Strokes uses high quality to avoid glitches. But this gives slower fps while animation. Here you can turn it off.

View panel

The View panel contains some camera settings for the world camera and the render camera.

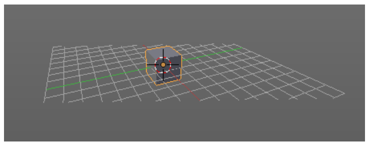


Lens



Here you can setup the lens viewport angle for the world camera. You need to be in perspectivic view. In Orthographic view the lens values doesn't have an effect.

Clip

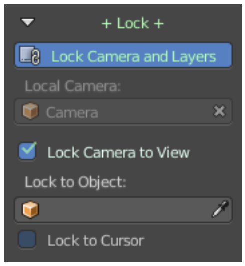


Here you can set up the clipping values for the world camera. Geometry behind the end value and before the start value will not be drawn.

Render border

When you have defined a renderborder then you can toggle it with this switch. See View menu in the 3d view header.

Submenu Lock



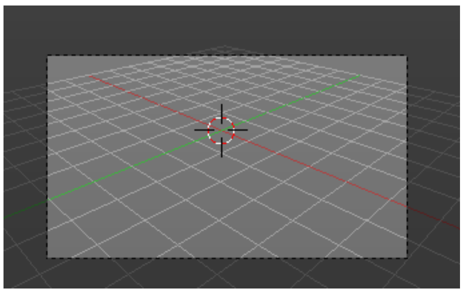
The submenu lock contains some camera settings regarding locking.

Lock Camera and Layers

This menu item also exists in the layers tab in the Tool shelf at the left.

Use the scene's active camera and layers in this view. And not local ones. When you untick this menu item thenyou can define a local camera below.

Lock Camera to view



This menu item allows you to navigate in camera view like you would be in world view. When it is unticked then you can navigate the passepartout, you can zoom and move it. And when you rotate the view, then you will leave the camera mode.

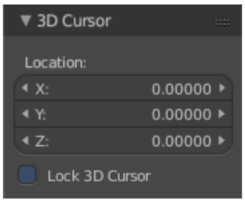
Lock to Object

Locks the view of the world camera to an object. Here you can choose an object for it.

Lock to cursor

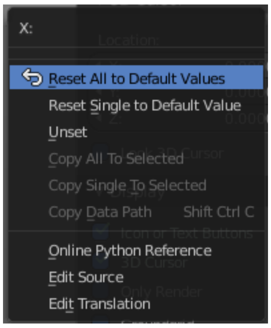
Locks the view of the world camera to the 3D cursor. You can either lock to an object or to the 3d cursor. When you choose an object then the checkbox for the 3d cursor vanishes.

3D Cursor Panel



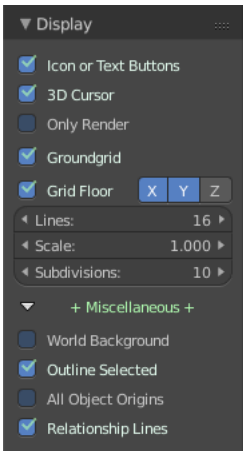
The 3d cursor panel contains the location edit boxes to display and set the 3D cursor in X, Y and Z Position. And it contains a checkbox to lock the 3D cursor.

Of interest is also the RMB menu where you can reset the 3D cursor to 0/0/0. Simply right click in one of the edit boxes and choose Reset All to default value.



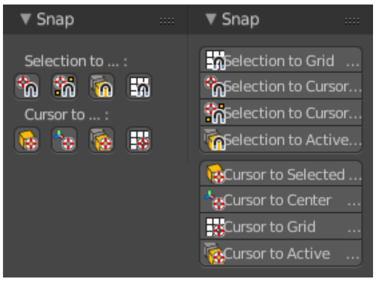
Display Panel

The Display panel contains various settings around the display in the current 3D view editor.



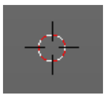
Icons or Text Buttons

The icons or text buttons checkbox defines if some of the buttons in the Tool Shelf are displayed as pure icon buttons, or as text buttons with icons.



3D Cursor

This checkbox can hide the 3D cursor.



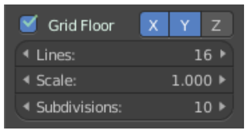
Only Render

When ticked then just the objects that gets rendered are displayed. This option hides the groundgrid and things like relationship lines and pivot points.

Ground Grid

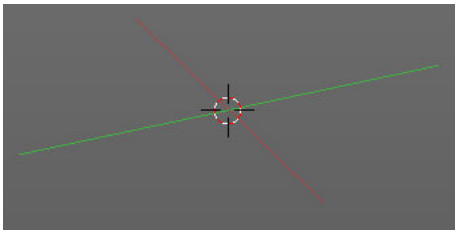
This checkbox can show or hide the whole Grid Floor at once. Other things like relationship lines or pivots are still displayed.

Grid Floor



The Grid Floor prop contains the settings for the Grid Floor. Number of lines, scale etc.

Grid Floor Checkbox



Displays or hides the grey grid of the Grid floor

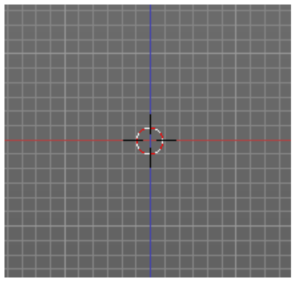
X, Y Z buttons

Displays the colored orientation lines.

Lines

The Lines edit box defines how much lines the grey grid has.

Scale



Scales the whole Grid Floor.

Subdivisions

This setting affects the orthographic views. Here you have sublines in the grey grid. And with Subdivisions you can define how much sublines a gridcell has.

Miscellaneous subtab

The Miscellaneous subtab contains settings that you rarely use.

World Background

Show or hide the world background.

Outline Selected

Display the selected object with an outline.

All Object Origins

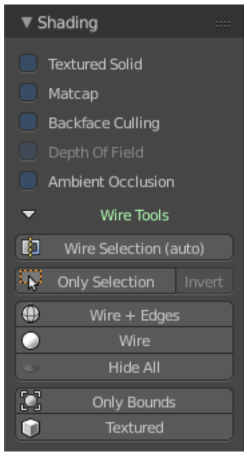
Display the origin of all objects in the scene. Normally just the origin of the selected object is displayed

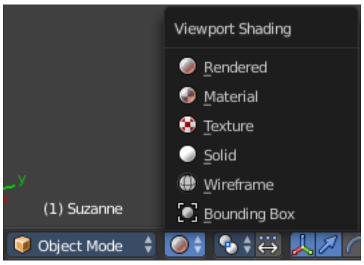
Relationship Lines

When you have a parenting relationship, then you will see a dotted line between the parent and the child object.

Shading Panel

The Shading Panel contains some shading related settings. You have different settings available in different Viewport shading modes. And in different Object modes with different object types too. So best thing is to list all available options instead of going through all possible combinations in shading and object modes.





Shading Options

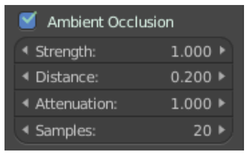
Backface Culling

Excludes the backfaces of the geometry from rendering.

Depth of Field

Use Depth of Field in the viewport from the active camera. Does not work with the world camera. You have to be in camera view.

Ambient Occlusion

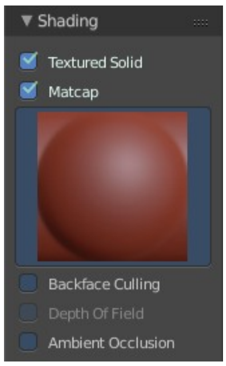


Use Ambient Occlusion in the viewport. When ticked some edit boxes with the Ambient Occlusion settings are revealed.

Shadeless

Displays the texture shadeless. Shows in Viewport shading Textured.

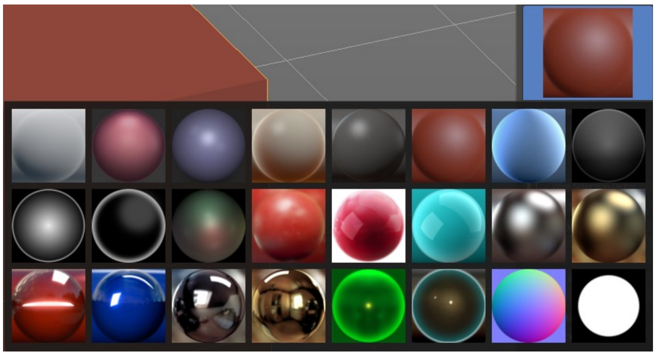
Textured solid



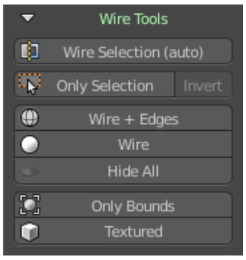
Normally the Solid shading mode doesn't display textures. With this checkbox ticked it does.

Matcap

Use Matcap Materials for solid display. Matcap stands for "material capture". It is a complete material that includes lighting and reflections. This is useful for sculpting needs for example. When you tick the Matcap checkbox then you will reveal a image field where you can choose different matcap materials.



Wire Tools Subtab



Wire Tools is an addon developed by Lapineige. You can turn it off in the addon manage if you want.

It offers a few more display mode posibilities. For example, normally you have to setup the mesh in the Properties editor to display the wireframe in Object mode. This can be done with this addon.

Wire Selection (Auto)

Display the Wire of the selection. Auto Update when selecting another object.

Only Selection

No idea. Somebody should ask the addon developer.

Invert

No idea. Somebody should ask the addon developer.

Wire + Edges

Display the Wire and Edges.

Wire

Display the Wire.

Hide All

Removes the wire display.

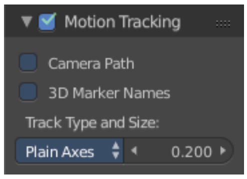
Only Bounds

Displays the selected object just as a bounding box.

Textured

Displays the selected object as textured.

Motion Tracking Panel



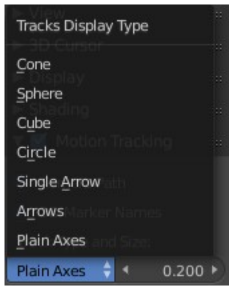
In case you do motion tracking with Bforartists, here are some options for it. Motion Tracking is another word for Motion Capture. Motion capture (in short Mo-cap) is the process of recording the movement of objects or people.

This panel can be activated an deactivated at once with the checkbox in the title.

Camera Path

Show or hide reconstructed camera path.

3D Marker Names

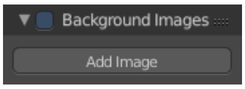


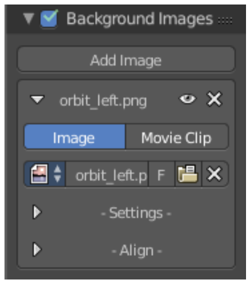
Show names for reconstructed track objects.

Track Type and Size

Here you can define the look and size of the track display type.

Background Images Panel





In this panel you can set up background reference images for modeling or painting needs.

The panel can be activated an deactivated at once with the checkbox in the title.

Note
Background images only shows in orthographic views. Front, back, etc.

Add Image

The Add Image button adds a new image panel to the list of background images.

Image Panel

The Image panel contains the settings and data for the background image.

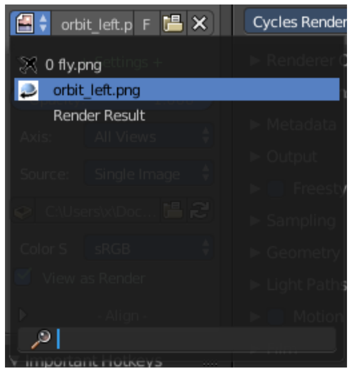
Image Panel Header

The header of the image panel contains the name of the file. The eye icon hides the image from the 3D view. The X button removes the whole image panel from the list of background images.

Data Source

Here you can define if you want to load a single image, or a movie clip.

Image Edit Box



The Image icon is a dropdown box where you can choose another image or movie that is already loaded into Bforartists.

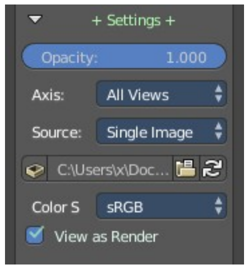
The **edit box** allows you to rename your image.

With the **F button** you can make this data block a fake user.

The **Folder icon** allows you to load another image here.

And the X button removes the image. The image panel is still there then.

Settings Subtab



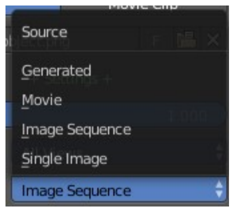
Opacity

Controls the transparency of the background image.

Axis

Choose which views the image is visible from. This is helpful when you have several reference images from different views (e.g. top, front and side).

Source

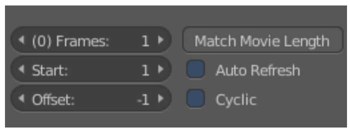


Here you can choose different source types.

Single Image

Single Image doesn't have further options.

Image Sequence and Movie



Frames

Number of frames to use.

Start

The start frame.

Offset

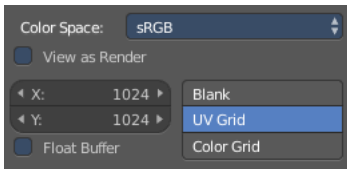
Offset the number of the frame to use in animation.

Match Movie Length
Set the image user length to the one of the movie.

Auto Refresh
Always refresh image on frame change

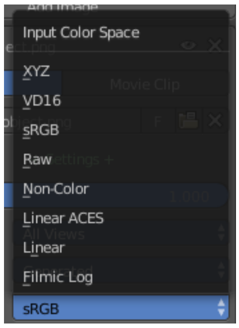
Cyclic
Cycle the images in the movie.

Generated



Generated doesn't use an external image, but a generated one.

Color Space
In this dropdown box you can define the color space.



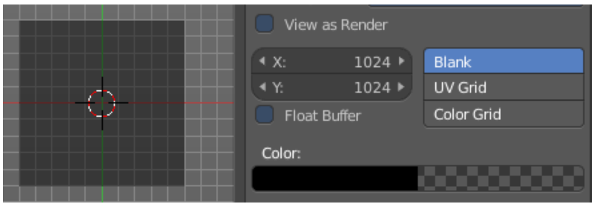
View as Render
Turns on or off the color management settings in the Properties window - Possible fail entry. Shouldn't belong here.

Size edit boxes
Here you can set the size of the image

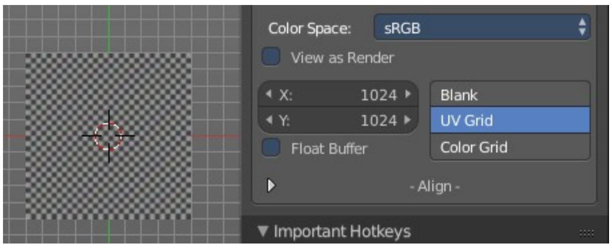
Float Buffer
Generate Floating Point Buffer. Gives a higher quality image.

Type
You can choose between three different types. Blank, UV Grid and Color.

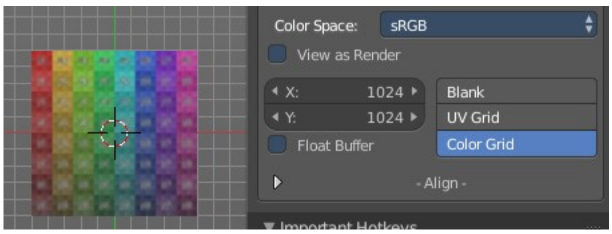
Blank is a plain color that you can define in a color picker below.



UV Grid is a black and white checker texture.



Color Grid is a colored checker texture.



Align Subtab

This tools helps you to align the image in the view.

Back / Front

Display the image in the front of the scene objects, or behind the scene objects.

Stretch / Fit / Crop

This option is for camera view. It does not work with the world camera.

Stretch stretches the background image into the current camera view. It fills the whole view.

Fit fits the background image into the height of the current camera view. Offset parts are cut off.

Crop fits the background image into the width of the current camera view. Offset parts are cut off.

Offset Editboxes

Here you can position the image in x and y position.

Flip Horizontal

Flip the image horizontal.

Flip Vertical

Flip the image vertical.

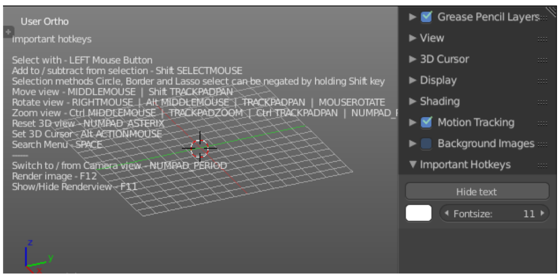
Rotation

Rotate the image.

Size

Set the size of the image.

Important Hotkeys Panel



Important Hotkeys is an addon. It displays the most important hotkeys as strings in the viewport.

This addon can be deactivated and uninstalled from the User Preferences in case you don't need it anymore.

Show Text / Hide Text

Shows or hides the text.

Color

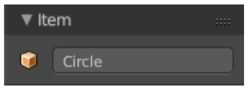
Here you can set the color of the font.

Fontsize

Here you can set the size of the font.

Item Panel

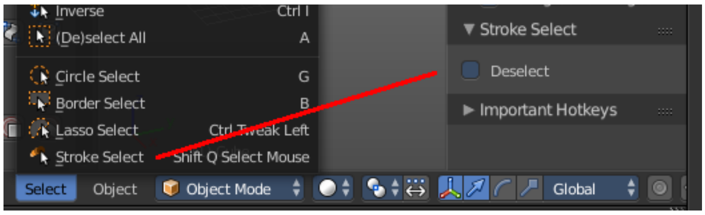
When you have an object in the scene then you will see the Item panel.



This edit box shows the name of the current selected item. And here you can also rename the item.

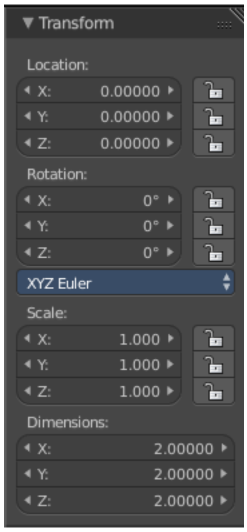
Stroke Select Panel

Stroke select is an addon. You can switch between select and deselect with the right mouse button. This panel is the visual end to show you in which mode you currently are.



Transform Panel

The transform panel shows you the transform values. The content depends of what object you have chosen, and in what mode you are. In Edit mode you may have other transform values than in object mode. Non Primitive objects doesn't have a edit dimensions box, and so on.



In Object Mode

Location

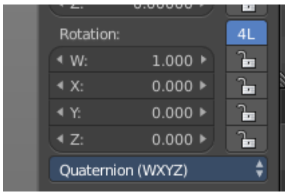
The location edit boxes. Here you can see and set the position of the selected object. The lock symbol behind the edit boxes allows you to lock the axis position

Rotation

The Rotation edit boxes. Here you can see and set the rotation of the selected object. The lock symbol behind the edit boxes allows you to lock the axis rotation.

Rotation mode

Rotation mode is a dropdown box where you can choose between different rotation modes.



Euler angles gets calculated with three values. Quaternions with four angles. And so you get a fourth angle value when you choose Quaternions as the rotation mode.

The 4L button allows you to lock out the fourth component from editing.

Scale

The Scale edit boxes. Here you can see and set the scale factor of the selected object. The lock symbol behind the edit boxes allows you to lock the axis scale.

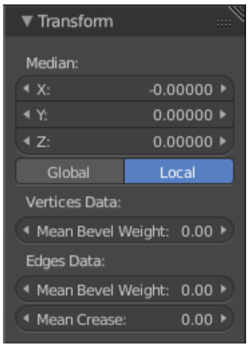
Dimensions

The Dimensions edit boxes. Here you can see and set the dimensions of the selected object in world coordinates. The lock symbol behind the edit boxes allows you to lock the axis rotation.

The Dimensions edit boxes are just available for primitives objects. Objects like Empties or a Camera doesn't have a dimension, but a scale factor.

In Edit Mode

Just primitive objects does have an edit mode. Non primitive objects like a camera or an empty doesn't have an edit mode. With two exceptions. Text and Force Field type Curve Guide. Both are curve types.



Mesh Objects

Median

Median is the position of the selected mesh part

Global / Local

Here you can define if the orientation of the selection is local to the selected object, or global to the world coordinates.

Mean Bevel Weight - Vertices Data

Here you can adjust the bevel weight for the selected vertices when you have a bevel modifier at the mesh.

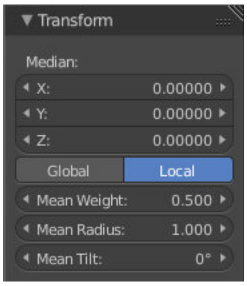
Mean Bevel Weight - Edges Data

Here you can adjust the bevel weight for the selected edges when you have a bevel modifier at the mesh.

Mean Crease

Here you can adjust the weight of the selected vertices when you have a subdivision surface modifier at the mesh.

Curve Objects / Surface Objects



Median

Median is the position of the selected mesh part

Global / Local

Here you can define if the orientation of the selection is local to the selected object, or global to the world coordinates.

Mean Weight

Here you can adjust the weight used by softbody. Needs softbody.

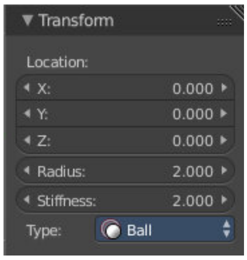
Mean Radius

Here you can adjust the radius of the curve control points

Mean Tilt

Here you can adjust the tilt of the curve control points.

Metaball Objects



Median

Median is the position of the selected mesh part

Global / Local

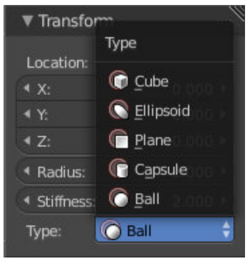
Here you can define if the orientation of the selection is local to the selected object, or global to the world coordinates.

Radius

Here you can adjust the radius of the selected meta element.

Stiffness

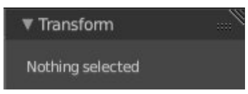
Here you can adjust the stiffness of the selected meta element.



Type

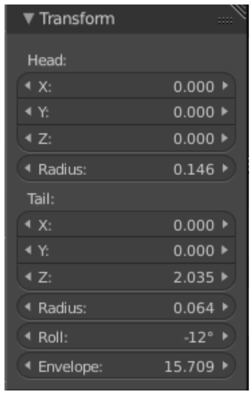
Type is a dropdown box. Here you can adjust the meta element type.

Text Objects



Text objects do have an edit mode, but they don't show content in the Transform panel.

Armature objects Edit Mode



Bones do have a head and a tail. You cannot position the whole bone by numeric values, but the head and tail joints.

Head

Here you can adjust the world position of the head joint.

Radius

This is just useful when you use Envelopes type bones. Here you can adjust the Envelope radius of the head joint.

Tail

Here you can adjust the world position of the tail joint.

Radius

This is just useful when you use Envelopes type bones. Here you can adjust the Envelope radius of the tail joint.

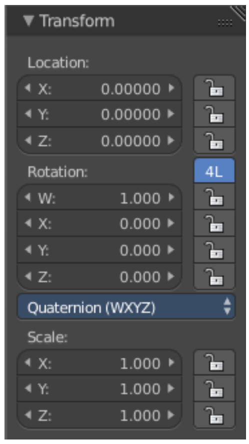
Roll

Here you can adjust the bone roll.

Envelope

This is just useful when you use Envelopes type bones. Here you can adjust the overall Envelope size.

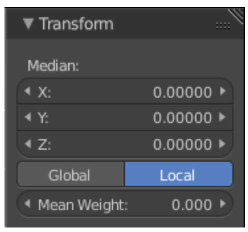
Armature Objects in Pose Mode



The content in Pose mode is the same than in Object mode. We have Location, Rotation and Scale Edit Boxes. And the corresponding lock buttons.

Wiht one small difference. The rotation mode starts with Quaternions by default. And not with Euler Angles.

Lattice Objects



You need to have some vertices of the Lattice object selected to see the content.

Vertex

Here you can see and set the vertex positions of the lattice objects.

Global / Local

Here you can define if the orientation of the selection is local to the selected object, or global to the world coordinates.

Mean Weight

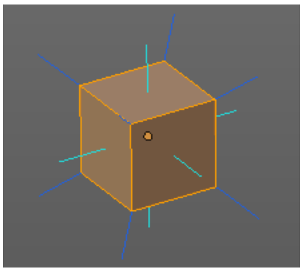
Lattice object is a deform cage. Here you can adjust the mean weight of the selected vertice(s).

Mesh Display Panel

This panel just shows in Edit mode with a mesh object selected. It contains some mesh related display settings like normals, or that you can display the length of an edge.

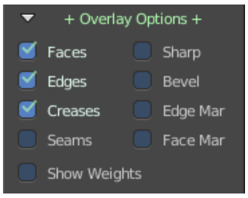
Normals

Here you can display the vertex, edge and faces normals at the selected mesh. The size box allows you to adjust the length of the stroke that displays the normal.



Overlay Options subtab

This subtab contains various display settings.



Faces

Displays selected faces with the orange select color.

Edges

Displays selected edges with the orange select color.

Creases

Displays Creases.

Seams

Displays marked seams.

Show Weights

Shows the weights of the vertices.

Sharp

Shows as sharp marked edges.

Bevel

Shows Beveled edges.

Edge Marks

Shows Edge Marks.

Face Marks

Shows Face marks.

Info Options subtab

The info Options subtab contains some settings with which you can display additional informations at the mesh geometry. The values are in world coordinates.

Edge Info

Length

Displays the length of the selected edges.

Angle

Displays what angle the adjacent faces of the selected edges has.

Face Info

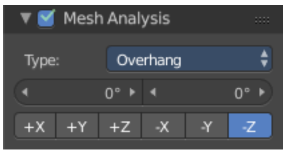
Area

Displays how big the area of the selected faces is.

Angle

Displays what angle the adjacent faces of the selected edges has.

Mesh Analysis Panel



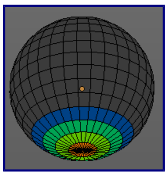
The Mesh Analysis is to analyze mesh attributes for 3D printing. For example, Some 3D printers have a physical limit to the overhang that can be printed. Or it needs a specific thickness.

The Mesh Analysis panel just shows in Edit mode with a mesh object selected. And in Solid Mode. Furthermore you need to have a Deform modifier at the mesh. You can activate and deactivate the whole panel at once in the header.

Type dropdown box

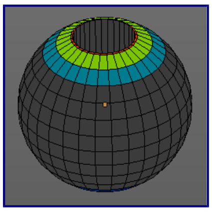
Here you can choose between the different methods of analysis

Overhang



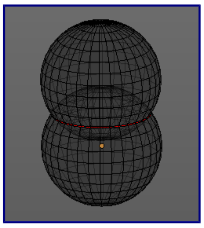
Calculates and displays the overhang areas.

Thickness



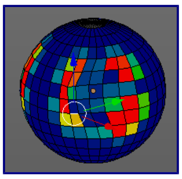
Calculates and displays the thickness.

Intersections



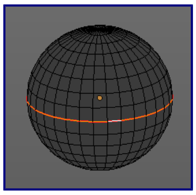
Displays intersecting faces in red. This mode has no settings.

Distortion



Displays non planar quads and n-gons dependant of a given angle.

Sharp Edges



Similar to wall-thickness, sharp edges can form shapes that are too thin to be able to print.

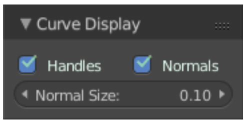
Angle

Here you can adjust the angle for the calculation

Axis

Here you can choose the axis that should be calculated.

Curve Display Panel



Here you can find some display settings for Curve objects.

This panel is just visible with a Curve Object in Edit Mode.

Handles

Display the handles at the curve object.

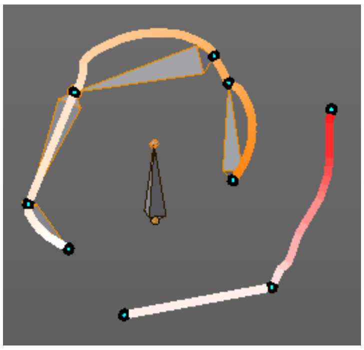
Normals

Display the normals at the curve object.

Normal Size

Adjust the size of the normals at the curve object.

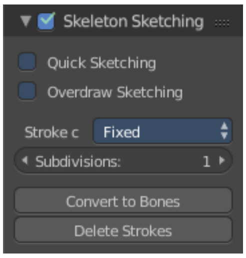
Skeleton Sketching Panel



This is a tool, and should belong into the tool shelf. For now it's in the Properties.

Skeleton sketching allows you to paint your skeleton with strokes instead of extruding out bones. Every point becomes a joint then. And when you click the convert button, then the armature gets created.

The Skeleton sketching panel is just visible in Edit mode with an Armature object.



To activate and deactivate this tool simply tick the checkbox in the header of the panel. Then you will be able to paint strokes in the viewport. Right click to end a stroke.

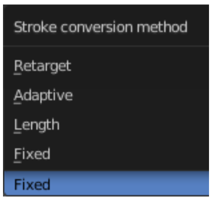
Quick Sketching

Automatically convert the strokes to bones when you end the stroke.

Overdraw Sketching

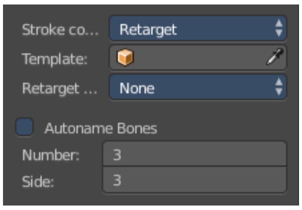
With this option ticked you can adjust strokes by painting near them.

Stroke Conversion method



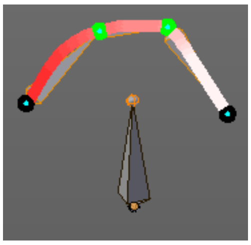
Here you can choose between different conversion methods.

Retarget



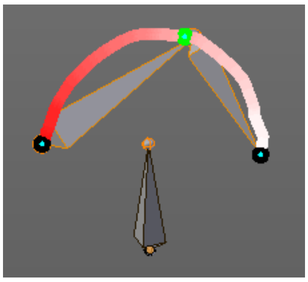
This method is unfortunately not documented in the Blender manual, it is listed as Todo. And it is not to find out how this is meant to work.

Adaptive



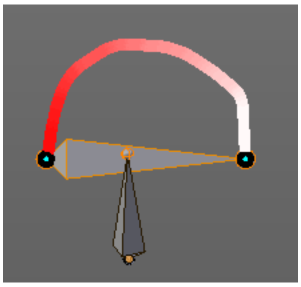
Draws bones in the average length of the stroke, but tries to follow the shape of the stroke.

Length



Draws bones in the average length of the stroke.

Fixed



Draws bones between the points in the stroke.

Convert to bones

Converts the current strokes into an armature.

Delete Strokes

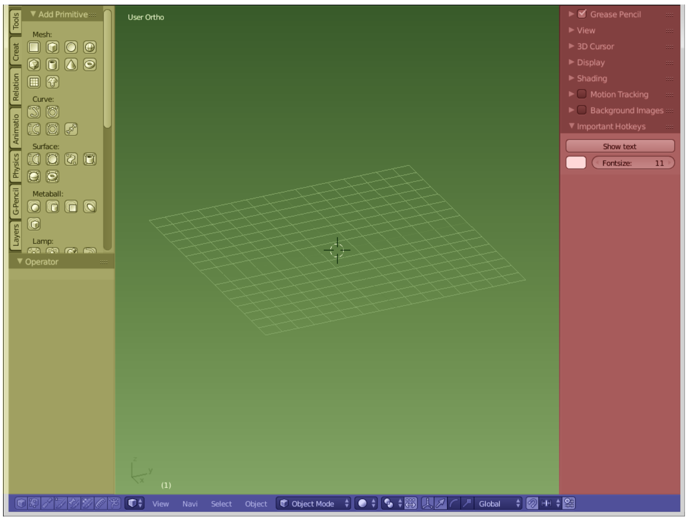
Deletes all strokes from the viewport.

3D View by tools - Properties Sidebar

Detailed Table of content

3D View by tools - Properties Sidebar

Introduction



The 3D View is made of several areas.

Yellow is the Tool Shelf.

Blue is the Header or Menu bar. It can be at the top or the bottom.

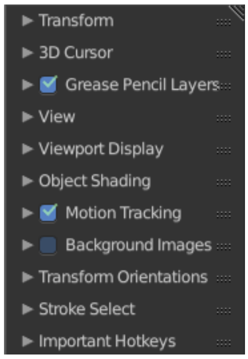
Green is the Viewport. Here you will see and work with your 3D data.

Red is the Properties Sidebar.

The content of the Tool Shelf , the Header and the Properties Sidebar can vary. It depends of the type of the objects and the modes that you are in.

This chapter here is about the Properties Sidebar.

Properties Sidebar

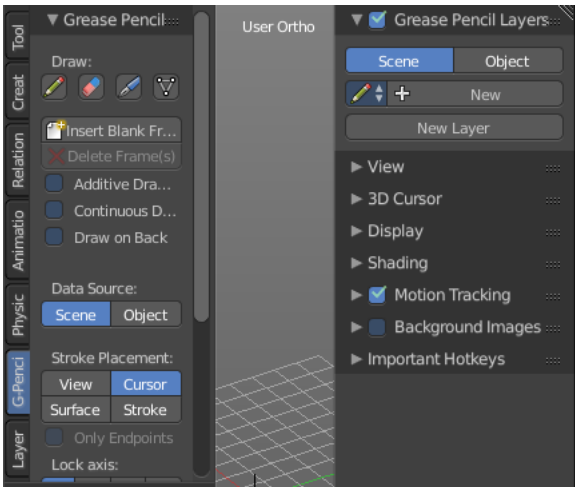


The Properties Sidebar contains various settings for the 3d view.

The Properties Sidebar is made of several panels. The range goes from object related settings, Grease Pencil settings, across things like Motion Tracking settings, Background Image settings, up to to Viewport related settings.

Most panels shows in all modes and with all content. Some Panels and its content is varying dependant of what object type you use, and in what object mode you are.

Grease Pencil Layers Panel



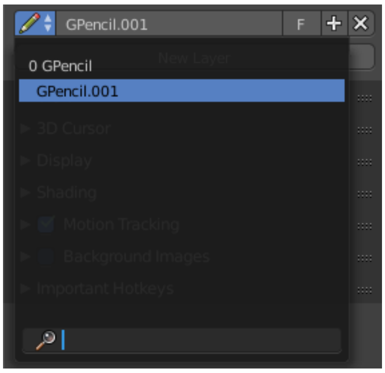
The Grease Pencil Layers are connected with the Grease Pencil panel in the Tool Shelf. And provides you with the layer settings for the Grease Pencil.

When no layer exists then there are just a few buttons available.

Scene / Object

Here you can adjust if the Grease Pencil stroke is relative to the selected object, or relative to the Screen.

Grease Pencil Prop



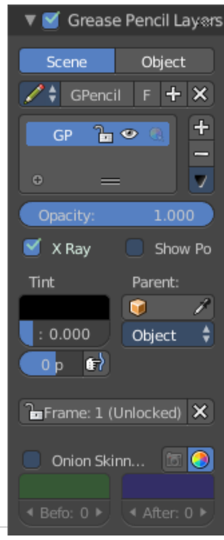
Here you can add a new grease pencil to work with. Or choose an existing grease pencil.

The **edit box** allows you to rename the current grease pencil.

The **F Button** adds a fake user to the grease pencil. So that it does not get deleted when you delete the connected object and close the scene.

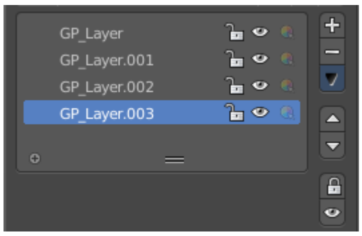
When you add a fake user, then a number field will appear that shows how much users are connected with the current pencil.

New Layer



Here you can create a new layer for your grease pencil. Doing so will reveal several layer settings. And another panel with some color settings.

Layer list



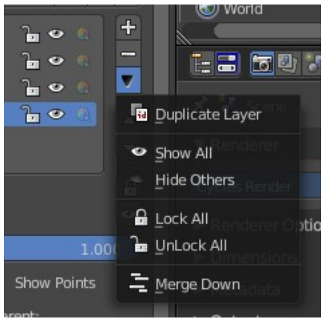
Here you can see a list of the current layers. And here you can select the current active layers.

Grease Pencil Layers can be locked (lock icon) and hidden (eye icon). The third symbol is to unprotect selected colors from further modifications.

Add / Delete

Right besides the layer list box there is a add button and a delete button. The plus button adds a new layer, The minus button removes the current layer.

Layer Specials menu



Below the add and delete buttons there is a text menu with some further options.

Duplicate Layer

Duplicates the currently selected layer.

Show All

Unhides all hidden layers.

Hide Others

Hides all layers but the selected.

Lock All

Locks all layers.

Unlock All

Unlocks all layers.

Merge Down

Merges all layers into one.

Move Up / Move down

Moves the currently selected Grease pencil layer one up or down the list.

Lock Unlock unselected / Show Hide unselected

Lock Unlock unselected toggles the lock for the unselected layers.

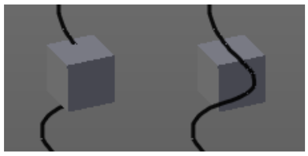
Show Hide unselected toggles the visibility for the unselected layers.

Opacity

Opacity sets the opacity of the current grease pencil stroke.

X Ray

X Ray makes the grease pencil stroke appear in front of objects. Without X Ray the stroke will be invisible behind objects.



Show Points

Shows the points in the current grease pencil stroke.

Tint

Tint tints the color of the current grease pencil stroke with the tint color.

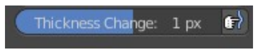
The upper field is a color picker where you can select a color. The fac slider defines the blending factor between the grease pencil stroke color and the tint color.

Parent

Here you can set the parent object for the current grease pencil layer

Thickness Change

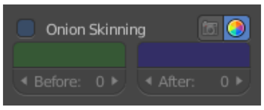
Increase or decrease the thickness of the grease pencil stroke.

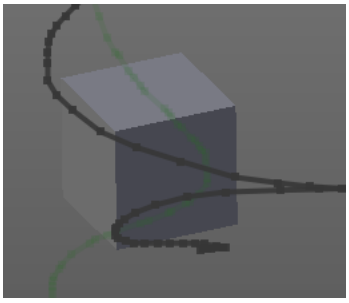


Lock Frame

You can draw grease pencil strokes in different frames. Here you can lock those frames from further editing.

Onion Skinning





You can draw grease pencil strokes in different frames. With onion skinning you can display the strokes from the previous and following frames as ghost drawings.

Onion Skinning checkbox

Activates / deactivates the onion skinning.

Use always ghosts

When activated the ghost images will also show in rendering.

Use custom colors

Here you can choose to display the ghost drawing in predefined colors, or in their original colors. Default is to display the predefined colors.

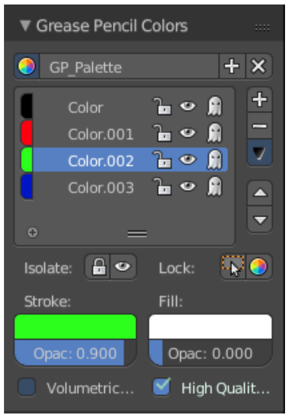
Before

Here you can choose in which color the previous frame gets displayed. And how many frames gets displayed before the current frame.

After

Here you can choose in which color the following frame gets displayed. And how many frames gets displayed after the current frame.

Grease Pencil Colors Panel



The grease pencil colors panel contains all the settings to set up and define the colors that you use for your grease pencil drawings.

It activates when you start to draw a grease pencil stroke. And shows its content then.

GP Palette

Here you can select, create and delete a color palette for the grease pencil colors. Define some colors in the Color list, then create a new palette with it.

Color List

Here you can add custom colors.

The color field at the beginning of the edit box reveals a color picker when you click at it. Which allows you to define a color.

The string “Color”, “Color 002” and “Color 003” is an edit box which allows you to rename the color. Click into the field to activate it.

The **Lock** symbol allows you to lock the current color.

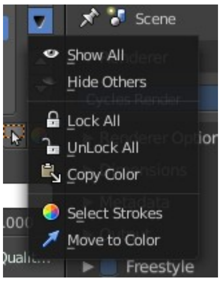
The **eye** symbol allows you to show or hide the current layer.

The **ghost** symbol allows you to display this color with onion skinning.

Add / Delete

Right besides the layer list box there is a add button and a delete button. The plus button adds a new layer, The minus button removes the current layer.

Palette color Specials menu



Below the add and delete buttons there is a text menu with some further options.

Show All

Unhides all hidden colors.

Hide Others

Hides all colors but the selected.

Lock All

Locks all colors.

Unlock All

Unlocks all colors.

Copy color

Copys the color.

Select strokes

Selects all grease pencil strokes that uses the curent color.

Move to color

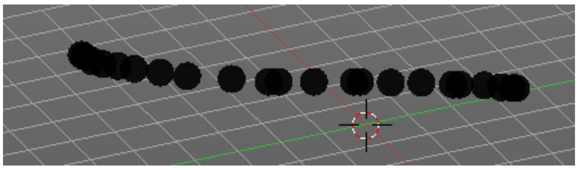
Move selected strokes to active color.

Strokecolor

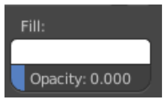
Here you can define the stroke color and set its opacity.

Volumetric Strokes

With Volumetric strokes the grease pencil stroke does not draw as a stroke, but a line of dotted points.

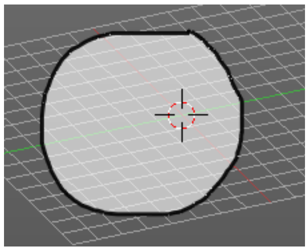


Fill



Fill fills the space between the grease pencil strokes.

The opacity is by default at zero. The fill color shows when you increase the opacity.

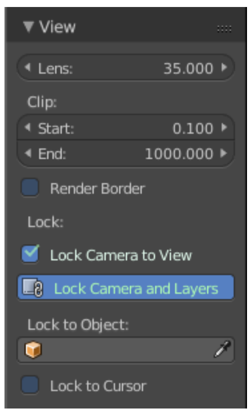


High Quality Fill

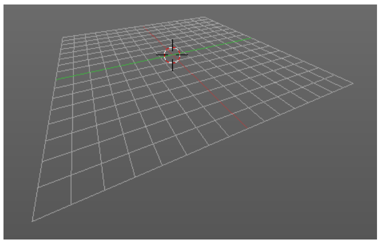
Fill Strokes uses high quality to avoid glitches. But this gives slower fps while animation. Here you can turn it off.

View panel

The View panel contains some camera settings for the world camera and the render camera.

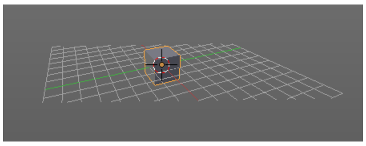


Lens



Here you can setup the lens viewport angle for the world camera. You need to be in perspectivic view. In Orthographic view the lens values doesn't have an effect.

Clip

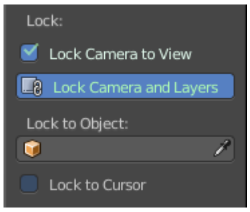


Here you can set up the clipping values for the world camera. Geometry behind the end value and before the start value will not be drawn.

Render border

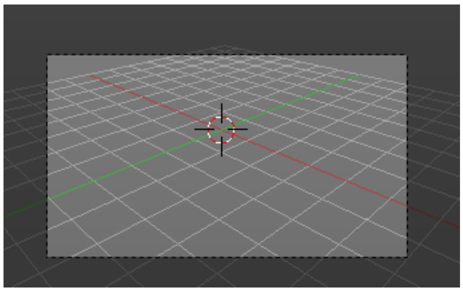
When you have defined a renderborder then you can toggle it with this switch. See View menu in the 3d view header.

Lock section



The lock section contains some camera settings regarding locking.

Lock Camera to view

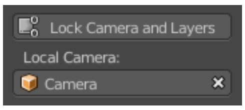


This menu item allows you to navigate in camera view like you would be in world view. When it is unticked then you can navigate the passepartout, you can zoom and move it. And when you rotate the view, then you will leave the camera mode.

Lock Camera and Layers

This menu item also exists in the layers tab in the Tool shelf at the left.

Use the scene's active camera and layers in this view. And not local ones. When you untick this menu item then you can define a local camera below.



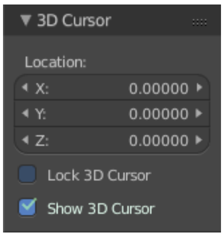
Lock to Object

Locks the view of the world camera to an object. Here you can choose an object for it.

Lock to cursor

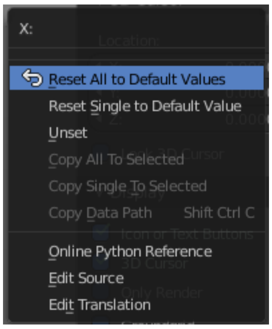
Locks the view of the world camera to the 3D cursor. You can either lock to an object or to the 3d cursor. When you choose an object then the checkbox for the 3d cursor vanishes.

3D Cursor Panel



The 3d cursor panel contains the location edit boxes to display and set the 3D cursor in X, Y and Z Position. And it contains a checkbox to lock the 3D cursor.

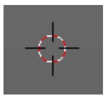
Of interest is also the RMB menu where you can reset the 3D cursor to 0/0/0. Simply right click in one of the edit boxes and choose Reset All to default value.



Lock 3D cursor

Locks the 3D cursor at its place.

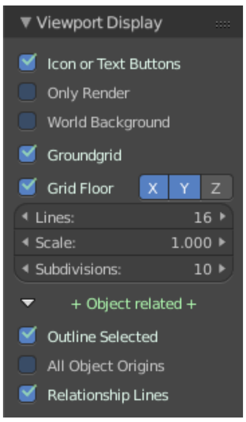
Show 3D Cursor



This checkbox can hide the 3D cursor.

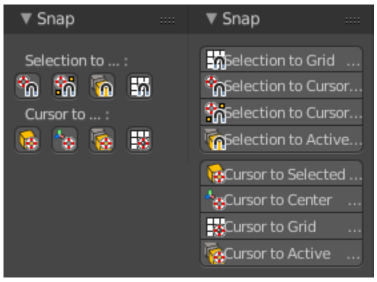
Viewport Display Panel

The Display panel contains various settings around the display in the current 3D view editor.



Icons or Text Buttons

The icons or text buttons checkbox defines if some of the buttons in the Tool Shelf are displayed as pure icon buttons, or as text buttons with icons.



Only Render

When ticked then just the objects that gets rendered are displayed. This option hides the groundgrid and things like relationship lines and pivot points.

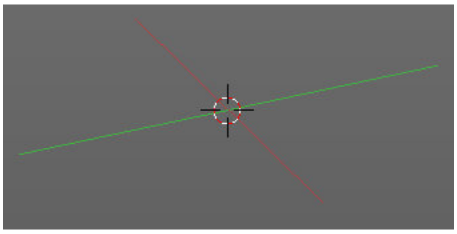
Ground Grid

This checkbox can show or hide the whole Grid Floor at once. Other things like relationship lines or pivots are still displayed.

Grid Floor

The Grid Floor prop contains the settings for the Grid Floor. Number of lines, scale etc.

Grid Floor Checkbox



Displays or hides the grey grid of the Grid floor

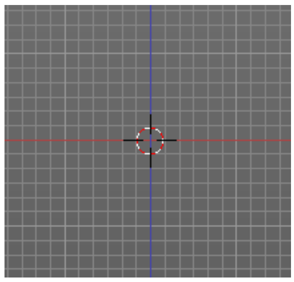
X, Y Z buttons

Displays the colored orientation lines.

Lines

The Lines edit box defines how much lines the grey grid has.

Scale



Scales the whole Grid Floor.

Subdivisions

This setting affects the orthographic views. Here you have sublines in the grey grid. And with Subdivisions you can define how much sublines a gridcell has.

Miscellaneous subtab

The Miscellaneous subtab contains settings that you rarely use.

World Background

Show or hide the world background.

Outline Selected

Display the selected object with an outline.

All Object Origins

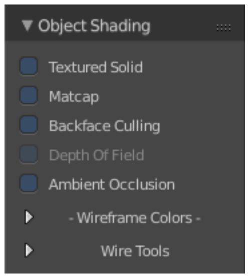
Display the origin of all objects in the scene. Normally just the origin of the selected object is displayed

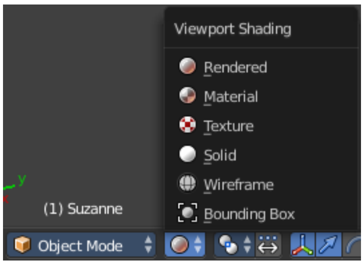
Relationship Lines

When you have a parenting relationship, then you will see a dotted line between the parent and the child object.

Object Shading Panel

The Shading Panel contains some shading related settings. You have different settings available in different Viewport shading modes. And in different Object modes with different object types too. So best thing is to list all available options instead of going through all possible combinations in shading and object modes.





Shading Options

Backface Culling

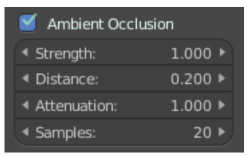
Excludes the backfaces of the geometry from rendering.

Depth of Field

Use Depth of Field in the viewport from the active camera. Does not work with the world camera. You have to be in camera view.

Ambient Occlusion

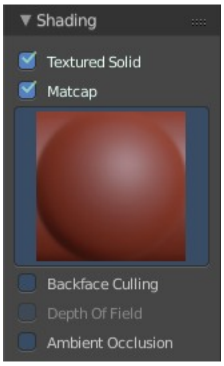
Use Ambient Occlusion in the viewport. When ticked some edit boxes with the Ambient Occlusion settings are revealed.



Shadeless

Displays the texture shadeless. Shows in Viewport shading Textured.

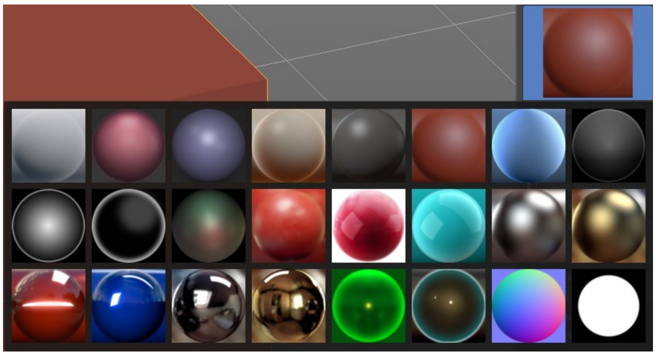
Textured solid



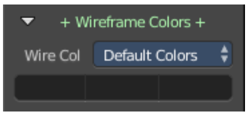
Normally the Solid shading mode doesn't display textures. With this checkbox ticked it does.

Matcap

Use Matcap Materials for solid display. Matcap stands for "material capture". It is a complete material that includes lighting and reflections. This is useful for sculpting needs for example. When you tick the Matcap checkbox then you will reveal a image field where you can choose different matcap materials.



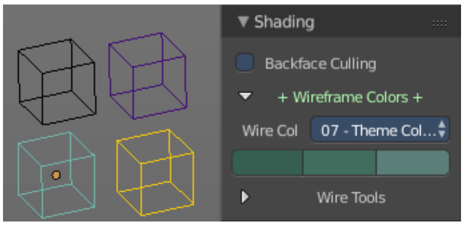
Wireframe Colors Subtab



The Wireframe Colors subtab contains a toolset where you can give any objects in the viewport different wire colors. As the name says, it makes most sense when you have a mode with wireframe display selected. And you need to have a object selected. When there is nothing selected then you will get a warning.

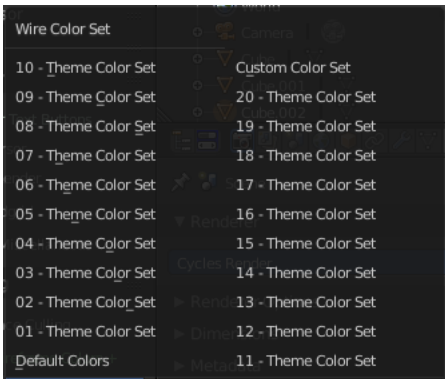
Wireframe colors works in all modes where you can have a wireframe display. Object mode, Edit Mode, Sculpt mode.

Here an example in Object mode with wireframe display.



Wire Color Set

Wire Color Set is a dropdown box where you can choose between 20 predefined color sets. The colors of this color sets are not editable.



Wire colors

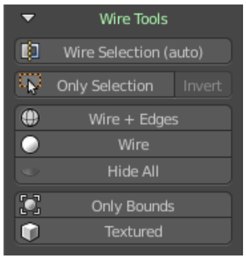
You can see three colors below the Wire Color Set. From left to right. The first color is the color for the object when it is not selected. The second is the color for the object when it is selected, but not the active object. The third color is the color for the object when it is selected and the active object.

Custom color set

There is also a Custom Color Set menu item in the Wire Color Set. This one is editable. When you click at one of the color fields below the Wire Color Set, then you open up a color picker dialog where you can choose a custom color for every object.

This custom colors are saved with the scene.

Wire Tools Subtab



Wire Tools is an addon developed by Lapineige. You can turn it off in the addon manage if you want.

It offers a few more display mode posibilities. For example, normally you have to setup the mesh in the Properties editor to display the wireframe in Object mode. This can be done with this addon.

Wire Selection (Auto)

Display the Wire of the selection. Auto Update when selecting another object.

Only Selection

No idea. Somebody should ask the addon developer.

Invert

No idea. Somebody should ask the addon developer.

Wire + Edges

Display the Wire and Edges.

Wire

Display the Wire.

Hide All

Removes the wire display.

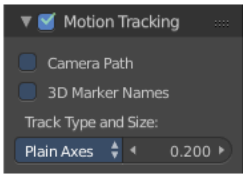
Only Bounds

Displays the selected object just as a bounding box.

Textured

Displays the selected object as textured.

Motion Tracking Panel



In case you do motion tracking with Bforartists, here are some options for it. Motion Tracking is another word for Motion Capture. Motion capture (in short Mo-cap) is the process of recording the movement of objects or people.

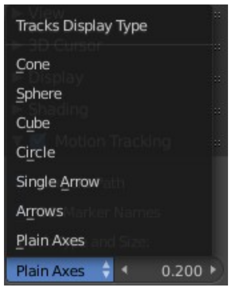
This panel can be activated an deactivated at once with the checkbox in the title.

Camera Path

Show or hide reconstructed camera path.

3D Marker Names

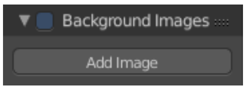
Show names for reconstructed track objects.

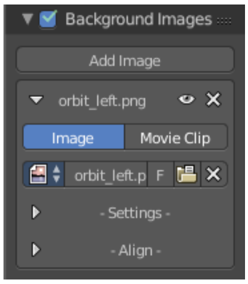


Track Type and Size

Here you can define the look and size of the track display type.

Background Images Panel





In this panel you can set up background reference images for modeling or painting needs.

The panel can be activated an deactivated at once with the checkbox in the title.

Note
Background images only shows in orthographic views. Front, back, etc.

Add Image

The Add Image button adds a new image panel to the list of background images.

Image Panel

The Image panel contains the settings and data for the background image.

Image Panel Header

The header of the image panel contains the name of the file. The eye icon hides the image from the 3D view. The X button removes the whole image panel from the list of background images.

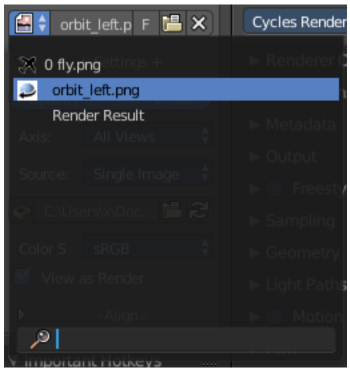
Data Source

Here you can define if you want to load a single image, or a movie clip.

Image Edit Box

The Image icon is a dropdown box where you can choose another image or movie that is already loaded into Bforartists.

The **edit box** allows you to rename your image.

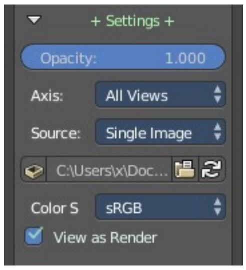


With the **F button** you can make this data block a fake user.

The **Folder icon** allows you to load another image here.

And the X button removes the image. The image panel is still there then.

Settings Subtab



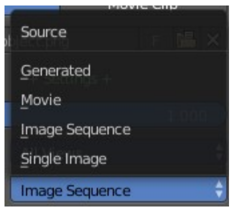
Opacity

Controls the transparency of the background image.

Axis

Choose which views the image is visible from. This is helpful when you have several reference images from different views (e.g. top, front and side).

Source

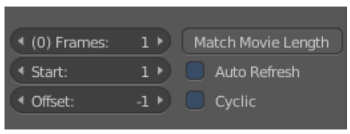


Here you can choose different source types.

Single Image

Single Image doesn't have further options.

Image Sequence and Movie



Frames

Number of frames to use.

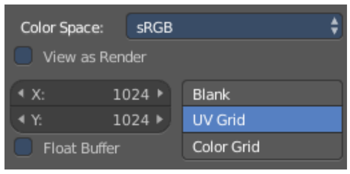
Start
The start frame.

Offset
Offset the number of the frame to use in animation.

Match Movie Length
Set the image user length to the one of the movie.

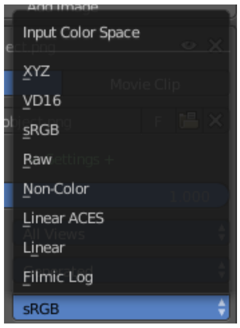
Auto Refresh
Always refresh image on frame change

Cyclic
Cycle the images in the movie.



Generated
Generated doesn't use an external image, but a generated one.

Color Space
In this dropdown box you can define the color space.



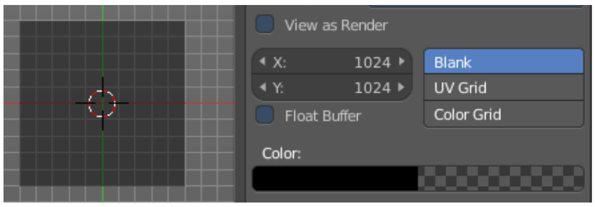
View as Render
Turns on or off the color management settings in the Properties window - Possible fail entry. Shouldn't belong here.

Size edit boxes
Here you can set the size of the image

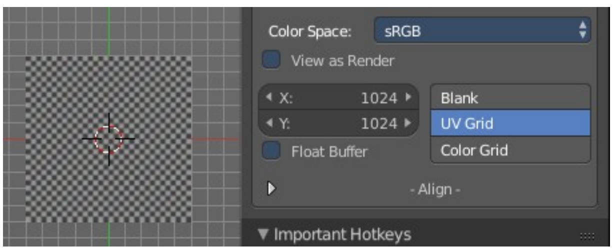
Float Buffer
Generate Floating Point Buffer. Gives a higher quality image.

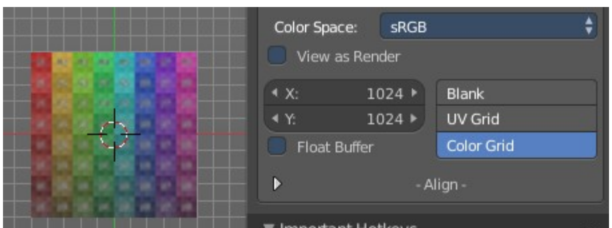
Type
You can choose between three different types. Blank, UV Grid and Color.

Blank is a plain color that you can define in a color picker below.



UV Grid is a black and white checker texture.





Color Grid is a colored checker texture.

Align Subtab

This tools helps you to align the image in the view.

Back / Front

Display the image in the front of the scene objects, or behind the scene objects.

Stretch / Fit / Crop

This option is for camera view. It does not work with the world camera.

Stretch stretches the background image into the current camera view. It fills the whole view.

Fit fits the background image into the height of the current camera view. Offset parts are cut off.

Crop fits the background image into the width of the current camera view. Offset parts are cut off.

Offset Editboxes

Here you can position the image in x and y position.

Flip Horizontal

Flip the image horizontal.

Flip Vertical

Flip the image vertical.

Rotation

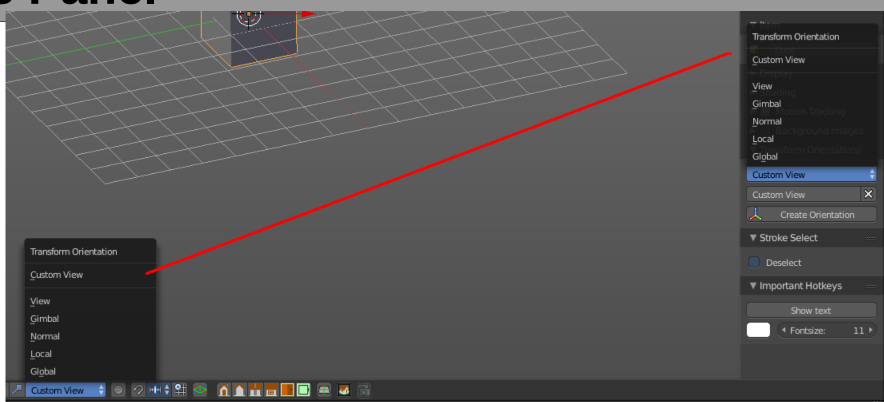
Rotate the image.

Size

Set the size of the image.

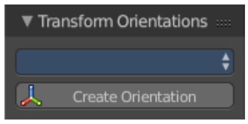
Transform Orientations Panel

Transform Orientations allows you to create and remove a custom transform orientation, using object or mesh elements.



When such a custom transform orientations is defined from objects, then it uses the local orientation of the object. When it is defined from mesh elements (vertices, edges, faces), then it uses the normal orientation of the selection.

Dropdown Box with the current views.

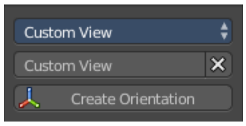


The dropdown box with the currently available views.

Create Orientation

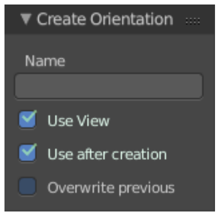
The create orientation button adds a new orientation from the current mode and view.

Transform Orientation Name



Here you can rename and delete the new created custom view.

Last Operator Create Orientation



Name

Here you can rename and delete the new created custom view.

Use View

The new orientation will be aligned to the view space.

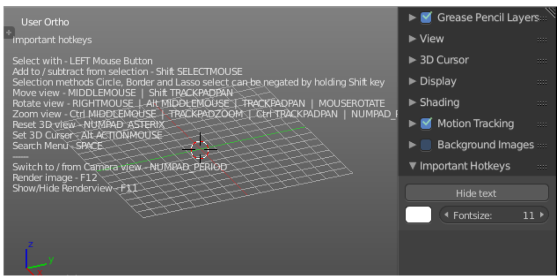
Use after creation

It leaves the newly created orientation active.

Overwrite previous

Overwrites previous created orientation.

Important Hotkeys Panel



Important Hotkeys is an addon. It displays the most important hotkeys as strings in the viewport.

This addon can be deactivated and uninstalled from the User Preferences in case you don't need it anymore.

Show Text / Hide Text

Shows or hides the text.

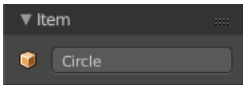
Color

Here you can set the color of the font.

Fontsize

Here you can set the size of the font.

Item Panel

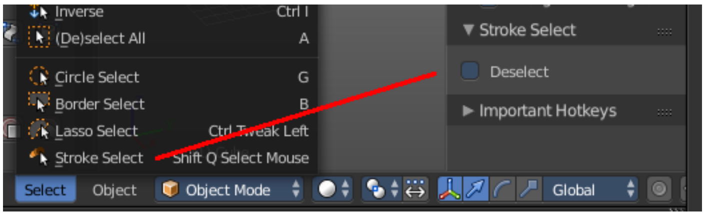


When you have an object in the scene then you will see the Item panel.

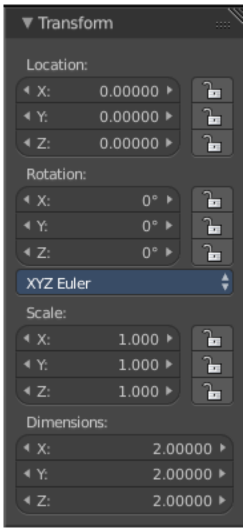
This edit box shows the name of the current selected item. And here you can also rename the item.

Stroke Select Panel

Stroke select is an addon. You can switch between select and deselect with the right mouse button. This panel is the visual end to show you in which mode you currently are.



Transform Panel



The transform panel shows you the transform values. The content depends of what object you have chosen, and in what mode you are. In Edit mode you may have other transform values than in object mode. Non Primitive objects doesn't have a edit dimensions box, and so on.

In Object Mode

Location

The location edit boxes. Here you can see and set the position of the selected object. The lock symbol behind the edit boxes allows you to lock the axis position

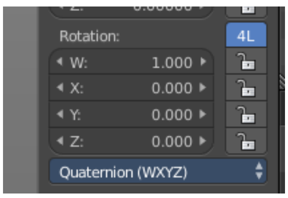
Rotation

The Rotation edit boxes. Here you can see and set the rotation of the selected object. The lock symbol behind the edit boxes allows you to lock the axis rotation.

Rotation mode

Rotation mode is a dropdown box where you can choose between different rotation modes.

Euler angles gets calculated with three values. Quaternions with four angles. And so you get a fourth angle value when you choose Quaternions as the rotation mode.



The 4L button allows you to lock out the fourth component from editing.

Scale

The Scale edit boxes. Here you can see and set the scale factor of the selected object. The lock symbol behind the edit boxes allows you to lock the axis scale.

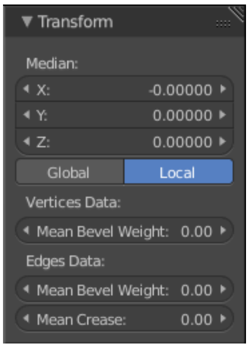
Dimensions

The Dimensions edit boxes. Here you can see and set the dimensions of the selected object in world coordinates. The lock symbol behind the edit boxes allows you to lock the axis rotation.

The Dimensions edit boxes are just available for primitives objects. Objects like Empties or a Camera doesn't have a dimension, but a scale factor.

In Edit Mode

Just primitive objects does have an edit mode. Non primitive objects like a camera or an empty doesn't have an edit mode. With two exceptions. Text and Force Field type Curve Guide. Both are curve types.



Mesh Objects

Median

Median is the position of the selected mesh part

Global / Local

Here you can define if the orientation of the selection is local to the selected object, or global to the world coordinates.

Mean Bevel Weight - Vertices Data

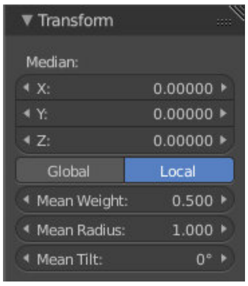
Here you can adjust the bevel weight for the selected vertices when you have a bevel modifier at the mesh.

Mean Bevel Weight - Edges Data

Here you can adjust the bevel weight for the selected edges when you have a bevel modifier at the mesh.

Mean Crease

Here you can adjust the weight of the selected vertices when you have a subdivision surface modifier at the mesh.



Curve Objects / Surface Objects

Median

Median is the position of the selected mesh part

Global / Local

Here you can define if the orientation of the selection is local to the selected object, or global to the world coordinates.

Mean Weight

Here you can adjust the weight used by softbody. Needs softbody.

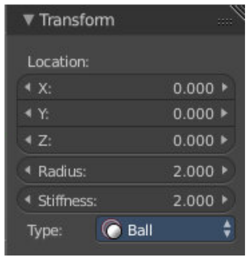
Mean Radius

Here you can adjust the radius of the curve control points

Mean Tilt

Here you can adjust the tilt of the curve control points.

Metaball Objects



Median

Median is the position of the selected mesh part

Global / Local

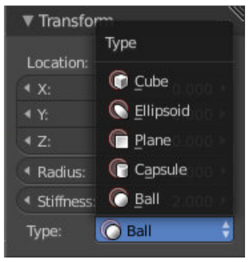
Here you can define if the orientation of the selection is local to the selected object, or global to the world coordinates.

Radius

Here you can adjust the radius of the selected meta element.

Stiffness

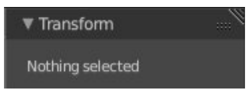
Here you can adjust the stiffness of the selected meta element.



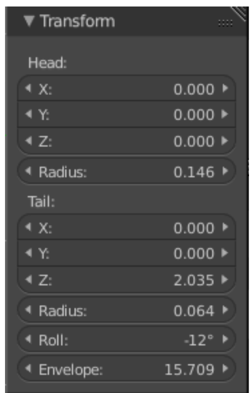
Type

Type is a dropdown box. Here you can adjust the meta element type.

Text Objects



Text objects do have an edit mode, but they don't show content in the Transform panel.



Armature objects Edit Mode

Bones do have a head and a tail. You cannot position the whole bone by numeric values, but the head and tail joints.

Head

Here you can adjust the world position of the head joint.

Radius

This is just useful when you use Envelopes type bones. Here you can adjust the Envelope radius of the head joint.

Tail

Here you can adjust the world position of the tail joint.

Radius

This is just useful when you use Envelopes type bones. Here you can adjust the Envelope radius of the tail joint.

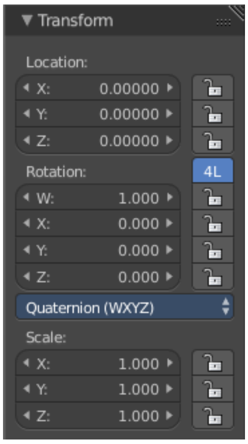
Roll

Here you can adjust the bone roll.

Envelope

This is just useful when you use Envelopes type bones. Here you can adjust the overall Envelope size.

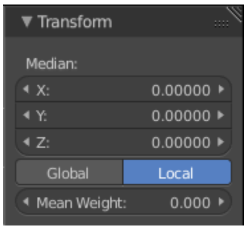
Armature Objects in Pose Mode



The content in Pose mode is the same than in Object mode. We have Location, Rotation and Scale Edit Boxes. And the corresponding lock buttons.

Wiht one small difference. The rotation mode starts with Quaternions by default. And not with Euler Angles.

Lattice Objects



You need to have some vertices of the Lattice object selected to see the content.

Vertex

Here you can see and set the vertex positions of the lattice objects.

Global / Local

Here you can define if the orientation of the selection is local to the selected object, or global to the world coordinates.

Mean Weight

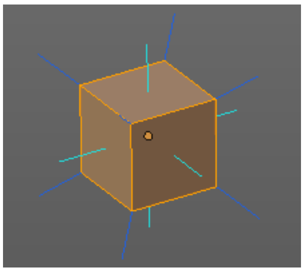
Lattice object is a deform cage. Here you can adjust the mean weight of the selected vertice(s).

Mesh Display Panel

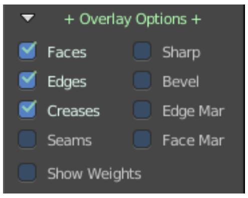
This panel just shows in Edit mode with a mesh object selected. It contains some mesh related display settings like normals, or that you can display the length of an edge.

Normals

Here you can display the vertex, edge and faces normals at the selected mesh. The size box allows you to adjust the length of the stroke that displays the normal.



Overlay Options subtab



This subtab contains various display settings.

Faces

Displays selected faces with the orange select color.

Edges

Displays selected edges with the orange select color.

Creases

Displays Creases.

Seams

Displays marked seams.

Show Weights

Shows the weights of the vertices.

Sharp

Shows as sharp marked edges.

Bevel

Shows Beveled edges.

Edge Marks

Shows Edge Marks.

Face Marks

Shows Face marks.

Info Options subtab

The info Options subtab contains some settings with which you can display additional informations at the mesh geometry. The values are in world coordinates.

Edge Info

Length

Displays the length of the selected edges.

Angle

Displays what angle the adjacent faces of the selected edges has.

Face Info

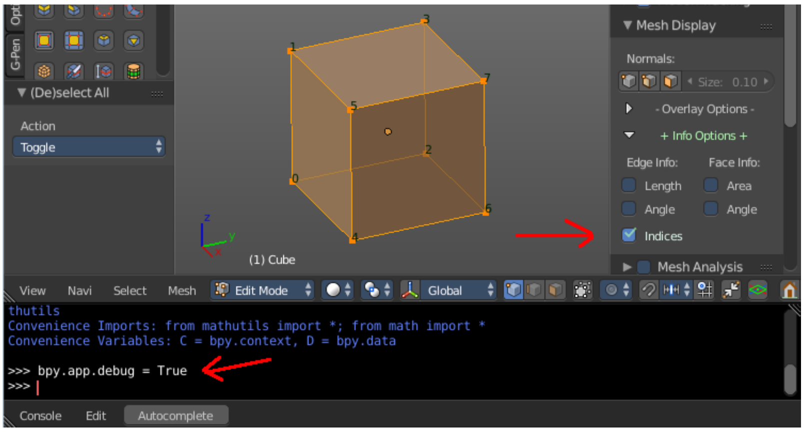
Area

Displays how big the area of the selected faces is.

Angle

Displays what angle the adjacent faces of the selected edges has.

Indices

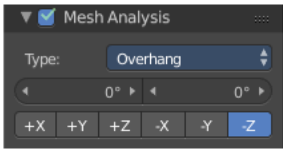


Indices is a special debug feature for programmers and developers. Sometimes the order of the mesh elements counts. With this option ticked you can display the indices of the mesh elements in the viewport.

This feature is deactivated by default. You first need to activate it in the Python console by activating the Debug mode. Type in 'bpy.app.debug = True', and hit enter . Then tick the Indices checkbox. And then you can see the values for the selected elements at the mesh.

When you are in Vertices mode then the indices numbers for the vertices gets displayed. When you are in Edge mode, then the indices for the Edges gets displayed. And when you are in Face mode, then the Face indices gets displayed.

Mesh Analysis Panel



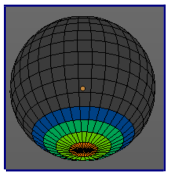
The Mesh Analysis is to analyze mesh attributes for 3D printing. For example, Some 3D printers have a physical limit to the overhang that can be printed. Or it needs a specific thickness.

The Mesh Analysis panel just shows in Edit mode with a mesh object selected. And in Solid Mode. Furthermore you need to have a Deform modifier at the mesh. You can activate and deactivate the whole panel at once in the header.

Type dropdown box

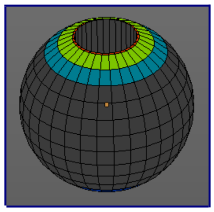
Here you can choose between the different methods of analysis

Overhang



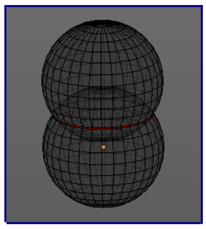
Calculates and displays the overhang areas.

Thickness



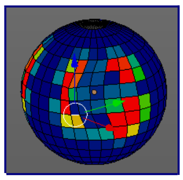
Calculates and displays the thickness.

Intersections



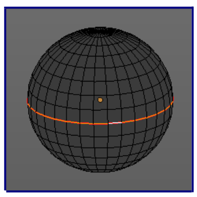
Displays intersecting faces in red. This mode has no settings.

Distortion



Displays non planar quads and n-gons dependant of a given angle.

Sharp Edges



Similar to wall-thickness, sharp edges can form shapes that are too thin to be able to print.

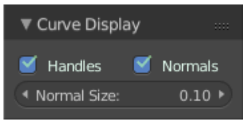
Angle

Here you can adjust the angle for the calculation

Axis

Here you can choose the axis that should be calculated.

Curve Display Panel



Here you can find some display settings for Curve objects.

This panel is just visible with a Curve Object in Edit Mode.

Handles

Display the handles at the curve object.

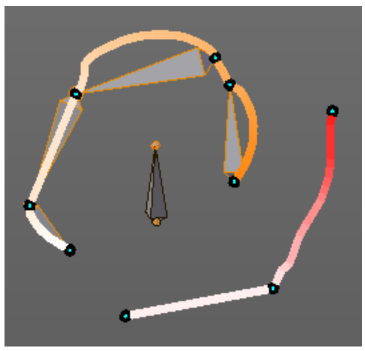
Normals

Display the normals at the curve object.

Normal Size

Adjust the size of the normals at the curve object.

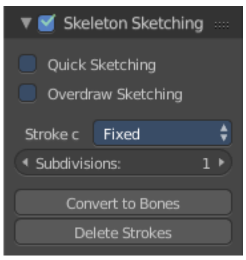
Skeleton Sketching Panel



This is a tool, and should belong into the tool shelf. For now it's in the Properties.

Skeleton sketching allows you to paint your skeleton with strokes instead of extruding out bones. Every point becomes a joint then. And when you click the convert button, then the armature gets created.

The Skeleton sketching panel is just visible in Edit mode with an Armature object.



To activate and deactivate this tool simply tick the checkbox in the header of the panel. Then you will be able to paint strokes in the viewport. Right click to end a stroke.

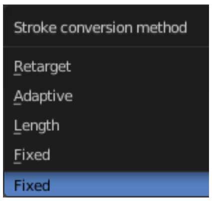
Quick Sketching

Automatically convert the strokes to bones when you end the stroke.

Overdraw Sketching

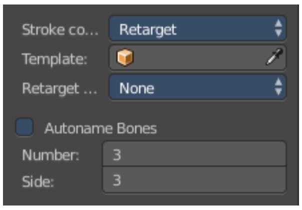
With this option ticked you can adjust strokes by painting near them.

Stroke Conversion method



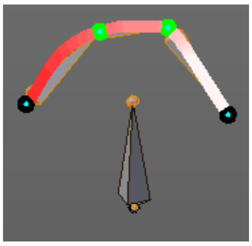
Here you can choose between different conversion methods.

Retarget



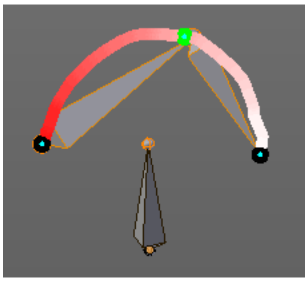
This method is unfortunately not documented in the Blender manual, it is listed as Todo. And it is not to find out how this is meant to work.

Adaptive



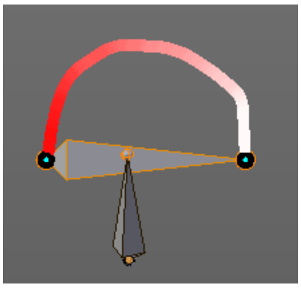
Draws bones in the average length of the stroke, but tries to follow the shape of the stroke.

Length



Draws bones in the average length of the stroke.

Fixed



Draws bones between the points in the stroke.

Convert to bones

Converts the current strokes into an armature.

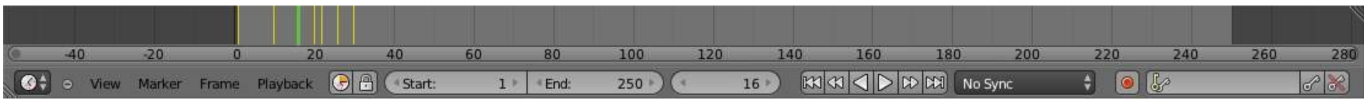
Delete Strokes

Deletes all strokes from the viewport.

3.3.1 Editors - Animation

Timeline Editor

The *Timeline* window, identified by a clock icon, is shown by default at the bottom of the screen.



Timeline

The *Timeline* is not much of an editor, but more of a information and control window.

Here you can have an overview of the animation part of your scene
: What is the current time frame, either in frames or in seconds, where are the keyframes of the active object, the start and end frames of your animation, markers, etc...

The *Timeline* has *Player Controls*, to play, pause the animation, and to skip though parts of the scene.

It also has some tools for *Keyframes*, *Keying Sets*, and *Markers*.

Timeline Elements

Time Cursor

Time Cursor

The *Time Cursor* is the green line, its used to set and display the current time frame.

The *Time Cursor* can be set or moved to a new position by pressing or holding `LMB` in the Timeline window.

The current frame or second can be displayed on the *Time Cursor*, check the View menu for settings.

The *Time Cursor* can be moved in steps by pressing `Left` or `Right`, or in steps of 10 frames by pressing `Shift-Up` or `Shift-Down`.

Keyframes

For the active and selected objects, keyframes are displayed as a yellow line.

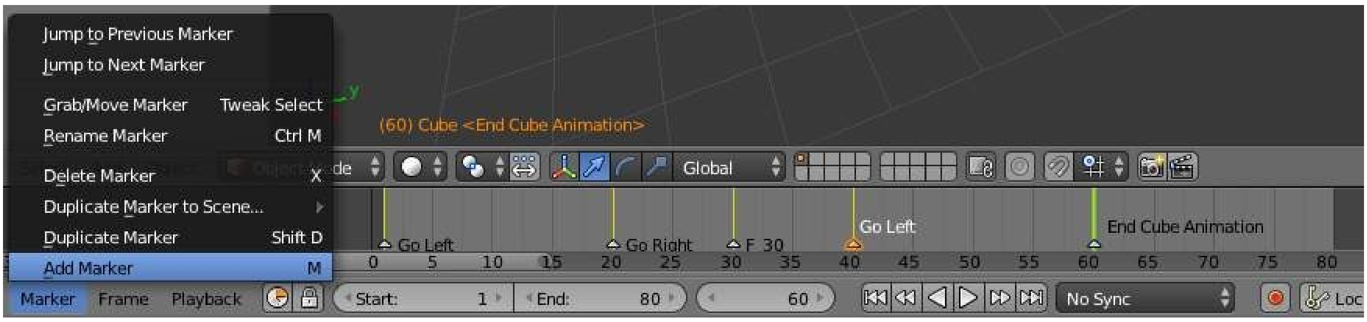
For *Armatures*, the object keyframes and the pose bones keyframes are drawn.

Only Selected Channels can be enabled. *Timeline* > *View* > *Only Selected Channels*. For *Armatures*, this will draw the object keyframes, and the keyframes for the active and selected pose bones.

Markers

Markers are the small triangles, with their name near them.

Markers are usually used to identify key parts of the animation.



Markers

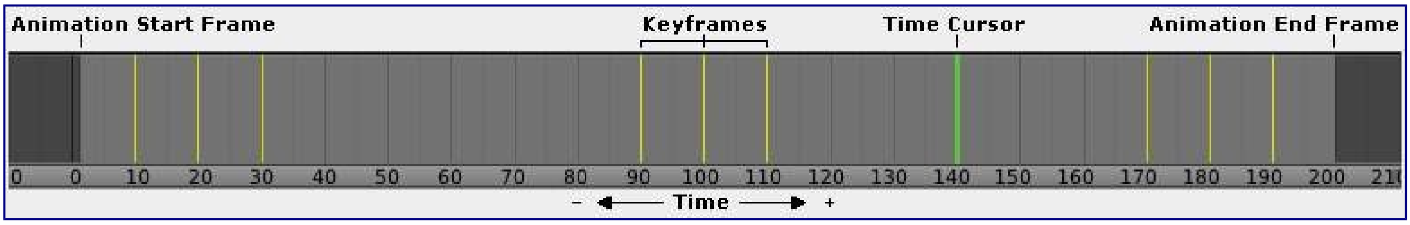
Markers can be selected by pressing `RMB` or `Shift-RMB` to select more.

See Marker Menu below or *Markers* for more info.

Adjusting the View

Timeline Area

The main *Timeline* area displays the animation frames over time.



Timeline Main Area

The *Timeline* can be panned by holding `MMB`, then dragging the area left or right.

You can zoom the *Timeline* by using `Ctrl-MMB`, the mouse `Wheel`, or pressing the `Minus` and `Plus` keys on the numpad.

By default, the *Playback/Rendering Range* (Frame Start 1 to Frame End 200) is a lighter shade of gray. The start and end frame can be set to the *Time Cursor* by pressing `S` or `E`. The *Playback Range* can also be set by pressing `P` then drawing a box.

Timeline Header

View Menu

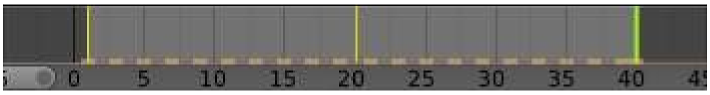
The *View Menu* controls what you see, and what it looks like.

Toggle Full Screen
: Maximize or minimize the *Timeline* window. `Ctrl-Up` or `Ctrl-Down`

Duplicate Area into New Window
: This creates a new OS window, and sets the editor window to the *Timeline*.

Bind Camera to Markers
: This is used switch cameras during animation. It binds the active camera to the selected markers. First select a camera. Then select the marker(s). Then use the function. `Ctrl-B`

Cache
: This will display the baked *Cache Steps* for the active object.



Timline Cache

Show Cache
: Show all enabled types.

Softbody, *Particles*, *Cloth*, *Smoke*, *Dynamic Paint*, *Rigid Body*.

Only Selected Channels
: For *Armatures*, this will draw the object keyframes, and the keyframes for the active and selected pose bones.

Show Frame Number Indicator

This will draw the current frame or seconds on the *Time Cursor.*

View All

Maximize the *Timeline* area based on the Animation Range. `Home`

Show Seconds

Show time in seconds for the *Timeline* and the *Time Cursor* based on the FPS.

Marker Menu

Jump to Previous Marker

Jump to Next Marker

Grab/Move Marker

Grab/Move the selected markers. `G`

Rename Marker

Rename the active marker.

Delete Marker

Delete selected markers.

Duplicate Marker to Scene...

Duplicate the selected markers to another scene.

Duplicate Marker

Duplicate the selected markers.

Add Marker

Add marker to the current frame.

Frame Menu

Auto-Keyframing Mode

This controls how the Auto Keyframe mode works. Only one mode can be used at a time.

Add & Replace

Add or Replace existing keyframes.

Replace

Only Replace existing keyframes.

Playback Menu

- *Audio Scrubbing* If your animation has sound, this option plays bits of the sound wave while you move the time cursor with LMB or keyboard arrows.
- *Audio Muted* Mute the sound from Sequence Editors.
- *AV-sync* Play back and sync with audio clock, dropping frames if frame display is too slow. See 4. Synchronize Playback for more info.
- *Frame Dropping* Play back dropping frames if frames are too slow. See 4. Synchronize Playback for more info.
- *Clip Editors* While playing, updates the *Movie Clip Editor.*
- *Node Editors* While playing, updates the Node properties for the *Node Editor.*
- *Sequencer Editors* While playing, updates the *Video Sequence Editor.*

Note

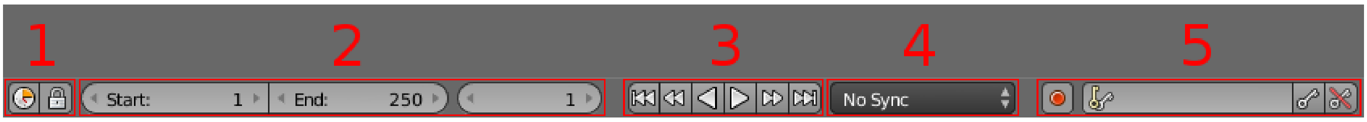
Image Editors

TODO Not sure what is updated, maybe gif images or, image sequence.

- *Image Editors* Todo
- *Property Editors* When the animation is playing, this will update the property values in the UI.
- *Animation Editors* While playing, updates the *Timeline*, *Dope Sheet*, *Graph Editor*, *Video Sequence Editor.*
- *All 3D View Editors* While playing, updates the *3D View* and the *Timeline*.
- *Top-Left 3D Editor* While playing, updates the *Timeline* if *Animation Editors* and *All 3D View Editors* disabled.

Header Controls

The Timeline header controls.



Timeline header controls.

1. Range Control

Use Preview Range

This is an alternative range used to preview animations. This works for the UI playback, this will not work for rendering an animation.

Lock Time Cursor to Playback Range

This limits the *Time Cursor* to the *Playback Range*.

2. Frame Control

Start Frame

The start frame of the animation / playback range.

End Frame

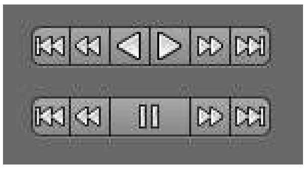
The end frame of the animation / playback range.

Current Frame

The current frame of the animation / playback range. Also the position of the *Time Cursor.*

3. Player Control

These button are used to set, play, rewind, the *Time Cursor.*



Player Controls.

Jump to start
: This sets the cursor to the start of frame range.

Jump to previous keyframe
: This sets the cursor to the previous keyframe.

Rewind
: This plays the animation sequence in reverse. SWhen playing the play buttons switch to a pause button.

Play
: This plays the animation sequence. When playing the play buttons switch to a pause button.

Jump to next keyframe
: This sets the cursor to the next keyframe.

Jump to end
: This sets the cursor to the end of frame range.

Pause
: This stops the animation.

4. Synchronize Playback

3D View Red FPS. 60:54.75

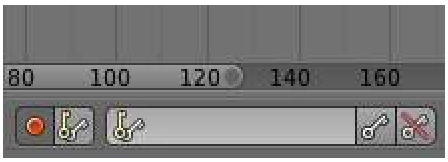
When you play an animation, the FPS is displayed at the top left of the 3D View. If the scene is detailed and playback is slower than the set *Frame Rate* (see Dimensions Presets, these options are used to synchronize the playback.

No Sync
: Do not sync, play every frame.

Frame Dropping
: Drop frames if playback is too slow. This enables *Frame Dropping* from the *Playback Menu*.

AV-sync
: Sync to audio clock, dropping frames if playback is slow. This enables *AV-sync* and *Frame Dropping* from the *Playback Menu*.

5. Keyframe Control



Timeline Auto Keyframe.

Auto Keyframe

The “Record” red-dot button enables something called *Auto Keyframe* : It will add and/or replace existing keyframes for the active object when you transform it in the 3D view.

For example, when enabled, first set the *Time Cursor* to the desired frame, then move an object in the 3d view, or set a new value for a property in the UI.

When you set a new value for the properties, Bforartists will add keyframes on the current frame for the transform properties.

Auto Keying Set - Optional if Auto Keyframe enabled. *Auto Keyframe* will insert new keyframes for the properties in the active *Keying Set*.

Note that *Auto Keyframe* only works for transform properties (objects and bones), in the 3D views (i.e. you cant use it e.g. to animate the colors of a material in the Properties window...).

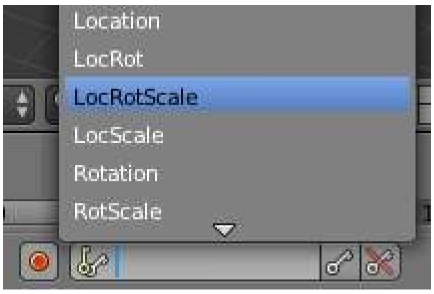
Note

Layered

Todo.

Timeline Layered.

Layered - Optional while playback. TODO.



Timeline Keying Sets.

Active Keying Set

Keying Sets are a set of keyframe channels in one.

They are made so the user can record multiple properties at the same time.

With a keying set selected, when you insert a keyframe, Bforartists will add keyframes for the properties in the active *Keying Set*.

There are some built in keying sets, ‘LocRotScale’, and also custom keying sets.

Custom keying sets can be defined in the in the panels *Properties > Scene > Keying Sets + Active Keying Set*.

Insert Keyframes

Insert keyframes on the current frame for the properties in the active *Keying Set*.

Delete Keyframes

Delete keyframes on the current frame for the properties in the active *Keying Set*.

User Preferences

Some related user preferences from the **Editing** tab.

Playback

Allow Negative Frames

Time Cursor can be set to negative frames with mouse or keyboard. When using *Use Preview Range*, this also allows playback.

Keyframing

Visual Keying

When an object is using constraints, the objects property value doesnt actually change. *Visual Keying* will add keyframes to the object property, with a value based on the visual transformation from the constraint.

Only Insert Needed

This will only insert keyframes if the value of the propery is different.

Auto Keyframing

Enable *Auto Keyframe* by default for new scenes.

Show Auto Keying Warning

Displays a warning at the top right of the *3D View*, when moving objects, if *Auto Keyframe* is on.

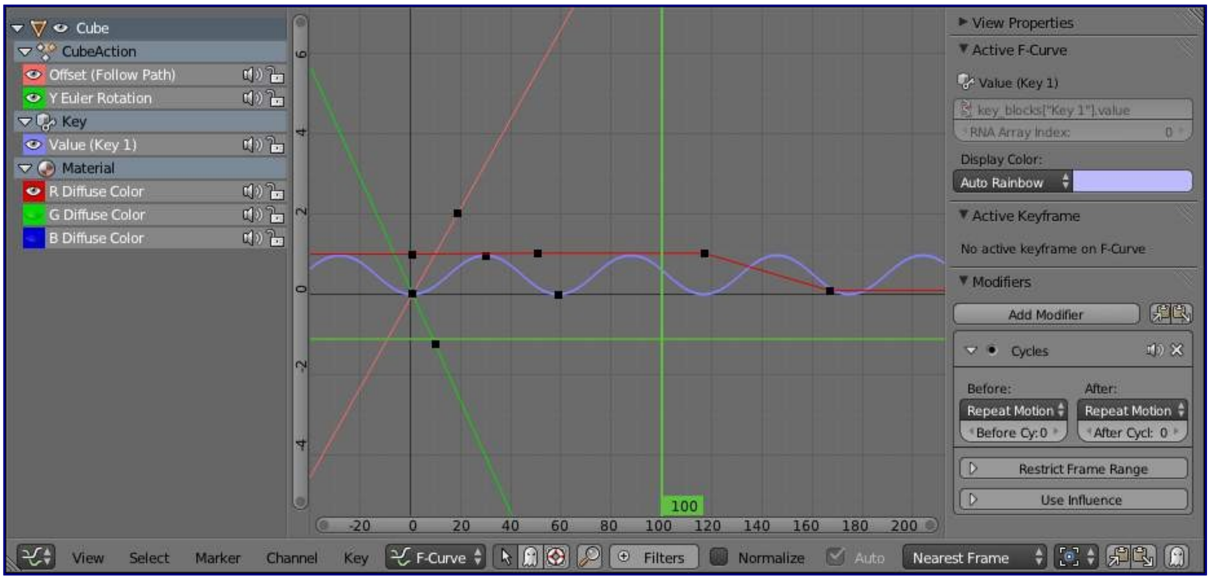
Only Insert Available

With *Auto Keyframe* enabled, this will only add keyframes to channel F-Curves that already exist.

Graph Editor

The graph editor is the main animation editor. It allows you to modify the animation for any properties using *F-Curves*.

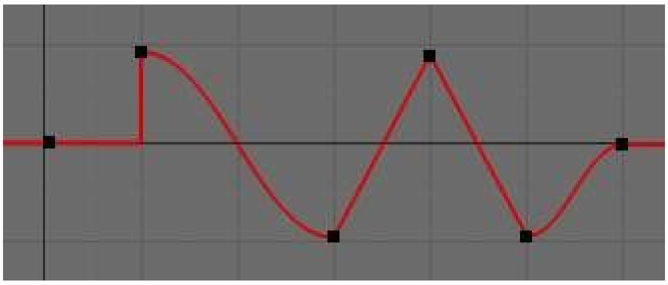
The graph editor has two modes, *F-Curve* for *Actions*, and *Drivers* for *Drivers*. Both are very similar in function.



The Graph Editor.

Curve Editor Area

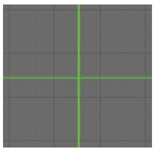
Here you can see and edit the curves and keyframes.



A curve with different types of interpolation.

See *F-Curves* for more info.

2D Cursor



Graph Editor 2D Cursor.

The current frame is represented by a green vertical line called the *Time Cursor.*

As in the *Timeline*, you can change the current frame by pressing or holding `LMB`.

The green horizontal line is called the *Cursor.* This can be disabled via the *View Menu* or the *View Properties* panel.

The *Time Cursor* and the *Cursor* make the *2D Cursor.* The *2D Cursor* mostly used for editing tools.

View Axes

For *Actions* the X-axis represents time, the Y-axis represents the value to set the property.

For *Drivers* the X-axis represents the *Driver Value*, the Y-axis represents the value to set the property.

Depending on the selected curves, the values have different meaning: For example rotation properties are shown in degrees, location properties are shown in Bforartists Units. Note that *Drivers* use radians for rotation properties.

Markers

Like with most animation editors, markers are shown at the bottom of the editor.

Graph Editor Markers.

Markers can be modified in the *Graph Editor* though its usually best to use the *Timeline*.

See *Markers* for more info.

Header

Here you'll find.

- The menus.
- Graph Editor mode.
- View controls.
- Curve controls.

Header Controls

Graph Mode.

Mode
F-Curve for *Actions*, and Drivers for *Drivers*.

View Controls.

View controls

Show Only Selected
Only include curves related to the selected objects and data.

Show Hidden
Include curves from objects/bones that are not visible.

Show Only Errors
Only include curves that are disabled or have errors.

Search Filter
Only include curves with keywords contained in the search text.

Type Filter
Filter curves by property type.

Normalize
Normalize curves so the maximum or minimum point equals 1.0 or -1.0.

Auto
Automatically recalculate curve normalization on every curve edit.

Curve Controls.

Curve controls

Auto Snap

Auto snap the keyframes for transformations.

No Auto-Snap Time Step Nearest Frame Nearest Marker

Pivot Point

Pivot point for rotation.

Bounding Box Center
Center of the select keyframes.
2D Cursor
Center of the *2D Cursor. Time Cursor + Cursor.*
Individual Centers
Rotate the selected keyframe *Bezier* handles.

Copy Keyframes
Copy the selected keyframes to memory.

Paste Keyframes
Paste keyframes from memory to the current frame for selected curves.

Create Snapshot
Creates a picture with the current shape of the curves.

Channels Region

Channels Region.

The channels region is used to select and manage the curves for the graph editor.

Hide curve
Represented by the eye icon.

Deactivate/Mute curve
Represented by the speaker icon.

Lock curve from editing
Represented by the padlock icon.

Channel Editing

Select channel

Multi Select/Deselect

Toggle Select All

Border Select

Border Deselect

Delete selected

Lock selected

Make only selected visible

Enable Mute Lock selected

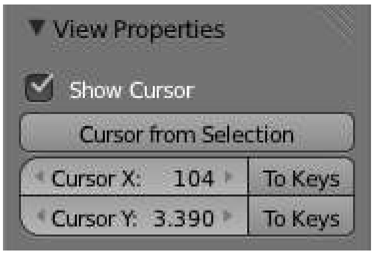
Disable Mute Lock selected

Toggle Mute Lock selected

Properties Region

The panels in the *Properties Region*.

View Properties Panel



View Properties Panel.

Show Cursor
Show the vertical *Cursor.*

Cursor from Selection
Set the *2D cursor* to the center of the selected keyframes.

Cursor X

Time Cursor X position.

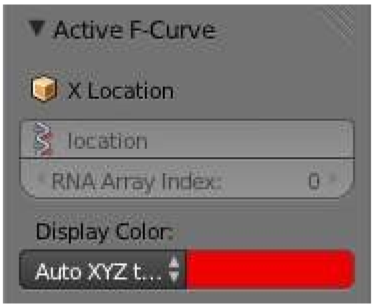
To Keys
Snap selected keyframes to the *Time Cursor.*

Cursor Y

Vertical *Cursor* Y position.

To Keys
Snap selected keyframes to the *Cursor.*

Active F-Curve Panel



Active F-Curve Panel.

This panel displays properties for the active *F-Curve*.

***Channel Name* (X Location)**
: *ID Type* + Channel name.

RNA Path
: *RNA Path* to property + Array index.

Color Mode
: *Color Mode* for the active *F-Curve*.

  Auto Rainbow
  : Increment the *HUE* of the *F-Curve* color based on the channel index.

  Auto XYZ to RGB
  : For property sets like location xyz, automatically set the set of colors to red, green, blue.

  User Defined
  : Define a custom color for the active *F-Curve*.

Active Keyframe Panel

Active Keyframe Panel.

Interpolation
: Set the forward interpolation for the active keyframe.

  Constant
  : Keep the same value till the next keyframe.

  Linear
  : The difference between the next keyframe.

  Bezier
  : Bezier interpolation to the next keyframe.

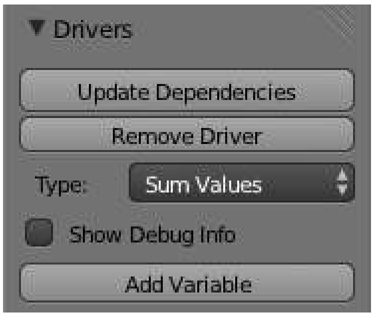
Key
: **Frame**
  : Set the frame for the active keyframe.

Value
: Set the value for the active keyframe.

Left Handle
: Set the position of the left interpolation handle for the active keyframe.

Right Handle
: Set the position of the right interpolation handle for the active keyframe.

Drivers Panel



Drivers Panel.

See Drivers Panel for more info.

Modifiers Panel

Modifiers Panel.

See *F-Modifiers* for more info.

See also

- *Graph Editor - F-Curves*
- *Graph Editor - F-Modifiers*
- *Actions*
- *Drivers*

F-Curves

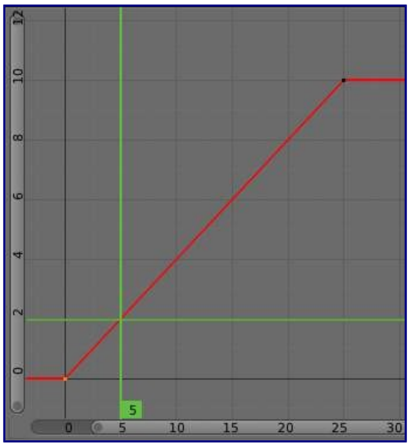
After animating some property in Bforartists using keyframes you can edit their corresponding curves. When something is “animated,” it changes over time. This curve in shown as something called an F-Curve. Basically what an F-Curve does is it a interpolates between two animated properties. In Bforartists, animating an object means changing one of its properties, such as an objects location, or its scale.

As mentioned, Bforartists’s fundamental unit of time is the “frame”, which usually lasts just a fraction of a second, depending on the *frame rate* of the scene. As animation is composed of incremental changes spanning multiple frames, usually these properties ARE NOT manually modified *frame by frame*, because:

- it would take ages!
- it would be very difficult to get smooth variations of the property (unless you compute mathematical functions and type a precise value for each frame, which would be crazy).

This is why nearly all direct animation is done using **interpolation**.

The idea is simple: you define a few Key Frames, which are multiple frames apart. Between these keyframes, the properties' values are computed (interpolated) by Bforartists and filled in. Thus, the animators' workload is significantly reduced.



Example of interpolation

For example, if you have:

- a control point of value `0` at frame `0`,
- another one of value `10` at frame `25`,
- and you use linear interpolation,

then, at frame `5` we get a value of `2`.

The same goes for all intermediate frames: with just two points, you get a smooth growth from `0` to `10` along the **25 frames**. Obviously, if you'd like the frame `15` to have a value of `9`, you'd have to add another control point (or keyframe)...

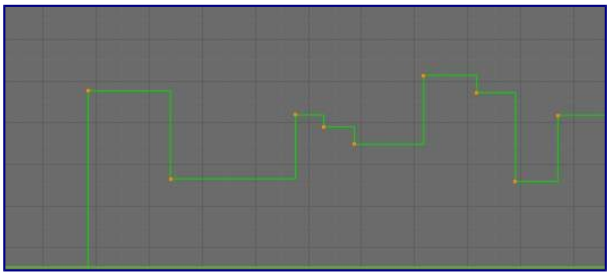
Settings

F-curves have three additional properties, which control the interpolation between points, extension behavior, and the type of handles.

Interpolation Mode

You have three choices (`T`, or Curve ‣ Interpolation Mode):

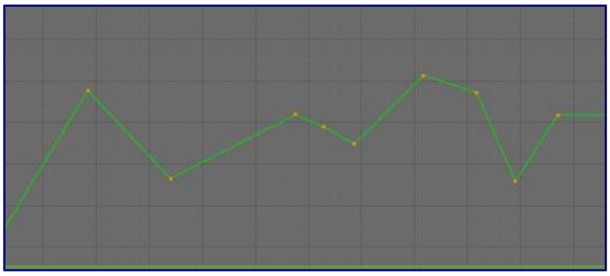
Constant
: There is no interpolation at all. The curve holds the value of its last keyframe, giving a discrete (stairway) "curve". Usually only used during the initial "blocking" stage in pose-to-pose animation workflows.



Constant.

Linear

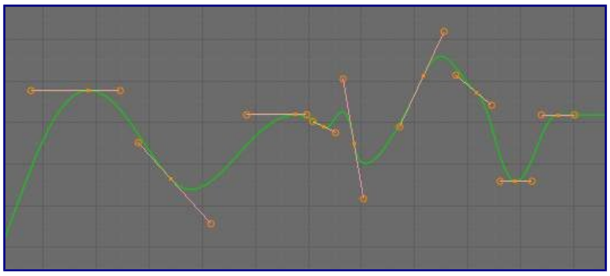
This simple interpolation creates a straight segment between each neighbor keyframes, giving a broken line. It can be useful when using only two keyframes and the *Extrapolation* extend mode, to easily get an infinite straight line (i.e. a linear curve).



Linear.

Bezier

The more powerful and useful interpolation, and the default one. It gives nicely smoothed curves, i.e. smooth animations!



Bézier.

Remember that some FCurves can only take discrete values, in which case they are always shown as if constant interpolated, whatever option you chose.

Extrapolation

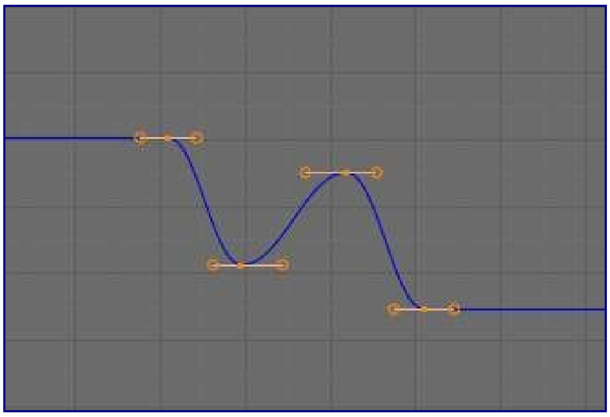
(`Shift-E`, or Channel ‣ Extrapolation Mode)

Extrapolation defines the behavior of a curve before the first and after the last keyframes.

There are two basic extrapolation modes:

Constant

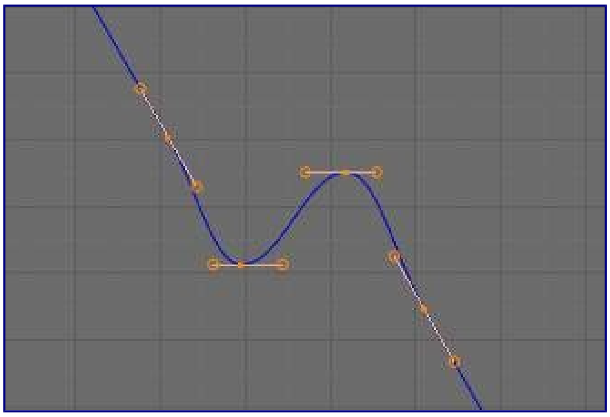
The default one, curves before their first keyframe and after their last one have a constant value (the one of these first and last keyframes).



Constant extrapolation

Linear

Curves ends are straight lines (linear), as defined by their first two keyframes (respectively their last two keyframes).



Linear extrapolation

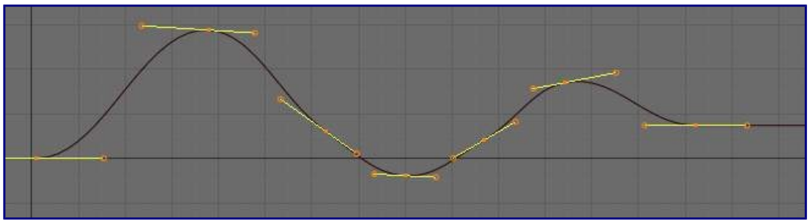
Additional extrapolation tools (e.g. the “Cycles” F-Modifier) are located in the *F-Curve Modifiers*

Handle Types

There is another curve option quite useful for Bézier-interpolated curves. You can set the type of handle to use for the curve points V

Automatic

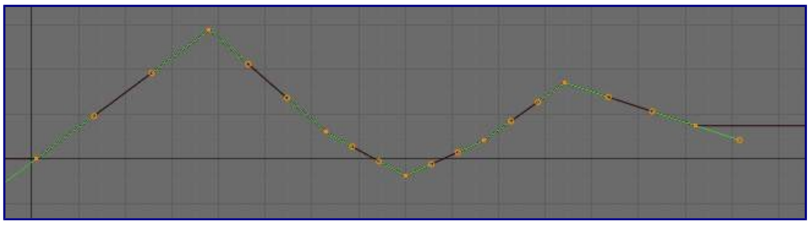
Keyframes are automatically interpolated



Auto handles

Vector

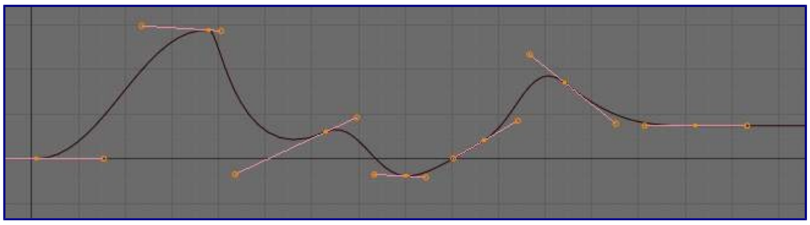
Creates linear interpolation between keyframes. The linear segments remain if keyframe centers are moved. If handles are moved, the handle becomes Free.



Vector handles

Aligned

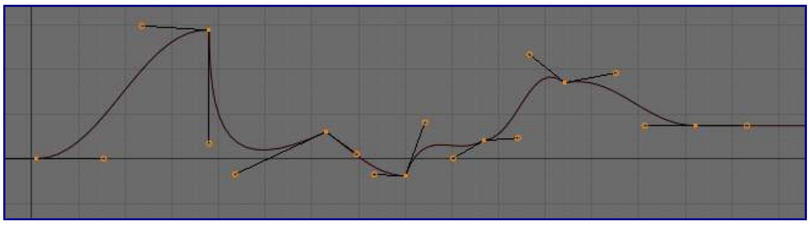
Handle maintain rotation when moved, and curve tangent is maintained



Aligned handles

Free

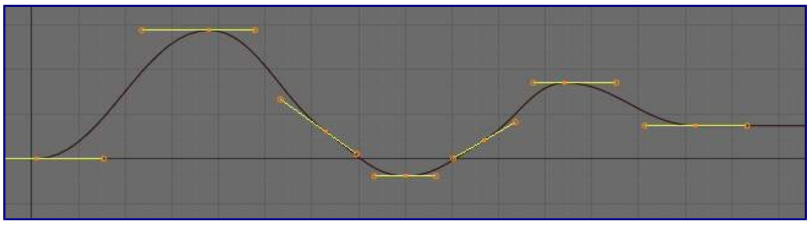
Breaks handles tangents



Free handles

Auto Clamped

Auto handles clamped to not overshoot



Auto clamped handles

Direction of time

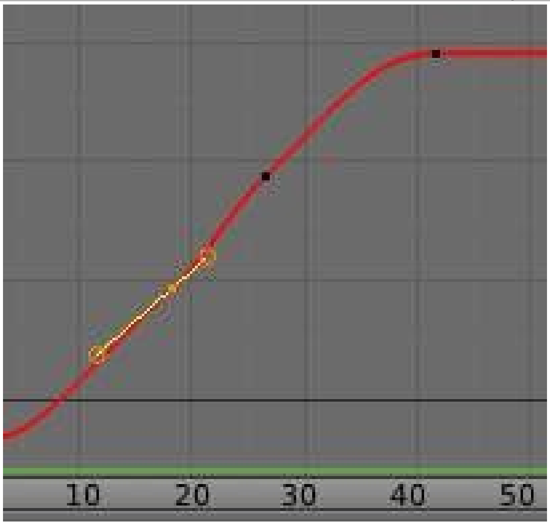
Although F-curves are very similar to Bezier Curves, there are some important differences.

For obvious reasons, **a property represented by a Curve cannot have more than one value at a given time**, hence:

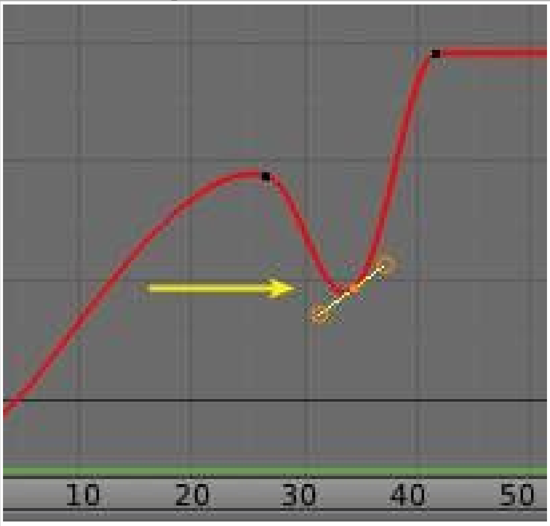
- when you move a control point ahead of a control point that was previously ahead of the point that you are moving, the two control points switch their order in the edited curve, to avoid that the curve goes back in time

- for the above reason, it’s impossible to have a closed Ipo curve

Two control points switching: the curve can’t go back in time!



Before moving the second keyframe



After moving the second keyframe

Editing Tools

By default, when new channels are added, the *Graph Editor* sets them to *Edit Mode*. Selected channels can be locked by pressing `Tab`.

Many of the hotkeys are the same as the viewport ones, for example Navigation hotkeys and select keys. Which one depends of the chosen keymap.

And of course you can lock the transformation along the X (time frame) or Y (value) axises by pressing `X` or `Y` during transformation.

For precise control of the keyframe position and value, you can set values in the *Active Keyframe* of the Properties Region.

Transform Snapping

When transforming keyframes with the navigation hotkeys the transformation can be snapped to increments.

Snap Transformation to 1.0 `Ctrl`

Divide Transformation by 10.0 `Shift`

Keyframes can be snapped to different properties by using the *Snap Keys* tool.

Snap Keys `Shift-S`

Current Frame
: Snap the selected keyframes to the *Time Cursor.*

Cursor Value
: Snap the selected keyframes to the *Cursor.*

Nearest Frame
: Snap the selected keyframes to their nearest frame individually.

Nearest Second
: Snap the selected keyframes to their nearest second individually, based on the *FPS* of the scene.

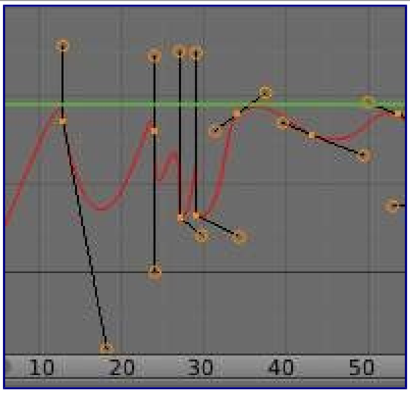
Nearest Marker

Snap the selected keyframes to their nearest marker individually.

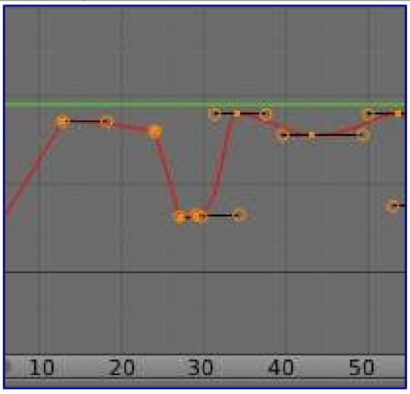
Flatten Handles

Flatten the *Bezier* handles for the selected keyframes.

Flatten Handles snapping example.



Before Flatten Handles.



After Flatten Handles.

Mirror

Selected keyframes can be mirrored over different properties using the *Mirror Keys* tool.

Mirror Keys

By Times Over Current Frame

Mirror horizontally over the *Time Cursor.*

By Values over Cursor Value

Mirror vertically over the *Cursor.*

By Times over Time 0

Mirror horizontally over frame 0.

By Values over Value 0

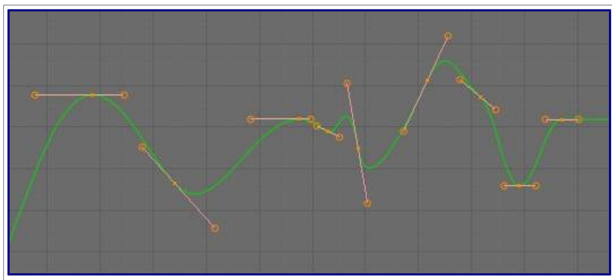
Mirror vertically over value 0.

By Times over First Selected Marker

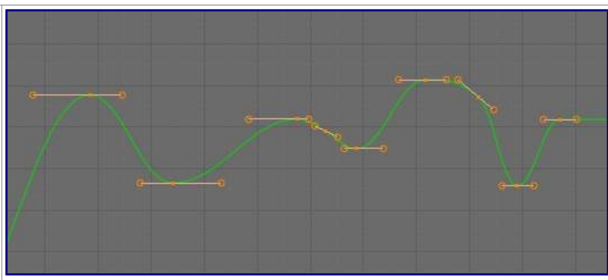
Mirror horizontally the over the first selected *Marker.*

Clean Keyframes

Clean Keyframes resets the keyframe tangents to their auto-clamped shape, if they have been modified. *Clean Keyframes* 0



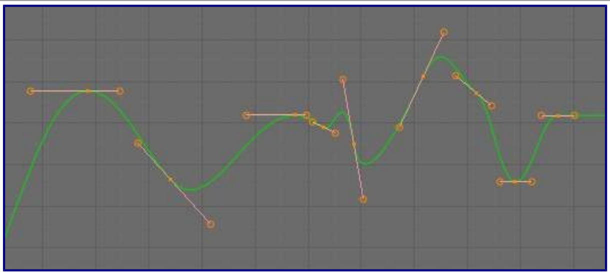
FCurve before cleaning

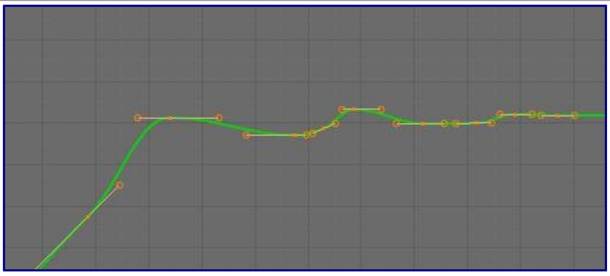


FCurve after cleaning

Smoothing

There is also an option to smooth the selected curves , but beware: its algorithm seems to be to divide by two the distance between each keyframe and the average linear value of the curve, without any setting, which gives quite a strong smoothing! Note that the first and last keys seem to be never modified by this tool.

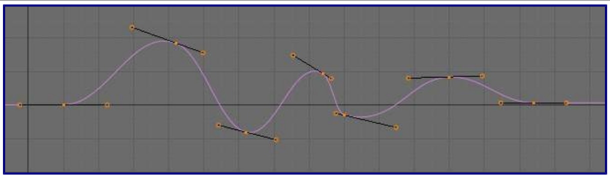

FCurve before smoothing

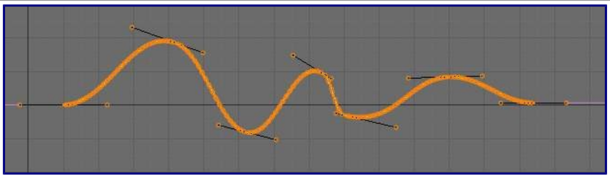

FCurve after smoothing

Sampling and Baking Keyframes

Sample Keyframes

Sampling a set a keyframes replaces interpolated values with a new keyframe for each frame.


FCurve before sampling


FCurve after sampling

Bake Curves

Baking a curve replaces it with a set of sampled points, and removes the ability to edit the curve.

F-Curve Modifiers

F-Curve modifiers are similar to object modifiers, in that they add non-destructive effects, that can be adjusted at any time, and layered to create more complex effects.

Adding a Modifier

The F-curve modifier panel is located in the Properties panel. Select a curve by selecting one of its curve points, or by selecting the channel list. Click on the *Add Modifier* button and select a modifier.

To add spin to an object or group, select the object/group and add a keyframe to the axis of rotation (x,y, or z)

Go to the Graph Editor.....make sure the f-curves properties panel is visible (View > Properties)

>Add Modifier > (e.g.) Generator

Types of Modifiers

Generator

Generator creates a Factorized or Expanded Polynomial function. These are basic mathematical formulas that represent lines, parabolas, and other more complex curves, depending on the values used.

Additive

This option causes the modifier to be added to the curve, instead of replacing it by default.

Poly Order

Specify the order of the polynomial, or the highest power of ‘x’ for this polynomial. (number of coefficients - 1).

Change the Coefficient values to change the shape of the curve.

See also

The Wikipedia Page for more information on polynomials.

Built-in Function

These are additional formulas, each with the same options to control their shape. Consult mathematics reference for more detailed information on each function.

- Sine
- Cosine
- Tangent
- Square Root
- Natural Logarithm
- Normalized Sine (sin(x)/x)

Amplitude

Adjusts the Y scaling

Phase Multiplier

Adjusts the X scaling

Phase Offset

Adjusts the X offset

Value Offset

Adjusts the Y offset

Envelope

Allows you to adjust the overall shape of a curve with control points.

Reference Value

Set the Y value the envelope is centered around.

Min

Lower distance from Reference Value for `1:1` default influence.

Max

Upper distance from Reference Value for `1:1` default influence.

Add Point

Add a set of control points. They will be created at the current frame.

Fra:

Set the frame number for the control point.

Min

Specifies the lower control point’s position.

Max

specifies the upper control point’s position.

Cycles

Cycles allows you add cyclic motion to a curve that has 2 or more control points. The options can be set for before and after the curve.

Cycle Mode
- **Repeat Motion**
  - Repeats the curve data, while maintaining their values each cycle.
- **Repeat with Offset**
  - Repeats the curve data, but offsets the value of the first point to the value of the last point each cycle.
- **Repeat Mirrored**
  - Each cycle the curve data is flipped across the X-axis.

Before/After Cycles
- Set the number of times to cycle the data. A value of 0 cycles the data infinitely.

Noise

Modifies the curve with a noise formula. This is useful for creating subtle or extreme randomness to animated movements, like camera shake.

Blend Type
- **Replace**
  - Adds a -.5 to .5 range noise function to the curve.
- **Add**
  - Adds a 0 to 1 range noise function to the curve.
- **Subtract**
  - Subtracts a 0 to 1 range noise function to the curve.
- **Multiply**
  - Multiplies a 0 to 1 range noise function to the curve.

Scale
- Adjust the overall size of the noise. Values further from 0 give less frequent noise.

Strength
- Adjusts the Y scaling of the noise function.

Phase
- Adjusts the random seed of the noise.

Depth
- Adjusts how detailed the noise function is.

Python

Limits

Limit curve values to specified X and Y ranges.

Minimum/Maximum X
- Cuts a curve off at these frames ranges, and sets their minimum value at those points.

Minimum/Maximum Y
- Truncates the curve values to a range.

Stepped

Gives the curve a stepped appearance by rounding values down within a certain range of frames.

Step Size
Specify the number of frames to hold each frame
Offset
Reference number of frames before frames get held. Use to get hold for '1-3' vs '5-7' holding patterns.
Use Start Frame
Restrict modifier to only act before its 'end' frame
Use End Frame
Restrict modifier to only act after its 'start' frame

Dope Sheet

- Action Editor
    - Action Data-Blocks
    - Channel Menu
- The Dopesheet
    - Dope Sheet Modes
    - Interface
- Shape Key

Action Editor

In Bforartists *Actions* are a generic containers for F-Curves. Actions can contain any number of F-Curves, and can be attached to any data block. As long as the RNA data paths stored in the Action's F-Curves can be found on that data block, the animation will work. For example, an action modifying 'X location' and 'Y location' properties can be shared across multiple objects, since both objects have 'X location' and 'Y location' properties beneath them.

The *Action Editor* window enables you to see and edit the FCurve data-blocks you defined as actions in the *FCurve Editor* window. So it takes place somewhere in-between the low-level *FCurves*, and the high-level *NLA editor*. Hence, you do not have to use them for simple Ipo curves animations - and they have not much interest in themselves, so you will mostly use this window when you do *NLA animation* (they do have a few specific usages on their own, though, like e.g. with the *Action constraint*, or the *pose libraries*).

This is not a mandatory window, as you do can edit the actions used by the NLA directly in the *FCurve Editor* window (or even the *NLA Editor* one). However, it gives you a slightly simplified view of your FCurve data-blocks (somewhat similar to the "key" mode of the FCurve window, even though more powerful in some ways) - and, more interesting, it can show you all "action" FCurve data-blocks of a same object at once.

Additionally, it also allows you to affect timing of the different keys of the layers created with the *grease pencil tool*.

Each "action" FCurve data-block forms a top-level channel (see below). Note that an object can have several *Constraint* (one per animated constraint) and *Pose* (for armatures, one per animated bone) FCurve data-blocks, and hence an action can have several of these channels.

Action Data-Blocks

As everything else in Bforartists, actions are data-blocks. Unlike FCurve ones, there is only one type of action, which can regroup all FCurve of a given object. You'll find its usual data-block controls in the *Action Editor* header.

However, there is one specificity with action data-blocks: they have by default a "fake user", i.e. once created, they are always kept in Bforartists file, even if no object uses them. This is due to the fact that actions are designed to be used in the NLA, where you can affect several different actions to a same object! Yes, this is the only way to use different actions (and hence, different FCurve data-blocks of the same kind) to animate a same object. But as you have to assign an action to an object to be able to edit it (and an object can only have one action data-block at a time), to have "fake users" guaranties you that you won't lost your precious previously-edited actions when you start working on a new one!

This window shows, by default, the action data-block linked to the current active object. However, as with FCurvs, you can pin an *Action Editor* to a given action with the small "pin" button to the left of the data-block controls, in the header. This will force the window to always display this data-block, whatever the current selected object is.

Channel Menu

Delete (X)

Deletes the whole channel from the current action (i.e. unlink the underlying FCurve data-block from this action data-block).

Warning

The X shortcut is area-dependent: if you use it in the left list part, it'll delete the selected channels, whereas if you use it in the main area, it'll delete the selected keyframes...

Settings ‣ Toogle/Enable/Disable a Setting
Enable/disable a channel's setting (selected in the menu that pops-up) - currently, "lock" and/or "mute" only.

Toggle Channel Editability Tab
Locks or unlocks a channel for editing

Extrapolation Mode
Change the extrapolation between selected keyframes. More options are available in the Graph Editor.

Expand Channels, Collapse Channels
Expands or collapses selected channels.

Move...
This allows you to move top-level channels up/down , or directly to the top/bottom.

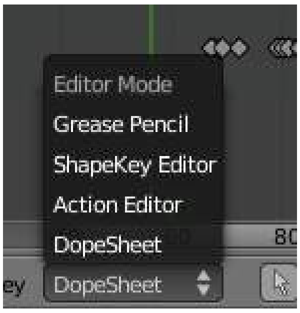
Revive Disabled F-Curves
Clears 'disabled' tag from all F-Curves to get broken F-Curves working again

The Dopesheet

The DopeSheet

Classical hand-drawn animators often made a chart, showing exactly when each drawing, sound and camera move would occur, and for how long. They nicknamed this the ‘dopesheet’. While CG foundations dramatically differ from classical hand-drawn animation, Bforartists’s Dopesheet inherits a similar directive. It gives the animator a ‘birds-eye-view’ of every thing occurring within a scene.

Dope Sheet Modes



DopeSheet modes

There are four basic views for the Dopesheet.These all view different contexts of animation:

DopeSheet
: The dopeSheet allow you to edit multiple actions at once.

Action Editor
: *Action Editor* is the default, and most useful one. It’s here you can define and control your actions.

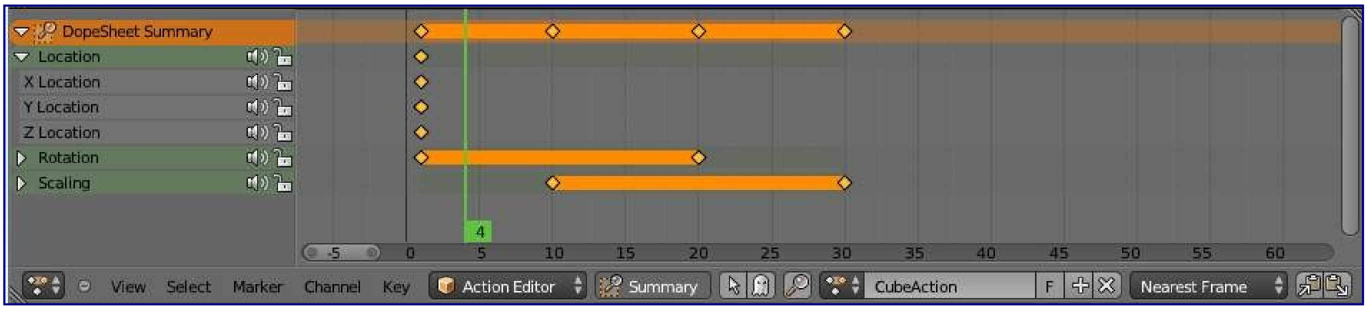
Shape Key Editor
: *ShapeKey Editor* is dedicated to the *Shape* Ipo data-blocks. It uses/edits the same action data-block as the previous mode. It seems to be an old and useless thing, as the *Action Editor* mode handles *Shape* channels very well, and this mode adds nothing...

Grease Pencil
: *Grease Pencil* is dedicated to the *grease pencil tool’s* keyframes - for each grease pencil layer, you have a

strip along which you can grab its keys, and hence easily re-time your animated sketches. As it is just another way to see and edit the grease pencil data, this mode uses no data-block (and hence has nothing to do with actions...). Note that you'll have as much top-level grease pencil channels as you have sketched windows (3D views, *UV/Image Editor*, etc.)

Interface

The *Action Editor* interface is somewhat similar to the *FCurve Editor* one, it is divided in three areas:



The Action Editor window, Action Editor mode, with an Object and Shape channels.

The header bar

Here you find the menus, a first block of controls related to the editor "mode", a second one concerning the action data-blocks, and a few other tools (like the copy/paste buttons, and snapping type).

The main area

It contains the keyframes for all visible action channels. As with the other "time" windows, the X-axis materializes the time. The Y-axis has no mean in itself, unlike with the FCurve editor, it's just a sort of "stack" of action channels - each one being shown as an horizontal colored strip (of a darker shade "during" the animated/keyed period). On these channel strips lay the keyframes, materialized as light-gray (unselected) or yellow (selected) diamonds. One of the key feature of this window is that it allow you to visualize immediately which channel (i.e. Ipo curve) is *really* affected. When the value of a given channel does not change at all between two neighboring keyframes, a gray (unselected) or yellow (selected) line is drawn between them.

The left "list-tree"

This part shows the action's channel "headers" and their hierarchy. Basically, there are:

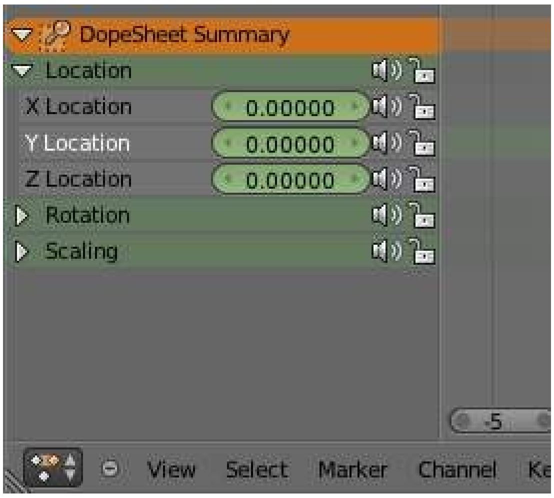
- "Top-level" channels, which represent whole FCurve data-blocks (so there's one for *Object* one, one for *Shape* one, etc.). They gather *all* keyframes defined in their underlying FCurve data-block.
- "Mid-level" channels, which seem currently to have no use (there's one per top-level channel, they are all named *FCurves*, and have no option at all...).
- "Low-level" channels, which represent individual FCurve , with their own keyframes (fortunately, only keyed Ipos are shown!).

Each level can be expended/collapsed by the small arrow to the left of its "parent" channel. To the right of the channel's headers, there are some channel's setting controls:

- Clicking on the small "eye" will allow you to mute that channel (and all its "children" channels, if any!).
- Clicking on the small "lock" will allow you to prevent this channel and its children to be edited (note that this is also working inside the NLA, but that it doesn't prevent edition of the underlying FCurve ...).

A channel can be selected (text in white, strip in gray-blue color) or not (text in black, strip in pink-brown color.), use LMB clicks to toggle this state. You can access some channel's properties by clicking Ctrl-LMB on its header. Finally, you can have another column with value-sliders, allowing you to change the value of current keyframes, or to add new ones. These are obviously only available for low-level channels (i.e. individual FCurve). See View Menu below for how to show these sliders.

View Menu



the action editor showing sliders

Realtime Updates
When transforming keyframes, changes to the animation data are flushed to other views

Show Frame Number Indicator
Show frame number beside the current frame indicator line

Show Sliders
A toggle option that shows the value sliders for the channels. See the *The Action Editor window, Action Editor mode, with a group and sliders* picture above).

Use Group Colors
Draw groups and channels with colors matching their corresponding groups.

AutoMerge Keyframes
Automatically merge nearby keyframes

Sync Markers
Sync Markers with keyframe edits

Show Seconds
Whether to show the time in the X-axis as frames or as seconds

Set Preview Range
Interactively define frame range used for playback. Allow you to define a temporary preview range to use for the Alt-A realtime playback (this is the same thing as the *Playback Range* option of the timeline window header).

Clear Preview Range
Clears the preview range

Auto-Set Preview Range
Automatically sets the preview range to playback the whole action.

Marker Menu

See the *Markers page*.

Shape Key

To do

Non-Linear Animation Editor

The NLA editor can manipulate and repurpose actions, without the tedium of keyframe handling. Its often used to make broad, significant changes to a scene's animation, with relative ease. It can also repurpose, and 'layer' actions, which make it easier to organize, and version-control your animation.

Tracks

Tracks are the layering system of the NLA. At its most basic level, it can help organize strips. But it also layers motion much like an image editor layers pixels - the bottom layer first, to the top, last.

Strips

There's three kinds of strips - Action, Transition, and Meta. Actions contain the actual keyframe data, Transitions will perform calculations between Actions, and Meta will group strips together as a whole.

Creating Action Strips

Any action used by the NLA first must be turned into an Action strip. This is done so by clicking the

next to the action listed in the NLA. Alternatively, you can go to

Reference
Menu: Add –> Action

Action Strip.

Creating Transition Strips

Select two or more strips on the same track, and go to

Reference

Menu: Add –> Transition

Transition Strip.

Grouping Strips into Meta Strips

If you find yourself moving a lot of strips together, you can group them into a Meta strip. A meta strip can be moved and duplicated like a normal strip.

Reference
Menu: Add –> Add Meta-Strips

Shift-select two or more strips..

Combine them into a meta strip.

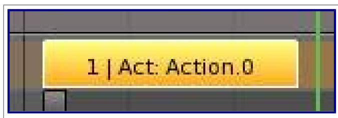
A meta strip still contains the underlying strips. You can ungroup a Meta strip.

Reference
Menu: Add –> Remove Meta-Strips

Editing Strips

The contents of Action strips can be edited, but you must be in 'Tweak Mode' to do so.

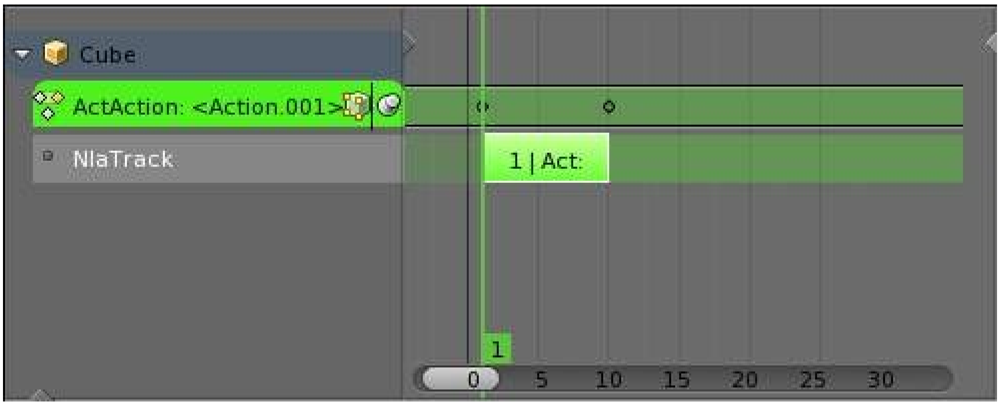
Reference
Menu: View –> Enter Tweak Mode



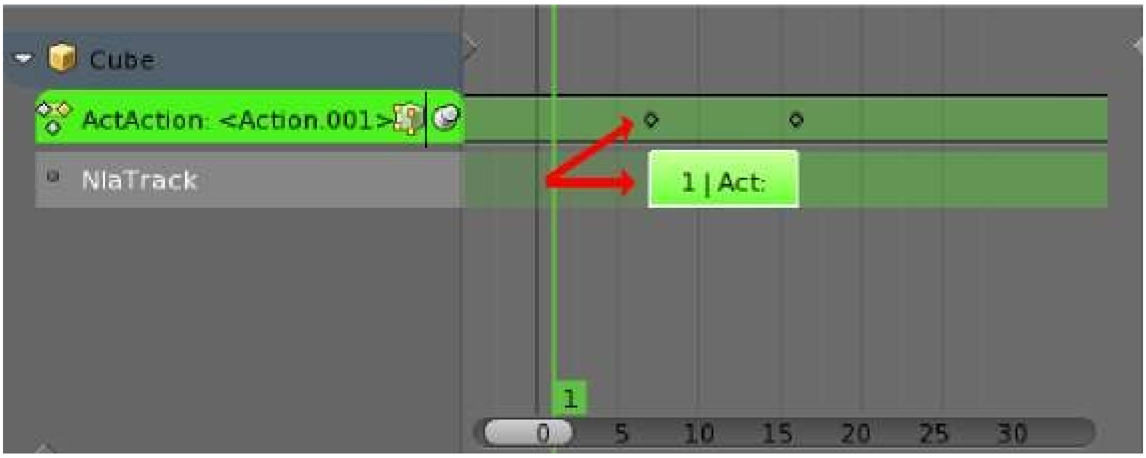
Strip in NLA mode..

Strip in Tweak mode.

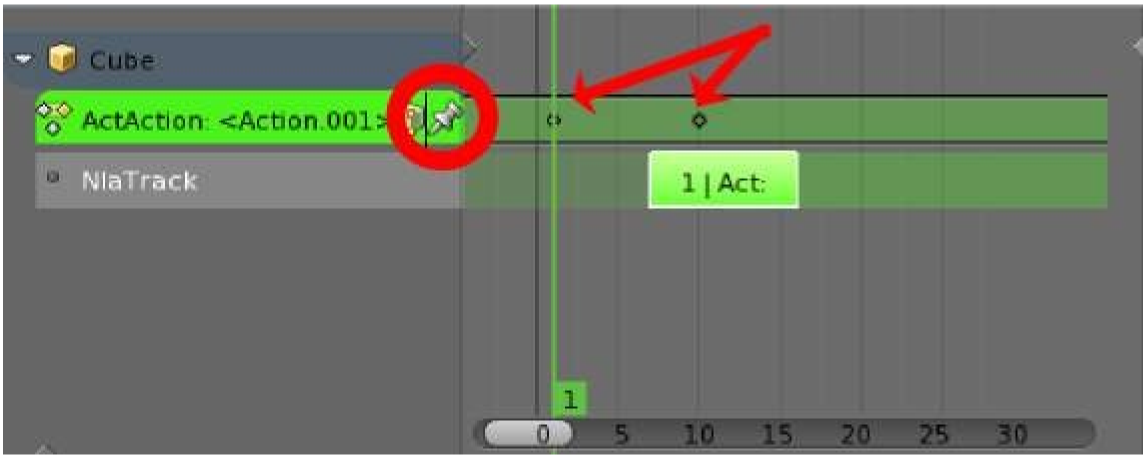
If you try moving the strip, while in edit mode, you'll notice that the keys will go along with it. On occasion, you'll prefer the keys to remain on their original frames, regardless of where the strip is. To do so, hit the 'unpin' icon, next to the strip.



Nla strip with pinned keys.



Strip moved, notice the keys move with it.



The unpinned keys return to their original frames.

When your finished editing the strip, simply go to View > Exit Tweak Mode. Note the default key for this is Tab.

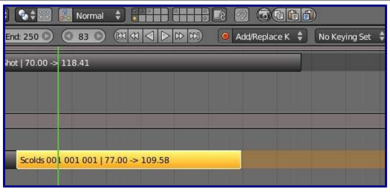
Re-Instancing Strips

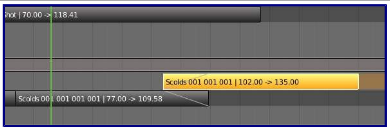
The contents' of one Action strip can be instanced multiple times. To instance another strip, select a strip, go to

Reference

Menu: Edit–> Duplicate Strips

Now, when any strip is tweaked, the others will change too. If a strip other than the original is tweaked, the original will turn to red.


Original strip.


Duplicated strip.


Duplicated strip being edited.

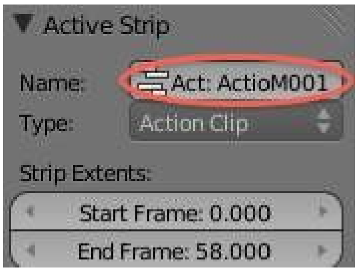
Strip Properties

Strip properties can be accessed via the NLA header.

Reference
Menu: View–> Properties

Renaming Strips

All strips can be renamed, in the “Active Track” section in the Strip Properties.

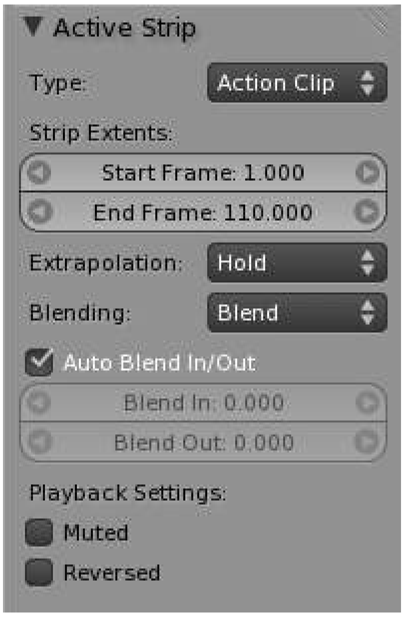


Active Track

This is which track the strip currently belongs to.

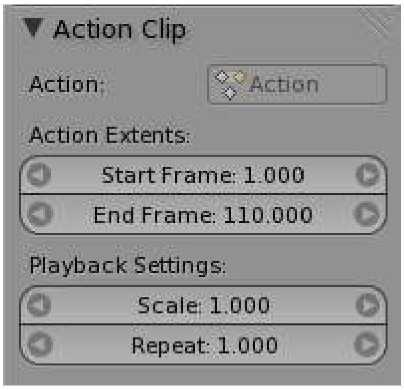
Active Strip

Elements of the strip itself. An Action Strip can be either an Action Clip, or a Transition Clip. Note that the ‘Strip Extents’ fields determine strictly the strip, and not the action. Also, the “Hold” value in the Extrapolation section means hold both beginning, and after. This can cause previous clips to not work, if checked.



Active Action

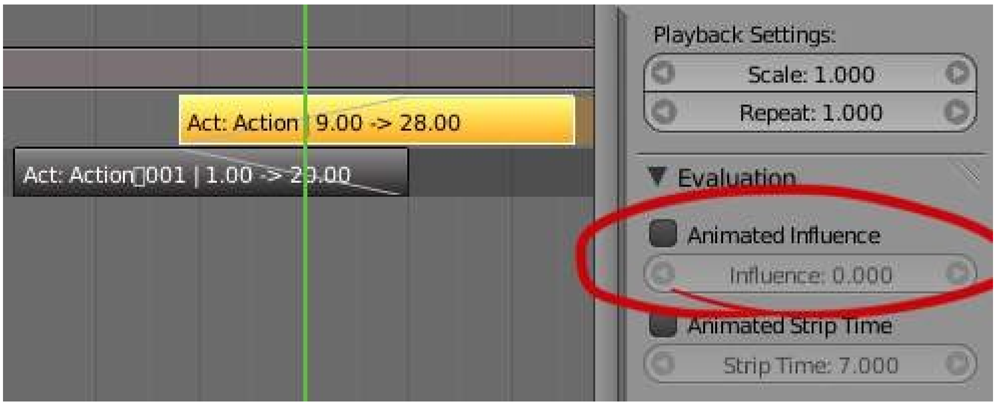
This represents the ‘object data’ of the strip. Much like the transform values of an object.



Evaluation

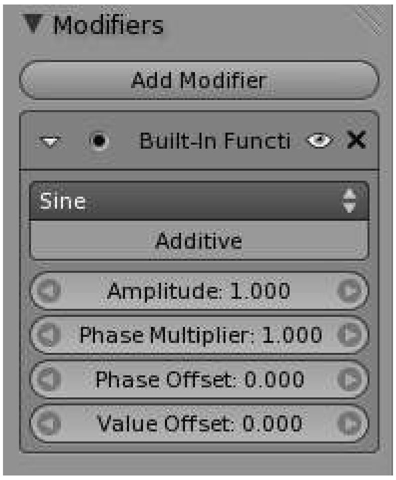
This determines the degree of influence the strip has, and over what time.

If influence isn’t animated, the strips will fade linearly, during the overlap.



Strip Modifiers

Like its close cousins in mesh and graph editing, Modifiers can stack different combinations of effects for strips. Obviously there will be more to come on this.



Editors - UV Image Editor

UV/Image Editor

Navigating

Panning can be done by clicking the `MMB` and dragging.

Zooming can be done by scrolling `MMB` up or down. Also, as in the 3D view, you can use `NumpadPlus` or `NumpadMinus` to zoom.

The following shortcuts are available, and through the *View Menu*:

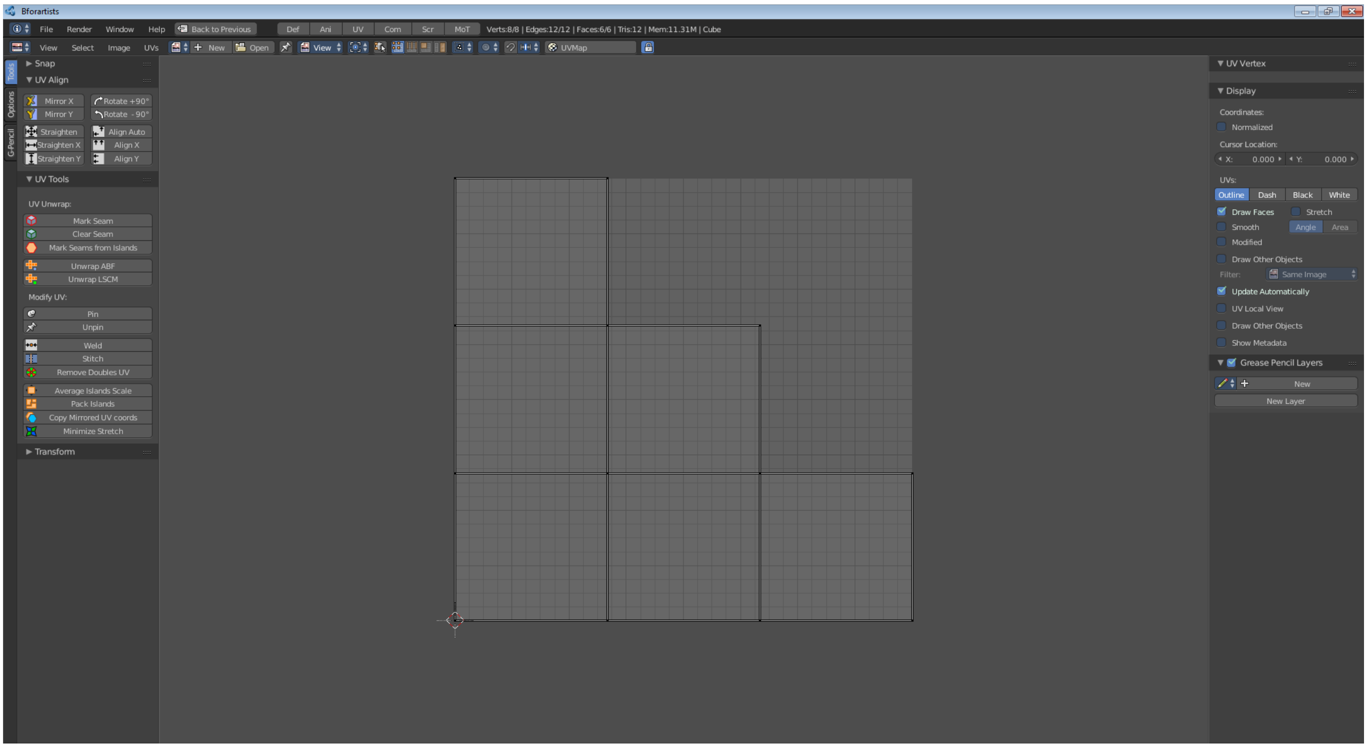
- View All `Home`
- View Center `NumpadPeriod`

Masking

To Do

Texturing

The UV/Image Editor is where you will be editing the UVs. This is an overview of the tools found there. Using the UV editor is explained more in depth in the next sections.



UV/Image Editor window for texturing.

Header Bar

UV/Image Editor Header

The header bar contains several menus and options for working with UVs

View Menu
: Tools for, working with the editor and controlling how things are displayed. The properties panel has display options and manipulation tools.

Select Menu
: Tools for *Selecting UV's*

Image Menu
: This contains options for when *Working with Images*

UVs Menu
: Contains tools for *Unwrapping Meshes* and *Editing UV's*.

Image Selector Menu
: Select the image to apply when *Working with Images*.

Pin Image
: Displays current image regardless of selected object.

Pivot Point Selector
: Similar to working with Pivot Points in the 3D view.

Sync Selection
: Keeps UV and Mesh component selections in sync.

Selection Modes:

- Vertex
- Edge

- Face
- Island

Sticky Selection Mode
When Sync Selection is disabled, these options control how UVs are selected.

Proportional Editing
See *Proportional Editing*.

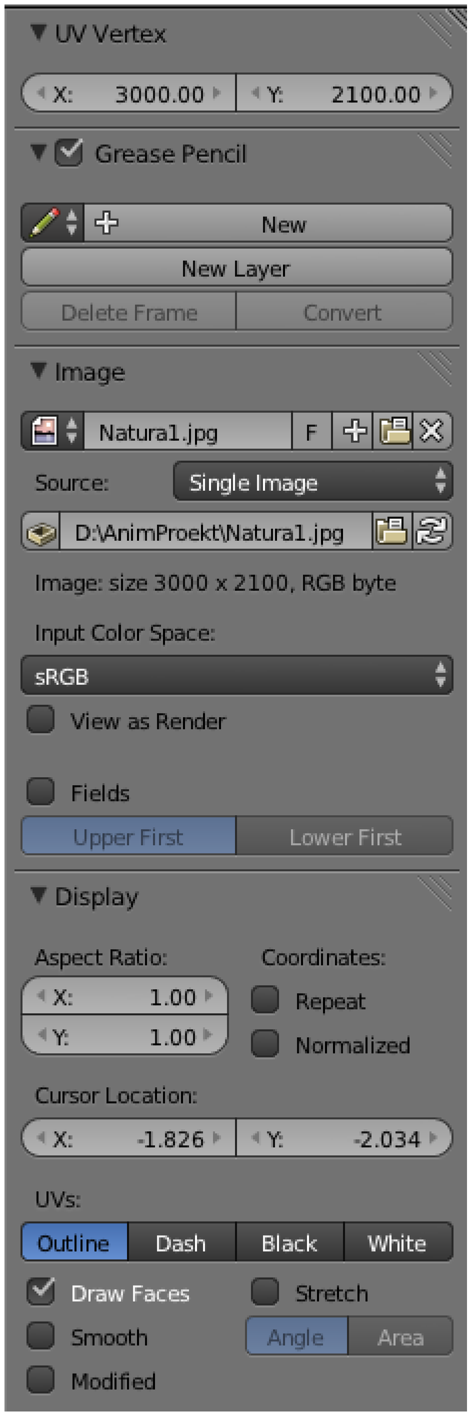
UV Snapping
Similar to Snapping in the 3D View

Active UV Texture Map Selector
Select which UV texture to use

Image Channels to Draw
Set the image to be displayed with *Color*, *Color and Alpha*, or just *Alpha*.

Auto Update Other Affected Windows
Update other affected windows space automatically to reflect changes during interactive operations e.g. transfom.

Properties Panel



UV Vertex
Transform Properties *Selecting UV's*.

Grease Pencil
See the *Grease Pencil* Docs.

Image
Contains the properties of the current Image.

Display
Controls display options for UVs and additional settings for when *Working with Images*.

Display Options

You can set how UVs are displayed in the *Display Panel*:

Aspect Ratio
Display Aspect for this image. Does not affect rendering.

Coordinates

Display UV coordinates

Repeat
Draw the image repeated outside of the main view.

Normalized
Display UV coordinates from 0.0 to 1.0 rather than in pixels

Cursor Location
2D cursor location for this view

Outline/Dash/Black/White
Sets how UV edges are displayed

Draw Faces
Draw faces over the image

Smooth
Makes edges appeared Antialiased

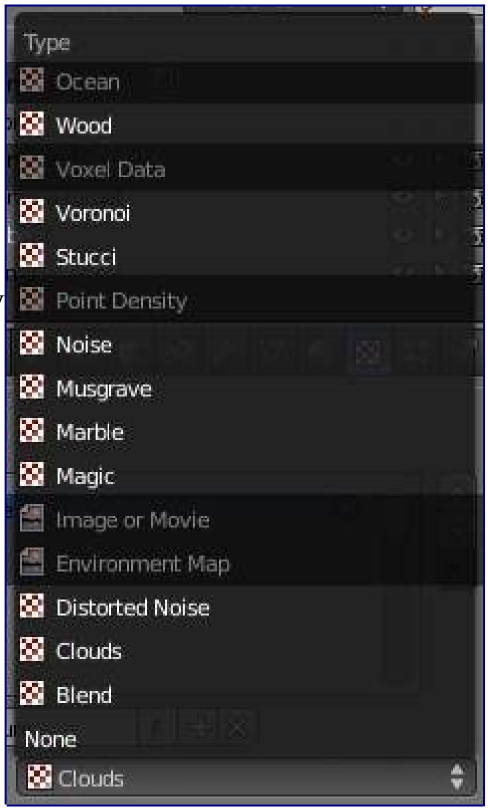
Modified

Show results of modifiers in the UV display

Stretch

Shows how much of a difference there is between UV coordinates and 3D coordinates. Blue means low distortion, while Red means high distortion. Choose to display the distortion of *Angles* or the *Area*.

Procedural Textures



Procedural textures are textures that are defined mathematically. They are generally relatively simple to use, because they don't need to be mapped in a special way - which doesn't mean that procedural textures can't become very complex.

These types of textures are 'real' 3D. By that we mean that they fit together perfectly at the edges and continue to look like what they are meant to look like even when they are cut; as if a block of wood had really been cut in two. Procedural textures are not filtered or anti-aliased. This is hardly ever a problem: the user can easily keep the specified frequencies within acceptable limits.

These are the available types:

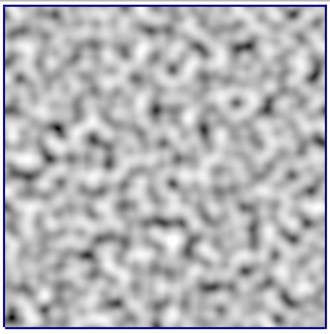
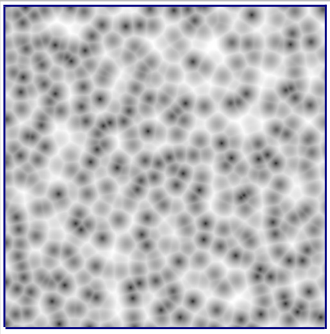
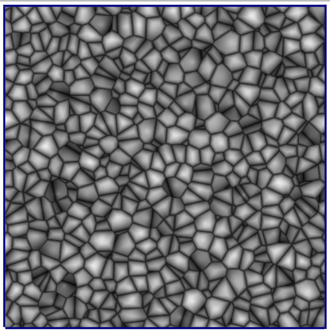
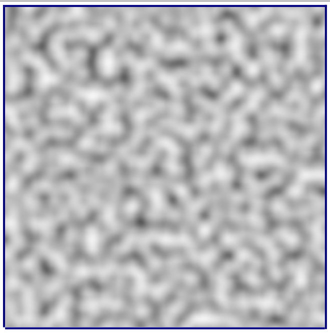
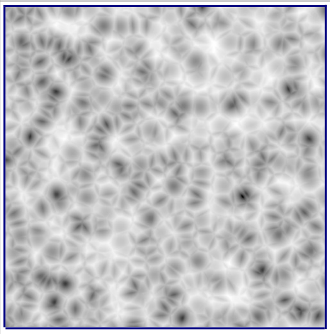
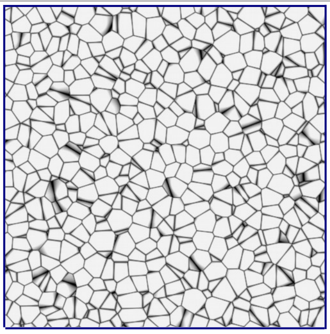
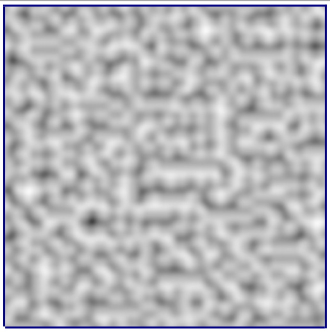
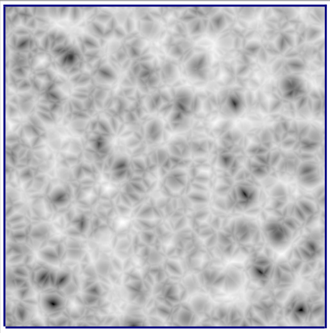
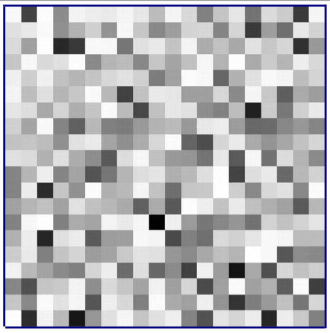
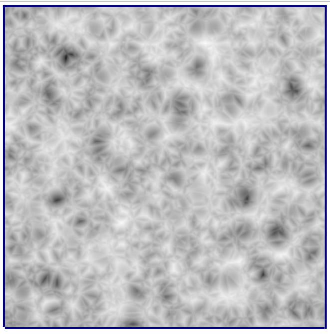
- *Blend*
- *Clouds*
- *Distorted Noise*
- *Magic*
- *Marble*
- *Musgrave*
- *Noise*
- *Stucci*
- *Voronoi*
- *Wood*

Common options

Noise Basis

Each noise-based Bforartists texture (with the exception of Voronoi and simple noise) has a *Noise Basis* setting that allows the user to select which algorithm is used to generate the texture. This list includes the original Bforartists noise algorithm. The *Noise Basis* settings makes the procedural textures extremely flexible (especially *Musgrave*).

The *Noise Basis* governs the structural appearance of the texture :

 Bforartists Original	 Voronoi F1	 Voronoi F2-F1
 Original Perlin	 Voronoi F2	 Voronoi Crackle
 Improved Perlin	 Voronoi F3	 Cell Noise
 Voronoi F4		

There are two more possible settings for *Noise Basis*, which are relatively similar to *Bforartists Original*: Improved Perlin and Original Perlin

Nabla

Almost all procedural textures in Bforartists use derivatives for calculating normals for texture mapping (with as exception *Blend* and *Magic*). This is important for Normal and Displacment Maps. The strength of the effect is controlled with the *Nabla* Number Button.

Hints

Use the size buttons in the *Mapping* panel to set the size that the procedural textures are mapped to.

Procedural textures can either produce colored textures, intensity only textures, textures with alpha values and normal textures. If intensity only ones are used the result is a black and white texture, which can be greatly enhanced by the use of ramps. If on the other hand you use ramps and need an intensity value, you have to switch on *No RGB* in the *Mapping* panel.

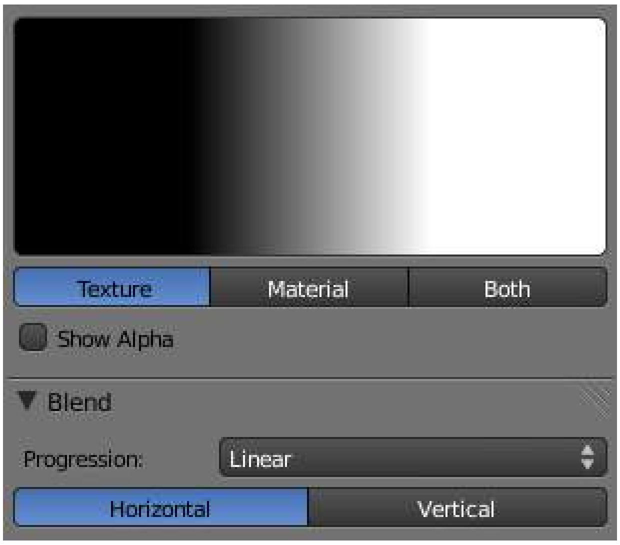
Procedural Shaders

Procedural shaders are shaders that relies at computer generated algorithms. Like a wood texture. Or a ocean surface.

Ocean

TODO

Blend



Blend Texture Panels

Often used for
: This is one of the most frequently used procedural textures. You can use blend textures to blend other textures together (with *Stencil*), or to create nice effects (especially with the *Mapping: Normal* trick). Just remember: if you use a ramp to create a custom blending, you may have to use *No RGB*, if the *Mapping* value needs an intensity input.

Result(s)
: Intensity. The Blend texture generates a smoothly interpolated progression.

Options

Progression

Profile of blend

Linear
A linear progression

Quadratic
A quadratic progression

Easing
A flowing, non-linear progression

Diagonal
A diagonal progression

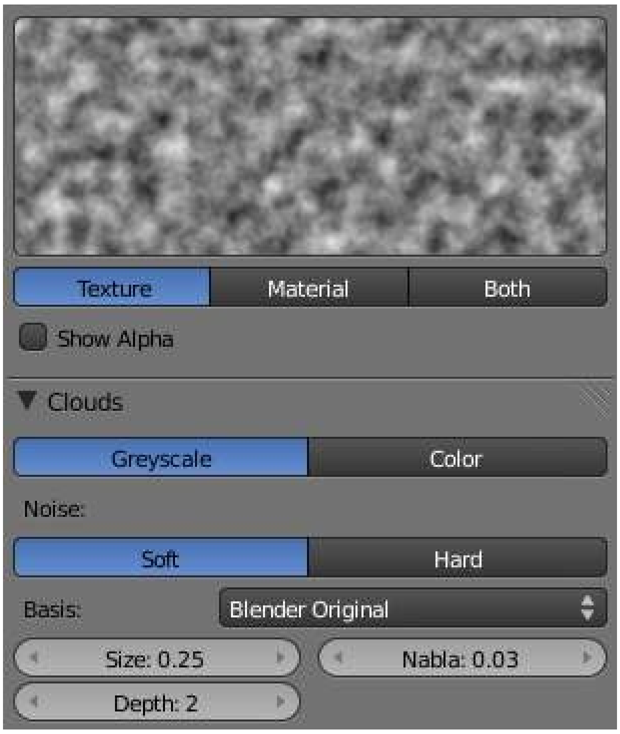
Spherical
A progression with the shape of a three-dimensional ball

Quadratic Sphere
A quadratic progression with the shape of a three-dimensional ball

Radial
A radial progression **Horizontal / Vertical** The direction of the progression is flipped a quarter turn.

Clouds

Clouds represent Perlin noise. In addition, each noise-based Bforartists texture (with the exception of Voronoi and simple noise) has a “Noise Basis” setting that allows the user to select which algorithm is used to generate the texture.



Often used for
Clouds, Fire, Smoke. Well-suited to be used as a Bump map, giving an overall irregularity to the material.

Result(s)
Greyscale (default) or RGB *Color*

Options

Greyscale
The standard noise, gives an intensity

Color
The noise gives an RGB value

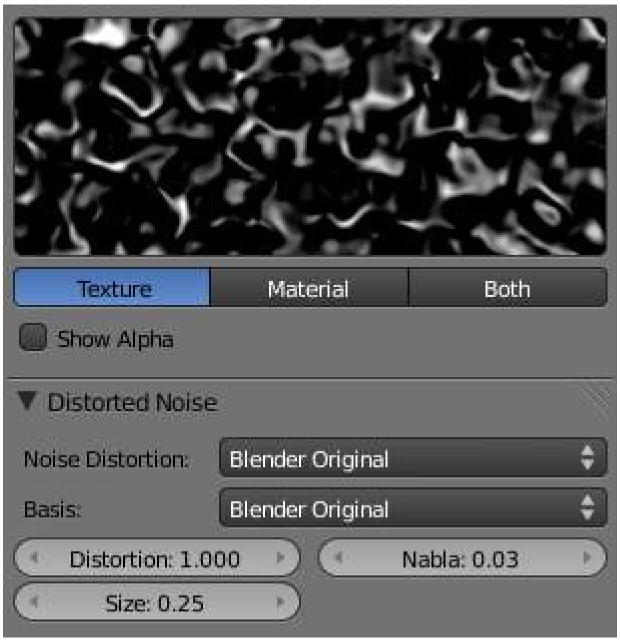
Noise
Soft or *Hard*, changes contrast and sharpness

Size
The dimension of the Noise table

Depth
The depth of the *Clouds* calculation. A higher number results in a long calculation time, but also in finer details.

Distorted Noise

Distortion Noise takes the option that you pick from *Noise Basis* and filters it, to create hybrid pattern.



Often used for
Grunge, very complex and versatile

Result(s)
Intensity

Options

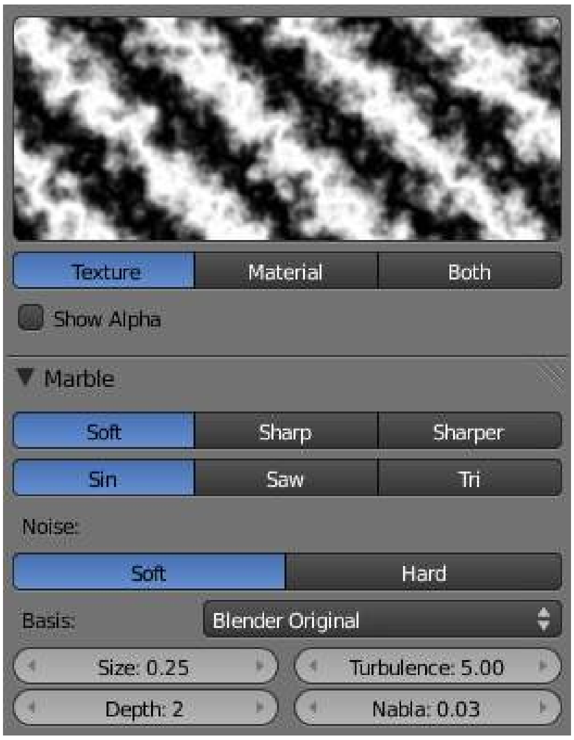
Noise Distortion
The texture to use to distort another

Basis
The texture to be distorted

Noise
The size of the noise generated

Distortion
The amount that *Distortion Noise* affects *Basis*

Magic



Often used for
Not frequently used. It can be used for “Thin Film Interference”, if you set *Mapping* to *Reflection* and use a relatively high *Turbulence*.

Result(s)
RGB color. The RGB components are generated independently with a sine formula.

Options

Depth
The depth of the calculation. A higher number results in a long calculation time, but also in finer details.

Turbulence
The strength of the pattern.

Marble

Often used for
Marble, Fire, Noise with a structure
Result(s)
Intensity value only

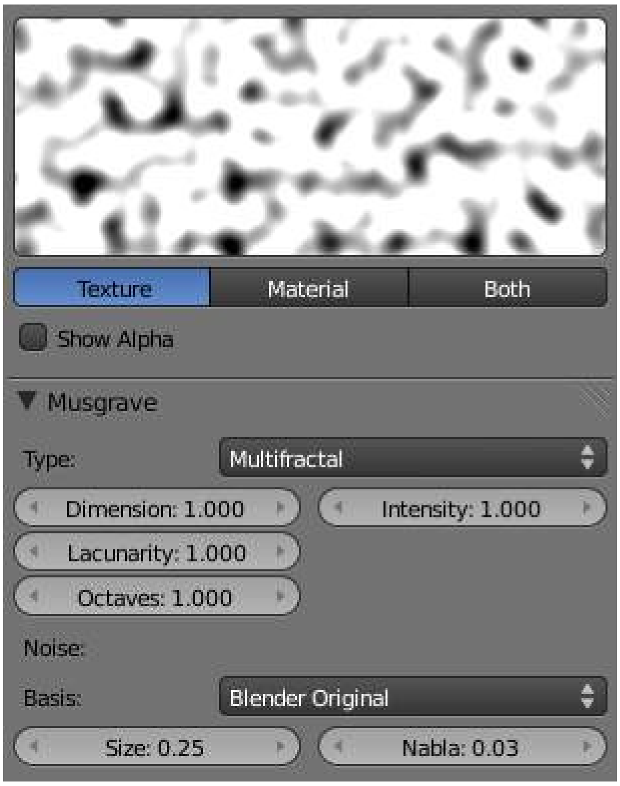
Bands are generated based on the sine, saw, or triangular formulae and noise turbulence.

Options

Soft / Sharp / Sharper
Three presets for soft to more clearly defined *Marble*
Sin / Saw / Tri
Shape of wave to produce bands
Soft / Hard
The noise function works with two methods.
Size
The dimensions of the noise table
Depth
The depth of the *Marble* calculation. A higher value results in greater calculation time, but also in finer details.
Turbulence
The turbulence of the sine bands.

Musgrave

Often used for
Organic materials, but it’s very flexible. You can do nearly everything with it.
Result(s)
Intensity



Options

Type

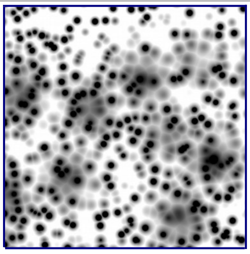
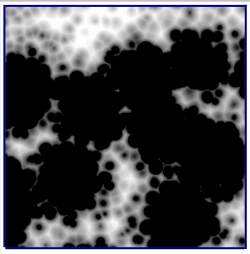
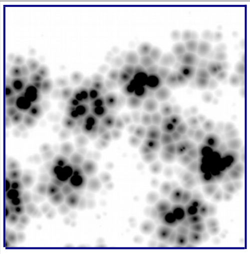
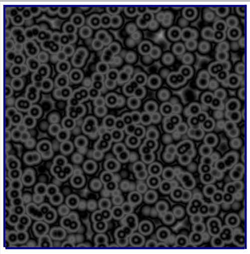
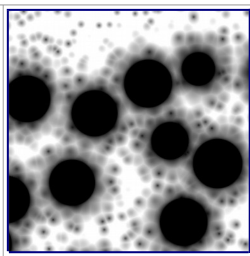
This procedural texture has five noise types on which the resulting pattern can be based and they are selectable from a dropdown menu at the top of the tab. The five types are:

- Hetero Terrain
- fBm
- Hybrid Multifractal
- Ridged Multifractal
- Multifractal

These noise types determine the manner in which

Bforartists layers successive copies of the same pattern on top of each other at varying contrasts and scales.

Examples with Basis : Voronoi F1 - Dimension : 0.5 - Lacunarity : 0.15 - Octave: 2.0

				
Hetero Terrain	fBM	Hybrid Multifrct	Ridged Multifrct	Multifractal

The main noise types have four characteristics:

Dimension
: Fractal dimension controls the contrast of a layer relative to the previous layer in the texture. The higher the fractal dimension, the higher the contrast between each layer, and thus the more detail shows in the texture. Range: 0 to 2.

Lacunarity
: Lacunarity controls the scaling of each layer of the Musgrave texture, meaning that each additional layer will have a scale that is the inverse of the value which shows on the button. i.e. Lacunarity = 2 –> Scale = 1/2 original. Range: 0 to 6.

Octaves
: Octave controls the number of times the original noise pattern is overlayed on itself and scaled/contrasted with the fractal dimension and lacunarity settings. Range: 0 to 8.

Intensity
: Light intensity. Called *Offset* for *Hetero Terrain*. Range: 0 to 10.

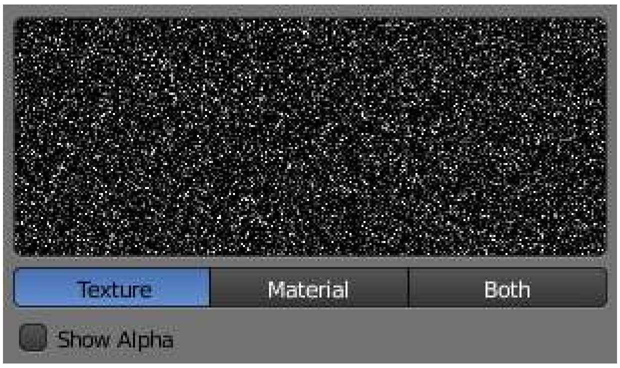
The *Hybrid Multifractal* and *Ridged Multifractal* types have these additional settings:

Offset
: Both have a “Fractal Offset” button that serves as a “sea level” adjustment and indicates the base height of the resulting bump map. Bump values below this threshold will be returned as zero. Range: 0 to 6.

Gain
: Setting which determines the range of values created by the function. The higher the number, the greater the range. This is a fast way to bring out additional details in a texture where extremes are normally clipped off. Range: 0 to 6.

Noise

Although this looks great, it is not Perlin Noise! This is a true, randomly generated Noise. This gives a different result every time, for every frame, for every pixel.



There are no options for this noise

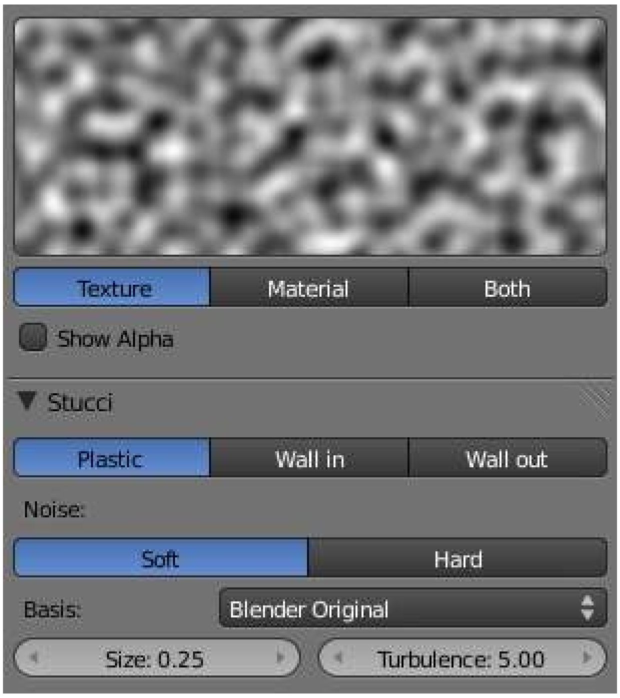
Often used for
: White noise in an animation. This is not well suited if you don’t want an animation. For material displacement or bump, use clouds instead.

Result(s)

Intensity

Stucci

The *Stucci* texture is based on noise functions.



Often used for

Stone, Asphalt, Oranges. Normally for Bump-Mapping to create grainy surfaces.

Result(s)

Normals and Intensity

Options

Plastic / Wall In / Wall out

Plastic is the standard Stucci, whilst the “walls” is where Stucci gets it name. This is a typical wall structure with holes or bumps.

Soft / Hard

There are two methods available for working with Noise

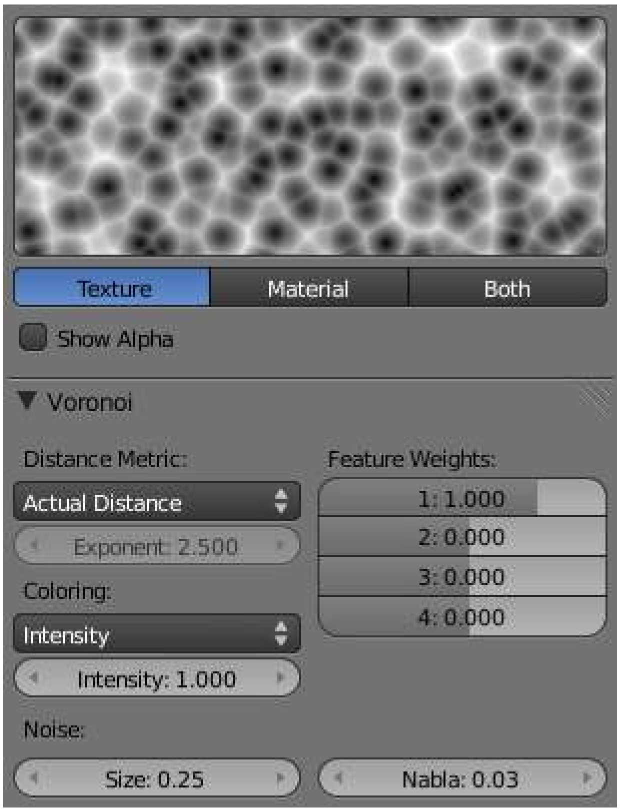
Size

Dimension of the Noise table

Turbulence

Depth of the *Stucci* calculations

Voronoi



Often used for

Very convincing Metal, especially the “Hammered” effect. Organic shaders (e.g. scales, veins in skin).

Result(s)

Intensity (default) and Color

Options

Distance Metric

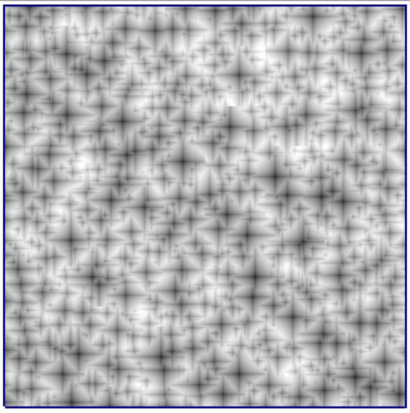
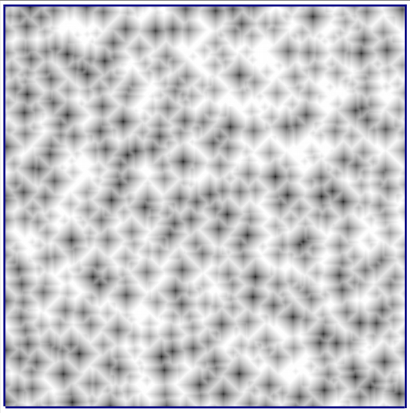
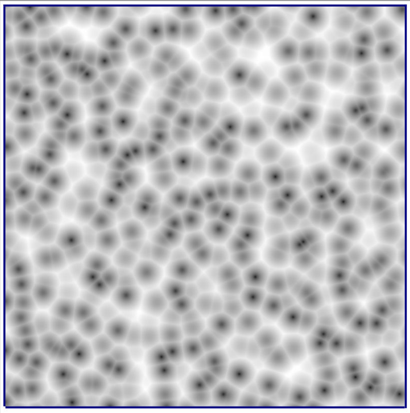
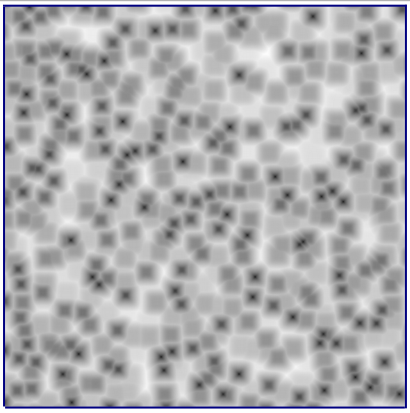
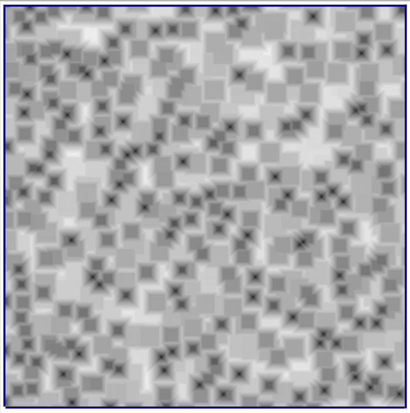
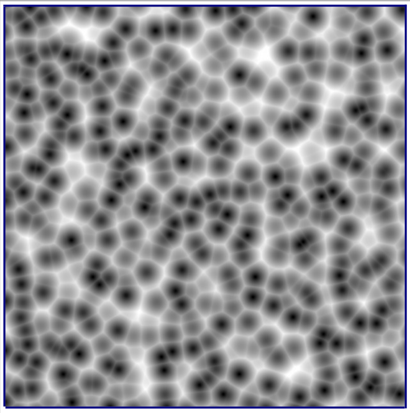
This procedural texture has seven Distance Metric options. These determine the algorithm to find the distance between cells of the texture. These options are:

- Minkovsky
- Minkovsky 4
- Minkovsky 1/2
- Chebychev
- Manhattan
- Distance Squared

- Actual Distance

The *Minkovsky* setting has a user definable value (the *Exponent* button) which determines the Minkovsky exponent (e) of the distance function $(x^e + y^e + z^e)^{1/e}$. A value of one produces the *Manhattan* distance metric, a value less than one produces stars (at **0.5**, it gives a *Minkovsky 1/2*), and higher values produce square cells (at **4.0**, it gives a *Minkovsky 4*, at **10.0**, a *Chebychev*). So nearly all Distance Settings are basically the same - variations of *Minkowsky*.

You can get irregularly-shaped rounded cells with the *Actual Distance* / *Distance Squared* options.

		
Minkovsky Exponent: 0.5 (Minkovsky 1/2)	Minkovsky Exponent: 1 (Manhattan)	Minkovsky Exponent: 2 (Actual Distance)
		
Minkovsky Exponent: 4 (Minkovsky 4)	Minkovsky Exponent: 10 (Chebychev)	Distance Squared (More contrast than ActualDistance)

Feature Weights

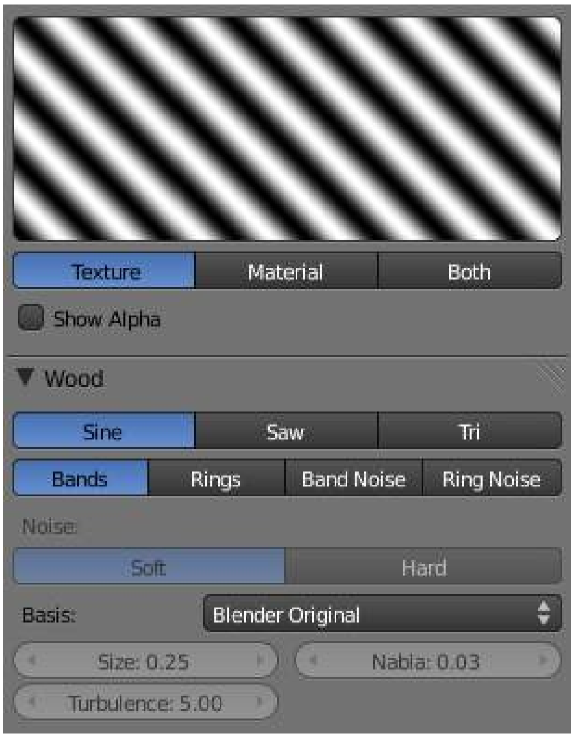
These four sliders at the bottom of the Voronoi panel represent the values of the four Worley constants, which are used to calculate the distances between each cell in the texture based on the distance metric. Adjusting these values can have some interesting effects on the end result...

Coloring

Four settings (*Intensity*, *Position*, *Position and Outline*, and *Position, Outline, and Intensity*) that can use four different noise basis as methods to calculate color and intensity of the texture output. This gives the Voronoi texture you create with the “Worley Sliders” a completely different appearance and is the equivalent of the noise basis setting found on the other textures.

Wood

Often used for
Woods and ring-shaped patterns.
Result(s)
Intensity only



Options

Sin / Saw / Tri
Shape of wave to produce bands
Bands / Rings / Band Noise / Ring Noise
Set the bands to either straight or ring-shaped, with or without turbulence
Soft / Hard
There are two methods available for the Noise function
Size
Dimension of the Noise table
Turbulence
Turbulence of the Band Noise and Ring Noise types

UV Mapping

The most flexible way of mapping a 2D texture over a 3D object is a process called “UV mapping”. In this process, you take your three-dimensional (X,Y & Z) mesh and unwrap it to a flat two-dimensional (X & Y ... or rather, as we shall soon see, “U & V”) image. Colors in the image are thus mapped to your mesh, and show up as the color of the faces of the mesh. Use UV texturing to provide realism to your objects that procedural materials and textures cannot do, and better details than Vertex Painting can provide.

UVs Explained

Box being inspected

Box mapped flat

The best analogy to understanding UV mapping is cutting up a cardboard box. The box is a three-dimensional (3D) object, just like the mesh cube you add to your scene.

If you were to take a pair of scissors and cut a seam or fold of the box, you would be able to lay it flat on a tabletop. As you are looking down at the box on the table, we could say that U is the left-right direction, is V is the up-down direction. This image is thus in two dimensions (2D). We use **U** and **V** to refer to these “texture-space coordinates” instead of the normal **X** and **Y**, which are always used (along with **Z**) to refer to “3D space.”

When the box is reassembled, a certain UV location on the paper is transferred to an (X,Y,Z) location on the box. This is what the computer does with a 2D image in wrapping it around a 3D object.

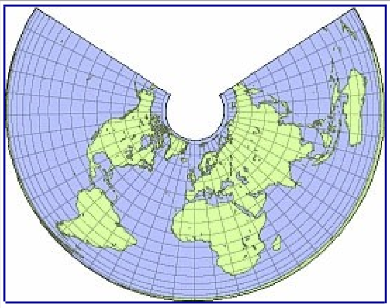
During the UV unwrapping process, you tell Bforartists exactly how to map the faces of your object (in this case, a box) to a flat image in the UV/Image Editor window. You have complete freedom in how to do this. (Continuing our previous example, imagine that, having initially laid the box flat on the tabletop, you now cut it into smaller pieces, somehow stretch and/or shrink those pieces, and then arrange them in some way upon a photograph that’s also lying on that tabletop ...)

Cartography Example

Cartographers (map makers) have been dealing with this problem for millennia. A cartography (map-making) example is creating a projection map of the whole world. In cartography, we take the surface of the earth (a sphere) and make a flat map that can be folded up into the glove compartment aboard the space shuttle. We ‘fill in’ spaces toward the poles, or change the outline of the map in any of several ways:

Mercator Projection

Mollweide Projection

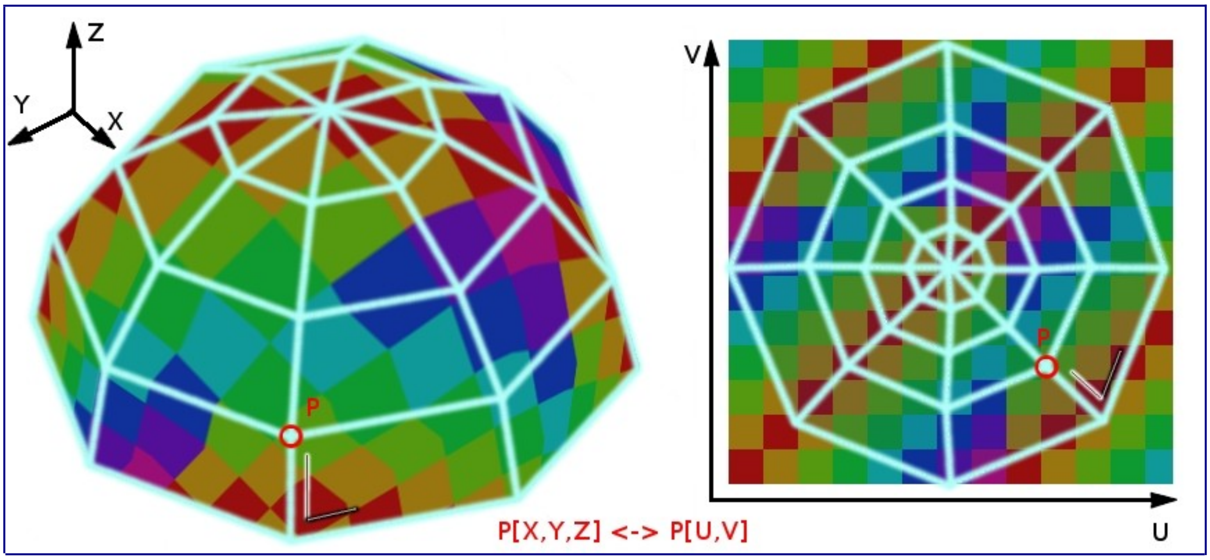


Albers-equal Projection

Each of these is an example of a way to UV map a sphere. Each of the hundred or so commonly accepted projections has its advantages and disadvantages. Bforartists allows us to do the same thing any way we want to, on the computer.

On more complex models (like seen in the earth map above) there pops up an issue where the faces can’t be ‘cut’, but instead they are stretched in order to make them flat. This helps making easier UV maps, but sometimes adds distortion to the final mapped texture. (Countries and states that are closer to the North or the South Pole look smaller on a flat map than do ones which are close to the Equator.)

Half-Sphere Example



3D Space (XYZ) versus UV Space (click to enlarge)

In this image you can easily see that the shape and size of the marked face in 3D space is different in UV space.

This difference is caused by the ‘stretching’ (technically called mapping) of the 3D part (XYZ) onto a 2D plane (i.e the UV map).

If a 3D object has a UV map, then, in addition to the 3D-coordinates X, Y, and Z, each point on the object will have corresponding U and V coordinates. (*P* in the image above is an example of how a point on a 3D object might be mapped onto a 2D image.)

The UV Editor

About functionalities for mapping UV see UV/Image Editor section for details.

Advantages of UVs

While procedural textures (described in the previous chapters) are useful-they never repeat themselves and always “fit” 3D objects-they are not sufficient for more complex or natural objects. For instance, the skin on a human head will never look quite right when procedurally generated. Wrinkles on a human head, or scratches on a car do not occur in random places, but depend on the shape of the model and its usage. Manually-painted images, or images captured from the real world gives more control and realism. For details such as book covers, tapestry, rugs, stains, and detailed props, artists are able to control every pixel on the surface using a UV Texture.

A UV map describes what part of the texture should be attached to each polygon in the model. Each polygon’s vertex gets assigned to 2D coordinates that define which part of the image gets mapped. These 2D coordinates are called UVs (compare this to the XYZ coordinates in 3D). The operation of generating these UV maps is also called “unwrap”, since it is as if the mesh were unfolded onto a 2D plane.

For most simple 3D models, Bforartists has an automatic set of unwrapping algorithms that you can easily apply. For more complex 3D models, regular Cubic, Cylindrical or Spherical mapping, is usually not sufficient. For even and accurate projection, use seams to guide the UV mapping. This can be used to apply textures to arbitrary and complex shapes, like human heads or animals. Often these textures are painted images, created in applications like the Gimp, Photoshop, or your favorite painting application.

Note
Games UV mapping is also essential in games. It is the de facto standard for applying textures to models. Almost any model you find in a game is UV mapped.

UV Mapping a mesh

The first step is to unwrap your mesh. You want to unwrap when you feel your mesh is complete with respect to the number of faces it needs to have. If you do add faces or subdivide existing faces when a model is already unwrapped, Blender will add those new faces for you, but you may need to do additional mapping or editing. In this fashion, you can use the UV Texture image to guide additional geometry changes.

This section covers techniques for Mapping Uvs. The next sections cover Editing UVs, followed by methods of Managing UV Layouts, and Applying Images to UVs.

About UVs

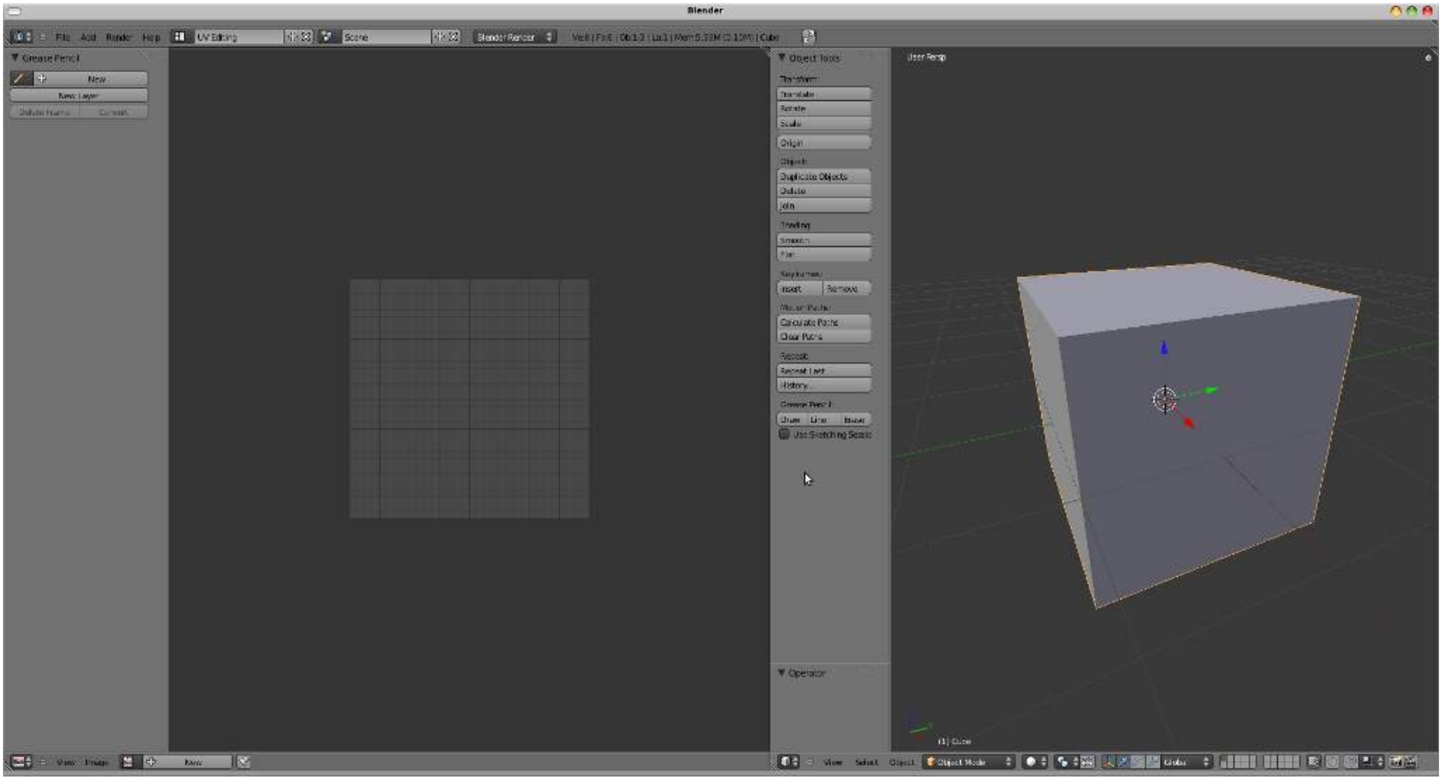
Every point in the UV map corresponds to a vertex in the mesh. The lines joining the UVs correspond to edges in the mesh. Each face in the UV map corresponds to a mesh face.

Each face of a mesh can have many UV Textures. Each UV Texture can have an individual image assigned to it. When you unwrap a face to a UV Texture in the UV/Image Editor, each face of the mesh is automatically assigned *four UV coordinates:* These coordinates define the way an image or a texture is mapped onto the face. These are 2D coordinates, which is why they are called UV, to distinguish them from XYZ coordinates. These coordinates can be used for rendering or for real-time OpenGL display as well.

Every face in Blender can have a link to a different image. The UV coordinates define how this image is mapped onto the face. This image then can be rendered or displayed in real time. A 3D View has to be in “Face Select” mode to be able to assign Images or change UV coordinates of the active Mesh Object. This allows a face to participate in many UV Textures. A face at the hairline of a character might participate in the facial UV Texture, *and* in the scalp/hair UV Texture.

These are described more fully in the next sections.

Getting Started



UV Editing screen layout.

By default, meshes are not created with UVs. First you must map the faces, then you can edit them. The process of unwrapping your model is done within Edit Mode in the 3D View editor. This process creates one or more UV Islands in the UV/Image Editor.

To begin, choose the *UV Editing* screen layout from the selection list at the top of your screen in the User Preferences header. This sets one of the area to show you the UV/Image Editor `Shift-F10`, and the other area to the 3D View `Shift-F5`.

Enter *Edit Mode*, as all unwrapping is done in Edit Mode. You can be in vertex, face, or edge selection mode.

Workflow

The process for unwrapping is straightforward, but there are tons of options available, each of which dramatically affect the outcome of the unwrap. By understanding the meaning behind the options, you will become more efficient at unwrapping. The process is:

- Mark Seams if necessary
- Select all of the mesh components
- Select a UV mapping method from the UV Unwrap menu
- Adjust the unwrap settings
- Add a test image to see if there will be any distortion. See Applying Images to UVs
- Adjust UVs in the UV/Image editor. See Editing UVs

Mapping Types

Blender offers several ways of mapping UVs. The simpler projection methods use formulas that map 3D space onto 2D space, by interpolating the position of points toward a point/axis/plane through a surface. The more advanced methods can be used with more complex models, and have more specific uses.

Basic:

Cube

Maps the mesh onto the faces of a cube, which is then unfolded.

Sphere

Projects the UVs onto a spherical shape. Useful only for spheres or spherical shapes, like eyes, planets, etc.

Cylinder

Projects UVs onto a cylindrical surface.

Project from View

Takes the current view in the 3D View and flattens it as it appears.

Advanced:

Unwrap ABF

Useful for organic shapes. Smooths the mesh into a flat surface by cutting along seams.

Unwrap LSCM

Useful for non organic shapes. Smooths the mesh into a flat surface by cutting along seams.

Smart UV Project

Breaks the mesh into islands based on an angle threshold.

Lightmap Pack

Separates each face and packs them onto the UV grid.

Follow Active Quads

Follow UV from active quads along continuous face loops.

You can also reset UVs, which maps each face to fill the UV grid, giving each face the same mapping.

If we were to use an image that was tileable, the surface would be covered in a smooth repetition of that image, with the image skewed to fit the shape of each individual face. Use this unwrapping option to reset the map and undo any unwrapping (go back to the start).

Basic Mapping

Based on the fundamental geometry of the object, and how it is being viewed, the Mesh ‣ UV Unwrap ‣ Cube, Cylinder and Sphere UV Calculations attempt to unfold the faces for you as an initial best fit. Here, the view from the 3D View is especially important. Also, the settings for cube size or cylinder radius (Editing buttons, UV Calculation panel) should be set (in Blender units) to encompass the object.

The following settings are common for the Cube, Cylinder, and Sphere mappings:

Correct Aspect
: Map UVs taking image aspect ratios into consideration. If an image has already been mapped to the texture space that is non-square, the projection will take this into account and distort the mapping to appear correct.

Clip to Bounds
: Any UVs that lie outside the (0 to 1) range will be clipped to that range by being moved to the UV space border it is closest to.

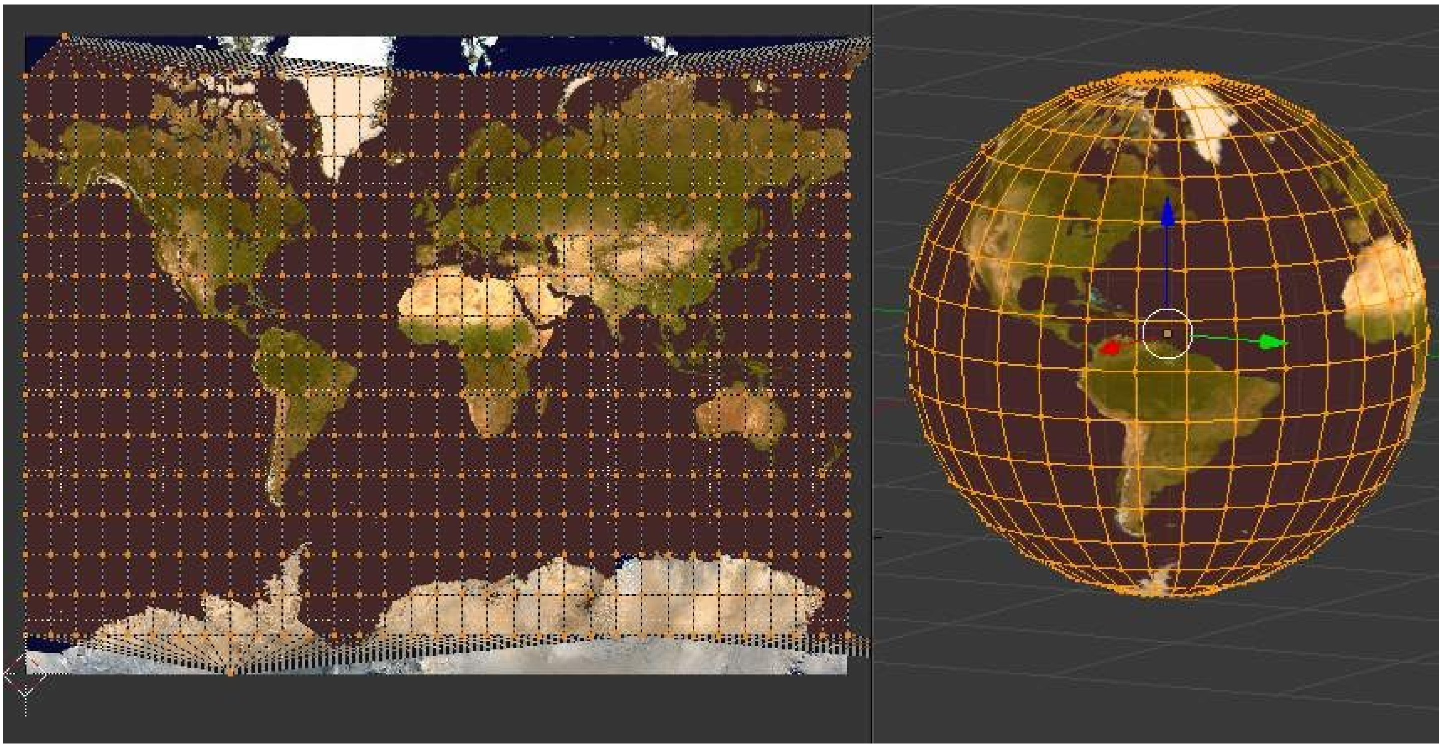
Scale to Bounds
: If the UV map is larger than the (0 to 1) range, the entire map will be scaled to fit inside.

Cube

Cube mapping projects s mesh onto six separate planes, creating six UV islands. In the UV/Image editor, these will appear overlapped, but can be moved. See Editing UVs.

Cube Size
: Set the size of the cube to be projected onto.

Cylinder and Sphere



Using a Mercator image with a Sphere Projection.

Cylindrical and Spherical mappings have the same settings. The difference is that a cylindrical mapping projects the UVs on a plan toward the cylinder shape, while a spherical map takes into account the sphere's curvature, and each latitude line becomes evenly spaced.

Normally, to unwrap a cylinder (tube) as if you slit it lengthwise and folded it flat, Blender wants the view to be vertical, with the tube standing "up". Different views will project the tube onto the UV map differently, skewing the image if used. However, you can set the axis on which the calculation is done manually. This same idea works for the sphere mapping:

Recall the opening cartographer's approaching to mapping the world? Well, you can achieve the same here when unwrapping a sphere from different perspectives. Normally, to unwrap a sphere, view the sphere with the poles at the top and bottom. After unwrapping, Blender will give you a Mercator projection; the point at the equator facing you will be in the middle of the image. A polar view will give a very different but common projection map. Using a Mercator projection map of the earth as the UV image will give a very nice planet mapping onto the sphere.

Direction

- **View on Poles**
  - Use when viewing from the top (at a pole) by using an axis that is straight down from the view
- **View on Equator**
  - Use if view is looking at the equator, by using a vertical axis
- **Align to Object**
  - Uses the object's transform to calculate the axis

Align

Select which axis is up

- **Polar ZX**
  - Polar 0 is on the x axis
- **Polar ZY**
  - Polar 0 is on the y axis

Radius

The radius of the cylinder to use

Project From View

In the 3D View, the Face ‣ Unwrap UVs ‣ Project from View option maps the face as seen through the view of the 3D View it was selected from. It is almost like you had x-ray vision or squashed the mesh flat as a pancake onto the UV map. Use this option if you are using a picture of a real object as a UV Texture for an object that you have modeled. You will get some stretching in areas where the model recedes away from you.

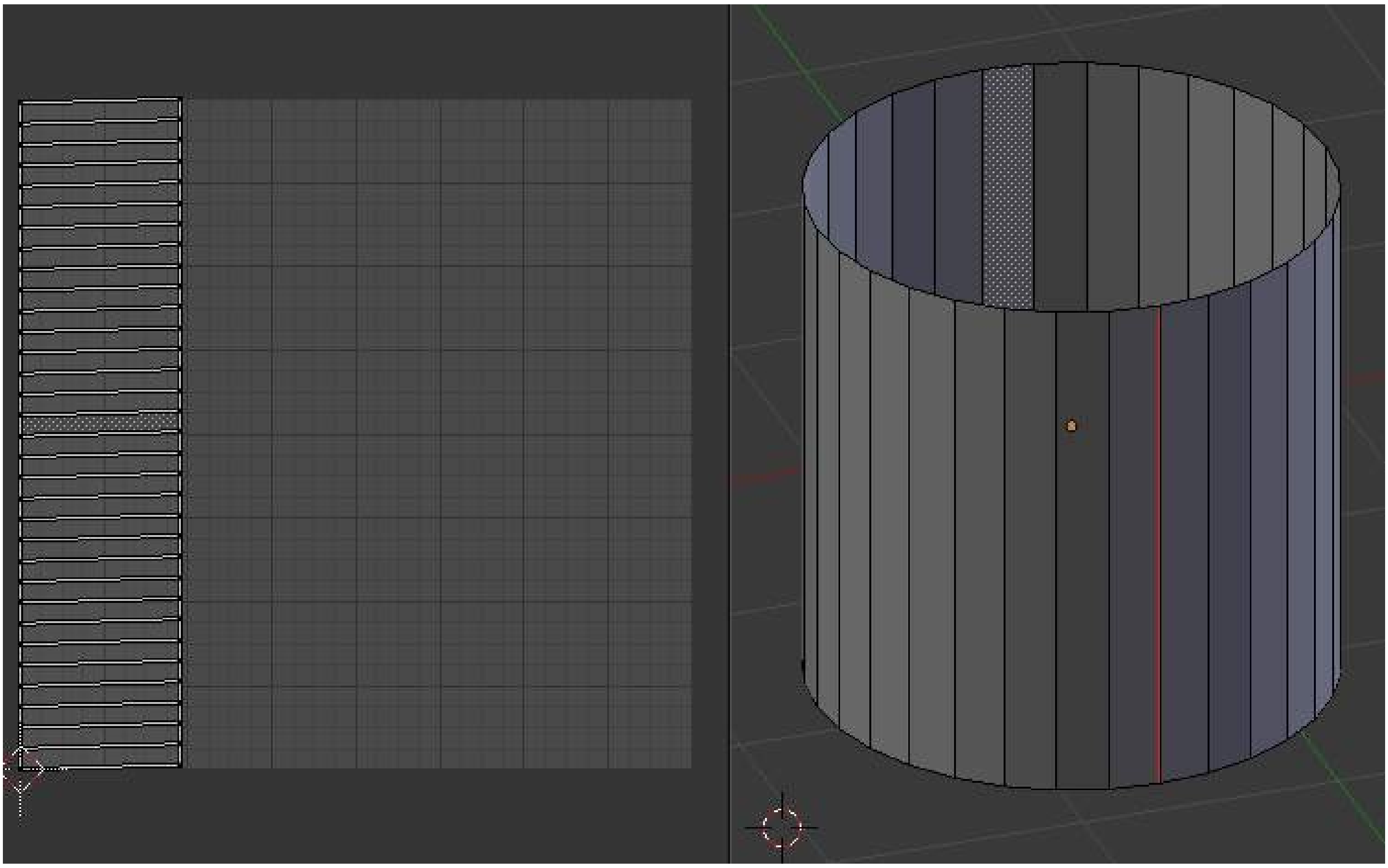
Using *Project from View (Bounds)* will do the same as above, but scales the UVs to the bounds of the UV space.

Resetting UVs

In the 3D View, Face ‣ Unwrap ‣ Reset maps each selected face to the same area of the image, as previously discussed. To map all the faces of an object (a cube, for example) to the same image, select all the faces of the cube, and unwrap them using the Reset menu option.

Advanced Mapping

Unwrapping Using Seams



Simple Seam on a Cylinder.

For many cases, using the Unwrap calculations of Cube, Cylinder, Sphere, or best fit will produce a good UV layout. However, for more complex meshes, especially those with lots of indentations, you may want to define a *seam* to limit and guide any of the unwrapping processes discussed above.

Just like in sewing, a seam is where the ends of the image/cloth are sewn together. In unwrapping, the mesh is unwrapped at the seams. Think of this method as peeling an orange or skinning an animal. You make a series of cuts in the skin, then peel it off. You could then flatten it out, applying some amount of stretching. These cuts are the same as seams.

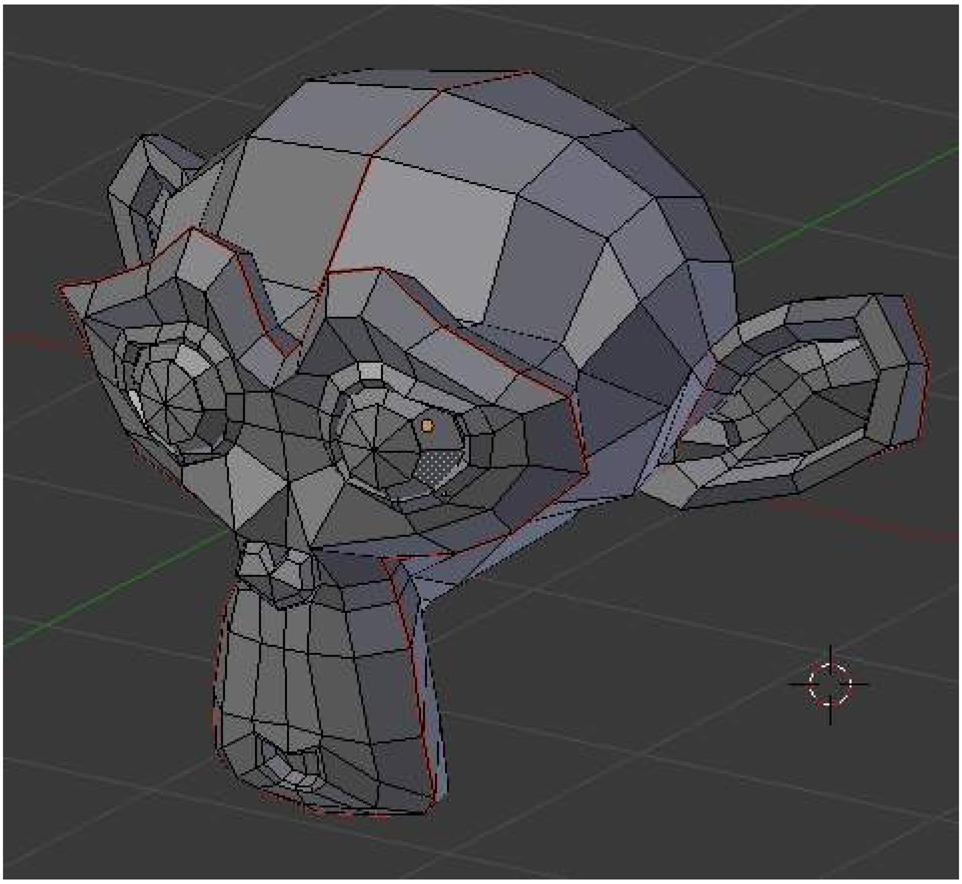
When using this method, you need to be aware of how much stretching there is. The more seams there are, the less stretching there is, but this is often an issue for the texturing process. It is a good idea to have as few seams as possible while having the least amount of stretching. Try to hide seams where they will not be seen. In productions where 3D paint is used, this becomes less of an issue, as projection painting can easily deal with seams, as opposed to 2D texturing, where it is difficult to match the edges of different UV islands.

The workflow is the following:

- Create seams. A seam is marked in Edit Mode by selecting edges to make the seam and then issuing the command to Mark Seam.
- Unwrap

- Adjust seams and repeat
- Manually adjust UVs. See the next section on Editing UVs.

Marking Seams



Seamed Suzanne.

To add an edge to a seam, simply select the edge and `Ctrl-E` *Mark Seam*. To take an edge out of a seam, select it, `Ctrl-E` and *Clear Seam*.

In the example to the right, the back-most edge of the cylinder was selected as the seam (to hide the seam), and the default unwrap calculation was used. In the UV/Image Editor, you can see that all the faces are nicely unwrapped, just as if you cut the seam with a scissors and spread out the fabric.

When marking seams, you can use the Select ‣ Linked Faces or `Ctrl-L` in Face Select Mode to check your work. This menu option selects all faces connected to the selected one, up to a seam. If faces outside your intended seam are selected, you know that your seam is not continuous. You do not need continuous seams, however, as long as they resolve regions that may stretch.

Just as there are many ways to skin a cat, there are many ways to go about deciding where seams should go. In general though, you should think as if you were holding the object in one hand, and a pair of sharp scissors in the other, and you want to cut it apart and spread it on the table with as little tearing as possible. Note that we seamed the outside edges of her ears, to separate the front from the back. Her eyes are disconnected sub-meshes, so they are automatically unwrapped by themselves. A seam runs along the back of her head vertically, so that each side of her head is flattened out.

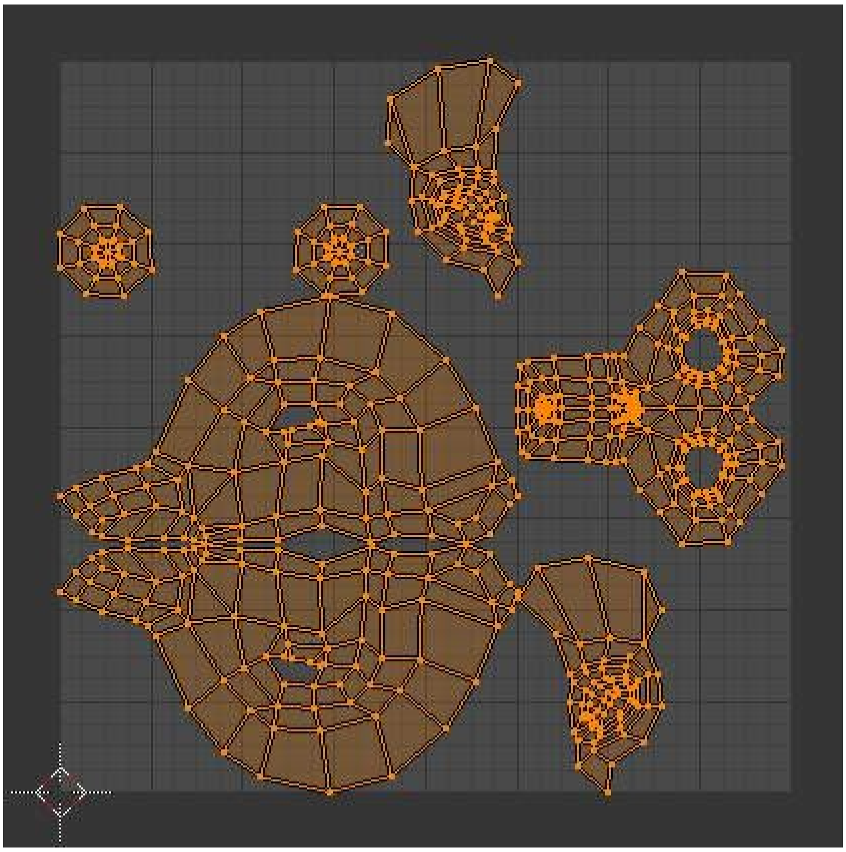
Another use for seams is to limit the faces unwrapped. For example, when texturing a head, you do not really need to texture the scalp on the top and back of the head since it will be covered in hair. So define a seam at the hairline. Then, when you select a frontal face, and then select linked faces before unwrapping, the select will only go up to the hairline seam, and the scalp will not be unwrapped.

When unwrapping anything that is bilateral, like a head or a body, seam it along the mirror axis. For example, cleave a head or a whole body right down the middle in front view. When you unwrap, you will be able to overlay both halves onto the same texture space, so that the image pixels for the right hand will be shared with the left; the right side of the face will match the left, etc.

Note

You **do not** have to come up with "one unwrapping that works perfectly for everything everywhere." As we will discuss later, you can easily have multiple UV unwrappings, using different approaches in different areas of your mesh.

Unwrap ABF or LSCM



Result of unwrapping Suzanne.

Begin by selecting all faces to be unwrapped in the 3D View. With our faces selected, it is now time to unwrap them. In the 3D View, select Mesh ‣ UV Unwrap ‣ Unwrap or U and select Unwrap.

You can also do this from the UV/Image Editor with UVs ‣ Unwrap or E. This method will unwrap all of the faces and reset previous work. The UVs menu will appear in the UV/Image Editor after unwrapping has been performed once.

This tool unwraps the faces of the object to provide the "best fit" scenario based on how the faces are connected and will fit within the image, and takes into account any seams within the selected faces. If possible, each selected face gets its own different area of the image and is not overlapping any other faces UV's. If all faces of an object are selected, then each face is mapped to some portion of the image.

Blender has two ways of calculating the unwrapping. They can be selected in the tool setting in the tool panel in the 3D View.

Angle Based - ABF
: This method gives a good 2D representation of a mesh. Good for organic shape.

Conformal - LSCM
: Uses LSCM (Least Squared Conformal Mapping). This usually gives a less accurate UV mapping than Angle Based, but works better for geometric shape.

Fill Holes
: Activating Fill Holes will prevent overlapping from occurring and better represent any holes in the UV regions.

Correct Aspect
: Map UVs taking image aspect into account

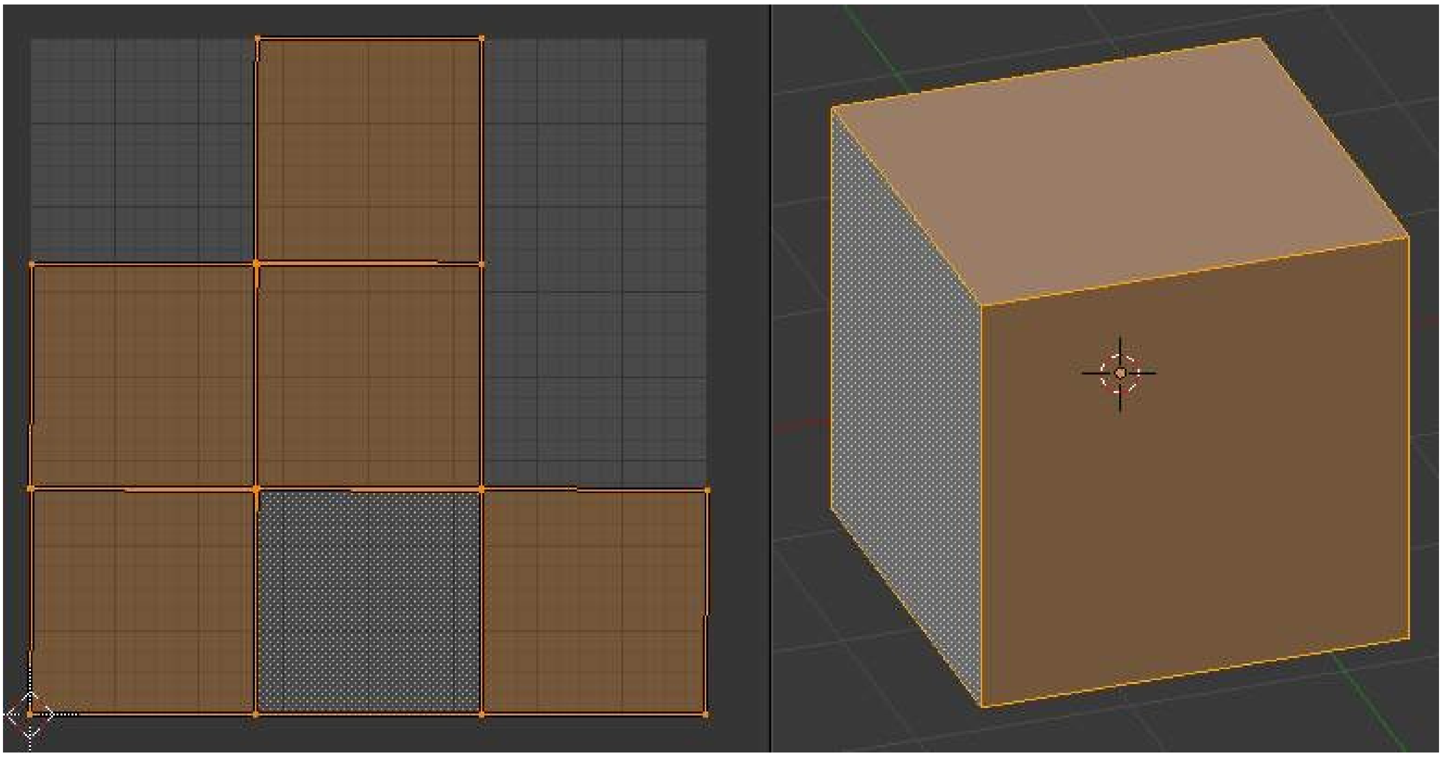
Use Subsurf Modifier
: Map UVs taking vertex position after subsurf modifier into account

Margin
: Space between UV islands

Tip

A face's UV image texture only has to use *part* of the image, not the *whole* image. Also, portions of the same image can be shared by multiple faces. A face can be mapped to less and less of the total image.

Smart UV Project



Smart UV project on a cube.

Smart UV Project, (previously called the Archimapper) gives you fine control over how automatic seams should be created, based on angular changes in your mesh. This method is good for simple and complex geometric forms, such as mechanical objects or architecture.

This function examines the shape of your object, the faces selected and their relation to one another, and creates a UV map based on this information and settings that you supply.

In the example to the right, the Smart Mapper mapped all of the faces of a cube to a neat arrangement of three sides on top, 3 sides on the bottom, for all six sides of the cube to fit squarely, just like the faces of the cube.

For more complex mechanical objects, this tool can very quickly and easily create a very logical and straightforward UV layout for you.

The Tool Settings panel in the Tool Shelf allows the fine control over how the mesh is unwrapped:

Angle Limit
: This controls how faces are grouped: a higher limit will lead to many small groups but less distortion, while a lower limit will create fewer groups at the expense of more distortion.

Island Margin

This controls how closely the UV islands are packed together. A higher number will add more space in between islands.

Area Weight

Weight projection's vector by faces with larger areas

Lightmap Pack

Lightmap Pack takes each of a mesh's faces, or selected faces, and packs them into the UV bounds. Lightmaps are used primarily in gaming contexts, where lighting information is baked onto texture maps, when it is essential to utilize as much UV space as possible. It can also work on several meshes at once. It has several options that appear in the Tool Shelf:

You can set the tool to map just *Selected Faces* or *All Faces* if working with a single mesh.

The *Selected Mesh Object* option works on multiple meshes. To use this, in *Object Mode* select several mesh objects, then go into *Edit Mode* and activate the tool.

Share Tex Space

This is useful if mapping more than one mesh. It attempts to fit all of the objects' faces in the UV bounds without overlapping.

New UV Layer

If mapping multiple meshes, this option creates a new UV layer for each mesh. See Managing the Layout.

New Image

Assigns new images for every mesh, but only one if *Shared Tex Space* is enabled.

Image Size

Set the size of the new image.

Pack Quality

Pre-packing before the more complex Box packing.

Margin

This controls how closely the UV islands are packed together. A higher number will add more space in between islands.

Follow Active Quads

The Face ‣ Unwrap ‣ Follow Active Quads takes the selected faces and lays them out by following continuous face loops, even if the mesh face is irregularly shaped. Note that it does not respect the image size, so you may have to scale them all down a bit to fit the image area.

Edge Length Mode:

Even

Space all UVs evenly.

Length

Average space UV's edge length of each loop.

Please note that it is the shape of the active quad in UV space that is being followed, not its shape in 3D space. To get a clean 90-degree unwrap make sure the active quad is a rectangle in UV space before using "Follow active quad".

Managing UV Maps

After you finish editing a UV map, you may need to create additional maps on the same object, or transfer a UV map to another mesh.

Transferring UV Maps

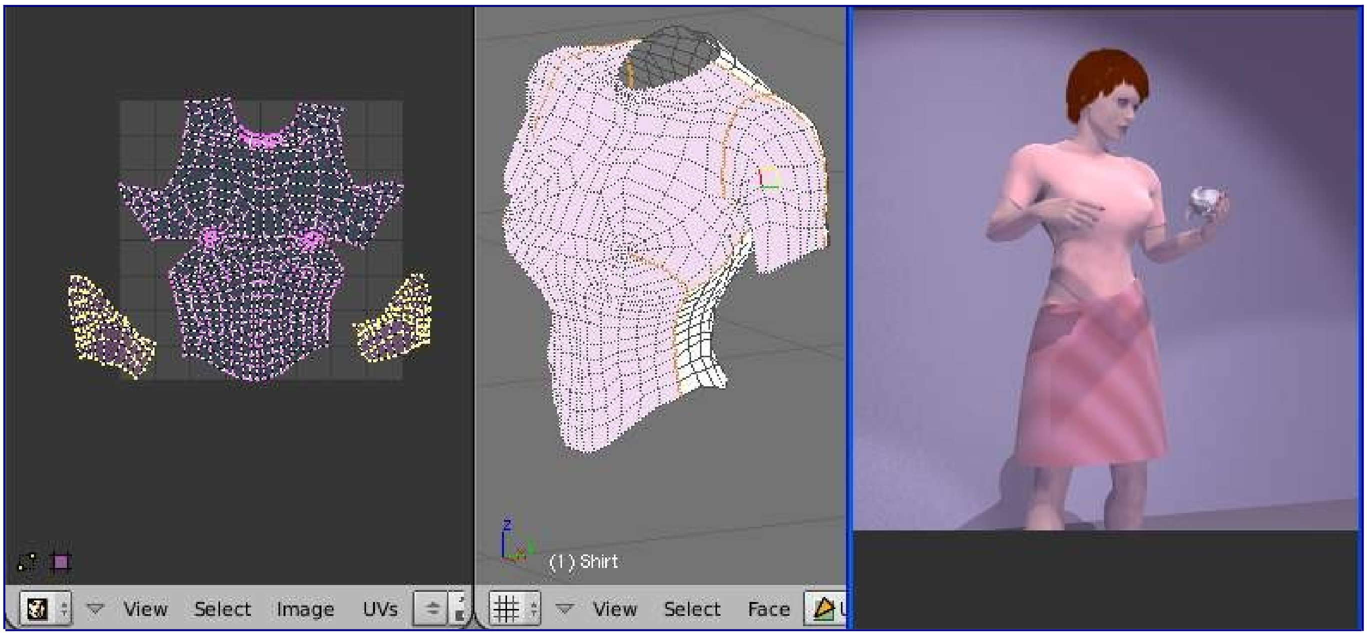
You can copy a UV Map from one mesh to another Mesh provided both meshes have the same geometry/vertex order. This is useful for example when you want to recreate a UV map from an earlier version of your model with intact UVs.

Workflow

- `RMB` Select the target mesh (to which you want to copy the UV Map)
- `Shift` select the source mesh (that contains the intact UV map)
- Object menu ‣ Make Links... ‣ Transfer UV Layouts (Shortcut: `Ctrl-L` ...)

The target Mesh will now have a UV map that matches the original mesh.

Multiple UV Maps



Mesh with Multiple UV Textures

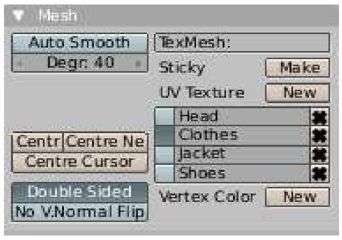
You are not limited to one UV Map per mesh. You can have multiple UV maps for parts of the mesh by creating new UV Textures. The first UV Texture is created for you when you select a face in UV Face Select mode. You can manually create more UV Textures by clicking the *New* button next to “UV Texture” on the Mesh panel in the Buttons Window, Editing Context) and unwrapping a different part of the mesh. Those faces will then go with that UV Texture, while the previously unwrapped faces will still go with the previous UV Texture. Note that if you unwrap the same face twice or more times (each time to a different UV Texture), the coloring for that face will be the alpha combination of the layers of those UV Textures.

In the example to the right, we have a mesh for a blouse. The mesh has been seamed as a normal blouse would, shown in the middle in UV Face Select mode. Wishing to make a cut pattern, the front of the blouse was unwrapped and basic rotation and scaling was done to center it in the UV/Image Editor window. It was then moved off to the side, while the left and right sleeves were unwrapped, each rotated and scaled. Then, select a sample face from each cloth piece, in the 3D View Select–>Linked Faces, and the UV/Image Editor will show all those pieces (as shown to the right). You can then work with all pieces for that UV Map. The example shows all three pieces moved onto the image area for painting. As you can see, the pattern nicely fits a square yard of cloth.

Another UV Map was created by clicking the New button in the Mesh panel, and the process was repeated for the backs of the sleeves and the back of the blouse. Two images, one for the front and one for the back, are used to color the fabric. In this case, some faces map to the first texture, while other faces map to the second texture.

UV Textures List

The Mesh panel lists the UV Texture maps created for this mesh, and allows you to create New ones as placeholders for future unwrapping operations.



Click the + button to add a new UV texture, and the - to delete an existing one}}. Deleting a UV Map for the mesh destroys all work done in all unwrapping associated the mesh. Click with care. You’ve been warned.

Each map has a selector button. Click the camera icon to enable that UV texture for rendering. You can change the name by selecting one and changing the text in the *Name* box. The selected map is displayed in the UV/Image Editor window. The example shows a few UV maps created for a character, and the map for Clothes is selected.

Note that each texture can be mapped to a specific UV texture. See the *Mapping* section of the texture panel.

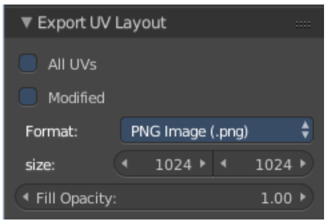
Applying Textures

Sooner or later, you may want to use an image texture on your model. If you are using an external application, you need to know where on the mesh you are painting. You may also need to test your UV mapping with a test image. This section covers how to export an outline of your UV map, and how to load images into the UV editor.

Exporting UV Layout Image

As a way of communicating to an artist who is painting your UV Texture for you, Bforartists has a tool called *Save UV Face Layout* (located in the UV/Image Editor Window, UVs–>Save UV Face Layout) that saves an image as a Targa (.tga), EPS, or an SVG format for the object you have selected.

The image is an outline of the UV face mapping. Activating the tool brings up the File Browser Window with options for saving the layout:



Export Options

All UVs
: if disabled, then only the UV faces selected will be outlined

Modified
: Export UVs from the modified mesh.

Format
: Select the type of image file to save (.png, .eps, .svg)

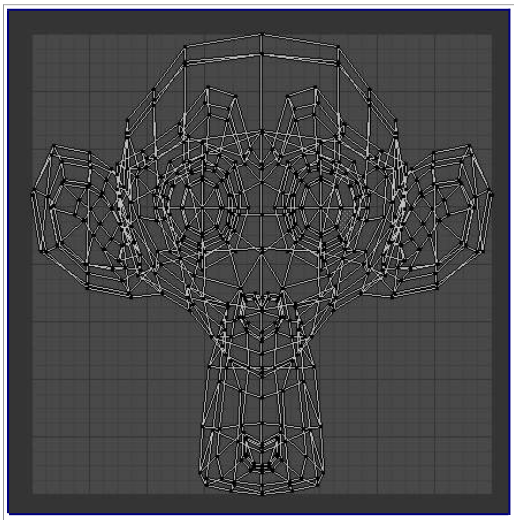
Size
: select the size of the image in pixels. The image be square.

Fill Opacity
: Set the opacity of the fill regions. Completely Opaque is 1, completely transparent is 0. It is opaque by default.

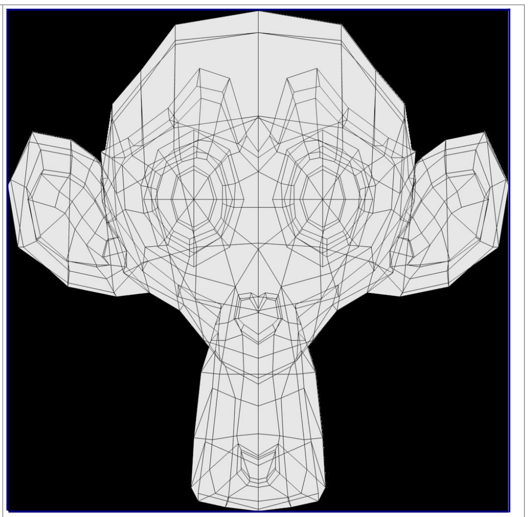
The image will be lines defining the UV edges that are within the image area of the UV mapping area. Edges outside the boundary, even if selected, will not be shown in the saved graphic.

The artist will use this as a transparent layer in their paint program as a guide when painting your texture. The example below shows Bforartists in the background, and the Gimp working on the texture, using the saved layout as a guide. Note that targa format supports the Alpha channel, so you can paint transparent areas of the mesh.

For using images as textures, see the page on *Image Textures*



A UV Layout in the UV Editor



A UV Layout in the Image Editor

Applying Textures to UVs

The UV/Image Editor allows you to map textures directly to the mesh faces. The 3D View window shows you the object being textured. If you set this window into Textured viewport shading, you will immediately see any changes made in the UV/Image Editor window in this window, and vice versa.

You can edit and load images, and even play a game in the Bforartists Game Engine with UV textures for characters and object, without a material, and still see them in the 3D window. This is because no 'real' rendering is taking place; it is all just viewport shading. If you were to apply an image to UVs then render, the texture would not show up by default

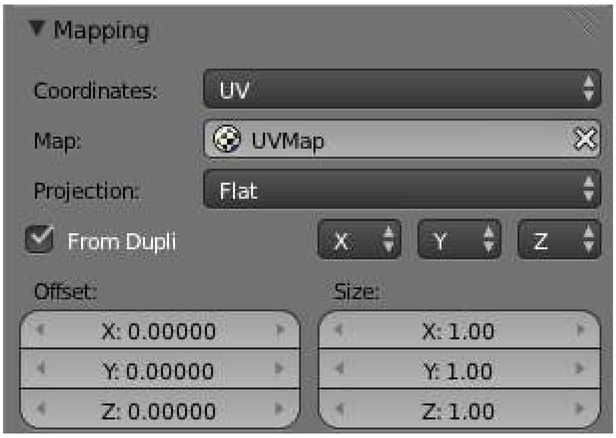
To render an image however, you must

- create a Material for the object, and
- tell Bforartists to use the UV Textures on faces when rendering.

To create a Material, you have to click *Add New* Material in the Shading context.

There are two ways to tell Bforartists to use the UV Texture when rendering: the Proper way and the Quick Way:

Use UV Coordinates



A texture setup to map using its UV coordinates

In the Texture channel panel, Add a New Texture and define the texture as an image and load the image you want to use. In the Mapping section, choose UV from the Coordinates menu, and select the UV layer to use.

Make sure it is mapped to Color in the Influence section as well (it will be mapped to Color by default, and the UV Texture is named "UVTex" by default). If the image has an alpha channel and you want to use it, click "UseAlpha" in the Map Image panel.

Full details of using Image textures are on the *Image Textures* page.

Note
Material is Required for Rendering You can perform UV Texturing on a mesh within Bforartists without assigning a material, and you will even see it in your 3D View in textured viewport mode. However, when you render, you will just get a default gray if the object does not have a Material assigned. You will get a black if you do not load an image. If you do not create a texture that uses the image, or enable *Face Texture*, your object will render according to the procedural material settings.

Face Textures

The Material panel with activated Face Textures button.

An alternate way is to set up a Face Textures Material as shown. To do so, with the buttons window displayed, press F5 to display the Shader Buttons. In the Buttons window, Material settings, click *ADD NEW* material.

On the Options panel, enable *Face Textures*. This way is quick, but bypasses the normal rendering system for fast results, but results which do not respect transparency and proper shading.

Loading and Saving Images

In the UV editor, you can assign certain faces certain textures. To do so, first you need an image to work with. In the *Image Menu* you can open an image file with the *File Browser*. If you have images in the file already, that you want to use, click the *Browse* button in the *Header*, or make a new texture by clicking the *New* button.

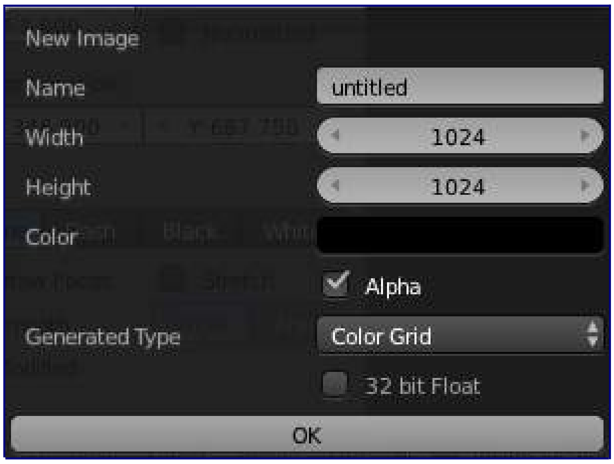
In a team environment, or if you are using an external paint program to edit the image while the .blend file is active, and the file is updated and re-saved, use the UV/Image Editor to *Image–>Reload* it and see the latest and greatest in Bforartists. Also, use Reload if you have mapped more faces to an image, and the 3D View will be updated with the latest image mapping back to faces.

If you move the image file, Bforartists may not be able to find it, and you will have to *Image–>Replace* it. Use this option to map a UV layout to a different image altogether.

Replacing the active Image

Recall that each face gets coordinates and a link to an image. To map a face to a different image, simply select that face (or faces) and use the UV/Image Editor window Image}} menu to *Replace* the current image with an existing file (such as a JPG or PNG file).

New Images



The new Image dialogue

When you select *New Image* you are presented with several options. This *Generated* image can also be modified afterward in the *Properties Panel*:

Image Name
: Set the name if the generated image

Width and Height
: Set the size if the image in pixels

Color
: Sets the default fill color if creating a blank image.

Alpha
: Adds an alpha channel to the image

Generated Type
: The type of image to generate:

  UV Grid
  : Creates a checkerboard pattern with a colored + in each square.

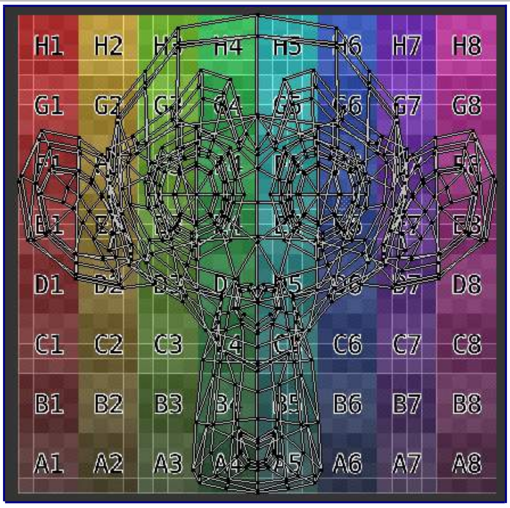
  Color Grid
  : Creates a UV Test Grid, which is useful for testing how UVs have been mapped, and to reduce stretching. There are two types available, which can be set after the image has been created.

  Blank
  : Generates a blank image of the specified color.

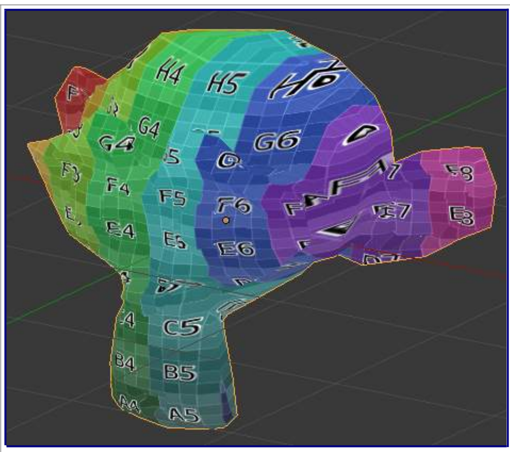
32 bit
: Creates a 32 bit image. This is a larger file size, but holds much more color information than the standard 8 bit image. For close ups and large gradients, it may be better to use a 32 bit image.

Using the Test Grid

Use the UV Test Grid option to check for undue stretching or distortion of faces. If your image is a base uniform pattern and you want the application of that image to your model to look like cloth, you do NOT want any stretching (unless you want the cloth to look like spandex).



The test grid applied to the UVs



A preview of the texture on the geometry

When you render, the mesh will have the test grid as its colors, and the UV Texture will be the size image you specified. You can save the UV image using the Image–>Save menu.

Image Settings

When an image has been loaded or created in the UV editor, an additional section appears in the *Properties Panel*. The first row of buttons allow you to:

- Browse for an image
- Change the image name
- Set as *Fake User*
- Create a *New Image*
- *Open* an image
- *Unlink Data-Block*

Select the image type in the *Source* menu. Each has different options:

Generated

Generates a new image:

Width and Height of image in pixels

Blank
Creates a Blank image
UV grid
Creates a checkerboard pattern with colored plus symbols in each square.
Color Grid
Creates a more complex colored grid with letters and numbers denoting locations in the grid.

File

Use for loading image files:

Fields
Use if image is made of fields. You can set it to use *Upper First* or Lower First
Premultiply
Converts RGB from key alpha to premultiplied alpha.

Movie and Sequence

Frames
Set the number of frames to use
Start
Set the starting frame of the movie/sequence
Offset
Offset the number of frame used in the animation
Fields
Set the number fields per rendered frame to use(2 fields is 1 frame)
Auto Refresh
Always refresh images on frame changes.
Cyclic
Cycle the images in a movie/sequence.

Saving Images

Images can be saved to external files if they were created or edited in Bforartists with tools in the *Image* menu. If images are already files, use the *Save* command (`Alt-S`). You can also *Save As* (`F3`) if the image was generated or you want to save as a different name. Using *Save as Copy*, (`F3`) will save the file to a specified name, but will keep the old one open in the Image editor.

Modifying your Image Texture

To modify your new Texture, you can:

- *Render Bake* an image based on how the mesh looks
  - The Render Bake feature provides several tools to replace the current image based on a render of Vertex Paint colors, Normals (bumps), Procedural materials, textures and lighting, and ambient occlusion.
- Paint using *Texture Paint*.
  - Use the UV/Image Editor menu *Image –> New*. Then start painting your mesh with
- Use external software to create an image
  - Using your favorite image painting program, you could use an exported UV layout to create a texture. Then save your changes, and back in Bforartists, use the Image–>Open menu command to load it as your UV image for the mesh in Face Select Mode for the desired (and active) UV Texture layer. Using the *Edit Externally* tool in the *Image* menu, Bforartists will open an image editor, as specified in the *User Preferences* and load in the image to be edited.
- Use the “projection painting” feature of recent versions of Bforartists
- Use the Bake uV-Textures to Vertex Colors add-on to create an image from vertex colors
- Some combination of the above.

The first three options, (UV Painter, Render Bake, and Texture Baker) replace the image with an image that they create. Texture paint and external software can be used to add or enhance the image. Regardless of which method you use, ultimately you must either

- save your texture in a separate image file (for example JPG for colors, PNG with RGBA for alpha),
- pack the image inside the blend file (UV/Image Editor Image–>Pack as PNG),
- or do both.

The advantage to saving as a separate file is that you can easily switch textures just by copying other image files over it, and you can use external editing programs to work on it. The advantage of packing is that your whole project is kept in the .blend file, and that you only have to manage one file.

You can invert the colors of an image by selecting the *Invert* menu. in the *Image* menu

Packing Images inside the Blend file

If you pack your .blend file, the current version of all UV Texture images are packed into the file. If those files later change, the updates will not be automatically re-packed; the old version of the image is what will be used. To update, you will have to re-pack or reload.

To pack an image, select *Pack Image* from the *Image* menu. To Unpack, select this option again and select *Remove Pack*. The File–>Append function automatically goes into `.blend` files and shows you the image textures packed in it.

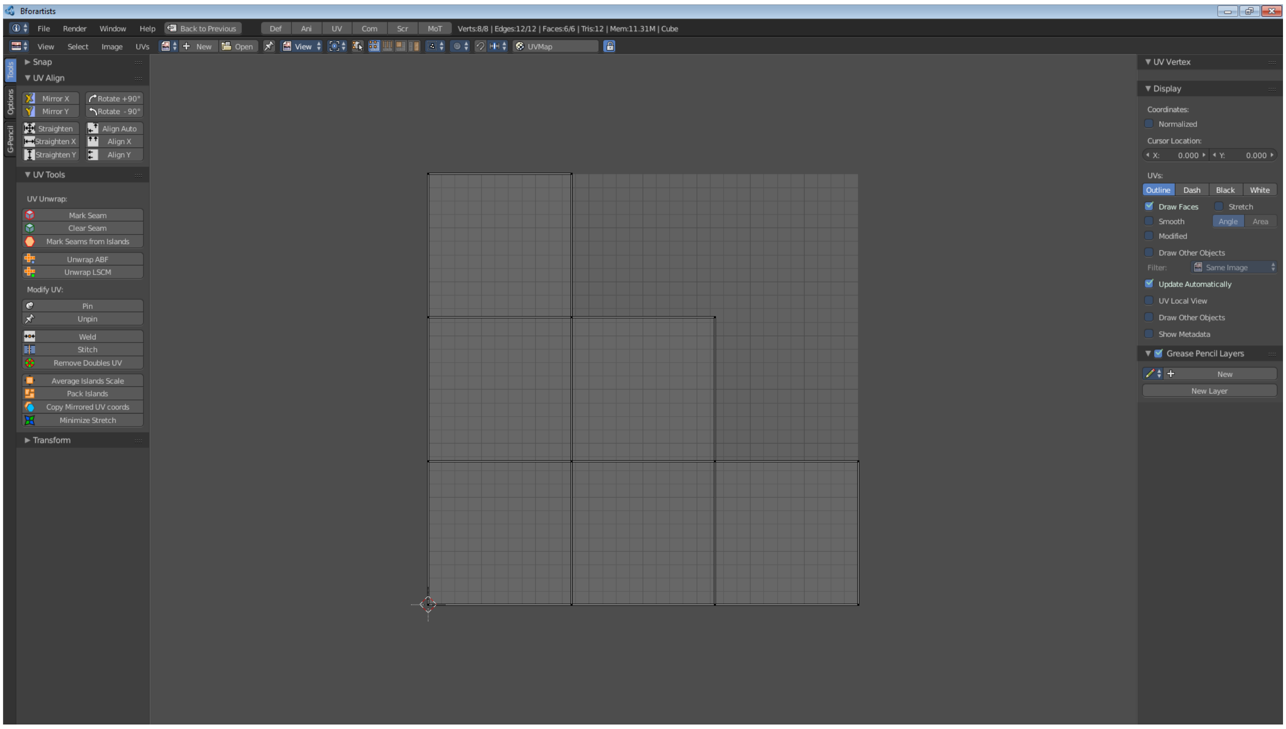
Editors - UV Image Editor by tools

Detailed table of content

UV/Image Editor

The UV Image Editor is the place where you deal with all the textures and images that you use in Bforartists.

It is also the place where you can display and edit the UV mapping, which doesn't necessarily require to have a image to be loaded. The UV / Image Editor has different modes, dependant of what you want to do and what element is active. We will go through them one by one.



Navigating in the UV IMage Editor viewport

Pan the view - MMB

Zoom - Mouse Wheel, LMB+CTRL, Numpad + / -

View All - Home

View Fit - Numpad Period

Header - View Menu

When nothing is loaded then you have just a few elements available in the header. And most of them are disfunctional until something is loaded.

View Menu

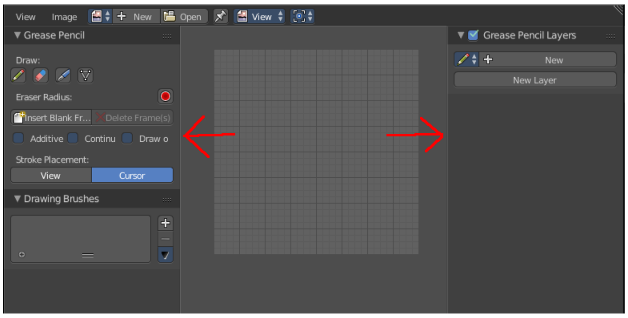
The View menu contains view related tools. The content is varying, dependant in what mode you are, and what you currently do.

Properties

Opens or closes the Properties sidebar at the right side of the UV Image Editor.

Tool Shelf

Opens or closes the Tool Shelf at the left side of the UV Image Editor.



View Zoom In

Zooms into the view

View Zoom Out

Zooms out of the view

Zoom 1:8 ... Zoom 8:1

A set of predefined zoom factors.

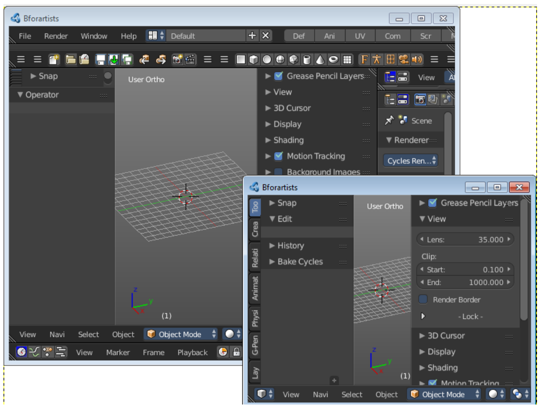
View All

View all zooms in or out until all selections are displayed fitting in the viewport.

View Fit

Zooms in or out to fit the selection into the current view.

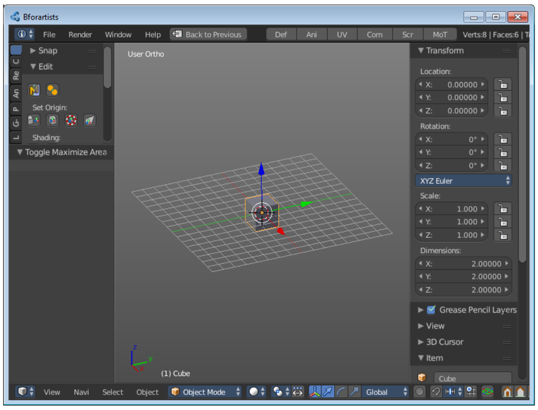
Duplicate Area into new Window



Duplicate Area into New Window makes the selected editor window floating. You can then drag it around at the monitor.

A separated window cannot be merged into the main window again. You have to close it when not longer needed.

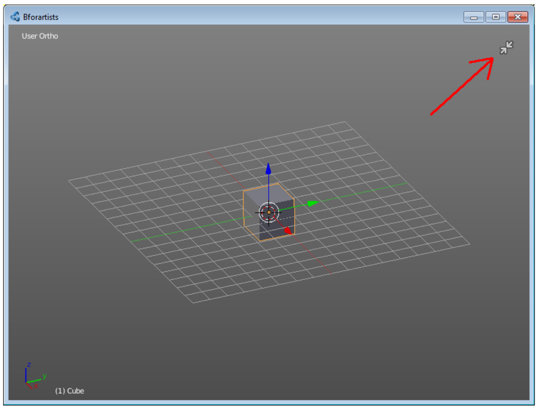
Toggle Maximize Area



Displays the editor maximized with menus.

To return to split view press hotkey Ctrl Up Arrow, or reuse the menu item in the View menu.

Toggle Full screen Area



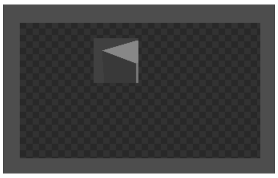
Displays the editor maximized without menus.

To return from the full screen view press hotkey Alt F10, or use the little button that appears up right when you move the mouse in

Render Border

Just visible when you have a render result selected!

This feature allows you for preview purposes to render just a part of the image instead of the full image.



Note that the render border in the Image editor is not visible like in the 3D view.

Clear Render Border

Just visible when you have a render result selected!

Removes an existing render border.

Render Slot Cycle Next

Just visible when you have a render result selected!

You can have up to 8 different render slots. Here you can cylce through them by menu entry and hotkey.

Render Slot Cycle Previous

Just visible when you have a render result selected!

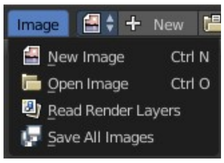
You can have up to 8 different render slots. Here you can cylce through them by menu entry and hotkey.

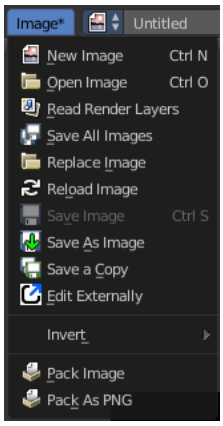
View Selected

Just visible with 3D View in Edit mode, for UV mapping.

View Selected zooms in or out until the Selection is displayed fitting in the viewport.

Header - Image menu

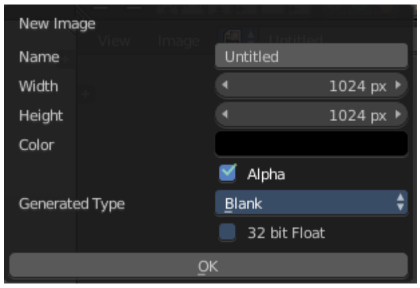




Here you will find all image related menu items.

When the currently selected image is unsaved then the menu name contains an asterisk.

New Image



Creates a new image. You will get a dialog where you can define settings for the new image.

Name

The name of the new image

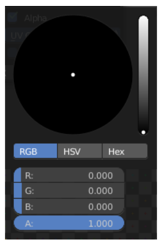
Width

The width of the new image.

Height

The height of the new image.

Color

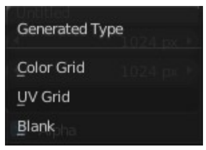


Here you can adjust the color of the new image. A click will call a color picker.

Alpha

Check this checkbox if the new image should have an alpha channel.

Generated Type



Here you can define what kind of texture you want to create.

Blank is one plain color.

UV Grid is a checker texture in black and white.

Color Grid is a colored checker texture.

32 Bit Float

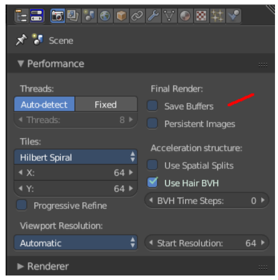
Check this checkbox if the image should be in 32 Bit floating point bit depth per channel. Else it is in 8 bit per channel.

Open Image

Opens the file browser to load an image.

Read Render Layers

Just visible when you have a render result selected!



Read all the current scene's render layers from cache, as needed. For this featute to work save Buffers needs to be activated in the Performance tab in the render settings.

This feature can be be used to save RAM while rendering because the render layers do not have to be saved in RAM. It can also be used to recover some information from a fail render.

Save all Images

Saves all images.

Note that the images must already exist somewhere at your hard disk so that they can be saved.

Replace Image

Replaces the currently active image by an image that you load.

Reload Image

Reloads the currently selected image.

Note that the images must already exist somewhere at your hard disk. When you create a new image in Bforartists, then this image isn't saved yet, and so you cannot reload it.

Save Image

Saves the currently selected image without any further questions. Note that the images must already exist somewhere at your hard disk.

Save As Image

Saves the currently selected image.

Save a Copy

Saves a copy of the currently selected image. This will save the file to a specified name, but will keep the old one open in the Image editor.

Edit Externally

Here you can open the image in a defined external image editor like The Gimp or Photoshop.

The image must be saved. And the image editor must be defined in the User Preferences.

Invert

Invert is a sub menu where you can invert the colors of the whole image, or just specific colors.

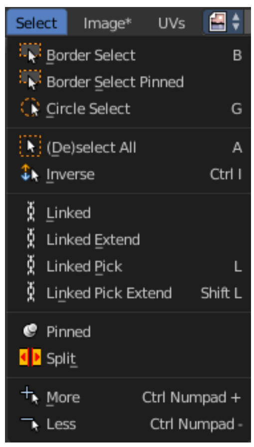
Pack Image / Pack as PNG

Packs the currently active image into the blend file. When you save the blend file the next time, then this image will be embedded.

Packed images are marked with a pack icon. A click at this icon will unpack the texture, and try to save it to file. Usually to the last existing location before it was packed.

Warnning
You cannot modify packed images. Changes at the image will not be saved. You need to unpack the image when you want to modify it. And repack it after you have done the changes.

Header - Select menu



This menu just appears when you are in Edit mode in the 3D viewport, and you edit the UV's of a mesh. It allows you to select the UV geometry in the UV / Image Editor.

Border Select

Border select enters the Border Select mode. This is a special select mode where you can select elements by dragging a rectangle. And what's inside of the rectangle gets selected then. It adds to selection by default.

To subtract from selection hold down Shift key.

The selection gets applied when you release the mouse. You leave the mode automatically when you release the mouse.

Border Select Pinned

Same as with Border Select. But just vertices that are pinned gets selected.

Circle Select

Circle select enters the Circle Select mode. This is a special select mode where you can select elements by moving with the mouse over it. It adds to selection by default.

To subtract from selection hold down Shift key. To exit the Circle select click with the right mouse button.

The pencil radius of the circle select tool can be adjusted with the scroll wheel.

(De)select All

Toggles between select all and deselect all.

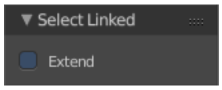
Inverse

Inverts the current selection.

Linked

Select all UV vertices linked to the active UV map. The previous selection gets cleared.

Last Operator Select Linked



Extend

The previous selection gets kept, the selection gets extended.

Linked Extend

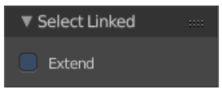
Select all UV vertices linked to the active UV map. The previous selection gets kept.

Linked Pick

Hotkey Only Tool!

Select all UV vertices linked to the active UV map. The previous selection gets cleared.

Last Operator Select Linked



Extend

The previous selection gets kept, the selection gets extended.

Linked Pick Extend

Hotkey Only Tool!

Select all UV vertices linked to the active UV map. The previous selection gets kept.

Pinned

Selects all pinned vertices.

Split

Select only entirely selected faces. When you just have three vertices of the face selected, then this face is not selected.

More

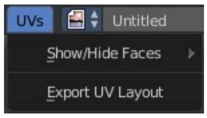
Select more

Less

Select less.

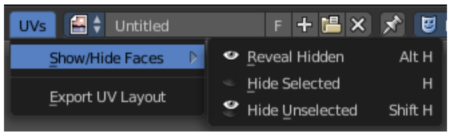
Header - UV's menu

This menu just appears when you are in Edit mode in the 3D viewport, and you edit the UV's of a mesh. It contains some UV editing related functionality.



Show/Hide Faces

This is a sub menu where you can show or hide UV faces. And this not only in the UV Image Editor, but also in the 3D view.



Show Hidden

Makes all faces visible again.

Hide Selected

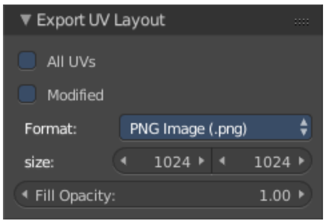
Hides the selected faces.

Hide Unselected

Hides the not selected faces. The selected faces stays visible.

Export UV Layout

Here you can export the UV layout to an image, so that you can use it as a mask to build your texture in your favourite image editing software like Phothoshop. It will open a file dialog, where you can define further export settings down left.



All UV's

Export all UV's, not just the visible ones.

Modified

Export UV's from the modified mesh.

Format

Here you can choose the export format.

Size

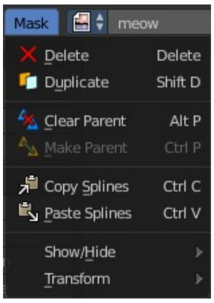
Here you can define the size of the image.

Fill Opacity

How opaque the wireframe lines are.

Header - Mask menu

This menu appears when you are in Mask mode. In Mask mode you can mask areas with splines. This can be useful for motion tracking.



Delete

Deletes the selected spline(s) or spline points.

Duplicate

Deletes the selected spline(s) or spline points.

Clear Parent

Clears the parent relationship.

Make Parent

Parents the selected spline points. Mask splines can be parented to motion tracker markers.

Copy Splines

Copys the selected spline(s) or spline points.

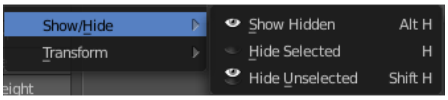
Paste Splines

Pastes the copied spline(s) or spline points.

Show/Hide

Show/Hide Faces

This is a sub menu where you can show or hide the selection.



Show Hidden

Makes hidden splines visible again.

Hide Selected

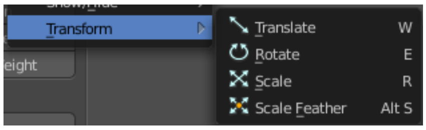
Hides the selected spline(s)

Hide Unselected

Hides the not selected spline(s). The selected spline(s) stays visible.

Transform

This is a sub menu with some transform menu items. This menu items are hotkey tools!



Translate

Move the selection.

Rotate

Rotate the selection.

Scale

Scale the selection.

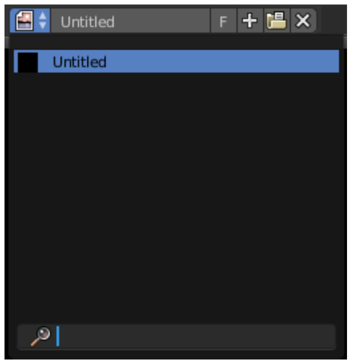
Scale Feather

Shrinkfattens the selection.

Header tools

The header contains several tools, dependand of what you do and what toolset is selected.

Image Prop



This property contains the list of loaded images. When no image is loaded then it displays the New and Open Buttons.
When an image exists then it displays the name of the currently selected image.

From left to right ...

List of images in the scene

This is a list of the images in the scene. Here you can switch to other images.

Image Edit Box

Here you can read the name of the currently selected image. And you can rename the image here too.

Fake User

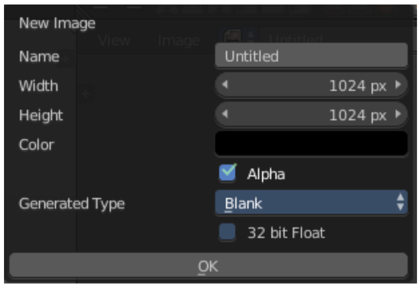
Wit this button you assign a fake user to this selected image.

Data, like images, that is not longer linked to anything else gets removed when you save and reload a scene. Bforartists has the concept of fake users to go around this behaviour. An image with a fake user is in fact linked to something. And so it is not lost when you save and reload the scene.

Search form

Here you can search for specific images.

New Image



Create a new image.

Creates a new image. You will get a dialog where you can define settings for the new image.

Name

The name of the new image

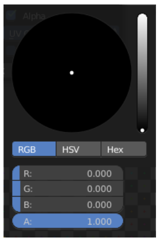
Width

The width of the new image.

Height

The height of the new image.

Color

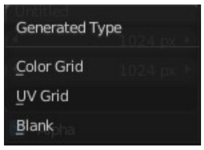


Here you can adjust the color of the new image. A click will call a color picker.

Alpha

Check this checkbox if the new image should have an alpha channel.

Generated Type



Here you can define what kind of texture you want to create.

Blank is one plain color.

UV Grid is a checker texture in black and white.

Color Grid is a colored checker texture.

32 Bit Float

Check this checkbox if the image should be in 32 Bit floating point bit depth per channel. Else it is in 8 bit per channel.

Open Image

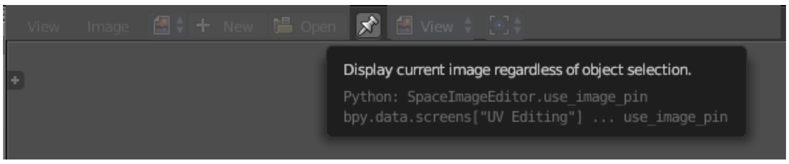
Opens the file browser to load an image.

Unlink Datablock

This deletes the selected image. Unfortunately not immediately. You need to save the scene and to reload it.

And you need to make sure that it is not linked to anything else. A mesh or a fake user for example. Have a look if there is a number besides the F button. When this is the case then the image has still a user, and so still loads with loading the scene.

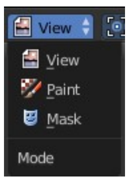
Use Image Pin



When you select another object. for UV mapping for example, then usually the connected images for this object gets displayed. Use image pin nails the currently selected image so that it stays displayed.

Mode

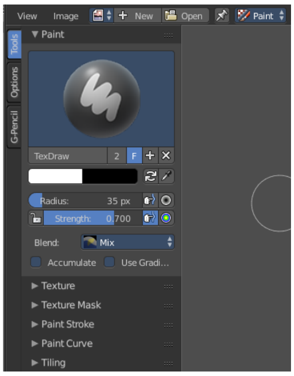
The UV Image Editor has three image modes. View, Paint and Mask mode.



View

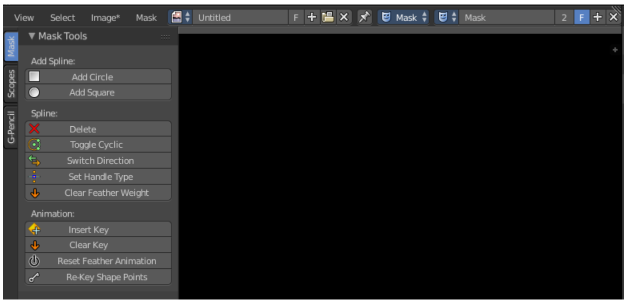
In this mode you can view the images.

Paint

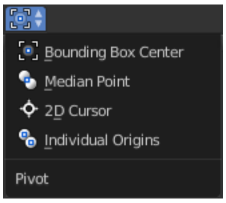


In this mode you can paint at images. The paint tools can be found in the tool shelf.

Mask



In this mode you can create a mask, and mask parts of the images with spline shapes. The mask tools can be found in the tool shelf.



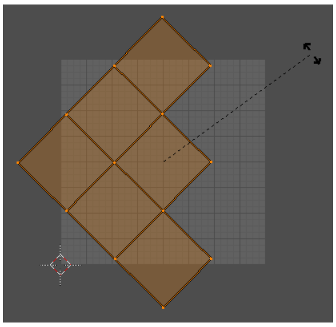
Pivot Point

This tool is for UV Editing.

The pivot point is the center point in the current selection of UV elements. Rotation happens around this center point for example. Here you can define where this center point is defined.

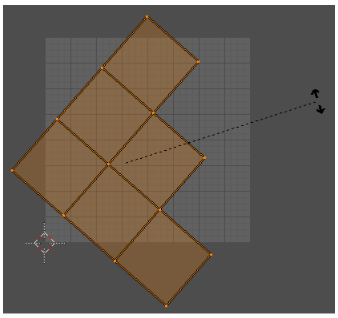
The pivot point is not visible.

Bounding Box Center



Uses the center of the bouding box around the current selection.

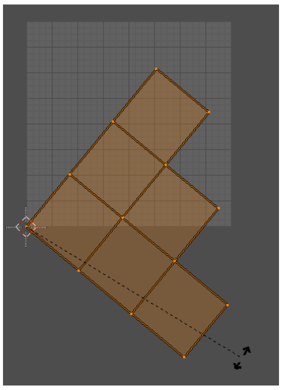
Median Point



Uses the center of the selected geometry.

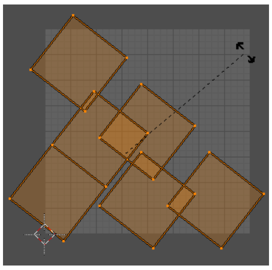
2D Cursor

Uses the 2D cursor as the pivot point.



Individual Origins

Uses an individual pivot point for every UV element.



Draw Channels

This toolbar appears when you have an image loaded. Here you can define specific display modes of the image

Color and Alpha

Displays the whole image, including alpha channel.

Color

Displays the whole image, but without alpha channel.

Alpha

Displays the alpha channel of the image.

Red

Displays the red channel of the image.

Green

Displays the green channel of the image.

Blue

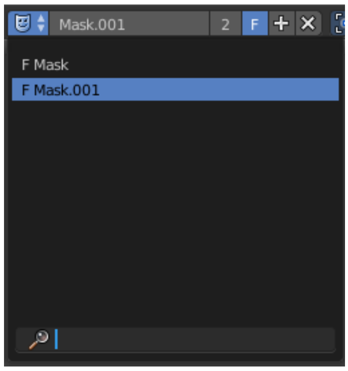
Displays the blue channel of the image.

Use Realtime Update

This setting appears when you are in Paint mode or in UV Editing mode.
Updates other editor windows like the 3D view while you paint or while you edit UV data.

Mask Prop

When you are in mask mode then you can create a new mask, and work with this mask then.



List of Masks

This is a list of the masks in the scene. Here you can switch to other masks.

Mask Edit Box

Here you can read the name of the currently selected mask. And you can rename the image mask too.

Fake User

Wit this button you assign a fake user to this selected mask. Masks gets created with a fake user already. Means when you save the scene and reopen it, then this mask will still be there.

Data, like images, that is not longer linked to anything else gets removed when you save and reload a scene. Bforartists has the concept of fake users to go around this behaviour. An image with a fake user is in fact linked to something. And so it is not lost when you save and reload the scene.

Search form

Here you can search for specific images.

Create Mask

Adds a new mask.

Unlink Datablock

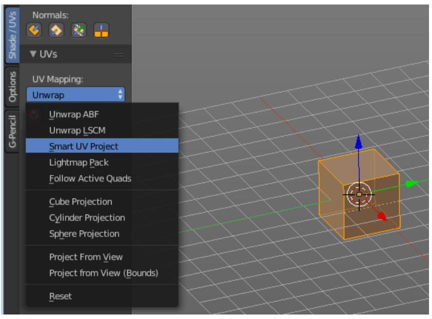
This deletes the selected mask. Unfortunately not immediately. You need to save the scene and to reload it.

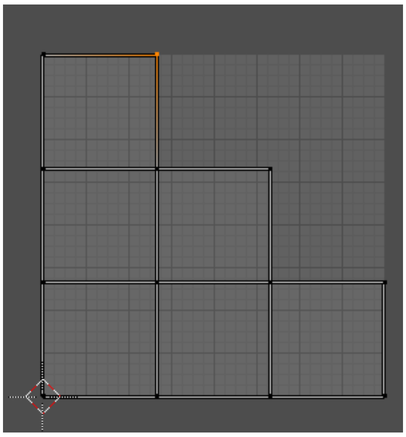
And you need to make sure that it is not linked to anything else. A mesh or a fake user for example. Have a look if there is a number besides the F button.
When this is the case then the image has still a user, and so still loads with loading the scene.

Header - UV Editing

The UV Image Editor is not only used for images. But also to manipulate the UV data of mesh objects. UV mapping is the process to project a 2D texture at your 3D mesh.

In the 3D view select your mesh object, enter edit mode, choose a uv mapping method like Smart UV project, and you will see the UV mapping result in the UV Image Editor. For our example cube all six sides are now laid out flat.

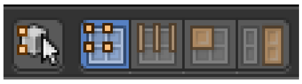




The image editor is the place where you can further edit this UV mesh now. The header provides some tools for this purpose.

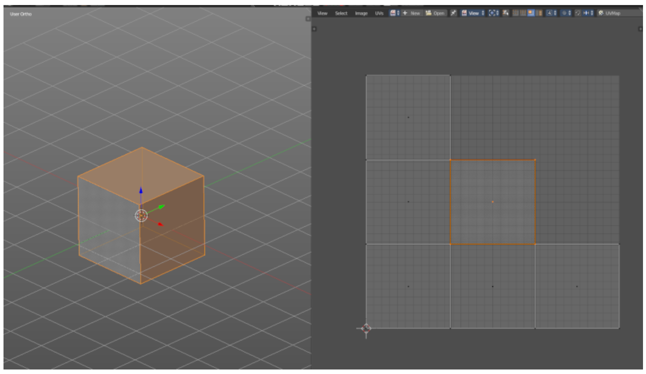
Use UV select Sync

Here you can toggle between two modes for editing the UV geometry. Both methods have their purpose.



With **UV Select Sync off** you will be able to modify single UV elements, like whole UV patches. And the 3D view will not change its selection.

When you have some geometry in the 3D view not selected, then it will not show up in the UV image editor neither.



Vertex selection mode

Select vertices in the UV geometry.

Edge selection mode

Select edges in the UV geometry

Face selection mode

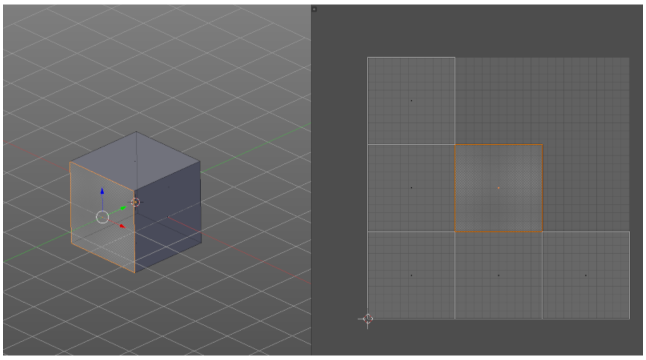
Select single faces in the UV geometry

Island selection mode

Select whole UV patches in the UV geometry.

With **UV Select Sync on** you will keep selections of UV space and 3D view in sync. But you cannot modify single UV elements anymore. In this mode you work with Vertices, Edges and Faces.

All UV geometry of the object will show up, no matter what's selected in the 3D view.



Vertex selection mode

Select vertices in the UV geometry and at the 3D mesh object.

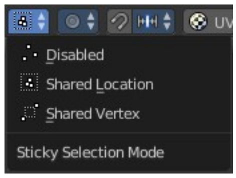
Edge selection mode

Select edges in the UV geometry and at the 3D mesh object.

Face selection mode

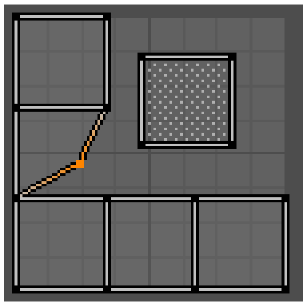
Select single faces in the UV geometry and at the 3D mesh object.

Sticky Selection mode



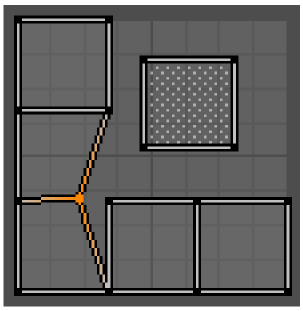
This options controls how UV's are selected when Sync Selection is off. This mainly affects vertices. But edge and face selection relies at vertices too.

Disabled



No sticky selection. You can just move one UV vertice at time. In case you have two vertices above each other, like with a UV patch with two faces, then just one vertice gets selected. Even when it's the same UV patch.

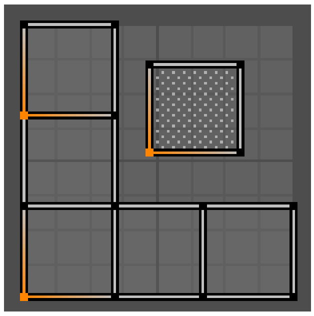
Shared Location



Selects all UV vertices under the mouse in case it's part of the same UV patch. Vertices of other UV patches gets ignored.

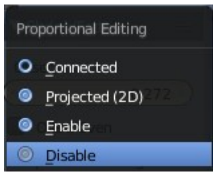
In this shot the two down left faces are one UV patch.

Shared Vertex



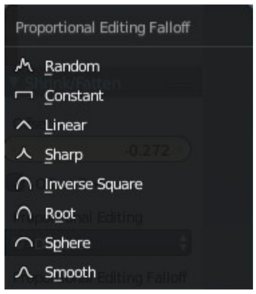
Selects all UV vertices that shares the same vertice at the 3D mesh. Regardless if it's the same UV patch or not.

Proportional editing



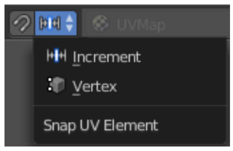
Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods, then the neighbour geometry gets influenced by any transformation too in a proportional way.

Proportional Editing Falloff



Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

Snapping



Here you can turn on or off Snapping.

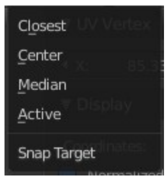
Increment

Snaps by two units at the grid that is displayed in the UV image editor.

Vertex

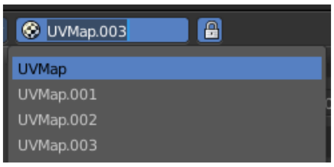
Snaps the selection to other vertices.

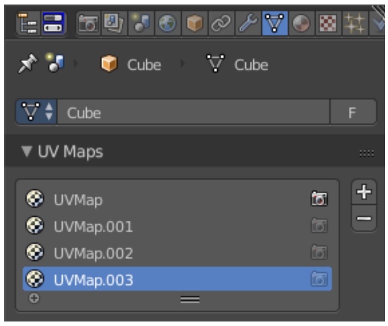
Snap target



Here you can adjust how the selection snaps to other vertices.

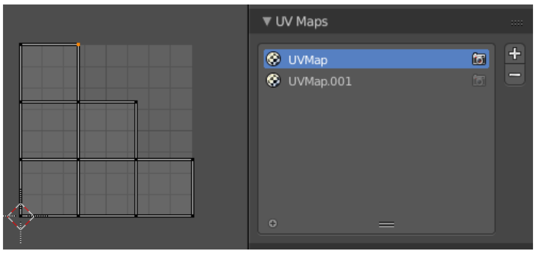
UV Map

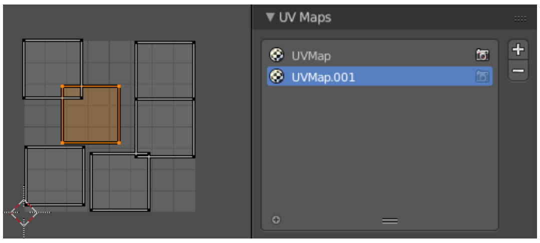




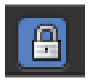
A mesh object can have more than one UV map. Usually you manage the UV maps in the properties editor. This dropdown list is to have a quick way to switch between the existing UV maps. So that you don't have to dive into the Properties editor for that.

A UV map is simply a group of selected UV elements. The UV layout can differ too. Secondary UV's are used where a mesh simply needs more than one texture. And you don't want to create more materials for it. A terrain mesh for example, to mix two textures together.



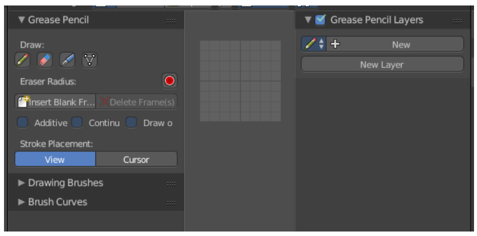


Use Realtime Update



This setting appears when you are in Paint mode or in UV Editing mode. Updates other editor windows like the 3D view while you paint or while you edit UV data.

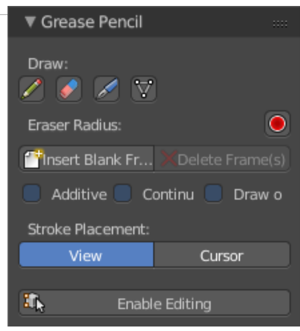
Tool Shelf - Grease Pencil



The Grease Pencil tool is a tool with which you can paint strokes in editors like the 3D view. They can be converted into polygons. The Grease Pencil tool is available in all modes.

It is unfortunately cluttered across two shelves. The Tool Shelf and the Properties Editor. Means you have to adjust settings at two places.

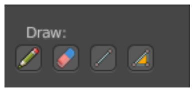
The first thing that you have to do is to create a new Grease pencil. This can either be done in the Properties Editor by clicking at New. Or in the Grease Pencil Tab in the Tool Shelf by simply clicking at the Draw button. Then all Grease Pencil tools becomes visible. And a Grease Pencil layer gets created.



Grease Pencil Panel

The Grease Pencil panel contains the general Grease Pencil tools. The Draw tool, eraser, some settings and tools.

Draw



The Draw section contains the draw tools.

Draw

Draw activates the freehand draw mode.

Erase

Erase is the eraser tool with which you can delete strokes.

Line

Line paints a straight line between start and end point.

Poly

Poly allows you to paint polygon shapes.

Eraser Radius

Here you can adjust the radius of the eraser tool. Have a look at the hotkey, it's a hotkey only tool for proper functionality.

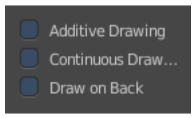
Insert Blank Frame

Insert a blank frame on the current frame.

Delete frames

Delete the active frame(s) of all editable grease pencil layers.

Draw Settings



The draw settings are placed besides each other, to save space.

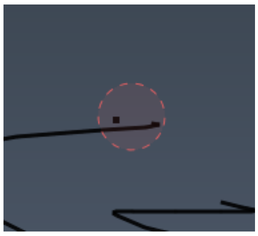
Additive Drawing

When you create new frames then the strokes from the previous active frame are included as the base for the current frame.

Continuous Draw

The Continuous Draw checkbox enables and disables the continuous draw mode. Normally the draw mode ends when you stop drawing the current line. And you have to activate the draw tool again when you want to continue with painting. With continuous draw you can immediately paint the second stroke without to enable the draw tool again.

Eraser in Continuous Draw



The draw tools are disabled as long as you are in continuous draw. To erase a stroke use the right mouse button. The pencil turns into a red circle. With which you can erase strokes now.

End Continuous Draw

The draw tools are disabled as long as you are in continuous draw. To end the continuous draw mode click outside of the viewport. In the tool shelf for example.

Draw on Back

New strokes will be drawn behind all other strokes in the layer

---

Stroke Placement

Stroke Placement defines where the Grease Pencil stroke is placed.

View

View will place the stroke at the top of the viewport. It is not drawn in the 3D view.

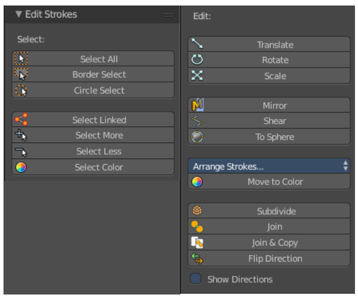
Cursor

Cursor will place the stroke aligned with the 3d cursor, and aligned with the current camera view. It is drawn in the 3D view.

Enable Editing

Sometimes you want to edit the strokes that you have placed. Here you can enter the editing mode, and reveal some editing tools.

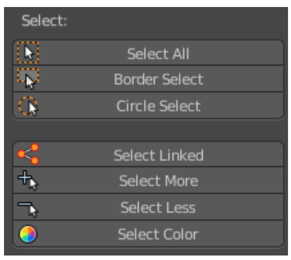
Edit Strokes Panel



The Edit Strokes Panel contains the tools to edit the Grease Pencil strokes. Most of the tools are pretty self explaining.

It is divided into two sections. Select and Edit.

Select



The select section.

Select All

Toggles between select all and deselect all.

Border Select

Border select enters the Border Select mode. This is a special select mode where you can select elements by dragging a rectangle. And what's inside of the rectangle gets selected then. It adds to selection by default.

To subtract from selection hold down Shift key.

The selection gets applied when you release the mouse. You leave the mode automatically when you release the mouse.

Circle Select

Circle select enters the Circle Select mode. This is a special select mode where you can select elements by moving with the mouse over it. It adds to selection by default.

To subtract from selection hold down Shift key. To exit the Circle select click with the right mouse button.

The pencil radius of the circle select tool can be adjusted with the scroll wheel.

Select Linked

Select the linked vertices of the same stroke.

Select More

More expands the selection.

Select Less

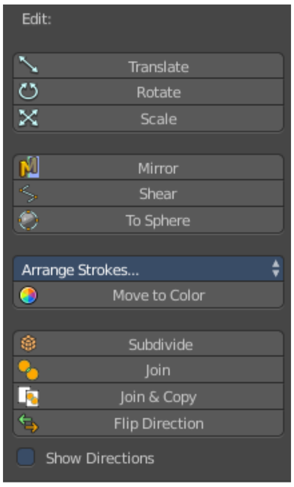
Less reduces the selection.

Select Color

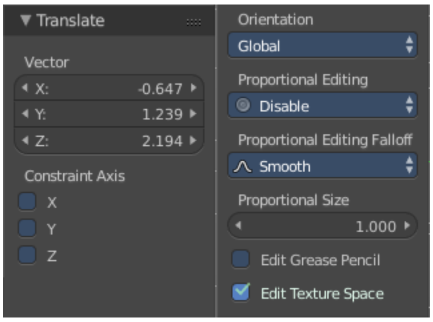
Select all grease pencil strokes with the same color than the currently selected one.

Edit

The Edit section.



Translate



Moves the selected grease pencil geometry in the viewport by moving the mouse.

Last Operator Translate

The last operator appears in the 3D view!

Vector

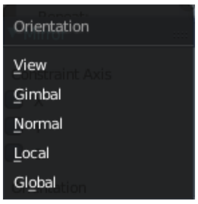
Here you can adjust the position values for the three values

Constraint Axis

Here you can limit the position relative to the source object.

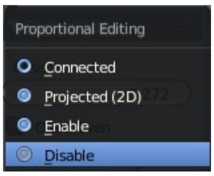
Orientation

Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.



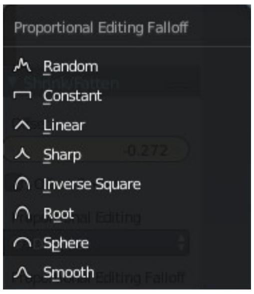
Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.



Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



Proportional Size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

Edit Texture Space

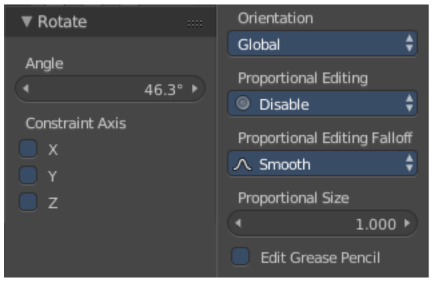
With Confirm on Release checked the action gets performed when you release the mouse button.

Rotate

The last operator appears in the 3D view!

Rotates the selected grease pencil geometryi in the viewport by moving the mouse.

Last Operator Translate



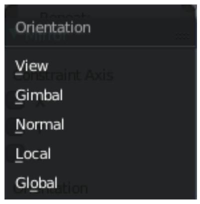
Angle

Here you can adjust the rotation angle.

Constraint Axis

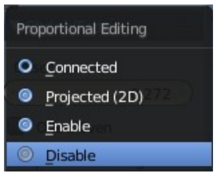
Here you can limit the position relative to the source object.

Orientation



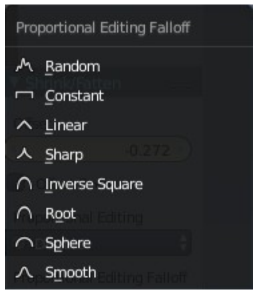
Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.

Proportional Editing



Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.

Proportional Editing Falloff



Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

Proportional Size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

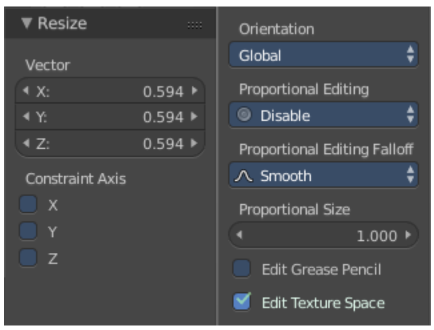
Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

Scale

The last operator appears in the 3D view!

Scales the selected grease pencil geometry in the viewport by moving the mouse.

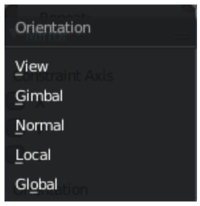


Last Operator Resize

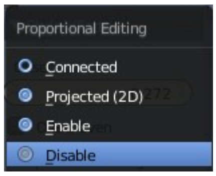
Vector

Here you can adjust the position values for the three values

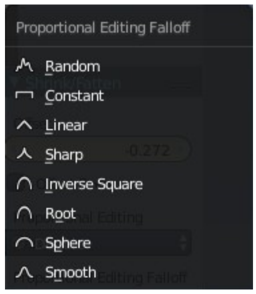
Constraint Axis
Here you can limit the position relative to the source object.

Orientation


Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.

Proportional Editing


Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.

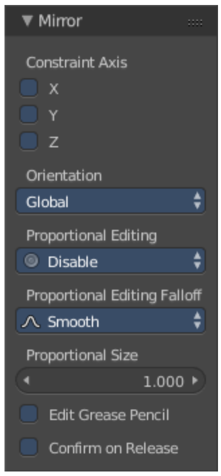
Proportional Editing Falloff


Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

Proportional Size
Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Edit Grease Pencil
Edit Grease Pencil edits the selected Grease Pencil strokes.

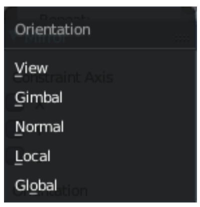
Edit Texture Space
With Confirm on Release checked the action gets performed when you release the mouse button.

Mirror


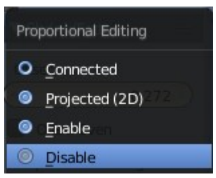
Mirror mirrors the selected geometry along the defined axis. Click the Mirror button, type in X, Y or Z, then confirm with enter.

Last Operator Mirror
The Last Operator Mirror panel gives you tools to adjust the mirror action.

Constraint Axis
Constraint Axis gives you again the possibility to define the mirror axis. You can choose more than one axis here.

Orientation


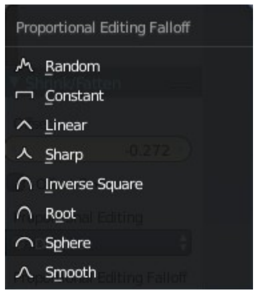
Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.

Proportional Editing


Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.

Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



Proportional size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

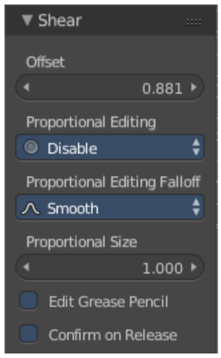
Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

Confirm on Release

With Confirm on Release checked the action gets performed when you release the mouse button.

Shear



Shear shears the selection.

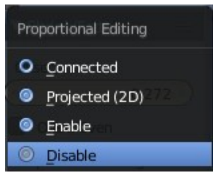
Last Operator Shear

Offset

Adjust the offset

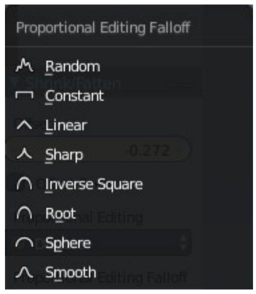
Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.



Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



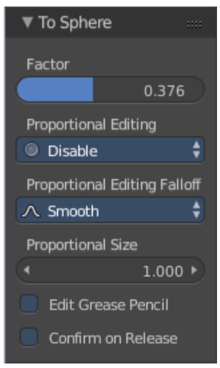
Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

Confirm on Release

With Confirm on Release checked the action gets performed when you release the mouse button.

To Sphere



To Sphere transforms the selection into a spherical form.

Last Operator To Sphere

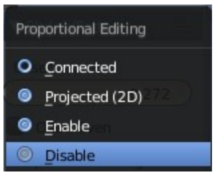
Factor

Adjust the rounding factor

Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.

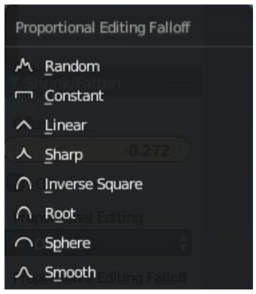
Proportional Editing Falloff



Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

Proportional Size

Adjust the proportional size



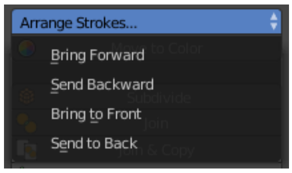
Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

Confirm on Release

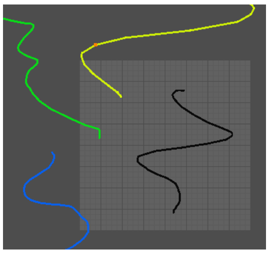
With Confirm on Release checked the action gets performed when you release the mouse button.

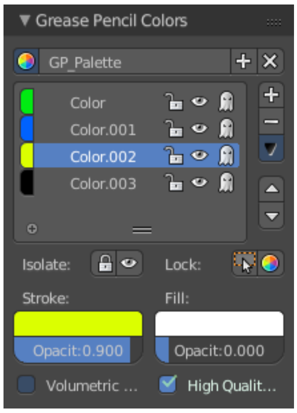
Arrange Strokes



This is a dropdown box where you can arrange the currently selected stroke relative to the other ones.

Move to Color





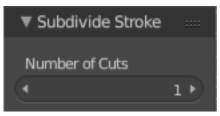
Recolors the currently selected grease pencil stroke with the active color in the Grease Pencil Colors color.

The grease pencil colors can be found in the properties sidebar at the right.

Subdivide

Subdivide subdivides the current selection.

Last Operator Subdivide Stroke



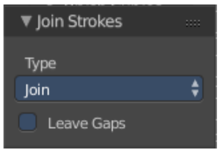
Number of Cuts

Adjust the number of subdivisions

Join

Joins strokes.

Last Operator Join Strokes



Type

Here you can choose if it should only join, or join and also copy the strokes.

Leave Gaps

Leave Gaps between joined strokes instead of linking them.

Join & Copy

Joins strokes and copies it.

For last operator see above.

Flip Direction

Change the direction of the stroke.

Sculpt Strokes Panel

The Sculpt Strokes Panel provides tools to sculpt the Grease pencil strokes.

Note!
The Sculpt Strokes Panel is just visible in Edit Strokes Mode!

Sculpt Strokes Button

The Sculpt Strokes Button activates the Sculpt brush. Now you can sculpt the Grease Pencil stroke with left mouse button. Clicking with right mouse button ends the sculpt mode.

Radius

The radius of the sculpt brush.

The button behind the edit box allows you to set the radius by moving the mouse. This should be done in the viewport and with the hotkey. This button is just a visible reminder.

Strength

The strength of the sculpt brush.

The button behind the edit box allows you to set the strength by moving the mouse. This should be done in the viewport and with the hotkey. This button is just a visible reminder.

Use Falloff

Defines if the brush has a falloff from the centre to the border of the pencil.

Position

The Brush affects the position of the point.

Strength

The Brush affects the strength of the point.

Thickness

The Brush affects the thickness of the point.

Selection Mask

Only sculpt the selected points.

Alpha

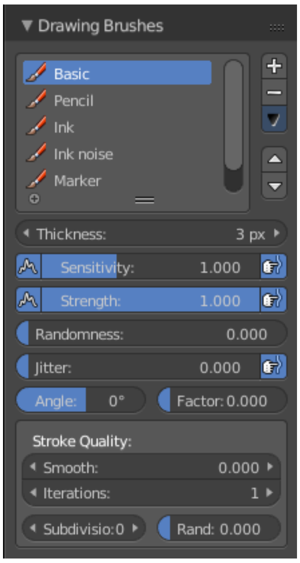
Alpha value for selected vertices.

Affect Pressure

Affect pressure values as well when smoothing strokes.

Drawing Brushes panel

The Drawing Brushes panel contains everything around the Brushes and their settings. It is visible in all modes. But the content just shows when you have activated the draw tool already.



Brushes selection box

Here you can choose different brush types. At the right you can add and remove brushes. And you can sort the brushes order.

Thickness

Defines the thickness of the stroke.

Sensitivity

Pressure sensitivity for new strokes.

Strength

Color strength for new strokes. The alpha factor of the color is affected.

Randomness

Randomness factor for pressure and strength of new strokes.

Jitter

Jitter factor for new strokes.

Angle

Direction of the stroke at which the brush gives the maximum thickness.

Factor

Reduce Brush thickness by this factor when stroke is perpendicular to angle direction

Smooth

Amount of smoothing to apply to newly created strokes to reduce jitter / noise.

Iterations

Number of times to smooth newly created strokes.

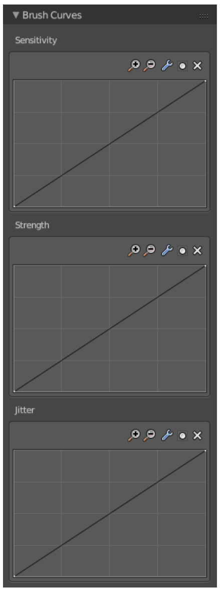
Subdivision

Number of times to subdivide newly created strokes, for less jagged strokes.

Randomness

Randomness factor for new strokes after subdivision.

Brush Curves Panel

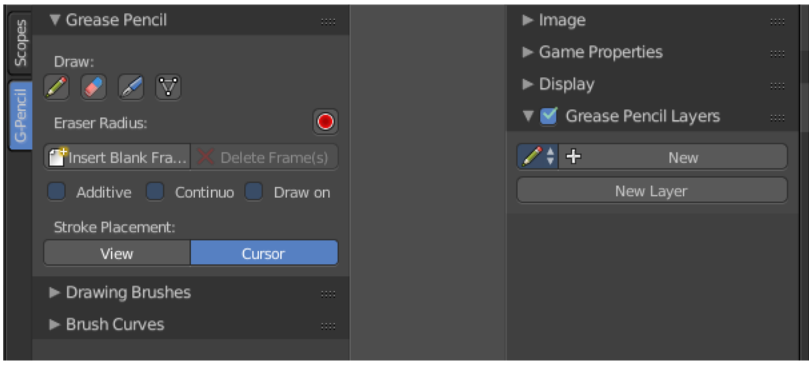


The Brush curves panel is meant for usage with tablets. Here you can manipulate the curves for Sensitivity, Strength and Jitter.

Grease Pencil - Properties Sidebar - Layers Panel

The Grease Pencil Layers are connected with the Grease Pencil panel in the Tool Shelf. And provides you with the layer settings for the Grease Pencil.

When no layer exists then there are just a few buttons available.



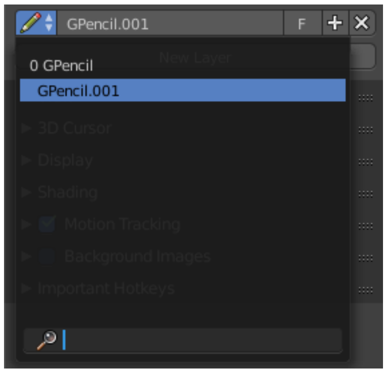
Grease Pencil Prop

Here you can add a new grease pencil to work with. Or choose an existing grease pencil.

The **edit box** allows you to rename the current grease pencil.

The **F Button** adds a fake user to the grease pencil. So that it does not get deleted when you delete the connected object and close the scene.

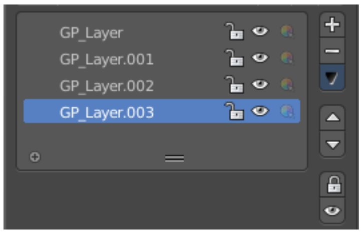
When you add a fake user, then a number field will appear that shows how much users are connected with the current pencil.



New Layer

Here you can create a new layer for your grease pencil. Doing so will reveal several layer settings. And another panel with some color settings.

Layer list



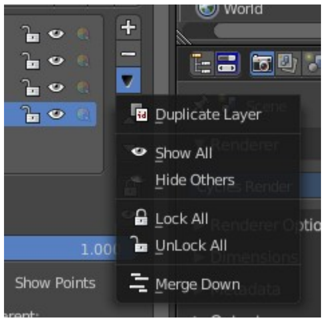
Here you can see a list of the current layers. And here you can select the current active layers.

Grease Pencil Layers can be locked (lock icon) and hidden (eye icon). The third symbol is to unprotect selected colors from further modifications.

Add / Delete

Right besides the layer list box there is a add button and a delete button. The plus button adds a new layer, The minus button removes the current layer.

Layer Specials menu



Below the add and delete buttons there is a text menu with some further options.

Duplicate Layer

Duplicates the currently selected layer.

Show All

Unhides all hidden layers.

Hide Others

Hides all layers but the selected.

Lock All

Locks all layers.

Unlock All

Unlocks all layers.

Merge Down

Merges all layers into one.

Move Up / Move down

Moves the currently selected Grease pencil layer one up or down the list.

Lock Unlock unselected / Show Hide unselected

Lock Unlock unselected toggles the lock for the unselected layers.

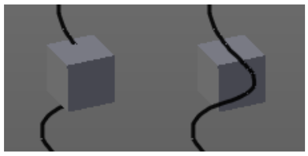
Show Hide unselected toggles the visibility for the unselected layers.

Opacity

Opacity sets the opacity of the current grease pencil stroke.

X Ray

X Ray makes the grease pencil stroke appear in front of objects. Without X Ray the stroke will be invisible behind objects.



Show Points

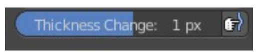
Shows the points in the current grease pencil stroke.

Tint

Tint tints the color of the current grease pencil stroke with the tint color.

The upper field is a color picker where you can select a color. The fac slider defines the blending factor between the grease pencil stroke color and the tint color.

Thickness Change

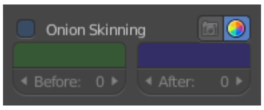


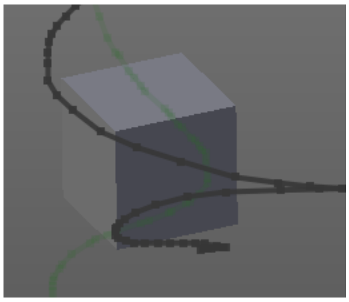
Increase or decrease the thickness of the grease pencil stroke.

Lock Frame

You can draw grease pencil strokes in different frames. Here you can lock those frames from further editing.

Onion Skinning





You can draw grease pencil strokes in different frames. With onion skinning you can display the strokes from the previous and following frames as ghost drawings.

Onion Skinning checkbox

Activates / deactivates the onion skinning.

Use always ghosts

When activated the ghost images will also show in rendering.

Use custom colors

Here you can choose to display the ghost drawing in predefined colors, or in their original colors. Default is to display the predefined colors.

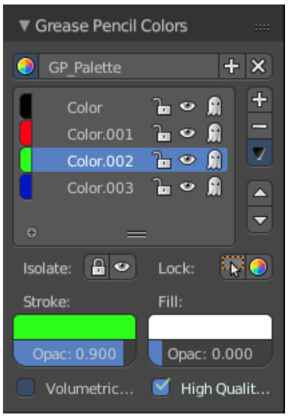
Before

Here you can choose in which color the previous frame gets displayed. And how many frames gets displayed before the current frame.

After

Here you can choose in which color the following frame gets displayed. And how many frames gets displayed after the current frame.

Properties Sidebar - Grease Pencil - Colors Panel



The grease pencil colors panel contains all the settings to set up and define the colors that you use for your grease pencil drawings.

It activates when you start to draw a grease pencil stroke. And shows its content then.

GP Palette

Here you can select, create and delete a color palette for the grease pencil colors. Define some colors in the Color list, then create a new palette with it.

Color List

Here you can add custom colors.

The color field at the beginning of the edit box reveals a color picker when you click at it. Which allows you to define a color.

The string “Color”, “Color 002” and “Color 003” is an edit box which allows you to rename the color. Click into the field to activate it.

The **Lock** symbol allows you to lock the current color.

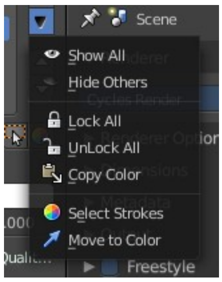
The **eye** symbol allows you to show or hide the current layer.

The **ghost** symbol allows you to display this color with onion skinning.

Add / Delete

Right besides the layer list box there is a add button and a delete button. The plus button adds a new layer, The minus button removes the current layer.

Palette color Specials menu



Below the add and delete buttons there is a text menu with some further options.

Show All

Unhides all hidden colors.

Hide Others

Hides all colors but the selected.

Lock All

Locks all colors.

Unlock All

Unlocks all colors.

Copy color

Copys the color.

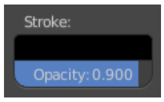
Select strokes

Selects all grease pencil strokes that uses the curent color.

Move to color

Move selected strokes to active color.

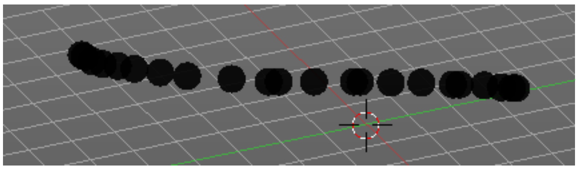
Strokecolor



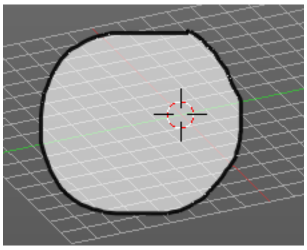
Here you can define the stroke color and set its opacity.

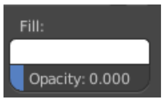
Volumetric Strokes

With Volumetric strokes the grease pencil stroke does not draw as a stroke, but a line of dotted points.



Fill





Fill fills the space between the grease pencil strokes.

The opacity is by default at zero. The fill color shows when you increase the opacity.

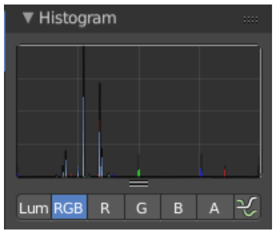
High Quality Fill

Fill Strokes uses high quality to avoid glitches. But this gives slower fps while animation. Here you can turn it off.

Tool Shelf - Scopes Tab

The Scopes tab contains several panels with analytic tools.

Histogram



Histogram is a graph that displays the color distribution of the pixels in the image. The range from left to right goes from 0, which represents black, to 255, which represents white. And the height represents how much pixels in the image have this specific color.

The different display modes are:

Luma

Shows the luminosity of an image.

RGB

Shows the RGB channels.

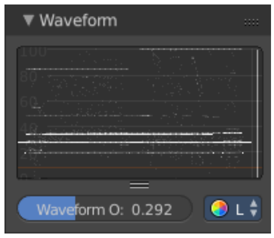
R/G/B/A

Shows the R, G, B, A channels.

Show line

Displays lines instead of filled shapes.

Waveform

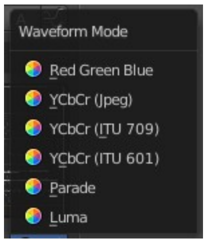


The waveform graph is another way to display the color information of the image.

Waveform Opacity

Here you can adjust the opacity of the pixels in the waveform histogram.

Waveform Mode



This is a dropdown box menu where you can choose further options.

Luma

Shows the luminosity of an image.

Parade

The RGB channels are shown side-by-side.

YCbCr (jpeg)

Displays the channels in the YCbCr standard, fitting to Jpg.

YCbCr (ITU 709)

Displays the channels in the YCbCr standard, fitting to ITU 709 standard.

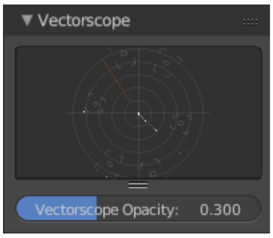
YCbCr (ITU 601)

Displays the channels in the YCbCr standard, fitting to ITU 601 standard.

Red Green Blue

Shows the RGB channels overlaid as a “Full color” waveform.

Vectorscope

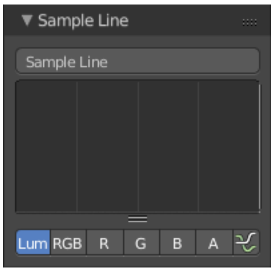


This is a graph to display the pixel color distribution in the image in a radial way. The radial arrangement allows to display data that is behind the maximum 255 of the normal histogram. This can happen with 32 bit float images for example.

Vectorscope Opacity

Here you can adjust the opacity of the pixels in the waveform histogram.

Sample Line



The Sample Line scope is a graph that allows you to get the sample data from a line.

Click at the Sample Line button above the histogram to draw a line. The pixels under this line will then be used to read the sample data from.

The different display modes are:

Luma

Shows the luminosity of an image.

RGB

Shows the RGB channels.

R/G/B/A

Shows the R, G, B, A channels.

Show line

Displays lines instead of filled shapes.

Scope Samples

Scope samples contains general option settings for the above histograms.

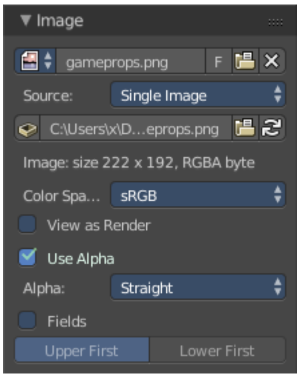
Full Sample

Sample every pixel.

Accuracy

Proportion of original image source pixel lines to sample.

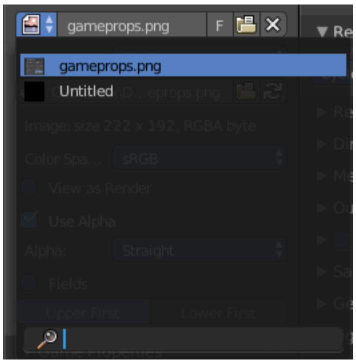
Properties Sidebar - Image panel



Here you will find some image related settings.

This settings are different, dependant of what Source type you have loaded.

Image Prop



This property contains the list of loaded images. It displays the name of the currently selected image.

From left to right ...

List of images in the scene

This is a list of the images in the scene. Here you can switch to other images or movies.

Image Edit Box

Here you can read the name of the currently selected image. And you can rename the image here too.

Fake User

Wit this button you assign a fake user to this selected image.

Data, like images, that is not longer linked to anything else gets removed when you save and reload a scene. Bforartists has the concept of fake users to go around this behaviour. An image with a fake user is in fact linked to something. And so it is not lost when you save and reload the scene.

Search form

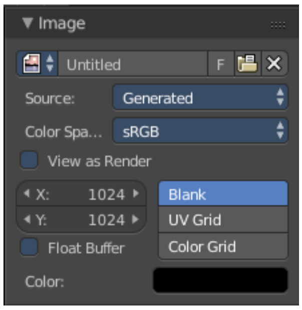
Here you can search for specific images.

Source

Here you can define what kind of image is loaded. The settings of the Image are different, dependant of what type you choose here.

Note that when you switch an Image to Generated for example, then the image information gets lost.

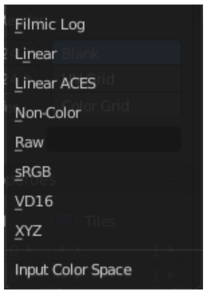
Generated



When you create a new image, then this image is generated.

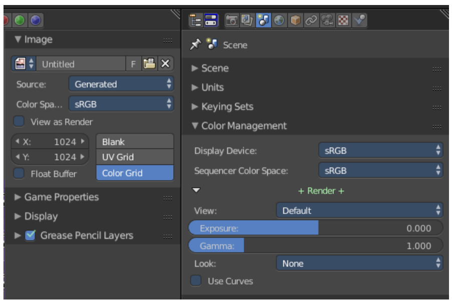
Generated images does not have a path.

Color Space



Here you can choose the color space type for the image.

View as Render



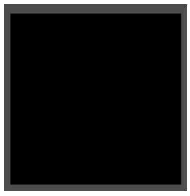
Toggles the color management settings in the color management panel in the properties window on and off.

X / Y

The image width and height.

Float Buffer

Use a floating point buffer. 8 Bit images uses integers. 32 Bit works with floats.

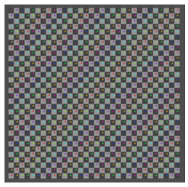


Generated Type Blank

This type displays an image with one blank color

Color

The color of the blank image.

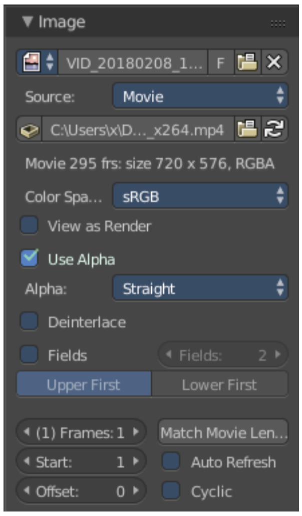


Generated Type UV Grid

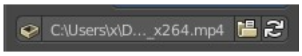
This type displays an with a black and white checker texture but colored dots.

Generated Type Color Grid

This type displays an with a colored checker texture with numbers.



Movie + Image Sequence



Path edit box

Pack

With this button you can pack the movie or the image sequence into the blend file. It gets packed when you save the blend file the next time.

Path edit box

Here you can see and edit the path to your movieor image sequence files.

Open

Here you can open a new movie or image sequence files. A file dialog will appear.

Refresh

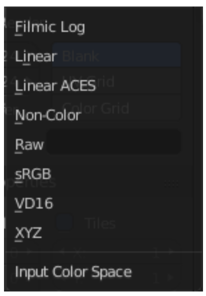
Here you can reread the movie or image sequence files.

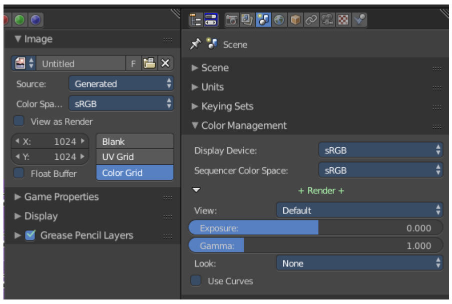
Info string

Some information about the currently loaded movie. Frames, resolution and colorspace.

Color Space

Here you can choose the color space type for the movie or image sequence files.



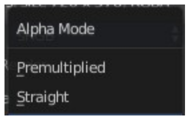


View as Render

Toggles the color management settings in the color management panel in the properties window on and off.

Use Alpha

Use an alpha channel if available.

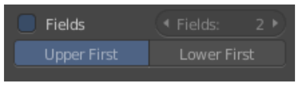


Alpha

Here you can choose the alpha channel mode. Straight or Premultiplied.

Deinterlace

Deinterlace the movie file on load.



Fields

Use fields of the image.

In video, a field is one of the many still images which is displayed sequentially to create the impression of motion on the screen. Two fields makes one video frame.

Number of fields

The number of fields to use. Usually two.

Upper or Lower First

Order of video fields. Upper or Lower first.

Frames

Number of frames of the movie or image sequence files to use.

Start

The start frame.

End

The end frame.

Match Movie Length

Sets the value in the Frames edit box to the movie length.

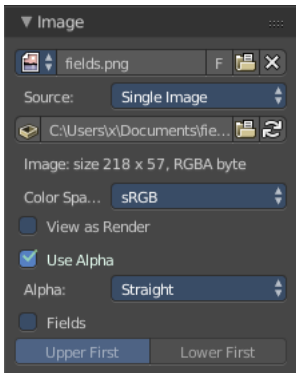
Auto Refresh

Always refresh image on frame changes

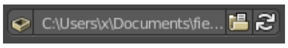
Cyclic

Cycle the images in the movie.

Single Image



Path edit box



Pack

With this button you can pack the movie or the image sequence into the blend file. It gets packed when you save the blend file the next time.

Path edit box

Here you can see and edit the path to your movieor image sequence files.

Open

Here you can open a new movie or image sequence files. A file dialog will appear.

Refresh

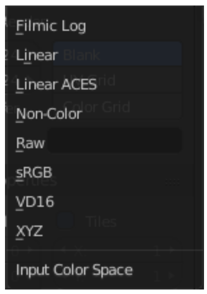
Here you can reread the movie or image sequence files.

Info string

Some information about the currently loaded image. Resolution and colorspace.

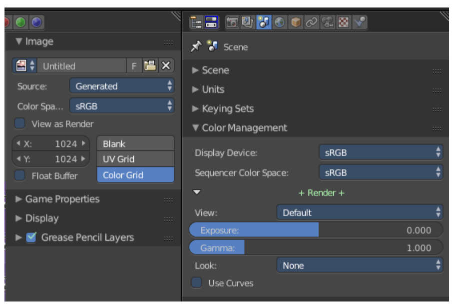
Color Space

Here you can choose the color space type for the movie or image sequence files.



View as Render

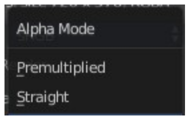
Toggles the color management settings in the color management panel in the properties window on and off.



Use Alpha

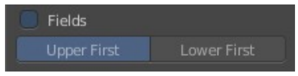
Use an alpha channel if available.

Alpha



Here you can choose the alpha channel mode. Straight or Premultiplied.

Fields



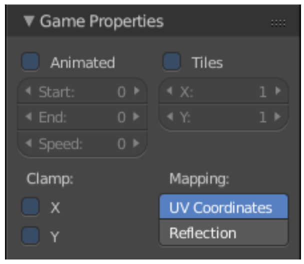
Use fields of the image.

In video, a field is one of the many still images which is displayed sequentially to create the impression of motion on the screen. Two fields makes one video frame.

Upper or Lower First

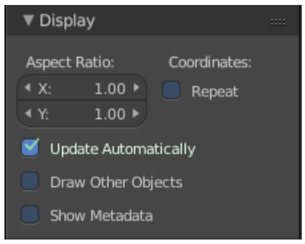
Order of video fields. Upper or Lower first.

Properties Sidebar - Game Properties panel



The BGE is fully accessible and functional. But Bforartists does officially not maintain, support or document any game related settings. Please refer to the Blender manual.

Properties Sidebar - Display panel with Image



The Display panel shows different content, dependant of what you do. Here we will cover the image related content.

Aspect Ratio

Here you can set the aspect ratio of the image.

Update Automatically

Update other editor windows simultaneously with the changes or transforms in the UV Image Editor.

Draw Other Objects

Draw other selected objects that shares the same image.

Show Metadata

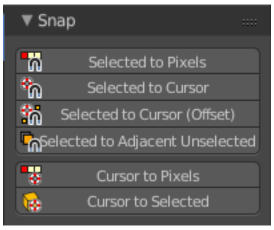
Draw Metadata properties of the image.

Coordinates

Repeat

With this ticked the image is repeated in the UV Image canvas.

Tool Shelf - Tools Tab - UV Editing - Snap panel



The Tools tab and its content just appears when you do UV editing at a mesh object.

Here you can find some snapping tools for the UV geometry.

Selected to Pixels

Selected to Pixels saps the selected element(s) to the nearest pixel.

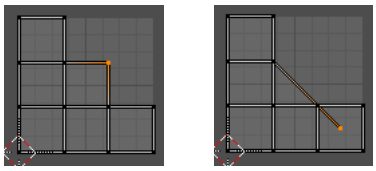
Selection to Cursor

Selection to Grid snaps the selected element(s) to the 2D cursor. ALL selected elements will end at cursor position. For example all selected vertices.

Selection to Cursor (Offset)

Selection to Grid snaps the selected element(s) to the 2D cursor. The centre of the selected elements will snap to the 2D cursor. A group of vertices for example will remain its shape.

Selection to Adjacent unselected



Selection to Adjacent unselected snaps the selected element(s) to the center of the closest adjacent unselected element(s) in the 3D space.

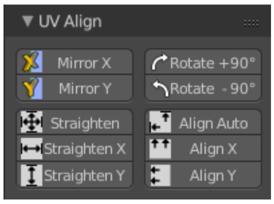
Cursor to Pixels

Cursor to Pixel snaps the 2D cursor to the nearest pixel

Cursor to Selected

Cursor to Selected snaps the 2D cursor to the selected element(s)

Tool Shelf - Tools Tab - UV Editing - UV Align panel

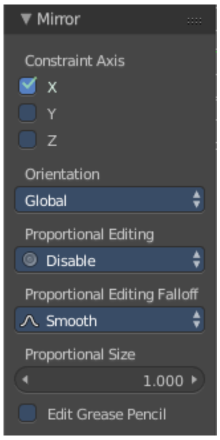


The Tools tab and its content just appears when you do UV editing at a mesh object.

Here you can find various align tools. The last operator for this tools can be found in the 3D view.

Mirror X

Mirrors the selection along the X axis. The mirror point is the pivot of the selection.



Mirror Y

Mirrors the selection along the Y axis. The mirror point is the pivot of the selection.

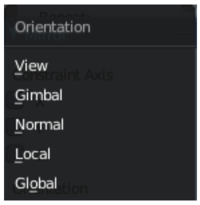
Last Operator Mirror

The Last Operator Mirror panel gives you tools to adjust the mirror action.

Constraint Axis

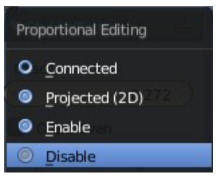
Constraint Axis gives you the possibility to define the mirror axis. You can choose more than one axis here.

Orientation



Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.

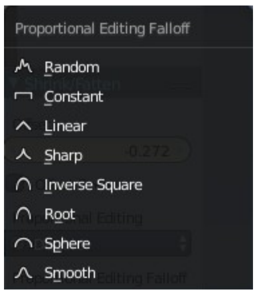
Proportional Editing



Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.

Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



Proportional size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

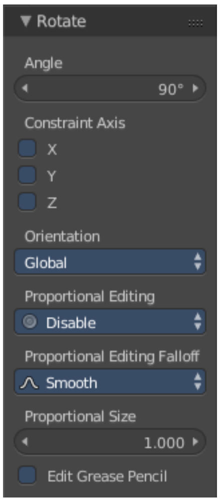
Rotate +90

Rotates the selection by 90 degrees clockwise.

Rotate -90

Rotates the selection by 90 degrees counter clockwise.

Last Operator Rotate



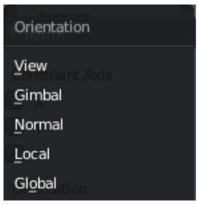
Angle

The amount that you want to rotate.

Constraint Axis

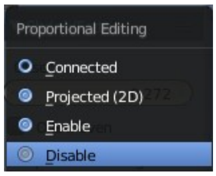
Constraint Axis gives you the possibility to define the constraint axis. You can choose more than one axis here.

Orientation



Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.

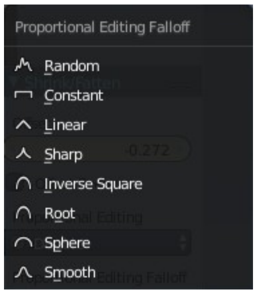
Proportional Editing



Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.

Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



Proportional size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

Straighten

Straightens the selected geometry in both directions, X and Y axis.

Straighten X

Straightens the selected geometry along the X axis.

Straighten Y

Straightens the selected geometry along the Y axis.

Align Auto

Aligns the selection. The align axis gets chosen from the selection itself. When it's higher than tall, then it aligns along the Y axis. When it's taller than high, then it aligns along the X axis.

The align point is the pivot of the selection.

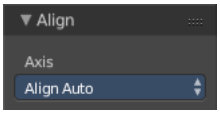
Align X

Aligns the selection along the X axis. The align point is the pivot of the selection.

Align Y

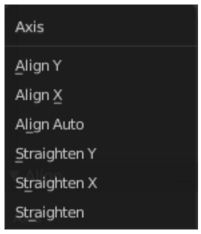
Aligns the selection along the Y axis. The align point is the pivot of the selection.

Last operator Align



The Last operator Align unions all the single straighten and align actions in one operator.

Axis



Lists the straighten and align methods again.

Tool Shelf - Tools Tab - UV Editing - UV Tools

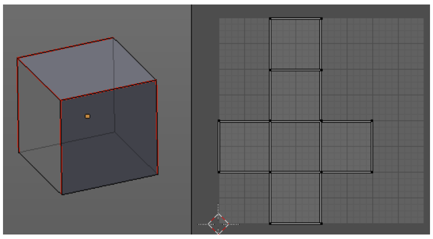
The Tools tab and its content just appears when you do UV editing at a mesh object.

The UV tools are divided into two sections. UV Unwrap and Modify UV

UV Unwrap

The Unwrap section.

Mark Seam



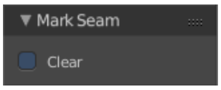
The unwrap algorithms Angle based and Conformal requires to have edges marked as seams. Think of it as a cutting pattern for a trouser for example. Such a trouser is also made of fabric patterns.

Same goes for the UV patches when you use Angle based or conformal unwrapping. You need to cut your mesh into parts and mark edges as seams, so that the algorithm knows where the seams are.

Mark seam marks the currently selected edge(s) as a seam. Seam edges will be displayed as red in the 3D viewport. But not in the UV Image Editor. The UV patches represents the seams.

You need to unwrap the mesh again when you want to apply changes.

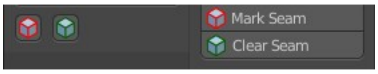
Last Operator Mark Seam



Clear

Clears the seam instead of marking it.

Clear Seam



Clear seam removes the seam from the currently selected edge(s) in the 3D view.

Mark Seams from Islands

Unwrapping creates the UV geometry from the 3D object. You mark the seams, then you click at unwrap, and the UV mesh gets created.

Mark Seams from islands goes the other way around for marking seams. It creates the seams at the mesh object in the 3D view from the UV geometry in the UV Image Editor.

A use case is wheen you import meshes. Then you usually just have the UV patches in the UV Image editor. And when you want to modify the UV's further, then you need the seams at the mesh.

Unwrap ABF

Unwrap ABF unwraps the selected geometry with the method Angle based. ABF stands for Angle Based Flattening. ABF can give a bit better result than LSCM when unwrapping organic shapes.

Note that you need to have the geometry selected in the 3D view.

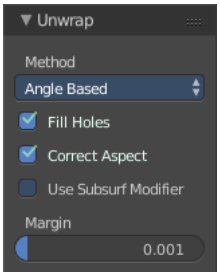
Unwrap LSCM

Unwrap ABF unwraps the selected geometry with the method Angle based. ABF stands for Angle Based Flattening. LSCM can give a bit better results than ABF with geometric shapes.

Note that you need to have the geometry selected in the 3D view.

Last Operator Unwrap

The last operator appears in the 3D view. Unwrap ABF and Unwrap LSCM shares the same Last Operator.



Method

Method is a drop down box where you can choose between Unwrap method Angle Based and Conformal.

Fill Holes

Fill holes in the mesh before unwrapping.

Correct Aspect

Take the Image Aspect Ratio into account.

Use Subsurf Modifier

Unwraps an existing Subsurf Modifier. You need to add a Subsurf Modifier first.

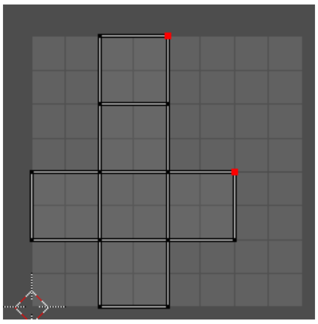
Margin

The distance between the single UV patches.

Modify UV

The tools to modify the UV geometry.

Pin



Pins the selected vertices . This vertices are now nailed for the unwrap algorithms Angle based and Conformal. Their positions will not change when you repeat the unrwapping. And the algorithms will try to fit the rest of the geometry to this pinned vertices.

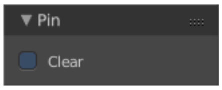
Pinned vertices are marked red.

A use case is for example when you have a distorted result for symmetric geometry like a face with the Conformal method. Then you can try to align two center vertices, pin them, and repeat the conformal method. It may be more symmetrical afterwards.

Unpin

Unpins pinned geometry.

Last operator Pin



This last opeartor appears in the 3D view. Pin and unpin shares the same last operator.

Clear

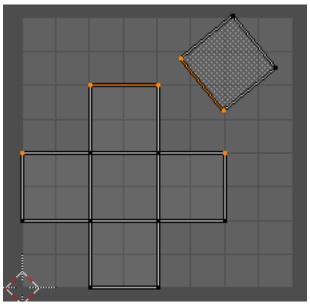
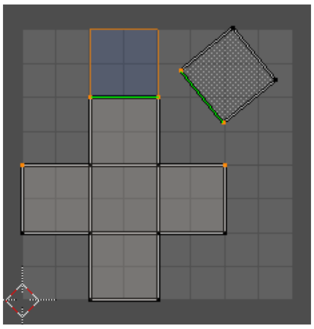
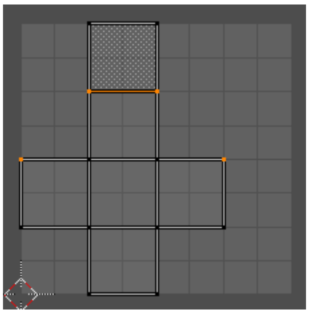
Unpins pinned geometry.

Weld

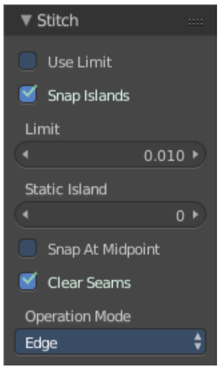
Welds selected vertices together. The weld happens at the center point.

Stitch

Stitch tries to union UV patches along the selected edges or vertices. You need to click the tool twice. The first click previews the stitching. The second click confirms the action then.

Last Operator Stitch



This last opeartor appears in the 3D view.

Use Limit

Just snap when the elements are below a given distance.

Snap Island

Snap the whole UV patch, or just the selected edge(s)/vertices

Limit

The limit distance for Use Limit.

Static Island

Here you can adjust which island stays in place when stitching.

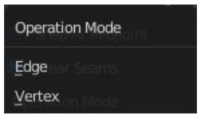
Snap at Midpoint

Snap at the center point of the two elements instead the first to the last.

Clear Seams

Unmarks seams when stitching.

Operation Mode

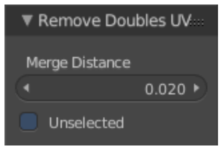


The operation mode. Edges or Vertices.

Remove Doubles UV

Welds overlapping UV vertices together.

Last operator Remove Doubles UV



This last opeartor appears in the 3D view.

Merge Distance

The distance below the vertices gets merged.

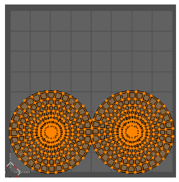
Unselected

Merge selected to other unselected vertices.

Average Island Scale

Scales the selected UV geometry to have the same relative size than the rest of the mesh. So that the texels at the mesh have roughly the same size everywhere.

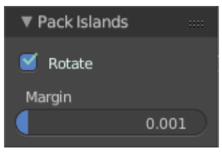
Pack Islands



Pack Islands tries to pack the selected UV geometry as close together as possible. Without to waste too much empty space.

Note that the algorithm fails at round geometry. It calculates with rectangle shapes.

Last Operator Pack Islands



This last opeartor appears in the 3D view.

Rotate

Allow the UV patches to be rotated while the pack operation.

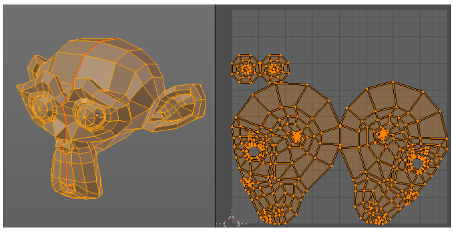
Margin

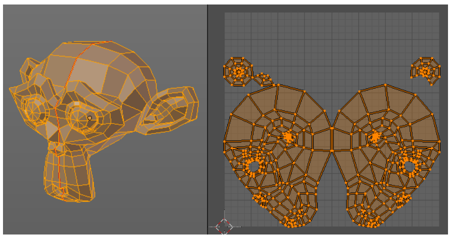
UV patches needs a margin between the single patches. So that the pixels of the texture doesn't bleed into other areas. Here you can adjust this margin.

Copy Mirrored UV coords

Copies and pastes the selected UV geometry on the X axis based on a mirrored mesh.

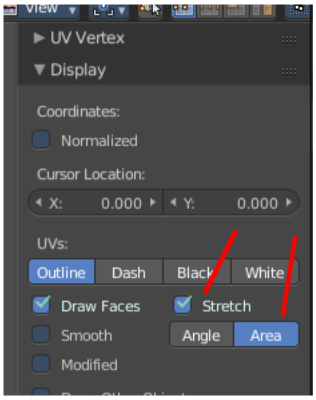
Use UV Select Sync must be off. The tool does not work with Use UV Select Sync on. And it is not fully reliable as our example shows.





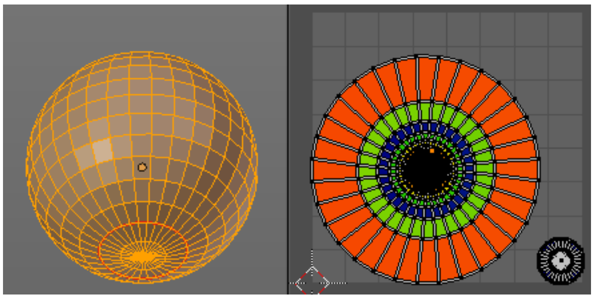
Minimize Stretch

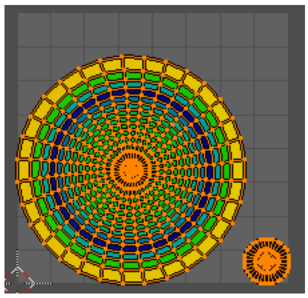
You might end in a UV mapping result that still shows unwanted distortions here and there. For example when you uv map a human face. Minimize Stretch tries to minimize this stretching effects in the UV patches.



To view stretched areas at your UV patches, tick Stretch in the Properties Sidebar in the Display panel, and switch from Angle to Area. Then a stretch mask gets displayed. The color range goes from blue to green to red, where blue is minimal stretch and red is maximal stretch.

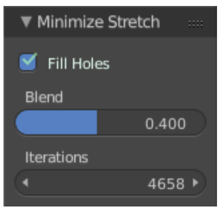
Let's explain it with an example. A sphere where the cut is nearly at the pole. And uv mapped with Angle Based. The result will of course show heavy stretched areas.





Note that the UV geometry must be selected in the UV Image editor. Now let's use the Minimize stretch tool. The algorithm now first tries its best to find the best fitting result that shows fewest stretching across the overall UV geometry.

The header shows a help text while the algorithm works. The Blend factor is the value between the original unwrapped UV mesh, and the maximum minimized stretch. You can also set this value manually by using the scroll wheel at your mouse, or with the + and - keys.



Last Operator Minimize Stretch

Fill Holes
Fill holes virtually fills holes before unwrapping to avoid overlappings and to preserve the geometry.

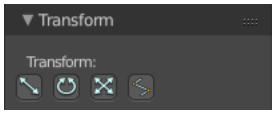
Blend
The Blend factor is the value between the original and the maximum minimized stretch.

Iterations
Number of iterations for the Minimize stretch algorithm.

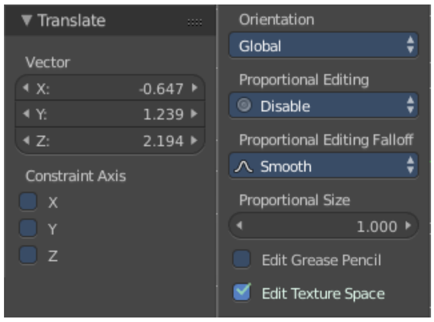
Tool Shelf - Tools Tab - UV Editing - Transform panel

The Tools tab and its content just appears when you do UV editing at a mesh object.

Here you will find some navigation tools.



Translate



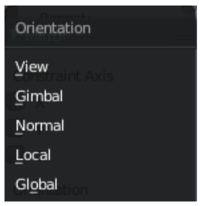
Moves the selected UV geometry in the viewport by moving the mouse.

Last Operator Translate

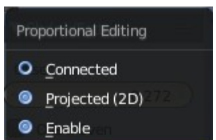
Vector
Here you can adjust the position values for the three values

Constraint Axis
Here you can limit the position relative to the source object.

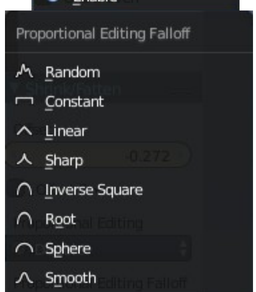
Orientation
Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.



Proportional Editing
Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.



Proportional Editing Falloff
Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



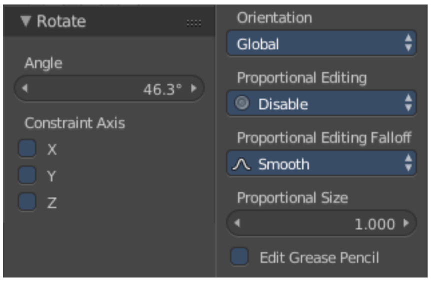
Proportional Size
Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Edit Grease Pencil
Edit Grease Pencil edits the selected Grease Pencil strokes.

Edit Texture Space
With Confirm on Release checked the action gets performed when you release the mouse button.

Rotate
Rotates the selected UV geometry in the viewport by moving the mouse.

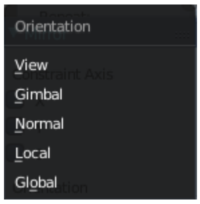
Last Operator Translate



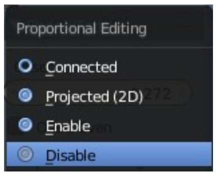
Angle
Here you can adjust the rotation angle.

Constraint Axis
Here you can limit the position relative to the source object.

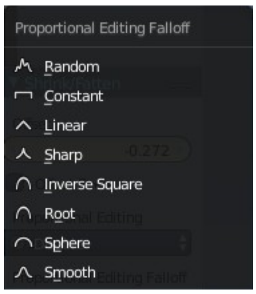
Orientation
Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.



Proportional Editing
Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.



Proportional Editing Falloff
Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



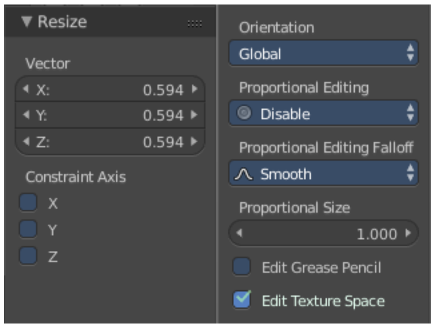
Proportional Size
Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Edit Grease Pencil
Edit Grease Pencil edits the selected Grease Pencil strokes.

Scale

Scales the selected UV geometry in the viewport by moving the mouse.

Last Operator Resize



Vector

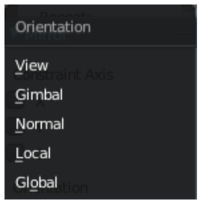
Here you can adjust the position values for the three values

Constraint Axis

Here you can limit the position relative to the source object.

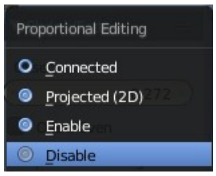
Orientation

Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.



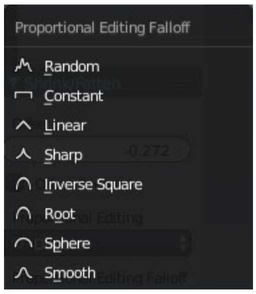
Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.



Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



Proportional Size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

Edit Texture Space

With Confirm on Release checked the action gets performed when you release the mouse button.

Shear

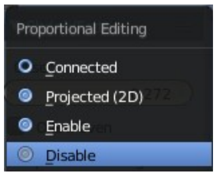
Shear shears the selection.

Last Operator Shear

Offset

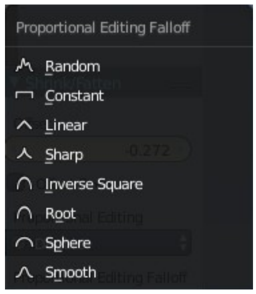
Adjust the offset

Proportional Editing



Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.

Proportional Editing Falloff

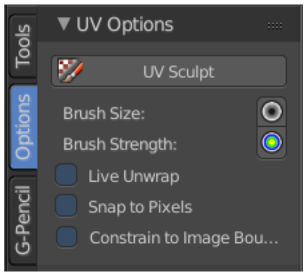


Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

Edit Grease Pencil

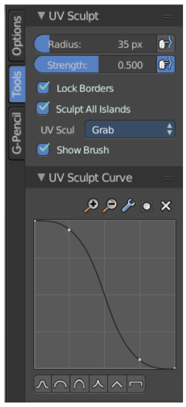
Edit Grease Pencil edits the selected Grease Pencil strokes.

Tool Shelf - UV Editing - Options Tab - Options Panel



In this panel you will find some options for UV editing. It has just one panel. The Options panel.

UV Sculpt



Here you can enable the UV sculpting mode. With UV Sculpt enabled you can sculpt the UV geometry.

When you turn on UV Sculpt, then the UV editing tools in the Tools tab disappears, and you will find the sculpting tools instead.

Brush Size

Here yo can adjust the brush size for the UV sculpt. Hotkey tool! See also the Tools tab. There are the sliders for this.

Brush Strength

Here yo can adjust the brush size for the UV sculpt. Hotkey tool! See also the Tools tab. See also the Tools tab. There are the sliders for this.

Live Unwrap

Continously unwrap the selected UV Island while transforming pinned vertices.

Snap to Pixels

Snap UV's to the closest pixel while editing.

Constraint to Image bounds

Constraints the UV geometry to stay within the image bounds while editing.

Tool Shelf - UV Sculpt - Tools Panel

When you turn on UV Sculpt in the UV Options, then the UV editing tools in the Tools tab disappears, and you will find the sculpting tools instead.

There are two panels now for sculpting the UV geometry. UV Sculpt Panel and UV Sculpt Curve Panel.

UV Sculpt Panel

Radius

Here yo can adjust the brush size for the UV sculpt. See also the Options tab.

Strength

Here yo can adjust the brush strength for the UV sculpt. See also the Tools tab.

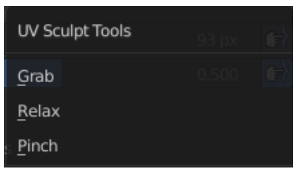
Lock Borders

With this option checked, the borders of the UV patches will not deform with sculpting.

Sculpt all Islands

With this option checked all UV patches that are covered by the brush will be deformed. Without this option checked just the UV patch under the mouse will be sculpted.

UV Sculpt Tools

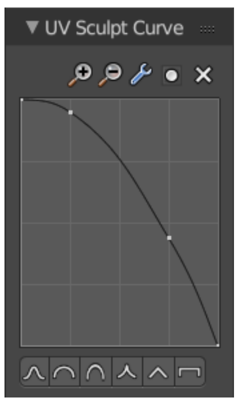


Here you can choose between three different brush types.

Show Brush

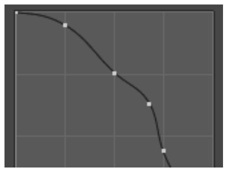
Shows the brush radius while sculpting.

UV Sculpt Curve Panel



Here you can adjust the brush falloff method. Use a curve shape, then adjust the handles.

Curve points can be moved by simply clicking at them and move them with the mouse.



A new handle point can be added by left clicking at the curve.

Selected curve points are slightly brighter. And when you select a curve point, then you will see two edit boxes with coordinates of this curve point.

Upper toolbar

Zoom in

Zooms in into the curve viewport.

Zoom out

Zooms out of the curve viewport

Tools

Reset View

Resets the curve viewport to initial zoom.

Vector Handle

Sets the handle type of the curve point to Vector Handle. This one breaks the tangent at the curve handle, and makes it an angle.

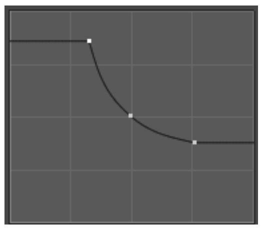
Auto Handle

Sets the handle type of the curve point to Auto Handle.

Auto Clamped Handle

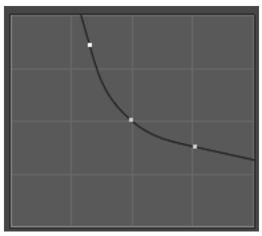
Sets the handle type of the curve point to Auto Clamped Handle.

Extend Horizontal

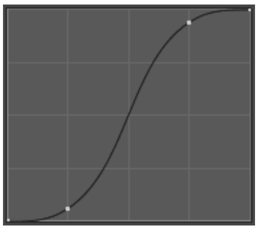


The line before and last handle point will go horizontal.

Extend Extrapolated



The line before and last handle point will go extrapolated from the curve.



Reset Curve

Resets the curve, and removes all handle points. Unfortunately this resetted curve points into the wrong direction.

Clipping

Use Clipping

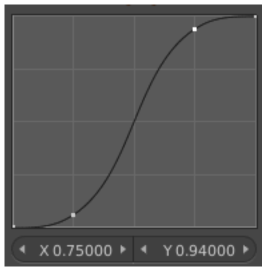
Forces the curve points to stay between specified values.

Min X/Y and Max X/Y

Set the minimum and maximum bounds of the curve points.

Delete Point

Deletes the selected curve point. The first and last curve point cannot be deleted.



X Y

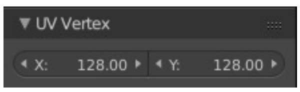
When you have a curve point selected, then you will see two edit boxes below the curve viewport. Here you can adjust the position of the curve point in a numerical way.

Curve presets

Below the curve viewport you will find some curve presets.

Properties Sidebar - UV Editing

When you are in UV editing then the Properties sidebar will show UV editing related properties.



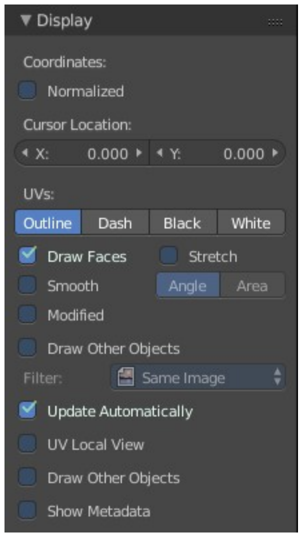
UV Vertex panel

X / Y

Here you can adjust the position of your current selection.

Without an image loaded the range goes from 0 to 255. With an image loaded you will work with the dimensions of the image.

Display Panel



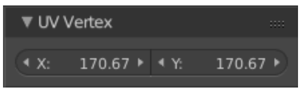
The Display panel has different content, dependant of what you work at. It shares its settings between image and UV editing related settings.

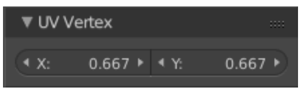
Coordinates

Normalized

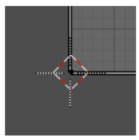
Draws the coordinates in a range of 0 to 1 instead of pixels. This affects for example the UV Vertex values.

First image is coordinates of a vertex in pixels. Second image shows it with the range.





Cursor Location

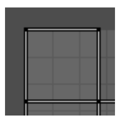


X / Y

The location of the 2D cursor in the image.

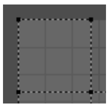
UV's

Outline



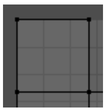
Displays the UV mesh wire as white with a black outline.

Dash



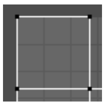
Displays the UV mesh wire as dashed lines.

Black



Displays the UV mesh wire as pure black.

White

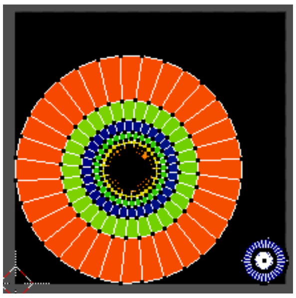


Displays the UV mesh wire as pure white.

Draw Faces

Draws the faces between the wireframe lines.

Stretch



Displays stretched areas in the mesh by color. The range goes from blue across green up to red. Where blue is the fewest stretch, and red is the strongest stretch.

This setting is required when you want to work with the minimize stretch tool, and want to see the stretched areas.

Angle

Shows the angular distortion between UV and 3D angles.

Area

Shows the area distortion between UV and 3D faces.

Smooth

Draw the UV wire with antialias.

Modified

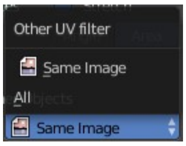
Draw edges after modifiers are applied.

A use case for this setting is the SDS modifier. Without this setting just the original mesh gets displayed. With this setting, also the edges of the SDS modifier gets displayed.

Draw Other Objects

Draw other selected objects that shares the same image.

Other UV Filter



Draw just for same image, or all images.

Update Automatically

Update other editor windows simultaneously with the changes or transforms in the UV Image Editor.

UV Local View

Draw only faces with the currently displayed image assigned.

Draw Other Objects

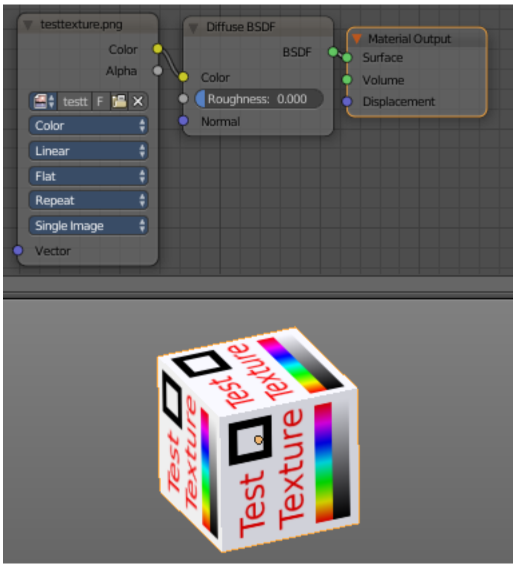
Same as Draw other objects above. This one is a double menu entry.

Show Metadata

Draw Metadata properties of the image.

Applying Textures

Apply material to mesh



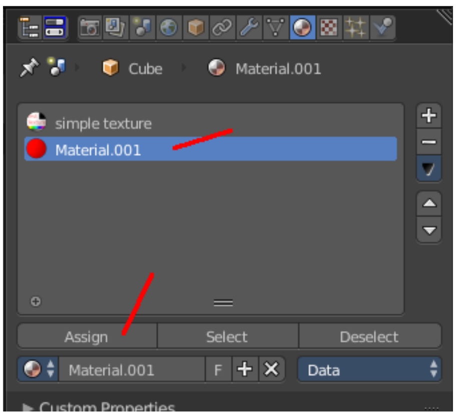
The most obvious way to apply a texture is first to create a valid UV mapping, then to create a material with a texture. And assign this material to the mesh.

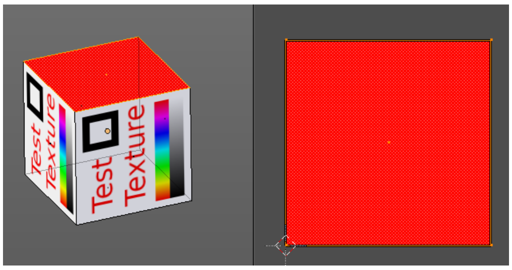
We use the Cycles material system here. But the method works the same with Blender Render.

Apply material to Mesh parts

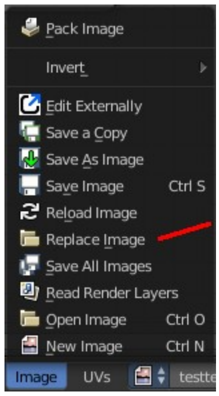
In Edit Mode you can apply different materials to specific faces too. First, create a second material like the one above, with our second texture.

Enter Edit Mode, select the faces that you want to map with this other texture. In the Properties Editor, click at Assign button. Then this second material gets assigned to the selected geometry.





Replace Texture



When you want to replace a texture, then you can either do this from the material. Or you choose the Replace Image menu item in the Image menu.

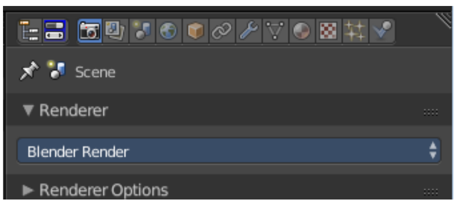
This will replace the currently selected texture by the one that you load.

Checker texture without material

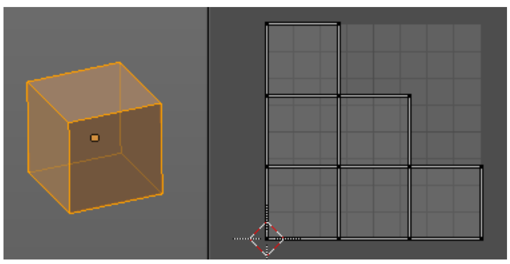
There are cases where you want to test the UV mapping beforehand, with a checker texture for example. To check if there are strong distortions in the UV mapping. This checker texture can of course be assigned with a material, like shown above. But there is also an internal way, without to create and assign a material first.

Note!
This method just works with the Blender Render and Blender Game. It will not work with Cycles Renderer. Also note, this is no way to assing a texture to a mesh! This image will not render. It is just a preview. For rendering a material is required!

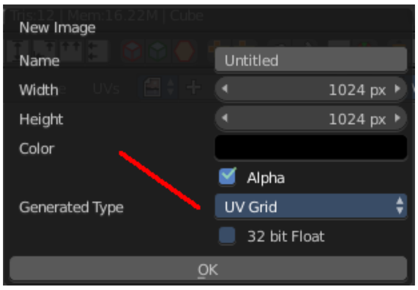
Switch to Blender Render.



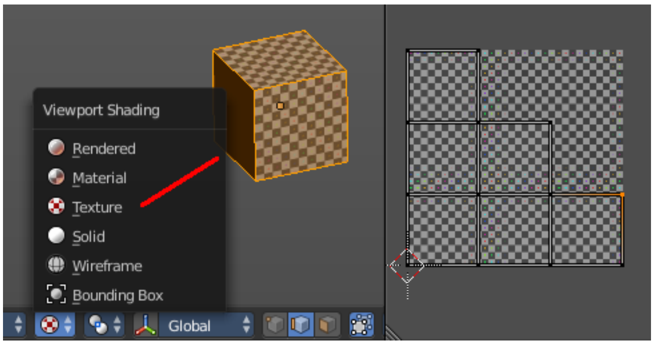
Unrwap your mesh.



Create a new texture, and set it to UV Grid or Color Grid.



Last needed step to see the checker texture in the viewport is to set the Viewport shading to Texture.



Editors - Video Sequence Editor

Video Sequence Editor

This manual part is grabbed 1: 1 from Blender.

Note that the Video Sequence Editor is not officially supported in Bforartists. It is still there. It is fully functional. You can work with it, the layout exists. It's the same VSE than in Blender. But Bforartists does not support it officially. We recommend to use something more useful. Everything is better than the Video Sequence Editor in Bforartists. Kdenlive is opensource and multiplatform. Hitfilm has a free version. Or do yourself a favour and spend the few bucks for one of the commercial solutions. It is well spent money.

NOTE ALSO THAT THE BFORARTISTS KEYMAP DOES NOT HAVE THE HOTKEYS THAT ARE MENTIONED IN THIS MANUAL PART. THEY ARE REMOVED. YOU WOULD HAVE TO USE THE BLENDER KEYMAP TO USE THE VSE.

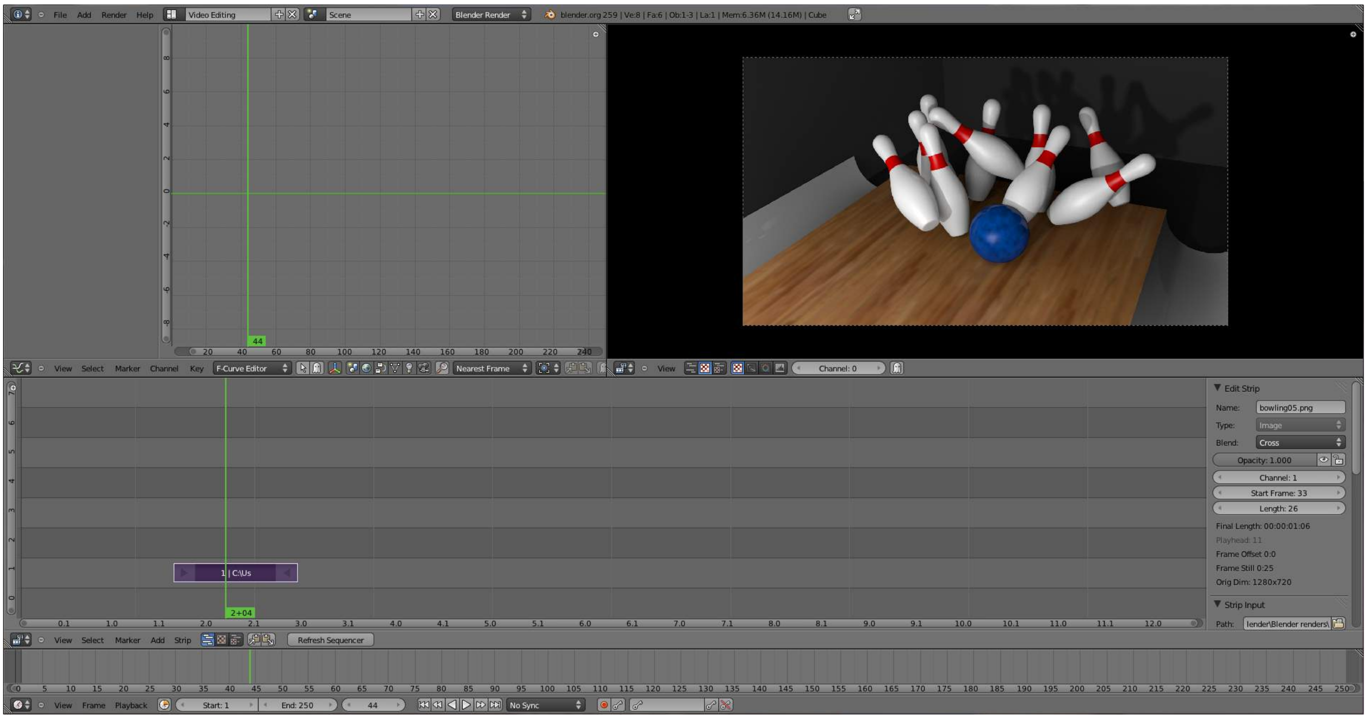
This manual part is just up because it doesn't hurt to have it online since the functionality is there.

Introduction

In addition to modeling and animation, Bforartists has a fully functional Video Sequence Editor (VSE) as well as an advanced node-based editor that also manipulates a video stream. *Compositing Nodes* operate equally well on images or video streams, and can apply detailed image manipulation on the stream.

The VSE within Bforartists is a complete video editing system that allows you to combine multiple video channels and add effects to them. You can use these effects to create powerful video edits (especially when you combine it with the animation power of Bforartists!) Furthermore, it is extensible via a plugin system to perform an unlimited number of image manipulations.

Using the VSE, you load multiple video clips and lay them end-to-end (or in some cases, overlay them), inserting fades and transitions to link the end of one clip to the beginning of another. Finally, add an audio track so you can synchronize the timing of the video sequence to match it. The result of using the VSE is your finished movie.



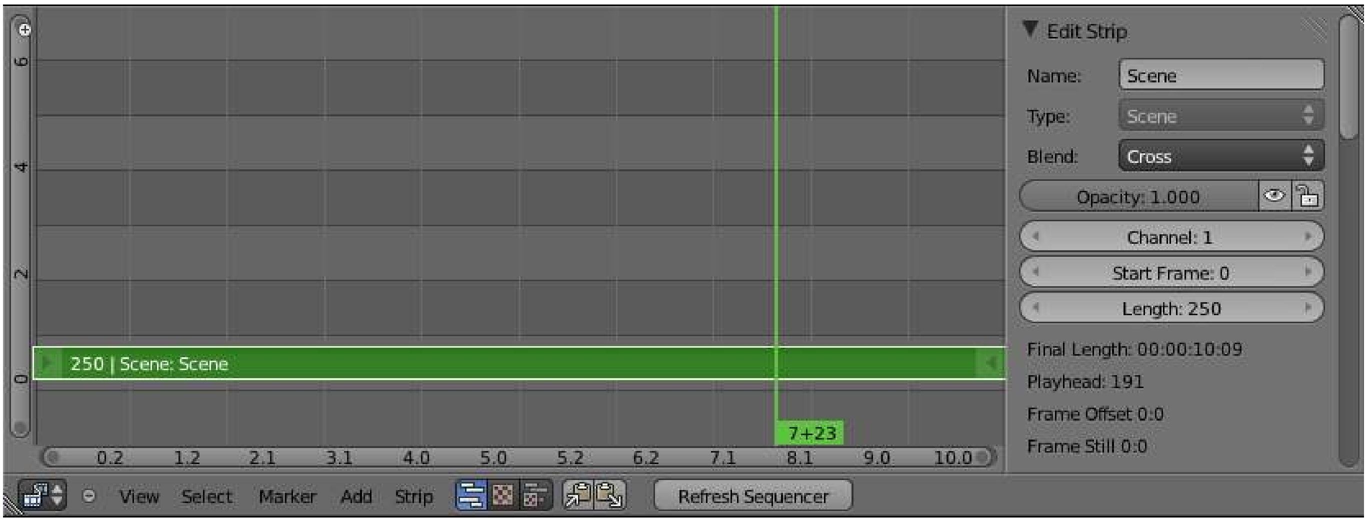
Default Video Editing screen layout.

The Video Sequence Editor has a header (where the menu and view modes are shown) and a workspace, and works in one of several view modes. The Marker menu allows you to add markers in the VSE. Markers are shared across animation editors. See *Markers*

The sequencer workspace is horizontally striped into channels and each video strip will go in a horizontal channel. Each channel is numbered on the left-hand side, starting from 0 and going up.

Reference
The first channel *0* is unusable as a place to put strips. This is because it is used by the *Sequencer Display* to show a composite of all strips above channel *0*.

Stripes toward the bottom are more dominant, which we'll get to in a minute. In the x direction, seconds of animation or frames of animation (`Ctrl-T` to choose) are used as the measure of time (seconds 1 through 7 are shown). You can scale the time using the zoom keys or mouse actions (see the Reference for more info).



Video Sequence Editor in Sequence display mode

Reference
By default the Sequencer is enabled however, it can be disabled in the *Post Processing Panel*.

Editing and Manipulating

Adjusting the View

Use these shortcuts to adjust the sequence area of the VSE: Pan `MMB` Zoom `Wheel` Vertical Scroll use `Shift-Wheel`, or drag on the left scroll bar. Horizontal Scroll use `Ctrl-Wheel`, or drag on the lower scroll bar. Scale View Vertically, drag on the circles on the vertical scroll bar. Scale View Horizontally, drag on the circles on the horizontal scroll bar.

As usual, the View Menu controls what and how you view in the workspace.

Properties Panel
: The Properties Panel contains options for the way the preview is displayed.

View all Sequences `Home`
: Zooms (out) the display to show all strips.

Fit preview in Window `Home`
: Resizes preview so that it fits in the window.

Show Preview `1:1` `Numpad1`
: Resizes preview to a `1:1` scale (actual size).

View Selected `NumpadPeriod`
: Zooms in the display to fit only the selected strips

Use this when working arranging a lot of strips and you want to use all of your screen to work.

Reference
Mode: Sequence

Menu: View –> Show Frames, View –> Show Seconds
Hotkey: `Ctrl-T`

Draw Frames
: Displays the frame number instead of the time, in the Frame Number Indicator.

Show Frame Number Indicator
: Toggles the units of measure across the bottom of the workspace between seconds or frames.

Safe Margin
: Displays an overlay on the preview, marking where title safe region is.

Separate Colors
: When using Luma Waveform view, this separates R,G, and B into separate graphs.

Transform Markers
: Transform Markers as well as Strips.

Scrubbing

To move back and forth through your movie, use the Timeline window. `LMB` click and drag left/right in the timeline window, moving the vertical bar which indicates the current frame. As you do, the image for that frame is displayed in the VSE window.

When you `LMB` directly on a sequence strip, this will show the strip *solo*, (temporarily disregarding effects and other strips, showing only this strips output).

Real-time scrubbing and image display is possible on reasonable computers when viewing an image sequence or movie (avi/mov) file.

Scene strips can use OpenGL previews or proxies for realtime playback, otherwise displaying rendered frame is supported, but typically too slow for real-time playback.

View Modes

The icons in the header allow to change the view of the VSE. By default, only the sequencer is displayed. The second button displays only the Preview window, and the third button displays both the Sequencer and the Preview.

When the preview is enabled, you have several options to change what type pf preview to display. They are explained in the *Display Modes Page*.

Scene Preview

When using a Scene Strip in the sequencer, these settings in the Properties Panel determine how they are shown in the preview window.

Open GL Preview
: If you have Open GL, enable this setting to use Open GL for the scene preview renders. The drop down menu allows you to change how the Scene is displayed (Bounding Box, Wireframe, Solid, Textured).

View Settings

The View Settings section in the properties panel contains addition display options.

Show Overexposed
: Increasing this number to 1 or greater displays a striped overlay to the preview image, showing where it is overexposed. A higher number gives a higher threshold for marking overexposure.

Safe Margin
: Displays an overlay on the preview, marking where title safe region is.

Proxy Render Size
: Draws preview using full resolution or different proxy resolutions. Render resolution is determined in the render settings panel. Using a smaller preview size will increase speed.

Refresh View

Certain operations, like moving an object in 3D View, may not force the Sequencer to call for a refresh of the rendered image (since the movement may not affect the rendered image). If an image or video, used as a strip, is changed by some application outside of Bforartists, Bforartists has no real way of being notified from your operating system. To force Bforartists to re-read in files, and to force a re-render of the 3D View, click the Refresh button to force Bforartists to update and synchronize all cached images and compute the current frame.

Selecting Strips

The Select Menu helps you select strips in different ways.

Strips to the Left
: Select all strips to the left of the currently selected strip.

Strips to the Right
: Select all strips to the right of the currently selected strip.

Select Surrounding Handles **`Alt-Ctrl-RMB`**
: Select both handles of the strip, plus the neighboring handles on the immediately adjoining strips. Select with this method to move a strip that is between to others without affecting the selected strip’s length.

Left Handle **`Alt-RMB`**
: Select the left handle of the currently selected strip.

Right Handle **`Ctrl-RMB`**
: Select the right handle of the currently selected strip.

Linked
: Select all strips linked to the currently selected strip

Select All **`A`**
: Selects all the strips loaded.

Select Inverse
: Inverts the current selection.

Border Select **`B`**
: Begins the *Box* mode select process. Click and drag a rectangular lasso around a region of strips in your Sequence workspace. When you release the mouse button, the additional strips will be selected.

Moving and Modifying Strips

`G` Moves the selected strip(s) in time or in channels. Move your mouse horizontally (left/right) to change the strip’s position in time. Move vertically (up/down) to change channels.

- To snap while dragging hold `Ctrl`
- To ‘ripple edit’ (Make room for strips you drag) hold `Alt` when placing a strip.

If you have added a strip by mistake or no longer want it, delete it by pressing *X* or using this menu option.

Duplicate a strip to make an unlinked copy; drag it to a time and channel, and drop it by `LMB` click.

The Strip Menu contains additional tools for working with strips:

- *Grab/Move*
- *Grab/Extend from Frame*
- *Cut (hard) at frame*
- *Cut (soft) at frame*
- *Separate Images*
- *Deinterlace Movies*
- *Duplicate Strips*
- *Erase Strips*
- *Set Render Size*
- *Make Meta Strip*
- *UnMeta Strip*
- *Reload Strips*
- *Reassign Inputs*
- *Swap Inputs*
- *Lock Strips*
- *UnLock Strips*
- *Mute Strips*
- *Un-Mute Strips*
- *Mute Deselected Strips*
- *Snap Strips*
- *Swap Strips*

Snap to Frame

`Shift-S` Position your cursor (vertical green line) to the time you want. Snap to current frame to start a strip exactly at the beginning of the frame. If your Time display is in seconds, you can get to fractional parts of a second by zooming the display; you can get all the way down to an individual frame.

Separate Images to Strips

`Y` Converts the strip into multiple strips, one strip for each frame. Very useful for slide shows and other cases where you want to bring in a set on non-continuous images.

Editing Strips

- `RMB` in the middle of the strip selects the **entire** strip; holding it down (or pressing `G` rab) and then moving the mouse drags a strip around.
- `RMB` on the left arrow of the strip selects the **start** frame offset for that strip; holding it down (or pressing `G` rab and then moving the mouse left/right changes the start frame within the strip by the

number of frames you move it:

  - If you have a 20-image sequence strip, and drag the left arrow to the right by 10 frames, the strip will start at image 11 (images 1 to 10 will be skipped). Use this to clip off a rollup or useless lead-in.
  - Dragging the left arrow left will create a lead-in (copies) of the first frame for as many frames as you drag it. Use this when you want some frames for transitions to the this clip.

- `RMB` on the right arrow of the strip selects the **end** frame of the strip; holding it down (or pressing `G` rab) and then moving the mouse changes the ending frame within the strip:
  - Dragging the right arrow to the left shortens the clip; any original images at the tail are ignored. Use this to quickly clip off a rolldown.
  - Dragging the right arrow right extends the clip. For movies and images sequences, more of the animation is used until exhausted. Extending a clip beyond its end results in Bforartists making a copy of the last image. Use this for transitions out of this clip.

Note

Multiple selection

You can select several (handles of) strips by `Shift-RMB` clicking: when you press `G`, everything that's selected will move with your mouse- this means that, for example, you can at the same time move a strip, shorten two others, and extend a forth one.

- STRIP EXTEND. With a number of Image strips selected, pressing `E` enters EXTEND mode. All selected strip handles to the "mouse side" of the current frame indicator will transform together, allowing you to essentially extend the strips that fall exactly on the current frame marker and having all others adjust to compensate.

While splicing two strips happens just by placing them finish-to-start, cut a strip by pressing `K` to cut. At the selected frame for the selected strips, `K` cuts them in two. Use Cut to trim off roll-ups or lead-ins, or roll-downs or extra film shot.

Reference

Note on the 'cut'

When you 'cut' a strip, you don't really make a cut like it was with the 'old editing' on real film. In fact, you make a copy of the strip: the end of the original one is 'winded' to the cut point, as with the beginning of the new copy.

For example, imagine that you have a strip of **50** frames, and that you want to delete the first ten ones. You have to go to the `11` th frame, and press `K`; the cut 'divides' your strip in two parts. You now can select the first small part (frames `1` to `10`), and delete it press `X`.

You might think that you have really erased the frames **1** to **10**, but there are still there, 'winded', as in a film reel, under your frame **11** : you just have deleted one of the two copies of your strip created by the 'cut'. And you can at any time get your 'lost' frames back (just `RMB` -click on the left arrow of the strip, then `G` grab it to the left to display the desired number of frames again (or to the right to 'hide' more frames - this is another way to remove frames at the beginning/end of a strip!).

This is at the heart of nearly every editor solution, and that’s quite handy!

Note

Action Stops

When extending the start beyond the beginning or end after the ending, keep in mind that only the last image copies, so when viewed, action will stop on that frame. Start your transition (fade, cross) a little early while action is still happening so that the stop action is not that noticeable (unless, of course, you want it to be, like the 80’s drama sitcoms).

Change the length of an effect strip by changing the start/end frame of the origin strips.

Copy and Paste

You can copy a clip and paste it using the two header buttons.

Strip Properties

The properties for the strip are examined and set in the properties panel, shortcut kbd`N`.

- Edit Strip - change properties of the strip
- Strip Input - where to pull images from
- Effect - Settings for effects strips
- Filter - Image pre-processing
- Proxy - Use representatives of the real image, for low-powered PCs
- Scene - Settings for when a scene strip is selected
- Sound - Settings for a sound clip

The panels for each of these sets of options and controls are shown to the right

- Edit Strip Panel
- Strip Input Panel
- Filter Panel
- Proxy / Timecode Panel
  - Proxy
  - Timecode
- Modifiers Panel

Edit Strip Panel

Name
  You can name or rename your strips here.
Type
  Displays the type of strip selected.
Blend Mode
  By default, a strip Replaces the output image of any lower-level strips. However, many other blending modes are available based on the strip type. For example, Alpha-Over automatically overlays the image on top of a lower level strip. Autoblending modes remove the need for separate effect strips. Blend percent controls how much of an effect the strip exerts, even over time.
Opacity
  Set the opacity of the strip.
Mute
  Hides the strip so that it does not participate in the final image computation
Lock
  Prevents the strip from being moved.
Channel
  Changes the channel number, or row, of the strip.
Start Frame
  Changes the starting frame number of the strip, which is the same as grabbing and moving the strip. Tip when you add a strip, I like to just drop it and then use this field to place it at the frame I want, rather that trying to drag and drop in exactly the right place.
Length
  Specify the number of frames to use for the strip.

Use the Convert to Premul button if a strip has an Alpha (transparency) channel. Use FilterY if the strip is from broadcast video and has even or odd interlacing fields. Enhance the color saturation through the Mul tiply field. Play a strip backwards by enabling Reverse Frames. Tell Bforartists to display every nth frame by entering a Strobe value. Finally, when using MPEG video (VCD, DVD, XVid, DivX, ...), an image is built up over the course of a few frames; use the Preseek field to tell Bforartists to look backward and compose the image based on the n previous frames (e.g. 15 for Mpeg2 DVD).

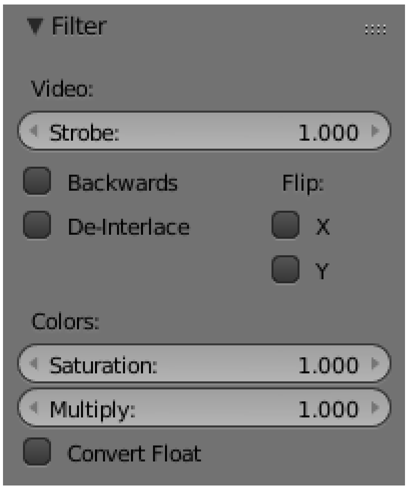
Strip Input Panel

Controls the source of the strip. Fields include file path, file name, image offset, crop settings.

This is here you can editupdate the path of the file used by a strip. Very useful when you moved it one way or the other - this avoid you deleting and re-creating the strip!

You have two text fields for path, the first being the path of the parent directory (Path), and the second the file name itself.

Filter Panel



Enables you to quickly set common image pre-processing options.

Strobe
: To display only a defined number of images. For example, if you set this to 10, the strip will only display frames 1,11,21,31,41... of the source.

Flip
: X flips (reverses) the image left-to-right, Y reverses top-to-bottom.

Backwards
: Reverses strip image sequence

De-Interlace
: Removes fields in a video file.

Saturation
: Increase or decrease the saturation of an image.

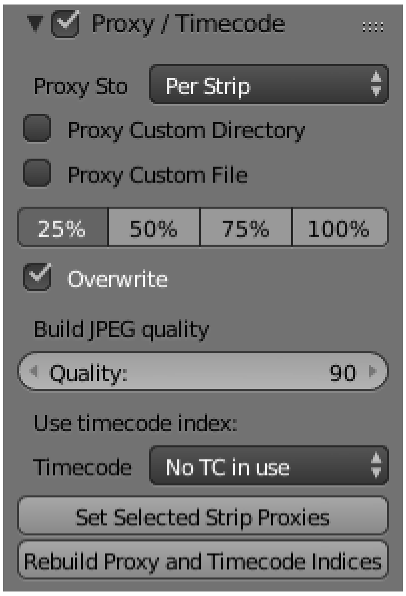
Multiply
: Multiplies the colors by this value.

Convert Float
: Converts input to float data.

Proxy / Timecode Panel

Once you’ve chosen the Proxy/Timecode parameters, you need to use Strip ‣ Rebuild Proxy and Timecode indices to generate the proxy clip and it will be available after Bforartists makes it.

Proxy



A proxy is a smaller image (faster to load) that stands in for the main image. When you Rebuild proxy Bforartists computes small images (like thumbnails) for the big images and may take some time. After computing them, though, editing functions like scrubbing and scrolling and compositing functions like cross using these proxies is much faster but gives a low-res result. Disable proxies before final rendering.

In order to actually use the proxies, the proper Proxy Render Size dropdown value must be selected in the Properties panel of the Sequencer View (where the edit plays back).

Proxy Storage

Defines whether the proxies are for individual strips or the entire sequence.

Per Strip

Proxies are stored in the directory of the input.

Proxy Custom Directory
By default, all generated proxy images are storing to the <path of original footage> /BL_proxy/<clip name> folder, but this location can be set by hand using this option.

Proxy Custom File
Allows you to use pre-existing proxies

Project

All proxies are stored in one directory

Proxy Directory
The location to to store the proxies for the project.

Proxy Size
Buttons to control how big the proxies are. The available options are `25`,``50``, `75`, `100` percent of original strip size.

Overwrite
Saves over any existing proxies in the proxy storage directory.

Quality
Defines the quality of the JPEG's used for proxies.

Timecode
See Timecode.
Set Selected Strip Proxies
Same as choosing the *Proxy Size* and *Overwrite*
Rebuild Proxy and Timecode Indices
Generates Proxies and Timecodes, same as doing Strip ‣ Rebuild Proxy and Timecode indices

Timecode

When you’re working with footage directly copied from a camera without pre-processing it, there might be bunch of artifacts, mostly due to seeking a given frame in sequence. This happens because such footage usually doesn’t have correct frame rate values in their headers. So, for Bforartists to calculate the position of a needed frame in the stream works inaccurately and can give errant result. There are two possible ways to avoid this:

- Preprocess your video with, say, mencoder to repair file header and insert correct keyframes.
- Use Proxy/Timecode option in Bforartists.

Options

Timecode
Timecode to use on the selected movie strip.

The following timecodes are supported:

- No TC in use- do not use any timecode
- Record Run
- Free Run
- Free Run (rec date)
- Record Run No Gaps

Note

Record Run is the timecode which usually is best to use, but if the clip’s file is totally damaged, ‘Record Run No Gaps’ will be the only chance of getting acceptable result.

Modifiers Panel

Modifiers are used to make adjustments on the image, like contrast, brightness, saturation, color balance and applying masks.

You can add these modifiers directly to the selected strip, or you can use it within an “Adjustment Layer” effect strip, which allows you to apply these modifiers onto several strips the same time.

Use Linear Modifiers
Calculate modifiers in linear space instead of sequencer space.

Each modifiers have several buttons at their top:

- The “eye” is to disable the modifier. Very useful to compare the image, with / without modifications.
- The next two buttons (up and down arrows) are used to change the modifier’s position in the stack.
- The cross is to delete the modifier from the stack.
- Strip Use this to apply the modification on the whole image, or to use another strip’s image (with alpha channel) for masking the modifier (and only this modifier), by choosing it in the “Mask” drop-down list.
- Mask This one allows you to choose a Mask created in the Mask editor which will limit the modification to the masked image’s zones.

Currently, the following modifiers are supported:

Color Balance

Color balance adjustments, through Lift, Gamma, and Gain.

Note
This modifier works the same as the *Color Balance Node*

Curves

C/RGB curves.

Note
This modifier works the same as the *Curves Node*

Hue Correct

HSV multi points curves.

Note
This modifier works the same as the *Curves Node*

Bright/Contrast
Adjusts the brightness and contrast of the modifier input.

Mask

Use it for masking the other modifiers in the stack which are below.

For example, to correct the brightness only on a certain zone of the image, you can filter the Bright/Contrast modifier by placing a Mask modifier, just before it in the stack. You can choose to use a Mask created in the Mask editor, or to use another strip as a mask (the image of this strip must have an alpha channel). This mask will be applied on all the others modifiers below it in the stack.

White Balance

Use it to adjust the white balance by choosing the color that should be white.

Tone Map

Used to map one set of colors to another in order to approximate the appearance of high dynamic range images in a medium that has a more limited dynamic range.

Note

This modifier works the same as the *Tone Map Node*

Strip Types

- Introduction
- Scene Strip
- Image and Movie Strips
- Effect Strips
  - Introduction
  - Add Effect
  - Adjustment Layer
  - Alpha Over, Under, and Over Drop
  - Gaussian Blur
  - Color
  - Cross
  - Gamma Cross
  - Glow
  - Multicam Selector
  - Multiply
  - Speed Control
  - Subtract Effect
  - Text Effect
  - Transform
  - Wipe
- Sound Strips
  - Options
  - Working with Audio Tracks
  - Animating Audio Track Properties
  - Output

  - Known Limitations
- Meta Strips

Introduction

The Add Menu

The Add menu is the main menu you will be using to add content to the VSE. In general, you load up your strips, create strips of special transition effects, and then animate out your sequence by selecting “Do Sequence” and clicking the Anim button. You can use the Add menu in the header, or hover your mouse cursor over the Sequence workspace and press `Shift-A`.

Note

Clips can be Huge

A three minute quicktime .mov file can be 140Megs. Loading it, even over a high-speed LAN can take some time. Don’t assume your computer or Bforartists has locked up if nothing happens for awhile.

First, let’s add a clip:

- A movie clip in the Audio-Video Interleaved format (`*.avi` file)
- A movie clip in the Apple QuickTime format (`*.mov`)
- A single still image to be repeated for a number of frames (`*.jpg`, `*.png`, etc.)
- A numbered sequence of images (`*-0001.jpg`, `*-0002.jpg`, `*-0003.jpg`, etc, of any image format)
- One or more images from a directory
- A Scene in your `.blend` file.

Bforartists does not care which of these you use; you can freely mix and match any of them. They all become a color-coded strip in the VSE:

- Blue is used for Avi/mov codec strips
- Grey is a single image that is repeated/copied
- Purple is an image sequences or group of images played one after the other
- Green is an Audio track

When you choose to add one of these, the VSE window will switch to a file browser for you to select what you want to add. Supported files have a little rectangle next to their name (blue for images, green for clips) as a visual cue that you can pick them successfully:

Scene Strip

You can add the virtual image output of a Scene in your current .blend file as well. Select the scene from the pop-up list, and a strip will be added and rubberbanded to your mouse just like a movie or image. The strip length will be determined based on the animation settings in that scene (not the current scene, unless the VSE is operating in the same scene).

When adding a Scene strip, please note that, in order to show you the strip in the VSE Image preview mode, Bforartists must render the scene. This may take awhile if the scene is complex, so there may be a delay between the time you select the scene and the time the strip appears. To reduce the delay, simplify the scene rendering by selecting fewer layers to render.

If the extra overhead of rendering the scene becomes burdensome (for either preview or for multiple test renders) and you have enough disk space consider rendering the scene to a sequence of PNGs and using an Image Sequence strip instead of a scene. This is very popular for static graphic overlays like title cards which are often little more than a static image with animated opacity.

Sequencer
: Process the render (and composited) result through the video sequence editor pipeline, if sequencer strips exist. This is the same function as in the render settings.

Camera Override
: Change the camera that will be used.

Image and Movie Strips

When adding a Movie or Movie+Audio `LMB` to put the name of the file into the text box at the top; this selects a **single** file (like a movie)

In the case of (numbered) image **sequences**, you have a choice:

Directory
: `RMB` right-click on a directory name, and all files in that directory will be brought in as part of the image, in sort order, one image per frame

Range
: Navigate into the directory and right-click and drag over a range of names to highlight multiple files. You can page down and continue right-click-dragging to add more to the selection

Batch
: Shift-right-click selected non-related stills for batch processing; each image will be one frame, in sort order, and can be a mix of file types (jpg, png, exr, etc.)

All
: Press `A` to select/deselect All files in the directory.

When you click the *Select <whatever>* button, the window pane will switch back to VSE, and the strip will be rubber-banded to your mouse. You cannot load multiple movies at the same time by right-clicking them; no movies load if you right click them. Right-clicking only works for images.

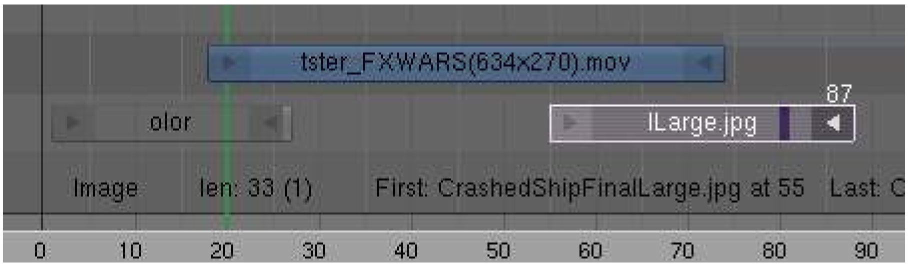
In order to add items to the VSE, left-click for movies, left-click for single images, or right-click and drag for image sequences. Move your mouse to the frame/time and stripe you want, and click to break the rubberband and drop the strip in place (in a channel and starting at a frame).

When you add an image, Bforartists makes it into a 50-frame strip, which means that image will be in your video for two seconds (at 25 fps - PAL). Aside from re-positioning it, you will want to scale it by `RMB` -clicking on either the start or end arrow, and dragging left or right. As you move, the frame number updates to say where the arrow is. Click `LMB` to validate, or `RMB` to cancel the modification.

Tip

Dealing with Different Sizes

Dealing with different sized images and different sized outputs is tricky. Think like a pixel. If you have a mis-match between the size of the input image and the render output size, the VSE does try to auto-scale the image to fit it entirely in the output. This may result in clipping. If you do not want that, use Crop and/or Offset in the Input panel to move and select a region of the image within the output. When you use Crop or Offset, the auto-scaling will be disabled and you can manually re-scale by adding the Transform effect.

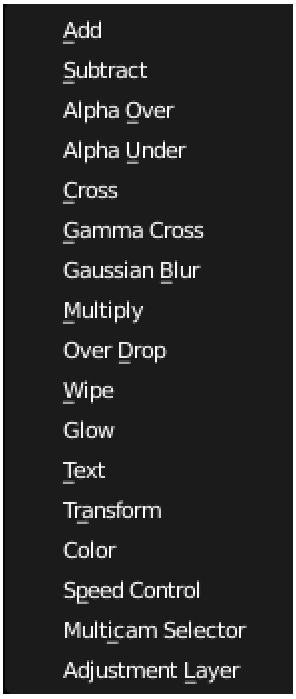


If you scroll up the workspace, you will see an information channel (at vertical location channel 0) that gives you some helpful hints about the active strip. The example above shows a color strip from frames 1 to 25, then a mov file, and then an image strip. The info channel shows handy information about the image strip, whose name has been scrunched in the strip display, but is clearly spelled out in the information strip.

Effect Strips

- Introduction
- Add Effect
- Adjustment Layer
- Alpha Over, Under, and Over Drop
- Gaussian Blur
    - Options
- Color
- Cross
- Gamma Cross
- Glow

Introduction



Available Effects.

Bforartists offers a set of effects that can be added to your sequence. Theses effects are listed to the right. Each effect is explained in the next pages individually, but they all are added and controlled in the same way. To add an effect strip, select one base strip (image, movie, or scene) by `RMB` clicking on it. For some effects, like the Cross transition effect, you will need to `Shift-RMB` a second overlapping strip (it depends on the effect you want). Then select Add ‣ Effect and pick the effect you want from the pop-up menu. When you do, the Effect strip will be shown above the source strips. If it is an independent effect, like the *Color Generator*, it will be rubberbanded to your mouse; click to drop the strip.

Note

Since most Effects strips depend on one or two source strips, their frame location and duration depends on their source strips. Thus, you may not be able to move it; you have to move the source strips in order to affect the effect strip.

To use an effect that combines or makes a transition between (or composites) two strips, you must Box select (`B`) or shift-right-click two of them. When you add the effect strip, it will be placed in a channel above the two in Grab mode (click to drop it on a channel). Its duration will be the overlap between the two strips as a maximum.

With some effects, like the *Alpha Over*, the order in which you select the strips is important. You can also use one effect strip as the input or source strip with another strip, thus layering effects on top of one another.

Note

The only exception is the *Color Generator* effect. It does not depend on a base strip; you can add and position it independent of any other strip. Change the length as you would any strip.

If you picked the wrong effect from the menu, you can always change it by selecting the strip (`RMB`) and using the Strip ‣ Change Effect selection. Or, you can press `C` to switch effects on a selected Effects strip.

Add Effect

Can you hear the thunder?

The Add effect adds two colors together. Red and Cyan (Green and Blue) make White. Red and Blue make “Magenta” (i.e. Purple!). Red and Green make Yellow.

The Add Effect adds the colors of two strips together, Use this effect with a base image strip, and a modifier strip. The modifier strip is either a solid color or a black-and-whte mask, or another image entirely. The example to the right shows what happens when you add gray to an image, and animate the effect over time. The image gets bright because we are adding gray (R:.5, G:.5, B:.5) to say, a blue color (R.1, G:.1, B:.5) resulting in (R:.6, G:.6, B:1.0) which retains the original hue (relationship between the colors) but is much brighter (has a higher value). When applied to the whole image like this, the whole image seems to flash.

You can use this effect to increase the brightness of an image, or if you use a BW mask, selectively increase the brightness of certain areas of the image. The Mix node, in Add mode, does exactly the same thing as the Add sfx strip here, and is controlled the same way by feeding the Factor input.

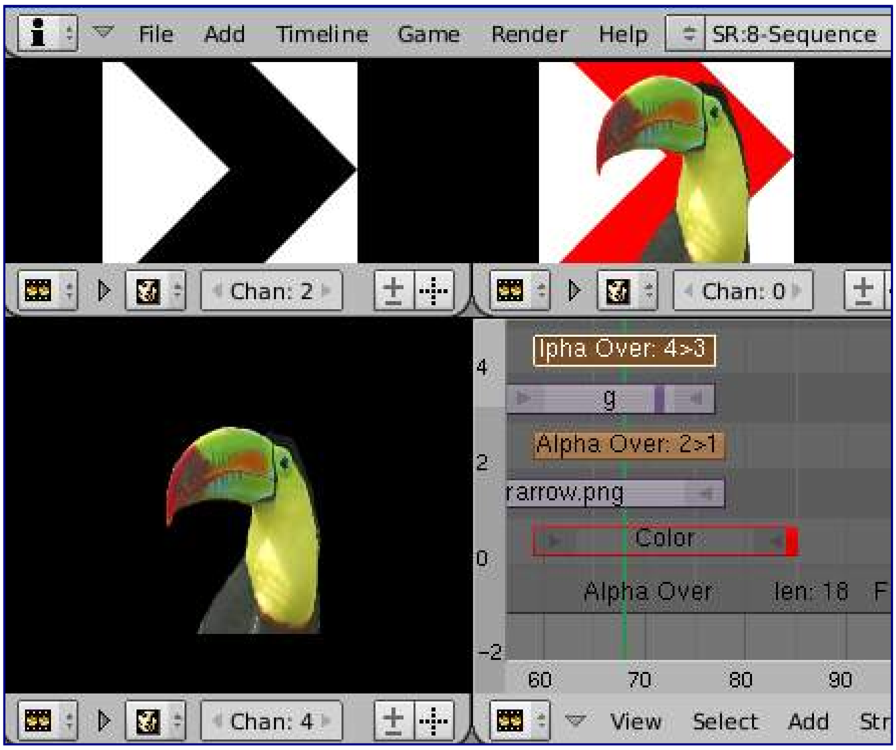
Adjustment Layer

The Adjustment Layer strip works like a regular input file strip except for the fact, that it considers all strips below it as it's input.

Real world use cases: you want to add some last finishing color correction on top of parts of your final sequencer timeline without messing with metastrips around. Just add an adjustment layer on top and activate the color balance.

Or: you can stack a primary color correction and several secondary color correction on top of each other (probably using the new mask input for area selection).

Alpha Over, Under, and Over Drop



AlphaOver Effect

Using the alpha (transparency channel), this effect composites a result based on transparent areas of the dominant image. If you use a Scene strip, the areas of the image where there isn't anything solid are transparent; they have an alpha value of 0. If you use a movie strip, that movie has an alpha value of 1 (completely opaque).

So, you can use the *Alpha Over* / *Alpha Under* effect to composite the CGI Scene on top of your movie. The result is your model doing whatever as if it was part of the movie. The Factor curve controls how much the foreground is mixed over the background, fading in the foreground on top of the background. The colors of transparent foreground image areas is ignored and does not change the color of the background.

Select two strips (`Shift-RMB`):

- With *Alpha Over*, the strips are layered up in the order selected; the first strip selected is the background, and the second one goes *over* the first one selected. The *Fac* tor controls *the transparency of the foreground*, i.e. a *Fac* of **0.0** will only show the background, and a *Fac* of **1.0** will completely override the background with the foreground (except in the transparent areas of this one, of course!)
- With *Alpha Under*, this is the contrary: the first strip selected is the foreground, and the second one, the background. Moreover, the *Fac* tor controls *the transparency of the background*, i.e. a *Fac* of **0.0** will only show the foreground (the background is completely transparent), and a *Fac* of **1.0** will give the same results as with *Alpha Over*.
- *Alpha Over Drop* is between the two others: as with *Alpha Under*, the first strip selected will be the foreground, but as with *Alpha Over*, the *Fac* tor controls the transparency of this foreground.

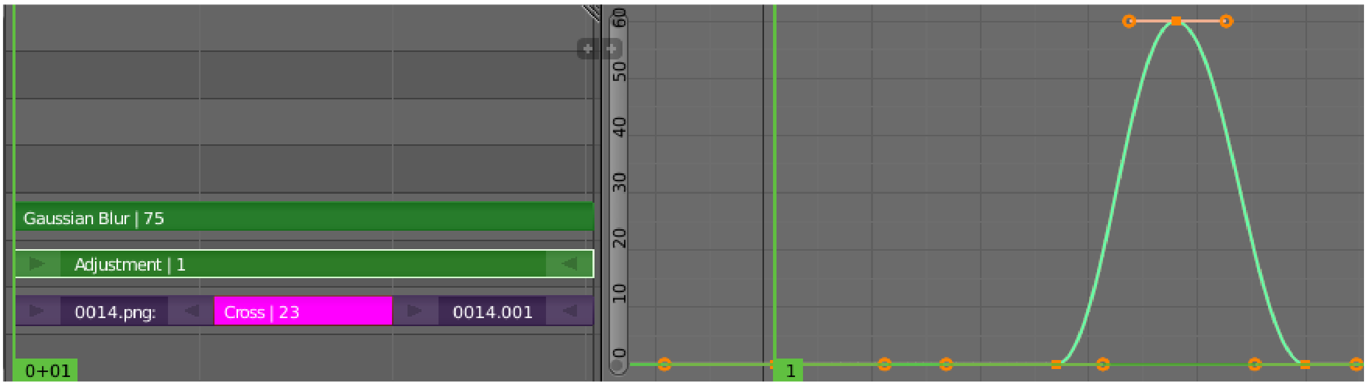
The example shows layering of AlphaOver effects. The very bottom channel is red, and an arrow is on top of that. Those two are AlphaOver to Channel 3. My favorite toucan is Channel 4, and Channel 5 alphaovers the toucan on top of the composited red arrow. The last effect added is tied to Channel 0 which will be rendered.

By clicking the PreMult Alpha button in the properties panel of the foreground strip, the Alpha values of the two strips are not multiplied or added together. Use this effect when adding a foreground strip that has a variable alpha channel (some opaque areas, some transparent, some in between) over a strip that has a flat opaque (Alpha=1.0 or greater) channel. If you notice a glow around your foreground objects, or strange transparent areas of your foreground object when using AlphaOver, enable PreMultiply. The AlphaOver Drop effect is much like the Cross, but puts preference to the top or second image, giving more of a gradual overlay effect than a blend like the Cross does. Of course, all of the Alpha effects respect the alpha (transparency) channel, whereas Cross does not.

The degree of Alpha applied, and thus color mixing, can be controlled by an F-curve. Creating a Sine wave could have the effect of the foreground fading in and out.

Gaussian Blur

The Guassian Blur strip is used to blur the input strip in the defined direction. This can be used to blur a background or to blur though a transition (see image).



Example of Bluring a Transition.

Options

Size X
Distance of the blur effect on the X axis.
Size Y
Distance of the blur effect on the X axis.

Color

This effect works by itself to create a color strip. By default, when it is created, it is 50 frames long, but you can extend it by grabbing and moving one of the ends. Click on the color swatch in the Effect panel under Sequencer buttons, which is under the Scene tab, to pick a different color (by default, it is gray). Use this strip crossed with your main movie to provide a fade-in or fade-out.

Cross

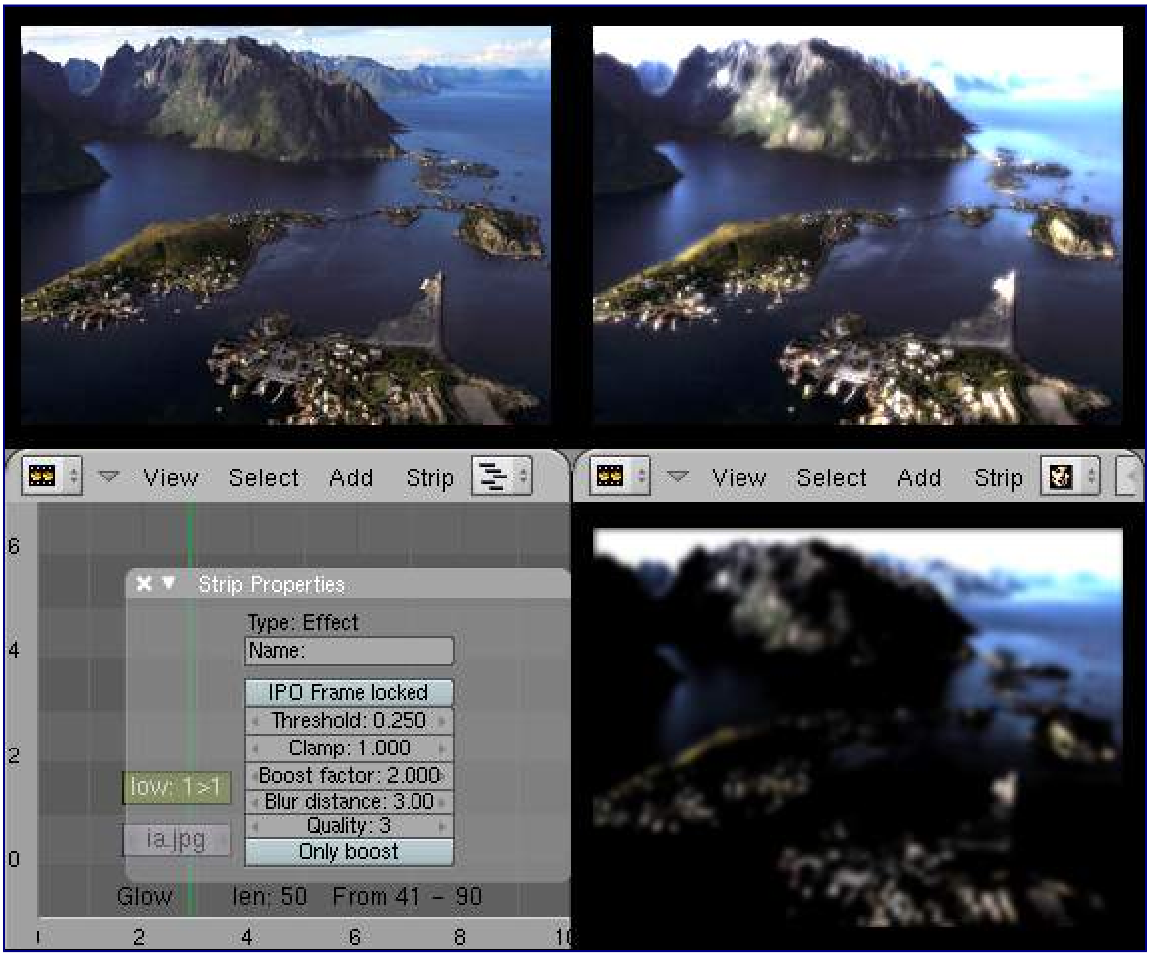
This effect fades from one strip to another, based on how many frames the two strips overlap. This is a very useful strip that blends the whole image from one to the other.

Gamma Cross

This effect fades from one strip to another, based on how many frames the two strips overlap. This is a very useful strip that blends the whole image from one to the other.

Gamma Cross uses color correction in doing the fade, resulting in a smooth transition that is easier on the eye.

Glow



Example of a Glow effect applied to a picture. Top left: base picture (Lofoten Islands, Norway - source: wikipedia.fr); Top right: result of the effect; Bottom left: effect settings; Bottom right: result with the Only boost button activated.

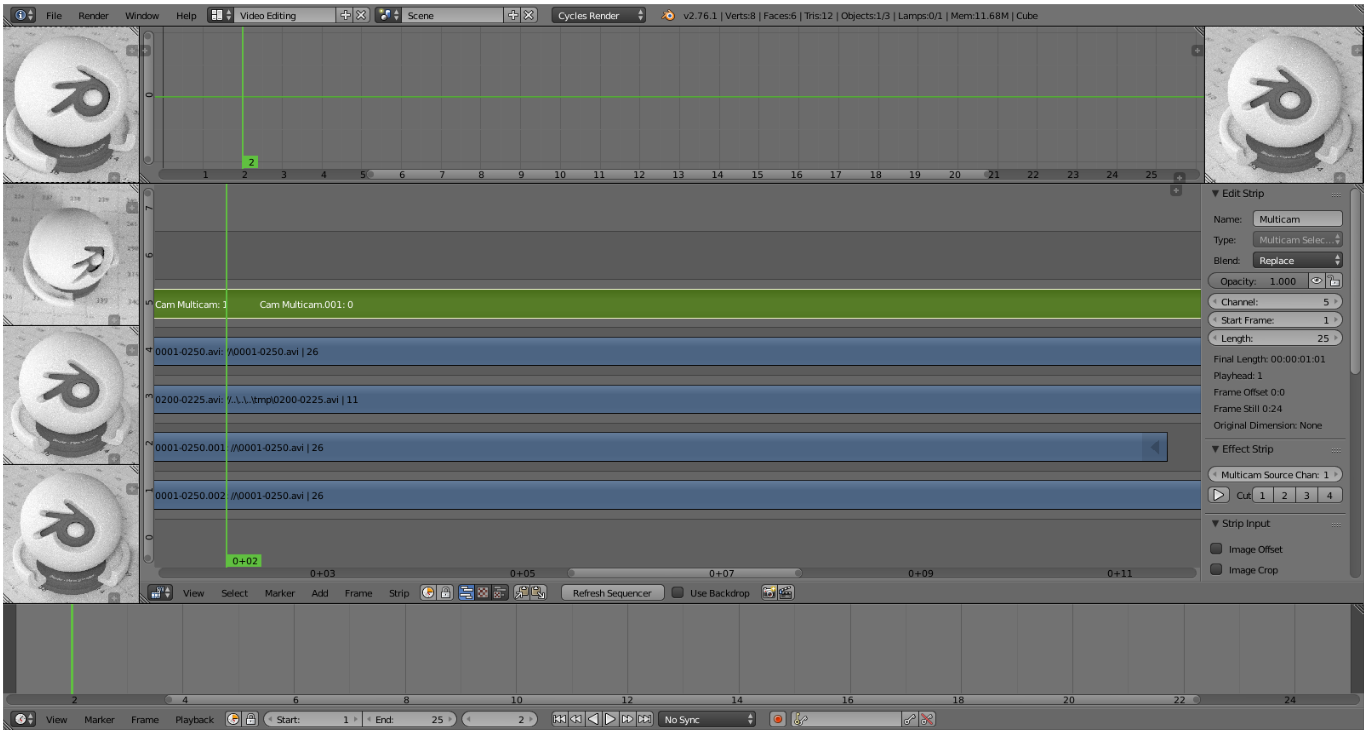
This effect makes parts of an image glow brighter by working on the luminance channel of an image. The *Glow* is the superposition of the base image and a modified version, where some areas (brighter than the *Threshold:*) are blurred. With the *Glow* strip properties, you control this *Threshold:*, the maximum luminosity that can be added (*Clamp:*), a *Boost factor:* for it, the size of the blur (*Blur distance:*), and its *Quality:*. The *Only boost* button allows you to only show/use the 'modified' version of the image, without the base one. To "animate" the glow effect, mix it with the base image using the Gamma Cross effect, crossing from the base image to the glowing one.

Multicam Selector

The Multicam Selector stip is used for multi camera editing. Multicam editing is for when you have multiple cameras recording the same scene from different angles. To edit these in the VSE can be easy if you do it right.

- First your going to want to add in each of your video strips.
- Next make sure to sync them to each other using there audio waveform see the *Audio Docs* or by the movement of objects.
- If you are using any effects on you strips it may helpful to use Meta Strips
- Add a viewer window for every input channel and put it into 25% proxy display mode
- Add a multicam selector effect strip *above* all the channel tracks

After Completing these steps you should get something similar to the image below:

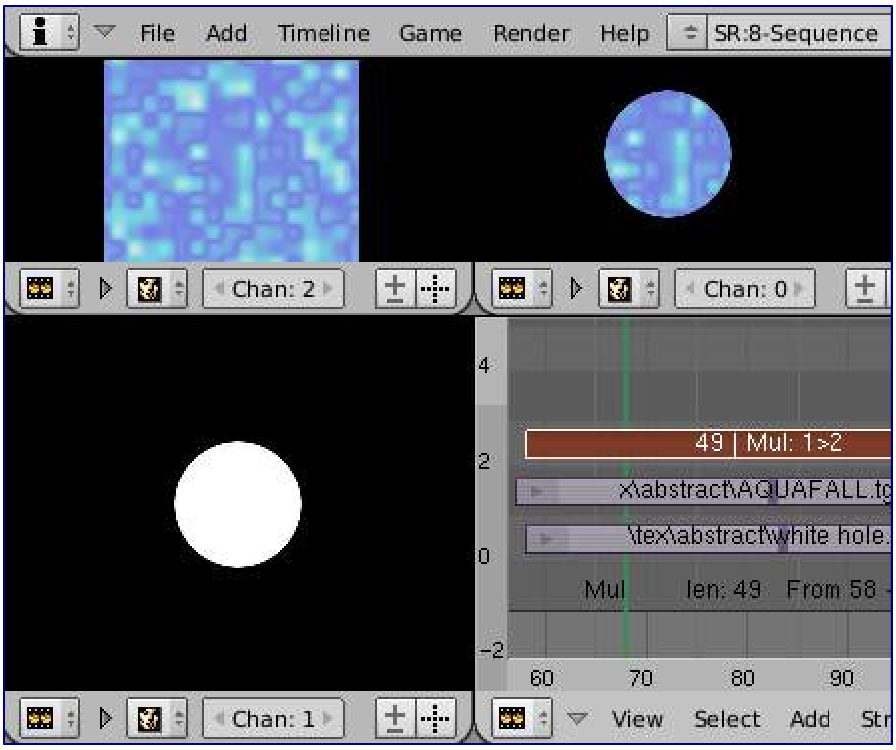


- Now select the multicam strip, if you take a look at the strip options (N-key), you will notice, that multicam is a rather simple effect strip: it just takes a selected channel as it's input. That's all. The magic comes with the convenient keyboard layout.

- When you select the multicam strip, the keys 1-9 are mapped to a python handler, that does a cut on the multicam and changes it's input.
- So: you select the multicam strip, you start playback and press the keys for the correct input while watching your show.
- You'll end up with a small multicam selector strip for every cut.

In reality, it boils down to: watch a few seconds to see, what's coming, watch it again and do a rough cut using the number keys, do some fine tuning by selecting the outer handles of two neighboring multicam for A/B rolling.

Multiply



Multiply Effect.

The *Multiply* effect multiplies two colors. Bforartists uses values between **0.0** and **1.0** for the colors, he doesn't have to normalise this operation, the multiplication of two terms between **0.0** and **1.0** always gives a result between **0.0** and **1.0** (with the 'traditional' representation with three bytes - like RGB(**124**, **255**, **56**) -, the multiplications give far too high results - like RGB(**7316**, **46410**, **1848**) -, that have to be 'brought back', normalised - just by dividing them by **256** ! - to 'go back' to range of **0** to **255** ...). **256** ! - to 'go back' to range of **0** to **255** ...).

This effect has two main usages:

With a mask

A mask is a B&W picture witch, after multiplication with a 'normal' image, only show this one in the white areas of the mask (everything else is black). The opening title sequence to James Bond movies, where the camera is looking down the barrel of a gun at James, is a good example of this effect.

With uniform colors

Multiplying a color with a ‘normal’ image allows you to soften some hues of this one (and so - symmetrically - to enhance the others). For example, if you have a brown pixel RGB(**0.50**, **0.29**, **0.05**), and you multiply it with a cyan filter (uniform color RGB(**0.0**, **1.0**, **1.0**), you’ll get a color RGB(**0.0**, **0.29**, **0.5**). Visually, the result is to kill the reds and bring up (by ‘symmetry’ - the real values remain unchanged!) the blues an greens. Physically, it is the same effect as shining a cyan light onto a chocolate bar. Emotionally, vegetation becomes more lush, water becomes more Caribbean and inviting, skies become friendlier.

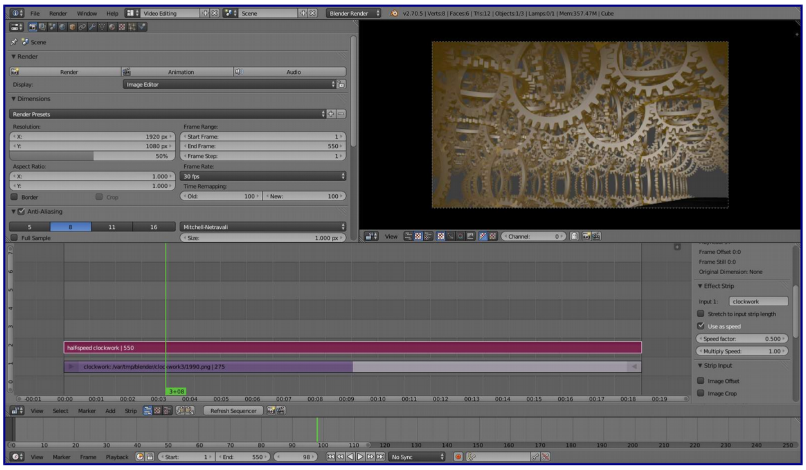
Note

This effect reduces the global luminosity of the picture (the result will always be smaller than the smallest operand). If one of the image is all white, the result is the other picture; if one of the image is all black, the result is all black!

Speed Control

Speed Control time-warps the strip, making it play faster or slower than it normally would. A Global Speed less than 1.0 makes the strip play slower; greater than 1. 0 makes it play faster. Playing faster means that some frames are skipped, and the strip will run out of frames before the end frame. When the strip runs out of frames to display, it will just keep repeating the last one; action will appear to freeze. To avoid this, position the next strip under the original at a point where you want motion to continue.

Creating a Slow-Motion Effect



50% Slow motion using Speed Control

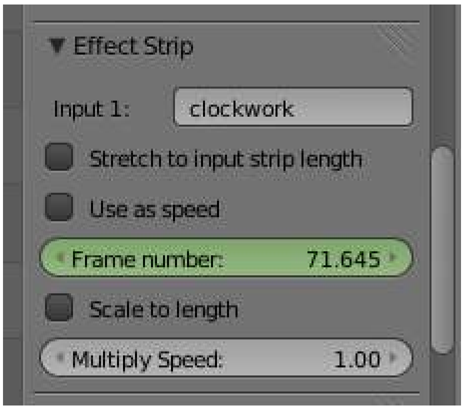
Suppose you want to slow your strip down. You need to affect the speed of the video clip without affecting the overall frame rate. Select the clip and Add–>Effect–>Speed Control effect strip. Click to drop it and press `N` to get the Properties. Uncheck the *Stretch to input strip length* option in the Effect Strip section. Set the Speed factor to be the factor by which you want to adjust the speed. To cut the displayed speed by 50%, enter `0.5`. Now, a 275-frame clip will play at half speed, and thus display only the first 137 frames.

If you want the remaining frames to show in slo-mo after the first set is displayed, double the Length of the source strip (since effects strip bounds are controlled by their source strips). If you're using a speed factor other than 0.5 then use the formula

`new_length = real_length / speed_factor`

That's it! Set your render to animate (in this example) all 550 frames.

Keyframing the Speed Control



keyframing the Frame number

To get even finer control over your clip timing, you can use curves! While it is possible to keyframe the Speed factor, usually you want to keyframe the Frame number directly.

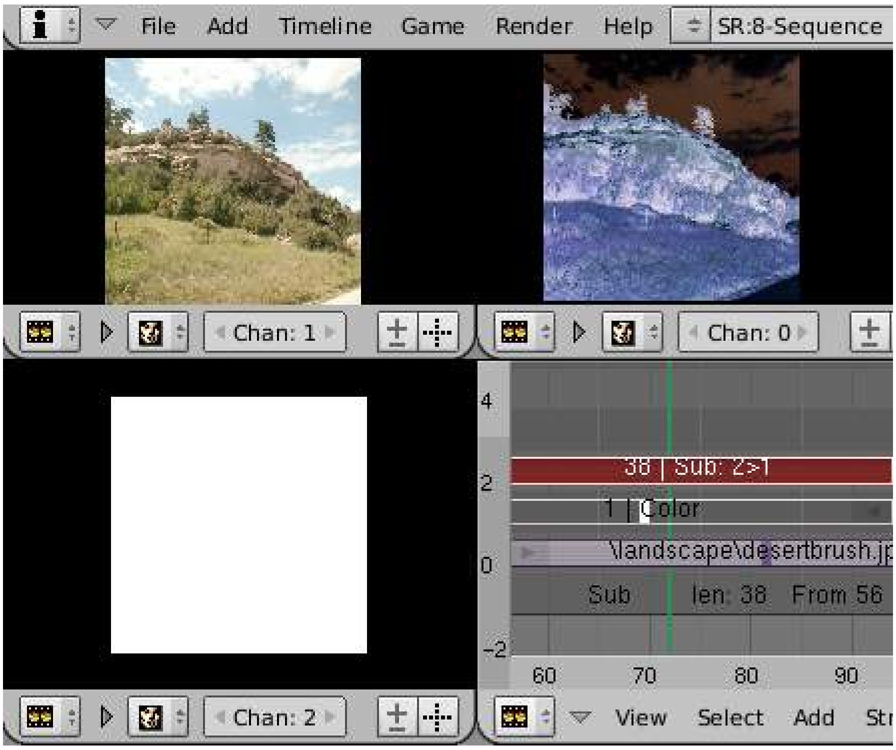
Uncheck *Stretch to input strip length* and uncheck *Use as speed*. You now have a Frame number field which you can keyframe. If you want the strip to animate **at all** you will have to insert some keyframes, otherwise it will look like a still. In most cases you will want to use the Graph editor view to set the curve interpolation to Linear since the default Bezier will rarely be what you want.

If you do choose to keyframe the Speed factor instead, remember to click the Refresh Sequencer button in the header of the Video Sequence Editor's strip view or your changes will not take effect.

Changing Video Frame Rates

You can use the speed control to change the frames per second (fps), or framerate, of a video. If you are rendering your video to a sequence set, you can effectively increase or decrease the number of individual image files created, by using a Global Speed value less than or greater than one, respectively. For example, if you captured a five-minute video at 30 fps and wanted to transfer that to film, which runs at 24 fps, you would enter a Global Speed of `30/24`, or `1.25` (and Enable Frame Blending to give that film blur feel). Instead of producing `5*60*30=9000` frames, Bforartists would produce `9000/1.25=7200=5*60*24` frames. In this case, you set a `start=1` and `end=7200`, set your Format output to Jpeg, 30fps, and image files `0001.jpg` through `7200.jpg` would be rendered out, but those images 'cover' the entire 9000 frames. The image file `7200.jpg` is the same a frame 9000. When you read those images back into your film .blend at 24 fps, the strip will last exactly 5 minutes.

Subtract Effect

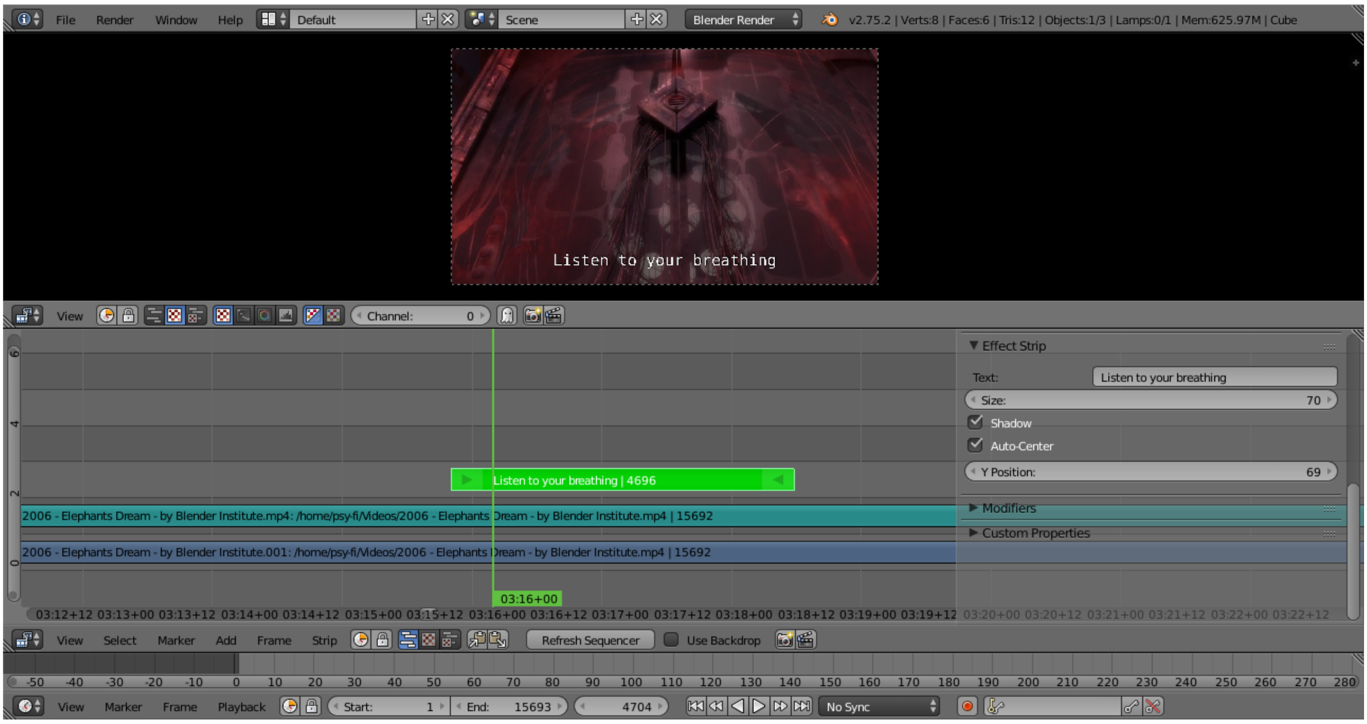


Subtract Effect

This effect takes away one strip’s color from the second. Make a negative of an image using this effect, or switch the order of the strips and just darken the strip. Subtracting a hue of blue from a white image will make it yellow, since red and green make yellow.

Text Effect

The text effect strip allows you to directly displaying text in the sequence editor. The strip will display the text inserted in its text field on the final sequence.



Text Effect

Options

Text

The actual text displayed.

Size

Size of the text.

Shadow

Creates a shadow under the text.

Auto Center

Centers the text on the x axis.

X Position

Positions the text on the x axis. Only appears if auto center is off.

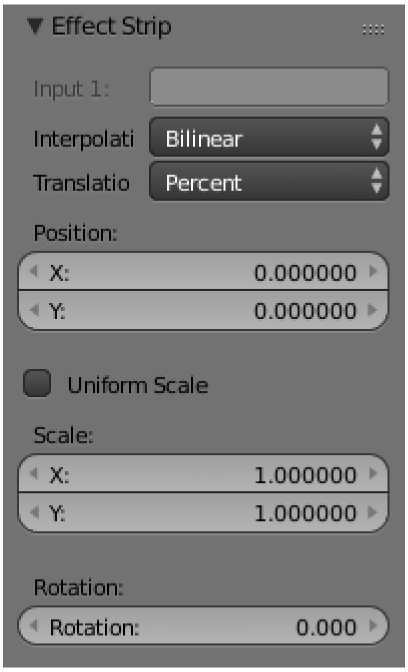
Y Position

Positions the text on the y axis.

Export Subtitles

Exporting subtitles in .srt format is also supported. The exported subtitles contain all text strips in the sequence editing.

Transform



Transform is a swiss-army knife of image manipulation. It scales, shifts, and rotates the images within a strip.

Options

Interpolation
: Todo.

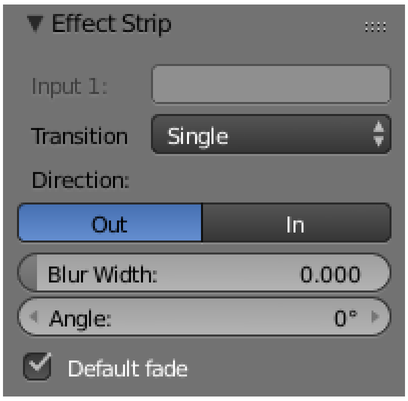
Translation Unit
: Control whether the input values are in *Percent* or *Pixels*

Uniform Scale
: Scale the input evenly along the X and Y axis.

Scale
: **Scale the image on the X and Y axis**

Rotation
: Rotates the input 2 dimensionally along the Z axis.

Wipe



Wipe Effect Settings

The wipe effect is a type of transition strip. It can be used to transition from one strip to the next. The wipe will have no effect if created from a single strip instead of two strips. The duration of the wipe is the intersection of the two source strips and can not be adjusted. To adjust the start and end of the wipe you must adjust the temporal bounds of the source strips in a way that alters their intersection.

Options

Transition

The type of transition used.

Clock
Like the hands of an analog clock, it sweeps clockwise or (if Wipe In is enabled) counterclockwise from the 9:00 position. As it sweeps, it reveals the next strip.

Iris
Like the iris of a camera or eye, it reveals the next strip through an expanding (or contracting) circle. You can blur the transition, so it looks like ink bleeding through a paper.

Double
Similar to *Single* but uses two lines either starting from the middle of the image or the outside. Unlike the other transitions you can control the angle of the line using the angle controls.

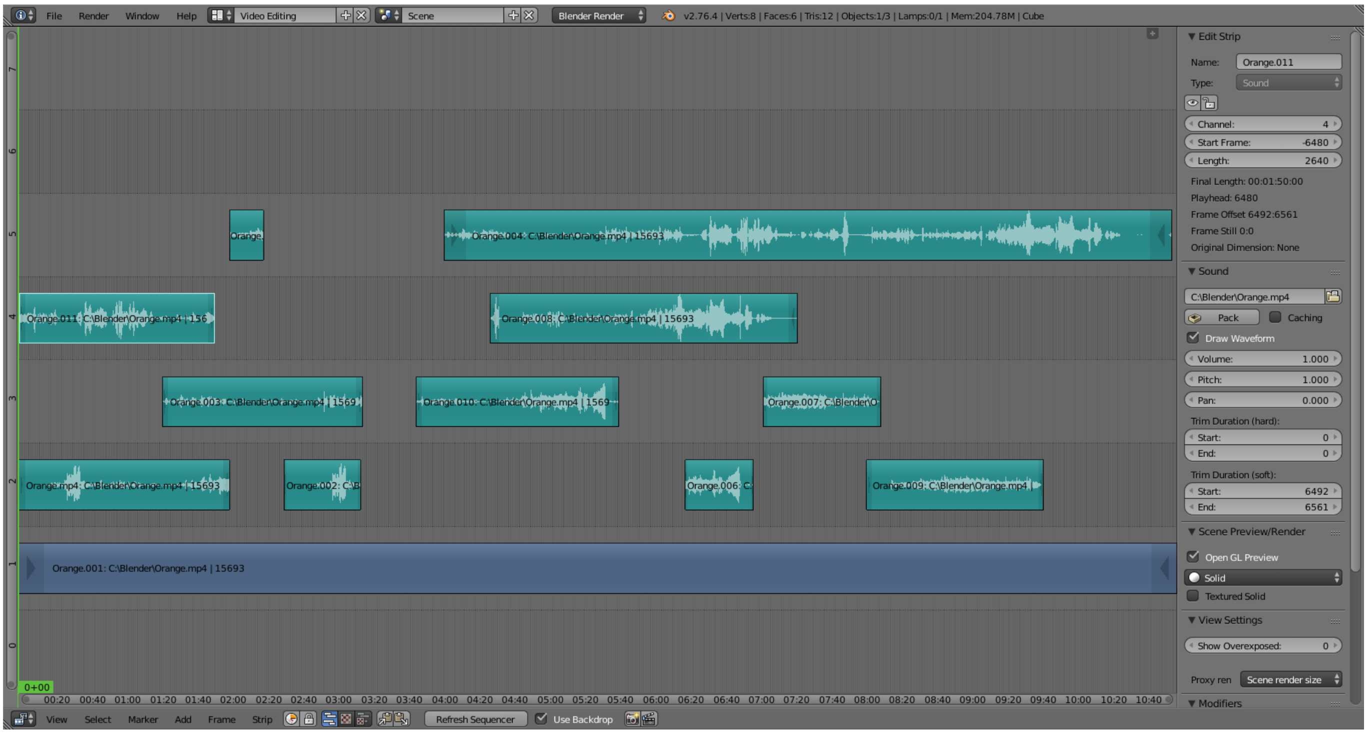
Single
Reveals the next strip by uncovering it in a strait line moving across the image. This transition also allows you to control the angle of the transition.

Direction
Control whether to fade *In* or *Out*.

Blur Width
The width of the blur used to blur the transition.

Sound Strips

As well as images and movies the VSE can also edit audio tracks. You can add WAV, Mp3 and other audio formates files from your hard disk as a file, or as encoded within a movie, and mix them using an F-Curve as a volume control.



Example of Sound Editing

Options

Pack

This allows you to save the audio file into the .blend file.

Caching

Caching loads a file into ram and plays it from there, apposed to reading it for the hard drive.

Draw Waveform

Draws a waveform over top of the sequence strip. This can be useful for syncing two or more audio strips.

Volume

Changes the loudness of the audio.

Pitch

Changes the frequency of the audio.

Pan

Used to pan the audio from left an right channels -2 being hard left, 2 being hard right.

Working with Audio Tracks

An audio track (strip) is just like any other strip in the VSE. You can grab and move it, adjust its starting offset using RMB over the arrow end handles, and K cut it into pieces. A useful example is cutting out the “um’s” and dead voice time.

You can have as many Audio strips as you wish and the result will be the mixing of all of them. You can give each strip its own name and volume via the N menu.

Overlapping strips are automatically mixed down during ANIM processing. For example, you can have the announcer on channel 5, background music on channel 6, and Foley sound effects on channel 7.

Animating Audio Track Properties

To animate audio strips simply hit `I` over any of its values. Examples of animating an audio strip are to fade in/out background music or to adjust volume levels. Layered/crossed audio strips are added together; the lower channel does not override and cut out higher channels (unlike image and video strips). This makes Bforartists an audio mixer. By adding audio tracks and using the curves to adjust each tracks' sound level, you have an automated dynamic multi-track audio mixer!

Output

There are two ways to render out your audio. You can either have it encoded with a video file or in its own audio file. To render your audio in an video file make sure to use a video format as the output with an audio codec and hit the render *ANIMATION* button in the properties editor. Read more on how to do this *here*. To render as a audio file simple use the *AUDIO* button. Read more on how to do this *here*.

Known Limitations

Hiss, Crackle and Pop

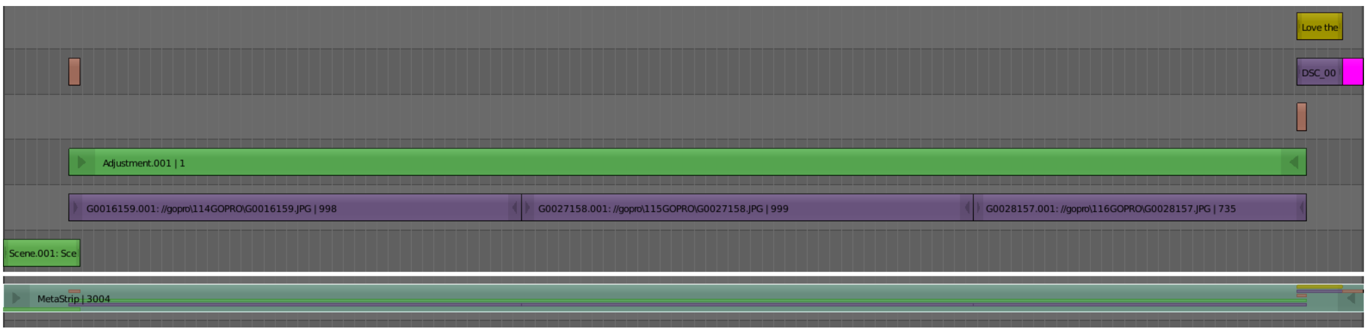
In some cases when *Caching* is disabled, playback noise/hiss is introduced.

If you hear pops and crackles, usually that is a sign that your hardware cannot keep up in real-time playback. They will not be present in your final rendered animation output.

Also, static hiss can occur whenever two or more audio strips are overlapping in the timeline.

Meta Strips

Meta-Strips are a kind of organization tool. For example, if you are using a lot of strips and they are complicated the the interface you can group them together using Meta-Strips. A Meta-Strip spans from the beginning of the first strip to the end of the last one, and condenses all channels into a single strip. Separating (ungrouping) them restores them to their relative positions and channels. To create a Meta-Strip select all the strips you want to group, and `Ctrl-G` to group them. If you choose to delete a Meta-Strip and want to keep the strips inside, use `Alt-G`.



Example of Meta-Strip.

After creating a Meta-Strip it is also possible to edit the contents inside a Meta-Strip. To do this select the desired Meta-strip and press `Tab`. Once you are done editing the contents inside a Meta-Strip press `Tab` again to exit the Meta-Strip. Meta-Strips can also be nested, which make editing them a little confusing. To exit out one level of Meta-Strip make sure you do not have a Meta-Strip selected when you press `Tab`.

Note

The default blend mode for a Meta strip is Replace. There are many cases where this alters the results of the animation so be sure to check the results and adjust the blend mode if necessary.

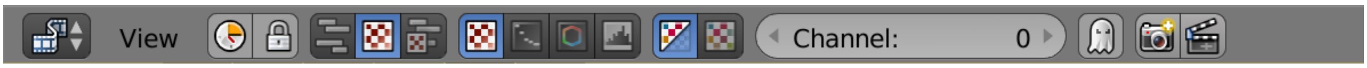
One convenient use for Meta-Strips is when you want to apply the same effect to multiple strips. For example: if you have a video that was recorded in different files and want to add an effect strip. It is much more convenient to apply a single set of effects to one Meta-Strip then applying it to each individual strip.

See also

It is also possible to do the similar task described above with a *Adustment Layer* effect strip.

Sequence Display Modes

By default, the VSE only displays the sequencer. Several options in the header bar allow you change the editor to display the sequence in real time, and in various ways.



Sequencer Display Header

The second button will change the editor to display only the preview, and the third button displays both the sequencer and the preview.

The VSE workspace can show you different aspects of the composite result, for the current frame:

- Image/Sequence: Colors (what you see)
- Chroma: Color hue and saturation
- Luma: Brightness/contrast
- Histogram: Levels of red, green, and blue

In the Chroma, Luma, and Image modes, a channel selector appears; channel 0 is the result of compositing the strips with their special effects strips. Channel 1 is what the current frame's image from the strip in channel 1 looks like (channel 1 is at the bottom of the heap). The display of these modes is either the composite (channel 0) or the frame from the strip (channels 1 through n).

Previews

Image Preview

In the upper window pane of the Sequence screen layout is another VSE window, this one set to Image Preview mode. It shows you what the resulting video will look like when saved. This is the main working mode for adding strips and moving them around, cutting, grouping (making meta) and splicing them through special effects.

Luma Waveform

For the selected channel, brightness, or luminosity, is mapped with this display.

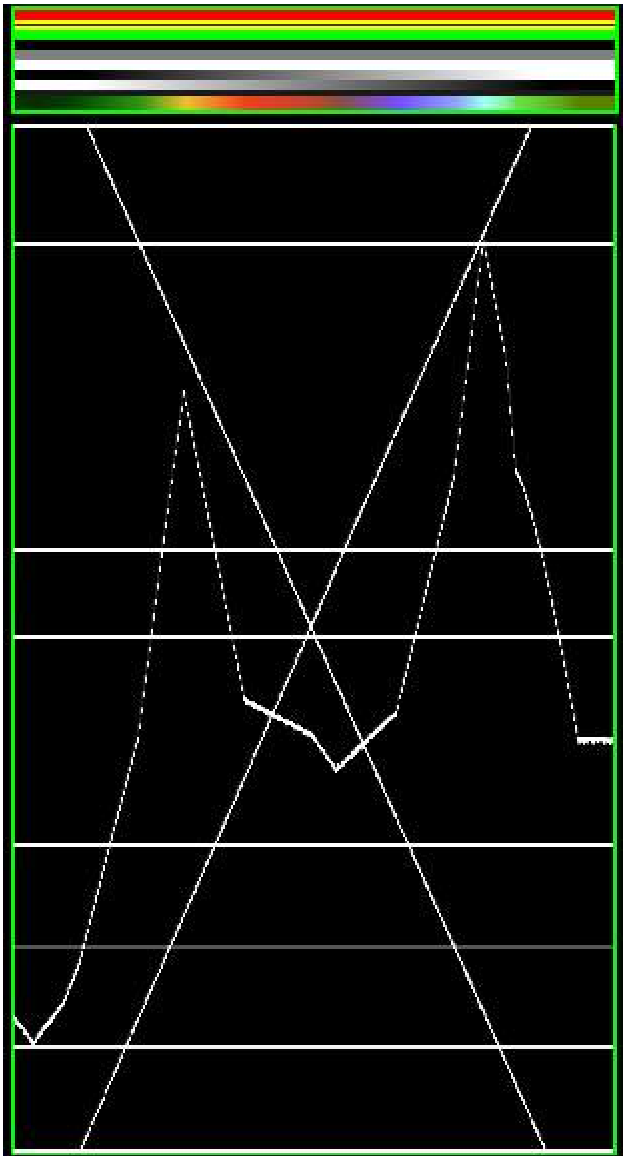
A luma waveform allows you to judge the quality of the luminance distribution across your video signal, you can view a luma-waveform instead of the usual output display on every control monitor.

The display plots for every scanline the luminance value. The lines are all drawn on top of each other. The points get brighter if the lines cross (which is very likely with several hundred scanlines). You will understand the picture most easily if you plug an oscilloscope to the Luma-video-output of your television set. It will basically look the same.

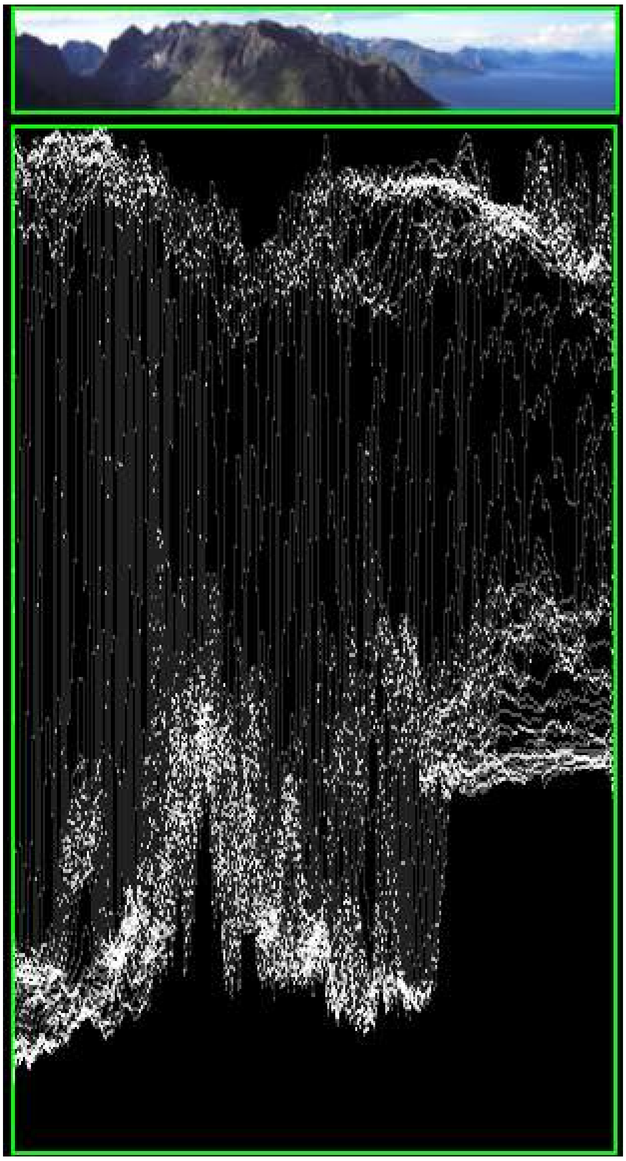
In this mode, the vertical axis represents the luminosity: 0 at the bottom, 1 at the top; the horizontal axis is a mapping from the horizontal axis of the frame. There are as many curves as scanlines in the frame: each one of this curves represents the luminosity of the pixels of one line. Moreover, the color of a pixel in this mode represents the number of pixels from the matching column of the frame sharing the same luminosity - i.e. the number of curves that cross at this point (black/transparent, for no pixel, white/opaque for at least 3 pixels).

This mode is good for:

- If the waveform does not fill the whole picture you might want to play with the “setup” and “gain” master-sliders in the “gamma”-plugin until it fills the whole picture (contrast autostretch).
- With the more advanced gamma-plugin you can decide where you have to desaturated (especially in dark regions).
- You can judge if you want to dump the whole thing since it is completely distorted and clips at the top or the bottom.



‘Simple’ picture. The various horizontal lines in the Luma waveform match the uniform-color lines of the picture. Note that the ‘grey 20%’ one-pixel width line (inside the yellow strip) is represented in the Luma waveform by a grey line. The two lines drawing an ‘X’ are from the two linear tone shades (white–>black and black–>white). Finally, the broken line matches the complex tone shade at the bottom of the picture.



A ‘real’ picture. The curves are quite visible. We found a luma of 80-100% for the sky, a luma around 40% for the sea, and a luma of 10-20% for the mountains, growing around 40% for the sunny part.

Note

Note that the pictures (first green frame, at the top) are only 50px high, to limit the number of curves displayed in the *Luma waveform*

Use this display to check for appropriate contrast and luminosity across all frames in the channel. When spots in the film that should have even illumination don’t, it looks like a flashbulb went off or an extra light was suddenly turned on. This can happen if two strips were rendered or shot under different lighting conditions but are supposed to be contiguous.

Chroma Vectorscope

Example of Chroma Vectorscope Preview.

Use this mode judge the quality of the color-distribution and saturation, you can also view a U/V scatter-plot.

The picture is converted to YUV-format. The U- and V-values represent the angle of the color. For pixel of the picture, one point is plotted in the display at the U and V-value-position. If several pixels happen to have the same U/V-value the pixel in the plot gets brighter.

To help you understand what color is meant, a hexagram marking the extreme positions (red, magenta, blue, cyan, green, yellow) is drawn and a red cross to mark the origin.

In other words, for the selected channel, this display shows the color space of the image inside a hexagon. Each point of the hexagon is a primary color: red, magenta, blue, cyan, green, and yellow. Black is at the center, and overall saturation is scaled as dots closer to the outside. The example to the right shows that the image has a lot of red (50% saturation) and small amount of blue, with no green.

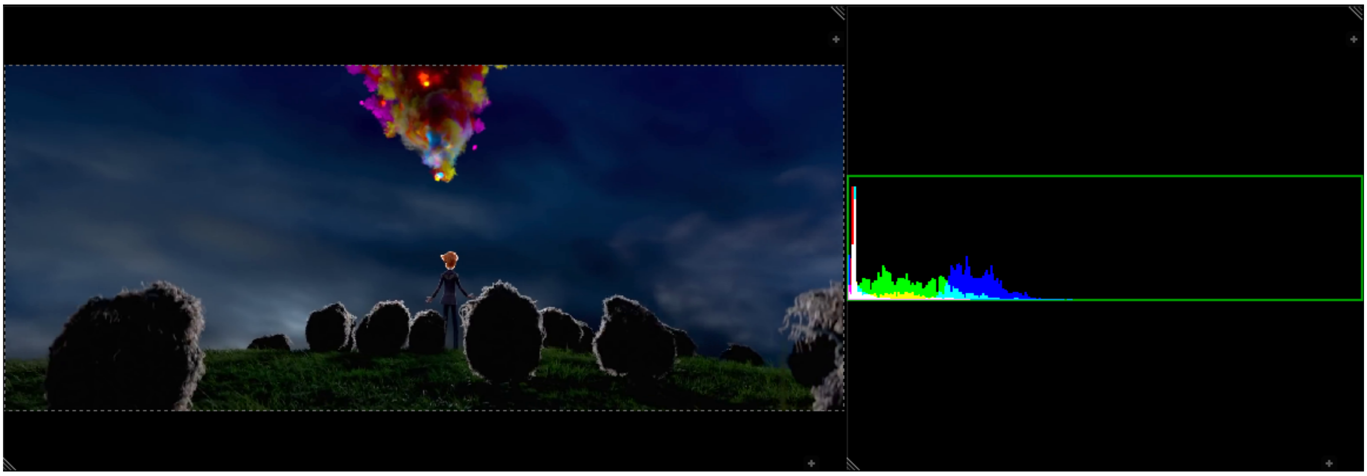
Always: remember to activate an additional control monitor of the end result. Color calibration is a matter of taste and depends on what you want.

Use this display to check for too much color saturation. While over-saturated images look great for op-art and computer displays, they stink when shown on the big screen TV. Use `Alt-A` to scrub the video; this display will update with a new/revised map for each frame. Just like watching the Image preview to see what it looks like, watch the Chroma Vectorscope to watch for color use.

This mode is good for:

- If you picture looks very moody or desaturated you might want to take a look at the U/V-plot. You will most likely see all pixels building a crowd at the origin. If you add saturation using the “gamma”-plugin you can see in the U/V-plot if you distort the color.
- If you do color-matching on a by hand basis you can match the angle you see of different channels monitors.

Histogram



Example of Histogram Preview.

This mode displays a graph showing the distribution of color information in the pixels of the currently displayed image. The X-axis represents values of pixel, from 0 to 1 (or 0 to 255), while the Y-axis represents the number of pixels in that tonal range. A predominantly dark image would have most of its information toward the left side of the graph.

Use this mode to balance out the tonal range in an image. A well balanced image should a nice smooth distribution of color values.

Movie Clip Editor

Detailled table of content

Tracking Introduction

Match moving is a cinematic technique that allows the insertion of computer graphics into live-action footage (a movie) with correct position, scale, orientation, and motion relative to the objects in the shot. And this is what motion tracking does.

Bforartists motion tracker supports tools for 2D tracking and 3D motion tracking. This includes camera tracking and object tracking, as well as some special features like the plane track for compositing. Tracks can also be used to move and deform masks for rotoscoping in the Mask Editor. This is available as a special mode in the Movie Clip Editor.

Manual Lens Calibration

All cameras record distorted video. That's how optical lenses work. For accurate camera motion you need the exact value of the focal length and the “strength” of distortion.

Focal length can only be automatically obtained from the camera’s settings or from the EXIF information. Both is not necessarily available. There are some tools which can help to find approximate values to compensate for distortion. There are also fully manual tools where you can use a grid which is getting affected by distortion model and deformed cells defines straight lines in the footage.

You can also use the grease pencil for this – just draw a line which should be straight on the footage using poly line brush and adjust the distortion values to make the grease pencil match lines on the footage.

To calibrate your camera more accurately, use the grid calibration tool from OpenCV. OpenCV is using the same distortion model, so it should not be a problem.

Camera and Object Motion Solving

Bforartists supports the solving of camera motion, including tripod shots,. It includes also the solving of object motion in relation to the motion of the camera. In addition to that there is the Plane Track, which solves the motion of all markers on one plane.

Tools for Scene Orientation and Stabilization

After solve, you need to orient the real scene in the 3D scene for more convenient compositing. There are tools to define the floor, the scene origin, and the X/Y axes to perform scene orientation.

Sometimes, the video footage includes spurious jumps and tilting movements, like e.g. when using a hand held camera. Based on some tracked image elements, the 2D Stabilization is able to detect and compensate such movements to improve the quality of the final result.

Movie Clip Editor Introduction

The Movie Clip Editor is the editor where you deal with the footage for motion tracking. Here you load your footage movies, mask them out, set the markers, and calculate the tracks.

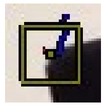
The Movie clip editor is three editors in one. The actual Clip editor, a Graph editor, and a Dopesheet editor. You can switch to the different editor types with this menu here in the header:

And the Clip editor has two modes. Tracking and Mask.

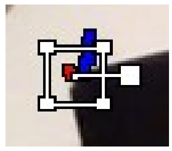
Marker

A marker is a tracking point in the movie. A point where the position of the pixel underneath the marker gets tracked. That's where the camera tries to follow the motion.

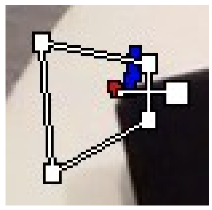
Each marker is represented by a rectangle. You can insert a marker by hand or automatically with the Detect feature.



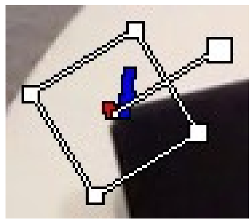
When you select a marker then it will be displayed with handlers. One in each corner, and a straight line from the center of the marker. This Handlers can be manipulated with the mouse.



The handlers in the corners allows to distort the marker, to fit it to distortions in the movie.



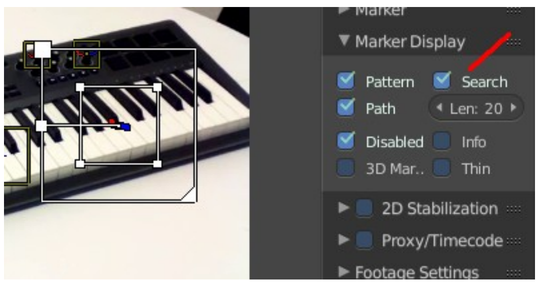
The straight handler from the center allows you to rotate and scale the marker.



Every marker has also a search area, where the searching for the tracking happens.

The search area can be enabled in the Marker Display panel in the Properties Sidebar.

This area usually scales with the marker. To scale this search area

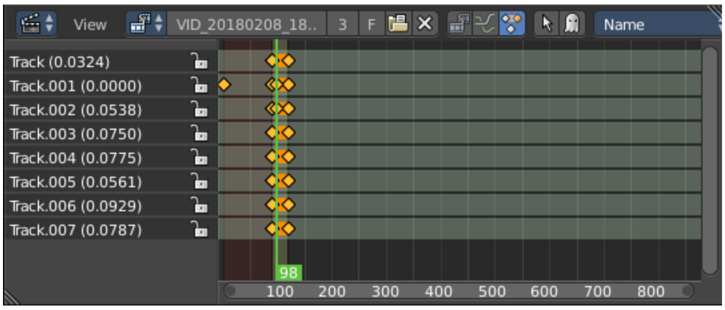


separately you can use the handlers of this search area.

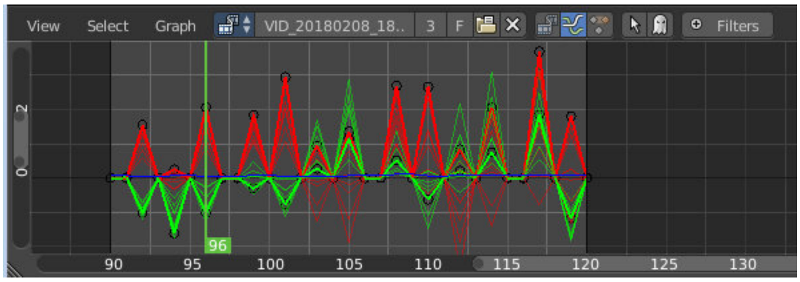
Or you can scale the marker only by pressing the scale hotkey twice.

Track

A track is the recorded movement of a marker. The movement is recorded in keyframes and curves. Once recorded you can see the track for the markers in the Dopesheet editor in the Movie Clip Editor.



And you can see the curves for this track(s) in the Graph editor.



Short tutorial

There are too many steps involved to get Motion tracking working. You can't figure it out by your own, nothing is self explaining. So here comes a short workflow tutorial.

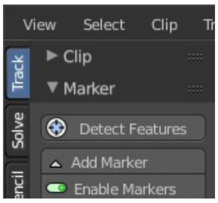
Note that we will just cover some of the basics here, some first steps. And we describe the setup for a ground tracking case here. I would suggest to search for a Blender tracking tutorial for more details.

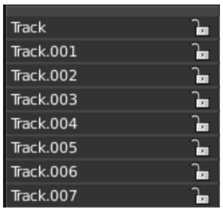
Preparing the video

Load a video.

Set the frame to the one where you want to start the tracking. The range of the movie to work with can be set in the Timeline at the bottom of the layout. I have chosen frame 90 to 120 here. Since especially the first frames of my example movie were very blurry.

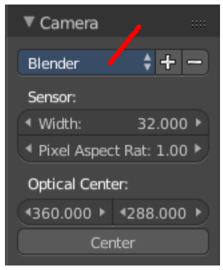
Click the Detect Features button in the tool shelf in the Track tab in the Marker panel. This sets some markers automatically, and adds tracks in the movie clip editor in dopesheet mode. Every track represents one marker.





You can add a few more markers manually with the Add Marker button, and place them at marcant locations in the current image of the movie. Borders or Corners for example. To do so, click the Add Marker button, then click in the image. We need minimum eight markers to have enough stability. The Add Marker button is below the Detect Features button.

Selected markers can be moved with the left mouse. You can fine tune the position of the marker in the Track panel in the Properties sidebar. Simply move the image there to the required position.

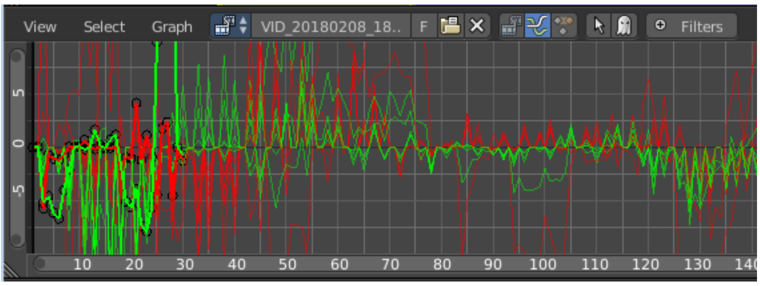


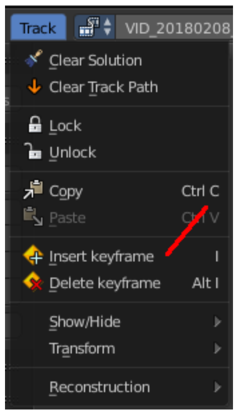
Now choose a camera preset in the properties sidebar in the Camera Data panel. If unsure, and your camera isn't listed, select Blender.

Or type in the values manually. Sensor and Optical Center ...

Select all markers.

Click the Track Forward button in the Track panel. This records everything. And you get data in the Graph Editor view. Blue and red lines for every marker.





Some markers may go crazy at this point. Motion means blurry graphics. And then a marker can loose its tracking position. Or the tracking point moves out of the visible area.

You can either remove such markers after tracking when you have enough working tracks left. Remember we need eight valid tracks. You can also try to add new markers, and repeat the procedure with this new markers.

Or you can manually adjust the markers, and add a keyframe where they loose their position. Scroll to the frames where the marker is loosing its position, move it back into location, and add a keyframe for it. Adding keyframes is done in the Track menu.

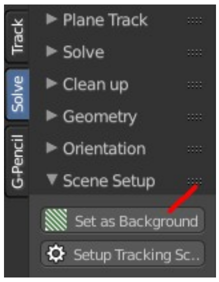
Tracking the object

This was the preparation of the movie material. Now for the tracking part. We need a camera. And something to track. A cube will do it for now.

In the 3D view, create or select the object that you want to track.

Now go into camera view, and adjust it so that it shows the content somehow in the center. Our cube for example.

Go to the solve tab into the solve panel. First adjust the range. I had tracked frame 90 to frame 120. So the default of 1 and 30 will not work since there are no keyframes for the markers at this position. And so you will get an error.

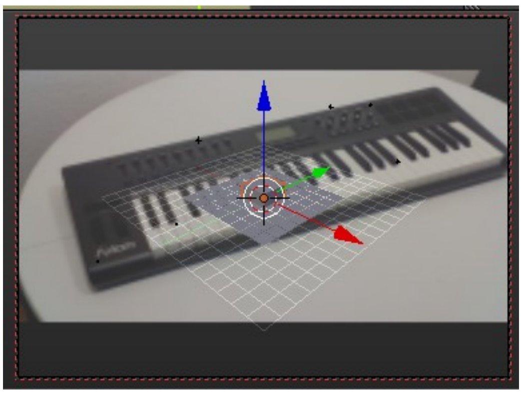


When done click at the solve camera motion button. This calculates the camera motion.

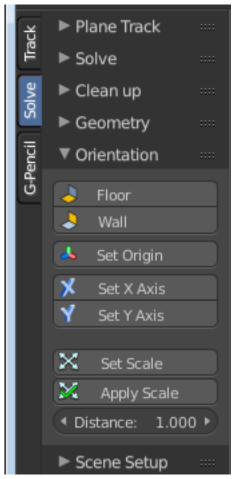
In the solve tab in the Scene Setup panel click at Set as Background. This will show our movie as background now in the 3D view in the camera view.

In the solve tab in the Geometry panel, click at 3D Markers to Mesh. You can also click Link Empty to Track. This will create an empty where you can parent things at.

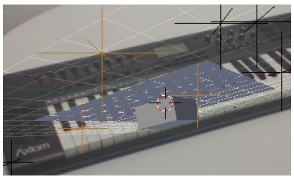
Then click at Setup Tracking Scene below the Set as Background button. This will create a ground plane, which is used for shadow catching in the rendering. And now our object should already follow the motion of the movie when you play back.



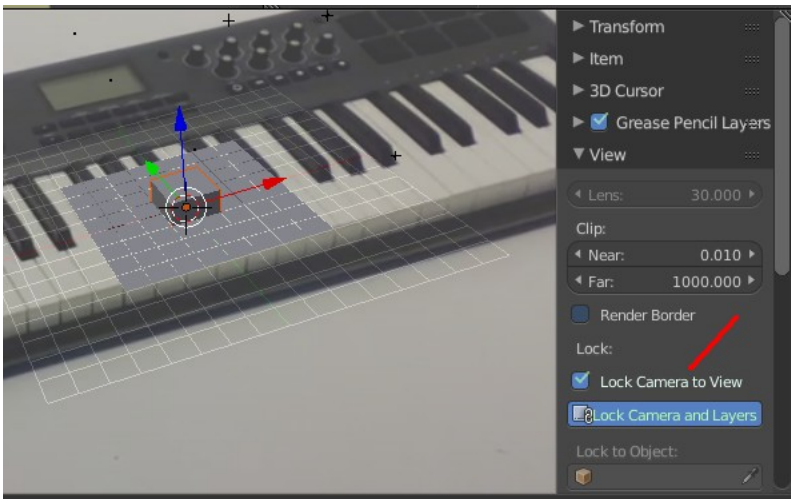
Orientation and dimensions



In the solve tab you can find the Orientation panel. This allows you to adjust the orientation of the object along marker points. Select three of your markers, and click at Floor, and the object will orient along this three points.



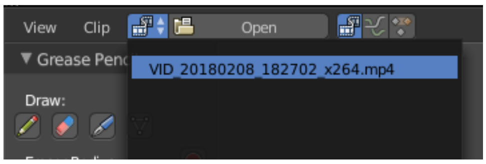
This may or may not lead to useful results. In our case it didn't. Even after selecting other markers. So we need to rotate our object manually.



Note that the view in the Motion Tracking layout the camera is NOT locked to view. So when you zoom then the passepartout zooms, not the view. And you can't rotate the camera view that way. So go to the View panel, and tick Lock Camera to view. Then you can navigate from the camera view, and rotate and zoom everything so that it fits.

You can also scale the object to the needed size. Or fit the perspectivic distortions by changing the Camera focal length, or by zooming.

Reloading a project



When you save your project and reload it then you might notice that the Movie Clip editor loads empty. This is because Bforartists has "Load UI" unticked. And so it looks like the movie is missing and the project is empty.

There is nothing missing. You just need to select the movie again in the dropdown box at the top.

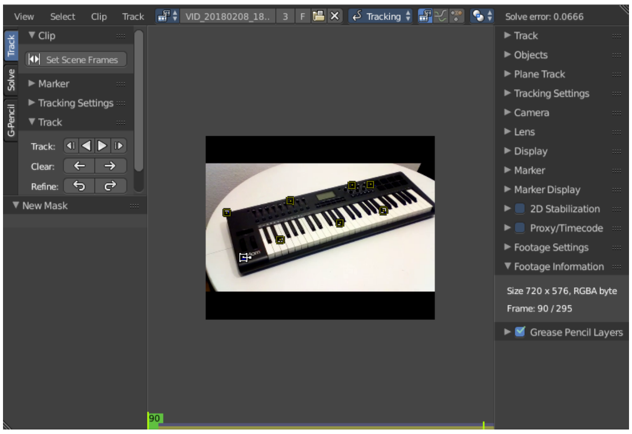
When you work more often with motion tracking, then you might want to activate Load UI in the user preferences permanently.

Clip Editor, Gaph Editor and Dopesheet Editor

The Tracking mode has three different sub editor types. Clip Editor, Graph Editor and Dopesheet Editor.

Clip Editor

The clip editor contains the footage related tools and settings. Here you deal with the footage movie. It's the main window that you see in the Motiontracking layout. The Clip Editor view has two main purposes. It can be used for for tracking or masking movies.

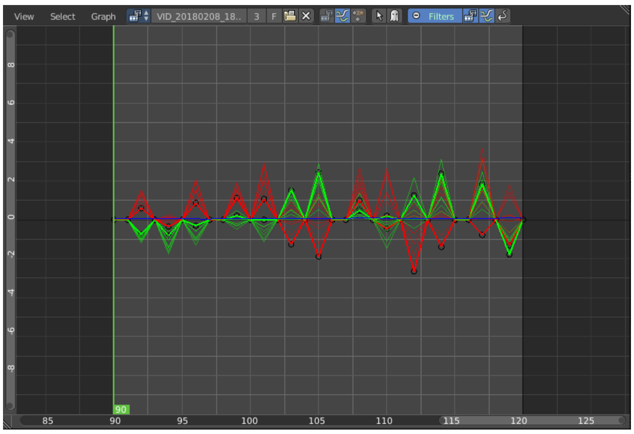


The Clip Editor has four areas. Actually five, since the tool shelf is divided into two areas.

The Header. The place for menus and some often used tools and settings.
The viewport, where you display your movies.
The Tool shelf. Here you will find the tools. When you are in Mask mode then the toolset will be different.
The Last Operator panel. Here you will find the settings for the currently active tool.
The Properties Sidebar. Here you will find properties.

Graph Editor

The Graph editor is the place where you can see and deal with the function curves of the recorded tracks.

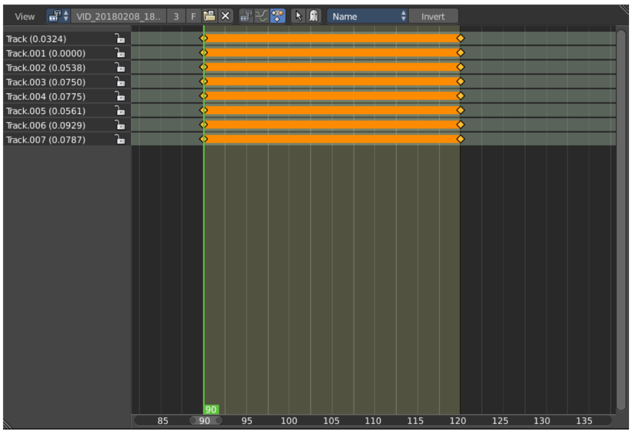


The Graph editor has two areas.

The Header. The place for menus and some often used tools and settings.
The viewport, where you display the curves.

Dopesheet Editor

The Dopesheet Editor is the place where you deal with the keyframes for the tracks.



The Dopesheet editor has three areas.

The Header. The place for menus and some often used tools and settings.
The left column where you can see the name of the tracks.
The right column where you can see the keyframes.

Clip Editor Introduction

The clip editor contains the footage related tools and settings. Here you deal with the footage movie. It's the main window that you see in the Motiontracking layout. The Clip Editor view has two main purposes. It can be used for for tracking or masking movies.

The Clip View is used is the main part of the of the Movie Clip editor. Almost all motion tracking tools are concentrated in the Movie Clip Editor.

Camera solver consists of three separate steps.

2D tracking of footage.
Camera intrinsics (focal length, distortion coefficients) specification/estimation/calibration.
Solving camera, scene orientation, and scene reconstruction.

Clip Editor general navigation

You can move the frame slider with the left mouse here.

To scroll in and out in the viewport you can use the scroll wheel. Or the + and - Buttons at the Numpad.

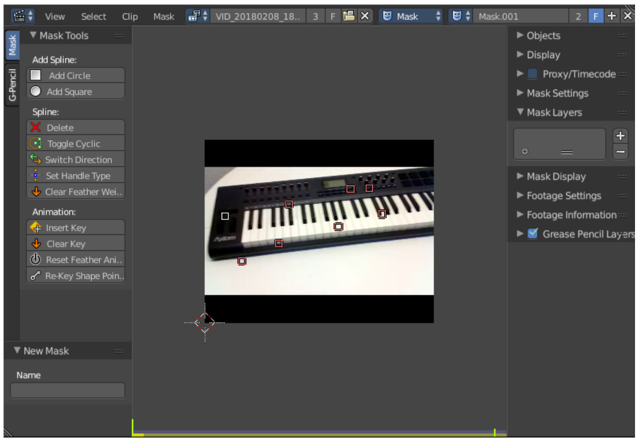
Panning the viewport happens with middle mouse button.

Clip Editor - Tracking and Mask Mode

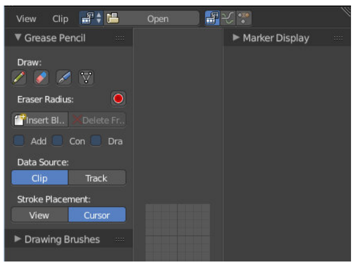
The Clip editor has two modes. Tracking Mode and Mask Mode.

The Tracking mode contains all functionality regarding motion tracking and footage. The Mask Mode contains tools to mask out parts of the footage. The masking part is spline based.

The mask tools in the Tool Shelf and the Properties Editor appears when you create a new mask.



Tool Shelf - Grease Pencil



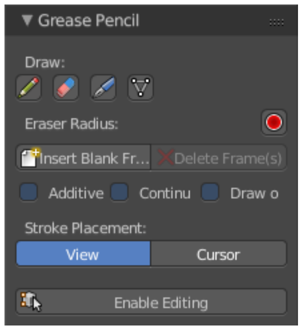
The Grease Pencil tool is a tool with which you can paint strokes in editors like the 3D view.

It is unfortunately cluttered across two shelves. The Tool Shelf and the Properties Sidebar. Means you have to adjust settings at two places.

The first thing that you have to do is to load a movie. Without a movie loaded you can't use the Grease Pencil here. Then you can create a new Grease pencil.

This can either be done in the Properties Editor by clicking at New. Or in the Grease Pencil Tab in the Tool Shelf by simply clicking at the Draw button. Then all Grease Pencil tools becomes visible. And a Grease Pencil layer gets created.

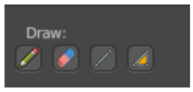
Grease Pencil Panel



The Grease Pencil panel contains the general Grease Pencil tools. The Draw tool, eraser, some settings and tools.

Draw

The Draw section contains the draw tools.



Draw

Draw activates the freehand draw mode.

Erase

Erase is the eraser tool with which you can delete strokes.

Line

Line paints a straight line between start and end point.

Poly

Poly allows you to paint polygon shapes.

Eraser Radius

Here you can adjust the radius of the eraser tool. Have a look at the hotkey, it's a hotkey only tool for proper functionality.

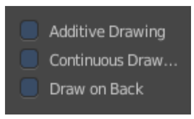
Insert Blank Frame

Insert a blank frame on the current frame.

Delete frames

Delete the active frame(s) of all editable grease pencil layers.

Draw Settings



The draw settings are placed besides each other, to save space.

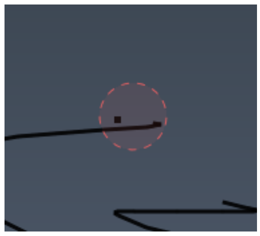
Additive Drawing

When you create new frames then the strokes from the previous active frame are included as the base for the current frame.

Continuous Draw

The Continuous Draw checkbox enables and disables the continuous draw mode. Normally the draw mode ends when you stop drawing the current line. And you have to activate the draw tool again when you want to continue with painting. With continuous draw you can immediately paint the second stroke without to enable the draw tool again.

Eraser in Continuous Draw



The draw tools are disabled as long as you are in continuous draw. To erase a stroke use the right mouse button. The pencil turns into a red circle. With which you can erase strokes now.

End Continuous Draw

The draw tools are disabled as long as you are in continuous draw. To end the continuous draw mode click outside of the viewport. In the tool shelf for example.

Draw on Back

New strokes will be drawn behind all other strokes in the layer

---

Stroke Placement

Stroke Placement defines where the Grease Pencil stroke is placed.

View

View will place the stroke at the top of the viewport. It is not drawn in the 3D view.

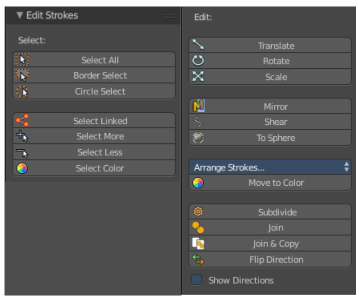
Cursor

Cursor will place the stroke aligned with the 3d cursor, and aligned with the current camera view. It is drawn in the 3D view.

Enable Editing

Sometimes you want to edit the strokes that you have placed. Here you can enter the editing mode, and reveal some editing tools.

Edit Strokes Panel

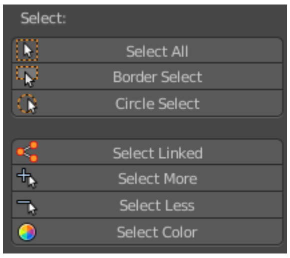


The Edit Strokes Panel contains the tools to edit the Grease Pencil strokes. Most of the tools are pretty self explaining.

It is divided into two sections. Select and Edit.

Select

The select section.



Select All

Toggles between select all and deselect all.

Border Select

Border select enters the Border Select mode. This is a special select mode where you can select elements by dragging a rectangle. And what's inside of the rectangle gets selected then. It adds to selection by default.

To subtract from selection hold down Shift key.

The selection gets applied when you release the mouse. You leave the mode automatically when you release the mouse.

Circle Select

Circle select enters the Circle Select mode. This is a special select mode where you can select elements by moving with the mouse over it. It adds to selection by default.

To subtract from selection hold down Shift key. To exit the Circle select click with the right mouse button.

The pencil radius of the circle select tool can be adjusted with the scroll wheel.

Select Linked

Select the linked vertices of the same stroke.

Select More

More expands the selection.

Select Less

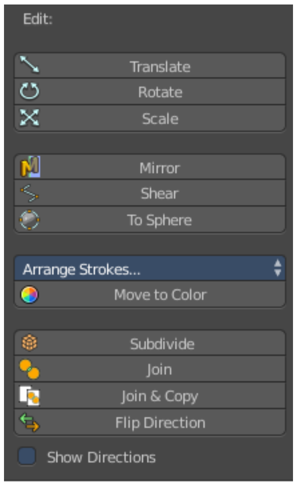
Less reduces the selection.

Select Color

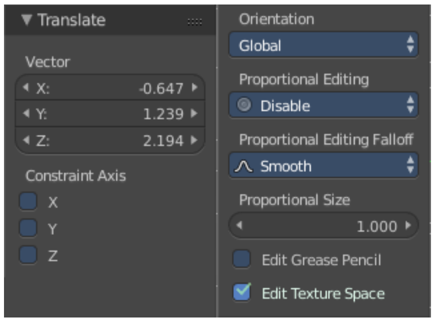
Select all grease pencil strokes with the same color than the currently selected one.

Edit

The Edit section.



Translate



Moves the selected grease pencil geometry in the viewport by moving the mouse.

Last Operator Translate

The last operator appears in the 3D view!

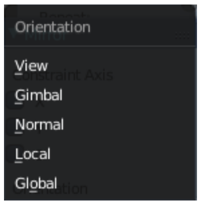
Vector

Here you can adjust the position values for the three values

Constraint Axis

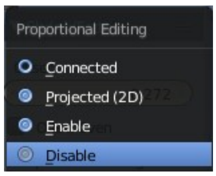
Here you can limit the position relative to the source object.

Orientation



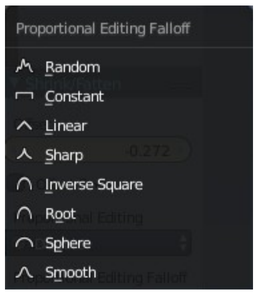
Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.

Proportional Editing



Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced in a proportional way.

Proportional Editing Falloff



Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

Proportional Size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

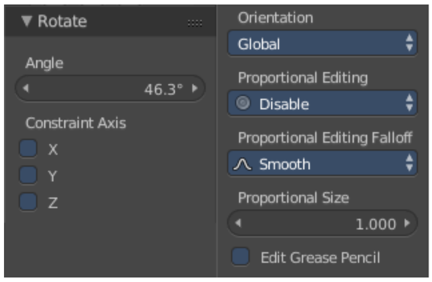
Edit Grease Pencil
Edit Grease Pencil edits the selected Grease Pencil strokes.

Edit Texture Space
With Confirm on Release checked the action gets performed when you release the mouse button.

Rotate

The last operator appears in the 3D view!

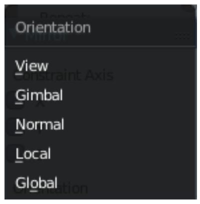
Rotates the selected grease pencil geometryi in the viewport by moving the mouse.



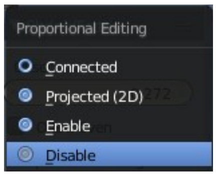
Last Operator Translate

Angle
Here you can adjust the rotation angle.

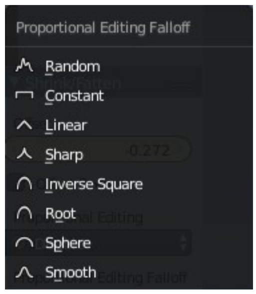
Constraint Axis
Here you can limit the position relative to the source object.

Orientation


Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.

Proportional Editing


Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.

Proportional Editing Falloff


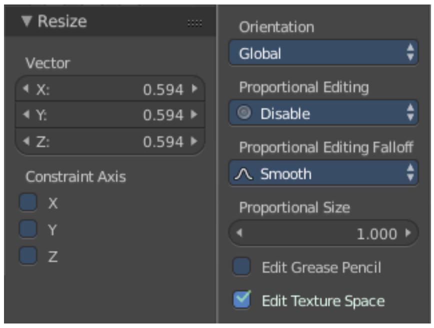
Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

Proportional Size
Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Edit Grease Pencil
Edit Grease Pencil edits the selected Grease Pencil strokes.

Scale

The last operator appears in the 3D view!



Scales the selected grease pencil geometry in the viewport by moving the mouse.

Last Operator Resize

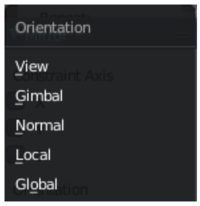
Vector

Here you can adjust the position values for the three values

Constraint Axis

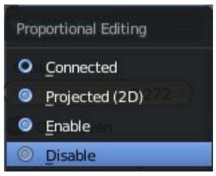
Here you can limit the position relative to the source object.

Orientation



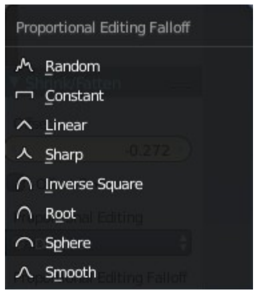
Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.

Proportional Editing



Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.

Proportional Editing Falloff



Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

Proportional Size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

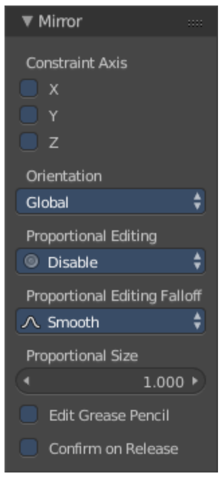
Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

Edit Texture Space

With Confirm on Release checked the action gets performed when you release the mouse button.

Mirror



Mirror mirrors the selected geometry along the defined axis. Click the Mirror button, type in X, Y or Z, then confirm with enter.

Last Operator Mirror

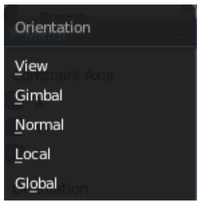
The Last Operator Mirror panel gives you tools to adjust the mirror action.

Constraint Axis

Constraint Axis gives you again the possibility to define the mirror axis. You can choose more than one axis here.

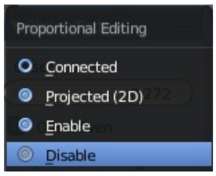
Orientation

Orientation is a drop-down box where you can choose the type of orientation for the mirroring action.



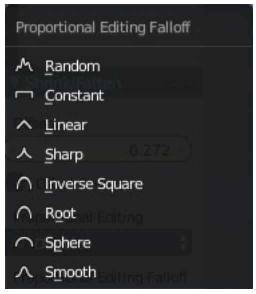
Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.



Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



Proportional size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

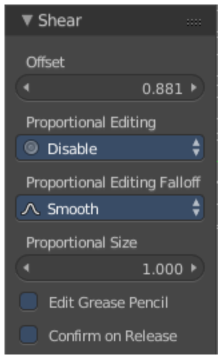
Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

Confirm on Release

With Confirm on Release checked the action gets performed when you release the mouse button.

Shear



Shear shears the selection.

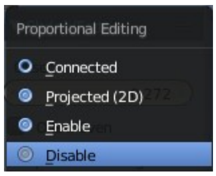
Last Operator Shear

Offset

Adjust the offset

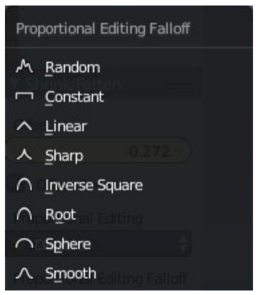
Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.



Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



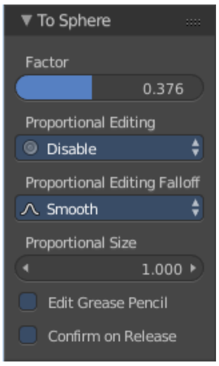
Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

Confirm on Release

With Confirm on Release checked the action gets performed when you release the mouse button.

To Sphere



To Sphere transforms the selection into a spherical form.

Last Operator To Sphere

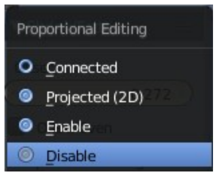
Factor

Adjust the rounding factor

Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing.
When you choose one of the active methods then the neighbour geometry gets influenced by Shrink/Fatten too in a proportional way.

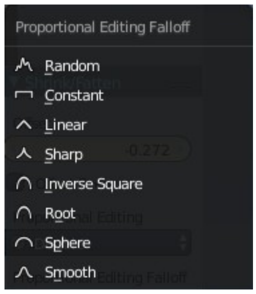
Proportional Editing Falloff



Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

Proportional Size

Adjust the proportional size



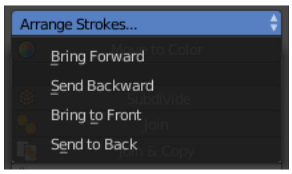
Edit Grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

Confirm on Release

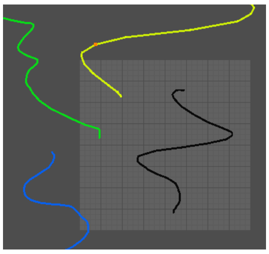
With Confirm on Release checked the action gets performed when you release the mouse button.

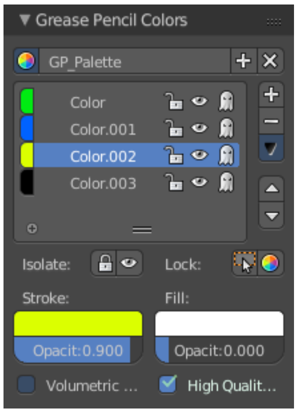
Arrange Strokes



This is a dropdown box where you can arrange the currently selected stroke relative to the other ones.

Move to Color





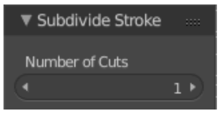
Recolors the currently selected grease pencil stroke with the active color in the Grease Pencil Colors color.

The grease pencil colors can be found in the properties sidebar at the right.

Subdivide

Subdivide subdivides the current selection.

Last Operator Subdivide Stroke



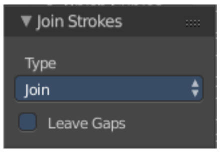
Number of Cuts

Adjust the number of subdivisions

Join

Joins strokes.

Last Operator Join Strokes



Type

Here you can choose if it should only join, or join and also copy the strokes.

Leave Gaps

Leave Gaps between joined strokes instead of linking them.

Join & Copy

Joins strokes and copies it.

For last operator see above.

Flip Direction

Change the direction of the stroke.

Sculpt Strokes Panel

The Sculpt Strokes Panel provides tools to sculpt the Grease pencil strokes.

Note!
The Sculpt Strokes Panel is just visible in Edit Strokes Mode!

Sculpt Strokes Button

The Sculpt Strokes Button activates the Sculpt brush. Now you can sculpt the Grease Pencil stroke with left mouse button. Clicking with right mouse button ends the sculpt mode.

Radius

The radius of the sculpt brush.

The button behind the edit box allows you to set the radius by moving the mouse. This should be done in the viewport and with the hotkey. This button is just a visible reminder.

Strength

The strength of the sculpt brush.
The button behind the edit box allows you to set the strength by moving the mouse. This should be done in the viewport and with the hotkey. This button is just a visible reminder.

Use Falloff

Defines if the brush has a falloff from the centre to the border of the pencil.

Position

The Brush affects the position of the point.

Strength

The Brush affects the strength of the point.

Thickness

The Brush affects the thickness of the point.

Selection Mask

Only sculpt the selected points.

Alpha

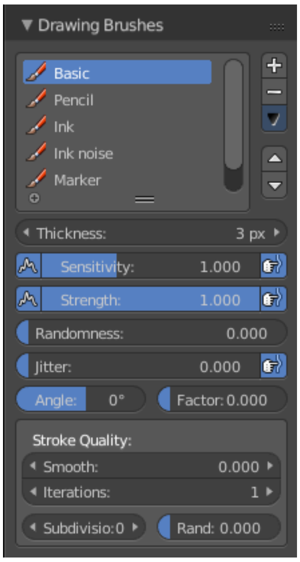
Alpha value for selected vertices.

Affect Pressure

Affect pressure values as well when smoothing strokes.

Drawing Brushes panel

The Drawing Brushes panel contains everything around the Brushes and their settings. It is visible in all modes. But the content just shows when you have activated the draw tool already.



Brushes selection box

Here you can choose different brush types. At the right you can add and remove brushes. And you can sort the brushes order.

Thickness

Defines the thickness of the stroke.

Sensitivity

Pressure sensitivity for new strokes.

Strength

Color strength for new strokes. The alpha factor of the color is affected.

Randomness

Randomness factor for pressure and strength of new strokes.

Jitter

Jitter factor for new strokes.

Angle

Direction of the stroke at which the brush gives the maximum thickness.

Factor

Reduce Brush thickness by this factor when stroke is perpendicular to angle direction

Smooth

Amount of smoothing to apply to newly created strokes to reduce jitter / noise.

Iterations

Number of times to smooth newly created strokes.

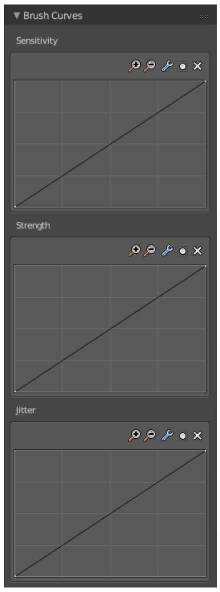
Subdivision

Number of times to subdivide newly created strokes, for less jagged strokes.

Randomness

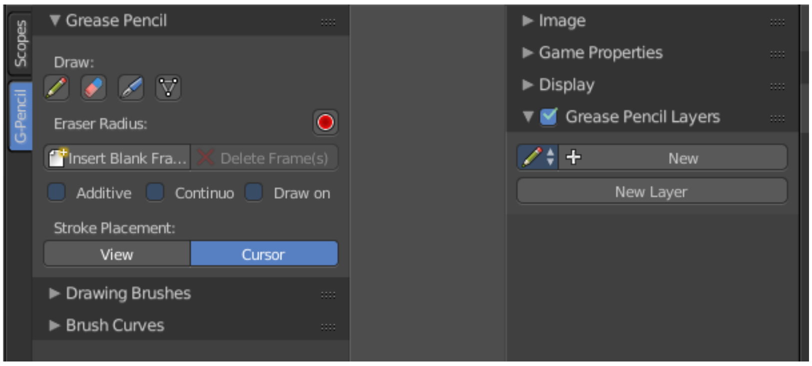
Randomness factor for new strokes after subdivision.

Brush Curves Panel



The Brush curves panel is meant for usage with tablets. Here you can manipulate the curves for Sensitivity, Strength and Jitter.

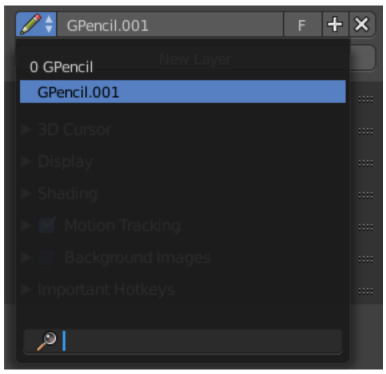
Properties Sidebar - Grease Pencil - Layers Panel



The Grease Pencil Layers are connected with the Grease Pencil panel in the Tool Shelf. And provides you with the layer settings for the Grease Pencil.

When no layer exists then there are just a few buttons available.

Grease Pencil Prop



Here you can add a new grease pencil to work with. Or choose an existing grease pencil.

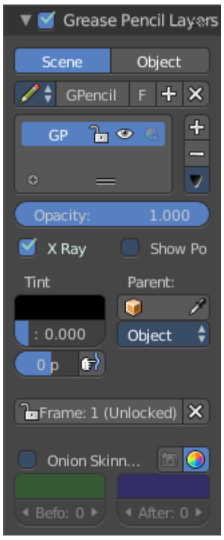
The **edit box** allows you to rename the current grease pencil.

The **F Button** adds a fake user to the grease pencil. So that it does not get deleted when you delete the connected object and close the scene.

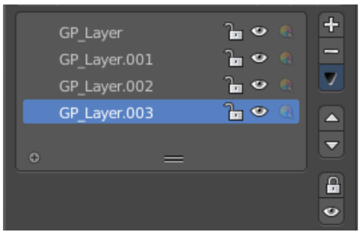
When you add a fake user, then a number field will appear that shows how much users are connected with the current pencil.

New Layer

Here you can create a new layer for your grease pencil. Doing so will reveal several layer settings. And another panel with some color settings.



Layer list



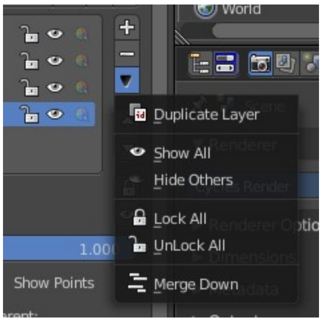
Here you can see a list of the current layers. And here you can select the current active layers.

Grease Pencil Layers can be locked (lock icon) and hidden (eye icon). The third symbol is to unprotect selected colors from further modifications.

Add / Delete

Right besides the layer list box there is a add button and a delete button. The plus button adds a new layer, The minus button removes the current layer.

Layer Specials menu



Below the add and delete buttons there is a text menu with some further options.

Duplicate Layer

Duplicates the currently selected layer.

Show All

Unhides all hidden layers.

Hide Others

Hides all layers but the selected.

Lock All

Locks all layers.

Unlock All

Unlocks all layers.

Merge Down

Merges all layers into one.

Move Up / Move down

Moves the currently selected Grease pencil layer one up or down the list.

Lock Unlock unselected / Show Hide unselected

Lock Unlock unselected toggles the lock for the unselected layers.

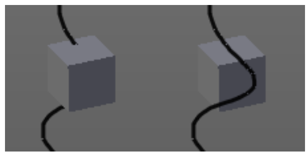
Show Hide unselected toggles the visibility for the unselected layers.

Opacity

Opacity sets the opacity of the current grease pencil stroke.

X Ray

X Ray makes the grease pencil stroke appear in front of objects. Without X Ray the stroke will be invisible behind objects.

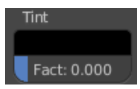


Show Points

Shows the points in the current grease pencil stroke.

Tint

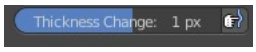
Tint tints the color of the current grease pencil stroke with the tint color.



The upper field is a color picker where you can select a color. The fac slider defines the blending factor between the grease pencil stroke color and the tint color.

Thickness Change

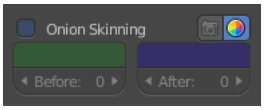
Increase or decrease the thickness of the grease pencil stroke.

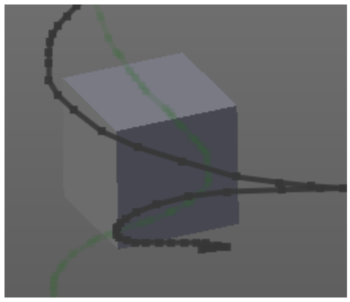


Lock Frame

You can draw grease pencil strokes in different frames. Here you can lock those frames from further editing.

Onion Skinning





You can draw grease pencil strokes in different frames. With onion skinning you can display the strokes from the previous and following frames as ghost drawings.

Onion Skinning checkbox

Activates / deactivates the onion skinning.

Use always ghosts

When activated the ghost images will also show in rendering.

Use custom colors

Here you can choose to display the ghost drawing in predefined colors, or in their original colors. Default is to display the predefined colors.

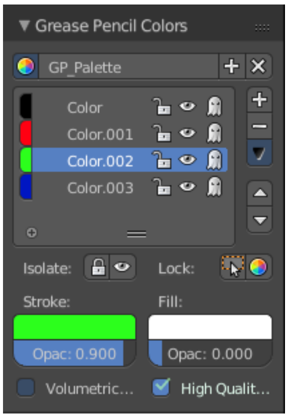
Before

Here you can choose in which color the previous frame gets displayed. And how many frames gets displayed before the current frame.

After

Here you can choose in which color the following frame gets displayed. And how many frames gets displayed after the current frame.

Properties Sidebar - Grease Pencil - Colors Panel



The grease pencil colors panel contains all the settings to set up and define the colors that you use for your grease pencil drawings.

It activates when you start to draw a grease pencil stroke. And shows its content then.

GP Palette

Here you can select, create and delete a color palette for the grease pencil colors. Define some colors in the Color list, then create a new palette with it.

Color List

Here you can add custom colors.

The color field at the beginning of the edit box reveals a color picker when you click at it. Which allows you to define a color.

The string “Color”, “Color 002” and “Color 003” is an edit box which allows you to rename the color. Click into the field to activate it.

The **Lock** symbol allows you to lock the current color.

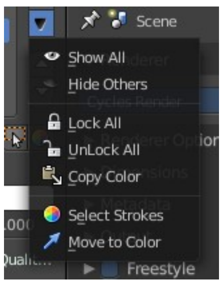
The **eye** symbol allows you to show or hide the current layer.

The **ghost** symbol allows you to display this color with onion skinning.

Add / Delete

Right besides the layer list box there is a add button and a delete button. The plus button adds a new layer, The minus button removes the current layer.

Palette color Specials menu



Below the add and delete buttons there is a text menu with some further options.

Show All

Unhides all hidden colors.

Hide Others

Hides all colors but the selected.

Lock All

Locks all colors.

Unlock All

Unlocks all colors.

Copy color

Copys the color.

Select strokes

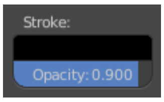
Selects all grease pencil strokes that uses the curent color.

Move to color

Move selected strokes to active color.

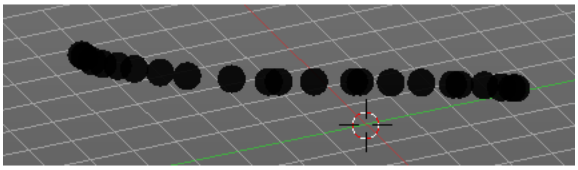
Strokecolor

Here you can define the stroke color and set its opacity.



Volumetric Strokes

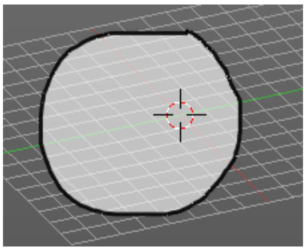
With Volumetric strokes the grease pencil stroke does not draw as a stroke, but a line of dotted points.

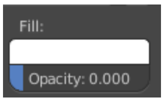


Fill

Fill fills the space between the grease pencil strokes.

The opacity is by default at zero. The fill color shows when you increase the opacity.



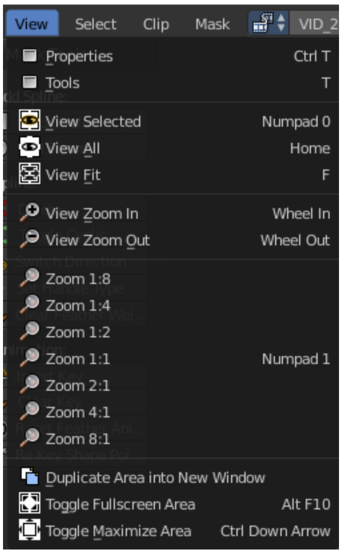


High Quality Fill

Fill Strokes uses high quality to avoid glitches. But this gives slower fps while animation. Here you can turn it off.

All Modes - Header - View Menu

The View menu provides you with some view related tools.

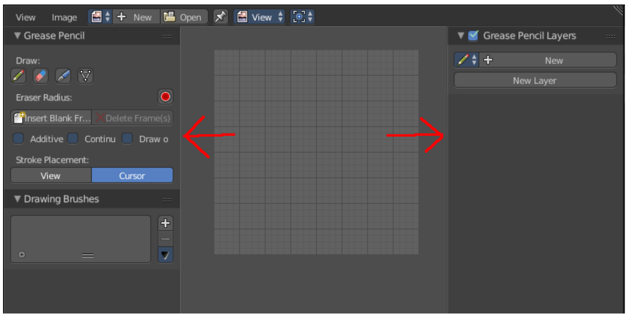


Properties

Opens or closes the Properties sidebar at the right side of the UV Image Editor.

Tools

Opens or closes the Tool Shelf at the left side of the UV Image Editor.



View Selected

Just visible with 3D View in Edit mode, for UV mapping.

View Selected zooms in or out until the Selection is displayed fitting in the viewport.

View All

View all zooms in or out until all selections are displayed fitting in the viewport.

View Fit

Zooms in or out to fit the selection into the current view.View Zoom In

Zooms into the view

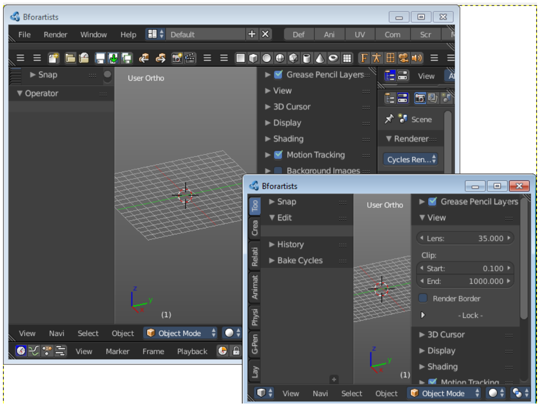
View Zoom Out

Zooms out of the view

Zoom 1:8 ... Zoom 8:1

A set of predefined zoom factors.

Duplicate Area into new Window



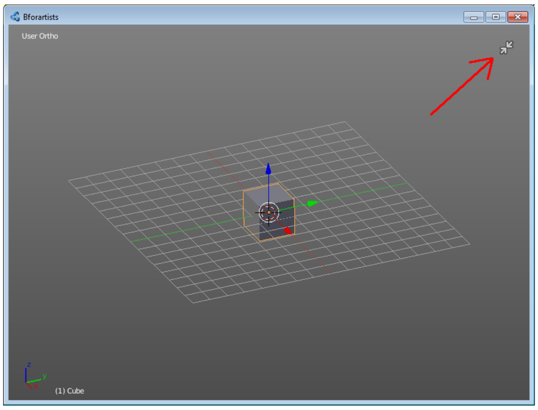
Duplicate Area into New Window makes the selected editor window floating. You can then drag it around at the monitor.

A separated window cannot be merged into the main window

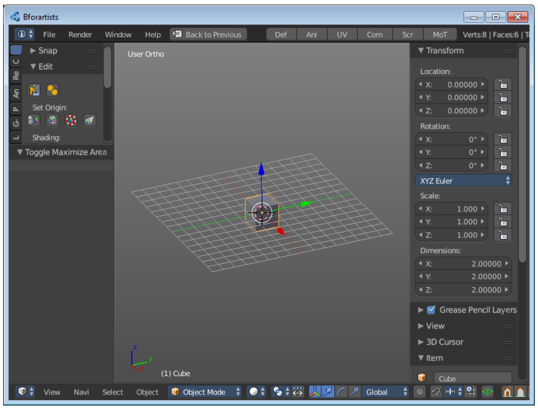
Toggle Full screen Area

Displays the editor maximized without menus.

To return from the full screen view press hotkey Alt F10, or use the little button that appears up right when you move the mouse in



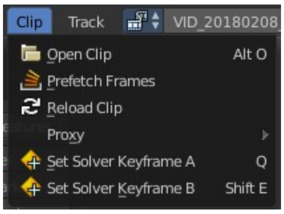
Toggle Maximize Area



Displays the editor maximized with menus.

To return to split view press hotkey Ctrl Up Arrow, or reuse the menu item in the View menu.

All Modes - Header - Clip menu



The clip menu contains clip related tools. It shows in both modes, Tracking and Mask.

Open Clip

Open a new movie file

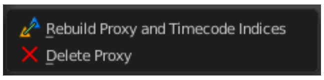
Prefetch Frames

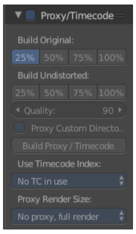
Preloads the frames of the movie file for faster playback.

Reload Clip

Reloads the movie file.

Proxy





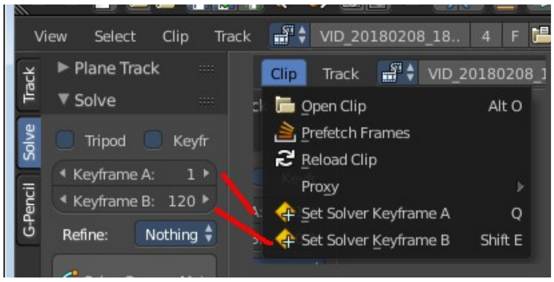
Proxy is a sub menu with proxy related settings. A proxy is a smaller image (faster to load) that stands in for the main image. And this allows faster editing once this proxy images are generated. The Proxy and Timecode settings are in the Properties sidebar at the right.

Rebuild Proxy and Timecode Indices

Rebuild all selected proxies and time code indicies in the background.

Delete Proxy

Delete the Proxy.



Set Solver Keyframe A

Set keyframe used by solver A at current keyframe position. It's the same solver keyframe than in the Solve panel.

Set Solver Keyframe B

Set keyframe used by solver B at current keyframe position. It's the same solver keyframe than in the Solve panel.

All Modes - Header - Tools

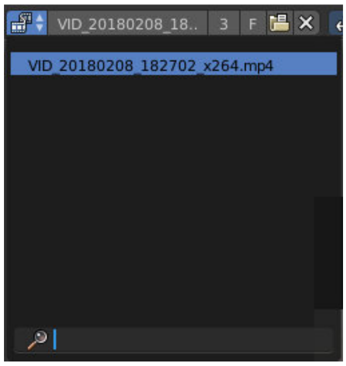
Clip Browser

The clip browser is the place where you can load a new movie and choose an existing movie.

When no movie is loaded, or when no movie is selected, then you will see the Open button.

When a movie is loaded and selected, then you will see the currently selected movie.

From left to right.



Clip browser

A dropdown box with the currently loaded movies.

Edit Box

Here you can read and edit the currently selected movie.

Number of users

How much other sources uses this movie at the moment.

Fake User

Pressing this button sets the selected movie to have a fake user. Zero user data-blocks are normally not saved. But sometimes you want to force the data to be kept even when the data block has no user.

Open Clip

Open a new movie

Delete Clip

Deletes the movie. Note that the numbers of users has to be zero when you really want to remove the movie completely from the Blend file. Else it always comes back.

Mode dropdown box

Here you can choose if you want to be in Tracking or in Mask mode.

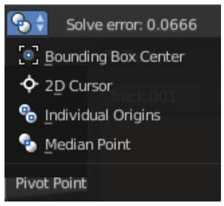
In Tracking mode you do motion tracking.

In Mask Mode you can mask out specific parts of the footage. For green screening for example.

Clip Editor Type

The clip editor is made of three sub editors. Clip Editor, Graph Editor and Dopesheet Editor. Here you can switch between them. This element is available in all three sub editor types.

Pivot Point



Here you can adjust where the pivot point of the currently selected element is. This is important for transforms like move or rotate.

Bounding Box Center

The pivot point is in the center of a bounding box around the selected element(s).

2D Cursor

The pivot point is at the 2D cursor.

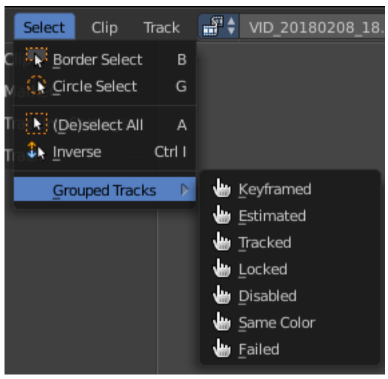
Individual Origins

Each selected element has its own pivot point.

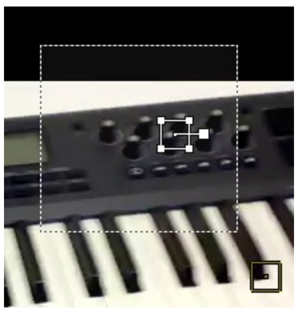
Median Point

The pivot point is in the center of the selected element(s).

Tracking Mode - Select Menu



Border Select

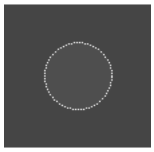


Border select enters the Border Select mode. This is a special select mode where you can select elements by dragging a rectangle. And what's inside of the rectangle gets selected then. It adds to selection by default.

To subtract from selection hold down Shift key.

The selection gets applied when you release the mouse. You leave the mode automatically when you release the mouse.

Circle Select



Circle select enters the Circle Select mode. This is a special select mode where you can select elements by moving with the mouse over it. It adds to selection by default.

To subtract from selection hold down Shift key. To exit the Circle select click with the right mouse button.

The pencil radius of the circle select tool can be adjusted with the scroll wheel.

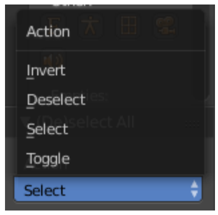
(De)Select All

Toggles between select all and deselect all.

Last Operator (De)Select All

Action

Action is a drop-down box where you can choose between different methods.



Invert
Inverts the selection.

Deselect
Deselects all.

Select
Selects all.

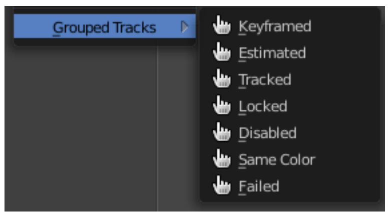
Toggle

Inverse

Inverts the current selection.

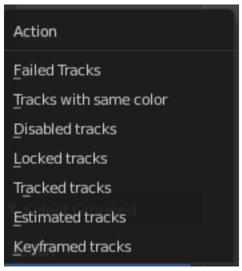
Grouped tracks

Grouped tracks is a sub menu where you can select grouped tracks by specific types. The menu items are pretty self explaining. So we won't go into detail here.



Last Operator Select Grouped

Action is again the same menu content from above. But the names differs here a bit. Here every item contains the term track.



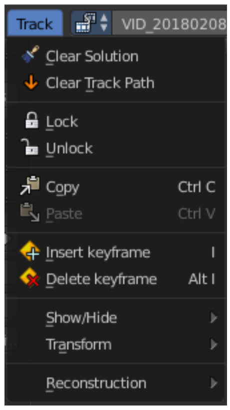
Tracking Mode - Header Tools

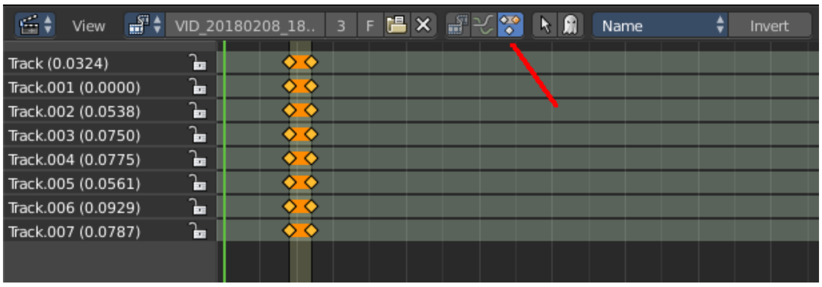
Info String

In this area you might get additional information. For example in this case the solve error after motion tracking calculation for the markers.

Tracking Mode - Track menu

The track menu contains some tracking related tools. They belong to the Dopesheet Editor in the Movie Clip Editor.





Clear Solution

Clears all calculated data.

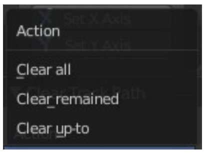
Clear Track Path

Clear tracks after/before current position or clears the whole track. It basically deletes the involved keyframes.

Last Operator Clear Track Path

Action

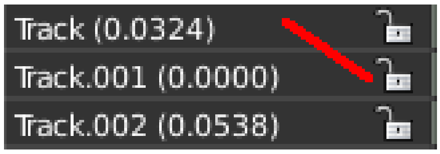
Action is a dropdown box where you can choose the clear method.



Clear Active

Clear just the active track instead of all selected tracks.

Lock

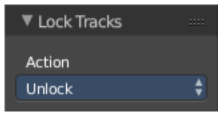


Locks the current track. This setting is related to the lock symbol in the Dopesheet editor.

Unlock

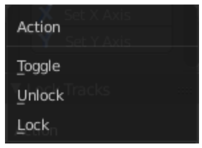
Unlocks the current track. This setting is related to the lock symbol in the Dopesheet editor.

Last Operator Lock Tracks



Action

A dropdown box where you can choose again if you want to lock or to unlock the current track. Plus a possibility to toggle the current lock.



Copy

Copies a track

Paste

Pastes the copied track

Insert Keyframe

Inserts a keyframe to the selected track(s) at current movie position

Delete Keyframe

Deletes a keyframe in the selected track(s) at current movie position

Show / Hide

Show Hide is a sub menu where you will find show hide functionality for the markers in the viewport.

Show Hidden

Shows all hidden markers.

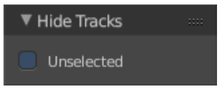
Hide Selected

Hides the selected markers.

Hide Unselected

Hides the unselected markers.

Last Operator Hide Tracks



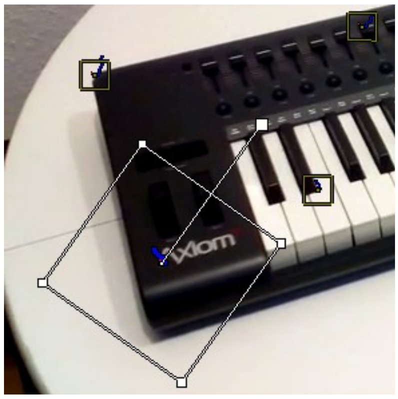
Unselected

Here you can again choose if you want to hide the selected or the unselected marker

---

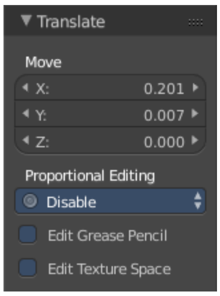
Transform

Markers can be changed in size position and rotation. Transform is a sub menu where you will find the menu items for the transform operations to manipulate the markers in the clip viewport.



Translate

Move the selected marker(s).



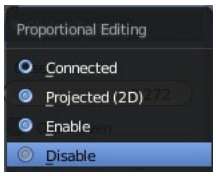
Last Operator Translate

Move

Here you can adjust the position.

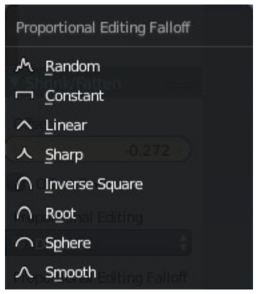
Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced too in a proportional way.



Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



Proportional size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Edit grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

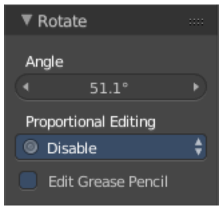
Edit Texture Space

Edit Object Data Texture space. - Note that this most probably doesn't belong here.

Rotate

Rotate the selected marker(s).

Last Operator Rotate

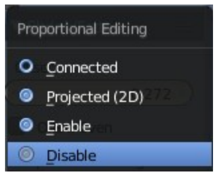


Values

Here you can adjust the position.

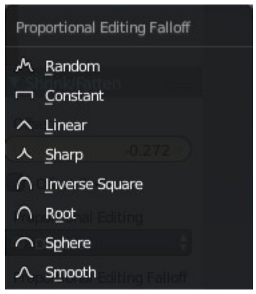
Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced too in a proportional way.



Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



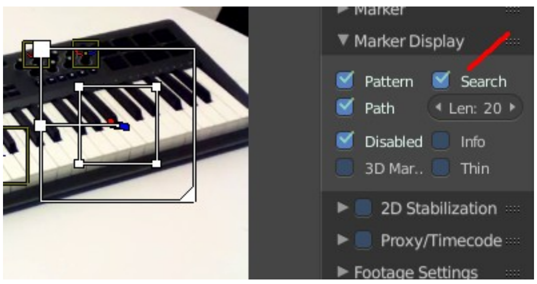
Proportional size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Edit grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

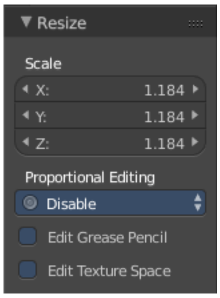
Resize



Scale the selected marker(s).

Note: Every marker has also a search area connected to it. It normally scales with the marker. You can scale just the marker without scaling the search area by pressing the Resize hotkey twice.

This functionality has no menu entry.



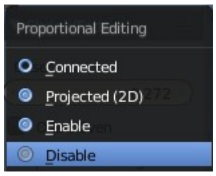
Last Operator Resize

Scale

Here you can adjust the scale.

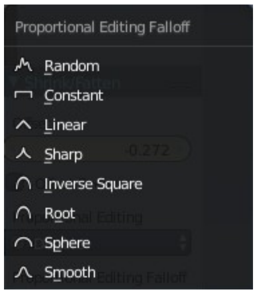
Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced too in a proportional way.



Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



Proportional size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Edit grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

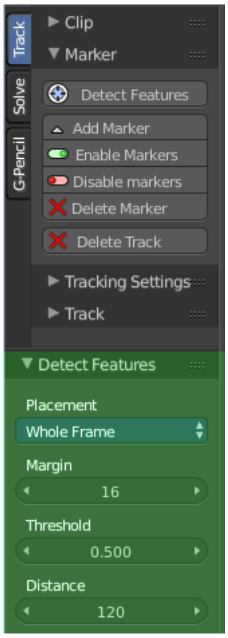
Edit Texture Space

Edit Object Data Texture space. - Note that this most probably doesn't belong here.

Reconstruction

This menu was formerly a menu full of double entries that can also be found in the tool shelf. It remains in place for addon compatibility.

Tracking Mode - Tool Shelf



The Tool Shelf is split into two areas. The upper area with the tabs is the actual tool shelf where you find your tools. It is also a usual place where add-ons gets installed, and adds their tab too.

The lower area is the so called Last Operator panel. Here you will find the settings for the currently performend tool.

The content is varying, dependant of the mode you are in. Tracking mode has other tools than the Masking mode.

Track Tab and Solve Tab

The track tab contains the tools around the movie side of things. Markers, tracking etc.

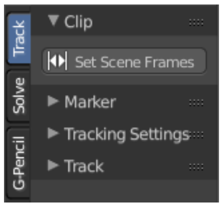
The solve tab contains the tools around the scene side of things. Scene setup, camera motion, etc.

Grease Pencil tab

The grease pencil tab contains grease pencil tools.

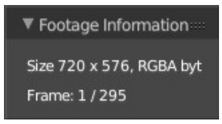
Tracking Mode - Tool Shelf - Track tab - Clip Panel

The Clip panel contains movie related tools.



Set Scene Frames

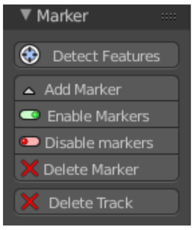
Sets the length, means start and end frame of the tracking to match the start and end frame of the active movie.



You can see the length of the active movie in the Properties sidebar in the Footage Information panel. And the tracking length and position can be seen and set in the time line.

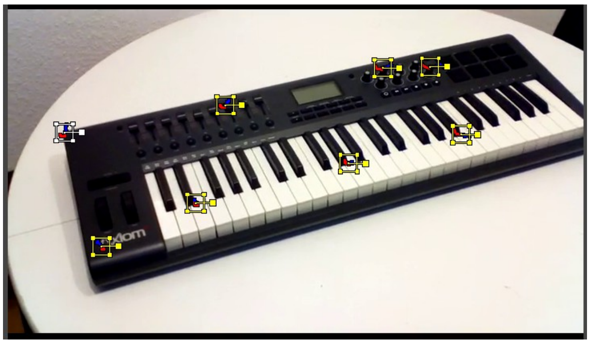
The default range for tracking is from 1 to 250. But our movie is 295 frames long. Pressing the Set Scene Frames button makes the range going from 1 to 295 here.

Tracking Mode - Tool Shelf - Track tab - Marker Panel



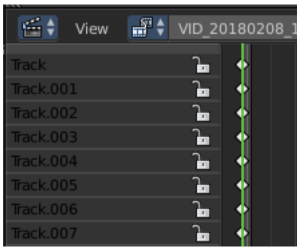
The marker panel contains marker related tools.

Detect Features

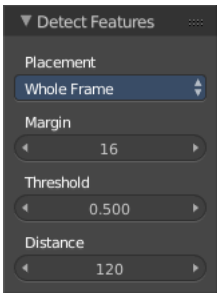


Adds automatically markers at the current movie position, and tries to detect marcant areas in the current frame that are useful for tracking. It also sets keyframes at this position.

When enough marcant areas are available then it adds up to eight markers that way.

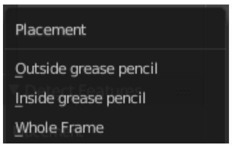


Last Operator Detect Features



Placement

Placement is a dropdown box where you can limit the placement of the markers.



Whole frame

The markers can be at every position of the current frame image.

Inside Grease Pencil

The markers have to be inside the Grease Pencil.

Outside Grease Pencil

The markers have to be outside Grease Pencil.

Margin

Gives a margin to the border of the frame image. Markers have to stay away from the border by the given amount.

Threshold

The threshold level to consider the current position of the marker as good enough for tracking.

Distance

The minimum distance between two markers.

Add Marker

Adds a marker by hand. First click the tool, then click at the location where you want it to be.

You can reposition this marker afterwards by simply clicking at it and move it to a new position.

Last Operator Add Marker at Click

This last operator has no functionality. Just a warning that redo is not supported.

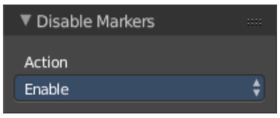
Enable Markers

Enables the currently selected marker(s)

Disable Markers

Disables the currently selected marker(s)

Last operator Disable Markers



Action

Edit box where you can again choose if you want to enable or disable the selected marker(s).

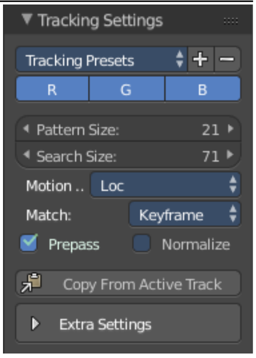
Delete Marker

Deletes the currently selected marker(s) data. The track stays available. And the marker is still there too. But cleared.

Delete Track

Deletes marker, marker data and track data.

Tracking Mode - Tool Shelf - Track tab - Tracking Settings Panel



In the Tracking Settings Panel you will find some settings for Tracking.

Tracking Presets

A dropdown box where you can choose between some predefined tracking presets.

+ Button adds a new preset with the current settings.

- Button removes the current tracking preset.

R G B

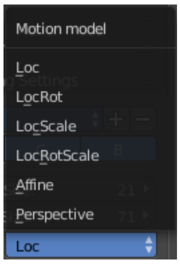
By default all three colors gets used for calculation. But you can enable or disable specific color range.

Pattern Size

Size of pattern area for newly created tracks.

Search Size

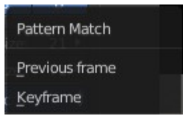
Size of search area for newly created tracks.



Motion

Here you can choose between different motion models for tracking.

Loc stands for location. Rot for Rotation, etc.



Match

The pattern match method.

Keyframe matches the tracking from the keyframe.

Previous frame matches the tracking from the previous frame. Regardless if there is a keyframe recorded or not.

Prepass

Use a Brute Force translation - only intialisation when tracking.

Normalize

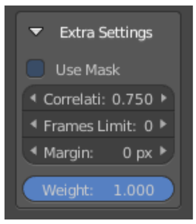
Normalize light intensities when tracking.

Copy from Active Track

Copy tracking settings from active track to default settings

Extra Settings

Extra settings is a sub menu that contains some not so often used settings.



Use Mask

Use a Grease Pencil data block as a mask.

Correlation

Default minimum value of correlation between matched pattern and reference that is still treated as successful tracking.

Frames Limit

In every tracking cylce the numbers of given frames are tracked.

Margin

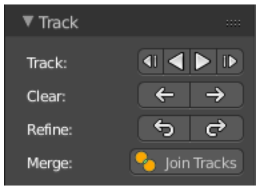
Default distance from image boundary at which markers stops tracking.

Weight

Influence of newly created track on a final solution.

Tracking Mode - Tool Shelf - Track tab - Track Panel

The tracking tools.



Track

Track selected markers in chosen direction. Usually you want to play them forward. But you can also track backwards. And by one step.

The two play buttons in the center tracks the whole range. The two outer buttons tracks just frame wise.

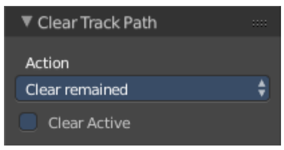
Tip

To select good points for tracking, use points in the middle of the footage timeline and track backwards and forwards from there. This will provide a greater chance of the marker and point staying in the camera shot.

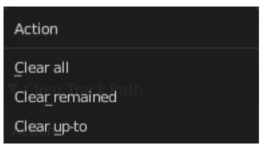
Clear

The left button clears the track before the chosen position. The right button clears the track after the chosen position.

Last Operator Clear Track Path



Action



Here you can again choose the direction.

Clear up to clears the track before the chosen position.

Clear remained clears the track after the chosen position.

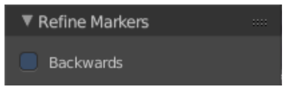
Clear all clears the whole track.

Clear active

When ticked, just the active track gets cleared.

Refine

Refine selected marker position in given direction from the current position.



Last operator Refine Markers

Backwards

Refine in backwards directory.

Merge

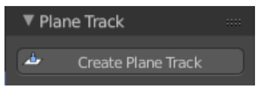
Joins selected tracks.

Tracking Mode - Tool Shelf - Solve tab - Plane Track Panel

Here you can create a plane track. A plane track can be used to map an image or a movie at an area in your clip. The Plane track.

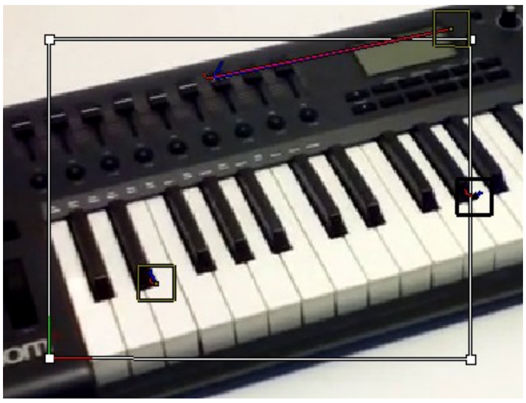
A plane track can be used to replace things like billboards and screens on the footage with another image or video. It can also be used for masking.

It is also possible to have some tracks appear and disappear during the time. This required to have two neighbor frames have at least 4 common tracks.



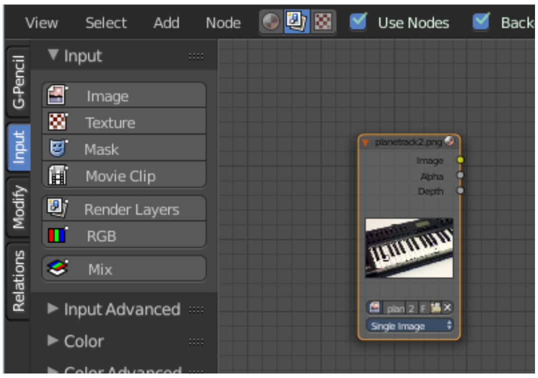
You need to select at least four markers. And the four markers should preferrably be at the corners of the area in which you want to map the image or movie.

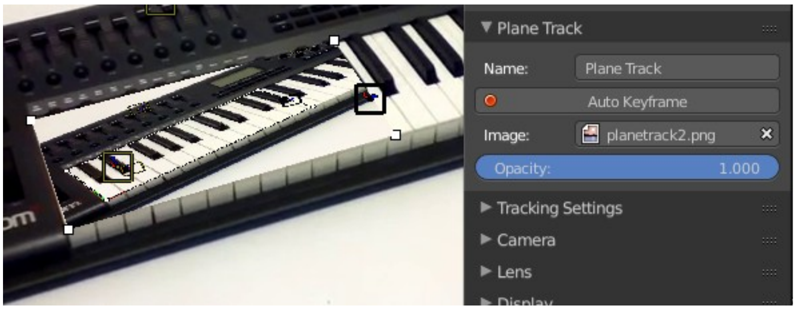
With the left mouse button and clicking at one of the corners of the cage you can move the plane track plane around in the view.
With the right mouse button and clicking at one of the corners of the cage you can move the single corners, and fit the plane into the area of the movie.



The image or movie that you want to display here has to be added in the node editor then, in the compositing mode.

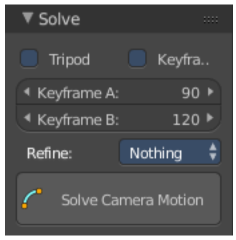
Here add a image or movie node, and load an image or movie. Then back in motion tracking layout have a look at the plane track panel in the Properties sidebar. Here choose the Image that we have added here.





Tracking Mode - Tool Shelf - Solve tab - Solve Panel

The Solve Panel contains functionality around solving the camera motion.



Tripod

Tripod tracking is a special method to track a stable camera position, and uses special solver. Tripod Motion can be used for footage where the camera does not move and only rotates. Here you can enable Tripod camera tracking. Keyframe A and B are greyed out then.

Note that Tripod behaves different from regular solver. More tracks doesn't imply to have more accuration. 5-10 solver is recommended.

Keyframe

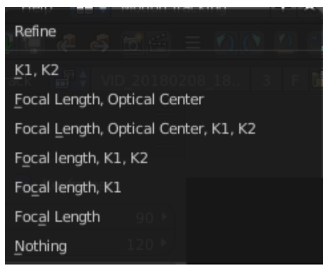
Automatically select Keyframes when solving camera / object motion

Keyframe A

The first keyframe for camera tracking.

Keyframe B

The last keyframe for camera tracking.



Refine

Here you can choose between different refine methods.

Solve Camera Motion

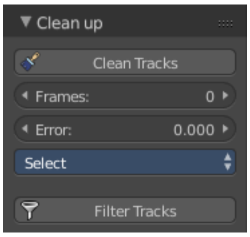
Starts the calculation for the camera motion to match the track motion.

There should be at least eight common tracks on the both of the selected keyframes.
There should be noticeable parallax effects between these two keyframes.

The average reprojection error is reported to the information space and to the clip editor header. Reprojeciton error means the average distance between reconstructed 3D position of tracks projected back to footage and original position of tracks. Reprojection error below 0.3 means accurate reprojection, (0.3 - 3.0) means quite nice solving which still can be used. Values above 3 means some tracks should be tracked more accurately, or that values for focal length or distortion coefficients were set incorrectly.

Tracking Mode - Tool Shelf - Solve tab - Cleanup Panel

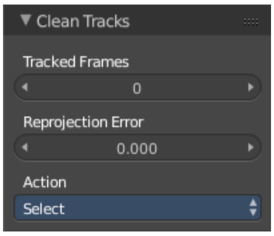
This panel contains tools to clean up tracks.



Clean Tracks

Cleans tracks with high error values or few frames. The tracks or segments in question can either be selected, or directly removed. Dependant of the settings.

Last Operator Clean Tracks



Frames

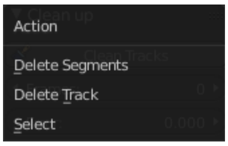
Here you can adjust the number of "few" frames for clean track. 0 means the feature gets ignored.

Error

Here you can adjust the error value for Clean Tracks.

See also Last Operator Clean Tracks.

Select



The action that should happen when you click at Clean Tracks. Default is select.

Frames

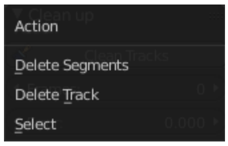
Here you can adjust the number of "few" frames for clean track. 0 means the feature gets ignored.

See also Last Operator Clean Tracks

Error

Here you can adjust the error value for Clean Tracks.

See also Last Operator Clean Tracks.



Select

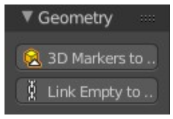
The action that should happen when you click at Clean Tracks. Default is select.

See also Last Operator Clean Tracks.

Filter Tracks

Removes tracks with too high spikes in their motion curve.

Tracking Mode - Tool Shelf - Solve tab - Geometry Panel



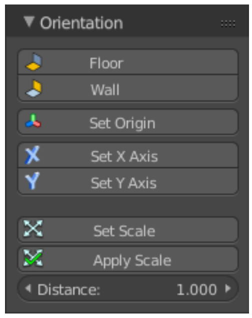
3D Markers to Mesh

Creates a vertex cloud using the coordinates of the reconstructed tracks.

Link Empty to Track

Creates an Empty which will be copying movement of active track.

Tracking Mode - Tool Shelf - Solve tab - Orientation Panel



Here you will find some orientation functionality to match the geometry in the 3D view to the movie.

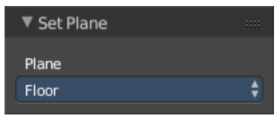
Floor

Set plane in the 3D space as a Floor plane, based at three selected markers.

Wall

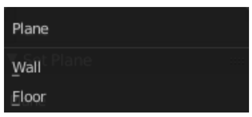
Set plane in the 3D space as a Wall plane, based at three selected markers.

Last Operator Set Plane



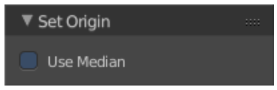
Plane

A dropdown box where you can choose if you want to set the selected markers as plane or as floor.



Set Origin

Set active marker as origin in 3D space.



Last Operator Set Origin

Use Median

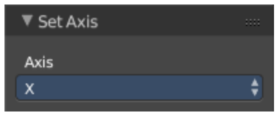
Set Origin to Median Point of selected bundles.

Set X Axis

Set X axis rotation in 3D space, based at the selected marker.

Set Y Axis

Set X axis rotation in 3D space, based at the selected marker.



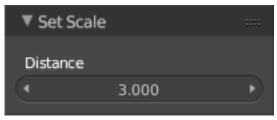
Last Operator Set Axis

Axis

A dropdown box where you can again choose if you want to use the axis to X or to Y

Set Scale

Set scale of scene by scaling camera, based at two selected markers.



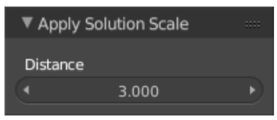
Last Operator Set Scale

Distance

The distance between two bundles used for scene scaling.

Apply Scale

Apply scale to solution.



Last operator Apply Solution Scale

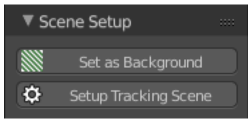
Distance

The distance between two bundles used for scene scaling.

Distance

The distance between two bundles used for scene scaling. This setting is a pre value, and gets used for Set Scale as well as for Apply Scale when you perform those tools.

Tracking Mode - Tool Shelf - Solve tab - Scene Setup Panel



Set as Background

Sets the current movie as background in the 3D view. You need to be in camera view to see the movie in the background.

Setup Tracking Scene

Prepare Scene for composing 3D objects into this footage.

This feature will create a ground plane, which is used for shadow catching in the rendering.

Tracking Mode - Properties Sidebar - Track Panel

Here you can find some marker settings for the currently selected marker.

Edit Box

Here you can read and edit the name of the currently selected marker.

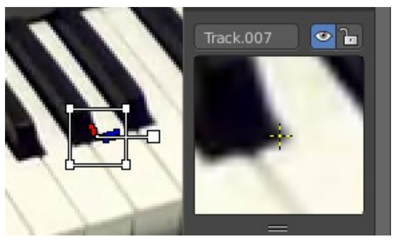
Enable

Enable the currently selected marker.

Lock

Lock the currently selected marker.

Track Scope

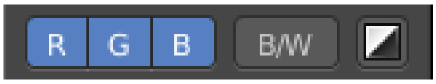


This is a preview image and fine tune window for the currently selected marker. The fade cross stays always in the center, but you can move the image with the left mouse. This automatically records the changed position, and inserts a keyframe at the current position if necessary.

You can pull it vertically bigger by pulling at the handler below the image. And horizontally bigger by pulling out the properties sidebar.

If an anchor is used (the position in the image which is tracking is different from the position which is used for parenting), a preview widget will display the area around the anchor position.

Color Settings



R, G, B

Use red, green and blue color in the preview image.

B/W

Use a greyscale preview image.

Alpha

Use existing alpha channel for preview image.

Weight

The influence of this track to the final solution. Altering the weights of problem tracking markers can correct or greatly reduce undesirable jumps. This parameter can be animated.

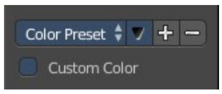
Stabilization Weight

The influence of this track on 2D stabilization.

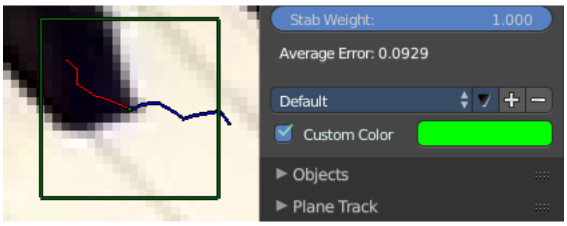
Average Error

The average error of this marker.

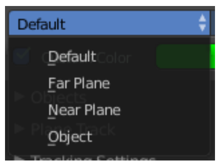
Marker Color



Here you can give the markers different colors.

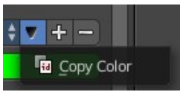


Color Preset



A dropdown box where you can choose between some predefined colors.

Copy



Here you can copy the color of the currently chosen preset.

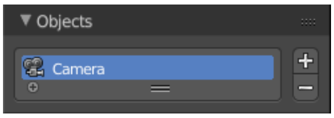
Add Preset, Remove Preset

Here you can add a new or remove a existing preset.

Custom Color

Use a custom color instead of a preset or the default color. A color field will appear. And you can change the color by clicking at it. A color picker will appear.

All Modes - Properties Sidebar - Objects Panel



This content shows in Tracking Mode and Masking mode.

A list of the tracked objects. Usually the camera. But you can track every other object too.

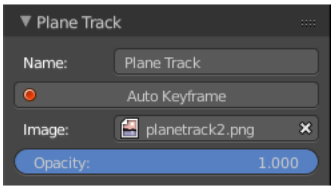
Add, Remove Tracking Object

The plus and minus buttons at the right allows you to add new objects to the list, or to remove existing objects from the list.

Search Field

The list field contains a hidden search field. Click at the little + button down left to reveal it.

Tracking Mode - Properties Sidebar - Plane Track Panel



This content is just active and visible when you have a Plane track in your footage.

Name

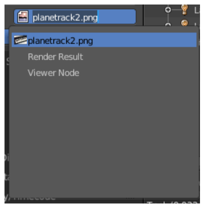
The name of the Plane track.

Auto Keyframe

Use Auto Keyframe when moving plane track corners.

Image

Here you can see and load images or movies that you want to display inside of the Plane track. Note that this image needs to exist already so that it gets displayed in the list. As a image node for example.

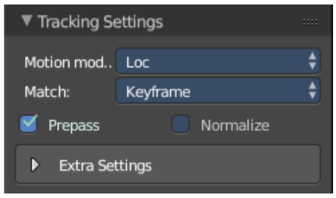


Opacity

The opacity of the image or movie.

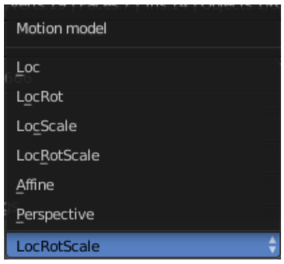
Tracking Mode - Properties Sidebar - Tracking Settings Panel

This content is visible when you have at least one of the markers selected.



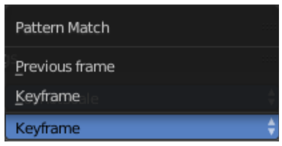
Motion Model

Here you can choose the motion model for the marker.



Match

Here you can choose the pattern match method.



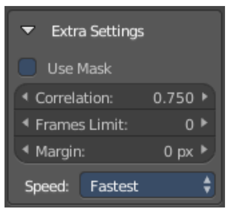
Prepass

Use a brute-force translation only pre-track before refinement.

Normalize

Normalize light intensities while tracking.

Extra settings is a sub menu that contains some not so often used settings.



Use Mask

Use a Grease Pencil data block as a mask.

Correlation

Default minimum value of correlation between matched pattern and reference that is still treated as successful tracking.

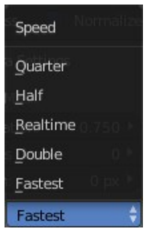
Frames Limit

In every tracking cylce the numbers of given frames are tracked.

Margin

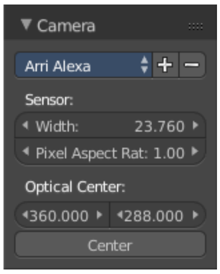
Default distance from image boundary at which markers stops tracking.

Speed



A dropdown box where you can choose the tracking speed. This is just a preview feature. The tracking quality is not affected.

Tracking Mode - Properties Sidebar - Camera Panel



Here you can choose the settings for the camera with which you have recorded the footage movie. Every camera has some specific settings. And this needs to be calculated too to match the footage to the 3D content.

Presets

A dropdown box where you can choose between different camera presets. When your camera is not listed then you need to do the settings manually.

Add / Remove Camera Preset

Here you can add a new preset or remove an existing preset

Sensor

The sensor width and pixel aspect ratio of your camera.

Width

The width of the CCD Sensor in your used camera. This value can be found in the camera specifications.

Pixel Aspect Ratio

The Pixel Aspect of the CCD Sensor in your used camera. This value can be found in the camera specifications.

This value ccan also be guessed. For example, when the footage should be 1920×1080, but the images themselves are 1280×1080, then the pixel aspect is: 1920 / 1280 = 1.5.

Optical center

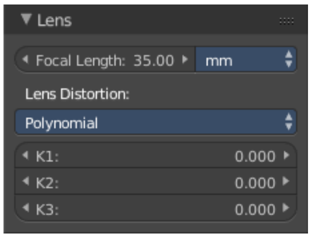
The optical center. Usually in the middle of the movie. But some cameras also have an offset here.

Center

Center the optical center.

In most cases it is equal to the image center, but it can be different in some special cases. Check camera/lens specifications in such cases. To set the optical center to the center of image, there is a `Return` button below the sliders.

Tracking Mode - Properties Sidebar - Lens Panel

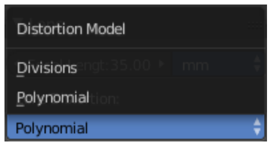


This panel belongs to the Camera panel above. Here you can type in your lens values from the camera with which you have recorded your footage movie.

Focal length

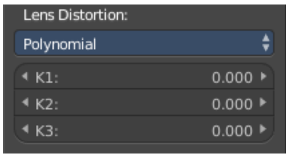
The focal length units with which the movie was shot. You can choose between milimeter and pixel.

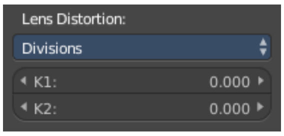
Lens Distortion



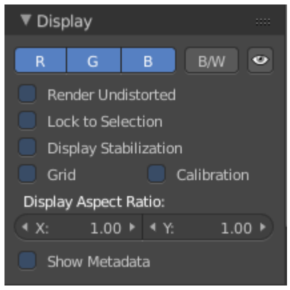
The lens distortion of your camera. You can choose between two distortion models. Polynomial and Divisions.

Basically, just tweak K1 until solving is most accurate for the known focal length (but also take grid and grease pencil into account to prevent “impossible” distortion).





All Modes - Properties Sidebar - Display Panel



This content shows in Tracking Mode and Masking mode.

Here you can adjust how the movie in the movie clip editor viewport gets displayed.

Color settings

R G B

Here you can activate single colors.

B / W

Display the footage movie in greyscale.

Mute Footage

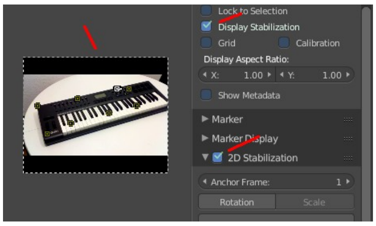
Hide the footage movie.

Render Undistorted

Display the footage movie undistorted, without the camera and lens settings.

Lock to Selection

Locks the display to selected markers through playback. Means the marker stays in position, and the movie moves.



Display Stabilization

Show stable footage movie in the viewport. 2D Stabilization must be enabled for this.

Grid

Displays a grid above the footage movie.

Calibration

Use manual calibration helpers.

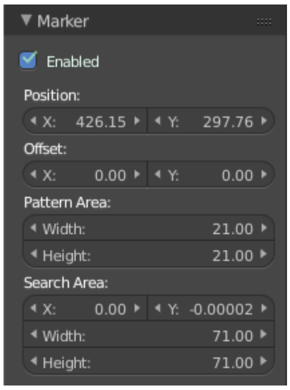
Display Aspect Ratio

The aspect ratio of the footage movie.

Show Metadata

Displays the metadata of the movie if available.

Tracking Mode - Properties Sidebar - Marker Panel



The Marker panel contains the settings for the selected marker(s).

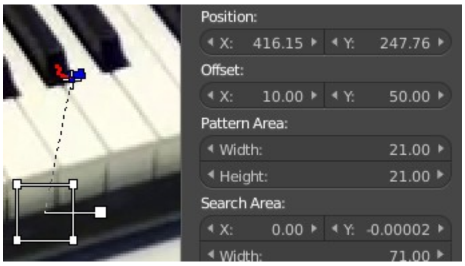
Enabled

Enable the selected marker(s).

Position

The position of the selected marker(s) in pixel. Zero is down left.

Offset



You can give the marker handler an offset. So that it gets displayed besides the marker.

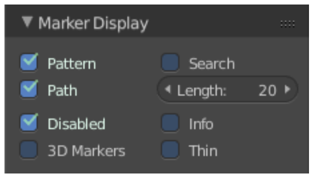
Pattern Area

The handler size.

Search Area

The size and position of the search area for this marker for tracking.

Tracking Mode - Properties Sidebar - Marker Display Panel



Pattern

Display the marker handler.

Path

Display the marker paths.

Disabled

Show disabled tracks from the footage.

3D Markers

Shows the 3D markers from the 3D view as colored dots. The color of the point depends on the distance between the projected coordinate and the original coordinate: if they are close enough, the point is green, otherwise it will be red.

Search

Shows a handler cage for the search area for the marker(s).

Length

This belongs to the path. Here you can adjust how many frames the path should display.

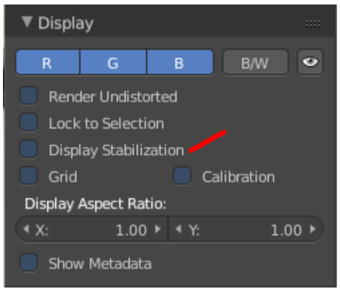
Info

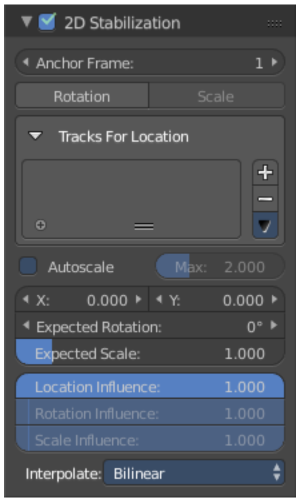
Displays a info string below the markers

Thin

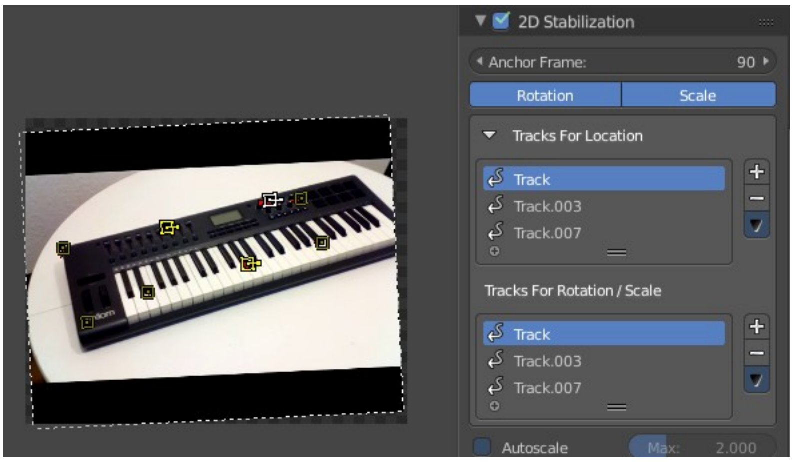
Displays the handlers as thin dotted lines instead of thick lines.

Tracking Mode - Properties Sidebar - 2D Stabilization Panel





The purpose of 2D Stabilization is to smooth out jerky camera handling on existing real world footage. To activate the 2D stabilizer, you need to set the toggle in the panel, and additionally you need to enable *Display Stabilization* in the Display panel. Then you'll need to set up some tracking points to detect the image movements.



Anchor Frame

The first frame of the stabilization.

Rotation/Scale

Normally you just stabilize the position. Here you can stabilize rotation and scale too. Note that you can't activate scale independently here.

Tracks for Location

The list of markers that gets used for location stabilization.

With the plus and minus button at the right you can add selected markers, or remove the markers from the list.

Tracks for Rotation/Scale

The list of markers that gets used for rotation/scale stabilization.

With the plus and minus button at the right you can add selected markers, or remove the markers from the list.

This list is just visible when you have at least Rotation activated.

Autoscale

The stabilization will lead to areas where the movie doesn't show at the canvas anymore. Autoscale scales the content so that the whole canvas is covered again.

Max

The maximum value for autoscale.

X / Y

The position of the movie at the canvas.

Expected Rotation

Here you can rotate the movie at the canvas manually.

Expected Scale

Here you can scale the movie at the canvas manually. Note that this slider is greyed out when you have Autoscale activated

Influence

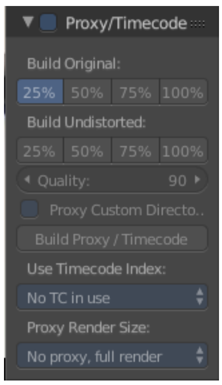
The influence of stabilization algorithm. You can independently adjust location, rotation and scale. When oyu have rotation off, then the sliders for rotation influence and scale influence are greyed out.

Interpolate

For rotation and scale the images needs to be recalculated. Here you can adjust the interpolation mode for it.

All Modes - Properties Sidebar - Proxy/Timecode Panel

This content shows in Tracking Mode and Masking mode.



A proxy is a smaller replacement image for the main image. Think of it as a thumbnail. The creation may take some time. But once done, all other calculations happens much faster. So it can make sense to use proxies for bigger footages.

Make sure to disable the Proxy images before doing the final render!

Build Original

Here you can define the resolution of the proxy images.

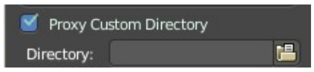
Build Undistorted

Builds the proxy images from the undistorted original images for the sizes set above.

Quality

Defines the quality of the JPEG images used for proxies.

Proxy Custom Directory

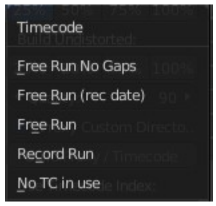


By default, all generated proxy images are storing to the `<path of original footage>/BL_proxy/<clip name>` folder. Here you can define a custom directory.

Build Proxy / Timecode

(Re)creates the proxy images and the timecode.

Use Timecode Index



When you are working with footage directly copied from a camera without pre-processing it, then there might be a bunch of artifacts. In this case the calculation can give errant result. One way to avoid this is to use the Proxy / Timecode option. Another method would be to use a external tool like mencoder to repair the file header and insert correct keyframes.

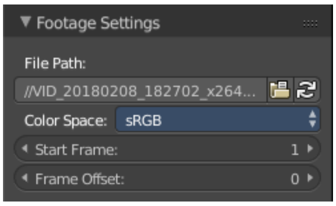
Note

Record Run is recommended for most needs. Buf when the clip's file is totally damaged, *Record Run No Gaps* will be the only chance of getting acceptable result.

Proxy Render Size

This setting defines which proxy image resolution is used for display in the viewport. If there is no generated proxies, render size is set to "No proxy, full render".

All Modes - Properties Sidebar - Footage Settings Panel



This content shows in Tracking Mode and Masking mode.

Here you can find some footage related settings.

File Path

The file path for the currently loaded and active video. Here you can also load another video, or refresh the video.

Color Space

The color space for the currently loaded and active video.

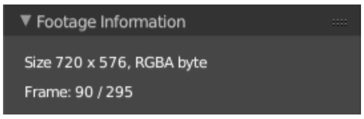
Start Frame

The start frame for the currently loaded and active video.

Frame Offset

Here you can define a frame offset.

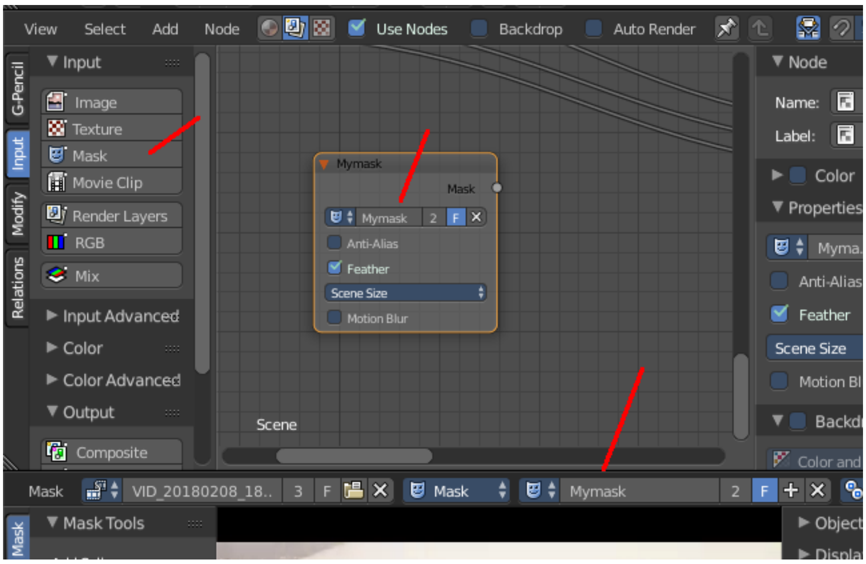
All Modes - Properties Sidebar - Footage Information Panel



This content shows in Tracking Mode and Masking mode.

Here you can see some information about the footage movie.

Masking Introduction



Masks have many purposes. They can be used in a motion tracking workflow to mask out, or influence a particular object in the footage. They can be used for manual rotoscoping to pull a particular object out of the footage. Or as a rough matte for green screen keying. This is done in the Node editor in compositing mode by a mask node.

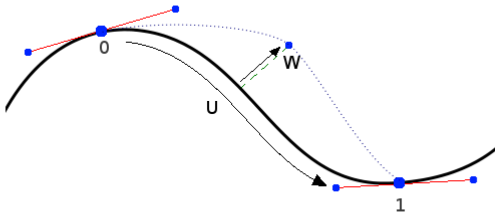
Masks are independent from a particular image of movie clip, and so they can just as well be used for creating motion graphics or other effects in the compositor.

Masks are defined by splines. Means you work with splines, and you have a bunch of spline tools available.

S-Curves

The curve type used for creating mask splines is almost a Bézier curve,. But there are some differences. Smooth edges of the mask are defined by feathering. These are called S-Curves.

Besides the handles, every control point also has points that define the feather between the current point and the next point on the spline. Each feather point is stored in UV space, where U means position across spline segment, and V means distance between main spline and feather points.

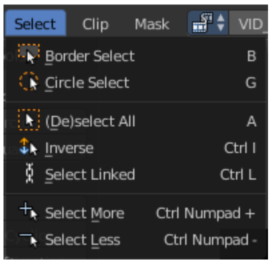


This allows for deforming the main spline in almost any way, and the feather will be updated automatically to reflect that change.

For example if there is just rotation of the spline, feather would stay completely unchanged. If one point’s feather is moved, the other feathers will be automatically stretched uniformly along that segment and the overall shape will be almost the same as artists would want it to be.

Mask Mode - Header - Select Menu

The select tools for masking.



Border Select

Border select enters the Border Select mode. This is a special select mode where you can select elements by dragging a rectangle. And what's inside of the rectangle gets selected then. It adds to selection by default.

To subtract from selection hold down Shift key.

The selection gets applied when you release the mouse. You leave the mode automatically when you release the mouse.

Circle Select

Circle select enters the Circle Select mode. This is a special select mode where you can select elements by moving with the mouse over it. It adds to selection by default.

To subtract from selection hold down Shift key. To exit the Circle select click with the right mouse button.

The pencil radius of the circle select tool can be adjusted with the scroll wheel.

Select All

Toggles between select all and deselect all.

Select Linked

Select the linked vertices of the same stroke.

Select More

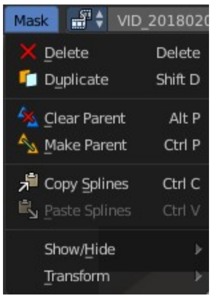
More expands the selection.

Select Less

Less reduces the selection.

Mask Mode - Header - Mask Menu

The mask menu contains some mask related functionality.



Delete

Deletes the selected mask spline.

Duplicate

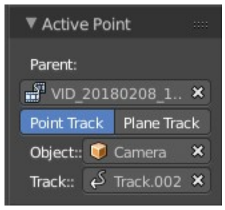
Duplicates the selected mask spline.

Clear Parent

You can parent spline points to motion tracks. This tool clears the parent relationship.

Make Parent

You can parent spline points to motion tracks. This tool creates the parent relationship.



Select spline point(s), hold down shift, select the marker where you want to parent it to. Then choose make parent.

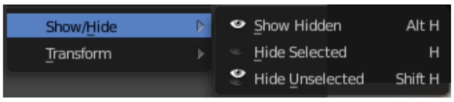
In the Properties editor you will see now content in the Active Point panel. The parent relationship for the active spline point(s).

Copy Splines

Copies the selected mask spline(s)

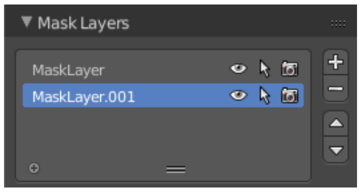
Paste Splines

Pastes the copied mask spline(s)



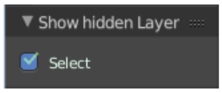
Show Hide

Here you can find the tools to show or hide mask layers. Every spline is one layer. See also the Mask layer list in the Mask layer panel in the Properties sidebar.



Show Hidden

Show the hidden mask layer.

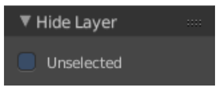


Last operator Show Hidden Layer

Select
Select the layer when revealing.

Hide Selected

Hide the selected mask layer.



Hide Unselected

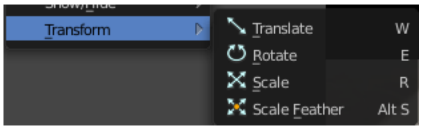
Hide unselected mask layer.

Last Operator Hide Layer

Unselected
Hide Selected or Hide Unselected.

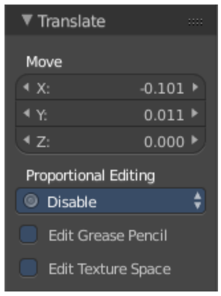
Transform

The transform tools. Usually you will use the hotkeys here, not the menu items.



Translate

Move the selected spline point(s).



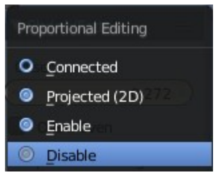
Last Operator Translate

Move

Here you can adjust the position.

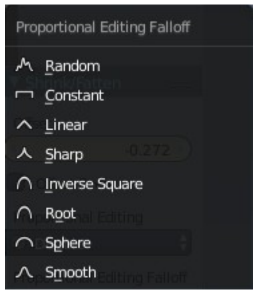
Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced too in a proportional way.



Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



Proportional size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Edit grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

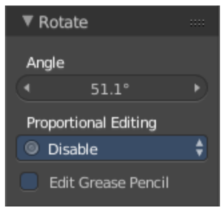
Edit Texture Space

Edit Object Data Texture space. - Note that this most probably doesn't belong here.

Rotate

Rotate the selected spline point(s).

Last Operator Rotate

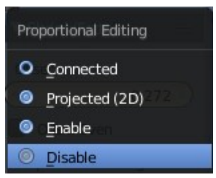


Values

Here you can adjust the position.

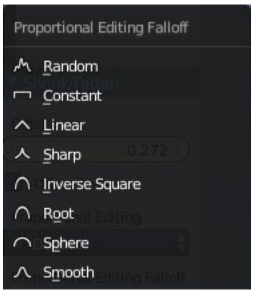
Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced too in a proportional way.



Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



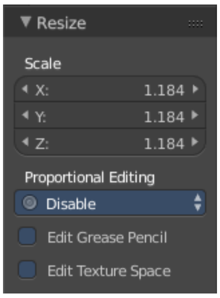
Proportional size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Edit grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

Scale



Scale the selected spline point(s).

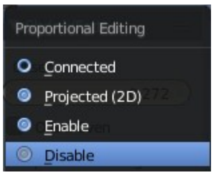
Last Operator Resize

Scale

Here you can adjust the scale.

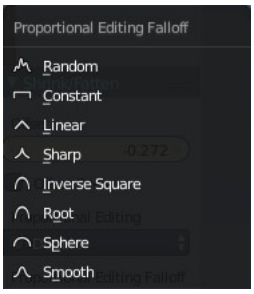
Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced too in a proportional way.



Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



Proportional size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

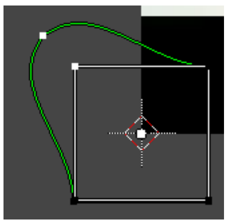
Edit grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

Edit Texture Space

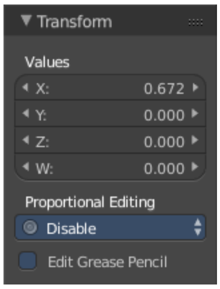
Edit Object Data Texture space. - Note that this most probably doesn't belong here.

Scale Feather



Scales the feather point(s). See chapter S Curves.

Last Operator Transform



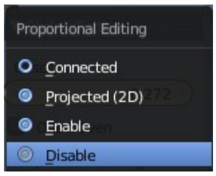
Values

Here you can adjust the scale amount.

X, Y and Z defines the position. W defines the rotation.

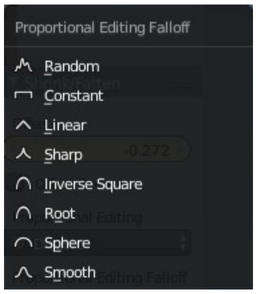
Proportional Editing

Proportional Editing is a drop-down box where you can choose to use proportional editing. When you choose one of the active methods then the neighbour geometry gets influenced too in a proportional way.



Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.



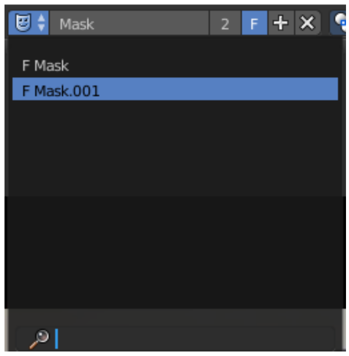
Proportional size

Proportional size is a edit box where you can adjust the strength of the Proportional falloff.

Edit grease Pencil

Edit Grease Pencil edits the selected Grease Pencil strokes.

Mask Mode - Header - Mask tools



Mask Browser

Here you can create new masks, and set the active mask.

From left to right:

Mask browser

A dropdown box with the available masks.

Edit Box

Here you can read and edit the currently selected mask.

Number of users

How much other sources uses this mask at the moment.

Fake User

Pressing this button sets the selected movie to have a fake user. Zero user data-blocks are normally not saved. But sometimes you want to force the data to be kept even when the data block has no user.

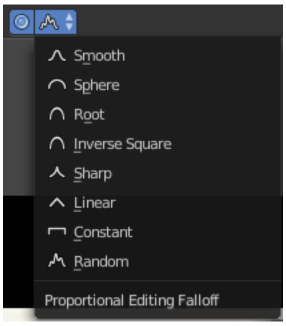
New Mask

Creates a new mask.

Delete Mask

Deletes the Mask. Note that the numbers of users has to be zero when you really want to remove the mask completely from the Blend file. Else it always comes back.

Proportional Editing

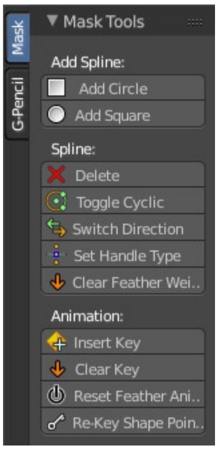


here you can activate Proportional editing. With proportional editing neighbour geometry gets influenced too.

Proportional Editing Falloff

Proportional Editing Falloff is a drop-down box where you can choose a method for the falloff for the proportional editing.

Mask Mode - Tool Shelf - Mask tools panel



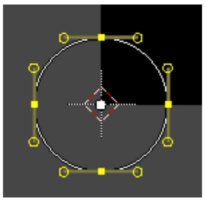
The Mask tools provides you with tools to modify the mask splines. It is divided into three sections. Add Spline, Spline and Animation.

The splines that you can add have handlers to change their position and size. And in the Spline section you can modify the splines even more. In the animation section you can animate the spline points.

Add Spline section

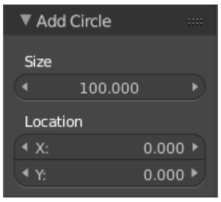
Here you can add two types of mask splines.

Add Circle



Add a circle shaped spline.

Last Operator Add Circle



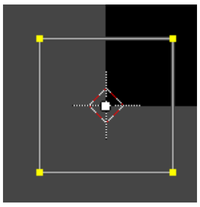
Size

The size of the mask spline.

Location

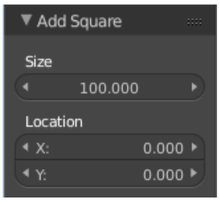
The location of the mask spline.

Add Square



Add a square shaped spline.

Last Operator Add Square



Size

The size of the mask spline.

Location

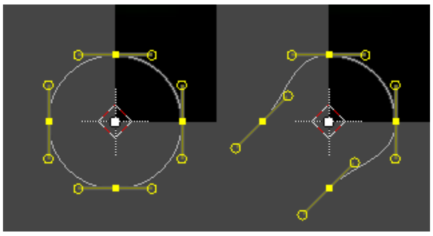
The location of the mask spline.

Spline Section

Delete

Deletes the selected spline point.

Toggle Cyclic

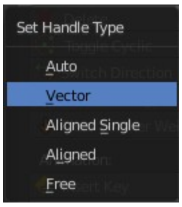


A spline can be closed or have two ends. Here you can toggle between a closed spline and a open spline.

Switch Direction

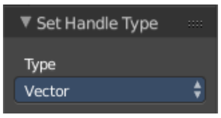
Switch direction switches the direction of the spline.

Set Handle Type



Here you can set the type of the spline handles. The different handle types gives you more control about the shape of the spline.

Last Operator Set Handle Type



Type

A dropdown box where you can again set the handle type.

Clear Feather Weight

With Scale feather in the Mask Transform menu you can scale the feather points. With Clear feather weight you can reset this scaling to default.

Animation section

Insert Key

Inserts a shape key to the selected spline points().

Clear Key

Removes a shape key from the selected spline points().

Reset Feather Animation

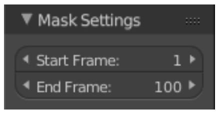
Resets feather weights at all selected points animation values.

Re Key Shape Points

Recalculate the animation data on selected points for the selected frames in the dope sheet.

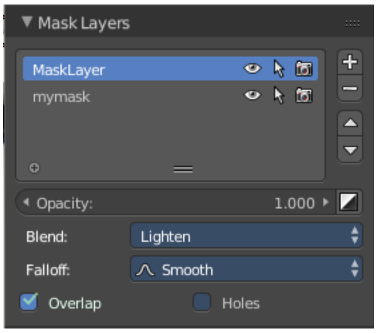
Mask Mode - Properties Sidebar - Mask Settings Panel

Here you can adjust the start and endframe for the mask.



Mask Mode - Properties Sidebar - Mask Layers Panel

Here you handle the mask layers and their settings. You can have more than one mask layer in a mask. And they can be blended in different ways.



Layers can be used to create complex shapes and to define how the splines interact with each other. Splines belonging to the same layer can be animated together,

List Box

The list of currently existing Mask layers.

Double clicking at a name allows you to rename the mask layer.

The eye icon allows you to hide this specific layer.

The arrow icon allows you to make this layer unselectable.

The camera icon allows you to make this layer not to render.

Add / Remove Layer

Here you can add a new layer, and remove an existing layer.

Move Layer upwards / downwards

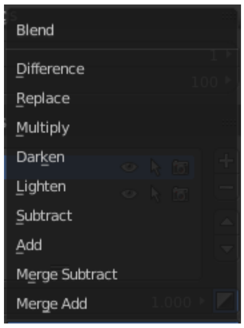
Here you can move the selected layer upwards or downwards the hierarchy.

Opacity

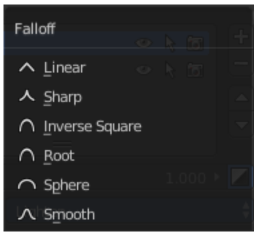
The opacity of this layer.

The button at the right end inverts the mask in black and white.

Blend



Layers can have different blend modes. The names of the blend modes should be self explaining.



Falloff

The falloff mode for the feather spline.

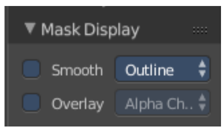
Overlap

Calculate self intersections and overlap before filling.

Holes

Calculate holes when filling overlapping curves.

Mask Mode - Properties Sidebar - Mask Display Panel



Here you can find some display options for the masks.

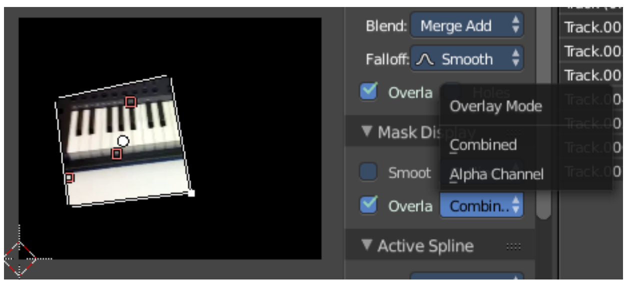
Smooth

Display the spline lines smoothed.

Edge Draw Type

How to draw the spline lines.

Overlay



Displays the mask in the footage. Masked areas are white.

Overlay Mode

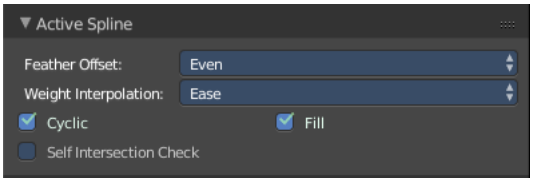
Combined

Displays the footage in the mask area. Areas outside the mask are displayed black.

Alpha Channel

Displays the masked area white, the rest black.

Mask Mode - Properties Sidebar - Active Spline Panel



Here you can find some settings for the active mask spline.

Feather Offset

The offset method for the feather spline.

Weight Interpolation

The type of weight interpolation for this spline.

Cyclic

Is it a closed spline or one with two ends.

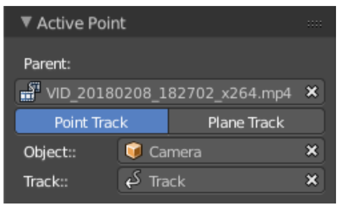
Fill

Make this spline filled.

Self Intersection Check

Prevent the feather spline from self intersecting.

Mask Mode - Properties Sidebar - Active Spline Panel



This panel content appears when you parent a spline to a marker. Here you can see and adjust the parent relationship for the currently active spline point.

Parent

The parent footage.

Point Track / Plane Track

The parent type. If you use point tracking here, or plane tracking.

Object

The tracking object. Usually the camera.

Track

The track / marker where this spline point is parented at.

Graph Editor Introduction

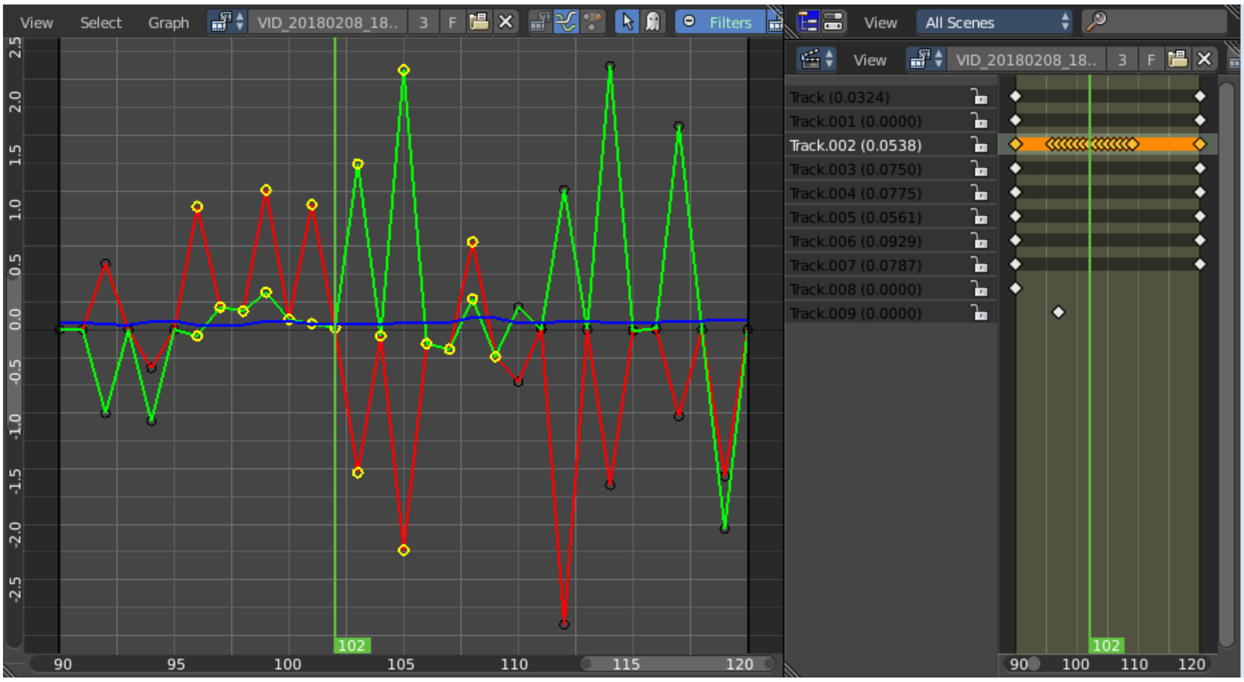
The Graph editor is the place where you can see and deal with the function curves of the recorded tracks.

There are not this much tools to find. And there is no Tool Shelf and no Properties Sidebar. The functionality is focused at the function curves.

The function curves shows you the speed of the trackers at the given frames. A function curve is made of a green curve and a red curve. The red curve represents the horizontal movement of a marker. The green curve the vertical moveoment. The first frame will always be at zero.

When you have performed a camera resolve then you will see a blue line. The blue line is the average per frame error. It is not editable. This line should be as flat as possible. The high points will show you the inaccurate tracking areas.

Frames outside of scene frame range are darkened.



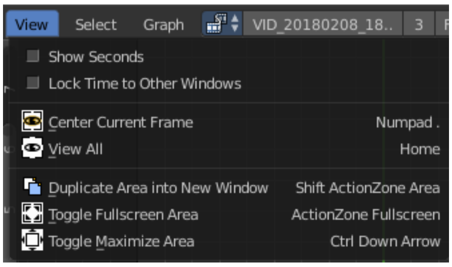
Graph Editor general navigation

You need to use the right mouse button to move the frame slider here. The left mouse button is used to select marker points.

To scroll in and out in the viewport you can use the scroll wheel. Or the + and - Buttons at the Numpad.

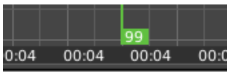
Panning the viewport happens with middle mouse button.

Graph Editor - View Menu



Show Seconds

This affects the scrolling bar below the view. You can display the values at it in frame units, or in second units.



Lock Time to Other Windows

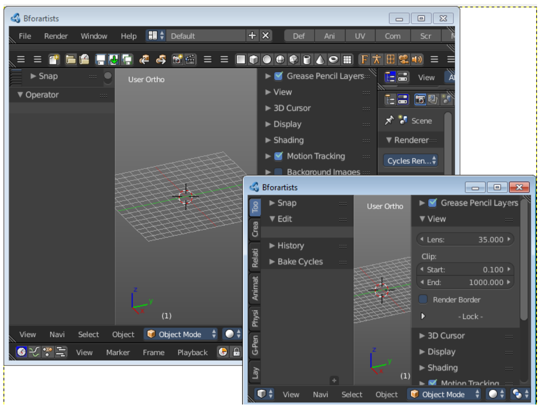
Synchronizes the frame position of the Motion tracking editors. That way these editors shows the identical part of the time you work on. When you scrub to frame 90 here, then in the other editors the marker scrubs to frame 90 too.

Center Current Frame

Centers the view at the current frame.

View All

Fits the view of the function curves into the window.

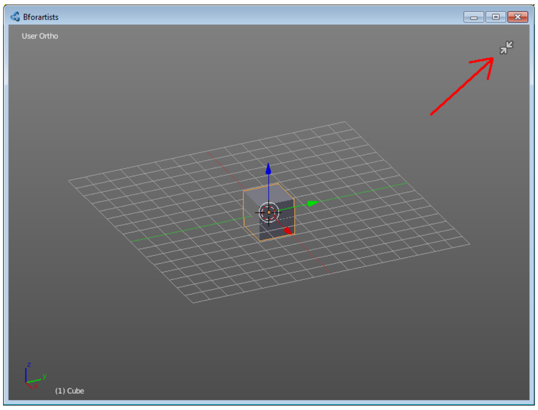


Duplicate Area into new Window

Duplicate Area into New Window makes the selected editor window floating. You can then drag it around at the monitor.

A separated window cannot be merged into the main window

Toggle Full screen Area



Displays the editor maximized without menus.

To return from the full screen view press hotkey Alt F10, or use the little button that appears up right when you move the mouse in

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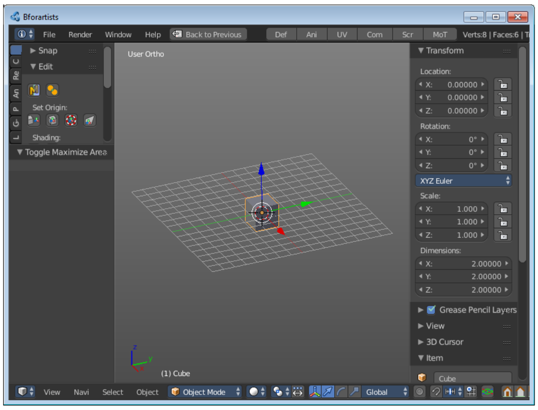
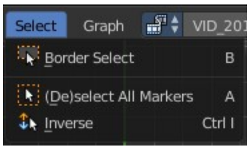
Toggle Maximize Area



Displays the editor maximized with menus.

To return to split view press hotkey Ctrl Up Arrow, or reuse the menu item in the View menu.

Graph Editor - Select Menu



Border Select

Border select enters the Border Select mode. This is a special select mode where you can select elements by dragging a rectangle. And what's inside of the rectangle gets selected then. It adds to selection by default.

To subtract from selection hold down Shift key.

The selection gets applied when you release the mouse. You leave the mode automatically when you release the mouse.

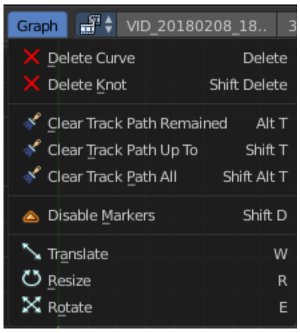
(De)select All Markers

Here you can select or deselect all markers of the currently selected tracks.

Inverse

Inverts the selection.

Graph Editor - Graph Menu



Note, selecting a track and its curve is done in the Dopesheet Editor.

Delete Curve

Deletes the selected curve(s). The track gets deleted.

Delete Knot

Deletes the selected knot(s) of the curve(s).

Clear Track Path Remained

Deletes the knots and track part after the current frame position.

Clear Track Path Up To

Deletes the knots and track part before the current frame position.

Clear Track Path All

Deletes the track.

Disable Markers

Disables the markers.

Translate

Move the selected knot points.

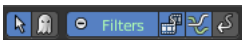
Resize

Scale the selected knot points along the Y axis

Rotate

Rotates the selected knot points along the center of the selection. The knot points will go up or downwards.

Graph Editor - Header Tools



Show Selected

Just display the function curve from the selected track(s).

Display Hidden

Include channels from objects or bones that aren't visible.

Filters

The filter section allows you to show or hide different kind of function curves.

Show Frames

Show curve for per frame average error for the selected track(s). This one requires to have a camera resolve first. The color is blue.

Show Track Motion

Displays the speed curves for the markers of the selected track(s). Red is X Direction. Green is Y direction.

Show Track Error

Display the reprojection error curve for the selected track(s). The color is blue like for the frame average error curve.

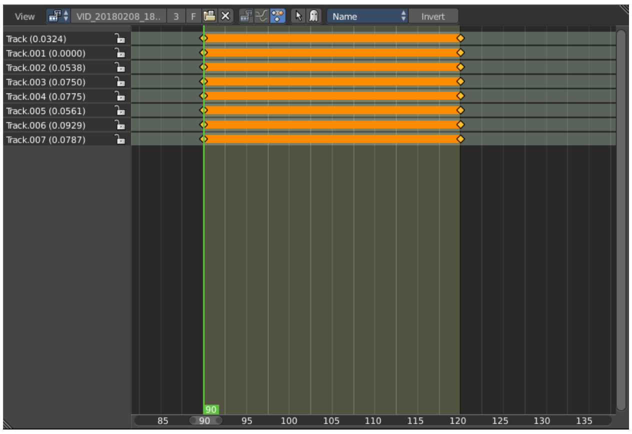
Dopesheet Editor - Intro

Dopesheet Editor

The Dopesheet Editor is the place where you deal with the keyframes for the tracks. The possibilties are limited. Adding or deleting keyframes is done in the Clip editor, by tracking.

In the left row you will see the tracks. In the right row the keyframes.

You can select or deselect tracks by clicking at them.



Tracks can be locked. The lock symbol in the left row besides the track name. Locked tracks can't be edited anymore.

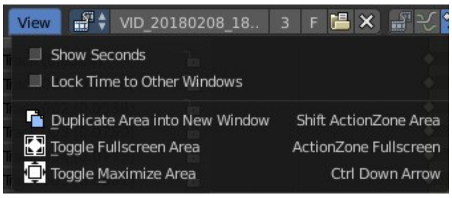
Dopesheet Editor general navigation

You can move the frame slider with the left mouse here.

To scroll in and out in the viewport you can use the scroll wheel. Or the + and - Buttons at the Numpad.

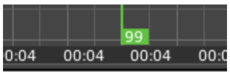
Panning the viewport happens with middle mouse button.

Dopesheet Editor - View menu



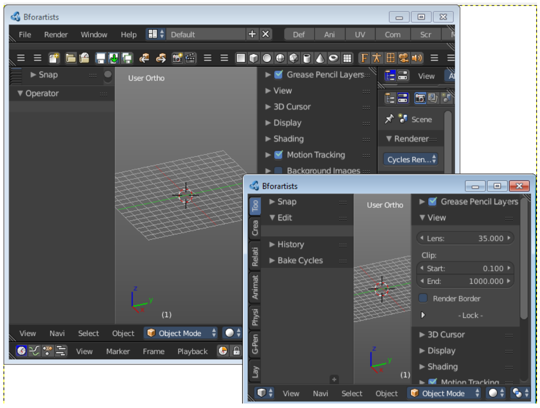
Show Seconds

This affects the scrolling bar below the view. You can display the values at it in frame units, or in second units.



Lock Time to Other Windows

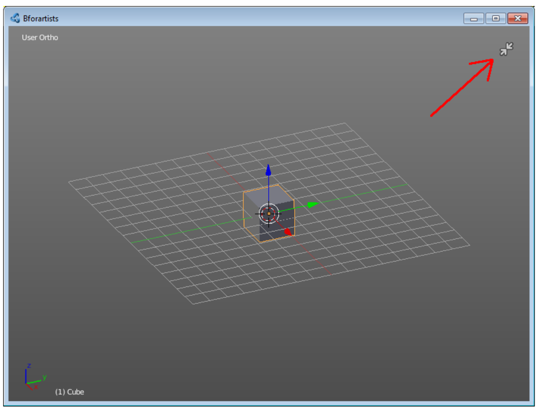
Synchronizes the frame position of the Motion tracking editors. That way these editors shows the identical part of the time you work on. When you scrub to frame 90 here, then in the other editors the frame slider also goes to this position.



Duplicate Area into new Window

Duplicate Area into New Window makes the selected editor window floating. You can then drag it around at the monitor.

A separated window cannot be merged into the main window

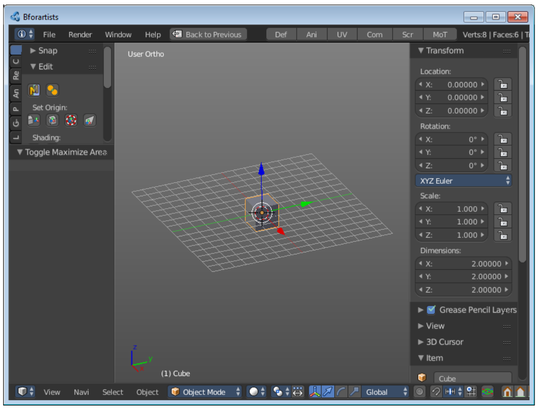


Toggle Full screen Area

Displays the editor maximized without menus.

To return from the full screen view press hotkey Alt F10, or use the little button that appears up right when you move the mouse in

Toggle Maximize Area



Displays the editor maximized with menus.

To return to split view press hotkey Ctrl Up Arrow, or reuse the menu item in the View menu.

Dopesheet Editor - Header Tools

Dopesheet Sort Field

Here you can sort the list of tracks by different methods.

Invert

This functionality is connected to the sort field. It inverts the list of tracks.

Editors - Text Editor

Text Editor

Bforartists has a *Text Editor* among its windows types, accessible via the *Window type* menu. It is mainly used to write Python scripts, and so the functionality orients towards this useage.

The newly opened Text window has a very simple toolbar (*Text Toolbar*).

Text Toolbar.

From left to right there are the standard *Window type* selection button and the window menus. Then there is the Text ID Block browse button followed by the New button for creating new Text files. Once you click it, you will find that the Toolbar has changed.. for good!

Text Toolbar with a file open

Now you find a textbox to change name of your text file, followed by **+** button to create new files. To remove the text block, click the **X** button.

The following three buttons toggle display of line numbers, word-wrap text and syntax highlighting respectively.

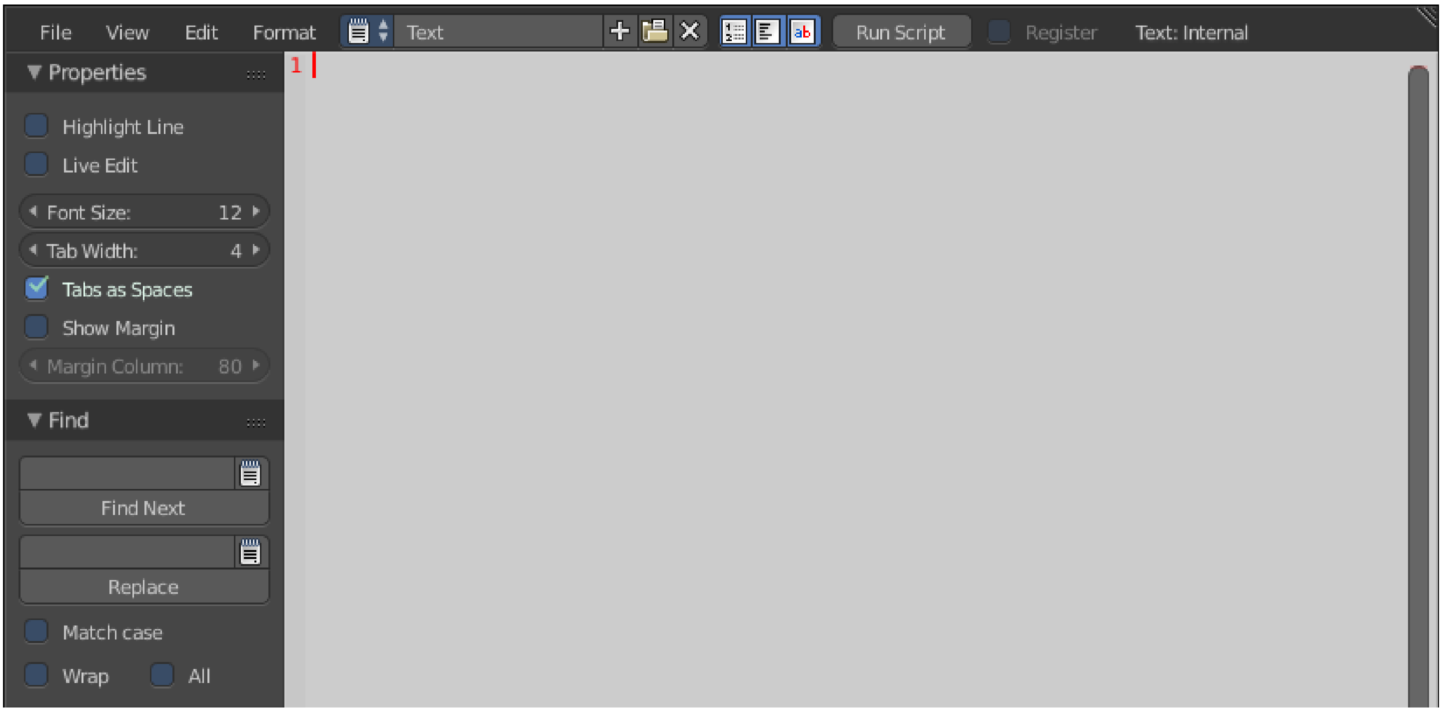
Typing on the keyboard produces text in the text buffer. As usual, pressing dragging and releasing `LMB` selects text.

To delete a text buffer just press the *X* button next to the buffer’s name, just as you do for materials, etc.

It is worth noticing that Bforartists comes with a fully functional Python interpreter built in, and with a lots of Bforartists-specific modules, as described in the API references.

The *Text Editor* has now also some dedicated Python scripts, which add some useful writing tools, like a class/function/variable browser, completion... You can access them through the File / Template menu entry.

Some functionality can also be found in the tool shelf at the left.



Tip
Usages for the Text window The text window is handy also when you want to share your `.blend` files with others. A *Text* window can be used to write in a `README` text explaining the contents of your blend file. Be sure to keep it visible when saving!

Editors - Text Editor by Tools

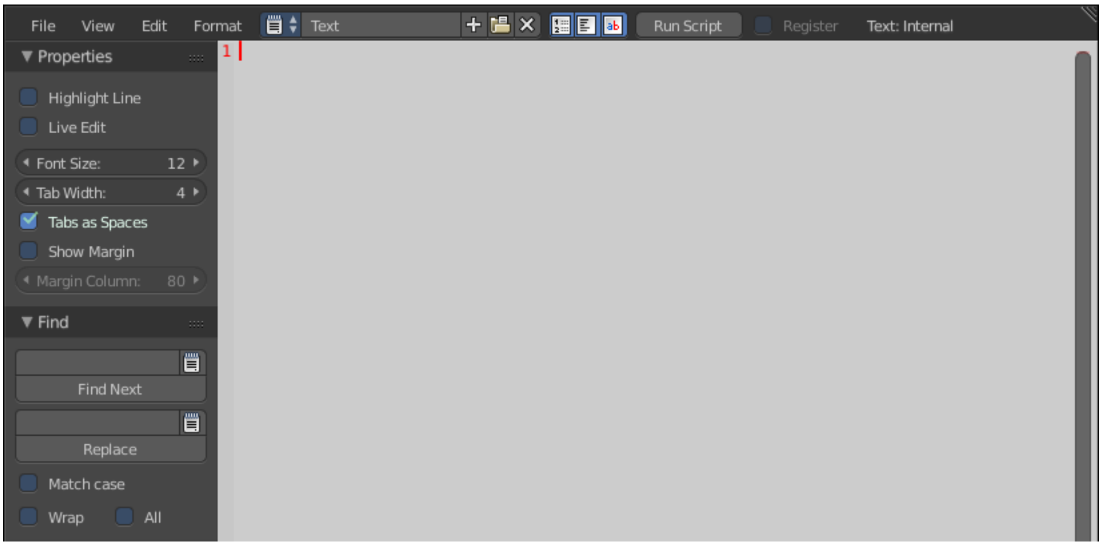
Text Editor

The Text Editor is mainly used to write scripts. And so the functionality orients towards this useage. But you can also use it to store some notes for the scene. See Tip below.

When you don't have a file loaded then the header content is rather small.

Once you create a new file, or load a file, you will see the toolbar change, and reveal further functionality.

Some text related functionality can also be found in the tool shelf at the left.

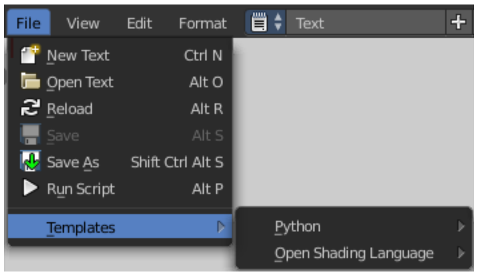


Tip

A Text window can be used to write in a `README` text explaining the contents of your blend file. Be sure to keep it visible when saving! And be sure to tell the receiver to activate Load UI to display the text file then. Bforartists has Load UI deactivated by default.

Header - File Menu

The File menu contains the load and save functionality. But also some Python and OSL templates.



New Text

Creates a new text file.

Open Text

Open a text file.

Reload

It can happen that you work with an external script editor, like Visual Studio, and change your script there. The reload button reloads the text file from hard disk.

Save

Saves the text file. Overwrites the existing version immediately.

Save As

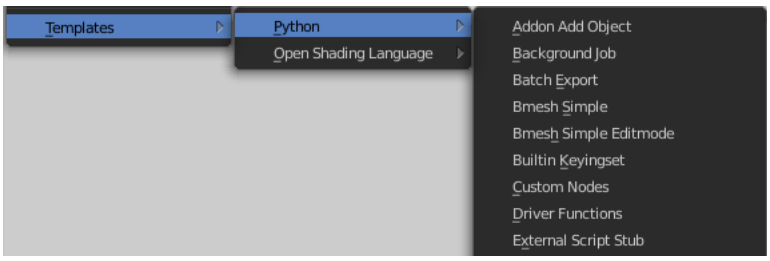
Save as opens a save as file dialog.

Run Script

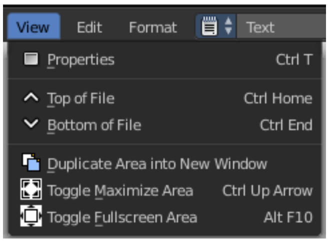
This button is for python or OSL scripts. It executes the script.

Templates

The Templates category contains some example scripts. There are two kind of templates. Python scripts and Open Shading Language scripts. The name of the files should tell you what the script is good for.



Header - View Menu



The View menu contains some view related functionality.

Properties

Opens or closes the Properties sidebar.

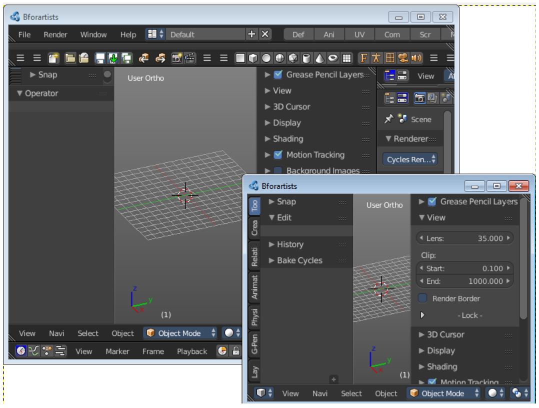
Top of File

Jumps to the top of the text file.

Bottom of File

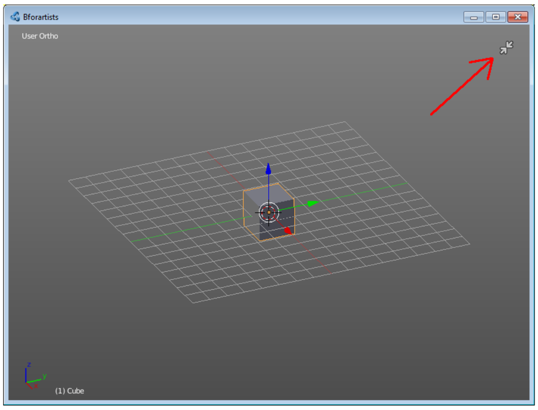
Jumps to the bottom of the text file.

Duplicate Area into New Window



Duplicate Area into New Window makes the selected editor window floating. You can then drag it around at the monitor.

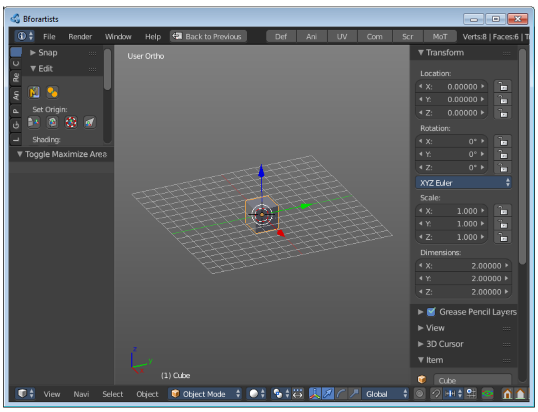
A separated window cannot be merged into the main window again. You have to close it when not longer needed.



Toggle Full screen Area

Displays the editor maximized without menus.

To return from the full screen view press hotkey Alt F10, or use the little button that appears up right when you move the mouse in this corner.



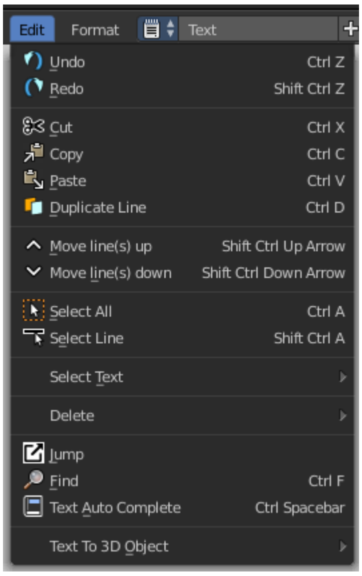
Toggle Maximize Area

Displays the editor maximized with menus.

To return to split view press hotkey Ctrl Up Arrow, or reuse the menu item in the View menu.

Header - Edit Menu

The Edit menu contains tools to modify the text.



Undo

Undoes the last operation

Redo

Redoes the undone operation.

Cut

Cuts the selected text.

Copy

Copies the selected text.

Paste

Pastes copied text at Textcursor position.

Duplicate Line

Duplicates the line where the Textcursor currently is.

Move Line up

Moves the line where the Textcursor is one line up.

Move Line down

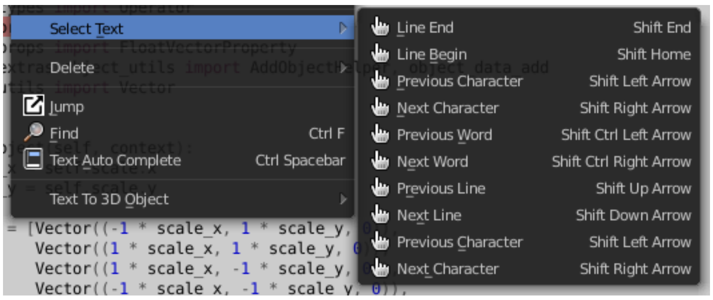
Moves the line where the Textcursor is one line down.

Select all

Selects all text.

Select Line

Selects the line where the Textcursor currently is

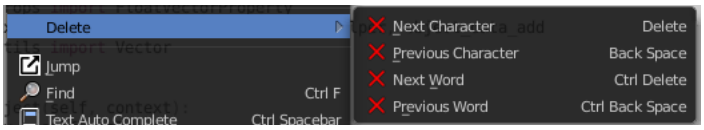


Select Text

Select text is a sub menu that contains selection functionality, starting from the current position of the Textcursor. The buttons should be self explaining.

And usually you use the hotkeys for this functionality.

Delete

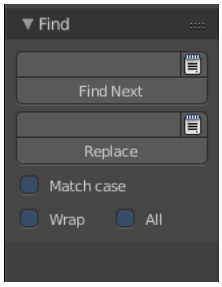


Delete is a sub menu with some special Delete methods, starting from the current position of the Textcursor. And usually you use the hotkeys for this functionality.

Jump

Go to Line number ... . This tool opens a sub menu where you can type in the line number.

Find



Find opens the Tool Shelf, where you can find a search panel. The search panel is explained in the tool shelf chapter.

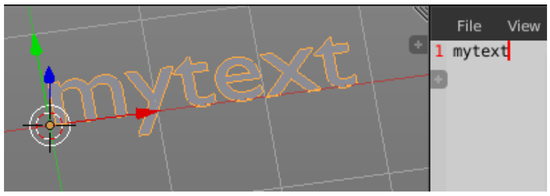
Text: Auto Complete

Auto Complete tries to complete your text input.

This feature is currently broken, and will most probably lead to crashes. Don't use it!

Text to 3D Object

Text to 3D Object converts the text of the file to a editable 3D object in the 3D Viewport.



One Object

Converts the whole text into one object.

One Object Per Line

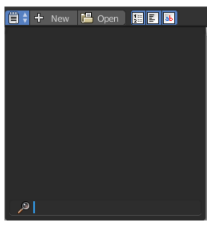
Converts every line of the text into a separate object.

Header - Tools

The Headertools provides you with quick access functionality.

Header Tools without a text file loaded

Text File Browser Dropdown box



This list is empty when no file is loaded.

New

Creates a new text file

Open

Opens a file browser where you can choose a file to load.

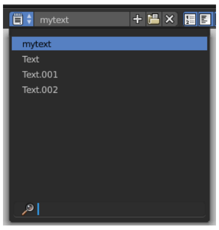
Show Line Numbers, Wrap and Syntax Highlight

See below.

Header Tools with a text file loaded

Text File Browser Dropdown box

This list shows you the currently loaded text files.



Text File Browser Edit Box

The edit box allows you to rename the currently active text file.

The + Button behind allows you to create a new text file.

The Button with the folder at it calls a file browser where you can load files.

The X button at the end unlinks the text file, means it deletes it from the Text file browser list.

Show Line Numbers, Wrap and Syntax Highlight

Show Line numbers dislpays a row of numbers at the left side of the text file.

Wrap words wraps the text to fit into the current editor size.

Syntax highlighting colors text parts fitting to the language.

Run Script

This button is for python or OSL scripts. It executes the script.

Register

This checkbox is for Python or OSL Scripts. When checked the classes of the script gets registered in Bforartists.

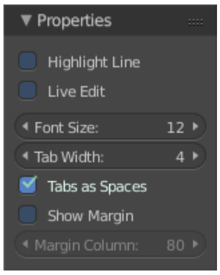
Info String

Shows infos about the current text file. When it's an internal created file then it displays the String File : Internal. When it's an external loaded file, then the string displays the path to the location of the file.

Tool Shelf

The Tool Shelf is the place for some options and the text search panel.

Properties Panel



Highlight

Highlights the line where the textcursor is.

Live Edit

Updates the script while editing.

Font Size

The font size for the text editor

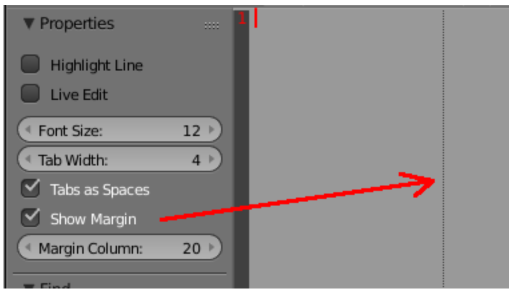
Tab width

Number of spaces to display tabs with. Default is four.

Tabs as spaces

When you press tab and Tabs as spaces is active, then it gets indented as a tab indent. When Tabs as spaces is unticked, then a tab just acts like pressing a spacebar.

Show Margin



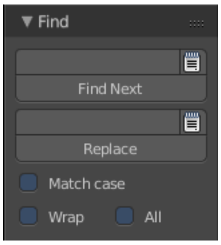
Shows a dotted line at the right. Note that we have curerntly a theming problem here with the default Bforartists theme. We have white text, means a white dotted line. And we have a white background. This means that the dotted line just shows with other themes where the header text color is black.

Margin Column

The width from the left at which the dotted margin line should show.

Find Panel

In the find panel you will find tools with text search and replace functionality.



Find Edit Box

Here you can type in the string that you want to search.

Find set selected

Copies the currently selected text into the Find edit box, searches for a matching string in the text, and selects this match then.

Find Next

Searches for the next matching string in the text.

Replace Edit Box

Here you can type in the string that you want to replace in the text.

Replace set selected

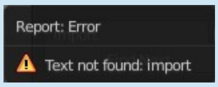
Copies the currently selected text into the Find edit box, searches for a matching string in the text, and replaces this match with the string in the Replace edit box.

Replace Next

Searches for the next matching string in the text. And replaces it the string in the Replace edit box.

Note

By default when the search does not find a matching string anymore in the text below the current selection, then you will get a warning that the search string is not present in the text file. It will not automatically start the search from the top again. You have to place the text cursor manually at the top of the text.



Or turn on the Wrap checkbox below.

Match case

When ticked then the search is Upper case sensitive.

Wrap

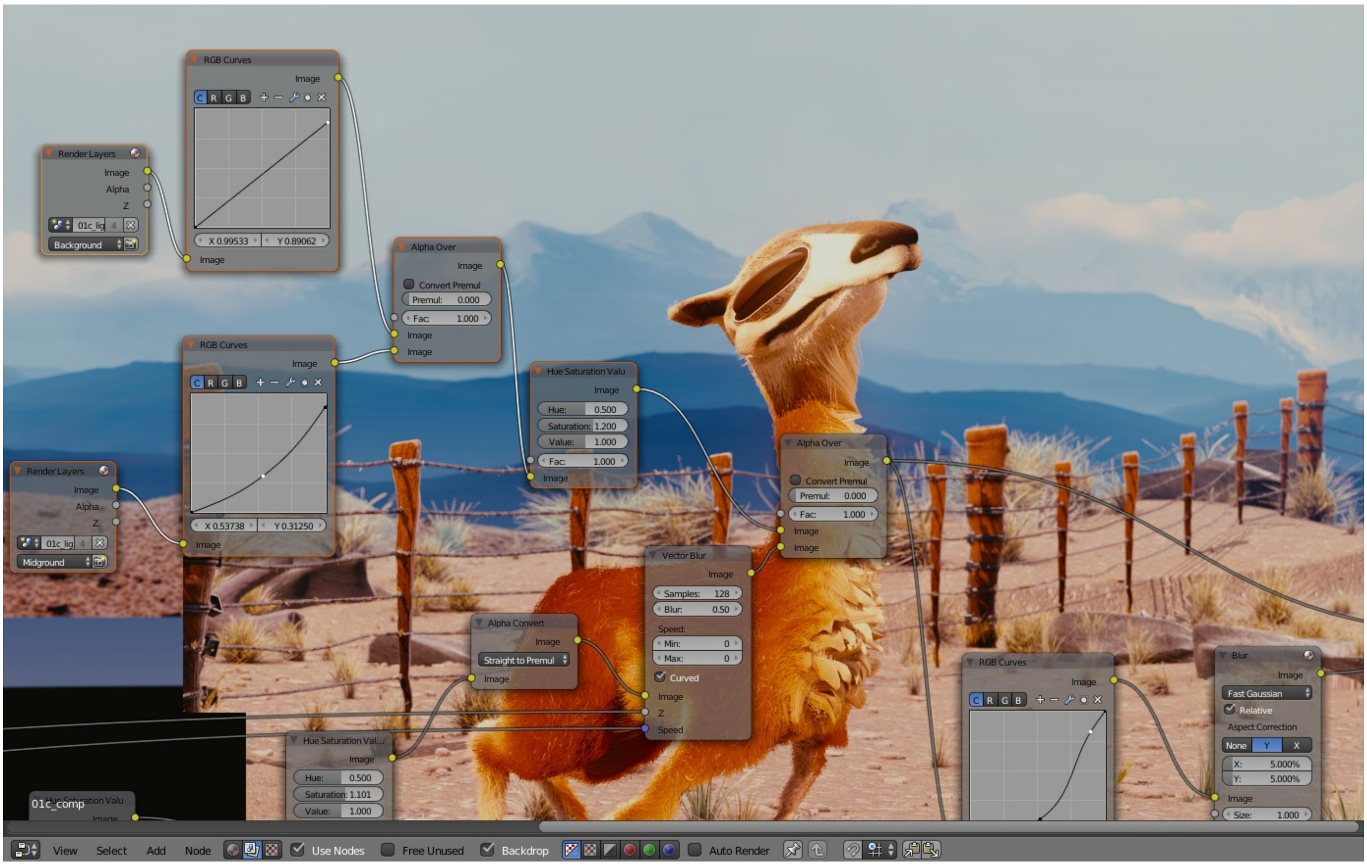
Starts the search from the top of the document when the search has reached the end of the document.

All

Search in all opened Textfiles, not just the currently active one.

Editors - Node Editor

Node Editor



The node editor

The *node editor* is used to work with node-based dataflows.

Navigating the node editor is done with the use of both mouse movement and keyboard shortcuts.

Pan (`MMB`)
: Move the view up, down, left and right

Zoom (`Ctrl-MMB/Wheel`)
: Move the camera forwards and backwards

Node Tree Types

Bforartists has a number of different node tree types:

- *Compositing Nodes*
- *Texture Nodes*
- Material Nodes (*Bforartists Internal*, *Cycles*)

The node tree type can be changed using the buttons in the node editor header.

Regions of the Node Editor

Toolshelf

The *toolshelf* is a context-sensitive region, natively containing tools for the grease pencil and buttons for adding nodes. The toolshelf is organized using tabs.

Properties Region

The *properties region* contains properties for the current selected node as well as node editor specific settings.

Header

The *header* contains various menus, buttons and options, partially based on the current node tree type.

Editor

By default, the header, when first displayed, is uninitialized as shown:

Default Node Editor Header

Activating Nodes

What nodes to use?

- If you want to work with a material node map, click the ball in the Material/Compositing node set selector.

Node Editor for Materials

- If you want to work with a compositing node map, click the overlaped pictures on the Material/Compositing node set selector.

Node Editor for Compositing

- If you want to work with a texture node map, click the checker on the Material/Compositing node set selector.

Node Editor for Texturing

To actually activate nodes, click the Use Nodes button.

Node Editor Window Actions

When the cursor is in the window, several standard Bforartists hotkeys and mouse actions are available, including actions like delete or box select.

Node Editor Header

On the window header, you will see header options:

View
This menu changes your view of the window.

Select
This menu allows you to select a node or groups of nodes, and does the same as typing the hotkey to select all A or start the border select B process.

Add
This menu allows you to add nodes.

Node
To do things with selected nodes, akin to vertices.

Material, Compositing or Texture buttons
Nodes are grouped into two categories, based on what they operate on:

- To work with Material Nodes, click on the ball,
- To work with Compositing nodes, click on the overlaped pictures,
- To work with Texture nodes, click on the checker.

Use Nodes
Tells the render engine to use the node map in computing the material color or rendering the final image, or not. If not, the map is ignored and the basic render of the material tabs or scene is accomplished.

Use Pinned
This button tells the render engine to use pinned node tree.

Go to Parent button
This button allows you go to parent node tree.

Snap
Toggle snap mode for node in the Node Editor window.

Snap Node Element Selector
This selector provide the follow node elements for snap:

- Grid (default) Snap to grid of the Node Editor window.
- Node X Snap to left/right node border.
- Node Y Snap to top/bottom node border.
- Node X/Y Snap to any node border.

Snap Target
Which part to snap onto the target.

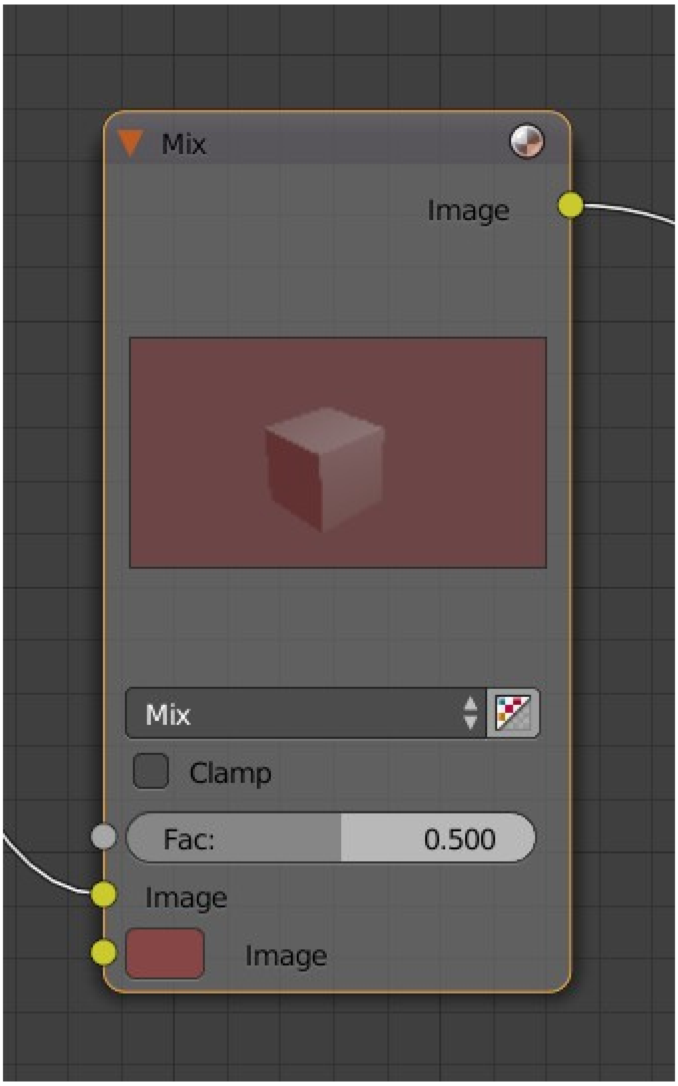
- Closest: Snap closest point onto target.
- Center: Snap center onto target.
- Median: Snap median onto target.
- Active: Snap active onto target.

Copy Nodes
This button allows you copy selected nodes to the clipboard.

Paste Nodes
This button allows you paste nodes from the clipboard to the active node tree.

Node Parts

All nodes in Bforartists are based off of a similar construction. This applies to any type of node. These parts include the Title, Sockets, Preview and more.



Title

The *Title* shows the name/type of the node. It can be overridden by changing the value of Label in the *Node* section of the *Properties Region* N. On the left side of the title is the *collapse toggle* which can be used to collapse the node this can also be done with H.

How a node appears when collapsed.

Sockets

The *Sockets* input and output values from the node. They appear as little colored circles on either side of the node. Unused sockets can be hidden. There are two functions of sockets; inputs and outputs.

Each socket is color-coded depending on what type of data it handles.

Color (Yellow)

Indicates that **color** information needs to be input or will be output from the node. This may or may not include an alpha channel.

Numeric (Grey)

Indicates values (**numeric**) information. It can either be a single numerical value or a so-called “value map”. (You can think of a value map as a grayscale-map where the different amount of bright/dark reflects the value for each point). If a single value is used as an input for a “value map” socket, all points of the map are set to this same value. Common use: Alpha maps and value options for a node.

Vector (Blue)

Indicates **vector/coordinate/normal** information.

Shader (Green)

Used for **shaders** in *Cycles*

Inputs

The *Inputs* are located on bottom left side of the node, and provide the data the node needs to perform its function. Each input socket, except for the green shader input, when disconnected, has a default value which can be edited via a color, numeric, or vector interface input. In the screen shot of the node above, the second color option is set by a color interface input.

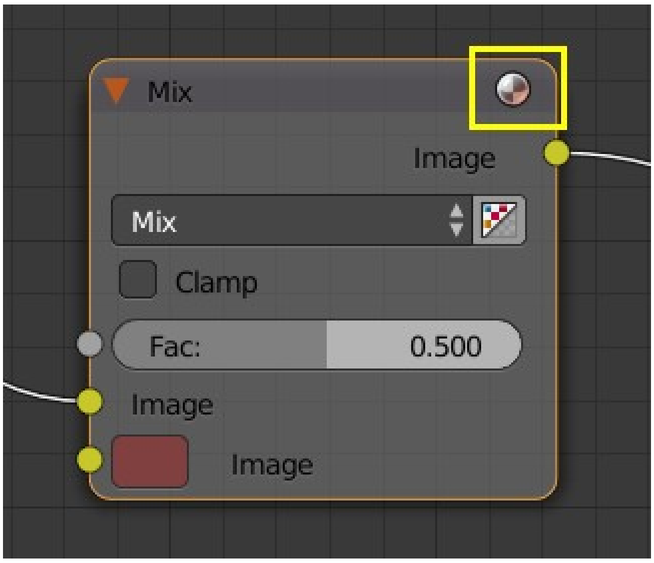
Outputs

The *Outputs* are located on the top right side of the node, and can be connected to the input of nodes further down the node tree.

Preview

On some nodes this shows a preview image of how the output data for a certain channel will appear. Usually it shows color data.

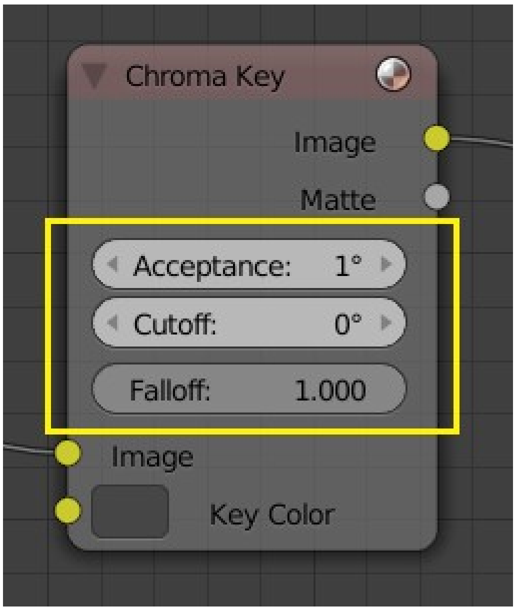
The preview can be toggled using the icon on the very top right hand corner of the node, next to the title.



How a node appears without the preview.

Settings

Many nodes have settings which can affect the way they interact with inputs and outputs. Node settings are located below the outputs and above any inputs.



An example of the controls on the chroma key node.

Using Nodes

Adding Nodes

Nodes are added in two ways to the node editor:

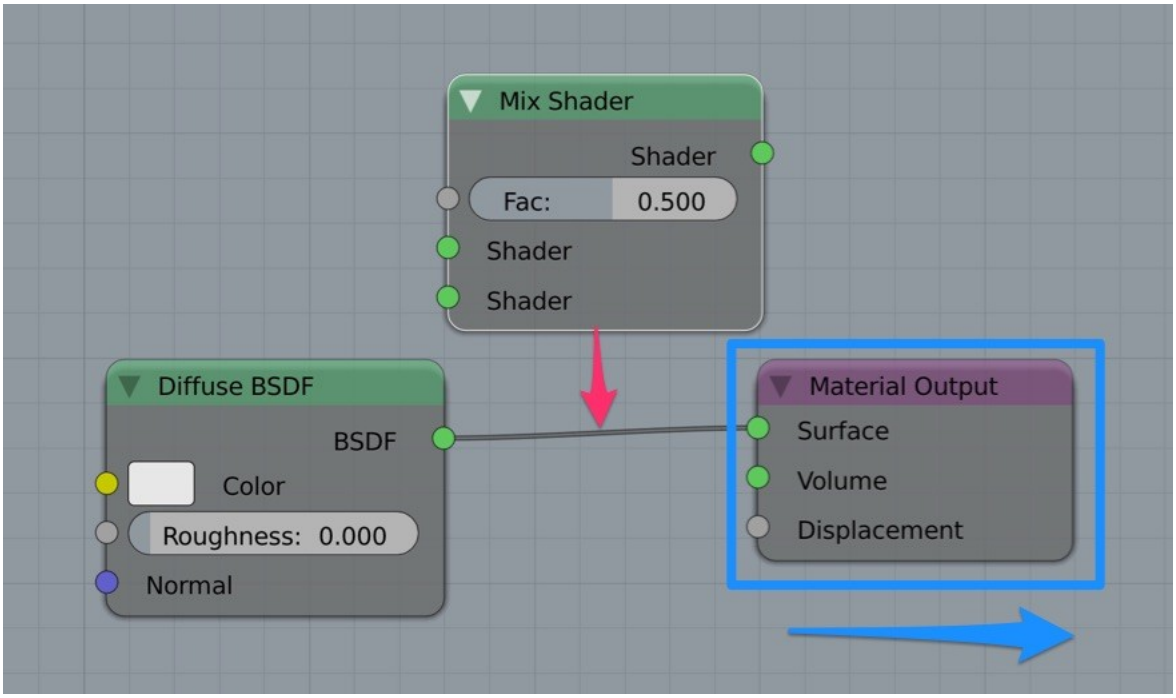
- By using the toolshelf which has buttons for adding nodes, organized with tabs, or
- By using the Add menu

Arranging Nodes

In general, try to arrange your nodes within the window such that the image flows from left to right, top to bottom. Move a node by clicking on a benign area and drag it around. A node can be clicked almost anywhere to start dragging.

Auto-offset

Auto-offset is a feature that helps organizing node layouts interactively without interrupting the user workflow. When you drop a node with at least one input and one output socket onto an existing connection between two nodes, auto-offset will, depending on the direction setting, automatically move the left or right node away to make room for the new node.



Auto-offset is enabled by default, but it can be disabled from the node editor header.

You can toggle the offset direction while you are moving the node by pressing `T`.

The offset margin can be changed using the *Auto-offset Margin* setting in the editing section of the User Preferences.

Connecting nodes

`LMB`-click on a socket and drag. You will see a line coming out of it: This is called a *link* or *noodle*.

Keep dragging and connect the link to an input socket of another node, then release the `LMB`.

While multiple links can route out of an output socket, only a single link can be attached to an input socket.

To reposition the outgoing links of a node, rather than adding a new one, hold `Ctrl` while dragging from an output socket. This works for single as well as for multiple outgoing links.

Disconnecting nodes

To break a link between sockets `Ctrl-LMB`-click in an empty area, near the link you want to disconnect, and drag: You will see a little cutter icon appearing at your mouse pointer. Move it over the link itself, and release the `LMB`.

Duplicating a node

Click `LMB` or `RMB` on the desidered node, press `Duplicate` and move the mouse away to see the duplicate of the selected node appeing under the mouse pointer.

Note
When you duplicate a node, the new node will be positioned *exactly* on top of the node that was duplicated. If

you leave it there (and it's quite easy to do so), you can **not** easily tell that there are *two* nodes there! When in doubt, grab a node and move it slightly to see if something's lurking underneath.

Node Groups

Both material and composite nodes can be grouped. Grouping nodes can simplify the node network layout in the node editor, making your material or composite 'noodle' (node network) easier to work with. Grouping nodes also creates what are called NodeGroups (inside a .blend file) or NodeTrees (when appending).

Conceptually, "grouping" allows you to specify a *set* of nodes that you can treat as though it were "just one node". You can then re-use it one or more times in this or some other .blend file(s).

As an example: If you have created a material using nodes that you would like to use in another .blend file, you *could* simply append the material from one .blend file to another. However, what if you would like to create a new material, and use a branch from an existing material node network? You could re-create the branch. Or you could append the material to the new .blend file, then cut and paste the branch that you want into the new material. Both of these options work, but are not very efficient when working across different .blend files. A better method of re-use, for either material node branches or composite node networks, would be to create groups of nodes.

Once a group has been defined, it becomes an opaque object; a reusable software component. You can (if you choose) ignore exactly how it is *defined*, and simply use it as many times as you like.

Grouping Nodes

To create a node group, in the node editor, select the nodes you want to include, then choose Make Group. A node group will have a green title bar. All of the selected nodes will now be contained within the group node. Default naming for the node group is *NodeGroup, NodeGroup.001* etc. There is a name field in the node group you can click into to change the name of the group. Change the name of the node group to something meaningful. When appending node groups from one .blend file to another, Bforartists does not make a distinction between material node groups or composite node groups, so it's recommended some naming convention that will allow you to easily distinguish between the two types.

Note

What not to include in your groups (all types of Node editors)

Remember that the essential idea is that a group should be an easily-reusable, self-contained software component. Material node groups should **not include**:

Input nodes
: if you include a source node in your group, you'll end up having the source node appearing *twice:* once inside the group, and once outside the group in the new material node-network.

Output node
: if you include an output node in the group, there won't be an output socket available *from* the group!

Editing Node Groups

With a group node selected, `Tab` expands the node to a window frame, and the individual nodes within it are shown. You can move them around, play with their individual controls, re-thread them internally, etc. just like you can if they were a normal part of your editor window. You will not be able, though, to thread them to a node outside the group; you have to use the external sockets on the side of the group node. To add or remove nodes from the group, you need to ungroup them.

Ungrouping Nodes

The `Ungroup` command removes the group and places the individual nodes into your editor workspace. No internal connections are lost, and now you can thread internal nodes to other nodes in your workspace.

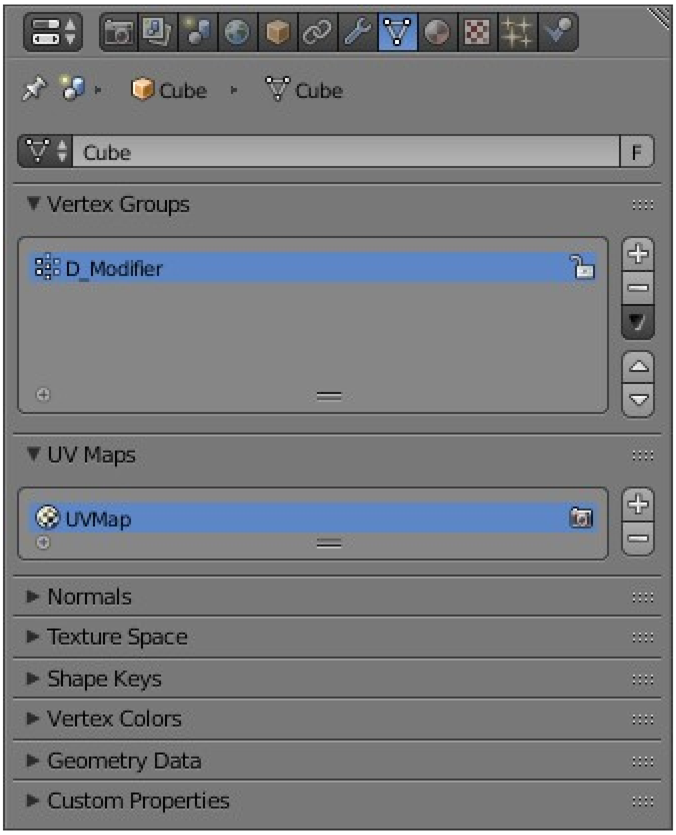
Appending Node Groups

Once you have appended a NodeTree to your .blend file, you can make use of it in the node editor by pressing Add ‣ Group, then select the appended group. The “control panel” of the Group is the individual controls for the grouped nodes. You can change them by working with the Group node like any other node.

Editors - Properties Editor

Properties Editor

The *Properties Editor* is used to edit data and properties for the *Active Scene* and the *Active Object*. It also contains lots of other functionality that you would expect to find in separate settings. Rendersettings. Materials, particle settings and and and.



The Properties Editor with the Mesh tab selected.

Contexts

The Properties (or Buttons) Window shows several *Contexts*, which can be chosen via the icon row in the header.

Scene / Render

These tabs are used to add features, and to change properties for the Active Scene.

Scene / Render tabs.

Render
: Everything related to render output (dimensions, anti-aliasing, performance etc).

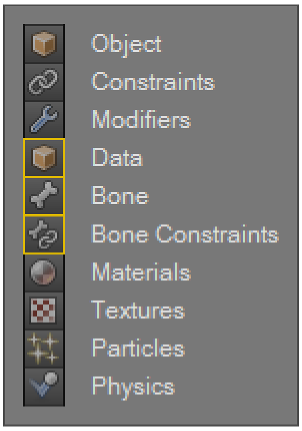
Render Layers
: Render Layers and Passes.

Scene
: Gravity, Units to use, Keying Sets, Color Management, Audio settings, Physics, and scene simplification options.

World
: Environmental lighting, sky, mist and Ambient Occlusion.

Object Data

These tabs are used to add features, and to change properties for the Active Object (and other active elements, material, curve... etc).



Object Data tabs.

The Object Data tabs shown depend on what type of object was selected last (The Active Object).

Features unique to the object type are usually added to the Data and Bone tabs, highlighted in yellow.

Object
: Transformations, display options, visibility settings (via layers) duplication settings and animation information (regarding Object position).

Constraints
: Used to control an Object’s transform (position, rotation, scale), tracking and relationship properties.

Modifiers
: Array, Mirror, Subdivision Surface, Armature, Cast.

Object Data
: Settings for the objects data, depending on the Object Type.

Bone
: Armature Bone settings.

Bone Constraints

Armature Bone constraints.

Materials

Properties of the surface (color, specularity, transparency, etc).

Textures

Used by materials, world and brushes to provide additional details.

Particles

Hair and Emitter particles.

Physics

Properties relating to Cloth, Force Fields, Collision, Fluid and Smoke Simulation.

Documentation

Rendering is mainly documented in its own section, there is also information on materials and textures.

- *Render*

Scene features are mainly documented in the data-system, though some tools are added to different sections.

- *Scenes*
- *Keying Sets*

The Object features are usually documented in the 'Objects' part of the 3D Viewport Section.

- *Modeling*

The other features each have their own section in the manual.

- *Constraints*
- *Modifiers*
- *Particles*
- *Physics*

Editors - Outliner

Outliner

The Outliner window.

The *Outliner* is a list that organizes data in your scene. In the outliner, you can:

- View the data in the scene.
- Select and deselect objects in the scene.
- Hide or show an object in the scene.
- Enable or disable selection (to make an object "unselectable" in the 3D View).
- Enable or disable the rendering of an object.
- Delete objects from the scene.
- Unlink data (equivalent to pressing the *X* button next to the name of a data-block).
- Easily select which render layer to render.
- Easily select which render pass to render (for example, you can choose to render just the *Specular* pass).

Using the Outliner

Each row in the *Outliner* shows a data-block. You can click the plus-sign to the left of a name to expand the current data-block and see what other data-blocks it contains.

You can select data-blocks in the *Outliner*, but this won't necessarily select the data-block in the scene. To select the data-block in the scene, you have to activate it.

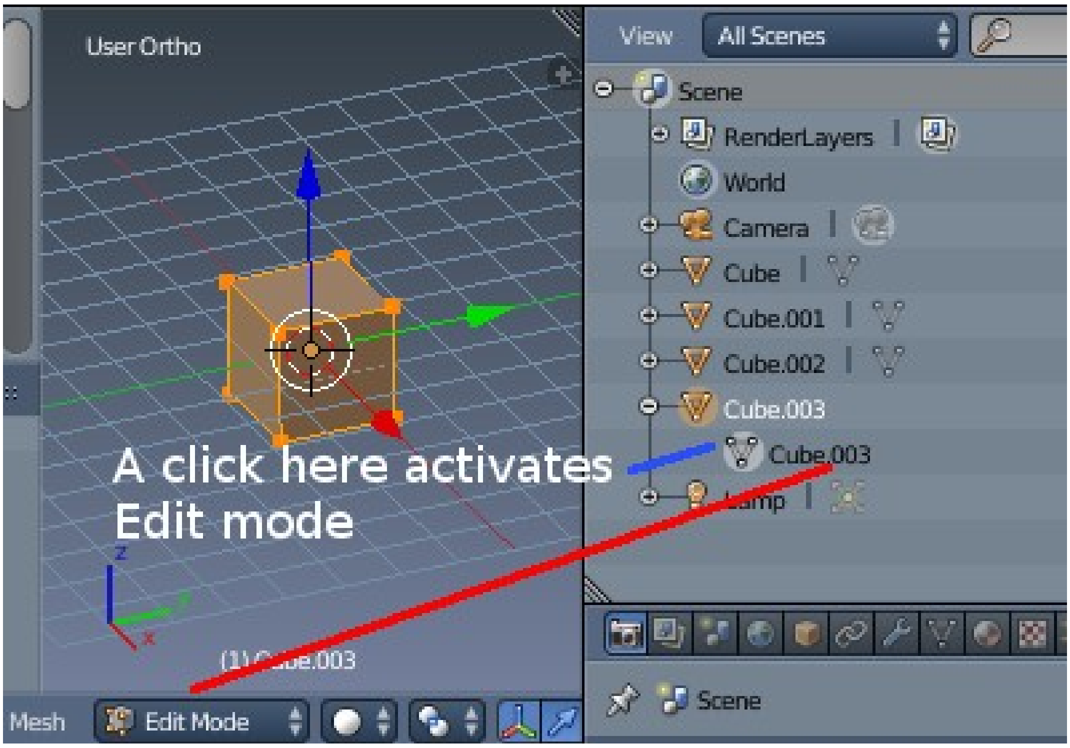
Selecting and Activating

Single selection doesn't require any pre-selection: just work directly with LMB (and/or RMB - contextual menu, see below) *inside* the name/icon area.

When you select an object in the list this way, it is selected and becomes the active object in all other 3D Views. Use this feature to find objects in your 3D View, select them in the *Outliner*, then zoom to them with View ‣ Show Active or NumpadPeriod.

Activating a data-block

Activate the data-block with LMB on the *icon* of the data-block. Activating the data-block will automatically switch to the relevant mode. For example, activating the mesh data of the cube will select the cube and enter *Edit mode* while activating the object data of the cube will select the cube and enter *Object mode* (see right).



Toggling pre-selection of a data-block.

Toggle pre-selection of a group of data-blocks

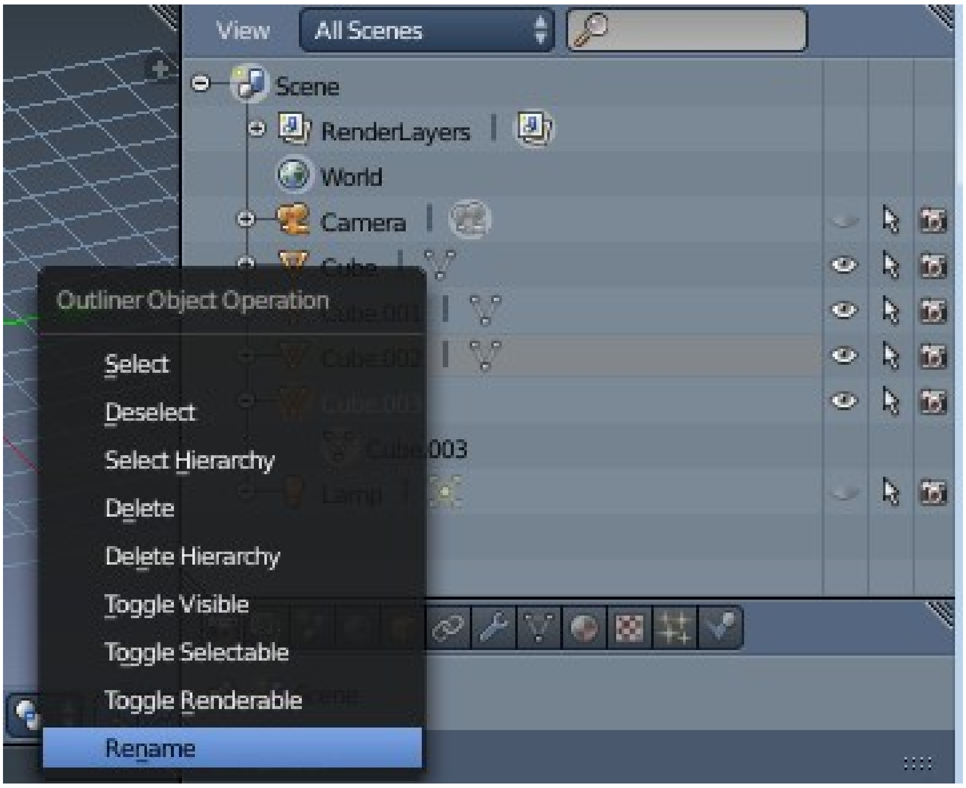
Useful when you want to select/deselect a whole bunch of data-blocks. For this you must prepare the selection using, to your liking:

- RMB or LMB,
- Shift-RMB or Shift-LMB,
- RMB and drag or LMB and drag,

all *outside* the name/icon area. Those pre-selected have their line in a lighter color. You then can (de)select them with a RMB *on* the name/icon area, which brings on a context menu (see bellow).

Context menu

Right click at an item and you will see the context menu. Depending on the type of the pre-selected data-block(s), you will have a different set of options.



Note
Some data-block types will not have a context menu at all!

Toggling object-level restrictions

The three following options, in the right side of the *Outliner* window, are only available for objects:

Visibility (*eye icon*)
: Toggles the visibility of the object in the 3D View. V will toggle this property for any objects that are selected in the *Outliner*.

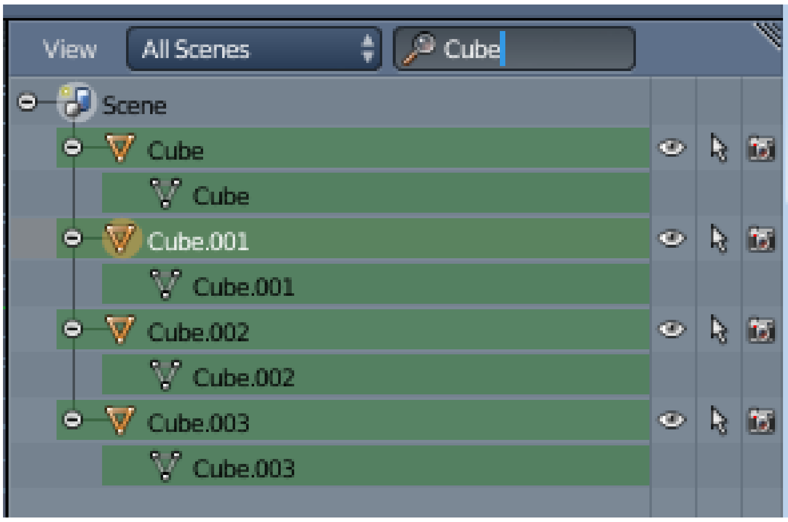
Selectability (*mouse cursor icon*)
: This is useful for if you have placed something in the scene and don’t want to accidentally select it when working on something else. S will toggle this property for any objects that are selected in the *Outliner*.

Rendering (*camera icon*)
: This will still keep the object visible in the scene, but it will be ignored by the renderer.

Searching

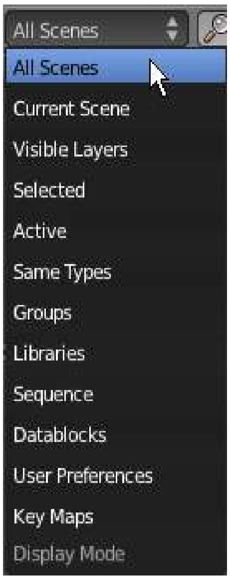
You can search the file for data-blocks by using the *Search* menu in the header of the *Outliner*

Matching data-blocks will be automatically selected.



Filtering the display

The window header has a field to let you select what the outliner should show to help you narrow the list of objects so that you can find things quickly and easily.



All Scenes
Shows *everything* the outliner can display (in all scenes, all layers, etc.)

Current Scene
Shows everything in the current scene.

Visible Layers
Shows everything on the visible (currently selected) layers in the current scene. Use the *layer* buttons to make objects on a layer visible in the 3D window.

Selected
Lists only the object(s) currently selected in the 3D window. You can select multiple objects by `Shift-RMB` -clicking.

Active
Lists only the active (often last selected) object.

Same Types
Lists only those objects in the current scene that are of the same types as those selected in the 3d window.

Groups
Lists only *Groups* and their members.

Libraries
TODO *

Sequence
TODO *

Data Blocks
TODO *

User Preferences
TODO *

Key Maps
TODO *

*Thank you Blender devs for not having a complete manual after 20 years ...

Editors - Info Editor

Info Editor

Info Window

The Info Editor is found at the top of the Default Scene. It contains the default file menu. And has the following components:

Menu options
: The menus provides access to the main menu options.

Current Screen (default is Default)
: The dropdown box allows you to select different *Screens*. By default, Bforartists comes with several pre-configured *Screen* s for you to choose from. If you need custom screen layouts, you can create and name them.

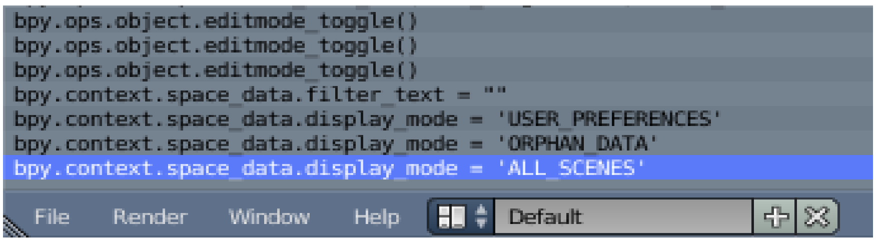
Resource Information
: The information string ives you information about the current scene. This region will tell you how much memory is being consumed based on the number of vertices, faces and objects in the selected scene, as well as totals of what resources are currently selected. This can help identify when you are reaching the limits of your hardware.

Message area

The toolbar also contains an message area. When there is a warning or an error, then it will pop up besides the Current Screen dropdown box. But also a progressbar can be found here.

Info Area

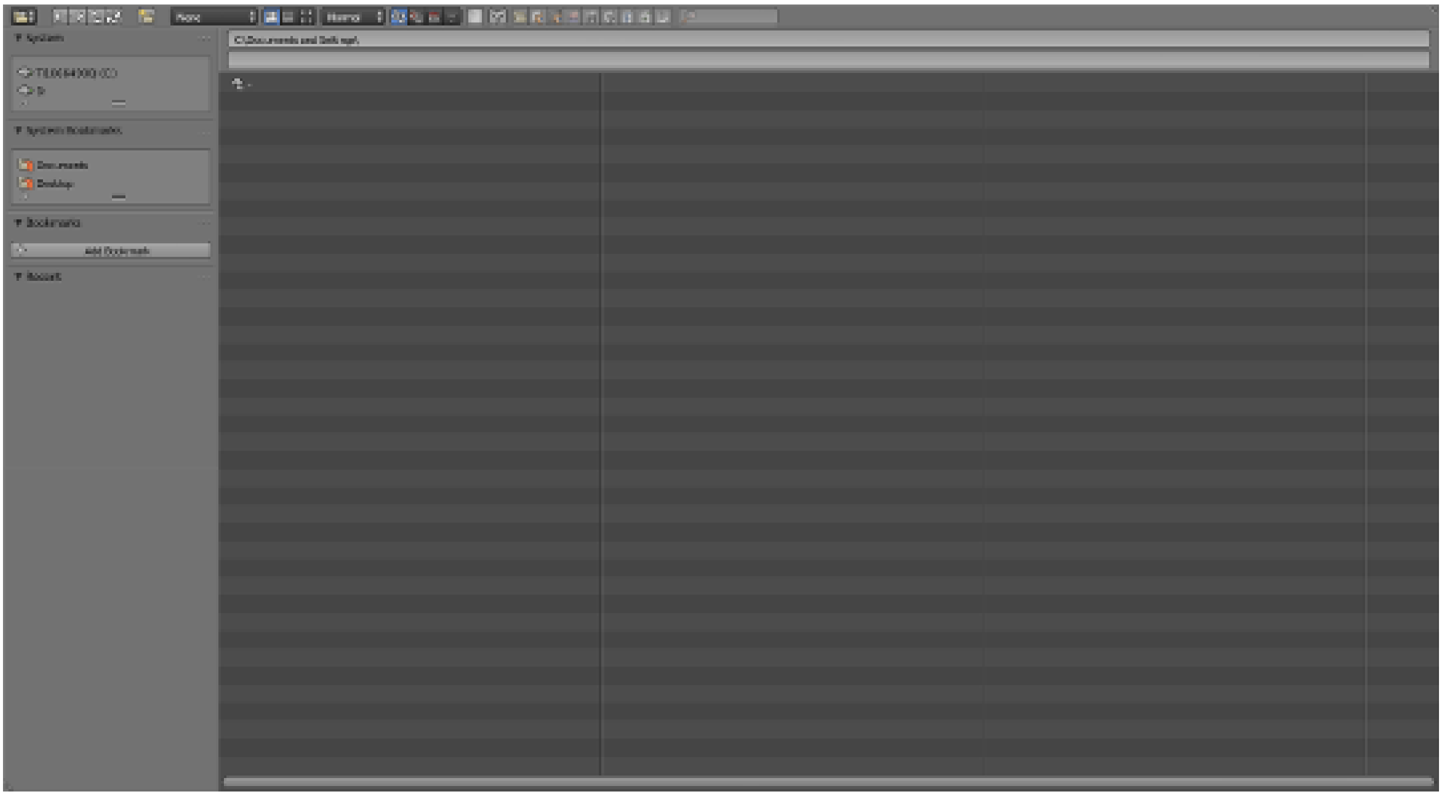
The info editor is not just a file menu bar for the standard layout. It also has a Info are, which brings a list of the last used commands as Python commads. This is useful for programming needs. When you write a plugin for example. Or when you want to automatize a task.



To access this Info area simply drag down the menu bar a bit. Or switch to the Scripting layout. There you can see this area open by default.

Editors - File browser

File Browser



Usage

The file browser has multiple uses, while its often used for save/load, it can be kept open for other uses too.

Use cases include:

- Opening and Saving Blend files.
- Import/Export other file formats.
- Picking new locations for existing file-paths (images, video’s, fonts... etc).
- Browsing inside other `.blend` files, when using *Append and Link*.

You can also keep the file selector open, as with any other window type. In this case the buttons to load a files is removed.

The main purpose of this is to be able to drag media files.

- Images into the Video Sequence Editor (to set background or apply as material textures).
- Media files into the Video Sequence Editor.

Interface

Toolbar

The left sidebar displays different ways to find files and several options.

System
The system menu contains a list of drives that are available to navigate through to find files. Click on one to jump to that drive.

Bookmarks
These are folders that you want to be able to access often without having to navigate to them in the file browser. To add a directory to the bookmark menu, navigate to that folder, then click the *Add* button. To remove a folder from the list, simply click the *X* icon next to it.

Recent
This is a list of recently accessed folders. You can control how many folders appear in this list by going to the *File* tab of the *User Preferences*, in the box labeled *Recent Files*.

Header

The Header contains several tools for navigation of files. The four arrow icons allow you to:

- *Move to previous folder*
- *Move to next folder*
- *Move up to parent directory*
- *Refresh current folder*

Create a new folder inside the current one by clicking the *Create New Directory* button.

The other icons allow you to control what files are visible and how they are displayed. You can:

- *Display files as a short list*
- *Display files as a detailed list*
- *Display files as thumbnails*

Hint
Along with all supported image & video formats, thumbnails for fonts and `.blend` are displayed too.

You can sort files:

- *Alphabetically*
- *By file type*
- *By Date of last edit*
- *By file size*

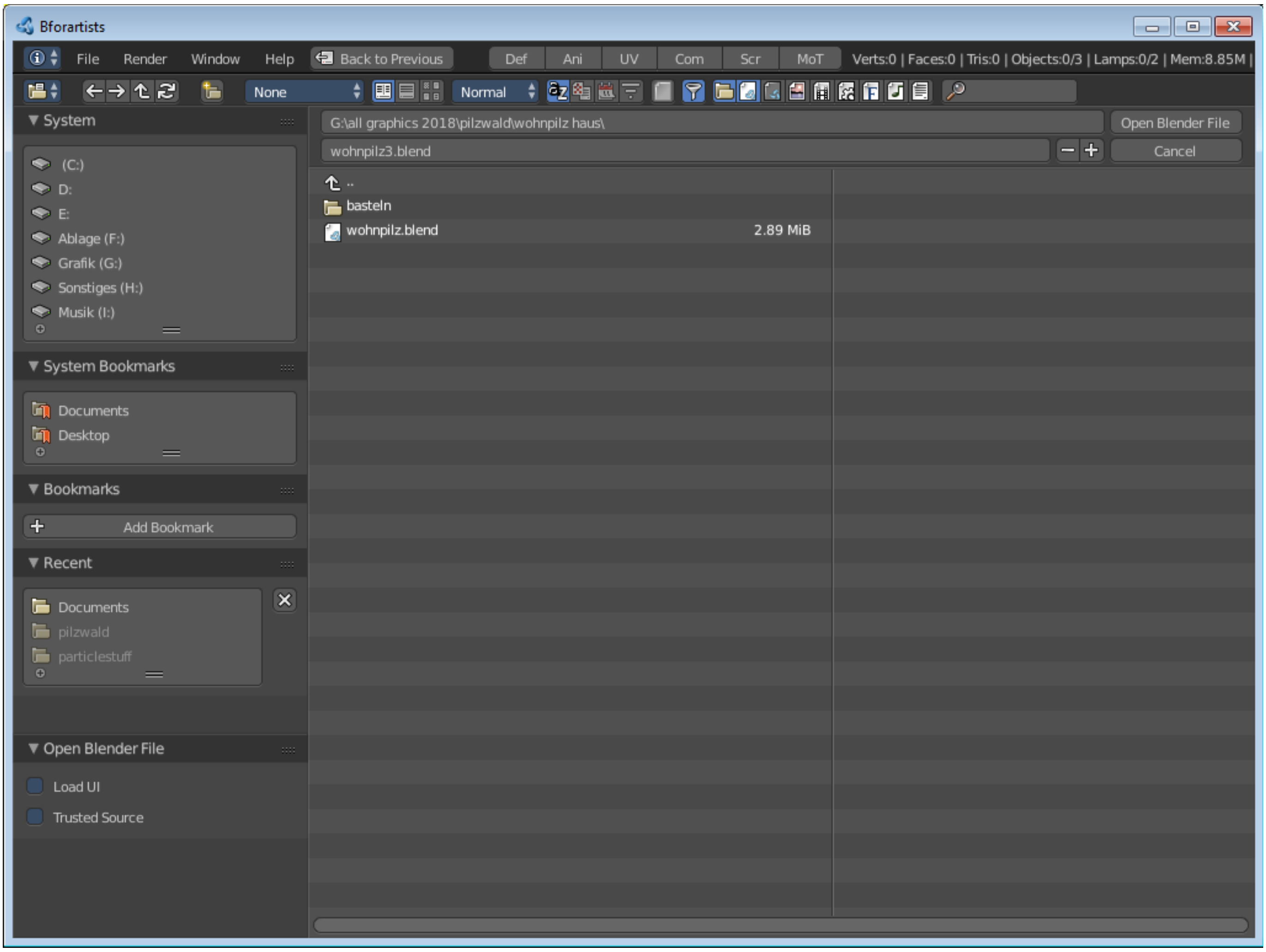
Click the funnel icon to toggle which file types are shown:

- *Folders*

- *Blend files*
- *Images*
- *Movie files*
- *Scripts*
- *Font files*
- *Music files*
- *Text files*

Editors - File browser by tools

File Browser



The file browser is a explorer dialog that allows you to browse for locations and files, and allows you to load and save them.

The file browser has multiple uses. While its often used for save/load, it can be kept open for other uses too.

Use cases include:

- Opening and Saving Blend files.
- Import/Export other file formats.
- Picking new locations for existing file-paths (images, video's, fonts... etc).
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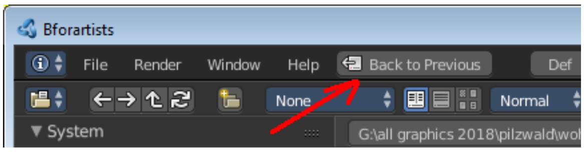
You can also keep the file selector open, as with any other window type. In this case the buttons to load files is removed. The main purpose of this is to be able to drag media files.

- Images into the Video Sequence Editor (to set background or apply as material textures).

- Media files into the Video Sequence Editor.

Back to Previous

Once you open the file browser you will see a "Back to Previous" Button in the header of the Info Editor. This allows you to leave the File Browser when you decide not to load or save. The same can of course be done with the Cancel button.



Header tools

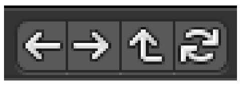
There are several tools in the header to find. The range goes from navigation elements across filters up to display options. Some defaults differs, dependant of what file format you try to load or to save.

Editor Type menu

Allows you to change the editor type from File Browser to another editor type.

Note
This menu is required when you build layouts. You can for example incorporate the file browser into a layout as a drag n drop location for your movies. In a callable file browser it's a bit disturbing, and should be hidden. But there is unfortunately no way to hide it by default since when you call the file browser then you create the editor type from scratch, with this menu showing.This means we have to live with this menu here.

Folder Navigation



Previous Folder

Navigates to the previous folder location

Next Folder

Navigates to the next folder location. This just works when you had Previous folder clicked before.

Parent File

Moves one upwards in the explorer hierarchy

Refresh List

Refreshes the file list. This is useful when you did some modifications at the folder content outside of the file browser.

Create new Directory

Creates a new folder inside of the currently selected directory.

Recursion

Recursion is a dropdown menu where you can adjust how deep the explorer should dig. Normally it just lists the content of the currently selected directory. But it is also possible to list the content of the folders three levels lower.

The recursion direction is always downwards. Default is None.

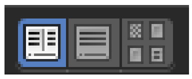
None

Just the matching content of the current directory is showing.

One Level, Two Levels, Three Levels

The matching content of the current directory is showing, plus the content of possible subfolders, defined by how deep the search should go.

Display mode for File List



There are three methods to display the content of the folders.

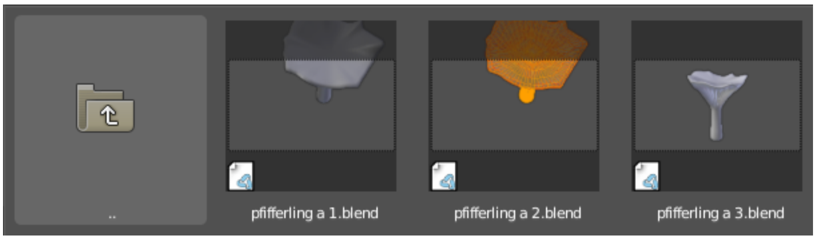
Short List

Displays the content of the file browser as a short list. Just File name and size gets displayed.

Long List

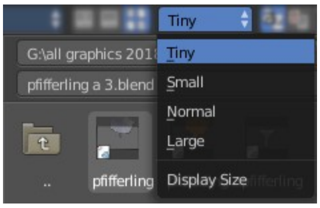
Displays the content of the file browser as a list. Besides Filename and Size also the create date gets displayed.

Thumbnails



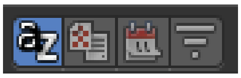
Displays the content of the file browser as thumbnails. This is especially for images of use.

Display Size



Here you can adjust how big the directory content gets displayed.

Sort Method



Here you can adjust how the directory list gets sorted.

Alphabetically

Sorts the content by its name.

By Extension Type

Sorts the content by the extension type.

By Modification Time

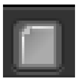
Sorts the content by date.

By Size

Sorts the content by size.

Show hidden Dot Files

This is a Unix feature. Unix systems like Linux or Mac hides files from file browsers and explorers by having a dot before the file. A good example is the .htaccess file at servers. Show hidden Dot Files makes such files visible to the file browser.



Filtering

You can filter the content of the file browser in various ways. The defaults differs, dependant of what you want to load or to save.

Enable Filtering of Files

This is the button that enables or disables filtering at all.

Show Folders

Display folders.

Show Blend files

Display Blend files.

Show Blend1, Blend2, Blend3, etc. files

Display blender backup scenes. Blender creates sometimes backups with the file ending with an increasing number at the end. blend1 for example.

Show Image files

Display image files.

Show Movie Files

Display movie files.

Show Script files

Display script files

Show Font files

Display font files.

Show Sound files

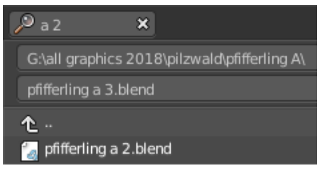
Display sound files.

Show Text files

Display text files.

Filter by string

Here you can filter the results in the file browser by a string.

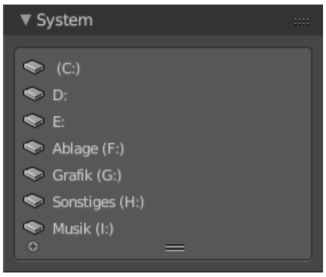


Tool Shelf

The Tool Shelf provides you with some panels for quick access to files and bookmarks.

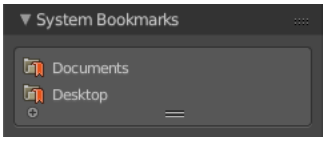
System Panel

Lists your drives.



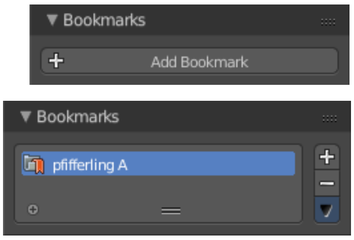
System Bookmarks

Lists some system libraries.



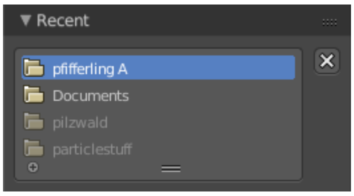
Bookmarks

Here you can add your own bookmarks.



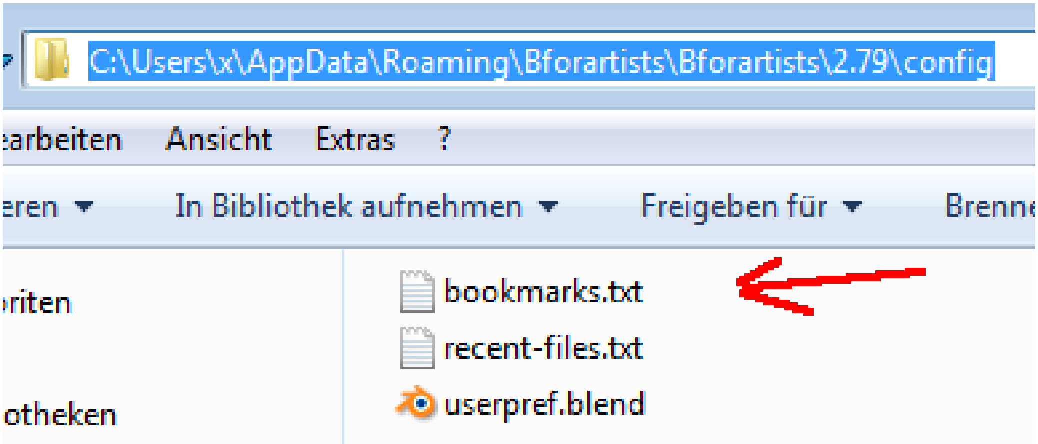
Recent

A list of the recent accessed folders.

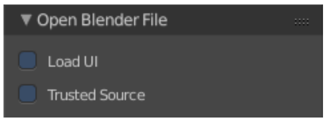


Greyed out folders are not longer existing directories. There is unfortunately no way to remove them from within Bforartists. You would need to do this manually in the History text files in the settings folder.

Under Windows this is the bookmarks.txt file in the Appdata folder.



Import Export Settings



At the lower half of the Tool Shelf you will find the special Import or Export settings for the current file format. For a Blend file you will just see two entries. For file formats like FBX you wil find plenty of settings.

As an example, and to explain the two settings for loading a blend file:

Load UI

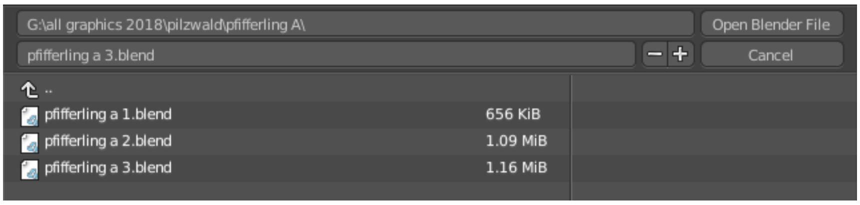
Bforartists comes with the feature *Load UI* unticked. This means the Bforartists UI will not change when you load a scene. Here you can temporary enable to load the scene with the layout and UI arrangement in which the scene was saved.

Trusted Source

With Load UI you can also load script files, which can execute. This is a potential security risk when the file comes from an unknown source.

File dialog

The file dialog is the actual place where your files and directories gets listed.



Path edit box

Here you can see and edit the full path to the file. And here you can set or modify it manually too. But usually you will use the navigation elements in the tool shelf. Or navigate by clicking at the folders and items in the list.

Open / Save Button

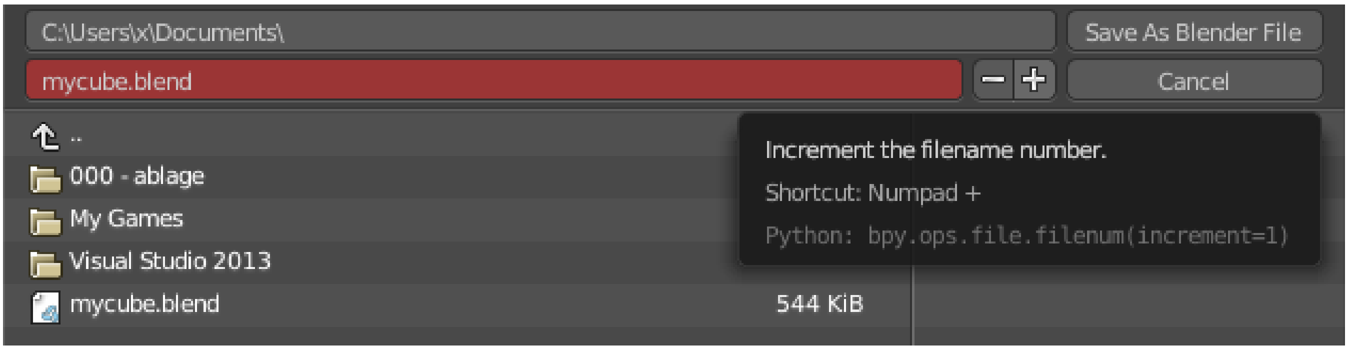
Execute loading or saving. For file loading, you can also double click at the file in the list to open it.

File edit box

Here you can read the file name. When you save a file, then this is the place to insert your needed file name.

+ and - Buttons behind File Edit box

This feature is of interest when you want to save a file with increasing number. The + button adds a increasing number at the end of the file name. The - button decreases this value. This means when you have a file with no number at the end, like cube, then the name changes to cube1. When the name is cube1, and you press the + button, then the name changes to cube2. When the file name is cube2, and you press the + button, then the file name changes to cube3. And so on.

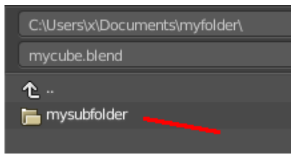


The red color indicates that a file with this name already exists.

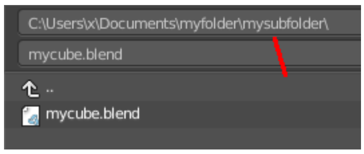
Cancel Button

Cancel the load or save action completely. The file dialog will close.

File Dialog navigation

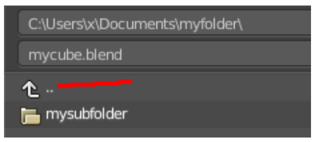


Usually you move one hierarchy downwards by simply clicking at the folder in the list that you want to explore.



So when i click at "mysubfolder" here, then we will enter this folder. And its content gets displayed. As you can see, the path has changed. We are now in the subfolder directory.

A double click at the mycube.blend file will open the file then.



There is also a way to navigate upwards. It's the arrow button in the list. A click at it, and we are back at the parent directory.

Editors - Python Console

Python Console

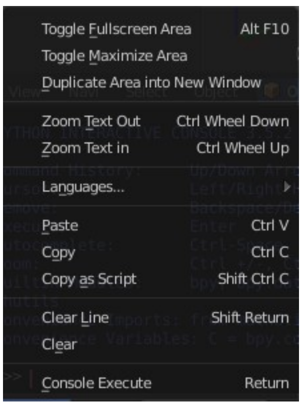
The Python console is a quick way to execute commands, with access to the entire Python API, command history and auto-complete.

Its a good way to explore possibilities, which can then be pasted into larger scripts.

Menus

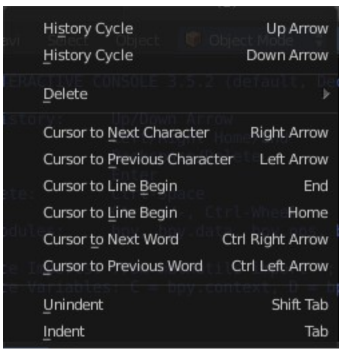
Console Menu

The Console menu provides you with the text operation and window tools.



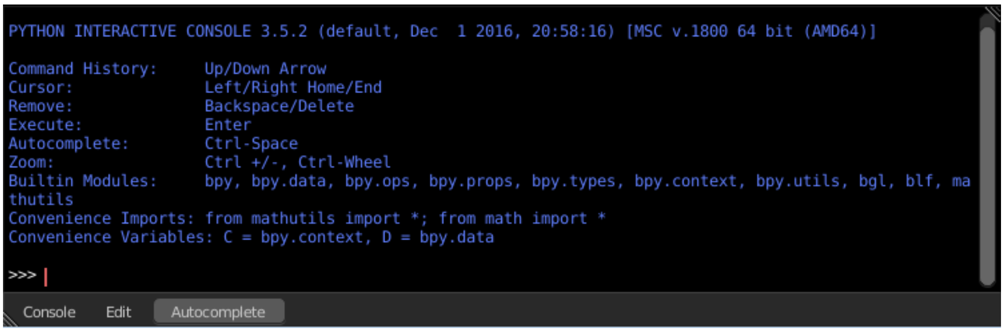
Edit Menu

The Edit menu provides you with the usual navigation tools.



Usage

Accessing Built-in Python Console

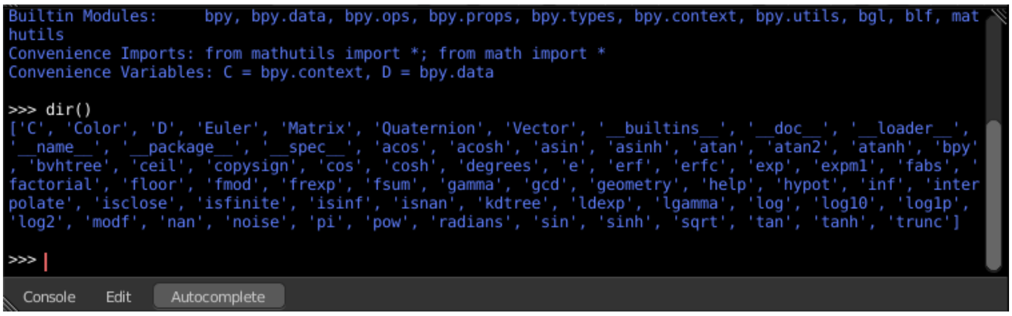


From the screen shot above, you will notice that by clicking at the Autocomplete button you can enable Auto-complete feature.

The command prompt is typical for Python 3.x, the interpreter is loaded and is ready to accept commands at the prompt >>>

First look at the Console Environment

To check what is loaded into the interpreter environment, type dir() at the prompt and execute it.



Following is a quick overview of the output

C

Quick access to `bpy.context`

D

Quick access to `bpy.data`

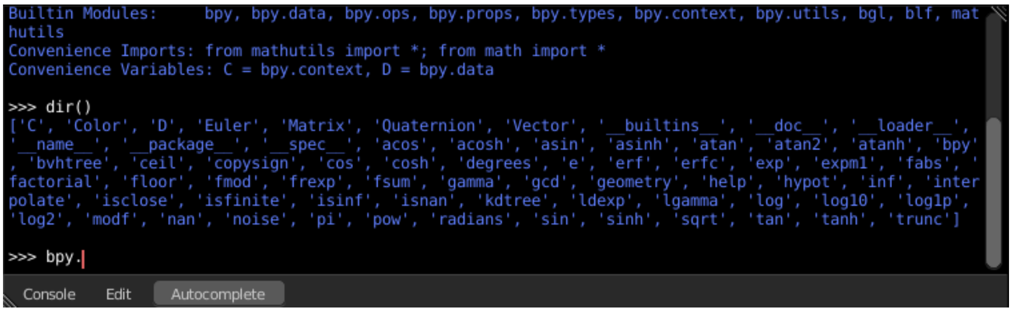
bpy

Top level Bforartists Python API module.

The rest of the commands are of various content. Most of them are mathematical expressions.

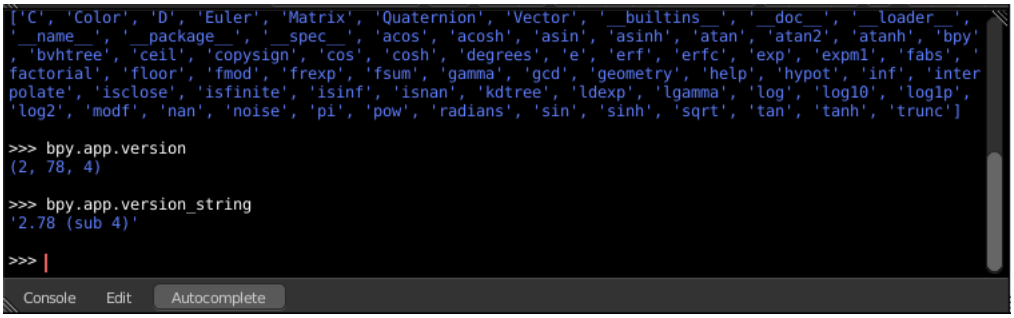
Auto Completion at work

Now, type bpy. and then press the Autocomplete button, and you will see the Console auto-complete feature in action.



You will notice that a list of sub-modules inside of bpy appear. These modules encapsulate all that we can do with Bforartists Python API and are very powerful tools.

Lets list all the contents of bpy.app module.



Notice the green output above the prompt where you enabled auto-completion. What you see is the result of auto completion listing. In the above listing all are module attribute names, but if you see any name end with '(', then that is a function.

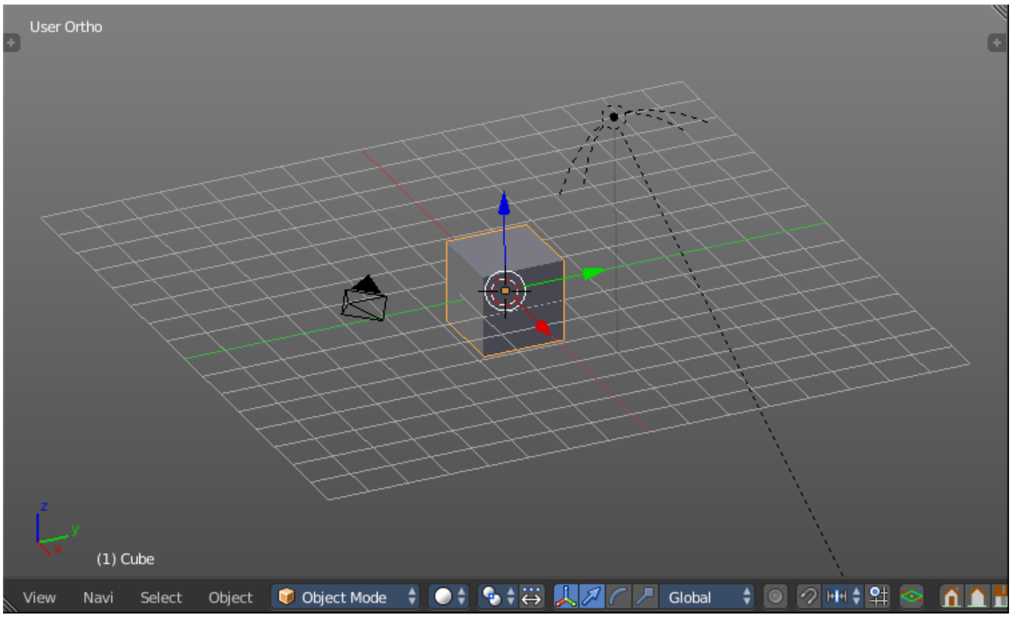
We will make use of this a lot to help our learning the API faster. Now that you got a hang of this, lets proceed to investigate some of modules in bpy.

Before tinkering with the modules..

If you look at the 3D Viewport in the default Bforartists scene, you will notice some objects. We have added a cube here too.

- All objects exist in a context and there can be various modes under which they are operated upon.
- At any instance, only one object is active and there can be more than one selected objects.
- All objects are data in the Bforartists file.
- There are operators/functions that create and modify these objects.

For all the scenarios listed above (not all were listed, mind you..) the bpy module provides functionality to access and modify data.



Examples

Note

For the commands below to show the proper output, make sure you have selected object(s) in the 3D view.

bpy.context

Try it out!

bpy.context.mode

Will print the current 3D View mode (Object, Edit, Sculpt etc.,)

bpy.context.object or bpy.context.active_object

Will give access to the active object in the 3D View

```
>>> bpy.context.object.location.x = 1
```

Change x location to a value of 1

```
>>> bpy.context.object.location.x += 0.5
```

Move object from previous x location by 0.5 unit

```
>>> bpy.context.object.location = (1, 2, 3)
```

Changes x, y, z location

```
>>> bpy.context.object.location.xyz = (1, 2, 3)
```

Same as above

```
>>> type(bpy.context.object.location)
```

Data type of objects location

```
>>> dir(bpy.context.object.location)
```

Now that is a lot of data that you have access to

bpy.context.selected_objects
Will give access to a list of all selected objects.

```
>>> bpy.context.selected_objects
```

... then press `Ctrl-Spacebar`

```
>>> bpy.context.selected_objects[0]
```

Prints out name of first object in the list

```
>>> [object for object in bpy.context.selected_objects if object != bpy.context.object]
```

Complex one... But this prints a list of objects not including the active object

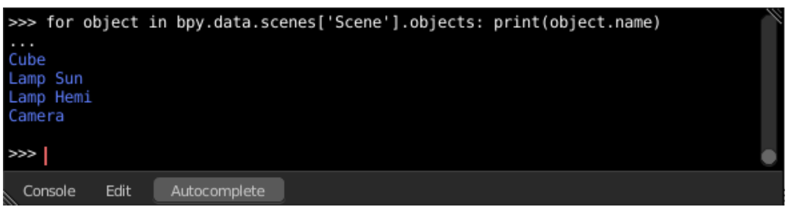
bpy.data

`bpy.data` has functions and attributes that give you access to all the data in the Bforartists file.

You can access following data in the current Bforartists file: objects, meshes, materials, textures, scenes, screens, sounds, scripts, ... etc.

That's a lot of data.

Try it out!



Exercise

```
>>> for object in bpy.data.scenes['Scene'].objects: print(object.name)
```

`Return` twice Prints the names of all objects belonging to the Bforartists scene with name “Scene”

```
>>> bpy.data.scenes['Scene'].objects.unlink(bpy.context.active_object)
```

Unlink the active object from the Bforartists scene named ‘Scene’

```
>>> bpy.data.materials['Material'].shadows
```

```
>>> bpy.data.materials['Material'].shadows = False
```

bpy.ops

The tool/action system in Bforartists 2.5 is built around the concept of operators. These operators can be called directly from console or can be executed by click of a button or packaged in a python script. Very powerful they are..

For a list of various operator categories, click here

Lets create a set of five Cubes in the 3D Viewport. First, delete the existing Cube object by selecting it and pressing X

Try it out!

The following commands are used to specify that the objects are created in layer 1. So first we define an array variable for later reference:

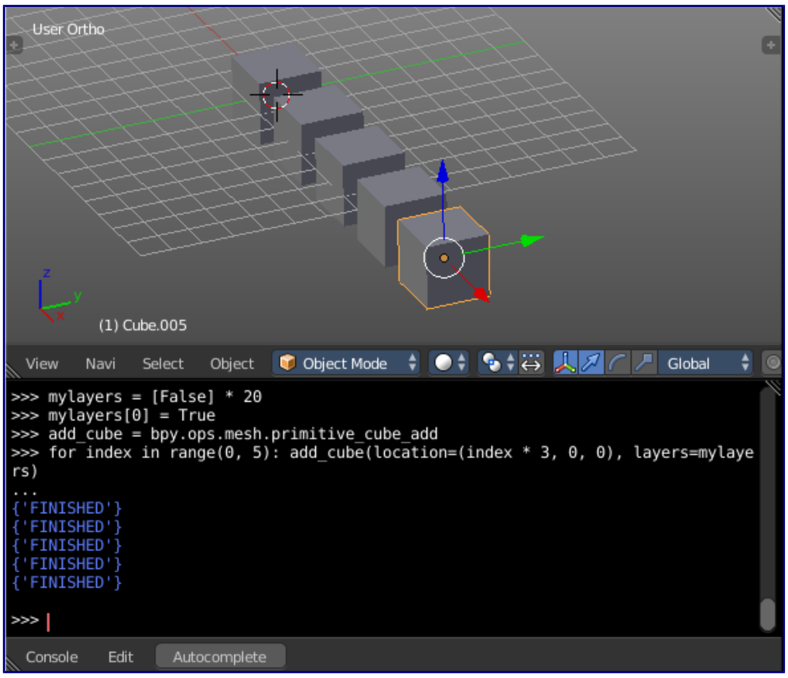
```
>>> mylayers = [False] * 20
>>> mylayers[0] = True
```

We create a reference to the operator that is used for creating a cube mesh primitive

```
>>> add_cube = bpy.ops.mesh.primitive_cube_add
```

Now in a for loop, we create the five objects like this (In the screenshot above, I used another method) Press ENTER-KEY twice after entering the command at the shell prompt.

```
>>> for index in range(0, 5): add_cube(location=(index * 3, 0, 0), layers=mylayers)
```



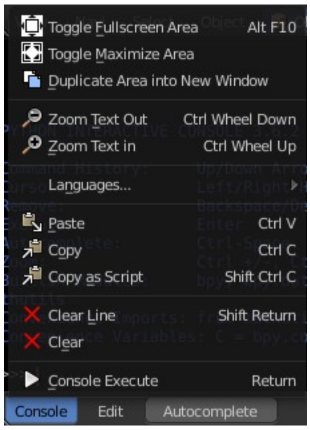
Python Console by tools

Python Console

The Python console is a quick way to execute commands, with access to the entire Python API, command history and auto-complete. It's a research tool for addon- and script developers. But also a place to quickly execute single operators or to try out some simple code.

Console Menu

The Console menu provides some console editor window specific functionality.

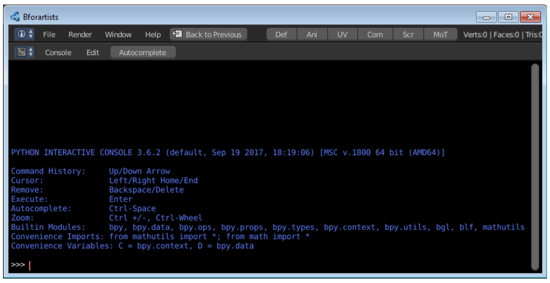


Toggle Full screen Area

Displays the editor maximized without menus.

To return from the full screen view press hotkey Alt F10, or use the little button that appears up right when you move the mouse in this corner.

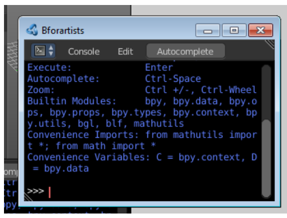
Toggle Maximize Area



Displays the editor maximized with menus.

To return to previous view press hotkey Ctrl Up Arrow, or reuse the menu item in the View menu.

Duplicate Area into new Window



Duplicate Area into New Window makes the selected editor window floating. You can then drag it around at the monitor.

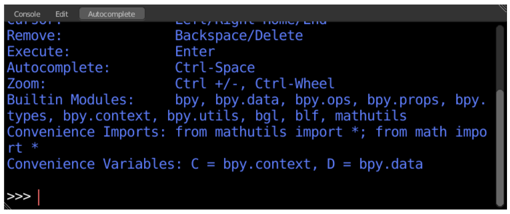
A separated window cannot be merged into the main window again. You have to close it when not longer needed.

Zoom Text Out

Zooms out the text in the console window.

Zoom Text In

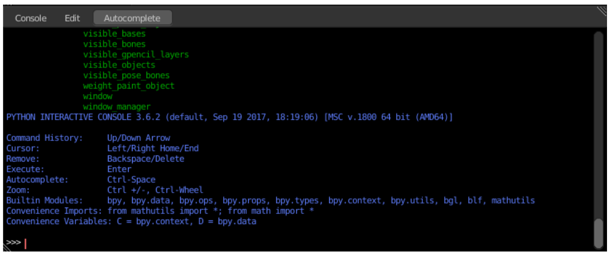
Zooms in the text in the console window.



Languages

Languages is a sub menu where you can choose the language.

This menu looks pretty uselesss, since there is just one language available. But it has its useage. With a click at the Python button you can restart the console when you have lost yourself in the deeps of the api.



Paste

Pastes copied content

Copy

Copies selected content.

Copy as Script

Copies the whole content of the console as a script that can be pasted into the Text editor.

Clear Line

Clears the selected line(s)

Clear

Clears all lines. The blue help text remains.

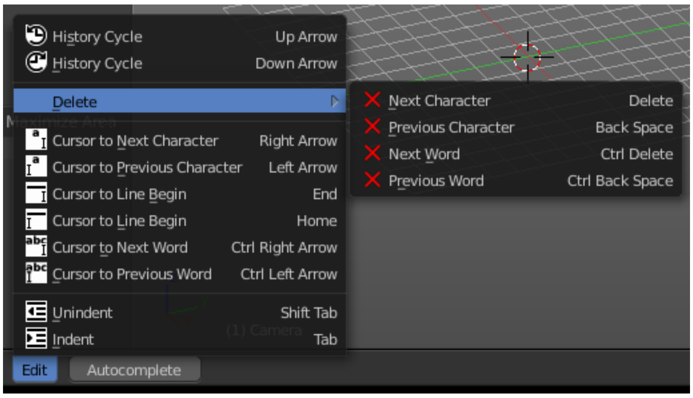
Console Execute

The expressions in the python console are not read only. You can execute them like you would do from a script.

This button executes a selected command.

Edit Menu

The Edit menu provides you with text specific functionality. Its content should be used by hotkeys. The menu is more to show that this functionality exists.



History Cycle

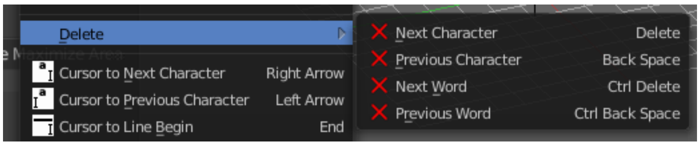
Cycles through the history. Up arrow cycles forwards through the history.

Down arrow cycles backwards through the history.

What does this mean? When you write some text, then add something more, delete something, then all this steps are entries in the history. And with History cycle you can access this steps.

Delete

Delete is a sub menu with several delete methods.



Next character

Deletes the character beyond the caret.

Previous Character

Deletes the character before the caret.

Next Word

Deletes the word beyond the caret.

Previous Word

Deletes the word before the caret.

Cursor to Next character

Sets the caret in front of the next character.

Cursor to Previous Character

Sets the caret in front of the previous character.

Cursor to Line End

Sets the caret to line end.

Cursor to Line Begin

Sets the caret to line begin.

Cursor to Next word

Sets the caret in front of the next word.

Cursor to Previous word

Sets the caret in front of the previous word.

Unindent

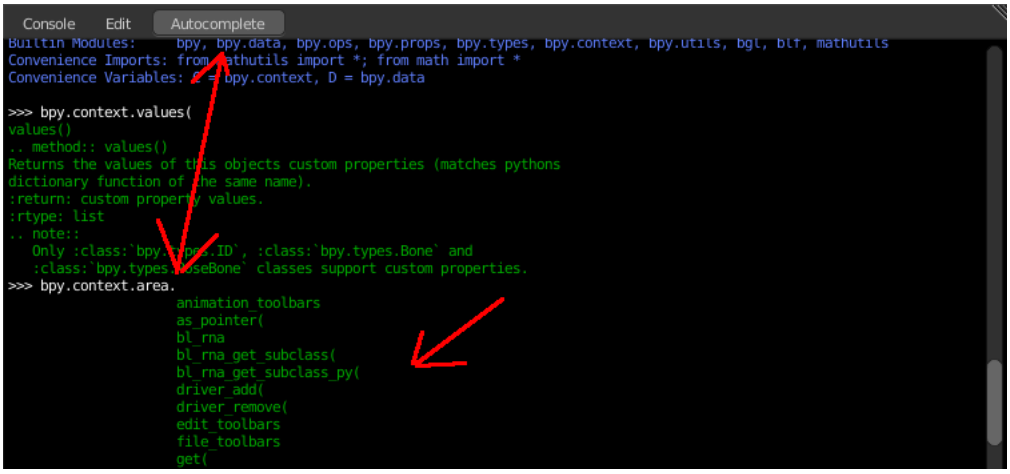
Removes indention of the selected text.

Indent

Indents the selected text.

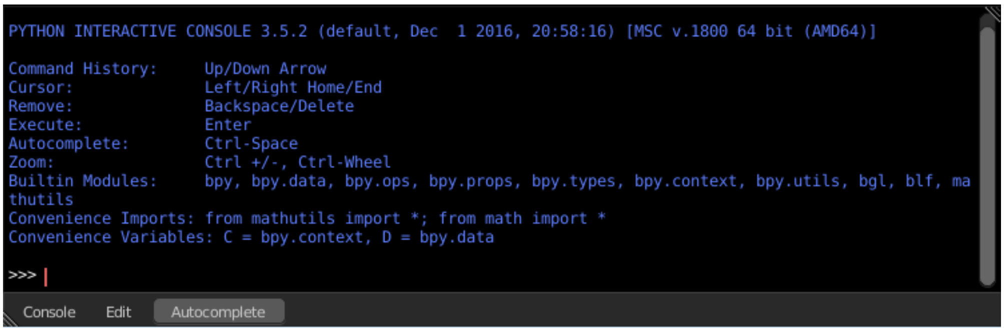
Autocomplete

Autocomplete is a functionality to autocomplete what you have written in the console. It lists for example all available bpy operators when you type in bpy.context.area. , and then hit the Autocomplete button. That way you can go through the whole bpy hierarchy down to what you need for your code, starting with bpy. , and having a look at what is available.



Usage

Accessing Built-in Python Console



From the screen shot above, you will notice that by clicking at the Autocomplete button you can enable Auto-complete feature.

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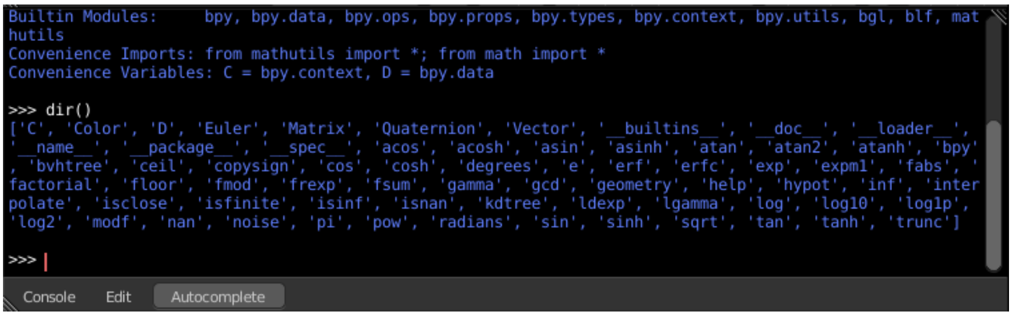
First look at the Console Environment

To check what is loaded into the interpreter environment, type dir() at the prompt and execute it.



Following is a quick overview of the output

C

Quick access to `bpy.context`

D

Quick access to `bpy.data`

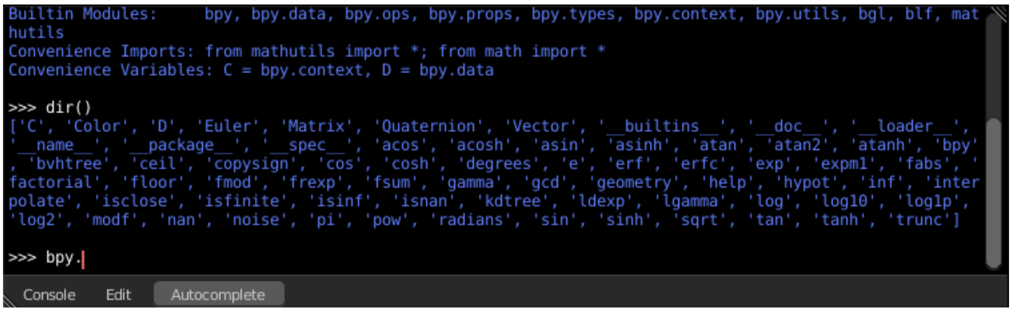
bpy

Top level Bforartists Python API module.

The rest of the commands are of various content. Most of them are mathematical expressions.

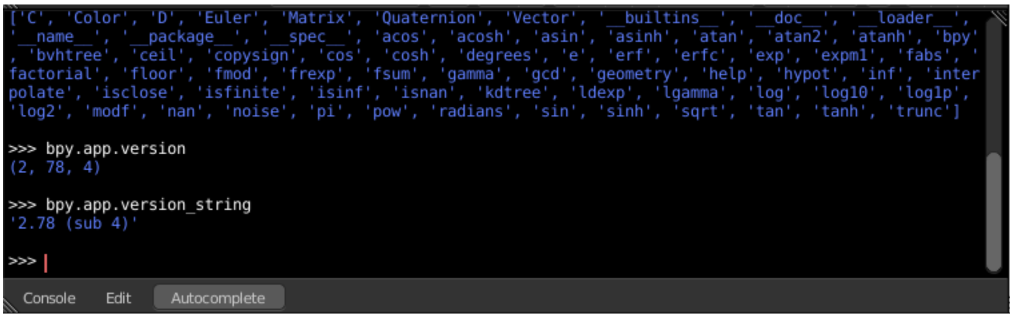
Auto Completion at work

Now, type bpy. and then press the Autocomplete button, and you will see the Console auto-complete feature in action.



You will notice that a list of sub-modules inside of bpy appear. These modules encapsulate all that we can do with Bforartists Python API and are very powerful tools.

Lets list all the contents of bpy.app module.



Notice the green output above the prompt where you enabled auto-completion. What you see is the result of auto completion listing. In the above listing all are module attribute names, but if you see any name end with '(', then that is a function.

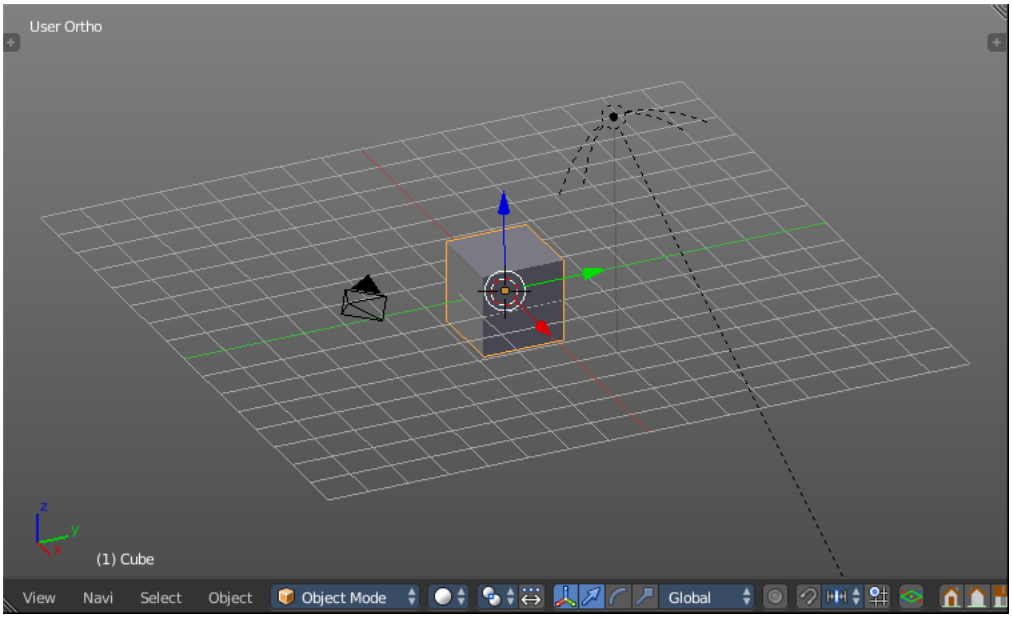
We will make use of this a lot to help our learning the API faster. Now that you got a hang of this, lets proceed to investigate some of modules in bpy.

Before tinkering with the modules..

If you look at the 3D Viewport in the default Bforartists scene, you will notice some objects. We have added a cube here too.

- All objects exist in a context and there can be various modes under which they are operated upon.
- At any instance, only one object is active and there can be more than one selected objects.
- All objects are data in the Bforartists file.
- There are operators/functions that create and modify these objects.

For all the scenarios listed above (not all were listed, mind you..) the bpy module provides functionality to access and modify data.

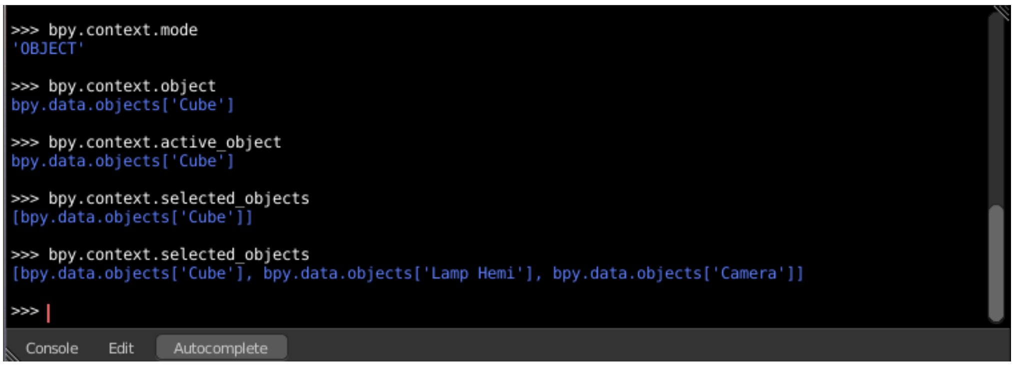


Examples

Note

For the commands below to show the proper output, make sure you have selected object(s) in the 3D view.

bpy.context



Try it out!

bpy.context.mode

Will print the current 3D View mode (Object, Edit, Sculpt etc.,)

bpy.context.object or bpy.context.active_object

Will give access to the active object in the 3D View

```
>>> bpy.context.object.location.x = 1
```

Change x location to a value of 1

```
>>> bpy.context.object.location.x += 0.5
```

Move object from previous x location by 0.5 unit

```
>>> bpy.context.object.location = (1, 2, 3)
```

Changes x, y, z location

```
>>> bpy.context.object.location.xyz = (1, 2, 3)
```

Same as above

```
>>> type(bpy.context.object.location)
```

Data type of objects location

```
>>> dir(bpy.context.object.location)
```

Now that is a lot of data that you have access to

bpy.context.selected_objects
Will give access to a list of all selected objects.

```
>>> bpy.context.selected_objects
```

... then press `Ctrl-Spacebar`

```
>>> bpy.context.selected_objects[0]
```

Prints out name of first object in the list

```
>>> [object for object in bpy.context.selected_objects if object != bpy.context.object]
```

Complex one... But this prints a list of objects not including the active object

---

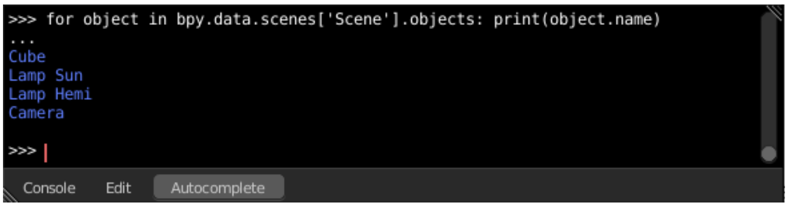
bpy.data

`bpy.data` has functions and attributes that give you access to all the data in the Bforartists file.

You can access following data in the current Bforartists file: objects, meshes, materials, textures, scenes, screens, sounds, scripts, ... etc.

That's a lot of data.

Try it out!



Exercise

```
>>> for object in bpy.data.scenes['Scene'].objects: print(object.name)
```

`Return` twice Prints the names of all objects belonging to the Bforartists scene with name “Scene”

```
>>> bpy.data.scenes['Scene'].objects.unlink(bpy.context.active_object)
```

Unlink the active object from the Bforartists scene named ‘Scene’

```
>>> bpy.data.materials['Material'].shadows
```

```
>>> bpy.data.materials['Material'].shadows = False
```

---

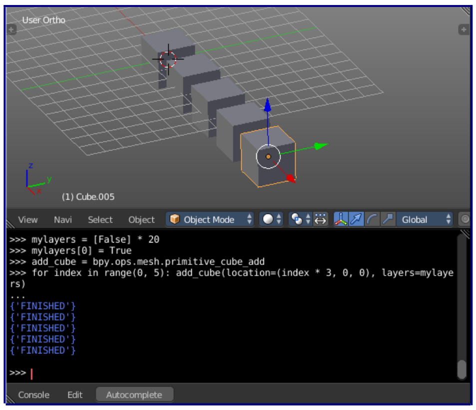
bpy.ops

The tool/action system in Bforartists is built around the concept of operators. These operators can be called directly from console or can be executed by click of a button or packaged in a python script. Very powerful they are..

For a list of various operator categories, click here

Lets create a set of five Cubes in the 3D Viewport. First, delete the existing Cube object by selecting it and pressing X

Try it out!



The following commands are used to specify that the objects are created in layer 1. So first we define an array variable for later reference:

```
>>> mylayers = [False] * 20
>>> mylayers[0] = True
```

We create a reference to the operator that is used for creating a cube mesh primitive

```
>>> add_cube = bpy.ops.mesh.primitive_cube_add
```

Now in a for loop, we create the five objects like this (In the screenshot above, I used another method) Press ENTER-KEY twice after entering the command at the shell prompt.

```
>>> for index in range(0, 5): add_cube(location=(index * 3, 0, 0), layers=mylayers)
```

User Preferences

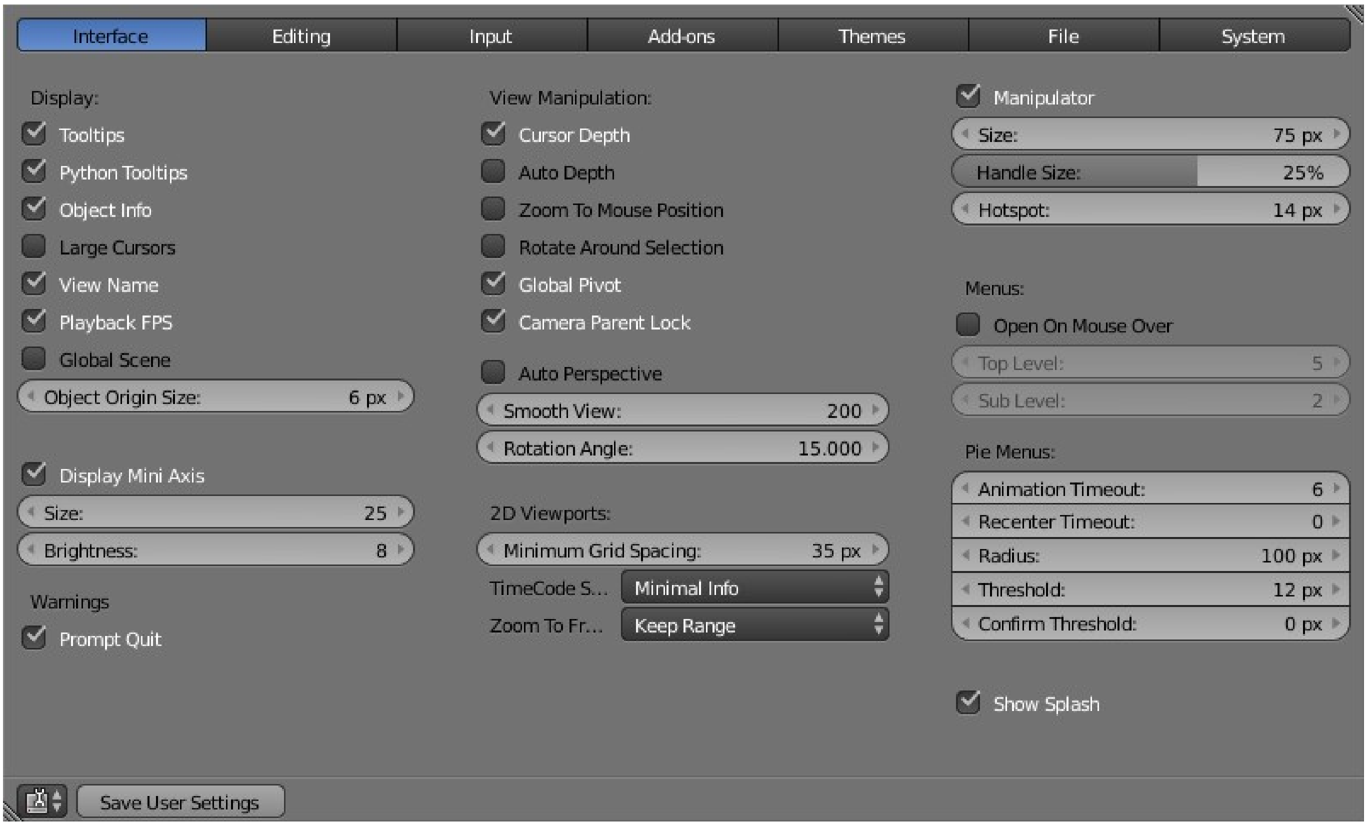
User Preferences

This chapter explains how to change Blender’s default configuration with the *User Preferences* editor.

The Blender *User Preferences* editor contains settings to control how Blender behaves.

Open User Preferences

To open the *User Preferences* editor go to File ‣ User Preferences.



Configure

Now that you have opened the User Preferences editor, you can configure Blender to your liking. At the top of the editor, the available options are grouped into seven tabs:

Interface
: Change how UI elements are displayed and how they react.

Editing

Control how several tools will interact with your input.

Input

Customize how Blender reacts to the mouse and keyboard as well as define your own keymap.

Add-ons

Manage Blender's *Add-ons*, allowing you to access features not built-in as well as install new features.

Themes

Customize interface appearance and colors.

File

Configure auto-save preferences and set default file paths for blend-files, rendered images, and more.

System

Set resolution, scripting console preferences, sound, graphics cards, and internationalization.

Save the new preferences

Once you have set your preferences, you will need to manually save them, otherwise the new configuration will be lost after a restart. Blender saves its preferences to *userpref.blend* in your user folder (see next section, "Load Factory Settings", for details).

In the *User Preferences* editor, click on the *Save User Settings* button in the bottom left. This will save all of the new preferences.

Load Factory Settings

Go to File ‣ Load Factory Settings then save the preferences via the *User Preferences* editor.

Hint

It can be valuable to make a backup of your preferences in the event that you lose your configuration.

See the directory layout section to see where your preferences are stored.

Startup File

Reference

Mode: All modes

Menu: File ‣ Save Startup File

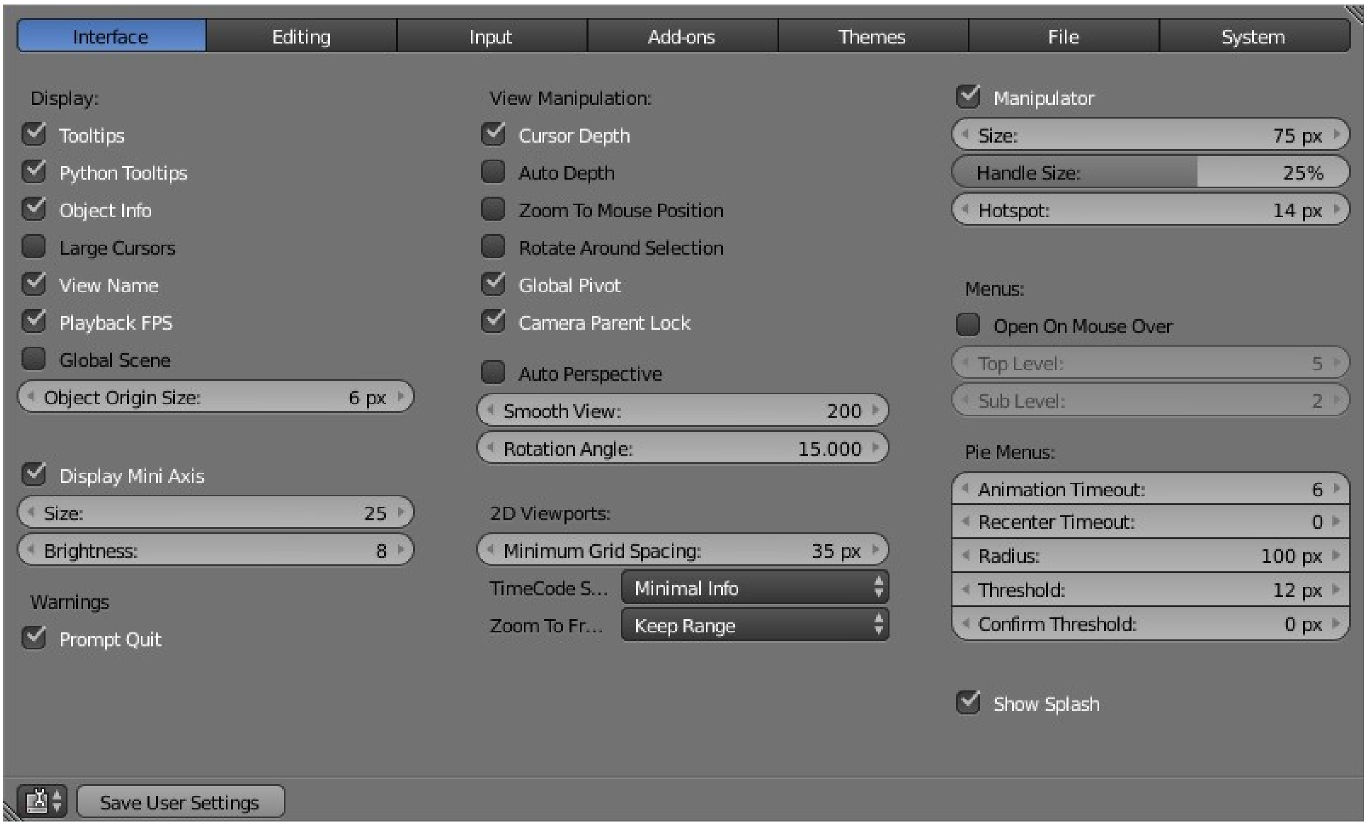
When you start Blender or start a new project with the menu entry File ‣ New, a new scene is created from the default scene included with Blender.

This default scene can instead be your own customized setup.

To change the default scene, make all of the desired changes to the current scene or current file and File ‣ Save Startup File.

Interface

Interface configuration lets you change how UI elements are displayed and how they react.



Display

Tooltips

When enabled, a tooltip will appear when your mouse pointer is over a control. This tip explains the function of what is under the pointer, gives the associated hotkey (if any) and the Python function that refers to it.

Python Tooltips

Displays a property's Python information below the tooltip.

Object Info

Display the active Object name and frame number at the bottom left of the 3D View.

Large Cursors

Use large mouse cursors when available.

View Name

Display the name and type of the current view in the top left corner of the 3D View. For example: *User Persp* or *Top Ortho*.

Playback FPS

Show the frames per second screen refresh rate while an animation is played back. It appears in the viewport corner, displaying red if the frame rate set cannot be reached.

Global Scene

Forces the current scene to be displayed in all screens (a project can consist of more than one scene).

Object Origin Size

Diameter of 3D Object centers in the view port (value in pixels from 4 to 10).

Display Mini Axis

Show the mini axis at the bottom left of the viewport.

Size

Size of the mini axis.

Brightness

Adjust brightness of the mini axis.

Warnings

Prompt Quit

When exiting Blender, a pop-up will ask you weather or not you really want to quit (currently only available on MS-Windows).

View Manipulation

Cursor Depth

Use the depth under the mouse when placing the cursor.

Auto Depth

Use the depth under the mouse to improve view pan, rotate, zoom functionality. Useful in combination with *Zoom To Mouse Position*.

Zoom to Mouse Position

When enabled, the mouse pointer position becomes the focus point of zooming instead of the 2D window center. Helpful to avoid panning if you are frequently zooming in and out.

Rotate Around Selection

The selected object becomes the rotation center of the viewport. When there is no selection the last selection will be used.

> **Hint**
>
> This may seem ideal behavior, however, it can become problematic with larger objects such as a terrain-mesh, where the center is not necessarily your point of interest.

Global Pivot

Lock the same rotation/scaling pivot in all 3D Views.

Camera Parent Lock

When the camera is locked to the view and in fly mode, transform the parent rather than the camera.

Auto Perspective

Automatically to perspective Top/Side/Front view after using User Orthographic. When disabled, Top/Side/Front views will retain Orthographic or Perspective view (whichever was active at the time of switching to that view).

Smooth View

Length of time the animation takes when changing the view with the numpad (Top/Side/Front/Camera...). Reduce to zero to remove the animation.

Rotation Angle

Rotation step size in degrees, when `Numpad4`, `Numpad6`, `Numpad8`, or `Numpad2` are used to rotate the 3D View.

2D Viewports

Minimum Grid Spacing

The minimum number of pixels between grid lines in a 2D (i.e. top orthographic) viewport.

TimeCode Style

Format of Time Codes displayed when not displaying timing in terms of frames. The format uses '+' as separator for sub-second frame numbers, with left and right truncation of the timecode as necessary.

Zoom To Frame Type

How zooming to frame focuses around current frame.

Keep Range:	Todo.
Seconds:	Todo.
Keyframes:	Todo.

Manipulator
Turns manipulators on and off.

Size
Diameter of the manipulator.

Handle Size
Size of manipulator handles, as a percentage of the manipulator radius (*size*/ 2).

Hotspot
Hotspot size (in pixels) for clicking the manipulator handles.

Menus

Open on Mouse Over
Select this to have the menu open by placing the mouse pointer over the entry instead of clicking on it.

Menu Open Delay
Time for the menu to open.

Top Level
Time delay in 1/10 second before a menu opens (*Open on Mouse Over* needs to be enabled).

Sub Level
Same as above for sub menus (for example: File ‣ Open Recent).

Pie Menus

Animation Timeout
Length of animation when opening Pie Menus.

Recenter Timeout
The window system tries to keep the pie menu within the window borders. Pie menus will use the initial mouse position as center for this amount of time, measured in 1/100ths of a second. This allows for fast dragged selections.

Radius
Size of the Pie Menu.

Threshold
Distance from center before a selection can be made.

Confirm Threshold
Distance threshold after which selection is made (zero disables).

Splash

Show Splash
Display the Splash Screen when starting Blender.

Editing

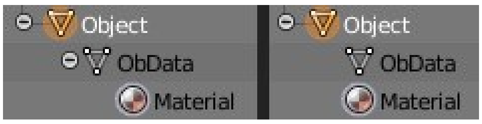
These preferences control how several tools will interact with your input.

Link Materials To

Example for a Mesh.

To understand this option properly, you need to understand how Blender works with Objects. Almost everything in Blender is organized in a hierarchy of data-blocks. A data-block can be thought of as containers for certain pieces of information. For example, the Object data-block contains information about the Object's location while the Object Data `ObData` data-block contains information about the mesh.

A material may be linked in two different ways:



A material linked to ObData (left) and Object (right).

ObData
: Any created material will be created as part of the ObData data-block.

Object
: Any created material will be created as part of the Object data-block.

New objects

Enter Edit Mode
: If selected, Edit Mode is automatically activated when you create a new object.

Align To

World
: New objects align with world coordinates.

View
: New object align with view coordinates.

Undo

Global Undo

This enables Blender to save actions done when you are **not** in *Edit Mode*. For example, duplicating Objects, changing panel settings or switching between modes.

Warning

While disabling this option does save memory, it stops the redo panel from functioning, also preventing tool options from being changed in some cases.

For typical usage, its best to keep this enabled.

Step
: Number of Undo steps available.

Memory Limit
: Maximum memory usage in Mb (0 is unlimited).

Grease Pencil

Grease Pencil permits you to draw in the 3D View with a pencil-like tool.

Manhattan Distance
: The minimum number of pixels the mouse has to move horizontally or vertically before the movement is recorded.

Euclidian Distance
: The minimum distance that mouse has to travel before movement is recorded.

Eraser Radius
: The size of the eraser used with the grease pencil.

Smooth Stroke
: Smooths the pencil stroke after it is finished.

Playback

Allow Negative Frame
: Time Cursor can be set to negative frames with mouse or keyboard. When using *Use Preview Range*, this also allows playback.

Keyframing

In many situations, animation is controlled by keyframes. The state of a value (e.g. location) is recorded in a keyframe and the animation between two keyframes is interpolated by Blender.

Visual Keying
: When an object is using constraints, the objects property value doesnt actually change. *Visual Keying* will add keyframes to the object property, with a value based on the visual transformation from the constraint.

Only Insert Needed
: This will only insert keyframes if the value of the propery is different.

Auto Keyframing
: Enables *Auto Keyframe* by default for new scenes.

Show Auto Keying Warning
: Displays a warning at the top right of the *3D View*, when moving objects, if *Auto Keyframe* is on.

Only Insert Available
: This will only add keyframes to channel F-Curves that already exist.

New F-Curve Defaults

Interpolation

This controls how the state between two keyframes is computed. Default interpolation for new keyframes is Bézier which provides smooth acceleration and de-acceleration whereas Linear or Constant is more abrupt.

XYZ to RGB

Color for X, Y or Z animation curves (location, scale or rotation) are the same as the color for the X, Y and Z axis.

Transform

Release confirm
: Dragging `LMB` on an object will move it. To confirm this (and other) transforms, a `LMB` is necessary by default. When this option is activated, the release of `LMB` acts as confirmation of the transform.

Sculpt Overlay Color

This color button allows the user to define a color to be used in the inner part of the brushes circle when in sculpt mode, and it is placed as an overlay to the brush, representing the focal point of the brush influence. The overlay color is visible only when the overlay visibility is selected (clicking at the *eye* to set its visibility), and the transparency of the overlay is controlled by the alpha slider located at the brush pop-up, located at the top of the tool shelf, when in sculpt mode.

Duplicate Data

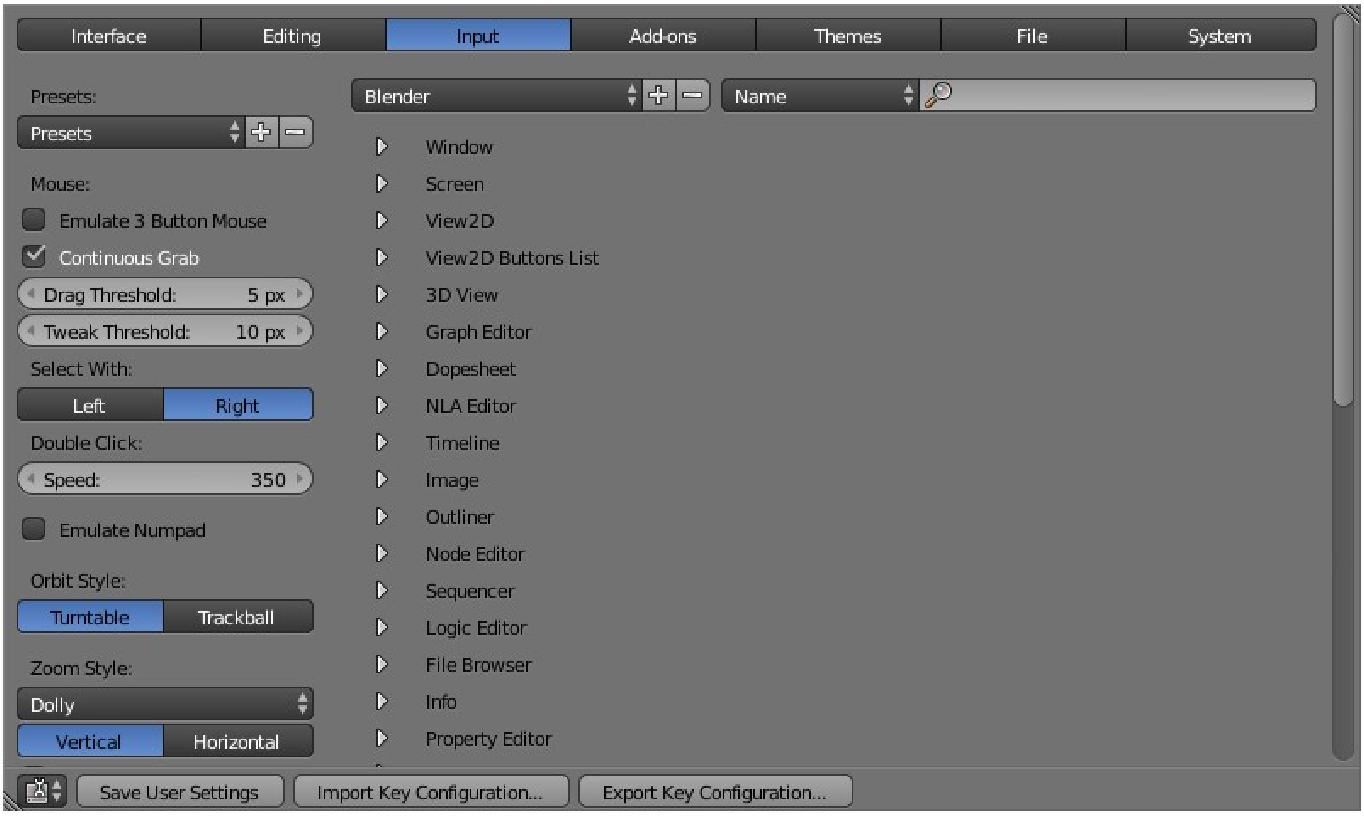
The ‘Duplicate Data’ check-boxes define what data is copied with a duplicated Object and what data remains linked. Any boxes that are checked will have their data copied along with the duplication of the Object. Any boxes that are not checked will instead have their data linked from the source Object that was duplicated.

For example, if you have Mesh checked, then a full copy of the mesh data is created with the new Object, and each mesh will behave independently of the duplicate. If you leave the mesh box unchecked then when you change the mesh of one object, the change will be mirrored in the duplicate Object.

The same rules apply to each of the check-boxes in the 'Duplicate Data' list.

Input

In the Input preferences, you can customize how Blender reacts to the mouse and keyboard as well as define your own keymap.



Presets

Blender lets you define multiple *Preset* input configurations. Instead of deleting the default keymap to create yours, you can just add new *Presets* for both the mouse and keyboard. Mouse options can be found on the left-hand side of the editor and keyboard options to the right in the above picture.

Adding and deleting presets

Before changing anything in the default configuration, click on the "plus" symbol shown in the picture to add a new *Preset*. Blender will ask you to name your new preset after which you can select the *Preset* from the list to edit it. If you want to delete your *Preset*, select it from the list and then click the "minus" symbol.

Selecting presets

You can change the preset you are using by doing one of the following:

- Selecting the configuration from the *Interaction* menu of the splash screen at startup or by selecting Help ‣ Splash Screen.
- Selecting the configuration from the *User Preferences* Input tab.

Hint

Note that either of the above options will only change the preset for the current file. If you select File ‣ New or File ‣ Open, the default preset will be re-loaded.

Setting presets to default

Once you have configured your mouse and keyboard *Presets*, you can make this the default configuration by:

- Opening the *User Preferences Input* editor and select your presets from the preset list or,
- Selecting your preset configuration from the splash screen.
- Saving your configuration using the *Save As Default* option from a *User Preferences* editor

Export/Import key configuration

In some cases, you may need to save your configuration in an external file (e.g. if you need to install a new system or share your keymap configuration with the community). Simply `LMB` *Export Key Configuration* on the *Input* tab header and a file browser will open so that you can choose where to store the configuration. The *Import Key Configuration* button installs a keymap configuration that is on your computer but not in Blender.

The exported keymap will only contain keymaps and categories that have been modified by the user. In addition, add-ons may register keymaps to their respective functions, however, these keymaps are not exported unless changed by the user. This exported file may be thought of as a *"keymap delta"* instead of a full keymap export.

Mouse

Emulate 3 Button Mouse

Blender can be configured to work with pointing devices which do not have a middle-mouse button (such as a two-button mouse, Apple single-button mouse, or laptop touch-pad). The functionality of the three mouse buttons will then be emulated with key/mouse button combinations as shown in the table below.

Shortcuts for supported mouse hardware¶

3-button Mouse	2-button Mouse	Apple Mouse
`LMB`	`LMB`	`LMB` (mouse button)
`MMB`	`Alt-LMB`	`Alt-LMB` (Option/Alt key +

3-button Mouse	2-button Mouse	Apple Mouse
		mouse button)
RMB	RMB	Cmd-LMB (Command/Apple key + mouse button)

Mouse/Keyboard combinations referenced in this manual can be expressed with the combinations shown in the table. For example:

- MMB drag becomes Alt-LMB drag.
- Shift-Alt-RMB becomes Shift-Alt-Cmd-LMB on a single-button mouse.

Continuous Grab

This feature is used to prevent the problem where an action such as grabbing or panning a view, is limited by your screen bounds.

This is done by warping the mouse within the view.

Bemerkung

Cursor warping is only supported by *relative* input devices (mouse, trackball, trackpad).

Graphics tablets, however, typically use *absolute* positioning, this feature is disabled when a tablet is being used

This is detected for each action, so the presence of a tablet will not disable Continuous Grab for mouse cursor input.

Drag Threshold
The number of pixels that a User Interface element has to be moved before it is recognized by Blender.

Select with
You can choose which button is used for selection (the other one is used to place the 3D cursor).

Double Click
The time for a double click (in ms).

Hint

The Mouse emulate option is only available if *Select With* is set to *Right*.

Numpad Emulation

The Numpad keys are used quite often in Blender and are not the same keys as the regular number keys. If you have a keyboard without a Numpad (e.g. on a laptop), you can tell Blender to treat the standard number keys as Numpad keys. Just check *Emulate Numpad*.

View Manipulation

Orbit Style

Select how Blender works when you rotate the 3D View by default when holding `MMB`.

Turntable

Rotates the view keeping the horizon horizontal.

This behaves like a potter's wheel or record player where you have two axes of rotation available, and the world seems to have a better definition of what is "Up" and "Down" in it.

The drawback to using the *Turntable* style is that you lose some flexibility when working with your objects. However, you gain the sense of "Up" and "Down" which can help if you are feeling disoriented.

Orbit

Is less restrictive, allowing any orientation.

Zoom Style

Choose your preferred style of zooming in and out with `Ctrl-MMB`

Scale

Scale zooming depends on where you first click in the view. To zoom out, hold `Ctrl-MMB` while dragging from the edge of the screen towards the center. To zoom in, hold `Ctrl-MMB` while dragging from the center of the screen towards the edge.

Continue

The *Continue* zooming option allows you to control the speed (and not the value) of zooming by moving away from the initial click point with `Ctrl-MMB`. Moving up from the initial click-point or to the right will zoom out, moving down or to the left will zoom in. The further away you move, the faster the zoom movement will be. The directions can be altered by the *Vertical* and *Horizontal* radio buttons and the *Invert Zoom Direction* option.

Dolly

Dolly zooming works similarly to *Continue* zooming except that zoom speed is constant.

Vertical

Moving up zooms out and moving down zooms in.

Horizontal

Moving left zooms in and moving right zooms out.

Invert Zoom Direction

Inverts the Zoom direction for *Dolly* and *Continue* zooming.

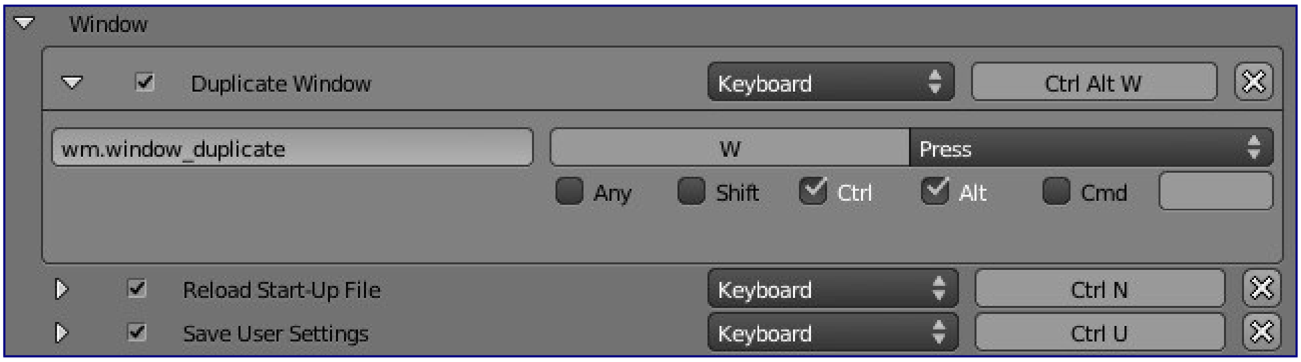
Invert Wheel Zoom Direction

Inverts the direction of the mouse wheel zoom.

NDOF device

Set the sensitivity of a 3D mouse.

Keymap Editor



The Keymap editor lets you change the default Hotkeys. You can change keymaps for each of Blender's editors.

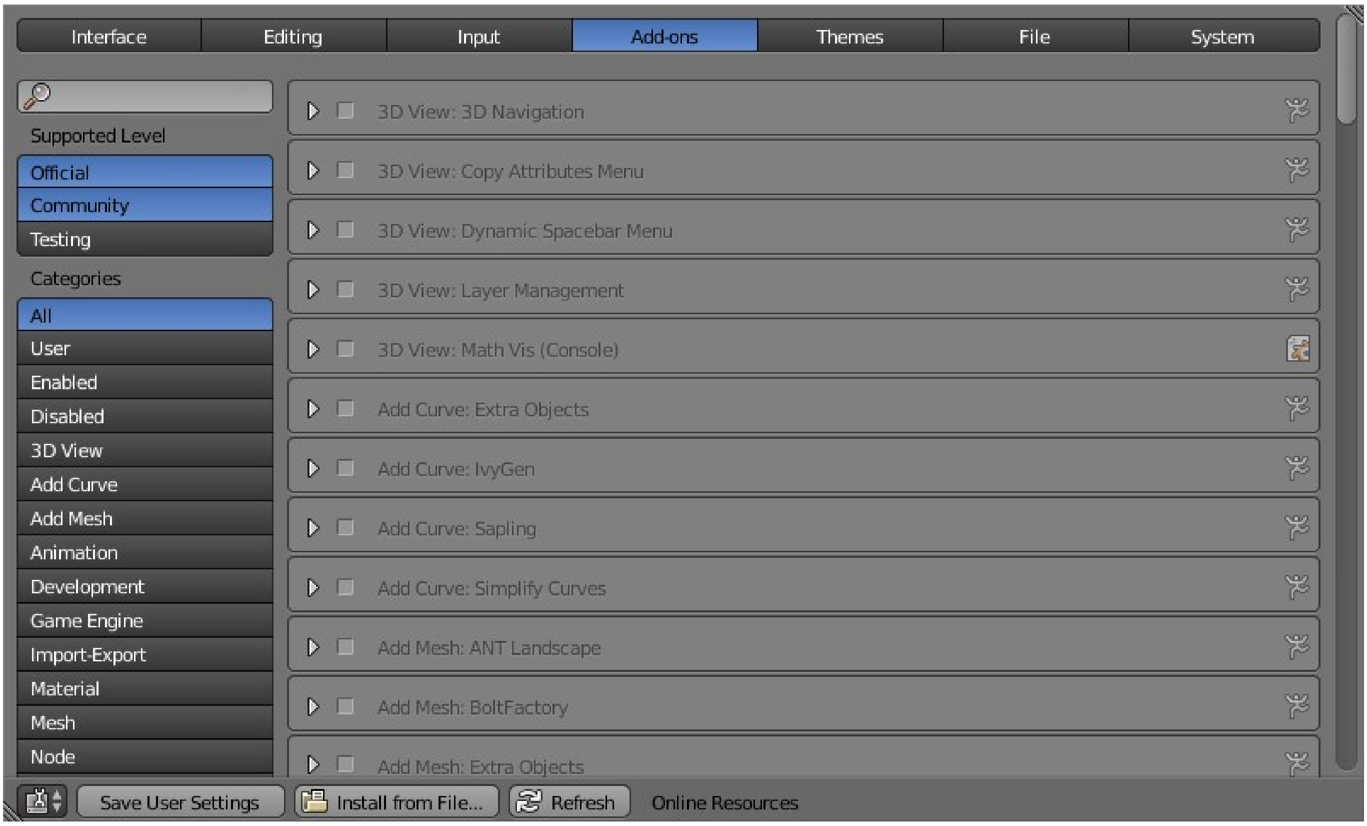
- Select the keymap you want to change and click on the white arrows to open up the keymap tree.
- Select which Input will control the function
    - Keyboard: Only hotkey or combo hotkey `E`, `Shift-E`.
    - Mouse: Left/middle/right click. Can be combined with `Alt`, `Shift`, `Ctrl`, `Cmd`.
    - Tweak: Click and drag. Can also be combined with the four previous keys.
    - Text input: Use this function by entering a text
    - Timer: Used to control actions based on a time period. e.g. By default, Animation Step uses Timer 0, Smooth view uses Timer 1.
- Change hotkeys as you want. Just click on the shortcut input and enter the new shortcut.

If you want to restore the default settings for a keymap, just click on the *Restore* button at the top right of this keymap.

Add-ons

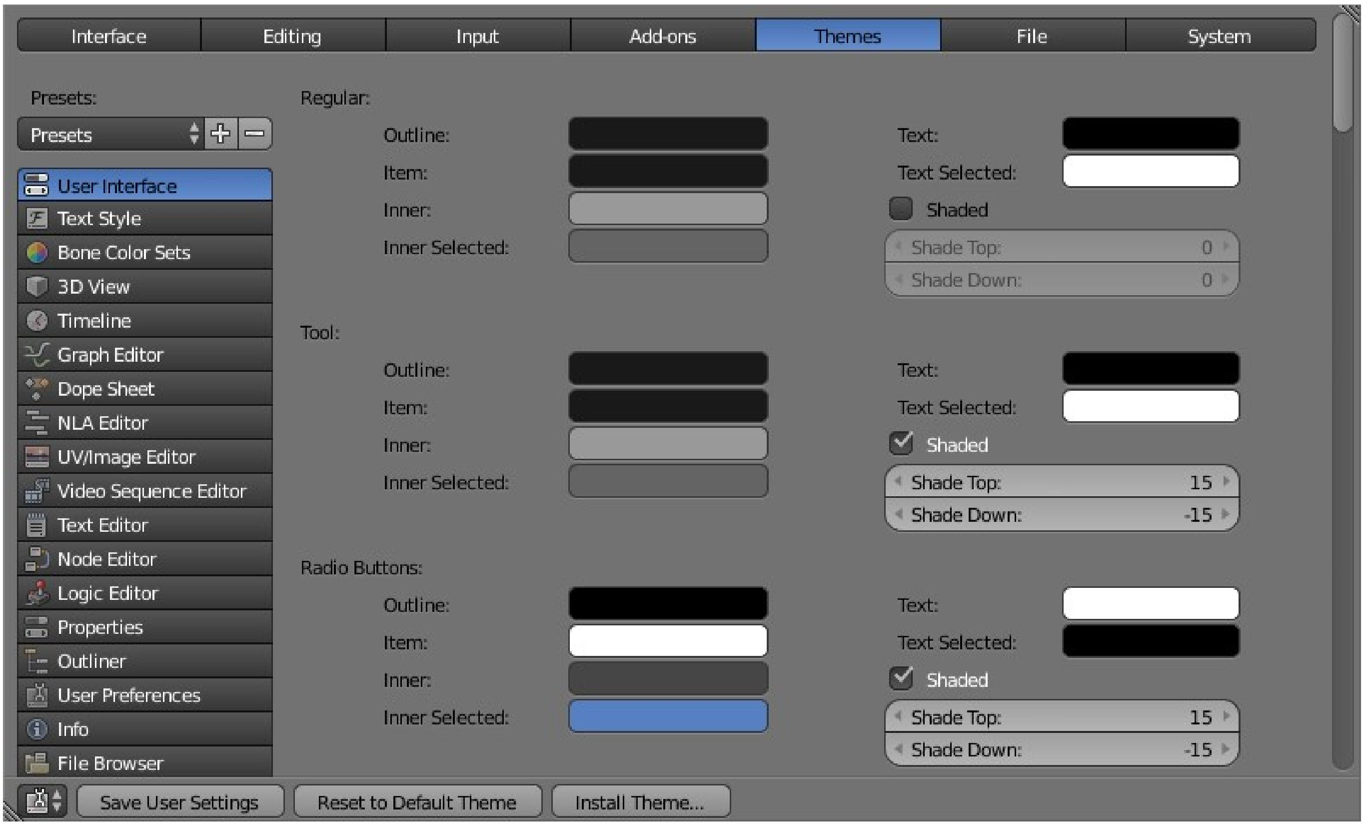
The Add-ons tab lets you manage secondary options which are not enabled in Blender by default. New features may be added with *Install Add-ons*. There will be a growing number of such Add-ons, generated by the Blender-community so look out for that one feature you were missing (or maybe simply create it yourself).

See the Add-ons Page for more on using Add-ons.



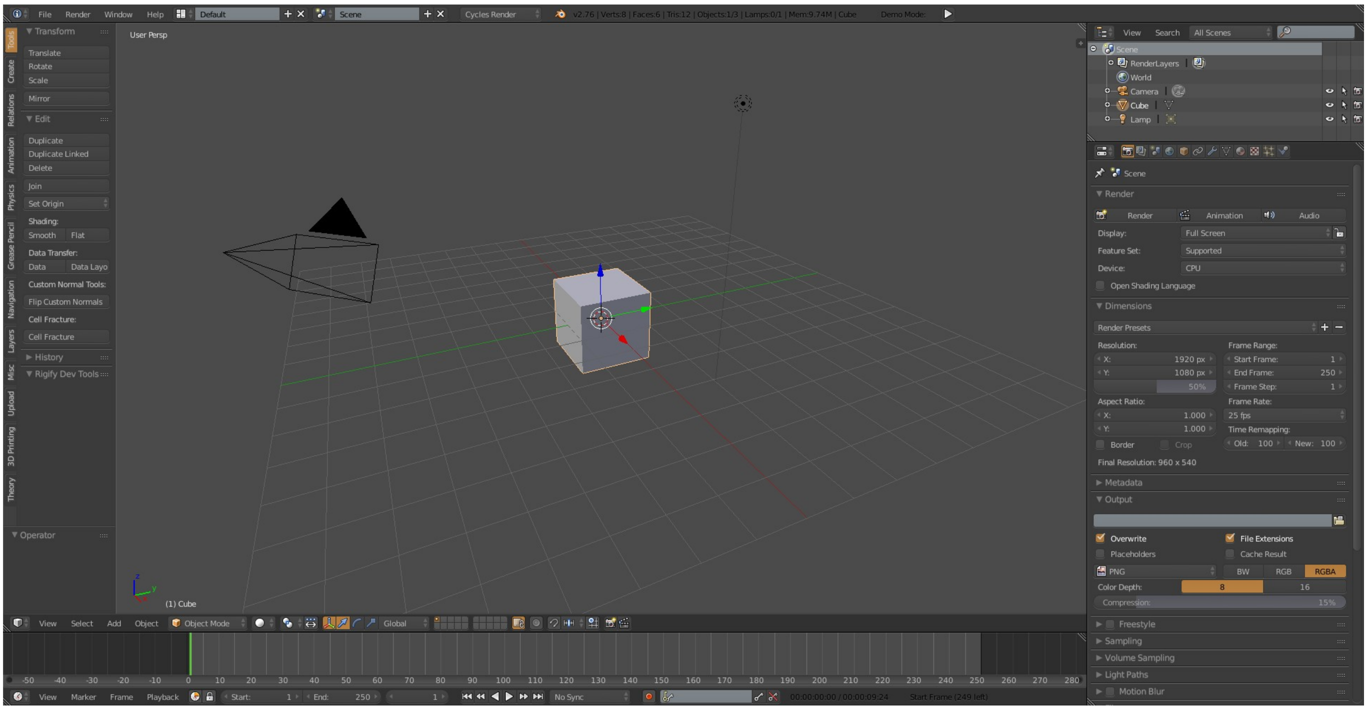
Themes

The *Themes* tab allows you to customize interface appearance and colors.



The colors for each editor can be set separately by simply select the editor you wish to change in the multi-choice list at the left, and adjust colors as required. Notice that changes appear in real-time on your screen. In addition, details such as the dot size in the *3D View* or the *Graph Editor* can also be changed.

Themes use Blender's preset system. To save a theme, click the **+** button next to the preset selection drop-down and enter a name. This will save the theme to an XML file in the `./scripts/presets/interface_theme/` subdirectory of one of the configuration directories.

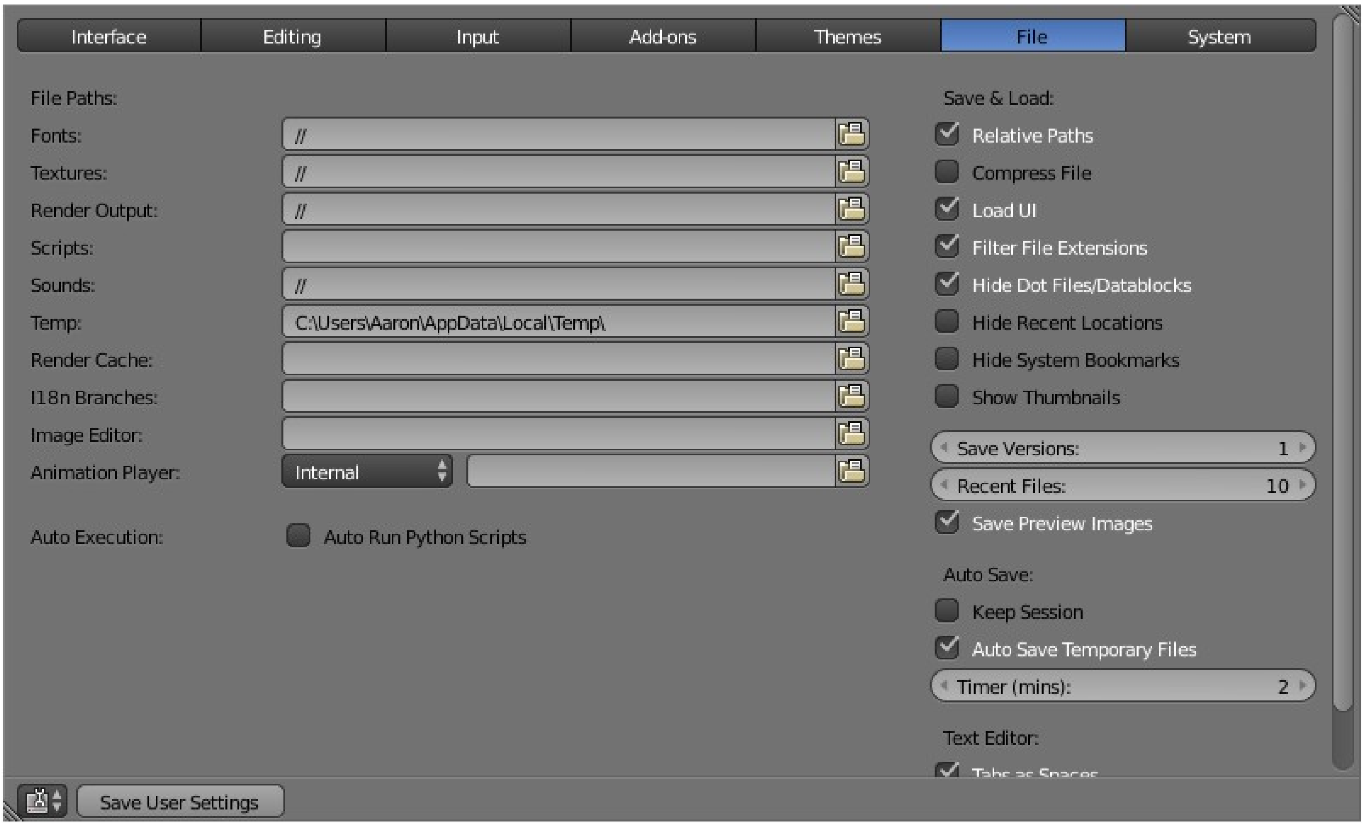


Blender comes bundled with a small selection of themes.

This is an example of the theme *Elsyiun*.

File Preferences

The *File Preferences* tab allows you to configure auto-save preferences and set default file paths for blend-files, rendered images, and more.



File Paths

Locations for various external files can be set for the following options:

Fonts
: Default location when searching for font files.

Textures
: Default location when searching for image textures.

Render Output
: Where rendered images/videos are saved.

Scripts
: An additional location to search for Python scripts. See Scripts Path below.

Sounds
: Default location when searching for sound files.

Temp
: The location where temporary files are stored.

Render Cache
: The location where cached render images are stored.

I18n Branches
: The path to the `/branches` directory of your local svn-translation copy, to allow translating from the UI.

Image Editor
: The path to an external program to use for image editing.

Animation Player
: The path to an external program to use for playback of rendered animations.

Hint

If these folders do not exist, they will *not* be created automatically.

Scripts Path

By default Blender looks in several directories (OS dependant) for scripts. By setting a user script path in the preferences an additional directory is looked in. This can be used to store certain scripts/templates/presets independently of the currently used Blender Version.

Inside the specified folder specific folders have to be created to tell Blender what to look for where. This folder structure has to mirror the structure of the scripts folder found in the installation directory of Blender:

- scripts
- add-ons
- modules
- presets
- camera
- cloth
- interface_theme
- operator
- render
- ...
- startup
- templates Not all of the folders have to be present.

Auto Execution

Python scripts (including driver expressions) are not executed by default for security reasons.

Auto Run Python Scripts
: You may choose to ignore these security issues and allow scripts to be executed automatically.

Excluded Paths
: Blend files in these folders will *not* automatically run Python scripts. This can be used to define where blend-files from untrusted sources are kept.

Save & Load

Relative Paths
: By default, external files use a relative path.

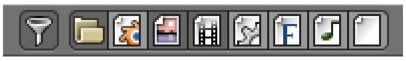
Compress File

Compress blend-file when saving.

The option to Compress files will compact your files whenever Blender is saving them. Dense meshes, large packed textures or lots of elements in your scene will result in a large blend being created.

This option may slow down Blender when you quit, or under normal operation when Blender is saving your backup files. Using this option traces processor time for file-size.

Load UI
Default setting is to load the Window layout (the Screens) of the saved file. This can be changed individually when loading a file from the *Open blend-file* panel of the File Browser.



File extension filter.

Filter File Extensions
By activating this, the file dialog in the File Browser will only show appropriate files (i.e. blend-files when loading a complete *Blender* setting). The selection of file types may be changed in the file dialog.

Hide Dot File/Data-blocks
Hide file which start with `.` on file browsers (in Linux and Apple systems, `.` files are hidden).

Hide Recent Locations
Hides the *Recent* panel of the File Browser which displays recently accessed folders.

Show Thumbnails
Displays a thumbnail of images and movies when using the File Browser.

Auto Save

Save Versions

Number of versions created for the same file (for backup).

This option tells Blender to keep the indicated number of saved versions of your file in your current working directory when you manually save a file. These files will have the extension: `.blend1`, `.blend2`, etc., with the number increasing to the number of versions you specify. Older files will be named with a higher number. e.g. With the default setting of 2, you will have three versions of your file: `*.blend` (your last save), `*.blend1` (your second last save) and `*.blend2` (your third last save).

Recent Files
Number of files displayed in File ‣ Open Recent.

Save Preview Images
Previews of images and materials in the File Browser are created on demand. To save these previews into your blend-file, enable this option (at the cost of increasing the size of your blend-file).

Auto Save Temporary File

Enable Auto Save (create a temporary file).

Checking this box tells Blender to *automatically* save a backup copy of your work-in-progress to the Temp directory (refer to the *File* tab in the *User Preferences* for its location).

The Auto Saved files are named using a random number and have a blend extension.

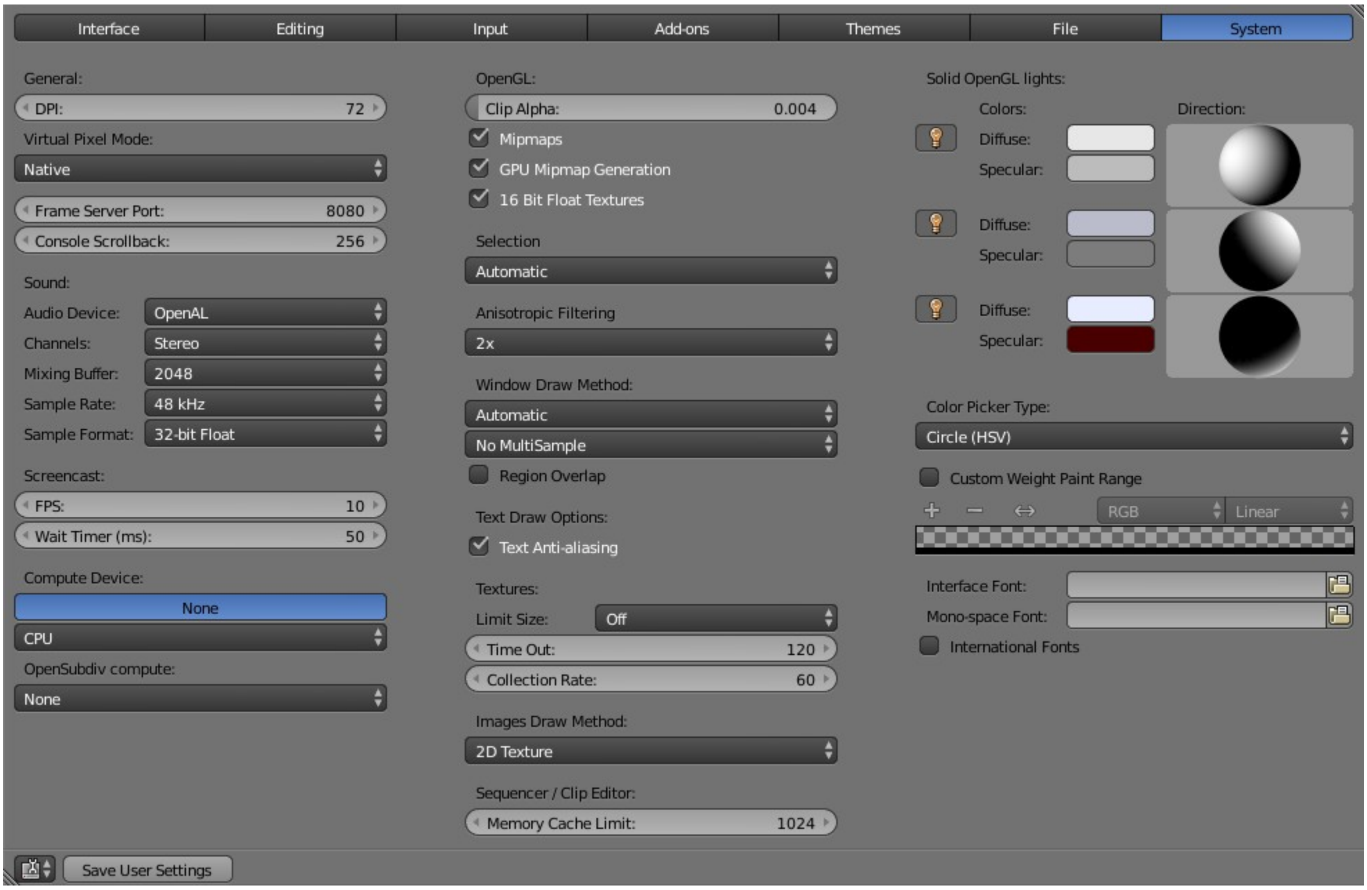
Timer

Time to wait between automatic saves.

This specifies the number of minutes between each Auto Save. The default value of the Blender installation is 5 (5 minutes). The minimum is 1, and the Maximum is 60 (Save at every one hour).

System Preferences

The *System* tab allows you to set resolution, scripting console preferences, sound, graphics cards, and internationalization.



General

DPI

Value of the screen resolution which controls the size of Blender's interface fonts and internal icons shown. Useful for taking screen shots for book printing and use of high resolution monitors. During typical usage, you may prefer to use zoom which is an available in many parts of Blender interface.

Virtual Pixel Mode

Allows you to select global scaling. While the DPI only scales the interface, this will scale line width, vertex-size. This is intended for hi-dpi monitors.

Native

The normal pixel size.

Double

Double of the native pixel size.

Hint
This is auto-detected on OSX.

Frame Server Port

TCP/IP port used in conjunction with the IP Address of the machine for frameserver rendering. Used when working with distributed rendering. Avoid changing this port value unless it is conflicting with already existing service ports used by your Operating System and/or softwares. Always consult your operating system documentation and services or consult your system administrator before changing this value.

Console Scrollback

The number of lines, buffered in memory of the console window. Useful for debugging purposes and command line rendering.

Sound

Audio Device

Set the audio output device or no audio support:

None

No Audio support (no audio output, audio strips can be loaded normally)

SDL

Uses Simple Direct Media Layer API from libsdl.org to render sounds directly to the sound device output. Very useful for sequencer strips editing.

OpenAL

Provides buffered sound rendering with 3D/spatial support. Used for 3D source support by *Speaker Objects* and the *Game Engine*.

Sound options

Specific to *SDL* or *OpenAL* enabled

Channels

Set the audio channel count. Available options are: *Stereo*, *4 Channels* , *5.1 Surround* , *7.1 Surround*

Mixing Buffer

Set the number of samples used by the audio mixing buffer. Available options are: *512* , *1024* , *2048*, *4096* , *8192*, *16384*, and *32768*

Sample Rate

Set the audio sample rate. Available options are: *44.1 Khz*, *48 Khs*, *96 Khz* and *192Khz*

Sample Format

Set the audio sample format. Available options are: *32 bit float*, *8 bit Unsigned*, *16 Bits Signed*, *24 Bits Signed*, *32 Bits Signed*, *32 Bits Float*, and *64 Bits Float*.

Screencast

These settings are used to control the frame-rate for recording a Screencast.

FPS

Frame-rate for screencast playback.

Wait Timer

Time in milliseconds between each frame recorded for screencast.

Compute Device

The Options here will set the compute device used by the Cycles render engine.

None
When set to *None* or the only option is *None*: your CPU will be used as a computing device for Cycles Render Engine

CUDA
If the system has a compatible Nvidia CUDA enabled graphics card you will be able to use it to render with the Cycles render engine.

OpenCL

If the system has a compatible OpenCL device, it will show up has an option for rendering cycles.

Note
that this currently has limited support, see: Cycles Features page for more information.

OpenSubdiv Compute

The Options here will set the compute device used by OpenSubdiv for the Subdivision Surface Modifier.

None
Disables any OpenSubdiv compute devices, makes sure legacy subsurf method is used. Use this option when OpenSubdiv causes any bugs or regressions.

CPU
Single threaded CPU implementation. It is mainly useful in cases when GPU compute is possible and threaded CPU option causes artifacts (it is unlikely to happen, but still possible).

OpenMP
Multi-threaded CPU implementation. Use it for maximum performance in cases when GPU compute is not available.

GLSL Transform Feedback
Uses GPU to perform calculations, has minimal requirements to video card and driver.

GLSL Compute
Uses GPU to perform calculations, supposed to be more efficient than *Transform Feedback* but also has higher requirements to video card and driver.

OpenGL

Clip Alpha
Clip alpha below this threshold in the 3D View. Note that the default is set to a low value to prevent issues on some GPU’s.

Mipmaps
Scale textures for 3D View using Mipmap filtering. This increases display quality, but uses more memory.

GPU MipMap Generation
Generate MipMaps on the GPU. Offloads the CPU Mimpap generation to the GPU.

16 Bit Float Textures
Enables the use of 16 Bit per component Texture Images (Floating point Images).

Selection

Selection method to use for selecting.

Automatic
Automatically choses the best setting depending on your OS, GPU, and drivers.

OpenGL Select

Legacy OpenGL selection method for legacy hardware.

OpenGL Occlusion Queries

More optimized OpenGL selection method. Use this method if you are using an OpenSubdiv Compute compute device.

Anisotropic Filtering

Sets the level of anisotropic filtering. This improves the quality of how textures are drawn at the cost of performance. Available Options are: *Off* (No Filtering), *2x*, *4x*, *8x*, and *16x*.

Window Draw Method

Window Draw Method

Specifies the Window Draw Method used to display Blender Window(s).

Automatic

Automatically set based on graphics card and driver.

Triple Buffer

Use a third buffer for minimal redraws at the cost of more memory. If you have a capable GPU, this is the best and faster method of redraw.

Overlap

Redraw all overlapping regions. Minimal memory usage, but more redraws. Recommended for some graphics cards and drivers combinations.

Overlap Flip

Redraw all overlapping regions. Minimal memory usage, but more redraws (for graphics drivers that do flipping). Recommended for some graphic cards and drivers combinations.

Full

Do a full redraw each time. Only use for reference, or when all else fails. Useful for certain cards with bad to no OpenGL acceleration at all.

Multi-Sampling

This enables FSAA for smoother drawing, at the expense of some performance.

Note

This is known to cause selection issues on some configurations

Region Overlap

This checkbox will enable Blender to draw regions overlapping the 3D View. It means that the *Object Tools* and *Transform Properties* regions, which are opened by using the shortcuts `T` and `N` will be drawn overlapping the 3D View editor.

If you have a capable graphics card and drivers with *Triple Buffer* support, clicking the checkbox will enable the overlapping regions to be drawn using the *Triple Buffer* method, which will also enable them to be drawn using Alpha, showing the 3D View contents trough the *Object Tools* and *Transform Properties* regions.

Text Draw Options

Enable interface text anti-aliasing. When disabled, texts are drawn using text straight render (Filling only absolute Pixels).

Textures

Limit Size

Limit the maximum resolution for pictures used in textured display to save memory. The limit options are specified in a square of pixels, (e.g.: the option 256 means a texture of 256×256 pixels) This is useful for game engineers, whereas the texture limit matches paging blocks of the textures in the target graphic card memory. Available Options are: *Off* (No limit), *128*, *256*, *512*, *1024*, *2048*, *4096*, and *8192*.

Time Out

Time since last access of a GL texture in seconds, after which it is freed. Set to 0 to keep textures allocated. Minimum: *0*, Maximum: *3600*.

Collection Rate

Number of seconds between each run of the GL texture garbage collector. Minimum: *0*, Maximum: *3600*.

Image Draw Method

Method to draw images as the following options are supported:

2D Texture

Uses CPU for display transform and draws images as a 2D texture.

GLSL

Fastest method using GLSL for display transform and draws images as a 2D texture.

Draw Pixels

Uses CPU for display transform and draws images as a 2D texture.

Sequencer/Clip Editor

Memory Cache Limit

Upper limit of the sequencer's memory cache (megabytes). For optimum clip editor and sequencer performance, high values are recommended.

Solid OpenGL lights

Solid OpenGL Lights are used to light the 3D View, mostly during *Solid view*. Lighting is constant and position "world" based. There are three virtual light sources, also called OpenGL auxiliary lamps, used to illuminate 3D View scenes, which will not display in renders.

The Lamp Icons allows the user to enable or disable OpenGL Lamps. At least one of the three auxiliary OpenGL Lamps must remain enabled for the 3D View. The lamps are equal, their difference is their positioning and colors. You can control the direction of the lamps, as well as their diffuse and specular colors. Available Options are:

Direction

Clicking with `LMB` in the sphere and dragging the mouse cursor let us the user change the direction of the lamp by rotating the sphere. The direction of the lamp will be the same as shown at the sphere surface.

Diffuse

This is the constant color of the lamp. Clicking on the color widget, opens the color picker pop-up and allows the user to change colors using the color picker.

Specular

This is the highlight color of the lamp Clicking on the color widget, opens the color picker pop-up and allows the user to change colors using the color picker.

Color Picker Type

Choose which type of color space you prefer. It will show when clicking `LMB` on any color field.

See the different color picker types at the Extended Controls page.

Custom Weight Paint Range

Mesh skin weighting is used to control how much a bone deforms the mesh of a character. To visualize and paint these weights, Blender uses a color ramp (from blue to green, and from yellow to red). Enabling the checkbox will enable an alternate map using a ramp starting with an empty range. Now you can create your custom map using the common color ramp options. For detailed information about how to use color ramps, see: to the Extended Controls page.

Internationalization

Blender supports a wide range of languages, enabling this check box will enable Blender to support International Fonts. International fonts can be loaded for the User Interface and used instead of Blender default bundled font.

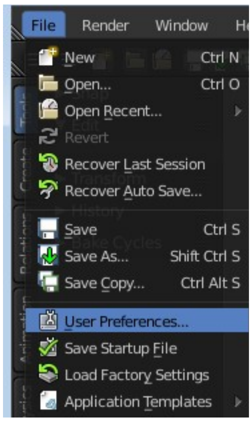
This will also enable options for translating the User Interface through a list of languages and Tips for Blender tools which appear whenever the user hovers a mouse over Blender tools.

Blender supports I18N for internationalization. For more Information on how to load International fonts, see: Editing Texts page.

User Preferences

Detailed table of content

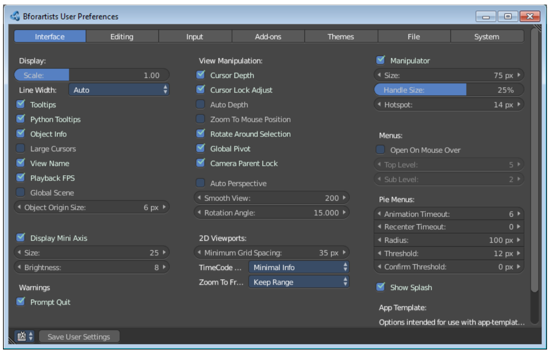
User Preferences



The user preferences is the place where you can tweak several settings to your needs. It can be opened in the File menu.

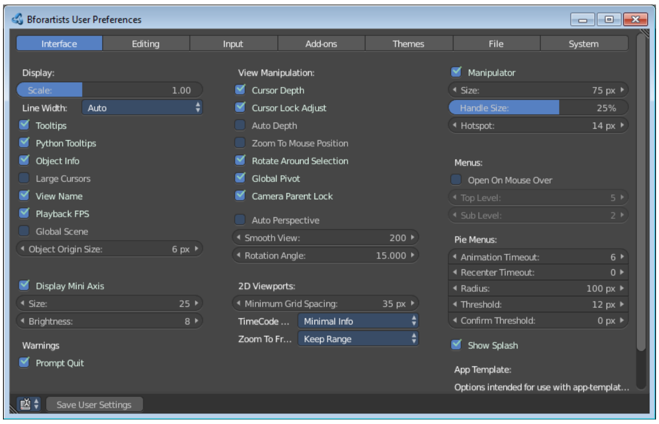
The User Preferences contains several tabs. And every tab contains several rows or panels with content. We will go through them one by one.

When you have changed something, and want that changes to be permanent, then you are required to save the user settings. See the Save User Settings button in the header.



Interface Tab

The Interface category contains settings to change how UI elements are displayed and how they react.



Header

Editor Type Menu

Here you can switch to another editor type.

Save User Settings

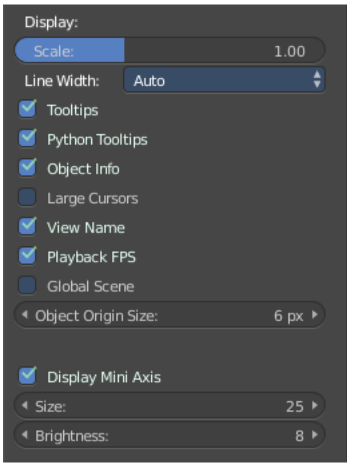
Save the user settings.

First Row

Ther first row contains some Display related settings.

Display

The Display section contains settings around the UI display.



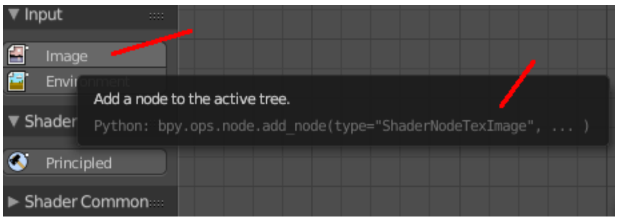
Scale Edit Box

At 4K displays the whole UI elements are usually ways too small. Here you can scale the whole UI size display by moving the slider to the needed value.

Tooltips

Display tooltips in the UI. With this feature unticked you won't see any tooltips anymore. It is not recommended to turn this feature off. The icon buttons needs the tooltips to display the tool name.

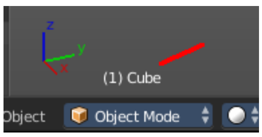
Python Tooltips



Every tooltip can also display the Python code tag for the tool. It may look like noise in the first moment. But can give you some further hints here and there. Some tooltips, like the Node editor buttons, doesn't have a proper tool description by design. Here the Python tooltip can tell you the function when you turn it into pure icon buttons.

It is not recommended to turn the Python tooltips off.

Object Info

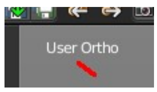


Display Object name and Frame number in the lower left edge of the 3D view

Large Cursors

Use large mouse cursors if available.

View Name



Display the name of the current view up left in the 3D view.

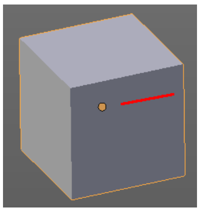
Playback FPS

Show the frames per second screen refresh rate while an animation is played back. It appears in the viewport corner, displaying red if the frame rate set cannot be reached. Amd replaces the View name while the animation is playing.

Global Scene

Forces the current scene to be displayed in all screens (a project can consist of more than one scene).

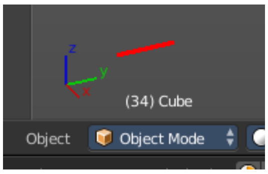
Object Origin Size



Here you can adjust the size of the Object origin, which is displayed as an orange dot at the place where the Object origin is.

The size can be set between 4 and 10 pixels.

Display Mini Axis



Display the mini axis widget down left

Size

Here you can define the size of the Mini Axis. The size can be set between 10 and 64 pixels

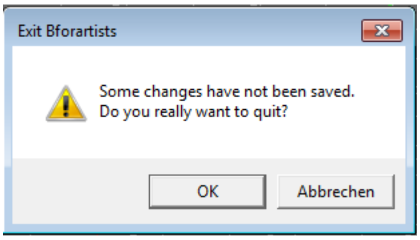
Brightness

Here you can set the transparency of the Mini axis. The range goes from 0 to 10. 10 is full opaque. 0 is around 50% semi transparent.

Warnings

This section has just one entry.

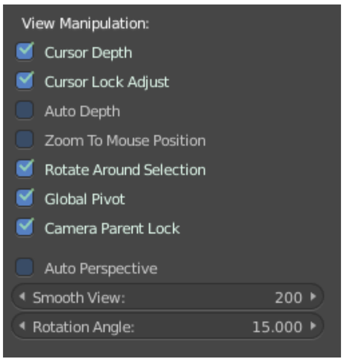
Prompt Quit



When you close Bforartists then you can display a do you really want to quit warning.

Second Row

View Manipulation



This section contains settings around things like mouse cursor and pivot.

Cursor Depth

Use the depth under the mouse when placing the 3D cursor. That way you can place the 3D cursor at the surface of an object.

Auto Depth

Use the depth under the mouse to improve view pan, rotate, zoom functionality.

Zoom to Mouse Position

When enabled, the mouse pointer position becomes the focus point of zooming instead of the 2D window center.

Rotate Around Selection

The selected object becomes the rotation center of the viewport. When there is no selection the point of the last selection will be used.

Hint
This may seem ideal behavior, however, it can become problematic with larger objects such as a terrain-mesh, where the center is not necessarily your point of interest.

Global Pivot

Lock the same rotation/scaling pivot in all 3D Views.

Camera Parent Lock

When the camera is locked to the view and in fly mode, transform the parent rather than the camera.

Auto Perspective

With Auto perspective off when you switch to one of the side views the chosen orthographic or perspectivic view is kept. Means when you have the distorted perspectivic view, and switch to top view, then your mesh will be perspectivic distorted here too.

With Auto Perspective the view in the side views will be orthographic, and not perspectivic, no matter what View Persp/Ortho is chosen.

Smooth View

The switch to change to another view is animated. Here you can adjust the length of time the animation takes when changing the view with the numpad (Top/Side/Front/Camera...). A value of zero will remove the animation, and immediately switch to the chosen view.

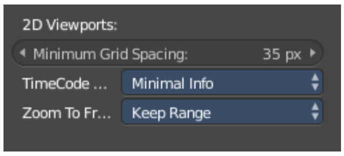
Rotation Angle

Rotation step size in degrees, when `Numpad4`, `Numpad6`, `Numpad8`, or `Numpad2` are used to rotate the 3D

View.

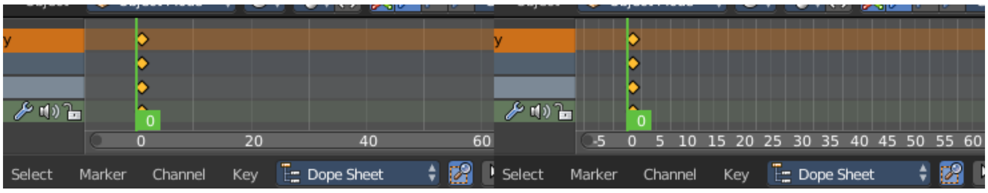
2D Viewports

Settings for 2D viewports like Timeline, Dopesheet, Graph or NLE Editor.



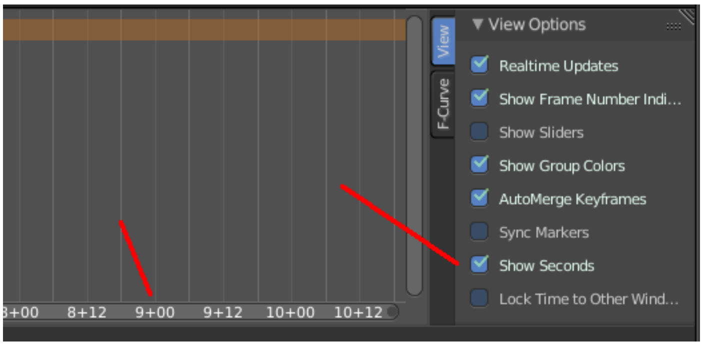
Minimum Grid Spacing

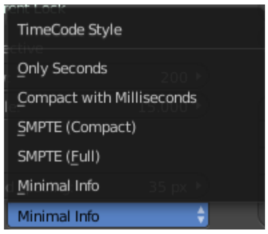
Here you can adjust the minimum number of pixels between grid lines in a 2D viewport. This affects for example Timeline, Dopesheet, Graph or NLE Editor.



TimeCode Style

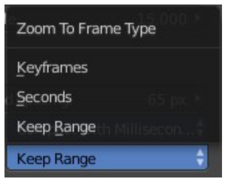
In Timeline, Dopesheet, Graph and NLE editor you can either display the keyframe number or the time in the timeline. Here you can define how the time gets displayed when you have chosen to display time.





Zoom To Frame Type

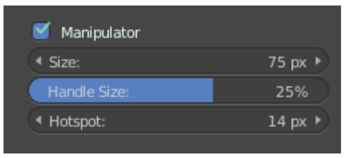
Timeline, Dopesheet, Graph and NLE. Here you can define how zooming to frame focuses around current frame.



Third Row

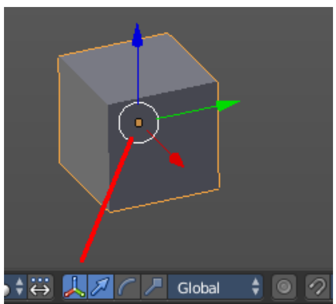
Manipulator

Turns the 3D widget on and off. Note that you can still turn the 3D widget on and off in the 3D view. So this checkbox is a bit useless.



Size

Here you can change the size of the 3D widget.



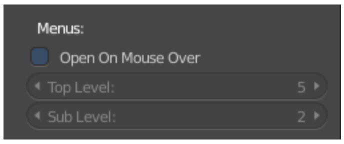
Handle Size

Here you can change the handle size of the 3D widget. The area that you can grab.

Hotspot

Here you can change the hotspot size of the 3D widget. The center of the widget.

Menus



Menus section contains some menu relatet settings.

Open on Mouse Over

With this ticked you don't need to click at a menu item to open it.

Top Level

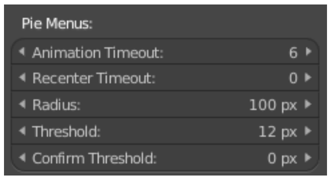
Time delay in 1/10 second before a menu opens (*Open on Mouse Over* needs to be enabled).

Sub Level

Same as above for sub menus (for example: File ‣ Open Recent).

Pie Menus

Bforartists has some pie menus onboard. Here you can adjust some settings for it.



Animation Timeout

Length of animation when opening Pie Menus.

Recenter Timeout

The window system tries to keep the pie menu within the window borders. Pie menus will use the initial mouse position as center for this amount of time, measured in 1/100ths of a second. This allows for fast dragged selections.

Radius

The size of the Pie Menu.

Threshold

The distance from center before a selection can be made.

Confirm Threshold

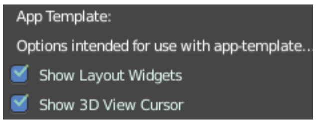
Distance threshold after which selection is made (zero disables).

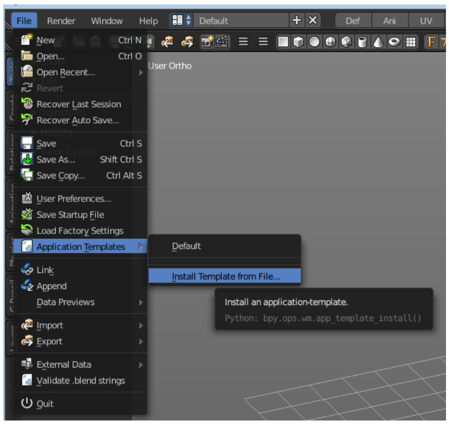
Show Splash

Display the Splash Screen when starting Bforartists.

App Template

App Templates section contains some settings for the Application template system. You need to create and use such a template to see the needed effect.





Show Layout Widgets

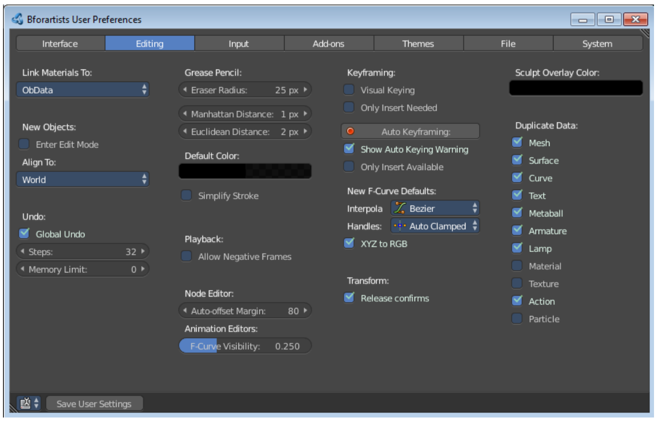
Show Screen Layout Editing UI.

Show 3D cursor

Show the 3D View Cursor.

Editing

These preferences control how several tools will interact with your input.



Header

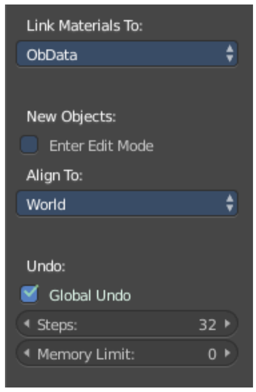
Editor Type Menu

Here you can switch to another editor type.

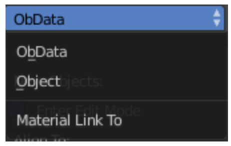
Save User Settings

Save the user settings.

First row



Link Materials To



Here you can define how materials will be linked to its objects. Almost everything in Bforartists is organized in a hierarchy of data-blocks. A data-block can be thought of as containers for certain pieces of information. For example, the Object data-block contains information about the Object's location while the Object Data `ObData` data-block contains information about the mesh.

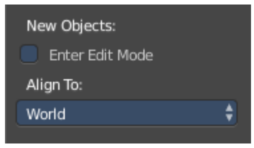
ObData

Any created material will be created as part of the ObData data-block.

Object

Any created material will be created as part of the Object data-block.

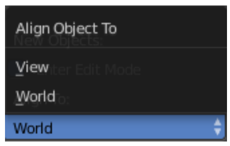
New objects



Enter Edit Mode

If selected, Edit Mode is automatically activated when you create a new object.

Align To



World

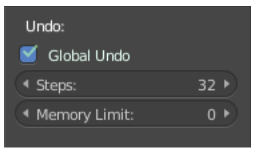
New objects align with world coordinates.

View

New object align with view coordinates.

Undo

Global Undo



Bforartists Undo system is split in several subparts. Global undo stores the undo step outside of Edit mode.For example for duplicating Objects, changing panel settings or switching between modes.

Warning

It is not recomended to turn it off! Disabling this option does save memory. But it stops the redo panel from functioning, also preventing tool options from being changed in some cases.

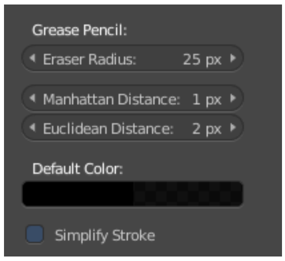
Steps

Number of Undo steps available.

Memory Limit

Maximum memory usage in Mb (0 is unlimited).

Grease Pencil



Here you can find some options for Grease Pencil

Eraser Radius

The size of the eraser used with the grease pencil. This setting can also be found in the tool shelf

Manhattan Distance

The minimum number of pixels the mouse has to move horizontally or vertically before the movement is recorded.

Euclidian Distance

The minimum distance that mouse has to travel before movement is recorded.

Default Color

The default color with which you draw a stroke.

Simplify Stroke

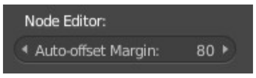
Simplifys the pencil stroke after it is finished.

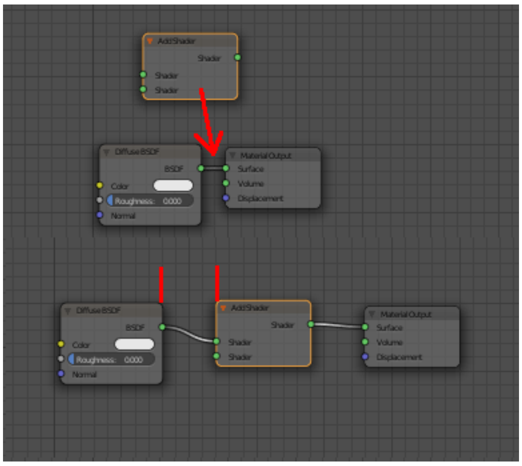
Playback

Allow Negative Frame

The time Cursor can be set to negative frames with mouse or keyboard. But usually it doesn't play it then. When using *Use Preview Range*, this also allows playback of frames in negative range.

Node Editor

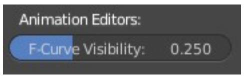




Auto Offset Margin

When you insert a new node between two existing connected nodes, then the two nodes gets pushed to left and right, with an offset. Here you can adjust this offset.

Animation Editors



F-Curve Visibility

The amount with which unselected FCurves in the Graph Editor are semitransparent.

Row Three

Keyframing

In many situations, animation is controlled by keyframes. The state of a value (e.g. location) is recorded in a keyframe and the animation between two keyframes is interpolated by Blender.

Visual Keying

When an object is using constraints, the objects property value doesnt actually change. *Visual Keying* will add keyframes to the object property, with a value based on the visual transformation from the constraint.

Only Insert Needed

This will only insert keyframes if the value of the propery is different.

Auto Keyframing

Enables *Auto Keyframe* by default for new scenes.

Show Auto Keying Warning

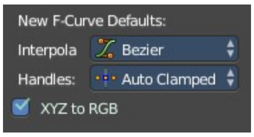
Displays a warning at the top right of the *3D View*, when moving objects, if *Auto Keyframe* is on.

Only Insert Available

This will only add keyframes to channel F-Curves that already exist.

New F-Curve Defaults

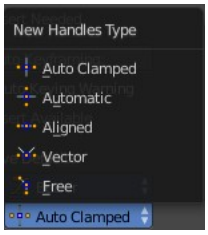
Interpolation



This controls how the state between two keyframes is computed. Default interpolation for new keyframes is Bézier which provides smooth acceleration and de-acceleration whereas Linear or Constant is more abrupt.

Handles

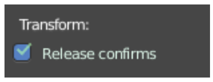
The default handle types for F-Curves.



XYZ to RGB

Color for X, Y or Z animation curves (location, scale or rotation) are the same as the color for the X, Y and Z axis.

Transform



Release confirm

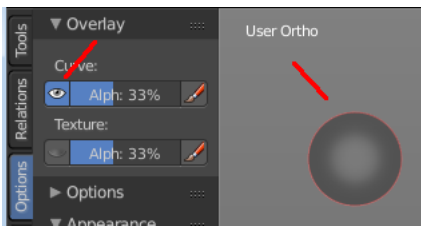
Dragging LMB on an object will move it. When you release the mouse, then the object "drops" from the mouse. Wiht this option unticked, a mouse click is necessary to drop the currently attached object.

Fourth Row

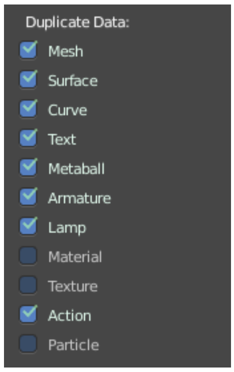
Sculpt Overlay Color

This color button allows the user to define a color to be used in the inner part of the brushes circle when in sculpt mode, and it is placed as an overlay to the brush, representing the focal point of the brush influence.

The overlay color is visible only when the overlay visibility is selected (clicking at the *eye* to set its visibility), and the transparency of the overlay is controlled by the alpha slider located at the brush pop-up, located at the top of the tool shelf, when in sculpt mode.

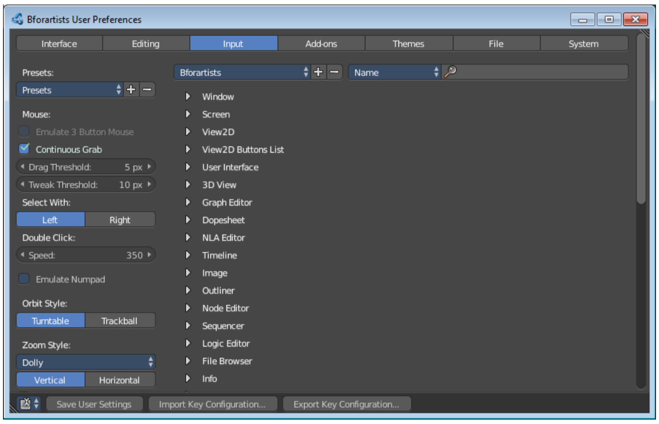


Duplicate Data



When you duplicate an object, then some of the containing data of it gets also duplicated. But not everything. Some data, like a material, remains linked with the original object . Here you can define what data gets duplicated for the new object too.

Input



Here you can customize how Blender reacts to mouse and keyboard, and change keymap entries.

In the left row you will find some general mouse related settings. Like with what mouse button to select, or the orbit style. The right row is the actual keymap. Here is all input defined. Not just tools. This also includes the mouse action to split windows for example.

Header

Editor Type Menu

Here you can switch to another editor type.

Save User Settings

Save the user settings.

Import Key Configuration

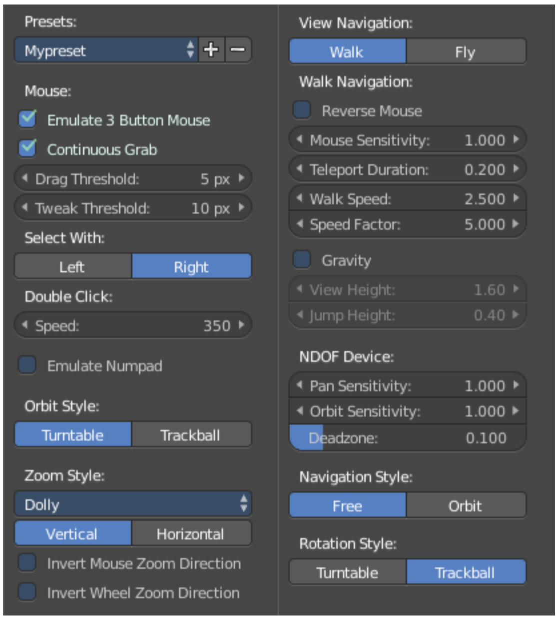
Import a key configuration python file into Bforartists.

Export Key Configuration

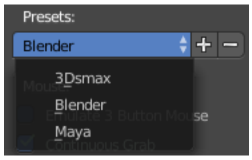
Export a key configuration python file from Bforartists.

Left row

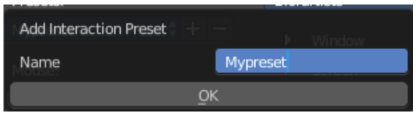
In the left row you can find some general mouse related settings.



Presets

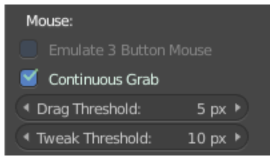


A dropdown box where you can choose some presets for the left row, the general mouse related settings. You can also ceate your own presets here by clicking at the + button, or delete a preset with the - button.



The created preset will be stored immediately by clicking at OK. You don't need to save the user preferences to store the new preset. But you need to save the user preferences to use this new preset.

Mouse



Emulate 3 Button Mouse

In the Windows world 3 button mouses are common. But Apple for example has a single mouse button. Bforartists can emulate a 3 button mouse. The third mouse button will then be emulated by a key combination.

3-button Mouse	2-button Mouse	Apple Mouse
`LMB`	`LMB`	`LMB` (mouse button)
`MMB`	`Alt-LMB`	`Alt-LMB` (Option/Alt key + mouse button)
`RMB`	`RMB`	`Cmd-LMB` (Command/Apple key + mouse button)

Mouse/Keyboard combinations referenced in this manual can be expressed with the combinations shown in the table. For example, `MMB` drag becomes `Alt-LMB` drag. `Shift-Alt-RMB` becomes `Shift-Alt-Cmd-LMB` on a single-button mouse.

Hint

The Mouse emulate option is only available if *Select With* is set to *Right*. It does not work with Left Click select.

Continuous Grab

When you work for example with a manipulator, then it can happen that you move your mouse out of the current editor. Normally the action that you want to perform then stops, since the mouse is not longer in the editor window where it belongs. Continuous grab fixes this problem by warping the mouse pointer within the current view.

Note

Cursor warping is only supported by *relative* input devices (mouse, trackball, trackpad).

Graphics tablets, however, typically use *absolute* positioning, this feature is disabled when a tablet is being used.

This is detected for each action, so the presence of a tablet will not disable Continuous Grab for mouse cursor input.

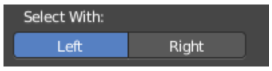
Drag Threshold

The number of pixels that a User Interface element has to be moved before it is recognized by Blender.

Tweak Threshold

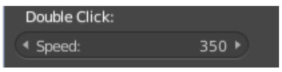
Number of pixels that you have to drag before a tweak event gets triggered.

Select with



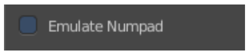
You can choose which button is used for selection (the other one is used to place the 3D cursor).

Double Click



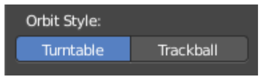
Here you can adjust the time after which two mouse clicks behind are recognized as a double click.

Emulate Numpad



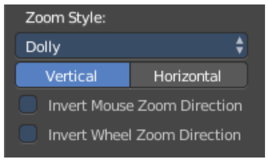
Laptops usually doesn't have Numpad keys. Here you can choose to use the number keys above the letters as numpad keys.

Orbit Style



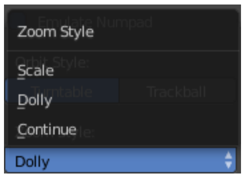
Here you can ajdust in what style you rotate the 3D View. Turntable and Trackball navigation reacts a bit different. Turntable navigation tries to hold the horizon line while rotation. Turntable rotation rotates also the horizon line.

Zoom Style



Zoom Style Dropdown Box

In the dropdown box you can adjust the zoom style.



Scale

Scale zooming depends on where you first click in the view.

Dolly

Dolly zooming works similarly to *Continue* zooming except that zoom speed is constant.

Continue

The *Continue* zooming option allows you to control the speed (and not the value) of zooming by moving away from the initial click point. Moving up from the initial click-point or to the right will zoom out, moving down or to the left will zoom in. The further away you move, the faster the zoom movement will be.

Vertical / Horizontal

With Vertical moving up zooms out and moving down zooms in. With Horizontal moving left zooms in and moving right zooms out.

Invert Mouse Zoom Direction

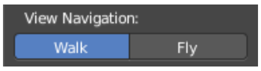
Inverts the Zoom direction for Dolly and Continue zooming.

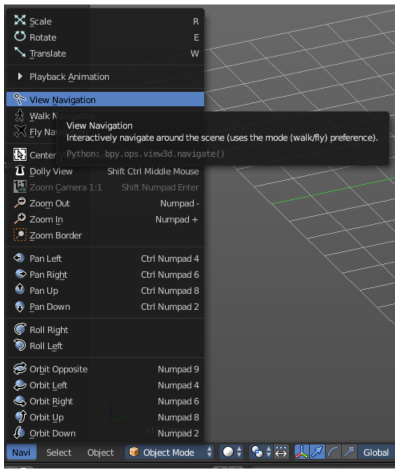
Invert Wheel Zoom Direction

Inverts the direction of the mouse wheel zoom.

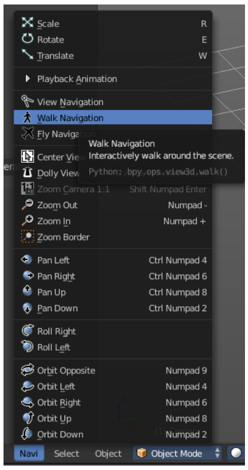
View Navigation

Here you can adjust how the View navigation in the 3D view behaves. You can choose between walk and fly.





Walk Navigation



Here you can adjust how the Walk navigation in the 3D view behaves. Note that these settings also influences the View navigation in Walk navigation style.

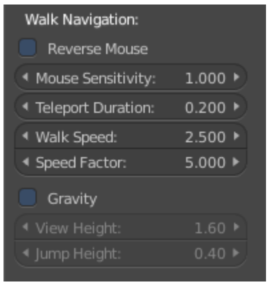
Reverse Mouse

Reverse the mouse movement when you move upwards or downwards

Mouse Sensitivity

Here you can adjust how strong the viewport movement reacts to the mouse movement

Teleport Duration



Here you can adjust the teleport duration when teleporting in navigation mode.

Walk Speed

Here you can adjust the walk speed

Speed Factor

Here you can adjust the run speed.

Gravity

Here you can choose if the virtual character, your point of view, uses gravity.

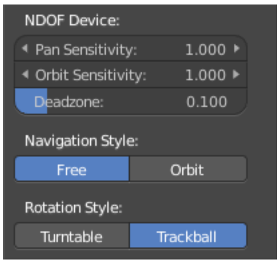
View Height

Here you can adjust the height of the point of view for your virtual character. This setting requires to have Gravity on.

Jump Height

Here you can adjust the maximal jump height for your virtual character. This setting requires to have Gravity on.

NDOF device



Here you can adjust some settings for a 3D mouse.

Pan Sensitivity

Here you can adjust the pan sensitivity.

Orbit Sensitivity

Here you can adjust the orbit sensitivity

Deadzone

The initial movement that is needed before the movement gets recognized.

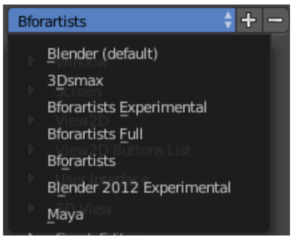
Navigation Style

Here you can choose the navigation style between Free and Orbit

Rotation Style

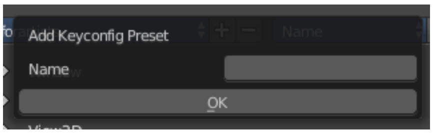
Here you can ajdust in what style you rotate the 3D View. Turntable and Trackball navigation reacts a bit different. Turntable navigation tries to hold the horizon line while rotation. Turntable rotation rotates also the horizon line.

Right row



Keyconfig dropdown box

Bforartists comes with several predefined key configurations. Here you can choose between them. You need to save the User Settings to make the change permanent.

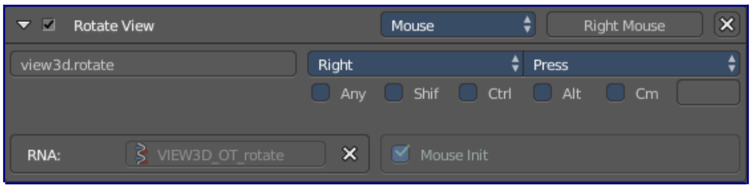


To add your own keymap, first change the keymap to your needs. Then click the + button. This will call a form where you can give your keymap a name. Click OK to store it. The process to create a new keymap does not require to save the user settings. To have this keymap active after the next restart does.

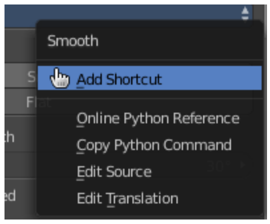
Search field

You can search the keymaps for keys and terms. In the left edit box you can adjust if you want to search for names and terms, or for keystrokes.

Keymap Editor

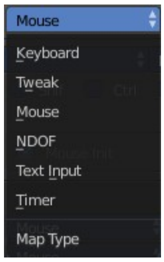


The Keymap editor is the list where the single inputs are defined. Every input can have several specific operator settings in the lower area. The upper area defines the general things like the key combos. The lower area those operator specific settings.



Normally you don't edit those key entries manually. Most of the usual tools have an entry in the right click menu to create or to change the hotkey. But sometimes you have to do this task manually.

Map Type



Here you define what input will control the function.

Type of Event

Here you define your main hotkey. In our case the right mouse.

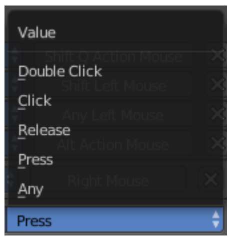
Operator

Here you can find the Python operator name for the tool.

Type of Event

The main hotkey again. For special events like mouse events you have a dropdown box here.

Value

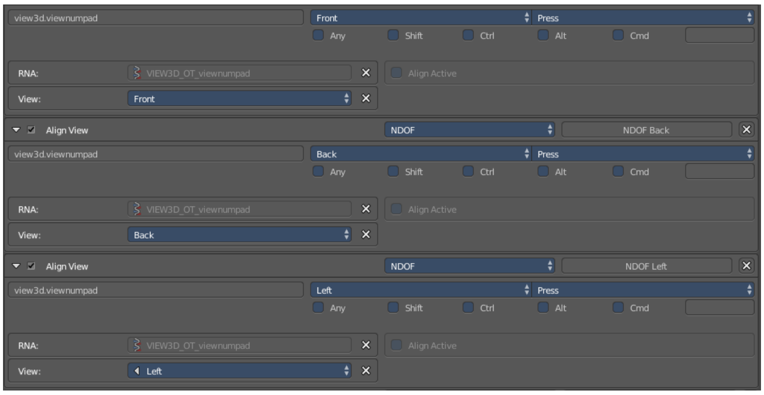


What key action is required. On click, on double click, etc. ...

Secondary hotkeys

Many hotkeys uses a key combination, for example Shift D for select. Here you can define those secondary hotkeys.

Specific settings



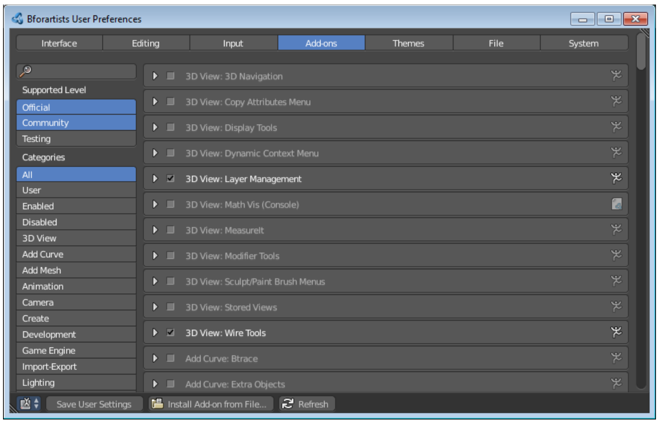
Every operator can have several settings. And some tools even just defines itself by those different settings. Align view for example has the same operator called view3d.viewnumpad. But switches to the needed view by the right entry in the specific settings then.

What is equal in the key map in all cases is the RNA entry. That's the name of the operator again. But this time not the Python operator name. But the C operator name.

Restore

When you modify a keymap item, then you will see a Restore button appear at the right side. This indicates that this keymap item gots modified. A click at the Restore button will restore the original hotkey.

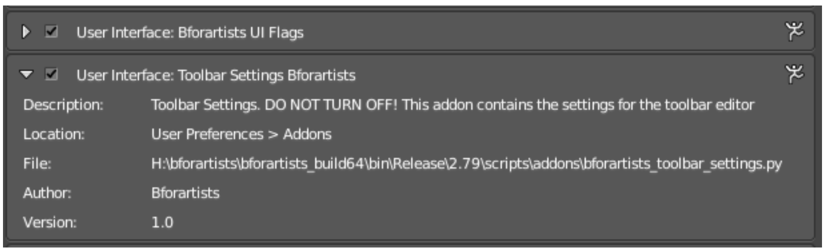
Add-ons



An add-on is external software written by other developers. Add-ons are a way to extend the core functionality of Bforartists. Bforartists already comes with lots of add-ons. Some already activated. Here you can manage them, and add even more add-ons if required.

Note that Bforartists works with Blender addons.

Note also that this list contains some add-ons that are required by Bforartists to work proper. You will see a warning in those addons. Don't turn them off. Or vital parts of Bforartists will not longer work. Like the toolbar.



Header

Editor Type Menu

Here you can switch to another editor type.

Save User Settings

When you have enabled or disabled an addon, then you should save the user settings to make the change permanent.

Install Add-on

Here you can install external add-ons. Note that addons that comes as a zip file should be loaded zipped. And not unzipped.

Refresh

Scan the add-on directories for new modules. This is useful when you decide to install an add-on manually.

Left Row

Search field

Here you can search for a specific addon

Supported Level

Here you can filter the addons by supported level.

The addons comes in three flavours. The official addons are the addons from the Blender developers. Community are the addons from Community developers that doesn't officially belong to the Blender developer team. And Testing add-ons are add-ons that aren't really finished yet. They can do the job, but are experimental.

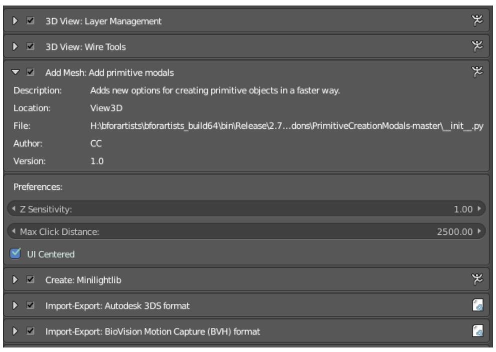
Categories

Here you can filter the addons by categories.

The addons comes in different categories, dependant of their useage.

Right row

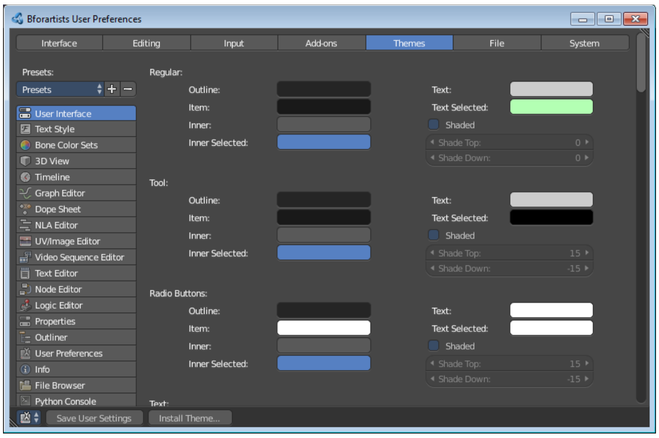
This is the list of add-ons. To enable an add-on, tick the checkbox at the left. When you expand an add-on then you will find some further informations. Sometimes you will also find some more settings.



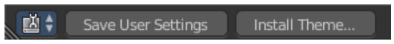
Themes

The Themes tab allows you to customize interface appearance and colors.

The colors for each editor can be set separately. Simply select the editor you wish to change in the multi-choice list at the left, and adjust colors as required. Notice that changes appear in real-time on your screen. In addition, details such as the dot size in the *3D View* or the *Graph Editor* can also be changed.



Header



Editor Type Menu

Here you can switch to another editor type.

Save User Settings

Save the user settings.

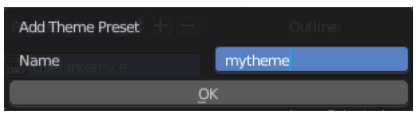
Install Theme

Here you can install a new theme.

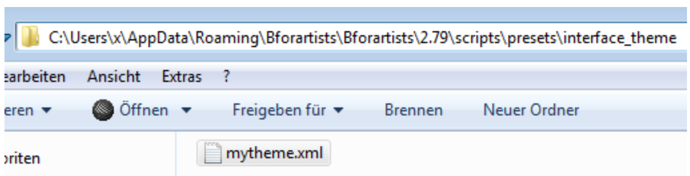
Presets

Bforartists comes with several theme presets. You can choose between them in the dropdown box. Don't forget to save the user settings to make the change permanent.

To create a new theme, click the + button next to the preset selection drop-down and enter a name. This will save the theme to an XML file in the `./scripts/presets/interface_theme/` subdirectory of one of the configuration directories.

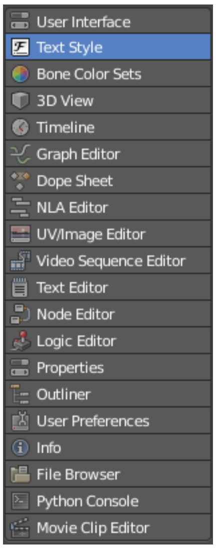


To share the new created theme you have to copy it from that folder. This xml file can then be loaded as a theme at another computer with Bforartists installed.



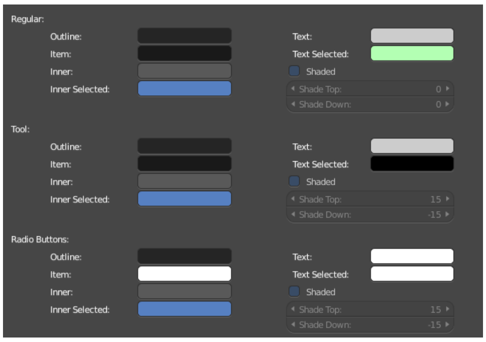
Editors

The list of the editors that you can theme. Every editor can have its own theming.



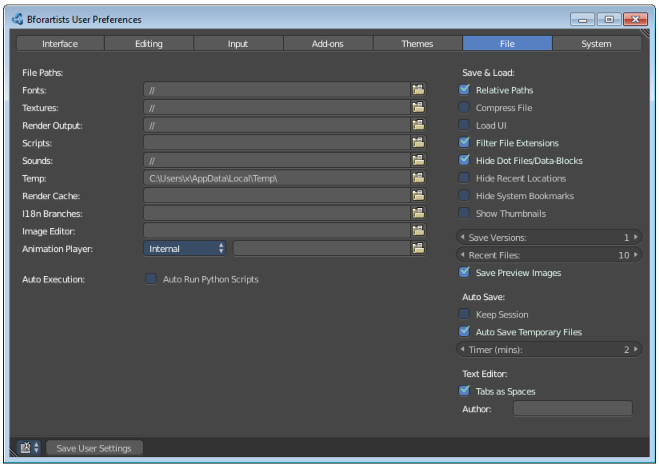
Theming settings

Here you can adjust the colors for the single UI elements.



File Preferences

The *File Preferences* tab allows you to configure auto-save preferences and set default file paths for blend-files, rendered images, and more.



Header

Editor Type Menu

Here you can switch to another editor type.

Save User Settings

Save the user settings.

File Paths

Locations for various external files can be set for the following options:

Fonts

Default location when searching for font files.

Textures

Default location when searching for image textures.

Render Output

Where rendered images/videos are saved.

Scripts

An additional location to search for Python scripts.

By default Bforartists looks in several directories (OS dependant) for scripts. By setting a user script path in the preferences an additional directory is looked in. This can be used to store certain scripts/templates/presets independently of the currently used Blender Version.

Inside the specified folder specific folders have to be created to tell Bforartists what to look for where. This folder structure has to mirror the structure of the scripts folder found in the installation directory of :

- scripts
- add-ons
- modules
- presets
- camera
- cloth
- interface_theme
- operator
- render
- ...
- startup
- templates

Not all of the folders have to be present.

Python scripts (including driver expressions) are not executed by default for security reasons.

Sounds

Default location when searching for sound files.

Temp

The location where temporary files are stored.

Render Cache

The location where cached render images are stored.

I18n Branches

The path to the `/branches` directory of your local svn-translation copy, to allow translating from the UI.

Image Editor

The path to an external program to use for image editing.

Animation Player

By default Bforartists uses the internal player to play back animations. Here you can choose an external program to use for playback of rendered animations. There are also some presets available.

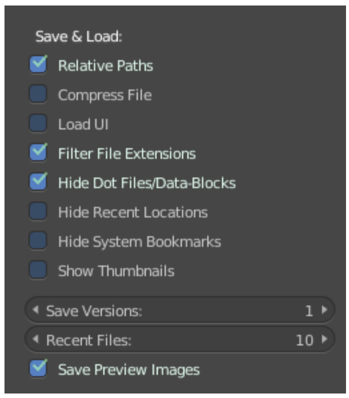
> **Hint**
>
> If these defined folders do not exist, they will *not* be created automatically.

Auto Execution

Auto Run Python Scripts

You may choose to ignore the security issues, and allow scripts to be executed automatically.

Save & Load



Relative Paths

By default, external files use a relative path.

Compress File

Compress blend-file when saving.

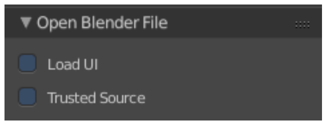
The option to Compress files will compact your files whenever Blender is saving them. Dense meshes, large packed textures or lots of elements in your scene will result in a large blend being created.

This option may slow down Blender when you quit, or under normal operation when Blender is saving your backup files. Using this option traces processor time for file-size.

Load UI

In Bforartists you can load the scene in the screen layout in which you have saved it. Default is off.

This can also be changed individually when loading a file from the *Open blend-file* panel of the File Browser.



Filter File Extensions

By activating this, the file dialog in the File Browser will only show appropriate files in the Load dialog. Blend files for example.

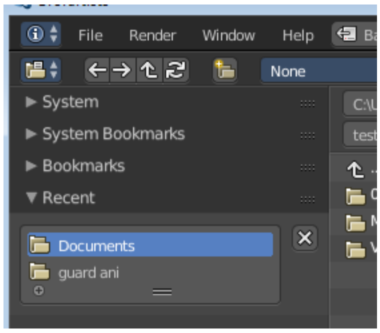
The selection of file types can also be changed in the header of the file dialog.

Hide Dot File/Data-blocks

On non Windows systems like Linux and Mac OS X files are hidden by a dot in front of the file name. Here you can make them visible in the file browser if you want. Note that this feature does not work with Windows

Hide Recent Locations

Hides the *Recent* panel of the File Browser which displays recently accessed folders.



Hide System Bookmarks

Hides the System Bookmarks panel of the File Browser which displays the system bookmarks.

Show Thumbnails

Displays a thumbnail of images and movies when using the File Browser.

Save Versions

Number of versions created for the same file (for backup).

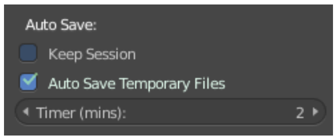
This option tells Bforartists to keep the indicated number of saved versions of your file in your current working directory when you manually save a file. These files will have the extension: `.blend1`, `.blend2`, etc., with the number increasing to the number of versions you specify. Older files will be named with a higher number. e.g. With the default setting of 2, you will have three versions of your file: `*.blend` (your last save), `*.blend1` (your second last save) and `*.blend2` (your third last save).

Recent Files

The number of recent files to display in the Recent panel.

Save Preview Images

When this option is off, previews of images and materials in the File Browser are created on demand. With this option on it will save these preview images into your blend-file. This will increase the size of your blend file by the size of the thumbnails.



Auto Save

Keep Session

Always load session recovery files and save it after quitting Bforartists. This means you can work at a blend file, quit Bforartists, and when you reopen it, then it will load with this blend file in the latest state.

Auto Save Temporary File

Enable Auto Save. Auto save creates a temporary file.

Checking this box tells Blender to automatically save a backup copy of your work-in-progress to the Temp directory (refer to the File tab in the User Preferences for its location).

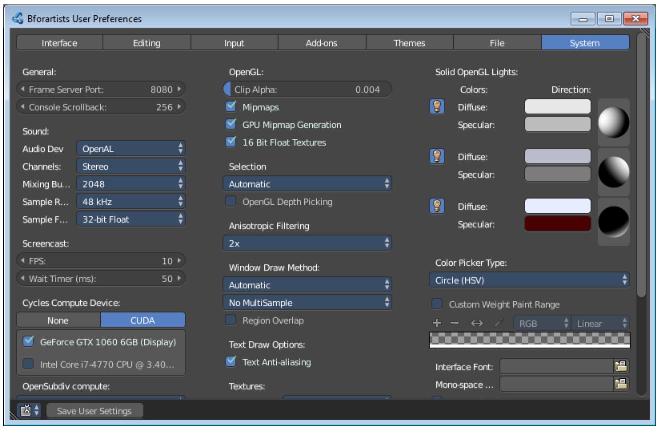
The Auto Saved files are named using a random number and have a blend extension.

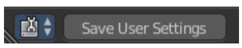
Timer

Here you can asjust the number of minutes between each Auto Save. The minimum is 1, and the Maximum is 60 (Save at every one hour).

System Preferences

The System tab contains system related settings. Such as Audio settings, Cuda device, OpenGL Color settings and so on.





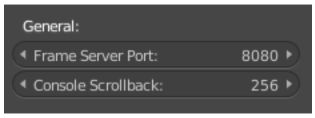
Header

Editor Type Menu

Here you can switch to another editor type.

General

Frame Server Port

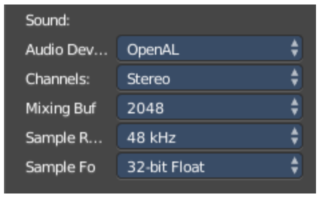


TCP/IP port used in conjunction with the IP Address of the machine for frameserver rendering. Used when working with distributed rendering. Avoid changing this port value unless it is conflicting with already existing service ports used by your Operating System and/or softwares. Always consult your operating system documentation and services or consult your system administrator before changing this value.

Console Scrollback

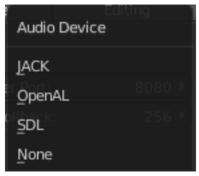
The number of lines, buffered in memory of the console window. Useful for debugging purposes and command line rendering.

Sound



Audio Device

Here you can set the audio device.



None

No Audio support. No audio output, but audio strips can be loaded normally.

SDL

Uses Simple Direct Media Layer API from libsdl.org to render sounds directly to the sound device output.

OpenAL

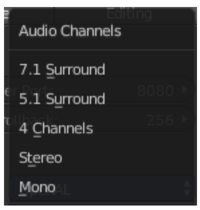
Provides buffered sound rendering with 3D/spatial support. Used for 3D source support by *Speaker Objects* and the *Game Engine*.

Jack

The Jack Audio Connection Kit

Channels

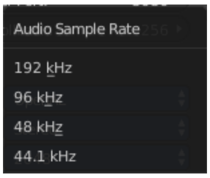
Set the audio channel count. Available options are: Stereo, 4 Channels , 5.1 Surround , 7.1 Surround



Mixing Buffer

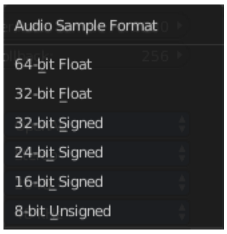
Set the number of samples used by the audio mixing buffer. Available options are: *512* , *1024* , *2048*, *4096* , *8192*, *16384*, and *32768*

Sample Rate



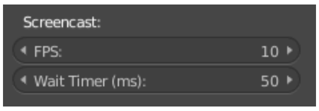
Set the audio sample rate. Available options are: *44.1 Khz*, *48 Khs*, *96 Khz* and *192Khz*

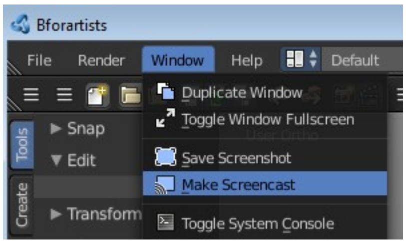
Sample Format



Set the audio sample format. Available options are: *32 bit float*, *8 bit Unsigned*, *16 Bits Signed*, *24 Bits Signed*, *32 Bits Signed*, *32 Bits Float*, and *64 Bits Float*.

Screencast





These settings are used to control the frame-rate for recording a Screencast.

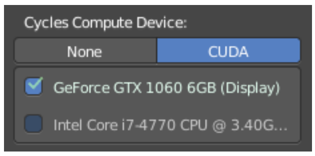
FPS

Frame-rate for screencast playback.

Wait Timer

Time in milliseconds between each frame recorded for screencast.

Compute Device



The Options here will set the compute device used by the Cycles render engine.

None

When set to *None* or the only option is *None*: your CPU will be used as a computing device for Cycles Render Engine.

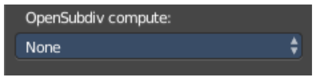
CUDA

If the system has a compatible Nvidia CUDA enabled graphics card you will be able to use it to render with the Cycles render engine.

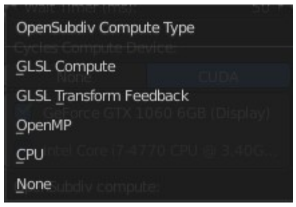
OpenCL

If the system has a compatible OpenCL device, it will show up has an option for rendering cycles. Note that OpenCL currently has limited support, see: Cycles Features page for more information.

OpenSubdiv Compute



The Options here will set the compute device used by OpenSubdiv for the Subdivision Surface Modifier.



None

Disables any OpenSubdiv compute devices, makes sure legacy subsurf method is used. Use this option when OpenSubdiv causes any bugs or regressions.

CPU

Single threaded CPU implementation. It is mainly useful in cases when GPU compute is possible and threaded CPU option causes artifacts (it is unlikely to happen, but still possible).

OpenMP

Multi-threaded CPU implementation. Use it for maximum performance in cases when GPU compute is not available.

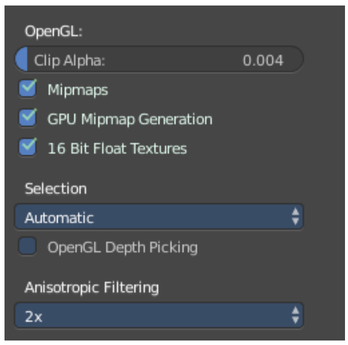
GLSL Transform Feedback

Uses GPU to perform calculations, has minimal requirements to video card and driver.

GLSL Compute

Uses GPU to perform calculations, supposed to be more efficient than *Transform Feedback* but also has higher requirements to video card and driver.

OpenGL



Here you can find some OpenGL settings.

Clip Alpha

Clip alpha below this threshold in the 3D View. Note that the default is set to a low value to prevent issues on some GPU’s.

Mipmaps

Scale textures for 3D View using Mipmap filtering. This increases display quality, but uses more memory.

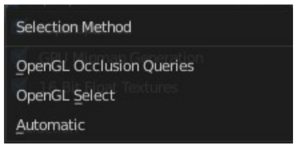
GPU MipMap Generation

Generate MipMaps on the GPU. Offloads the CPU Mimpap generation to the GPU.

16 Bit Float Textures

Enables the use of 16 Bit per component Texture Images (Floating point Images).

Selection



Selection method to use for selecting.

Automatic

Automatically choses the best setting depending on your OS, GPU, and drivers.

OpenGL Select

Legacy OpenGL selection method for legacy hardware.

OpenGL Occlusion Queries

More optimized OpenGL selection method. Use this method if you are using an OpenSubdiv Compute compute device.

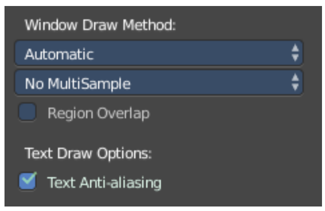
OpenGL Depth Picking

Use the depth buffer for picking 3D View selection.

Anisotropic Filtering

Sets the level of anisotropic filtering. This improves the quality of how textures are drawn at the cost of performance. Available Options are: *Off* (No Filtering), *2x*, *4x*, *8x*, and *16x*.

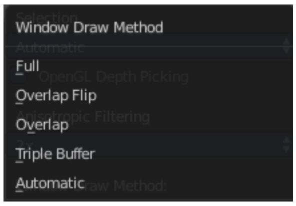
Window Draw Method



Some Window draw method related settings.

Window Draw Method

Specifies the Window Draw Method used to display Blender Window(s).



Automatic

Automatically set based on graphics card and driver.

Triple Buffer

Use a third buffer for minimal redraws at the cost of more memory. If you have a capable GPU, this is the best and faster method of redraw.

Overlap

Redraw all overlapping regions. Minimal memory usage, but more redraws. Recommended for some graphics cards and drivers combinations.

Overlap Flip

Redraw all overlapping regions. Minimal memory usage, but more redraws (for graphics drivers that do flipping). Recommended for some graphic cards and drivers combinations.

Full

Do a full redraw each time. Only use for reference, or when all else fails. Useful for certain cards with bad to no OpenGL acceleration at all.

Multi-Sampling

This enables FSAA for smoother drawing, at the expense of some performance.

> Note
>
> Multisampling is known to cause selection issues on some configurations.

Region Overlap

This checkbox will enable Blender to draw regions overlapping the 3D View. It means that the *Object Tools* and *Transform Properties* regions, which are opened by using the shortcuts `T` and `N` will be drawn overlapping the 3D View editor.

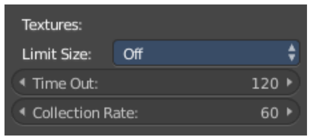
If you have a capable graphics card and drivers with *Triple Buffer* support, clicking the checkbox will enable the overlapping regions to be drawn using the *Triple Buffer* method, which will also enable them to be drawn using Alpha, showing the 3D View contents trough the *Object Tools* and *Transform Properties* regions.

Text Draw Options

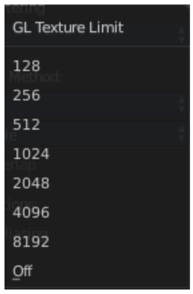
Text Anti-aliasing

Enable interface text anti-aliasing. When disabled, texts are drawn using text straight render (Filling only absolute Pixels).

Textures



Limit Size



Limit the maximum resolution for pictures used in textured display to save memory.
The limit options are specified in a square of pixels, (e.g.: the option 256 means a texture of 256×256 pixels) This is useful for game engineers, whereas the texture limit matches paging blocks of the textures in the target graphic card memory. Available Options are: *Off* (No limit), *128*, *256*, *512*, *1024*, *2048*, *4096*, and *8192*.

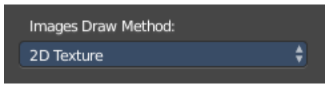
Time Out

Time since last access of a GL texture in seconds, after which it is freed. Set to 0 to keep textures allocated. Minimum: *0*, Maximum: *3600*.

Collection Rate

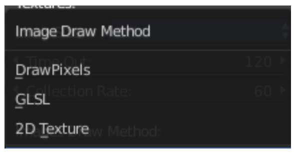
Number of seconds between each run of the GL texture garbage collector. Minimum: *0*, Maximum: *3600*.

Image Draw Method



Method to draw images as the following options are supported:

2D Texture



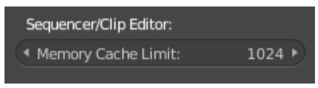
Uses CPU for display transform and draws images as a 2D texture.

GLSL

Fastest method using GLSL for display transform and draws images as a 2D texture.

Draw Pixels

Uses CPU for display transform and draws images as a 2D texture.

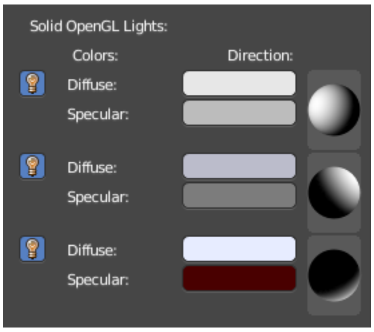


Sequencer/Clip Editor

Memory Cache Limit

Upper limit of the sequencer’s memory cache (megabytes). For optimum clip editor and sequencer performance, high values are recommended.

Solid OpenGL lights



The 3D view uses Solid OpenGL lamps to light the 3D view. You can enable three different light sources here. These lamps does not affect the rendering. Their only purpose is to light the 3D view.

You can turn on or off the lamps with the lamp icons in front . There should be at least one light enabled.

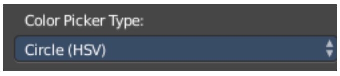
Diffuse color is the constant color of the lamp.

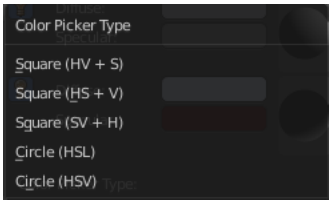
Specular is the hilight color of the lamp.

The icon at the end allows you to control the **direction** of the light source.

Color Picker Type

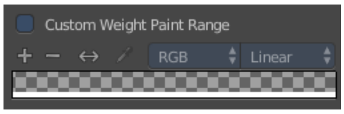






Here you can choose the type of Color picker that will show when you click on a color field. You can choose between three square types and two circle types.

Custom Weight Paint Range



How much a bone deforms is defined by Mesh Skin weighting. For visualization and weightpainting a color ramp is used. Which goes from blue to green to red. Blue is the lowest weighting, red the hightest.

Here you can define a custom color ramp with your own colors for weightpainting.

Custom Weight Paint Range

The checkbox to enable or disable the custom weight paint range.

Gradient Colors dialog

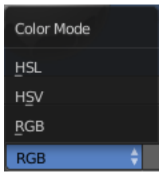
The + Button adds a color ramp point. That way you can have more than one color in the gradient.

The - Button removes the currently selected color ramp point.

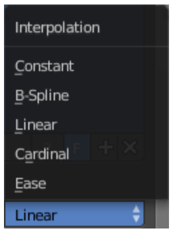
The <> Element flips the color ramp

The Color picker button? I have no idea! It is not documented, and not to figure out.

Color Mode is a dropdown box where you can choose the color mode for the gradient.



Interpolation is a dropdown box where you can choose the interpolation mode for the gradient.



In the **Color Ramp element** you will see the color ramp with the single color points.

Choose Active Color Stop is the stop point of the gradient.

Position is a edit box where you can fine tune the position of the currently selected color point

Set Color of selected color stop is the color of the currently selected color point. When you click at it then you will get a color dialog that allows you to setup the color.

Interface Font

Here you can define a custom interface font. The font in the whole UI.

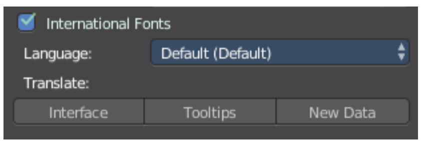
Monospace Font

Here you can define a custom Monospace font. That's the one used in the python console for example.

Internationalization

Bforartists supports a wide range of languages. Here you can enable the international fonts for it, and choose a localization for the interface.

This feature will also enable options for translating the user interface.



Bforartists supports I18N for internationalization.

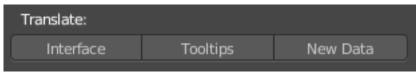
International Fonts

The checkbox to enable the international fonts.

Language

Here you can choose the language.

Translate



Here you can define what parts of the Ui you want to be localized.

Interface

Interface translates all the interface texts

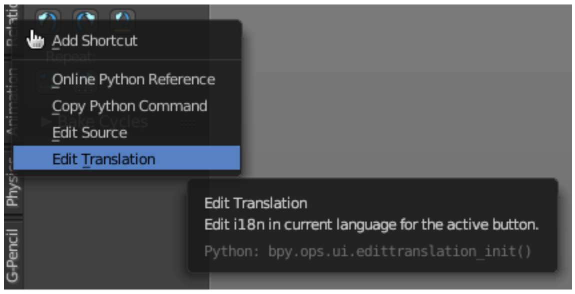
Tooltips

Tooltips translates the tooltips too.

New Data

New data is meant to edit the localization texts.

This can be done in the right click menus of the tools when everything is set up in the correct way.

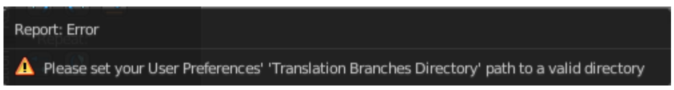


Note

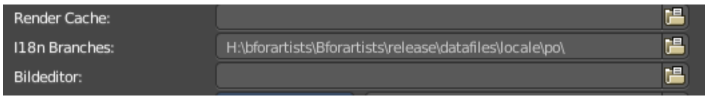
This feature is currently not functional in Bforartists. It ends in an error message.

Let's nevertheless document the way how it should work. Note that you need a Bforartists repository for that. The binary version does not come with the editable *.po files, but with already compiled *.mo files for the translation.

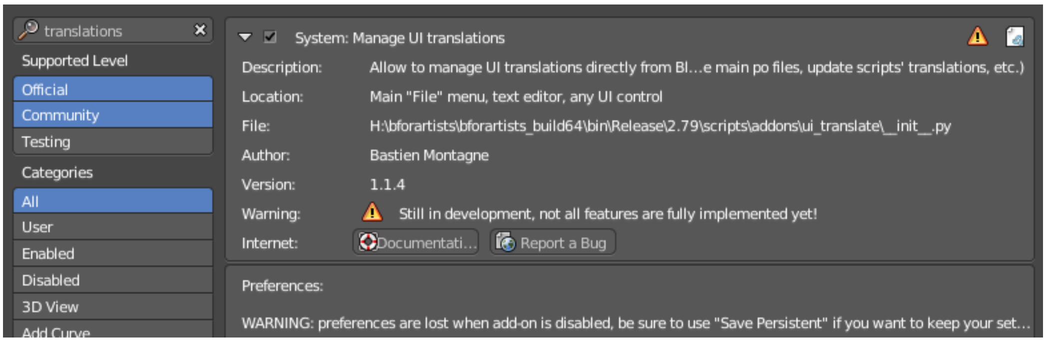
Note that you first need to set the path to the translation files for that. Or you will get an error. This is done in the File tab. The |18n string.



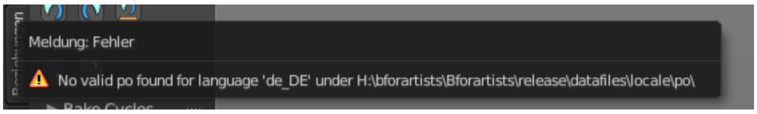
The path should lead to the *.po files that you want to translate. Which can be found in the Bforartistrs repository.



And you need to enable the Manage UI translations addon. And to fix the paths in this addon. The default paths are currently set for Blender.



And then you might end in this error here ...



In case somebody has an idea what's going on here, every hint is welcome ...

Editors - Toolbar Editor

Detailed Table of Content

Editors - Toolbar Editor detailed

Introduction

The Toolbar editor is what you normally have to avoid in UI design. It's a bunch of double menu entries. It is made by lots of tools that already exists elsewhere.

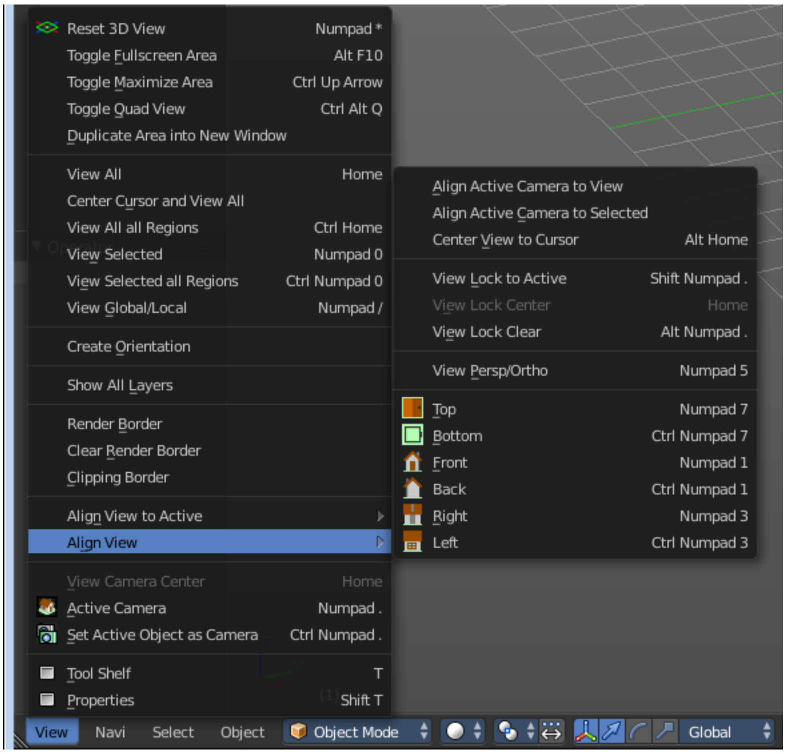
But the value of this this double menu here is that it is configurable. This customizable toolbar makes it possible to have the most needed tools at top UI level. This can save a ton of clicks, tabbing, scrolling, and digging in sub menus. And you can display what you need for your personal workflow. And hide away the rest.

The toolbar editor uses pure Icon buttons.

Parts of the toolbars are just visible when you are in the right mode. The full Primitives toolbar for example in just visible in Object mode. Parts of it are visible in Edit mode, dependant of what type of object you modify. And in the other modes the toolbars are hidden.

Parts of the toolbars are just visible when the right object type in the scene exists / is selected.

As told, the toolbars are double menu entries. This means te description of the tools in this chapter will be as short as possible. Closer descriptions, like how to use the tools, can be found in the other chapters where the tools comes from. The Tool Shelf in the 3D View for example.



Limits

- The toolbar does not contain all possible tools. More the opposite, the selection is very limited. Lots of tools depends to be performed in the editor type where you want to do the change. They just work there. And not in other editors. And the toolbar is another editor. This limits the available tools in the toolbar dramatically.

The global View buttons to switch to the orthographic views (Align View) is already a compromise. They change the view in all open 3D view editors. When you want to change the view just in one 3D view, then you have to use the entries in the View menu, or the Numpad hotkeys for them.

- The toolbars have a fixed order. The content is not sortable. The sorting is defined by the order of the toolbar type. And inside the toolbar type by the order in the toolbars menu. You would need to have to edit the python file to change this order.

- Just the toolbar types are independent. The checkboxes to display the toolbars themselves are global. Means when you set one toolbar type to Primitives, and activate all the primitives types there, then other toolbars will have the same primitives types displayed.

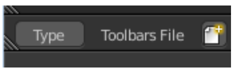
Menus

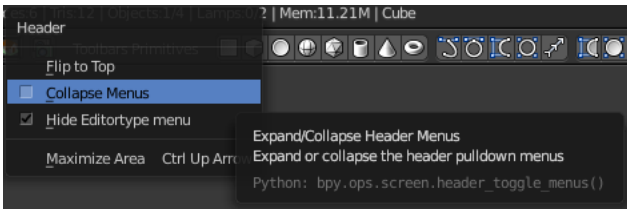
When you first look at the Toolbar then you will see no visible menus. They exists, but they are hidden away to save UI space. The text menus would eat lots of space that we can better spend in displaying more tools.

The Toolbar Type menu and the Toolbars menus are collapsed. You can expand those menus. This makes it easier to setup. But you can also work with the collapsed menus.

(Un-) Collapse the menus

Right click a the Toolbar. Untick Collapse Menus in the upcoming menu. Then the collapsed menus becomes visible again.





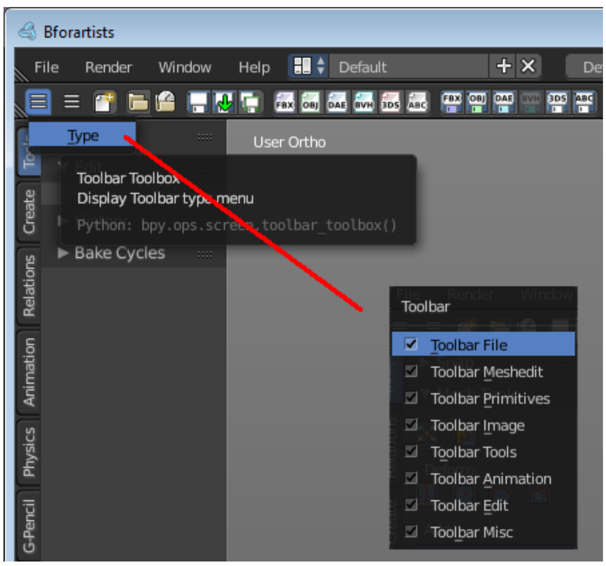
To collapse the menus go the opposite route. Right click a the Toolbar. And tick Collapse Menus in the upcoming menu.

Toolbar Type menu

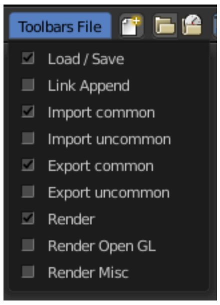
The first entry of a toolbar is the Toolbar Type menu.

Here you can choose what kind of Toolbar Type you want to show. You can show multiple types of toolbars at once.

The toolbar types are independant from each other. You can set up every toolbar to display different content.



Toolbars Menus



Every toolbar type has several toolbars to display.

In the toolbar menu you can choose what toolbars you want to display.

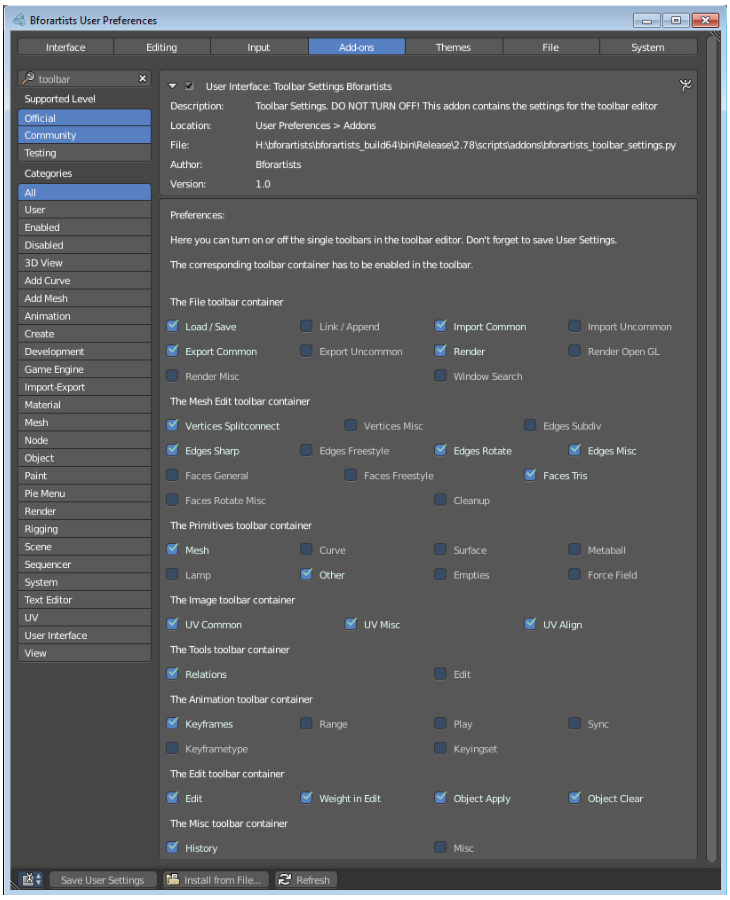
The toolbars are not independant. This setup is global. When you for example tick the Toolbar File in this toolbar, then it will be displayed in all other toolbars too. Including in other layouts.

These checkboxes are also available in the Toolbar Settings Bforartists addon.

Toolbar Settings Bforartists addon

The settings for the toolbar needs to be stored somewhere. This is done in an addon called Toolbar Settings Bforartists.

This addon contains the same checkboxes than the single toolbars menus in the toolbar. But all of them at once. And here is where they get stored when you save the user settings.

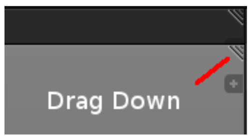


Warning!
Do not deactivate this addon. The toolbar will not work then. It depends of the settings in the addon!

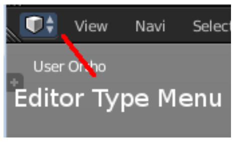
Create new toolbar

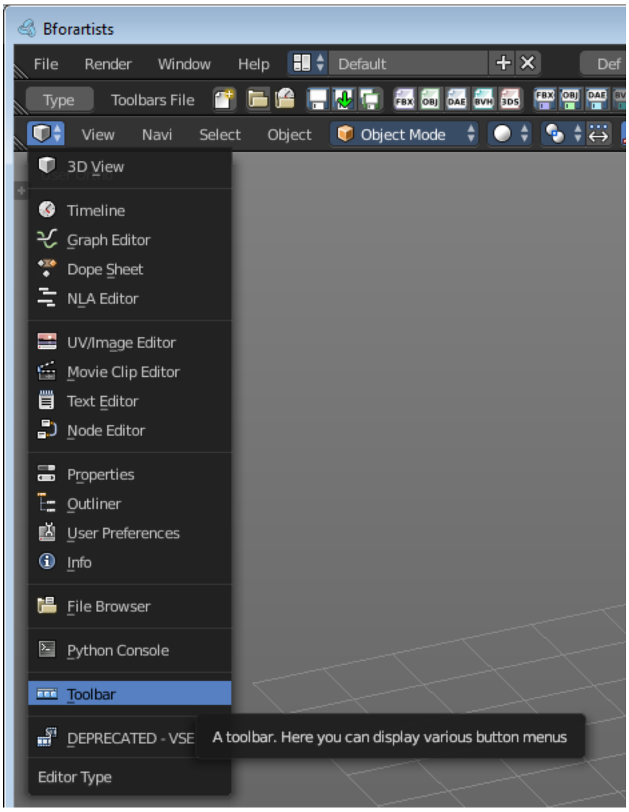
You might want to create your own toolbar for a new layout. Let's explain the needed steps.

First create a new editor type. This can be done by dragging the triangle area of an existing editor. And will create a new editor.



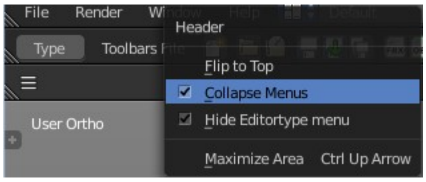
Look at the right of this new created editor type. You will now see a small button. This is the Editor type menu. Open it by clicking at it. And choose Toolbar.





Now set up your new created Toolbar editor. Choose the toolbar types you want to display here. Then choose the toolbars to display.

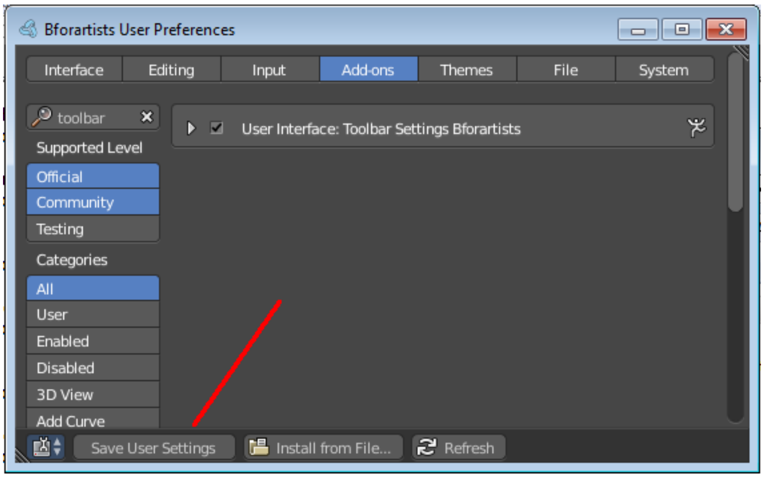
The last step is to hide the Editor Type menu and to collapse the menus. Right click at the toolbar, and tick Collapse Menus and Hide Editortype menu.



Save Toolbar state

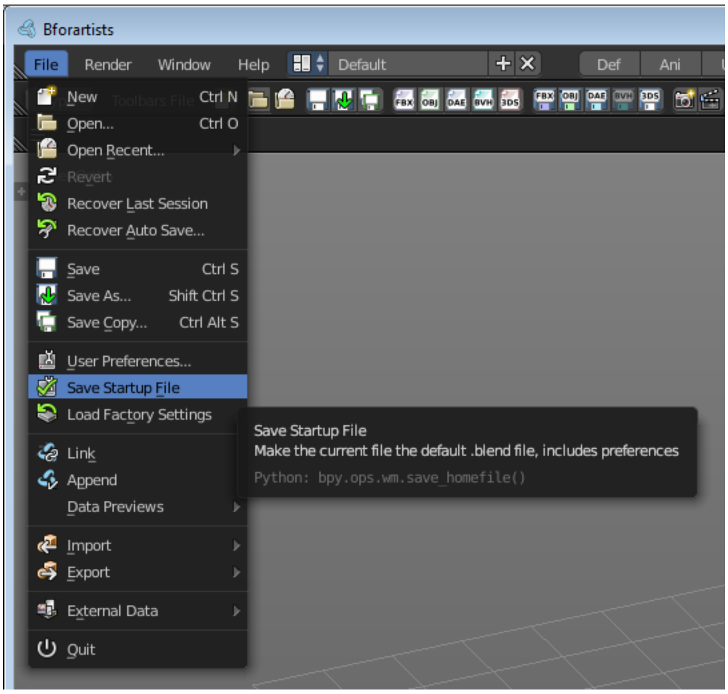
You may want to save the changes at the toolbar. Because without saving the changes you will loose them when you reopen Bforartists.

The state of the checkboxes are stored in the Toolbar Settings Bforartists Addon. So to save this part you have to save the User Settings in the User Preferences. It doesn't matter if you have changed the checkboxes in the toolbar or the addon. They are the same.



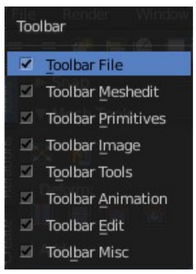
But the state of the collapsed Toolbar menus is not stored in the User Preferences. They are part of the layout. You have to save the startup file to make this changes permanent.

Be careful here. Saving the startup file saves every change at the layout. Including things like having a mesh in the scene.



Toolbar Types

Currently the Toolbar editor contains eight toolbar types.

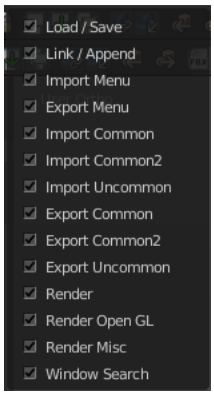


File - Contains some file menu related tools. Like load save. But also the render menu.
Mesh Edit - Contains tools for Meshes in Edit Mode.
Primitives - Contains the primitives from the Create tab in the Tool Shelf.
Image - Contains some tools for editing UV
Tools - Contains the content of the Relations panel in Object mode.
Animation - Contains Animation tools
Edit - Contains some tools from Object and Edit Mode
Misc - Contains Undo, and an empty menu as a place holder.

Toolbars File

The Toolbars File contains some file menu related tools. Like load save. But also the render menu.

These toolbars are available in all modes.



Available Toolbars

The description of the single buttons goes from left to right.

Load / Save

The original menu items are in the File menu of the Info editor.

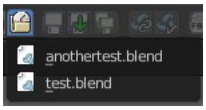
Reload Startup file

Creates a new scene.

Open Blend File

Load a Blend file.

Recent



The recent files menu.

Save Blend File

Save a Blend file.

Save As Blend File

Save a Blend file as.

Save Copy

Saves a copy of the Blend file.

Link Append

The original menu items are in the File menu of the Info editor.

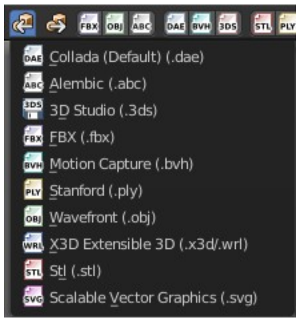
Link from Library

Link contend from a Blend file

Append from Library

Append content

Import Menu



The Import menu is the same menu that you can find in the File menu of the Info editor. It contains all available file import types.

Export Menu

The Export menu is the same menu that you can find in the File menu of the Info editor.

It contains all available file export types.

Import Common

The original menu items are in the File menu of the Info editor.

Import FBX

Import FBX files.

Import Obj

Import Object files.

Import ABC

Import Alembic files.

Import Common 2

The original menu items are in the File menu of the Info editor.

Import DAE

Import Collada files.

Import BVH

Import Biovision Motion Capture files.

Import 3DS

Import 3DS files.

Import Uncommon

The original menu items are in the File menu of the Info editor.

Import STL

Import STL files

Import PLY

Import PLY files.

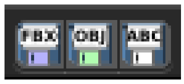
Import WRL

Import X3D or VRML2 files.

Import SVG

Import SVG Files.

Export Common



The original menu items are in the File menu of the Info editor.

Export FBX

Export as FBX file.

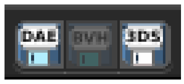
Export Obj

Export as Obj file.

Export ABC

Export as Alembic file.

Export Common 2



The original menu items are in the File menu of the Info editor.

Export DAE

Export as Collada file.

Export BVH

Export as BVH Motion Capture file.

Export 3DS

Export as 3DS file.

Export Uncommon

The original menu items are in the File menu of the Info editor.

Export 3DS

Export as 3DS.

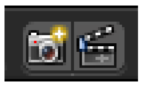
Export PLY

Export as PLY file.

Export WRL

Export as X3D or VRML2 files.

Render



The original menu items are in the Render menu of the Info editor.

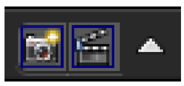
Render Image

Renders the current scene as an image by using the current offline renderer. Either Blender Internal or Cycles.

Render Animation

Renders the current scene as an animation. Either Blender Internal or Cycles.

Render Open GL



The Render Open GL toolbar is made of three tools.

Open GL Render Image

Renders the current scene as an image by using the Viewport and Open GL.

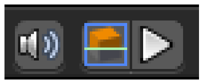
Open GL Render Animation

Renders the current scene as an animation by using the Viewport and Open GL.

Open GL Render Settings

The triangle button contains the Open GL Render settings.

Render Misc



The original menu items are in the Render menu of the Info editor.

Mixdown Audio

Mixdown and export the scene's audio to an audio file.

Show/ Hide Renderview

Toggles display of Render view.

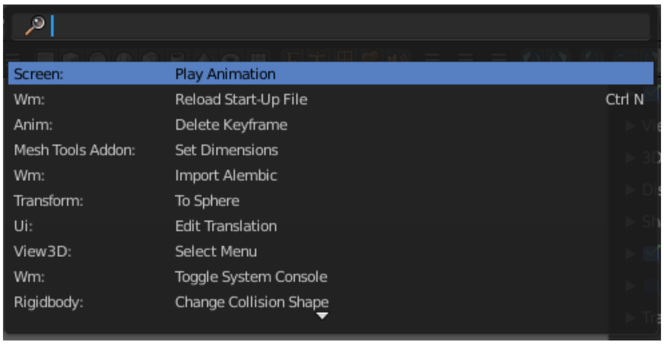
Play rendered animation

Play rendered Animation sequence.

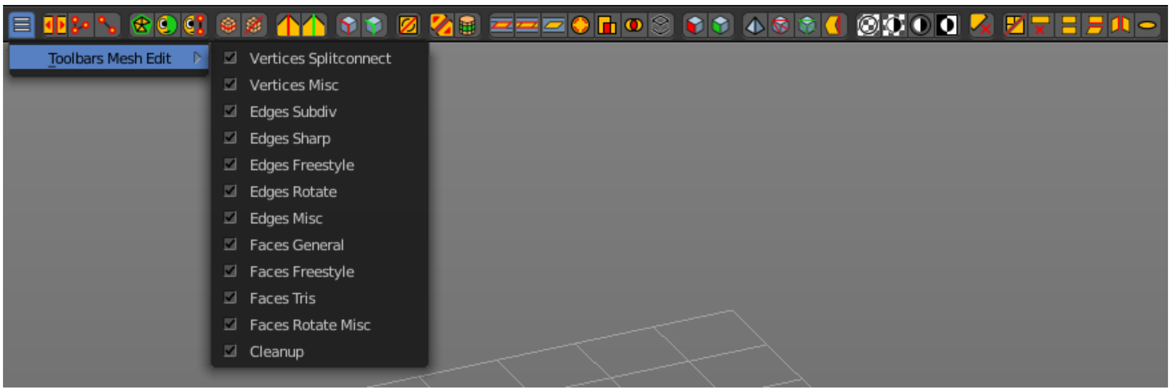
Window Search

The original menu item is in the Windows menu in the Info editor.

This button calls the search menu.



Toolbars Mesh Edit



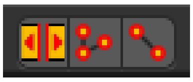
The Toolbars Mesh Edit contains tools for Mesh Objects in Edit Mode. The original menu items are mainly in the Mesh menu in Edit Mode. In the Vertices, Edges and Faces submenus.

This toolbars shows its content Edit mode.

Available Toolbars

The description of the single buttons goes from left to right.

Vertices Splitconnect



Split

Splits two connected Vertices.

Vertex Connect Path

Connect Vertices by their seleciton order, creating edges, splitting faces

Vertex Connect

Connect selected vertices of faces, splitting the face.

Vertices Misc

Convex Hull

Enclose selected vertices in a convex polyhedron.

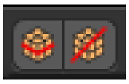
Blend from Shape

Blend in shape from a shapekey.

Shape Propagate

Apply selected vertex locations to all other shapekeys.

Edges Subdiv



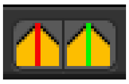
Subdivide Edge Ring

Subdivides an Edge Ring

Un-Subdivide

Unsubdivides selected edges and faces.

Edges Sharp



Mark Sharp

Mark selected edges as sharp.

Unmark Sharp

Unmark selected edges as sharp.

Edges Freestyle

Mark Freestyle Edge

Mark selected edges as Freestyle feature edges.

Unmark Freestyle Edge

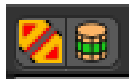
Unmark selected edges as Freestyle feature edges.

Edges Rotate

Rotate

Rotate selected edges or adjoining faces.

Edges Misc



Edge Split

Split selected edges so tthat each neighbour face gets its own copy.

Bridge Edgeloops

Create faces between selected edge loops.

Faces general

Fill

Fill a selected edge loop with faces.

Grid Fill

Fill grid from two loops.

Beautify Faces

Rearrange some faces to minimize degenerations.

Solidify

Create a solid skin by extruding. Compensating for sharp angles.

Intersect

Cut an intersection into faces.

Boolean Intersect

Cut solid geometry from selected to unselected.

Wire Frame

Create a solid wire frame from faces.

Faces Freestyle

Mark Freestyle Face

Mark selected faces for exclusion from freestyle feature edge detection.

Unmark Freestyle Face

Unmark selected faces for exclusion from freestyle feature edge detection.

Faces Tris

Poke Faces

Split a face into a fan.

Triangulate Faces

Triangulates selected faces.

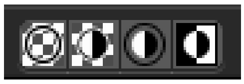
Tris to Quads

Join triangle faces into quads.

Split by Edges

Split faces by loose edges.

Faces Rotate Misc



Rotate UV's

Rotate UV coordinates inside faces.

Reverse UV's

Flip direction of UV coordinates inside faces.

Rotate Colors

Rotate Vertex Colors inside faces.

Reverse Colors

Flip direction of Vertex Colors inside faces.

Cleanup

Delete Loose

Delete loose vertices, edges or faces.

Decimate Geometry

Simplify geometry by collapsing edges.

Degenerate Dissolve

Dissolve zero area faces and zero length edges.

Make Planar Faces

Flatten selected faces.

Split Non Planar Faces

Split non planar faces that exceeds the angle threshold.

Split Concave Faces

Make all faces convex.

Fill Holes

Fill in holes (boundary edge loops)

Toolbars Primitives

The toolbars Primitives contains the Add items from the Create tab.

The full toolbar with all its content is just available in Object mode. In other modes it hides away. Single types are also visible in Edit mode. When you work at an mesh type, then the Mesh primitives toolbar is visible for example.

Available Toolbars

The description of the single buttons goes from left to right.

Mesh

The Mesh toolbar contains the Mesh primitives.

The original menu items are in the Tool Shelf in the 3D View, in the Create tab in the Add Primitives Panel.

Add Plane

Add a Plane primitive.

Add Cube

Add a Cube primitive.

Add Circle

Add a Circle primitive.

Add UV Sphere

Add a UV Sphere primitive.

Add Cylinder

Add a Cylinder primitive.

Add Cone

Add a Cone primitive.

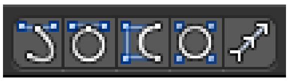
Add Torus

Add a Torus primitive.

Add Grid

Add a Grid primitive.

Curve



The Curve toolbar contains the Curve primitives.

The original menu items are in the Tool Shelf in the 3D View, in the Create tab in the Add Primitives Panel.

Add Bezier

Add a Bezier curve primitive.

Add Circle

Add a Circle curve primitive.

Add Nurbs Curve

Add a Nurbs Curve primitive.

Add Nurbs Circle

Add a Nurbs Circle curve primitive.

Add Nurbs Path

Add a Nurbs Path curve primitive.

Surface

The Surface toolbar contains the Surface primitives.

The original menu items are in the Tool Shelf in the 3D View, in the Create tab in the Add Primitives Panel.

Add Surface Curve

Add a Nurbs Surface curve primitive.

Add Surface Circle

Add a Nurbs Surface Circle primitive.

Add Surface Patch

Add a Nurbs Surface Patch primitive.

Add Surface Cylinder

Add a Nurbs Surface Cylinder primitive.

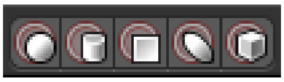
Add Surface Sphere

Add a Nurbs Surface Sphere primitive.

Add Surface Torus

Add a Nurbs Surface Torus primitive.

Metaball



The metaball toolbar contains the Metaball primitives.

The original menu items are in the Tool Shelf in the 3D View, in the Create tab in the Add Primitives Panel.

Add Metaball of type Ball

Add Metaball of type Ball primitive.

Add Metaball of type Capsule

Add Metaball of type Capsule primitive.

Add Metaball of type Plane

Add Metaball of type Plane primitive.

Add Metaball of type Elipsoid

Add Metaball of type Elipsoid primitive.

Add Metaball of type Cube

Add Metaball of type Cube primitive.

Lamp

The Lamp toolbar contains the different lamp types.

The original menu items are in the Tool Shelf in the 3D View, in the Create tab in the Add Misc Panel.

Add Lamp of type Point

Add Lamp of type Point.

Add Lamp of type Sun

Add Lamp of type Sun.

Add Lamp of type Spot

Add Lamp of type Spot.

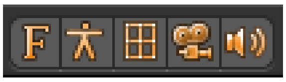
Add Lamp of type Hemi

Add Lamp of type Hemi.

Add Lamp of type Area

Add Lamp of type Area.

Other



The Other toolbar contains some other ground types like bones and text.

The original menu items are in the Tool Shelf in the 3D View, in the Create tab in the Add Misc Panel.

Add Text

Add a Text object.

Add Armature

Add a Armature object.

Add Lattice

Add a Lattice object.

Add Camera

Add a Camera object.

Add Speaker

Add a Speaker object.

Empties

The Empties toolbar contains the available empty types.

The original menu items are in the Tool Shelf in the 3D View, in the Create tab in the Add Misc Panel.

Add Empty of type Plain Axes

Add Empty of type Plain Axes.

Add Empty of type Sphere

Add Empty of type Sphere.

Add Empty of type Circle

Add Empty of type Circle.

Add Empty of type Cone

Add Empty of type Cone.

Add Empty of type Cube

Add Empty of type Cube.

Add Empty of type Single Arrow

Add Empty of type Single Arrow.

Add Empty of type Arrows

Add Empty of type Arrows.

Add Empty of type Image

Add Empty of type Image.

Force Field

The Force Field toolbar contains the available Force field types.

The original menu items are in the Tool Shelf in the 3D View, in the Create tab in the Add Misc Panel.

Add Physics Effector of Type Boid

Add Physics Effector of Type Boid.

Add Physics Effector of Type Charge

Add Physics Effector of Type Charge.

Add Physics Effector of Type Curve Guide

Add Physics Effector of Type Curve Guide.

Add Physics Effector of Type Drag

Add Physics Effector of Type Drag.

Add Physics Effector of Type Force

Add Physics Effector of Type Force.

Add Physics Effector of Type Harmonic

Add Physics Effector of Type Harmonic.

Add Physics Effector of Type Lennard-Jones

Add Physics Effector of Type Lennard-Jones.

Add Physics Effector of Type Magnetic

Add Physics Effector of Type Magnetic.

Add Physics Effector of Type Smoke Flow

Add Physics Effector of Type Smoke Flow.

Add Physics Effector of Type Texture

Add Physics Effector of Type Texture.

Add Physics Effector of Type Turbulence

Add Physics Effector of Type Turbulence.

Add Physics Effector of Type Vortex

Add Physics Effector of Type Vortex.

Add Physics Effector of Type Wind

Add Physics Effector of Type Wind.

Toolbars Image

The toolbars Image contains some image related tools. At

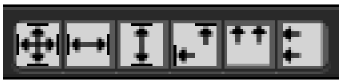
the moment this toolbar contains just tools to edit UV meshes. This means that you have to be in Edit mode with an UV mapped mesh to make the tools active.

The original menu items are in the Image menu of the UV Image Editor.

Available Toolbars

The description of the single buttons goes from left to right.

UV Align



The UV Align toolbar contains tools to clean up and align the selected UV geometry.

Align Straighten

Align UV's along the line defined by the end points of the selection.

Align Straighten X

Align UV's along the line defined by the end points along the X axis.

Align Straighten Y

Align UV's along the line defined by the end points along the Y axis.

Align Auto

Automatically choose the axis on which there is most alignmend already.

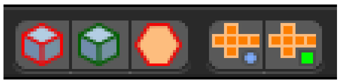
Align X

Align UV's at X axis

Align Y

Align UV's at Y axis

UV Unwrap



The UV Common toolbar contains tools for unwrapping.

Mark Seam

Mark selected UV Edges as Seam.

Clear Seam

Remove Seam from selected UV Edges.

Seams from Islands

Marks the border edges of the UV patches as Seam.

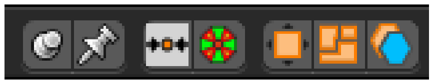
Unwrap Angle Based

Unwraps the selected geometry with the Angle based (ABF) method.

Unwrap Conformal

Unwraps the selected geometry with the Conformal (LSCM) method.

UV Modify UV



The UV Modify toolbar contains tools to clean up the uv mapping.

Pin

Pins the selected vertices.

Unpin

Unpins the selected verstices.

Weld

Weld the selected UV vertices together.

Remove Doubles UV

Removes double vertices

Average Island Scale

Average the size of separated UV patches, based at their size in 3D space.

Pack Island

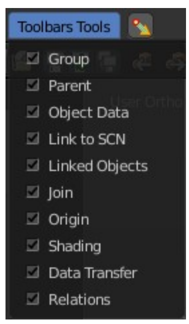
Packs the UV patches so that they fit best into the UV space, and as few texturespace as possible is wasted.

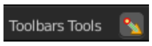
Copy mirrored UV Coordinates

Copy mirrored UV Coordinates at X axis based on a mirrored mesh.

Toolbars Tools

The Toolbars Tools contains some tools in object mode. The content from the relations panel and the edit panel in the tool shelf. And one tool in Edit mode. Make Vertex Parent. Since this is also part of the relations panel.

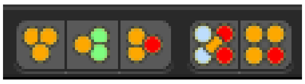




Available Toolbars

The description of the single buttons goes from left to right.

Group



The Group block.

Create new group

Creates a new group.

Add Selected to active group

Adds the selected object to the active group.

Remove from Group

Removes the selected object from the group.

Remove from all Groups

Removes the selected object from all groups.

Remove selected from active Group

Removes the selected object from the active group.

Parent

Make Parent

Parents the selected object to the active object.

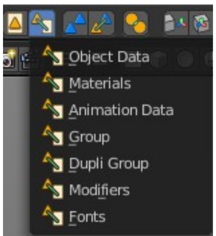
Clear Parent

Removes the parenting.

Object to Data

Make Single User

Make linked data local to each object.



Link Data

Apply active object links to other selected objects.

This button is a menu where you can choose the link method.

Link to SCN

Link to SCN

Link selection to another scene. This other scene has of course to exist.

Linked Objects

Make Local

Make library linked datablocks local to this file.

Make Proxy

Add empty object to become local replacement data of a library linked object.

Join

Join

Join selected objects into active objects.

Origin

Set Geometry to Origin

Sets the geometry to origín.

Set Origin to Geometry

Sets the origin to geometry.

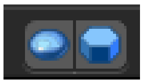
Set Origin to 3D cursor

Sets the origin to the 3D cursor.

Set Origin to Center of Mass

Sets the origin to the center of mass.

Shading



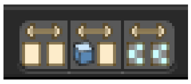
Shade Smooth

Shades the geometry smooth.

Shade Flat

Shades the geometry flat.

Data Transfer



Transfer Mesh Data

Transfers mesh data.

Transfer Mesh Data Layout

Transfers the mesh data layout.

Join UV's

Transfer UV Maps.

Relations

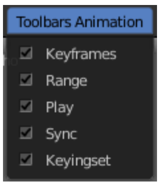
The Relations toolbar contains one tool in Edit mode. Make Vertex Parent.

Make Vertex Parent

Parents an object to the selected vertice(s).

Toolbars Animation

The Toolbars Animation contains tools around animation. The Toolbars Range, Play, Sync and Keyingset are the toolbars from the Timeline. But separated into four independant parts.



Available Toolbars

The description of the single buttons goes from left to right.

Keyframes

The Keyframes toolbar contains some keyframe tools. The original menu items can be found in the Tool Shelf in the Animation tab in the Animation panel.

The original menu items are in the Tool Shelf in the 3D View, in the Animation tab in the Animation panel.

Insert Keyframe Menu

When there is no keying set assigned to the currently selected object ,then this button is a menu where you can choose a keying set. When there is already a keying set assigned, then you can record a keyframe with this button

Delete Keyframe

Deletes the current Keyframe

Bake Action

Bakes the animation to a new action

Remove Animation

Remove all keyframe animation for selected objects

Calculate Object Paths

Calculate motion paths for the selected objects.

Clear Object Paths

Clears motion paths for the selected objects.

Range

Use Preview Range

Use an alternative start/end frame grange for animation playback and OpenGL renders instead of the Render Properties start/end frame range.

Lock Frame Selection to Range

Don't allow frame to be selected with mouse outside of frame range

Frame Start

The frame start point

Frame End

The frame end point

Play

Current Frame

The current frame number

Jump to Endpoint

Jumps to beginning of animation

Jump to Keyframe

Jumps to the previous keyframe

Play Animation

Play Animation

Plays animation reversed

Play Animation

Plays animation forward

Jump to Keyframe

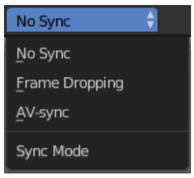
Jumps to next keyframe

Jump to Endpoint

Jumps to end of animation

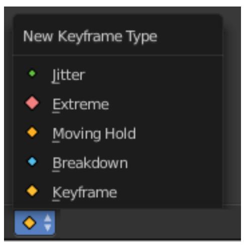
Sync

Sync is a dropdown box where you can adjust the syncing method.



Keyframe Type

Keyframe Type is a dropdown box where you can choose in what color the keyframe gets displayed in the Dope Sheet Editor.



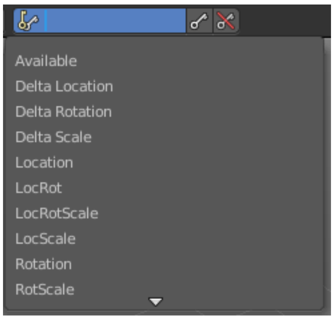
Keyingset

Use Keyframe Insert Auto

Auto insert keyframes at manipulation.

Keying set Dropdown box

This is a dropdown box where you can choose the keyingset method.



Insert Keyframe

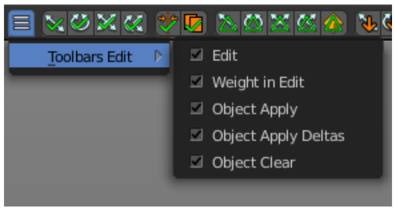
Insert a keyframe.

Delete Keyingset Keyframe

Delete Keyframe.

Toolbars Edit

The Toolbars Edit contains various toolbars around editing. Some content just shows when an object exists in the scene. Some content is visible in Object mode. Some content is visible in Edit mode.



Available Toolbars

The description of the single buttons goes from left to right.

Edit

The Edit toolbar is just visible in Edit Mode. The original menu items are in the Tool Shelf in the 3D View in the Tools tab in the Mesh Tools panel.

Dissolve Vertices

Dissolve Vertices.

Dissolve Edges

Dissolve Edges.

Dissolve Faces

Dissolve Faces.

Remove Doubles

Removes double vertices.

Limited Dissolve

Dissolve Edges and Vertices limited by the surrounding angle.

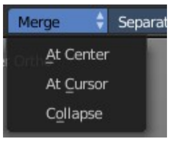
Dissolve Selection

Dissolve Geometry dependant of selection mode.

Edge Collapse

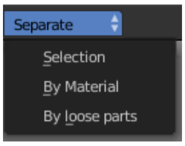
Collapse selected edges.

Merge



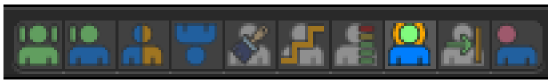
Merges selected geometry. This is a dropdown box where you can choose where to merge.

Separate



Separate the selection, and create a new object from it. This is a dropdown box where you can choose the separate method.

Weigth in Edit



The Weight in Edit toolbar is just visible in Edit Mode for normal meshes, and Pose mode when you have a rigged character selected. The original menu items are in the Tool Shelf in the 3D View in the Tools tab in the Weight Tools panel. You need to have a Vertex Group applied.

Normalize all

Normalizes the whole mesh.

Normalize

Normalizes the selection

Mirror

Mirrors the selection.

Invert

Inverts the weighting.

Clean

Remove Vertex Assignments that are not required.

Quantize

Set Weights to a fixed number of steps.

Levels

Add some offset and multiply with some gain the weights of the active vertex group.

Smooth

Smooth weights for selected vertices.

Limit Total

Limit deform weights.

Fix Deforms

Fix Deforms by modifying the position of selected vertices.

Object Apply

The Object Apply toolbar is just visible in Object Mode. The original menu items are in the Object menu in the 3D View. The Apply menu.

Location

Apply location.

Rotation

Apply Rotation.

Scale

Apply Scale.

Rotation & Scale

Apply Rotation, Scale.

Visual Transform

Apply Visual Transform.

Make Duplicates real

Make Duplicates attached to this object real.

Object Apply Deltas

Object Apply deltas converts normal object transforms to delta transforms. Any existing delta transform will also be included.

Location

Apply location.

Rotation

Apply Rotation.

Scale

Apply Scale.

All

Apply Location, Rotation, Scale.

Transforms to Delta Anims

Convert object animation for normal transforms to delta transforms

---

Object Clear

The Object Clear toolbar is just visible in Object Mode. The original menu items are in the Object menu in the 3D View. The Clear menu.

Location

Resets the position of the object to zero

Rotation

Resets the object's rotation to zero

Scale

Resets the object's scale to 1

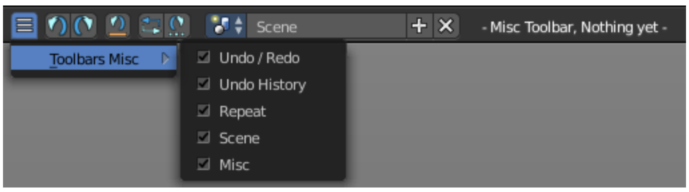
Origin

Resets the Origin Position

Toolbars Misc

The Toolbars Misc contains some miscellaneous tools.

Undo / Redo, Undo History and Repeat are originally located in the Tool Shelf in the 3D View. In the Tools tab in the History panel.



Available Toolbars

The description of the single buttons goes from left to right.

Undo / Redo

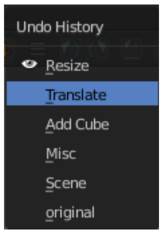
Undo

Undo the last step

Redo

Redo the last undone step

Undo History



Undo History

A click at at the button reveals a list of the last operations where you can undo more than one step.

Repeat

Repeat

Repeats the last action

Repeat History

A click at at the button reveals a list of the last operations where you can choose from wich undo step to repeat.

Scene

The Scene dropdown box to choose and create a new scene data block. The original dropdown box is in the Properties editor in the Scene tab in the Scene panel.

Misc

The Misc toolbar is currently empty besides a placeholder string.

Data System

Data System

Each `.blend` file contains a database. This database contains all scenes, objects, meshes, textures, etc. that are in the file.

A file can contain multiple scenes and each scene can contain multiple objects. Objects can contain multiple materials which can contain many textures. It is also possible to create links between different objects.

Outliner

You can easily inspect the contents of your file by using the *Outliner* editor, which displays all of the data in your .blend file.

The *Outliner* allows you to do simple operations on objects, such as selecting, renaming, deleting, linking and parenting.

Read more about the Outliner

Pack and Unpack Data

Bforartists has the ability to encapsulate (incorporate) various kinds of data within the .blend file that is normally saved outside of the `.blend` file. For example, an image texture that is an external `.jpg` file can be put “inside” the `.blend` file via File ‣ External Data ‣ Pack into .blend file. When the .blend file is saved, a copy of that `.jpg` file is put inside the `.blend` file. The `.blend` file can then be copied or emailed anywhere, and the image texture moves with it.

You know that an image texture is packed because you will see a little “Christmas present gift box” displayed in the header.

Unpack Data

When you have received a packed file, you can File ‣ External Data ‣ Unpack into Files.... You will be presented with the option to create the original directory structure or put the file in the `//` (directory where the .blend file is). Use “original locations” if you will be modifying the textures and re-packing and exchanging .blend files, so that when you send it back and the originator unpacks, his copies of the textures will be updated.

Data-Blocks

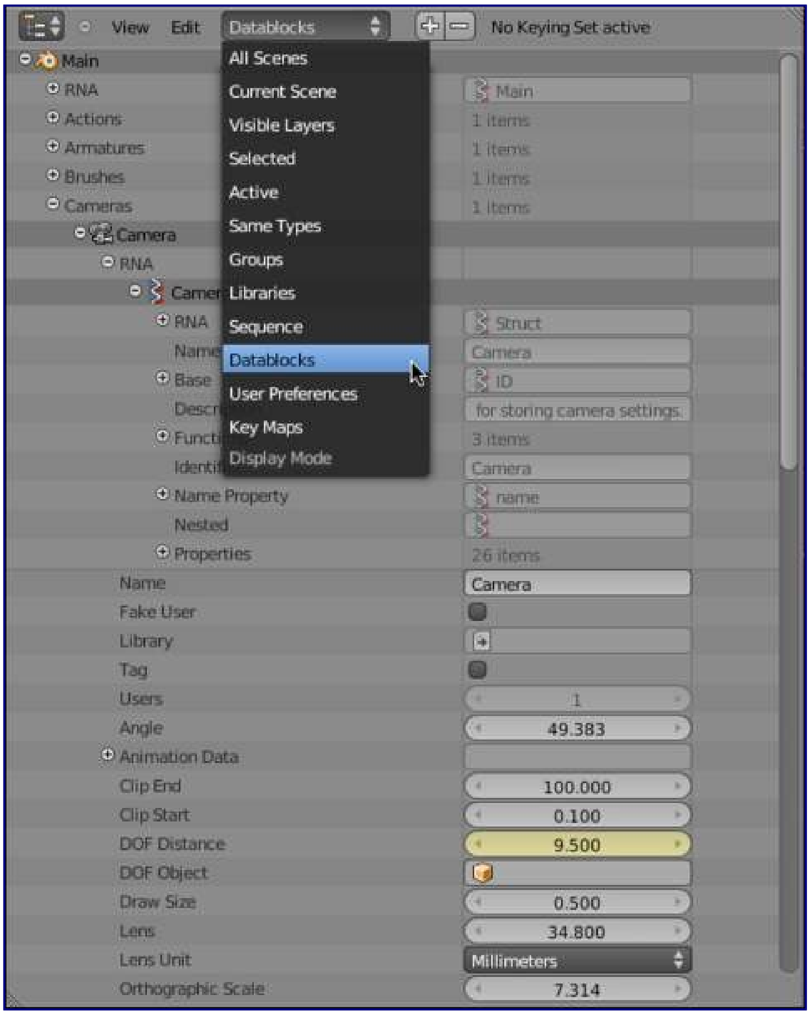
The base unit for any Bforartists project is the data-block. Examples of data-blocks include: meshes, objects, materials, textures, node-trees, scenes, texts, brushes and even screens.

For clarity, bones, sequence strips and vertex groups are **not** data-blocks, they belong to armature, scene and mesh types respectively.

Some common characteristics:

- They're the primary contents of the `.blend` file.
- They can link to each other, for reuse and instancing. *(child/parent, object/object-data, with modifiers and constraints too).*
- Their names are unique.
- They can be added/removed/edited/duplicated.
- They can be linked between files *(only enabled for a limited set of data-blocks)*
- They can have their own animation data.
- They can have custom properties.

When doing more complex projects managing data-blocks becomes more important, especially when inter-linking `.blend` files.



Data-blocks view

Users (Garbage Collection)

It's good to be aware of how Bforartists, handles data-blocks life-time, when they are freed and why.

Bforartists follows the general rule where unused data is eventually removed.

Since its common to add and remove a lot of data while working, this has the advantage of not having to manually manage every single data-block.

This works by skipping zero user data-blocks when writing `.blend` files.

In some cases you want to save a data-block even when its unused *(typically for re-usable asset libraries).* see Fake User.

Fake User

Since zero user data-blocks aren't saved. There are times when you want to force the data to be kept irrespective of its users.

If you're building a `.blend` file to serve as a library of things that you intend to link-to from *other* files, you'll need to make sure that they don't accidentally get deleted from the library file.

Do this by giving the data-blocks a *Fake User,* by pressing the *F* button next to the name of the data-block. This prevents the user count from ever becoming zero: therefore, the data-block won't be deleted. (since Bforartists doesn't keep track of how many other files link to this one.)

Users (Sharing)

Many data-blocks can be shared among other data-blocks,

Examples where sharing data is common.

- Sharing textures among materials.
- Sharing meshes between objects (instances).
- Sharing animated actions between objects, for example to make all the lights dim together.

You can also share data-blocks between files, see.

- *linked libraries*.

Removing Data-Blocks

As covered in Users (Garbage Collection), data-blocks are typically removed when they're no longer used.

There are some exceptions to this however.

The following data-blocks can be removed directly: Scene, Text, Group and Screen.

Other data-blocks such as groups and actions can be *Unlinked* from the *Outliner* context menu.

Tip

Some data (images especially) is hard to keep track of, especially since image views are counted as users.

For data-blocks that can be unlinked - hold `Shift` while pressing on the *X* button, This force-clears the user-count, so the data-block will be removed on reload.

Data-Block Types

For reference, here is a table of data-blocks types stored in `.blend` files.

Link:	Library Linking, *supports bing linked into other blend files*.
Pack:	File Packing, *supports file contents being packed into the blend file*.

Type	Link	Pack	Description
Action	✓	✗	Stores animation FCurves. Used as data-block animation data, and the Non-Linear-Editor.
Armature	✓	✗	Skeleton used to deform meshes. Used as object-data & by the Armature Modifier.
Brush	✓	✗	Used by paint tools.
Camera	✓	✗	Used as object-data.
Curve	✓	✗	Used by camera, font & surface objects.
Font	✓	✓	References font files. Used by Font object-data.
GreasePencil	✓	✗	2D/3D sketch data. Used as overlay *helper* info, by the 3D-View, Image, Sequencer & MovieClip editors.
Group	✓	✗	Reference object’s. Used by dupli-grous & often library-linking.
Image	✓	✓	Image files. Used by textures & shader nodes.
Lamp	✓	✗	Used as object-data.
Lattice	✗	✗	Grid based lattice deformation. Used as object-data and by the Lattice Modifier.
Library	✗	✓	References to external `.blend` files. Access from the outliner’s *Blendfile* view.
LineStyle	✓	✗	Used by the FreeStyle render-engine.
Mask	✓	✗	2D animated mask curves. Used by compositing nodes & sequencer strip.
Material	✓	✗	Set shading and texturing render properties. Used by objects, meshes & curves.
Mesh	✓	✗	Geometry verts/edges/faces. Used as object-data.
MetaBall	✓	✗	An isosurface in 3D space. Used as object-data.
MovieClip	✓	✗	Reference to an image sequence or video file. Used in the motion-tracking editor.
NodeGroup	✓	✗	Collections of re-usable nodes. Used in the node-editor.
Object	✓	✗	An entity in the scene with location, scale, rotation. Used by scenes & groups.
Particle	✓	✗	Particle settings.

Type	Link	Pack	Description
			Used by particle systems.
Palette	✓	✗	Store color presets. Access from the paint tools.
Scene	✓	✗	Primary store of all data displayed and animated. Used as top-level storage for objects & animation.
Screen	✗	✗	Screen layout. Used by each window, which has its own screen.
ShapeKeys	✗	✗	Geometry shape storage, which can be animated. Used by mesh, curve and lattice objects.
Sounds	✓	✓	References to sound files. Used by speaker objects and the game-engine.
Speaker	✓	✗	Sound sources for a 3D scene. Used as object-data.
Text	✓	✗	Text data. Used by Python scripts and OSL shaders.
Texture	✓	✗	2D/3D textures. Used by materials, world and brushes.
World	✓	✗	Used by scenes for render environment settings.

Scenes

Scenes are a way to organize your work. Usually you work with just one scene. But each `.blend` file can contain multiple scenes which share other data such as objects and materials

Scene management and library appending/linking is based on Bforartists's *Library and Data System*, so it is a good idea to read that manual page first if you're not familiar with the basics of that system.

You can select and create scenes with the *Scene selector*

Screen and Scene selectors

Adding a Scene

To add a scene, click on the scene list button, and select *Add New.* While you are adding a new scene, you have these options:

Add scene pop-up menu.

New
: Creates an empty scene with default values.

Copy Settings
: Creates an empty scene but also copies the settings from the active scene into the new one.

Link Objects
: This option creates a new scene with the same settings and contents as the active scene. However, instead of copying the objects, the new scene contains links to the objects in the old scene. Therefore, changes to objects in the new scene will result in the same changes to the original scene, because the objects used are literally the same. The reverse is also true.

Link Object Data

: Creates new, duplicate copies of all of the objects in the currently selected scene, but each one of those duplicate objects will have *links to* the object-data (meshes, materials and so on) of the corresponding objects in the original scene.

: This means that you can change the position, orientation and size of the objects in the new scene without affecting other scenes, but any modifications to the object-data (meshes, materials *etc*) will also affect other scenes. This is because a *single instance of* the “object-data” is now being shared by all of the objects in all of the scenes that link to it.

: More information at the *Window Type* page. This has the effect of making a new independent copy of the object-data.

Full Copy
: Using this option, nothing is shared. This option creates a fully independent scene with copies of the active scenes contents. Every object in the original scene is duplicated, and a duplicate, private copy of its object-data is made as well.

Note

To choose between these options, it’s useful to understand the difference between *Objects* and *Object Data*. See *Duplication*.

The choices for adding a scene, therefore determine just how much of this information will be *copied from* the active scene to the new one, and how much will be *shared* (linked).

Removing a Scene

You can delete the current scene by clicking the *X* next to the name in the Info Editor.

Background Set Scene

You can use a scene as a background, this is typically useful when you want to focus on animating the foreground for example, without background elements getting in the way.

You can assign a *Background* to your current scene from the *Properties Editor Scene* panel.

This scene can have its own animation, physics-simulations etc, but you will have to select it from the *Scene* browser if you want to edit any of its contents.

This can also be used in combination with Linking to a Scene, where one `.blend` file has the environment, which can be re-used in many places.

Linking to a Scene

You can link any object from one scene to another. Just open the scene where these objects are, from the 3d-view header access Obejct -> Make Links... and choose the scene where you want your objects to appear. The selected objects will be added to that scene but remain linked to the original objects.

To make them single user (independent and unlinked) in a given scene go to that scene, select them, then from the 3d-view header access Obejct -> Make Single User. You will be presented with a few options that allow you to free up the data-blocks (Object, Material, Texture...) that you want.

Files

The options to manage files are:

New
: Clears the current scene and loads startup.blend

Open
: Open a blend file

Open Recent
: Displays a list of recently saved .blend files to open

Recover last session
: This will load the quit.blend file Bforartists automatically saves just before exiting. So this option enables you to recover your last work session, e.g. if you closed Bforartists by accident

Recover Auto Save
: This will open an automatically saved file to recover it.

Save
: Save the current blend file.

Save As

Opens file browser to specify file name and location of save.

Save Copy

Saves a copy of the current file.

User Preferences

Opens the user preferences dialog.

Save User Settings

Saves the current scene and preferences to startup.blend.

Load Factory Settings

Restore the default scene to the factory settings.

Link or Append

You don’t have to load a complete file, you can load in only selected parts from another file if you wish.

Import

Bforartists can use information stored in a variety of other format files which are created by other graphics programs.

Export

Normally you save your work in a .blend file, but you can export some or all of your work to a format that can be processed by other graphics programs.

External Data

Pack into .blend

Pack all used external files into the .blend

Unpack into Files

Unpack all files packed into this .blend to external ones

Make all paths Relative

Make all paths to external files relative to current .blend

Make all paths Absolute

Make all paths to external files absolute

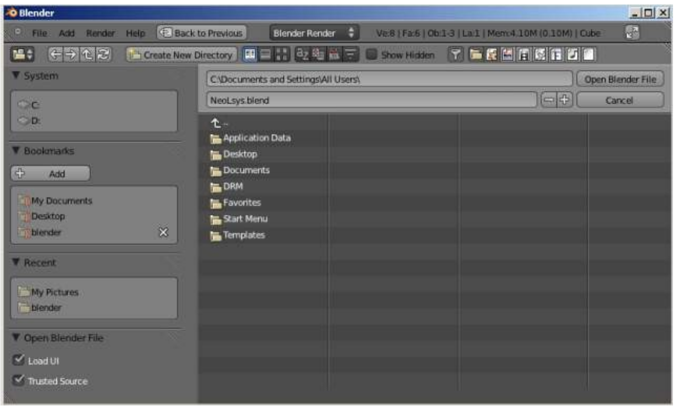
Report Missing Files

Report all missing external files

Find Missing Files

Try to find missing external files

Opening Files



Usage

Reference
Menu: File ‣ Open

The upper text box displays the current directory path, and the lower text box contains the selected filename.

Warning

For Linux and Mac-OSX users:

When existing you are **not** asked to save unsaved changes to the scene you were previously working on. So take care to save your work.

On MS-Windows there is a Save & Load option to warn on exit.

Options

Load UI

Inside each .blend file, Bforartists saves the user interface arrangement. By default, this saved UI is loaded, overriding any user defaults or current screen layouts that you have. If you want to work on the blend file using your own defaults, start a fresh Bforartists, then open the file browser and turn off the *Load UI* button, and then open the file.

Trusted Source

When enabled, Python scripts and drivers that may be included in the file will be run automatically. Enable this only if you created the file yourself, or you trust that the person who gave it to you did not include any malicious code with it. See *Scripting & Security* to configure default trust options.

Other File Open Options

From the *File* menu, you can also open files with the following tools:

Open Recent

Lists recently used files. Click on one to load it in.

Recover Last Session

This will load the `quit.blend` file Bforartists automatically saved just before exiting. This option enables you to recover your last work session if, for example, you closed Bforartists by accident.

Recover Auto Save

This will allow you to open an automatically saved file to recover it.

See also

Auto Saves

Saving Files

Reference

Editor: Info

Menu: File

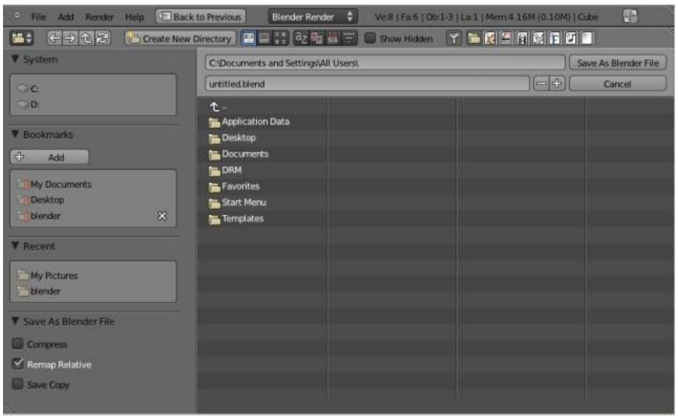
There are a number of slightly different methods you can use to save your blend file to your hard drive:

Save
Save an existing blend file over itself.

Save As
Choose a file to save the blend to.

Save Copy
Choose a file to save the blend to, but return to editing the original file upon completion. This can be used to save backups of the current working state without modifying the original file.

If the file name doesn’t end with `.blend`, the extension is automatically appended. If a file with the same given name already exists, the text field will turn red as a warning.



Tip

Use the **plus/minus** buttons to the right of the file name, or `NumpadPlus`/`NumpadMinus` to increase/decrease a number at the end of the file name (e.g. changing `file_01.blend` to `file_02.blend`).

Options

The save options appear at the bottom of the sidebar.

Compress File
When enabled, the saved file will be smaller, but take longer to save and load.

Remap Relative
This option remaps *relative paths* (such as linked libraries and images) when saving a file in a new location.

Save Copy
This option saves a copy of the actual working state, but does not make the saved file active.

Legacy Mesh Format
Save the blend file, but ignore faces with more than 4 vertices (“ngons”) so that older versions of Bforartists (before 2.63) can open it.

See also

Auto Save

Importing and Exporting Files

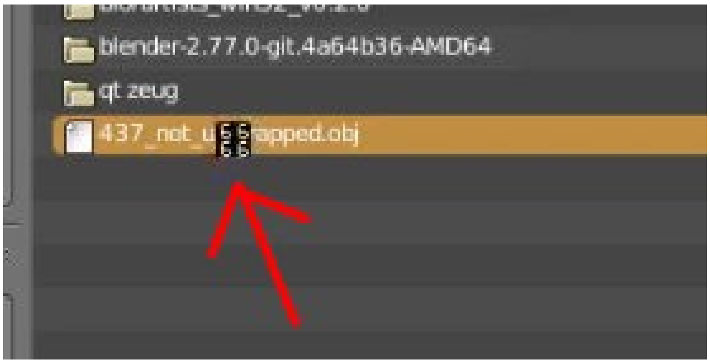
Bforartists supports import and export to and from other file formats (e.g. OBJ, FBX, 3DS, PLY... etc).

These formats can be accessed from the menus: File ‣ Import and File ‣ Export.

Popular formats are enabled by default, other formats are also supported and distributed with Bforartists, these can be enabled in the user-preferences through the use of *Add-ons*.

A list of these add-ons can be found on the Bforartists Add-ons Catalog

In case you wonder why the mouse pointer at import and export turns into this square symbol, this is not a bug. This little thing is a progress bar. Handy for large files where you could have the impression that the import or export is frozen.



Relative Paths

Many Bforartists files reference external images or other linked `.blend` files. A path tells Bforartists where to look for these files. If the external files are moved, the blend file that references them won't look right.

When you specify one of these external files, the default option is to make the path relative. Bforartists stores a partial path evaluated relative to the directory location of the referencing blend file. This choice helps when you need to reorganize folders or move your files.

With a relative path you can move the `.blend` file to a new location provided the externally linked files are moved along with it. For example you could send someone a folder that contains a .blend file and a sub-folder of external images that it references.

Most file selection windows provide a *Relative Path* check box, or when you type in a path into a text field, use a double slash prefix (`//`) to make it so.

Relative paths is the default but this can be changed in the *File Preferences Tab* of the User Preferences Editor.

Note

You can't enter relative paths into a new *untitled* blend file. Save it before linking to external files.

Hint

If it's necessary to relocate a blend file relative to its linked resources, use Bforartists's File *Save As* function which has an option to *Remap Relative* file links.

Supported Graphics Formats

Image Formats

This is the list of image file formats supported internally by Bforartists:

Format	Channel Depth	Alpha	Metadata	DPI	Extensions
BMP	8bit	✗	✗	✓	`.bmp`
Iris	8bit	✓	✗	✗	`.sgi .rgb .bw`
PNG	8, 16bit	✓	✓	✓	`.png`
JPEG	8bit	✗	✓	✓	`.jpg .jpeg`
JPEG 2000	8, 12, 16bit	✓	✗	✗	`.jp2 .jp2 .j2c`
Targa	8bit	✓	✗	✗	`.tga`
Cineon & DPX	8, 10, 12,16bit	✓	✗	✗	`.cin .dpx`
OpenEXR	float 16, 32bit	✓	✓	✓	`.exr`
Radiance HDR	float	✓	✗	✗	`.hdr`
TIFF	8, 16bit	✓	✗	✓	`.tif .tiff`

Hint

If you aren't interested in technical details, a good rule of thumb for selecting an output formats for your project is:

Use OpenEXR
if you intend to do compositing or color-grading on these images.
Use PNG
if you intend on-screen output or encoding into multiple video formats.
Use JPEG
for on-screen output where file size is a concern and quality loss is acceptable.

All these formats support compression which can be important when rendering out animations.

Note

Quicktime

On OSX, Quicktime can be used to access file formats not natively supported (such as GIF).

Channel Depth

Image file formats support a varying number of bits per pixel. This effects the color quality and file-size.

Commonly used depths:

8 bit *(256 levels)*
: Most common for on-screen graphics and video

10,12,16 bit *(1024,4096,65536 levels)*
: Used for some formats focusing on photography and digital film formats (such as DPX and JPEG 2000).

16 bit half float
: Since full 32bit float is often more than enough precision, half float can save on disk-space while providing high dynamic range.

32 bit float
: Highest quality color depth.

Internally Bforartists's image system supports either:

- 8 bit per channel (4 x 8 bits).
- 32 bit float per channel (4 x 32 bits) - *using 4x as much memory.*

  Images higher than 8 bits per channel will be converted into float on loading into Bforartists.

> **Note**
>
> Floating point is often used for HDRI,
>
> When an image has float colors, all imaging functions in Bforartists default to use that. This includes the Video Sequence Editor, texture mapping, background images, and the Compositor.

Metadata

Bforartists can save details such as render-time, marker, camera... etc, into the file. See: *Render Metadata*.

Only some files support this however.

Format Details

Cineon & DPX

Cineon is Kodak's standard for film scanning, 10 bits/channel and logarithmic. DPX has been derived from Cineon as the ANSI/SMPTE industry standard. DPX supports 16 bits color/channel, linear as well as logarithmic. DPX is currently a widely adopted standard used in the film hardware/software industry.

DPX as well as Cineon only stores and converts the "visible" color range of values between 0.0 and 1.0 (as result of rendering or composite).

OpenEXR

ILM's OpenEXR has become a software industry standard for HDR image files, especially because of its flexible and expandable structure.

An OpenEXR file can store multiple layers and passes. This means OpenEXR images can be loaded into a compositor keeping render layers, passes intact.

Output Options

Available options for OpenEXR render output are:

Half
: Saves images in a custom 16 bits per channel floating point format. This reduces the actual "bit depth" to 10 bits, with a 5 bits power value and 1 bit sign.

Zbuf
: Save the depth information. In Bforartists this now is written in floats too, denoting the exact distance from the camera in "Bforartists unit" values.

Preview
: On rendering animations (or single frames via command line), Bforartists saves the same image also as a JPEG, for quick preview or download.

Compression

This button is below the Image menu button, default set to "None"

PIZ
: lossless wavelet compression. Compresses images with grain well.

ZIP
: standard lossless compression using zlib.

RLE
: runlength encoded, lossless, works well when scanlines have same values.

PXR24
: lossy algorithm from Pixar, converting 32 bits floats to 24 bits floats.

Radiance HDR

Radiance is a suite of tools for lighting simulation. Since Radiance had the first (and for a long time the only) HDR image format, this format is supported by many other software packages.

Radiance (.hdr) files store colors still in 8 bits per component, but with an additional (shared) 8 bits exponent value, making it 32 bits per pixel.

Supported Video Formats

Video Formats

These formats are primarily used for compressing rendered sequences into a playable movie (they can also be used to make plain audio files).

A codec is a little routine that compresses the video so that it will fit on a DVD, or be able to be streamed out over the Internet, over a cable, or just be a reasonable file size. Codecs compress the channels of a video down to save space and enable continuous playback. *Lossy* codecs make smaller files at the expense of image quality. Some codecs, like H.264, are great for larger images. Codecs are used to encode and decode the movie, and so must be present on both the encoding machine (Bforartists) and the target machine. The results of the encoding are stored in a container file.

There are dozens, if not hundreds, of codecs, including XviD, H.264, DivX, Microsoft, and so on. Each has advantages and disadvantages and compatibility with different players on different operating systems.

Most codecs can only compress the RGB or YUV color space, but some support the Alpha channel as well. Codecs that support RGBA include:

- animation (quicktime)
- PNG TIFF Pixlet - not loss-less, and may be only available on Mac-OSX.
- Lagarith Loss-less Video Codec

AVI Codec
AVI codec compression. Available codecs are operating-system dependent. When an AVI codec is initially chosen, the codec dialog is automatically launched. The codec can be changed directly using the *Set Codec* button which appears (*AVI Codec settings.*).

AVI Jpeg
AVI but with Jpeg compression. Lossy, smaller files but not as small as you can get with a Codec compression algorithm. Jpeg compression is also the one used in the DV format used in digital camcorders.

AVI Raw
Audio-Video Interlaced (AVI) uncompressed frames.

Frameserver
Bforartists puts out frames upon request as part of a render farm. The port number is specified in the OpenGL User Preferences panel.

H.264
Encodes movies with the H.264 codec. See Advanced Encoding.

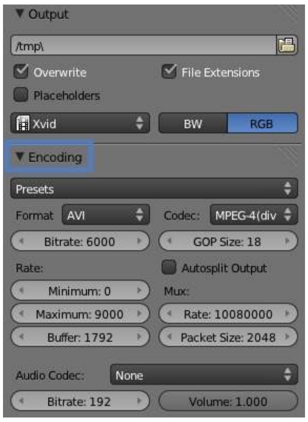
MPEG
Encodes movies with the MPEG codec. See Advanced Encoding.

Ogg Theora
Encodes movies with the Theora codec as Ogg files. See Advanced Encoding.

QuickTime
Apple's Quicktime `.mov` file. The Quicktime codec dialog is available when this codec is installed on OSX. See *Quicktime* in Video Formats.

Xvid
Encodes movies with the Xvid codec. See Advanced Encoding.

Advanced Encoding



If the *H.264*, *MPEG*, *Ogg Theora*, or *Xvid* codecs are chosen, an *Encoding* panel becomes available. This has settings for encoding these file types, and other formats using FFmpeg.

FFmpeg, short for Fast Forward Moving Pictures Expert Group, is a collection of free and open source software libraries that can record, convert and stream digital audio and video in numerous formats. It includes libavcodec, an audio/video codec library used by several other projects, and libavformat, an audio/video container mux and demux library.

Video Settings

Here you choose which video codec you want to use, and compression settings. With all of these compression choices, there is a tradeoff between file size, compatibility across platforms, and playback quality.

When you view the *System Console*, you can see some of the output of the encoding process. You will see even more output if you execute Bforartists as `Bforartists -d`.

You can use the presets, DV, SVCD, DVD, etc. which choose optimum settings for you for that type of output, or you can manually select the format (MPEG-1, MPEG-2, MPEG-4, AVI, Quicktime (if installed), DV, H.264, or Xvid (if installed). You must have the proper codec installed on your computer for Bforartists to be able to call it and use it to compress the video stream.

Video Containers

MPEG-1: `.mpg`, `.mpeg`
: A standard for lossy compression of video and audio. It is designed to compress VHS-quality raw digital video and CD audio down to 1.5 Mbit/s.

MPEG-2: `.dvd`, `.vob`, `.mpg`, `.mpeg`
: A standard for “the generic coding of moving pictures and associated audio information”. It describes a combination of lossy video compression and lossy audio data compression methods which permit storage and transmission of movies using currently available storage media and transmission bandwidth.

MPEG-4(DivX): `.mp4`, `.mpg`, `.mpeg`
: Absorbs many of the features of MPEG-1 and MPEG-2 and other related standards, and adds new features.

AVI: `.avi`
: A derivative of the Resource Interchange File Format (RIFF), which divides a file’s data into blocks, or “chunks.”

Quicktime: `.mov`
: A multi-tracked format. QuickTime and MP4 container formats can use the same MPEG-4 formats; they are mostly interchangeable in a QuickTime-only environment. MP4, being an international standard, has more support.

DV: `.dv`
: An intraframe video compression scheme, which uses the discrete cosine transform (DCT) to compress video on a frame-by-frame basis. Audio is stored uncompressed.

H.264: `.avi` *for now.*
: A standard for video compression, and is currently one of the most commonly used formats for the recording, compression, and distribution of high definition video.

Xvid: `.avi` *for now*
: A video codec library following the MPEG-4 standard. It uses ASP features such as b-frames, global and quarter pixel motion compensation, lumi masking, trellis quantization, and H.263, MPEG and custom quantization matrices. Xvid is a primary competitor of the DivX Pro Codec.

Ogg: `.ogg`, `.ogv`
: A free lossy video compression format. It is developed by the Xiph.Org Foundation and distributed without licensing fees.

Matroska: `.mkv`
: An open standard free container format, a file format that can hold an unlimited number of video, audio,

picture or subtitle tracks in one file.

Flash: `.flv`

A container file format used to deliver video over the Internet using Adobe Flash Player.

Wav: `.wav`

An uncompressed (or lightly compressed) Microsoft and IBM audio file format.

Mp3: `.mp3`

A highly-compressed, patented digital audio encoding format using a form of lossy data compression. It is a common audio format for consumer audio storage, as well as a de facto standard of digital audio compression for the transfer and playback of music on digital audio players.

Video Codecs

None

For audio-only encoding.

MPEG-1

See Video Formats.

MPEG-2

See Video Formats.

MPEG-4(DivX)

See Video Formats.

HuffYUV

Loss-less video codec created by Ben Rudiak-Gould which is meant to replace uncompressed YCbCr as a video capture format.

DV

See Video Formats.

H.264

See Video Formats.

Xvid

See Video Formats.

Theora

See Ogg in Video Formats.

Flash Video

See Video Formats.

FFmpeg video codec #1

A.K.A. FFV1, a loss-less intra-frame video codec. It can use either variable length coding or arithmetic coding for entropy coding. The encoder and decoder are part of the free, open-source library libavcodec in FFmpeg.

Options

Bitrate

Set the average bitrate (quality), which is the count of binary digits per frame. See also: ffmpeg -b:v

Rate

The bitrate control also includes a *Minimum* and a *Maximum*.

Buffer

The decoder bitstream buffer size.

GOP Size

The number of pictures per Group of Pictures. Set to 0 for “intra_only”, which disables inter-frame video. From ffmpeg docs: “For streaming at very low bitrate application, use a low frame rate and a small GOP size. This is especially true for RealVideo where the Linux player does not seem to be very fast, so it can miss frames”

Autosplit Output

If your video is HUGE and exceeds 2Gig, enable Autosplit Output. The main control over output filesize is the GOP, or keyframe interlace. A higher number generally leads to a smaller file, but needs a higher-powered device to replay it.

Mux

Multiplexing settings.

Rate

Maximum bit rate of the multiplexed stream.

Packet Size

(Undocumented in ffmpeg)

> **Note**
>
> Standards
>
> Codecs cannot encode off-the-wall video sizes, so stick to the XY sizes used in the presets for standard TV sizes.

Audio Settings

Audio is encoded using the codec you choose.

Audio Codecs

MP2

A lossy audio compression format defined by ISO/IEC 11172-3.

MP3

See MP3 in Video Formats above.)

AC3

Audio Codec 3, an audio compression technology developed by Dolby Laboratories.

AAC

Advanced Audio Codec,” a standardized, lossy compression and encoding scheme for digital audio.

AAC generally achieves better sound quality than MP3 at similar bit rates.

Vorbis

An open-standard, highly-compressed format comparable to MP3 or AAC.

Vorbis generally achieves better sound quality than MP3 at similar bit rates.

FLAC

Free Loss-less Audio Codec. Digital audio compressed by FLAC’s algorithm can typically be reduced to 50-60% of its original size, and decompressed into an identical copy of the original audio data.

PCM

Pulse Code Modulation, a method used to digitally represent sampled analog signals. It is the standard form for digital audio in computers and various Blu-ray, Compact Disc and DVD formats, as well as other uses such as digital telephone systems

Bitrate

For each codec, you can to control the bitrate (quality) of the sound in the movie. This example shows MP3 encoding at 128kbps. Higher bitrates are bigger files that stream worse but sound better. Stick to powers of 2 for compatibility.

Samplerate

Samplerate controls the number of samples per second of the audio. The default, 44100, is standard for many file types, including CD audio, and produces a high quality sound.

Volume

Set the output volume of the audio.

Tips

Choosing which format to use depends on what you are going to do with the image.

If you are animating a movie and are not going to do any post-processing or special effects on it, use either **AVI-JPEG** or **AVI Codec** and choose the XviD open codec. If you want to output your movie with sound that you have loaded into the VSE, use **FFMPEG**.

If you are going to do post-processing on your movie, it is best to use a frame set rendered as **OpenEXR** images; if you only want one file, then choose **AVI Raw**. While AVI Raw is huge, it preserves the exact quality of output for post-processing. After post-processing (compositing and/or sequencing), you can compress it down. You don’t want to post-process a compressed file, because the compression artifacts might throw off what you are trying to accomplish with the post-processing.

Note that you might not want to render directly to a video format. If a problem occurs while rendering, you have to re-render all frames from the beginning. If you first render out a set of static images (such as the default PNG, or the higher-quality OpenEXR), you can stitch them together with an Image Strip in the *Video Sequence Editor (VSE)*. This way, you can easily:

- Restart the rendering from the place (the frame) where the problem occurred.
- Try out different video options in seconds, rather than minutes or hours.
- Enjoy the rest of the features of the VSE, such as adding Image Strips from previous renders, audio, video clips, etc.

Append and Link

These functions help you reuse materials, objects and other *data-blocks* loaded from an external source `.blend` file. You can build libraries of common content and share them across multiple referencing files.

Link creates a reference to the data in the source file such that changes made there will be reflected in the referencing file the next time it is reloaded.

Where as *Append* makes a full copy of the data into your `.blend`. You can make further edits to your local copy of the data, but changes in the external source file will not be reflected in the referencing file.

Reference
Mode: All Modes Menu: *File –> Append or Link*

In the *File Browser* window navigate to the external source `.blend` file and select the data-block you want to reuse.

Options:

Relative Path
: Available only when linking, see *relative paths*.

Select
: Makes the object *Active* after it is loaded.

Active Layer
: Enabled by default, the object is assigned to the visible layers in your scene. Otherwise, it is assigned to the same layers it resides on in the source file.

Instance Groups
: This option links the Group to an object, adding it to the active scene.

When you select an Object type, it will be placed in your scene at the cursor. Many other data types - cameras, curves, and materials for example - must be linked to an object before they become visible.

Newly added Group types are available in Add ‣ Group Instances in 3D View, or for NodeTree groups, the same menu in the Node Editor.

Look in the Outliner, with display mode set to *Bforartists File*, to see all your linked and appended data-blocks. `Ctrl-LMB` on a file name allows you to redirect a link to another file.

Hint

You cannot move a linked object. Its position is defined in its source file.

If you want to modify the object locally you can either:

Use *Dupli-Groups*

> Instead of linking in *Objects* directly, its often more useful to link in *Groups*, which can be assigned to empties and moved, while maintaining the link to the original file.
>
> Its also useful to be able to add/remove objects from the group without having to manage linking in multiple objects.

Make Objects Local

> Use Object ‣ Make Local ‣ Selected Objects to make the position editable.
>
> This means that object data (animation, constraints, modifiers...) will be local to your `.blend` file. But the object-data will still be linked and remain immutable.

Note

Appending data you already have linked, will add objects / groups to the scene, but will keep them linked (and un-editable).

This is done so existing relationships with linked data remain intact.

Proxy Objects

Used with rigged models, proxy objects, allow specified bone layers to be linked back to the source file while the remainder of the object and its skeleton are edited locally.

`Ctrl-Alt-P*` makes the active linked object into a local proxy, appending *_proxy* to its name.

* I hate it. Dear Blender developers. Ever thought that users wants to know WHAT TOOL is meant, not WHAT HOTKEY ? - To Do

Set the *Protected Layers* in the source file using using the Skeleton panel of the Armatures tab. See Armature Layers. The bones in protected layers will have their position restored from the source file when the referencing file is reloaded.

Known Limitations

For the most part linking data will work as expected, however there are some corner-cases which aren't supported.

Circular Dependencies

In general dependencies shouldn't go in both directions.

Attempting to link or append data which links back to the current file will likely result in missing links.

Object Rigid-Body Constraints

When linking objects **directly** into a `.blend` file, the *Rigid Body* settings won't be linked in since they're associated with their scenes world.

As an alternative you could link in the entire scene and set it as a Background Set Scene.

5.1 Modeling - Meshes

Modeling

The creation of a 3D scene needs at least three key components: Models, Materials and Lights. In this part, we will delve deeper into the creation of the first of these: modeling. Modeling is the art and science of creating a surface that either mimics the shape of a real-world object or expresses your imagination of abstract objects.

There are three primary types of modeling - mesh modeling, curve/surface modeling, and meta modeling.

Mesh Modeling

is done within the *3D View* and typically begins with a primitive shape (e.g. circle, cube, cylinder...).

This *Mesh Primitive* is defined by an array of points in 3D space called vertices (singular form is Vertex). From there you might begin extruding faces and moving vertices to create a larger, more complex shape.

Mesh Modeling Modes

The 3D View has three principal modes that allow for the creation of, editing and manipulation of the mesh models. Each of the three modes have a variety of tools. Some tools may be found in one or more of the modes.

Modes that used for modeling:

- Object Mode
- Edit Mode
- Sculpt Mode

Creation of a mesh primitive typically starts by adding a mesh object in *Object Mode*. Limited types of editing such as size, location, and orientation can be accomplished in *Object Mode*. *Object mode* also provides the means to Join and Group multiple mesh primitives.

More detailed editing of the mesh model shape is done in *Edit Mode*, and *Sculpt Mode*. The nature of these three modes determines the tools that are available within the various panels of the 3D View. Switching between modes while modeling is common. Some tools may be available in more than one mode while others may be unique to a particular mode.

Curve modeling
Uses control points to define the shape of the curve.

Surface modeling
Similar to curve modeling, but instead of being limited to simple linear paths, they allow the creation of three dimensional surfaces, potentially with volume.

Meta Object (Metaball) Modeling

begins similarly to mesh modeling, with a base shape like a cube or sphere, but instead of extruding these base shapes, these objects are clumped together to form a larger object. In order to accomplish this, the metaballs have a liquid-like quality, when two or more are brought together they merge by smoothly rounding out the point of connection, appearing as one unified object.

This can also be a quick way to get started with a rough shape which can be converted to a mesh later.

Text Modeling -

inserting text is quite common for the creation of logos, and can be seen as a special case of neither curve nor mesh modeling.

You may define the text, font, bevel, extruded width and several other parameters that control generated object.

Scripted Modeling

Since Bforartists functionality is extensible via Python scripting, there are a number of very useful scripts that assist you in modeling. They may give you new mesh primitives to work with, or apply some fancy manipulation of the meshes that you are already working with.

Modeling scripts are an advanced topic, while not essential automating some tasks can be a huge time saver in certain cases.

Meshes

Meshes are the polygonal objects.

Edit Mode

Entering Edit Mode

You can work with geometric objects in two modes.

Object Mode
Operations in *Object Mode* affect the whole object. **Object Mode** has the following header in the 3D view:

Object Mode Header.

Edit mode

Operations in *Edit mode* affect only the geometry of an object, but not global properties such as location or rotation. **Edit Mode** has the following header in the 3D view:

Edit Mode Header.

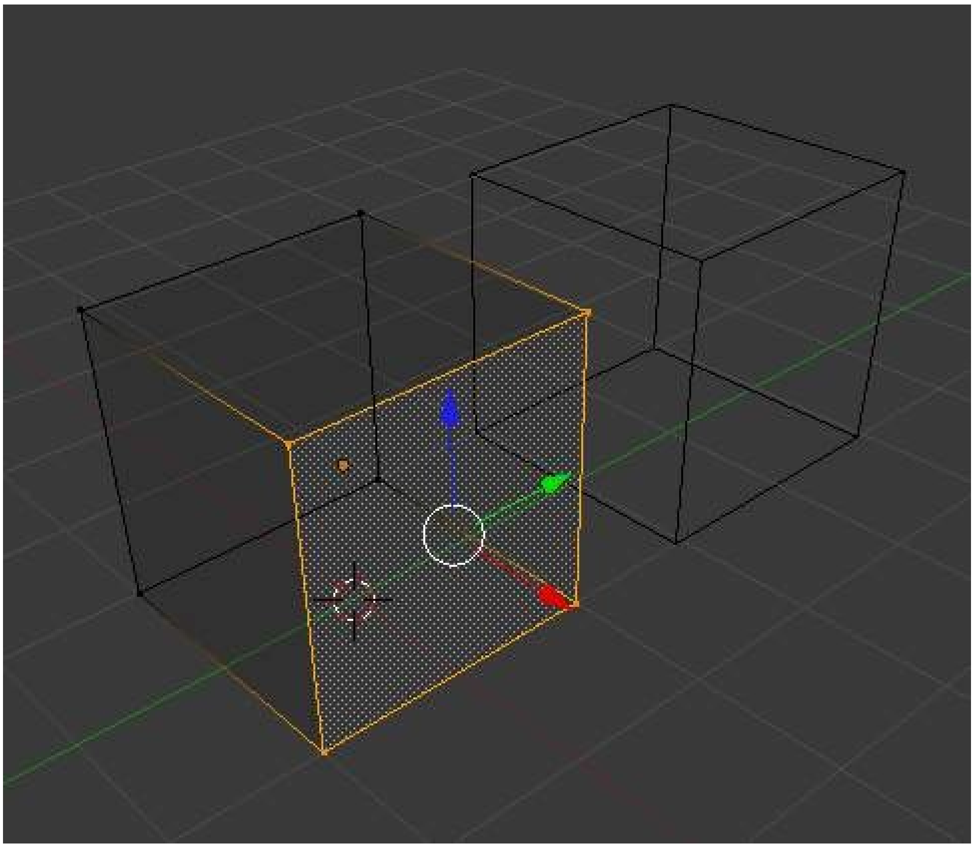
Tools and modes in the 3D view header are (left to right):

- View, Select, and Mesh menus
- Bforartists Mode
- Display method for 3D view
- Pivot center
- 3D manipulator widget
- Selection mode
- Depth buffer clipping (hide
- Proportional editing
- Snap
- OpenGL render

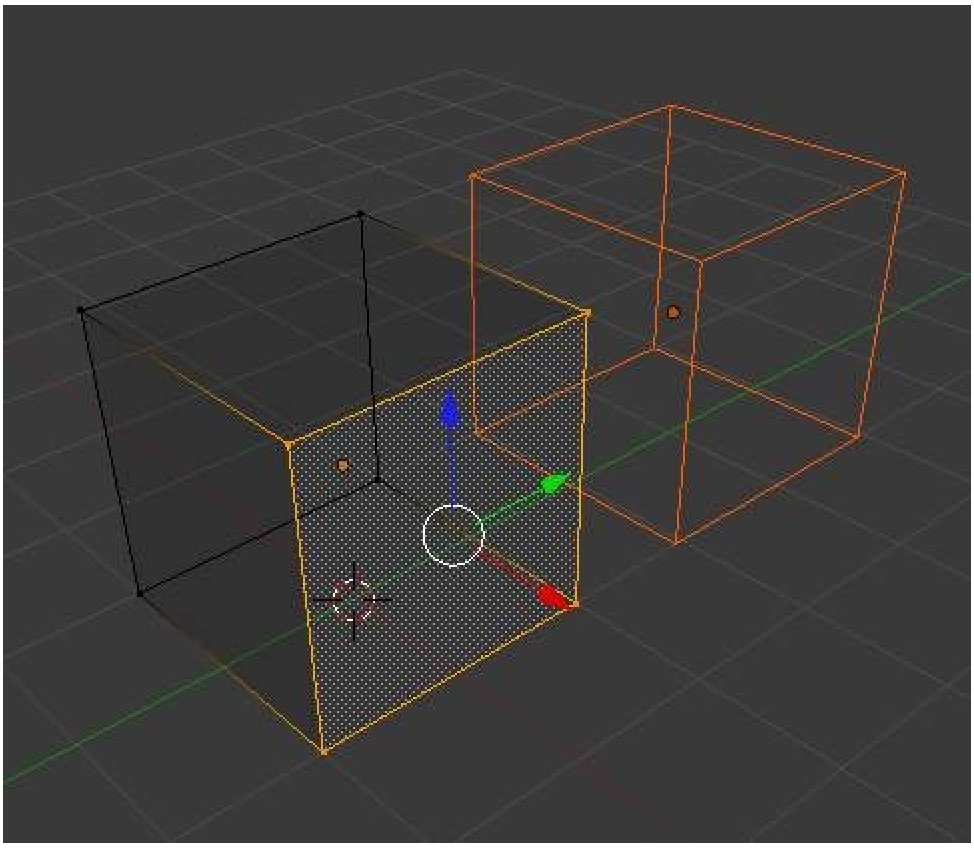
You can switch between the Object and Edit modes with the `Tab` key. You can change to any mode by selecting the desired *Mode* in the menu in the 3d view header.

After creating an object youd may be immediately placed in *Edit mode* - depending on whether the *Switch to Edit Mode* button is toggled in the *User Preferences Editing* tab. *Edit mode* only applies to one object at a time, the *active*, or most recently selected, object.

Visualization



One cube selected



Two cubes selected before entering Edit mode

By default, Bforartists highlights selected geometry in orange in both *Object mode* and *Edit mode*.

In *Object mode* with *Wireframe* shading enabled , objects are displayed in black when unselected and in orange when selected. If more than one object is selected, all selected object except the active object, typically the object last selected, is displayed in a darker orange color. Similarly, in *Edit mode*, unselected geometry is drawn in black while selected faces, edges, or vertices are drawn in orange. The active face is highlighted in white.

In *Edit mode*, only one mesh can be edited at the time. However, several objects can be joined into a single mesh and then separated again. If multiple objects are selected before entering *Edit mode*, all the selected objects remain highlighted in orange indicating that they are part of the active selection set.

If two vertices joined by an edge are selected in *Vertex selection mode*, the edge between them is highlighted too. Similarly, if enough vertices or edges are selected to define a face, that face is also highlighted.

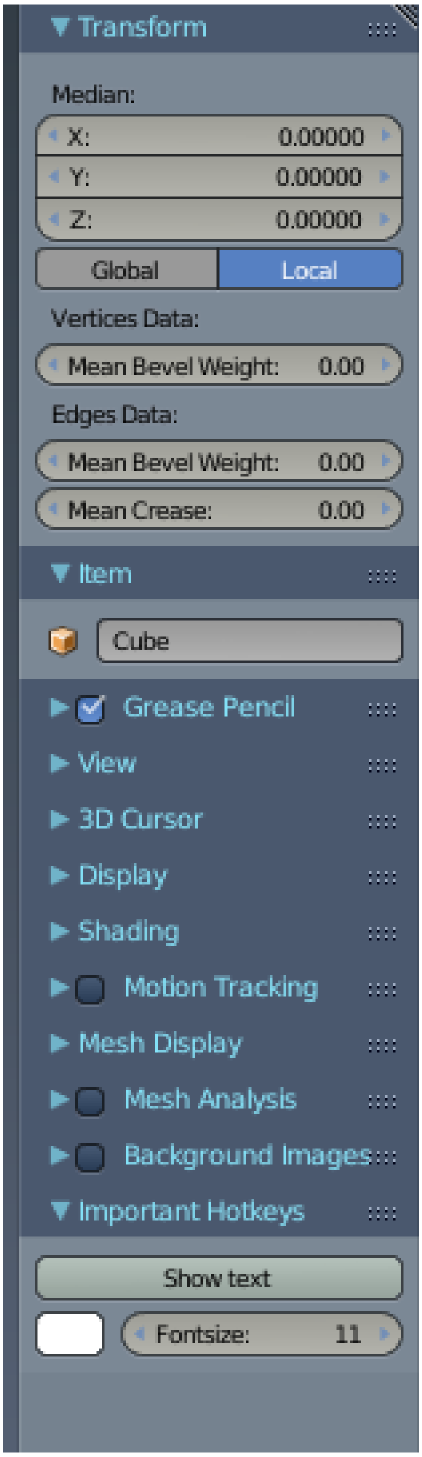
Tool Shelf

When entering *Edit mode*, several mesh tools become available.

Even more mesh editing tools can be enabled in the *User Preferences* ‘ *Add-ons* section.

For further information on panels see *Panels*.

Properties Shelf

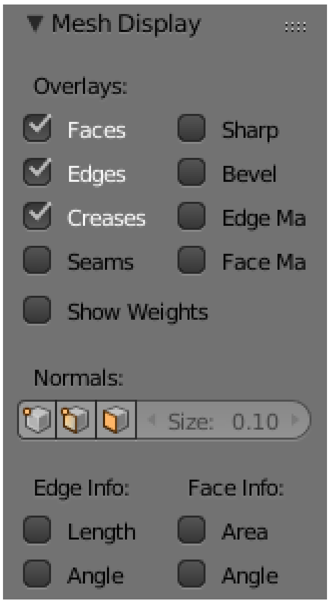


The Properties Shelf panel in edit mode (panel split in two parts for layout reasons)

In the *Properties Shelf*, panels directly related to mesh editing are the *Transform* panel, where numeric values can be entered, and the *Mesh Display* panel, where for example normals and numeric values for distances, angles, and areas can be turned on.

Other useful tools are found in the *Properties Editor* under the *Object* ‘s and *Object Data* ‘s *Context buttons*, including display options and *Vertex groups*.

Mesh Display



Mesh Display Panel

This panel is available only in edit mode, when the object being edited is a mesh.

The Overlays section provides controls for highlighting parts of the mesh.

Edges
: Toggles the option to see the selected edges highlighted. If enabled the edges that have both vertices selected will be highlighted This only affects in vertex selection mode and when *UV Unwrapping*.

Faces
: Defines if the selected faces will be highlighted in the *3D Viewport*. This affects all selection modes.

Creases and Bevel Weight
: Highlights edges marked with a crease weight for the *Subdivision Surface Modifier* and/or a bevel weight for the *Bevel Modifier*, respectively. In both cases, the higher the weight, the brighter the highlight.

Seams and Sharp
: Highlights edges marked as an UV seam for unwrapping and/or sharp edges for the *Edge Split Modifier*

Normals Section:

We can choose to show or not the normals of faces and/or vertices using the Face and Vertex tick boxes, under the Normals section. In addition, we can define the size of these with Normal Size.

The Numerics section lets us see some numerical measures of the selected elements on screen:

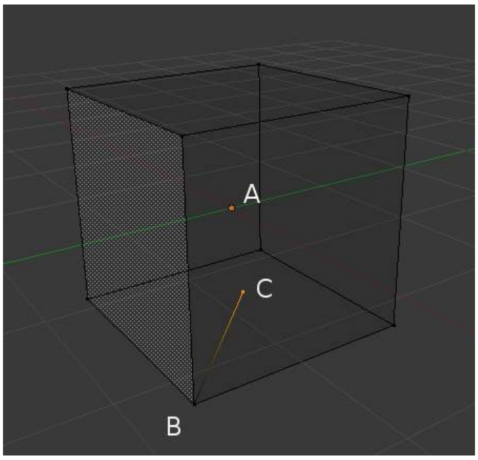
Edge Length
: shows the lenghts, in Bforartists units, of the selected edges.

Face Angles and Face Area
: show the angles (in degrees) and area (in square Bforartists units) of the selected faces.

Vertices, Edges and Faces

With meshes, everything is built from three basic structures: *Vertices*, *Edges* and *Faces*.

Vertices



Vertex example

A vertex is primarily a single point or position in 3D space. It is usually invisible in rendering and in *Object mode*. Don't mistake the center point of an object for a vertex. It looks similar, but it's bigger and you can't select it. (*Vertex example*) shows the center point labeled as `A`. `B` and `C` are vertices.

A simple way to create a new vertex is to click `Ctrl-LMB` in *Edit mode*. Of course, as a computer screen is two-dimensional, Bforartists can't determine all three vertex coordinates from a single mouse click, so the new vertex is placed at the depth of the 3D cursor. Using the method described above, any vertices selected previously are automatically connected to the new ones by an edge. In the image above, the vertex labeled *C* is a new vertex added to the cube with a new edge added between in *B* and *C*.

Edges

An edge always connects two vertices by a straight line. The edges are the "wires" you see when you look at a mesh in wireframe view. They are usually invisible on the rendered image. They are used to construct faces.

Faces

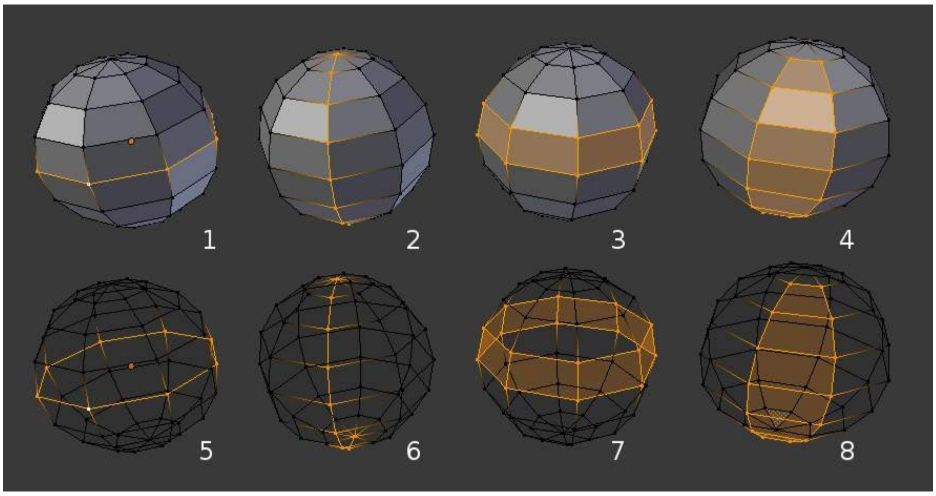
Faces are used to build the actual surface of the object. They are what you see when you render the mesh. If this area does not contain a face, it will simply be transparent or non-existent in the rendered image.

A face is defined as the area between either three (triangles), four (quadrangles) or more (ngons) vertices, with an edge on every side. These are often abbreviated to *tris, quads & ngons*.

Triangles are always flat and therefore easy to calculate. On the other hand, quadrangles "deform well" and are therefore preferred for subdivision modeling.

While you could build a cube with triangular faces, it would just look more confusing in *Edit mode*.

Loops



Edge and Face Loops

Edge and *Face Loops* are sets of faces or edges that form continuous “loops” as shown in (*Edge and Face Loops*). The top row (1 - 4) shows a solid view, the bottom row (5 - 8) a wireframe view of the same loops.

Note that loops 2 and 4 do not go around the whole model. Loops stop at so called poles because there is no unique way to continue a loop from a pole. Poles are vertices that are connected to either three, five, or more edges. Accordingly, vertices connected to exactly one, two or four edges are not poles.

In the image above, loops that do not end in poles are cyclic (1 and 3). They start and end at the same vertex and divide the model into two partitions. Loops can be a quick and powerful tool to work with specific, continuous regions of a mesh and are a prerequisite for organic character animation. For a detailed description of how to work with loops in Bforartists, see: *Advanced Selection*.

Edge Loops

Loops 1 and 2 in (*Edge and Face Loops*) are edge Loops. They connect vertices so that each one on the loop has exactly two neighbors that are not on the loop and placed on both sides of the loop (except the start and end vertex in case of poles).

Edge Loops are an important concept especially in organic (subsurface) modeling and character animation. When used correctly, they allow you to build models with relatively few vertices that look very natural when used as subdivision surfaces and deform very well in animation.

Take (*Edge Loops in organic modeling*) as an example: the edge loops follow the natural contours and deformation lines of the skin and the underlying muscles and are more dense in areas that deform more when the character moves, for example at the shoulders or knees.

Further details on working with Edge Loops can be found in Edge Loop Selection.

Face Loops

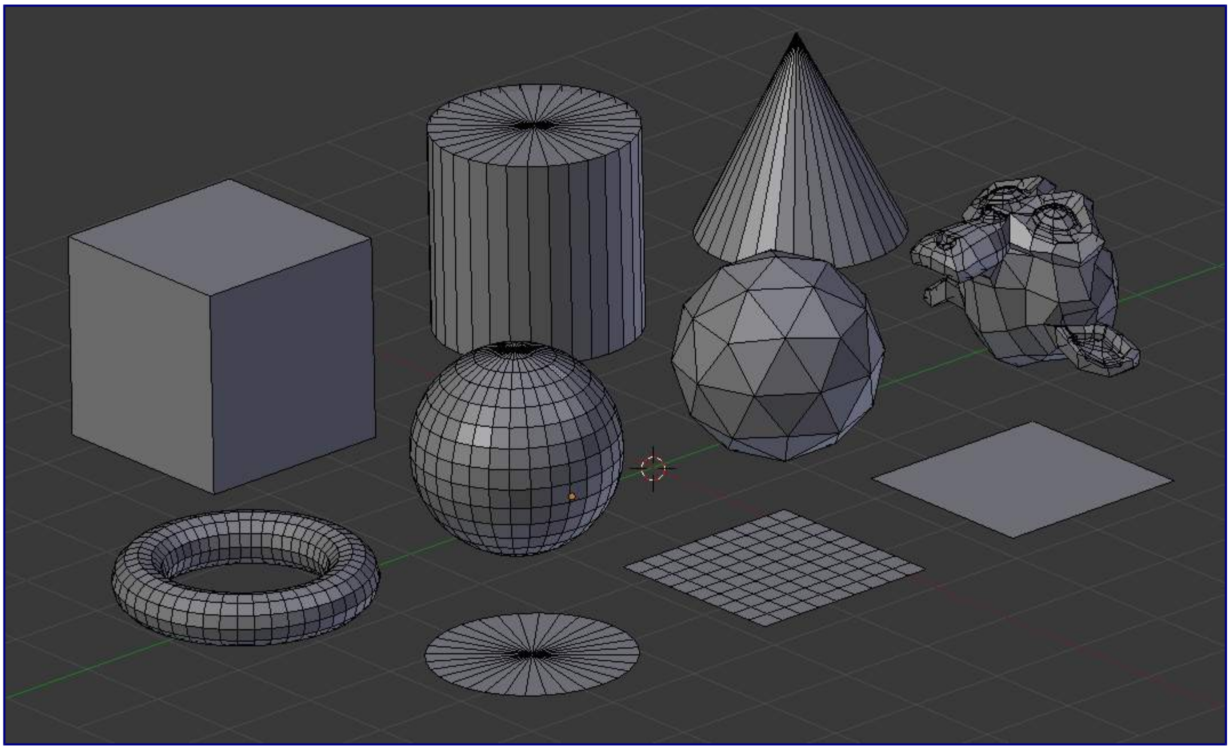
These are a logical extension of Edge Loops in that they consist of the faces between two Edge Loops, as shown in loops 3 and 4 in (*Edge and Face Loops*). Note that for non-circular loops (4) the faces containing the poles are not included in a Face Loop.

Further details on working with Face Loops can be found in Face Loop Selection.

Mesh Primitives

Reference
Mode: *Object* mode Menu: Toolshelf > Add Primitive

A common object type used in a 3D scene is a mesh. Bforartists comes with a number of “primitive” mesh shapes that you can start modeling from.



Bforartists’s ten standard primitives

Options included in more than one primitive are:

Radius
Sets the starting size for *Circle*, *Cylinder*, *Cone*, *UVSphere* and *IcoSphere*.

Depth
Sets the starting length for *Cylinder* and *Cone*.

Note
Note about planar primitives You can make a planar mesh three-dimensional by moving one or more of the vertices out of its plane (applies to *Plane*, *Circle* and *Grid*). A simple circle is actually often used as a starting point to create even the most complex of meshes.

Plane

A standard plane contains four vertices, four edges, and one face. It is like a piece of paper lying on a table; it is not a real three-dimensional object because it is flat and has no thickness. Objects that can be created with planes include floors, tabletops, or mirrors.

Cube

A standard cube contains eight vertices, twelve edges, and six faces, and is a real three-dimensional object. Objects that can be created out of cubes include dice, boxes, or crates.

Circle

A standard circle is comprised of *n* vertices. The number of vertices and radius can be specified in the context panel in the *Tool Shelf* which appears when the circle is created.

Vertices
: The number of vertices that define the circle. The more vertices the circle contains, the smoother its contour will be; see (*"Circles" obtained with various settings*). In contrast, a circle with only 3 vertices is actually a triangle - the circle is actually the standard way of adding polygons such as triangles, pentagons, et cetera.

Radius
: Sets the radius of the circle.

Fill Type
: Set how the circle will be filled

  Triangle Fan
  : Fill with triangular faces which share a vertex in the middle.

  Ngon
  : fill with a single ngon

  Nothing
  : Do not fill. Creates only the outer ring of vertices

UV Sphere

A standard UV sphere is made out of *n* segments and *m* rings. The level of detail and radius can be specified in the context panel in the *Tool Shelf* which appears when the UV sphere is created. Increasing the number of segments and rings makes the surface of the UV sphere smoother.

Segments
: Number of vertical segments. Like Earth's meridians, going pole to pole and

Rings
: Number of horizontal segments. These are like Earth's parallels.

> **Note**
>
> If you specify a six segment, six ring UVsphere you'll get something which, in top view, is a hexagon (six segments), with five rings plus two points at the poles. Thus, one ring fewer than expected, or one more, if you count the poles as rings of radius 0.

Icosphere

An icosphere is a polyhedra sphere made up of triangles. The number of subdivisions and radius can be specified in the context panel in the *Tool Shelf* after the Icosphere is created. Icospheres are normally used to achieve a more isotropical and economical layout of vertices than a UV sphere.

Subdivisions
: How many recursions are used to define the sphere. Increasing the number of subdivisions makes the surface of the Icosphere smoother. At level 1 the Icosphere is an icosahedron, a solid with 20 equilateral triangular faces. Any increasing level of subdivision splits each triangular face into four triangles, resulting in a more spherical appearance.

Size
: The radius of the sphere.

Note

It is possible to add an icosphere subdivided 500 times. Adding such a dense mesh is a sure way to cause a program crash. An icosphere subdivided 10 times would have 5,242,880 triangles, so be very careful about this!

Cylinder

A standard cylinder is made out of *n* vertices. The number of vertices in the circular cross-section can be specified in the context panel in the *Tool Shelf* that appears when the object is created; the higher the number of vertices, the smoother the circular cross-section becomes. Objects that can be created out of cylinders include handles or rods.

Vertices
: Then number of vertical edge loops used to define the cylinder. Similarly to the circle, specifying a small number of vertices produces an object with a polygonal cross section (a prism).

Radius
: Sets the radius of the cylinder.

Depth
: Sets the height of the cylinder.

Cap Fill Type
: Similar to circle (see above). When set to none, the created object will be a tube. Objects that can be created out of tubes include pipes or drinking glasses (the basic difference between a cylinder and a tube is that the former has closed ends).

Cone

A standard cone is made out of *n* vertices. The number of vertices in the circular base, dimensions and option to close the base of the cone can be specified in the context panel in the *Tool Shelf* that appears when the object is created; the higher the number of vertices, the smoother the circular base becomes. Objects that can be created out of cones include spikes or pointed hats.

Vertices
: The number of vertical edge loops used to define the cone. Similarly to the circle and cylinder, specifying a small number of vertices produces an object with a polygonal base section (a pyramid).

Radius 1

Sets the radius of the base of the cone.

Radius 2

Sets the radius of the tip of the cone. A value of 0 will produce a standard cone shape.

Depth

Sets the height of the cylinder.

Base Fill Type

Similar to circle (see above).

Torus

A doughnut-shaped primitive created by rotating a circle around an axis. The overall dimensions are defined by the *Major* and *Minor Radius*. The number of vertices (in segments) can be different for the circles and is specified in the context panel in the *Tool Shelf* with both radii (*Major Segments* and *Minor Segments*).

Major Radius

Radius from the origin to the center of the cross sections

Minor Radius

Radius of the torus's cross section

Major Segments

Number of segments for the main ring of the torus. If you think of a torus as a "spin" operation around an axis, this is how many steps in the spin.

Minor segments

Number of segments for the minor ring of the torus. This is the number of vertices of each circular segment.

Use Int+Ext Controls

Change the way the torus is defined:

Exterior Radius

When *Use Int+Ext Controls* is active, if viewed along the major axis, this is the radius from the center to the outer edge.

Interior Radius

When *Use Int+Ext Controls* is active, if viewed along the major axis, this is the radius of the hole in the center.

Grid

A standard grid is made out of *n* by *m* vertices. The resolution of the x-axis and y-axis can be specified in the context panel in the *Tool Shelf* which appears when the object is created; the higher the resolution, the more vertices are created. Example objects that can be created out of grids include landscapes (with the proportional editing tool or *Displace* modifier) and other organic surfaces. You can also obtain a grid when you create a plane and then use a subdivide modifier in *Edit mode*. However, there is a *Landscape* add-on available in the *User Preferences*.

X Subdivisions

The number of spans in the x direction. Minimum of 3, creating two face loops.

Y Subdivisions

The number of spans in the y direction.

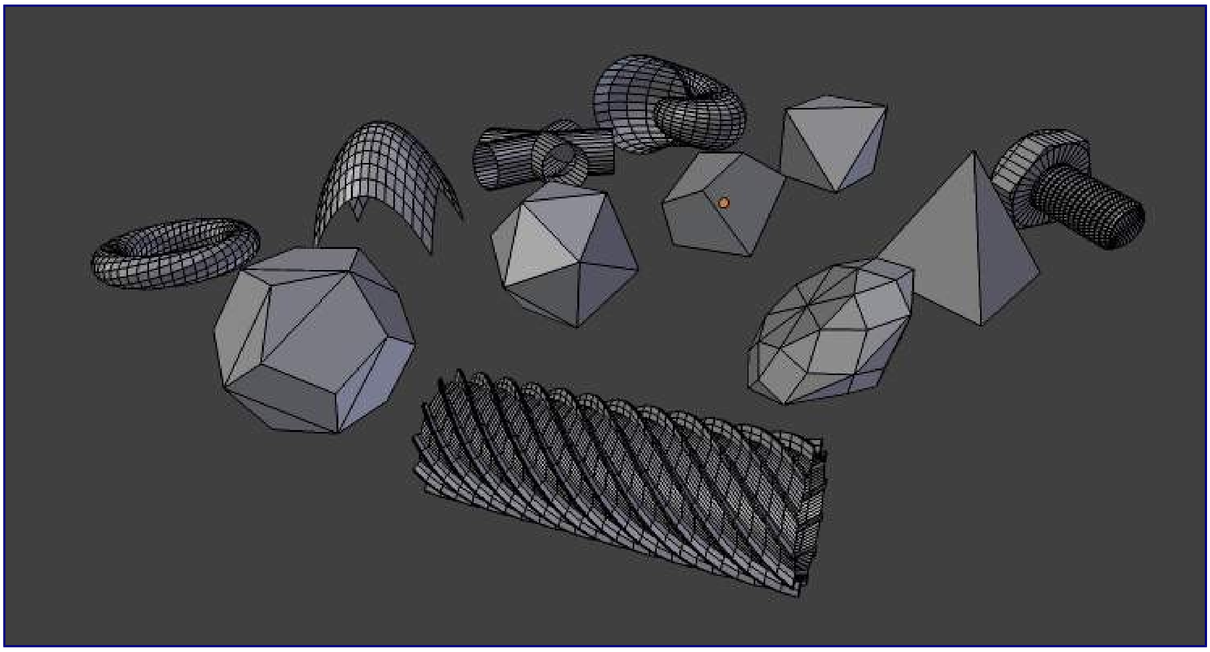
Size

The length of the sides of the grid.

Monkey

This is a gift from old NaN to the community and is seen as a programmer’s joke or “Easter Egg”. It creates a monkey’s head once you press the *Monkey* button. The Monkey’s name is “Suzanne” and is Bforartists’s mascot. Suzanne is very useful as a standard test mesh, much like the Utah Tea Pot or the Stanford Bunny.

Add-ons



A few of the mesh primitives available as add-ons.

In addition to the basic geometric primitives, Bforartists has a constantly increasing number of script generated meshes to offer as pre-installed add-ons. These become available when enabled in the *User Preferences* ‘ *Add-ons* section (filter by *Add Mesh*). Only a few are mentioned here:

Landscape
: Adds a landscape primitive. Many parameters and filters appear in the *Tool Shelf*.

Pipe Joints
: Adds one of five different pipe joint primitives. Radius, angle, and other parameters can be changed in the *Tool Shelf*.

Gears
: Adds a gear or a worm with many parameters to control the shape in the *Tool Shelf*.

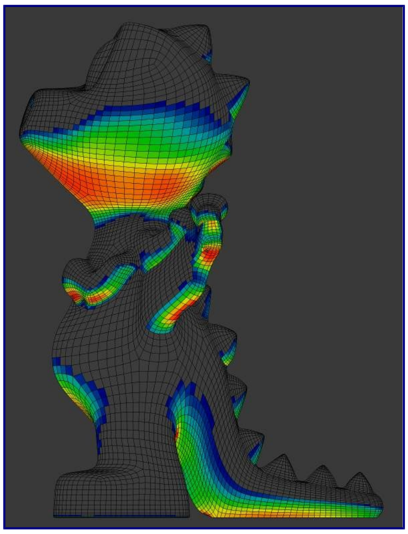
Mesh Analysis

Mesh analysis is useful for displaying attributes of the mesh that may impact certain use cases.

The mesh analysis works in editmode and shows areas with a high value in red, and areas with a low value in blue. Geometry outside the range is displayed grey.

Currently the different modes target 3d-printing as their primary use.

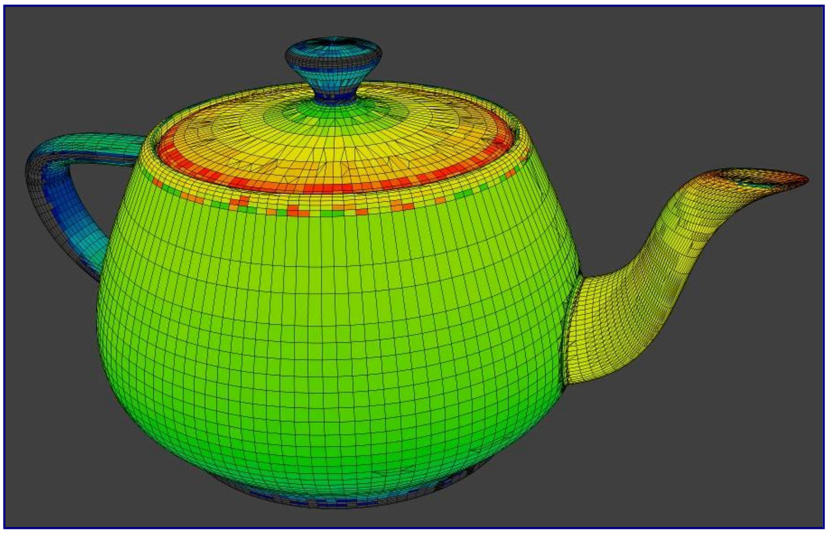
Overhang



Overhang

Extrusion 3D printers have a physical limit to the overhang that can be printed, this display mode shows the overhang with angle range and axis selection.

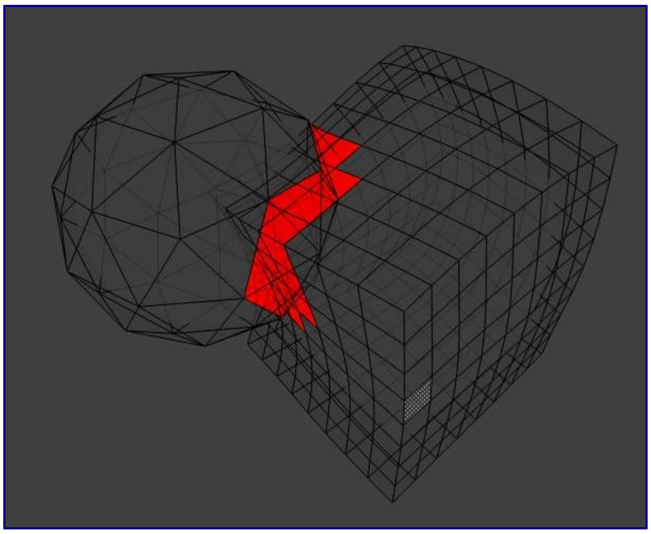
Thickness



Thickness

Printers have a limited *wall-thickness* where very thin areas can't be printed, this test uses ray casting and a distance range to the thickness of the geometry.

Intersections

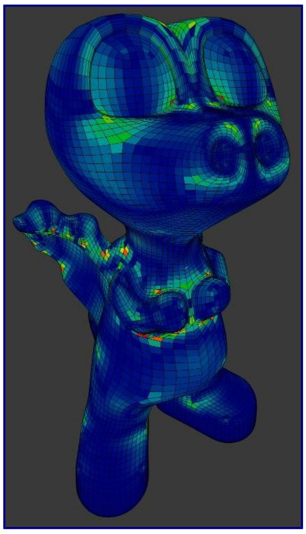


Intersecting faces

Another common cause of problems for printing are intersections between surfaces, where the inside/outside of a model can't be reliably detected.

Unlike other display modes, intersections have no variance and are either on or off.

Distortion

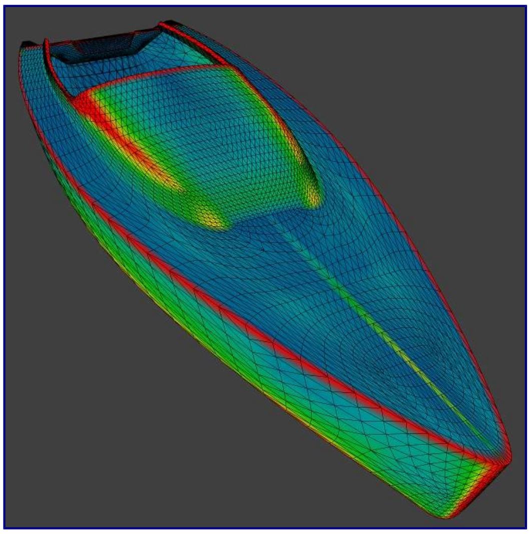


Distorted Faces

Distorted geometry can cause problems since the triangulation of a distorted ngon is undefined.

Distortion is measured by faces which are not flat, with parts of the face pointing in different directions.

Sharp Edges



Sharp edges

Similar to wall-thickness, sharp edges can form shapes that are too thin to be able to print.

Warning

There are some known limitations with mesh analysis

- Currently only displayed with deform modifiers.
- For high-poly meshes is slow to use while editing the mesh.

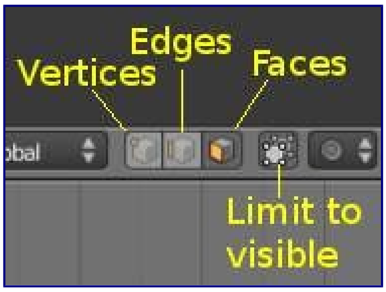
Selecting

Selecting Mesh Components

There are many ways to select elements, and it depends on what *Mesh Select Mode* you are in as to what selection tools are available. First we will go through these modes and after that a look is taken at basic selection tools.

Selection Mode

Select Mode Header Widgets



Edit mode selection buttons

In *Edit mode* there are three different selection modes. You can enter the different modes by selecting one of the three buttons in the toolbar.

Vertices

In this mode vertices are drawn as points.

Selected vertices are drawn in orange, unselected vertices in black, and the active or last selected vertex in white.

Edges

In this mode the vertices are not drawn.

Instead the selected edges are drawn in orange, unselected edges black, and the active or last selected edge in white.

Faces

In this mode the faces are drawn with a selection point in the middle which is used for selecting a face.

Selected faces and their selection point are drawn in orange, unselected faces are drawn in black, and the active or last selected face is highlighted in white.

When using these button, you can make use of modifier keys, see: Switching Select Mode.

Almost all tools are available in all three mesh selection modes. So you can *Rotate*, *Scale*, *Extrude*, etc. in all modes. Of course rotating and scaling a *single* vertex will not do anything useful *(without setting the pivot point to another location)*, so some tools are more or less applicable in some modes.

Select Mode Pop-up

Reference
Mode: *Edit* mode

Mesh Select Mode menu

You can choose a selection mode with the pop-up menu:

Select Mode ‣ Vertices

Select Mode ‣ Edges

Select Mode ‣ Faces

You can assign a hotkey to access the modes faster. The standard Bforartists keymap has assigned the keys 1 to 8 above the letter area to do so.

When using this menu, you can make use of modifier keys, see: Switching Select Mode.

Switching Select Mode

When switching modes in an “ascendant” way (i.e. from simpler to more complex), from *Vertices* to *Edges* and from *Edges* to *Faces*, the selected parts will still be selected if they form a complete element in the new mode.

For example, if all four edges in a face are selected, switching from *Edges* mode to *Faces* mode will keep the face selected. All selected parts that do not form a complete set in the new mode will be unselected.

Hence, switching in a “descendant” way (i.e. from more complex to simpler), all elements defining the “high-level” element (like a face) will be selected (the four vertices or edges of a quadrangle, for example).

Multiple Selection Modes

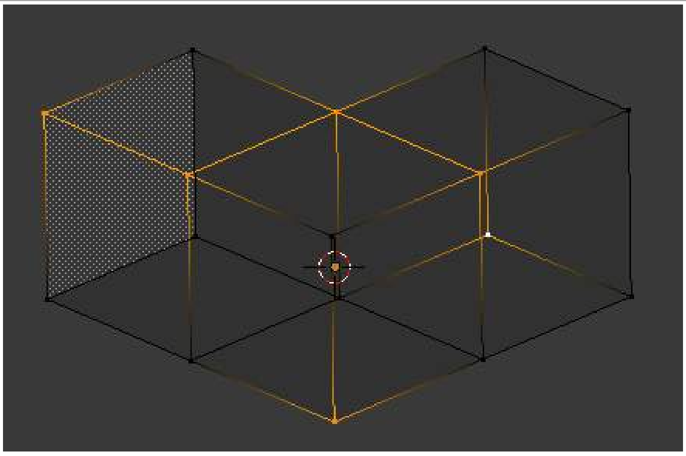
By holding `Shift-LMB` when selecting a selection mode, you can enable multiple *Selection Modes* at once.

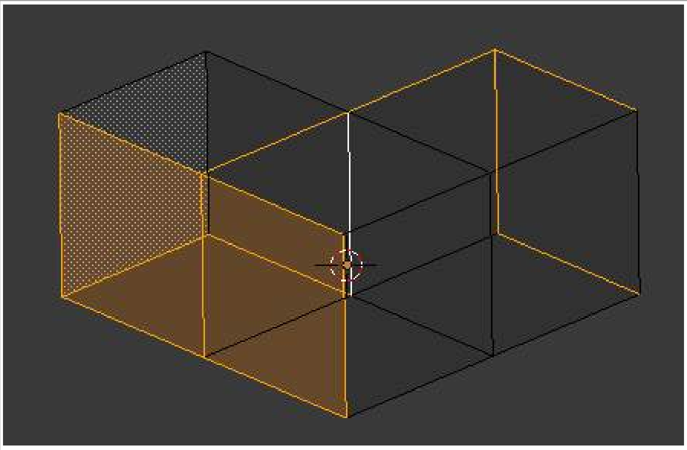
This allows you to quickly select Vertices/Edges/Faces, without first having to switch modes.

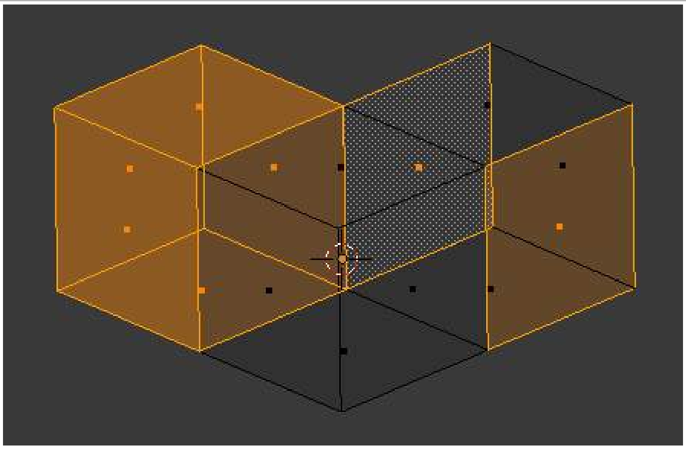
Expanding Selection Modes

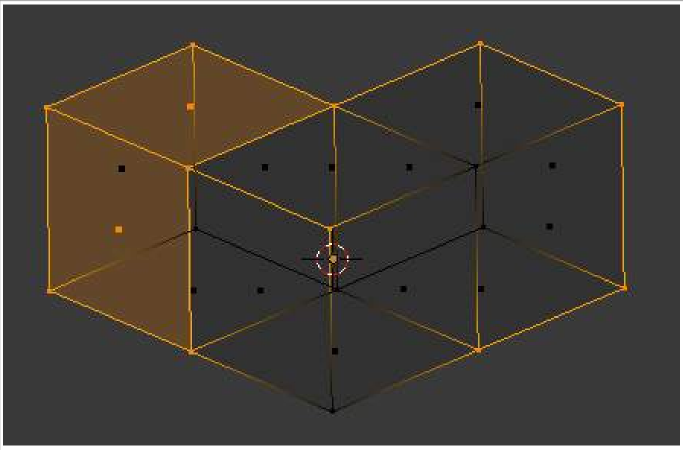
By holding `Ctrl` when selecting a higher selection mode, all elements touching the current selection will be added, even if the selection does not form a complete higher element.

See (*Vertices mode example*), (*Edges mode example*), (*Faces mode example*) and (*Mixed mode example*) for examples of the different modes.


Vertices mode example.


Edges mode example.


Faces mode example.


Mixed mode example.

Selection Tools

The select menu in edit mode contains tools for selecting components. These are described in more detail in the following pages.

Border Select
: Enables a rectangular region for selection

Circle Select
: Enables a circular shaped region for selection

(De)select All
: Select all or none of the mesh components.

Invert Selection
: Selects all geometry that are not selected, and deselect currently selected components.

Select Random
: Selects a random group of vertices, edges, or faces, based on a percentage value.

Checker Deselect
: Deselect alternating faces, to create a checker like pattern.

Select Sharp Edges
: This option will select all edges that are between two faces forming an angle less than a given value, which is asked you *via* a small pop-up dialog. The lower is this angle limit, the sharper will be the selected edges. At `180`, **all** manifold edges will be selected.

Linked Flat Faces
: Select connected faces based on a threshold of the angle between them. This is useful for selecting faces that are planar.

Interior Faces
Select faces where all edges have more than 2 faces.
Side of Active
Selects all data on the mesh in a single axis
Select Faces by Sides
Selects all faces that have a specified number of edges.
Non Manifold
Selects non-manifold geometry. See *Mesh Advanced Selection*.
Loose
Select all vertices or edges that do not form part of a face.
Similar

Select geometry based on how similar certain properties are to it.

Note
The items shown in the menu depend on the Selection Mode.

More
Propagates selection by adding geometry that are adjacent to selected elements.
Less
Deselects geometry that form the bounds of the current selection
Mirror
Select mesh items at the mirrored location.
Pick Linked
Selects all geometry connected to the geometry under the cursor.
Linked
Selects all geometry that are connected to the current selection.
Vertex Path
Selects a vertex path between two selected vertices
Edge Loop
Selects a loop of edges from a selected edge
Edge Ring
Selects edges parallel to a selected edge in the same ring of faces
Loop Inner-Region
Converts a closed selection of edges to the region of faces it encloses
Boundary Loop
Converts a selection of faces to the ring of edges enclosing it

Basic Selection

Reference
Mode: *Edit* mode

The most common way to select an element is to `RMB` on that item; this will replace the existing selection with the new item.

Adding to a Selection

To add to the existing selection, hold down `Shift` while right clicking. Clicking again on a selected item will deselect it.

As in *Object* mode, there is a unique *active* element, displayed in a lighter shade (in general, the last element selected). Depending on the tools used, this element might be very important!

Note that there is no option to choose what element to select between overlapping ones (like the `Alt-RMB` click in *Object* mode). However, if you are in solid, shaded, or textured viewport shading mode (not bounding box or wireframe), you will have a fourth button in the header that looks like a cube, just right of the select mode ones.

When enabled, this limits your ability to select based on visible elements (as if the object was solid), and prevents you from accidentally selecting, moving, deleting or otherwise working on backside or hidden items.

Selecting Elements in a Region

Reference
Mode: *Edit* mode

Region selection allows you to select groups of elements within a 2D region in your 3D view. The region can be either a circle or rectangle. The circular region is only available in *Edit mode*. The rectangular region, or *Border Select, is available in both *Edit mode* and *Object* mode.

Note

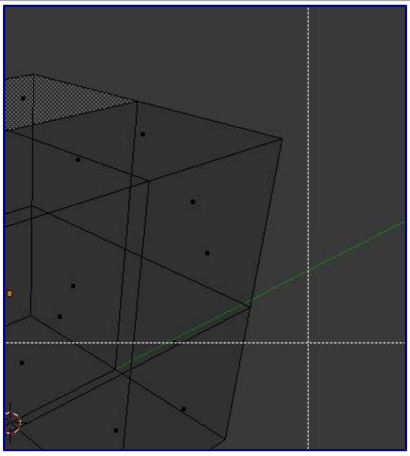
What is selected using both these tools is affected by the *Limit Selection to visible* feature (available under the 3D viewport) in *Solid Viewport Shading Mode*.

For example,

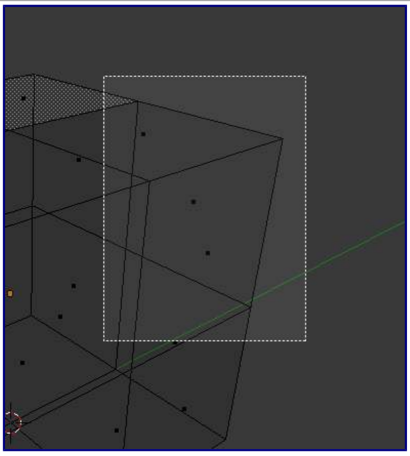
- in solid shading mode and face selection mode, all faces *within* the selection area will be selected;
- whilst in the wireframe shading mode and face selection mode, only faces whose handle are within the selection area will be selected.

Rectangular region (Border select)

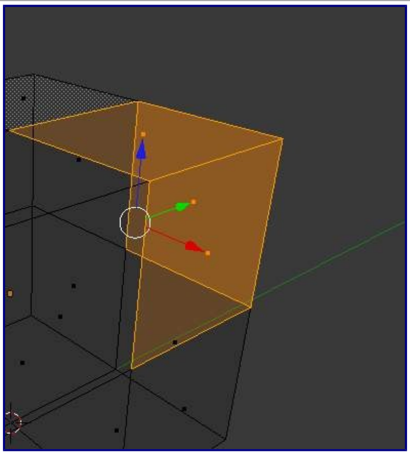
Border Select is available in either *Edit mode* or *Object* mode. To activate the tool use the `B`. Use *Border Select* to select a group of objects by drawing a rectangle while holding down `LMB`. In doing this you will select all objects that lie within or touch this rectangle. If any object that was last active appears in the group it will become selected *and* active.



Start



Selecting



Complete

In (*Start*), *Border Select* has been activated and is indicated by showing a dotted cross-hair cursor. In (*Selecting*), the *selection region* is being chosen by drawing a rectangle with the `LMB`. The selection area is only covering the selection handles of three faces. Finally, by releasing `LMB` the selection is complete; see (*Complete*).

Reference

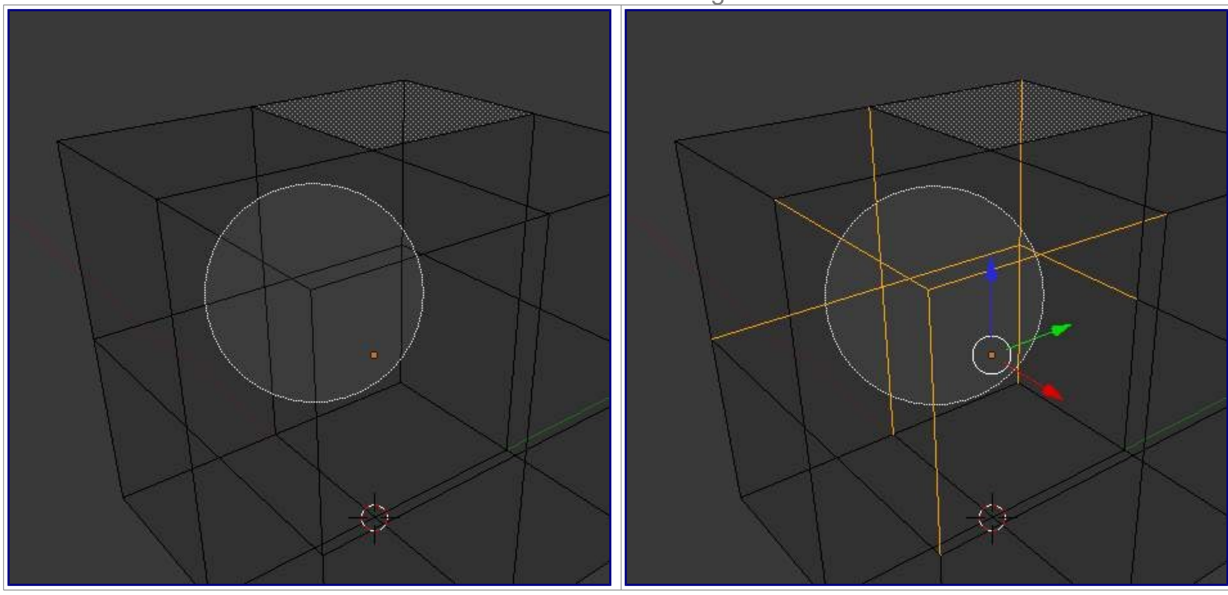
Border select adds to the previous selection, so in order to select only the contents of the rectangle, deselect all with `A` first. In addition, you can use `MMB` while you draw the border to deselect all objects within the rectangle.

Circular region

This selection tool is only available in *Edit mode* and can be activated with `C`. Once in this mode the cursor changes to a dashed cross-hair with a 2D circle surrounding it. The tool will operate on whatever the current select mode is. Clicking or dragging with the `LMB`, causing elements to be inside the circle will cause those elements to be selected.

You can enlarge or shrink the circle region using `NumpadPlus` and `NumpadMinus`, or the `Wheel`.

Circle Region Select



Before	After

(*Circle Region Select*) is an example of selecting edges while in *Edge Select Mode*. As soon as an edge intersects the circle the edge becomes selected. The tool is interactive such that edges are selected while the circle region is being dragged with the `LMB`.

If you want to deselect elements, hold `MMB` and begin clicking or dragging again.

For *Faces* select mode, the circle must intersect the face indicators usually represented by small pixel squares; one at the center of each face.

To exit from this tool, click `RMB`, or press the `Esc` key.

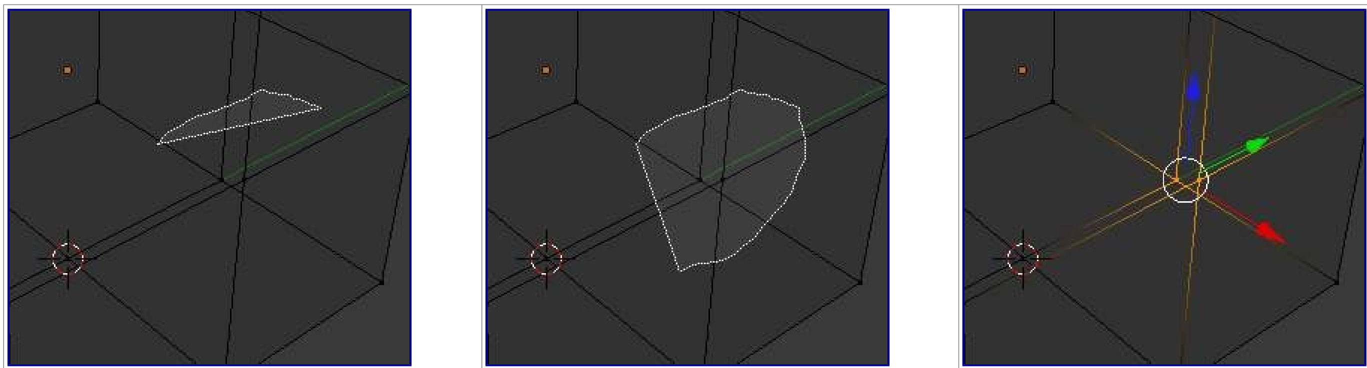
Lasso region

Lasso select is similar to *Border* select in that you select objects based on a region, except *Lasso* is a hand-drawn region that generally forms a circular/round-shaped form; kind of like a lasso.

Lasso is available in either *Edit Mode* or *Object Mode*. To activate the tool use the `Ctrl-LMB` while dragging. The one difference between *Lasso* and *Border* select is that in *Object mode*, *Lasso* only selects objects where the lasso region intersects the objects' center.

To deselect, use `Ctrl-Shift-LMB` while dragging.

Lasso selection



Start | Selecting | Complete

(*Lasso selection*) is an example of using the *Lasso* select tool in *Vertex Select Mode*.

Additional Selection Tools

The select menu in edit mode contains additional tool for selecting components:

(De)select All
: Select all or none of the mesh components.

Invert Selection
: Selects all components that are not selected, and deselect currently selected components.

More
: Propagates selection by adding components that are adjacent to selected elements.

Less
: Deselects components that form the bounds of the current selection

Advanced Selection

The select menu in edit mode contains additional tool for selecting components:

Mirror
Select mesh items at the mirrored location.
Linked
Selects all components that are connected to the current selection. (see Select Linked)
Random
Selects a random group of vertices, edges, or faces, based on a percentage value.
Checker Deselect
Deselect alternating faces, to create a checker like pattern.
Select Every N Number of Vertices
Selects vertices that are multiples of N.
Sharp Edges
This tool selects all edges between two faces forming an angle greater than the angle option, Where an increasing angle selects sharper edges.
Linked Flat Faces
Select connected faces based on a threshold of the angle between them. This is useful for selecting faces that are planar.

Non Manifold

Selects the non-manifold geometry of a mesh. This entry is available when editing a mesh, in Vertex and Edge selection modes only. The *redo* panel provides several selection options:

Extend
Lets you extend the current selection.
Wire
Selects all the edges that don’t belong to any face.
Boundaries
Selects edges in boundaries and holes.
Multiple Faces
Selects edges that belong to 3 or more faces.
Non Contiguous
Selects edges that belong to exactly 2 faces with opposite normals.
Vertices
Selects vertices that belong to *wire* and *multiple face* edges, isolated vertices, and vertices that belong to non adjoining faces.

Interior Faces
Select faces where all edges have more than 2 faces.
Side of Active
Selects all data on the mesh in a single axis
Select Faces by Sides
Selects all faces that have a specified number of edges.
Loose Geometry
Select all vertices or edges that do not form part of a face.

Select Linked

Reference

Mode: *Edit* mode
Menu: Select ‣ Linked

Select parts of a mesh connected to already selected elements. This is often useful when a mesh has disconnected, overlapping parts, where isolating it any other way would be tedious.

To give more control, you can also enable delimiters so the selection is constrained by seans, sharp-edges, materials or UV islands.

Hint

You can also select linked data directly under the cursor, using the `L` shortcut to select or `Shift-L` to deselect linked.

This works differently in that it uses the geometry under the cursor instead of the existing selection.

Select Similar

Reference

Mode: *Edit* mode
Menu: Select ‣ Similar...

Select components that have similar attributes to the ones selected, based on a threshold that can be set in tool properties after activating the tool. Tool options change depending on the selection mode:

Vertex Selection Mode:

Normal
: Selects all vertices that have normals pointing in similar directions to those currently selected.

Amount of Adjacent Faces
: Selects all vertices that have the same number of faces connected to them.

Vertex Groups
: Selects all vertices in the same *vertex group*.

Amount of connecting edges
: Selects all vertices that have the same number of edges connected to them.

Edge Selection Mode:

Length
: Selects all edges that have a similar length as those already selected.

Direction
: Selects all edges that have a similar direction (angle) as those already selected.

Amount of Faces Around an Edge
: Selects all edges that belong to the same number of faces.

Face Angles
: Selects all edges that are between two faces forming a similar angle, as with those already selected.

Crease
: Selects all edges that have a similar *Crease* value as those already selected. The *Crease* value is a

setting used by the *Subsurf Modifier*.

Bevel
Selects all edges that have the same *Bevel Weight* as those already selected.

Seam
Selects all edges that have the same *Seam* state as those already selected. *Seam* is a true/false setting used in UV-texturing.

Sharpness
Selects all edges that have the same *Sharp* state as those already selected. *Sharp* is a true/false setting (a flag) used by the *EdgeSplit Modifier*.

Face Selection Mode:

Material
Selects all faces that use the same material as those already selected.

Image
Selects all faces that use the same UV-texture as those already selected (see UV-texturing pages).

Area
Selects all faces that have a similar area as those already selected.

Polygon Sides
Selects all faces that have the same number of edges.

Perimeter
Selects all faces that have a similar perimeter as those already selected.

Normal
Selects all faces that have a similar normal as those selected. This is a way to select faces that have the same orientation (angle).

Co-planar
Selects all faces that are (nearly) in the same plane as those selected.

Selecting Loops

You can easily select loops of components:

Edge Loops and Vertex Loops

Reference

Mode: *Edit* mode –> *Vertex* or *Edge* select mode

Menu: Select ‣ Edge Loop or Mesh ‣ Edges ‣ Edge Loop

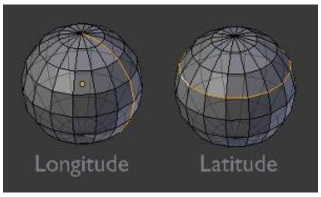
Holding `Alt` while selecting an edge selects a loop of edges that are connected in a line end to end, passing through the edge under the mouse pointer. Holding `Alt-Shift` while clicking adds to the current selection.

Edge loops can also be selected based on an existing edge selection, using either Select ‣ Edge Loop

Note

Vertex mode

In *Vertex* select mode, you can also select edge loops, by using the same hotkeys, *and clicking on the edges* (not on the vertices).



Longitudinal and latitudinal edge loops.

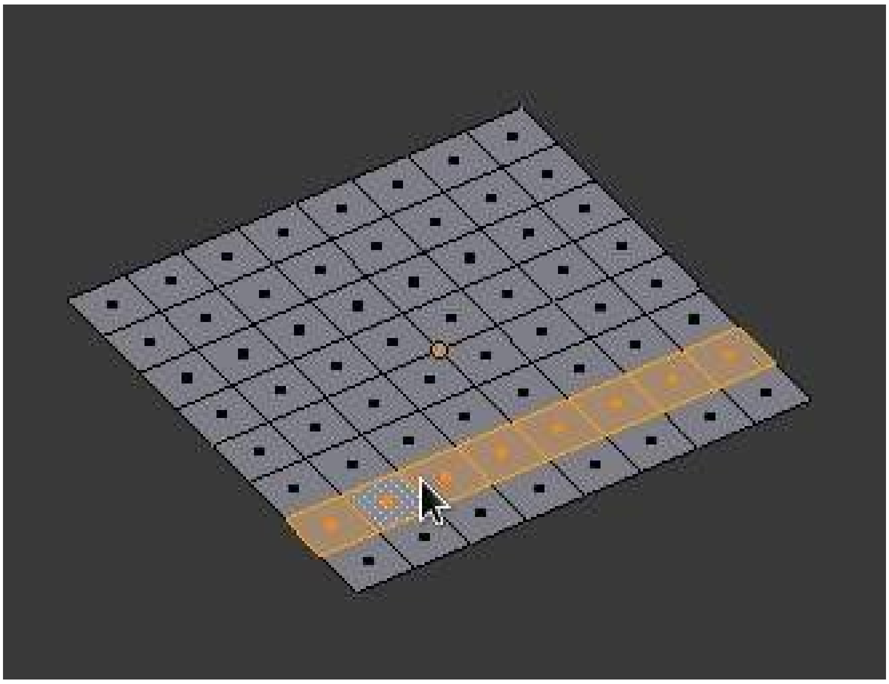
The left sphere shows an edge that was selected longitudinally. Notice how the loop is open. This is because the algorithm hit the vertices at the poles and terminated because the vertices at the pole connect to more than four edges. However, the right sphere shows an edge that was selected latitudinally and has formed a closed loop. This is because the algorithm hit the first edge that it started with.

Face Loops

Reference
Mode: *Edit* mode –> *Face* or *Vertex* select modes

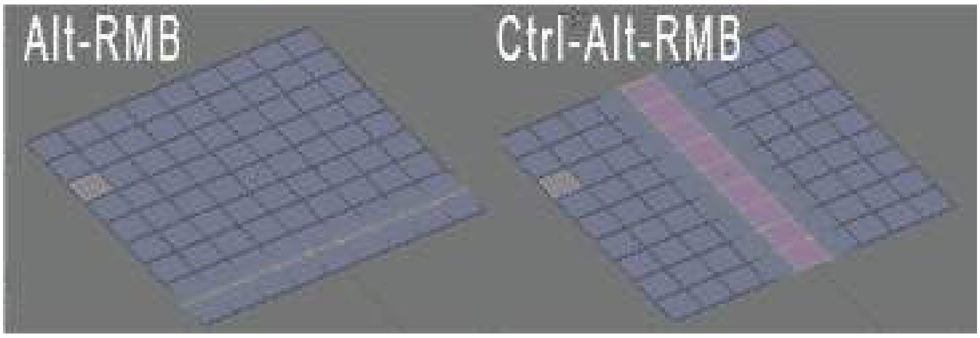
In face select mode, holding `Alt` while selecting an **edge** selects a loop of faces that are connected in a line end to end, along their opposite edges.

In vertex select mode, the same can be accomplished by using `Ctrl-Alt` to select an edge, which selects the face loop implicitly.



Face loop selection.

This face loop was selected by clicking with `Alt-RMB` on an edge, in *face* select mode. The loop extends perpendicular from the edge that was selected.



Alt versus Ctrl-Alt in vertex select mode.

A face loop can also be selected in *Vertex* select mode. Technically `Ctrl-Alt-RMB` will select an *Edge Ring*, however in *Vertex* select mode, selecting an *Edge Ring* implicitly selects a *Face Loop* since selecting opposite edges of a face implicitly selects the entire face.

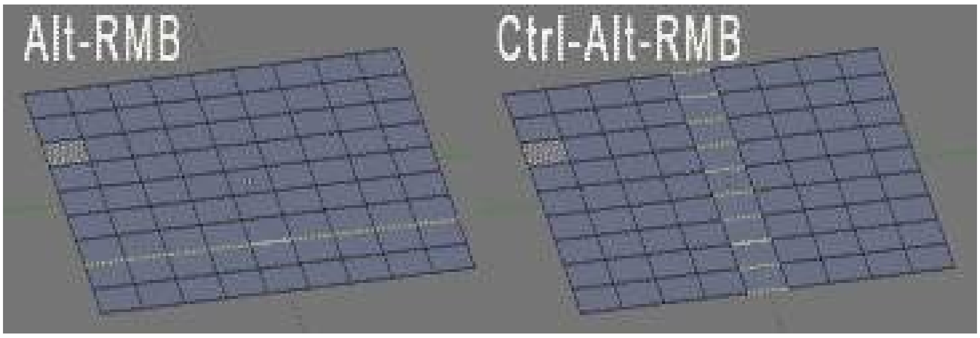
Edge Ring

Reference
Mode: *Edit* mode –> *Edge* select mode Menu: Select ‣ Edge Ring or Mesh ‣ Edges ‣ Edge Ring

In *Edge* select mode, holding `Ctrl-Alt` while selecting an edge selects a sequence of edges that are not connected, but on opposite sides to each other continuing along a *face loop*.

As with edge loops, you can also select edge rings based on current selection, using Select ‣ Edge Ring

Note
Vertex mode In *Vertex* select mode, you can use the same hotkeys when *clicking on the edges* (not on the vertices), but this will directly select the corresponding face loop...

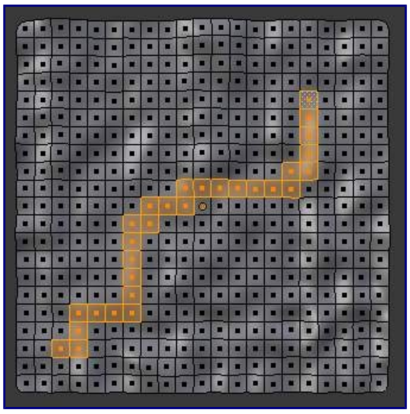


A selected edge loop, and a selected edge ring.

In (*A selected edge loop, and a selected edge ring*), the same edge was clicked on but two different “groups of edges” were selected, based on the different commands. One is based on edges during computation and the other is based on faces.

Path Selection

Reference
Mode: *Edit* mode



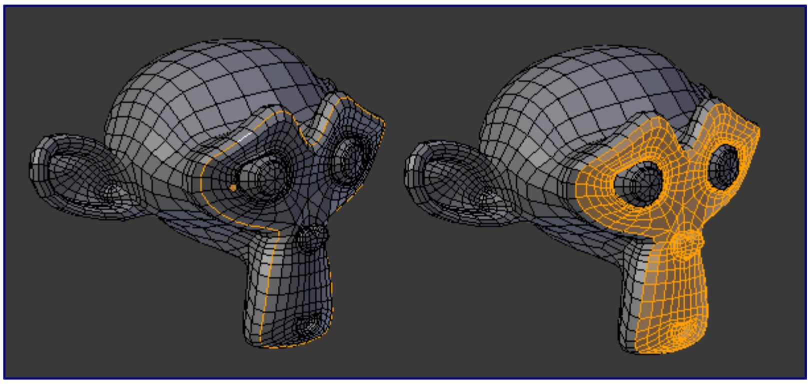
Select a face or vertex path with Ctrl-RMB

Selects all geometry along the shortest path from the active vertex/edge/face to the one which was selected.

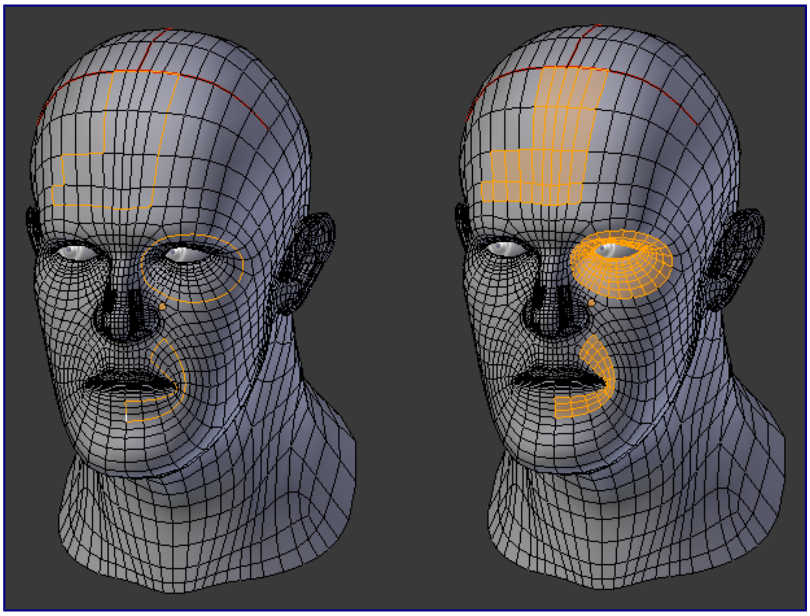
Loop Inner-Region

Reference
Mode: *Edit* mode –> *Edge* select mode Menu: Select ‣ Select Loop Inner-Region or Mesh ‣ Edges ‣ Select Loop Inner-Region

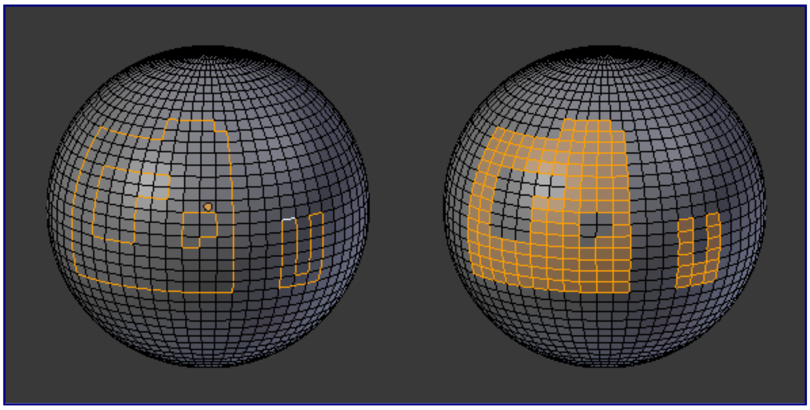
Select Loop Inner-Region selects all edges that are inside a closed loop of edges. While it is possible to use this operator in *Vertex* and *Face* selection modes, results may be unexpected. Note that if the selected loop of edges is not closed, then all connected edges on the mesh will be considered inside the loop.



Loop to Region.



This tool handles multiple loops fine, as you can see.



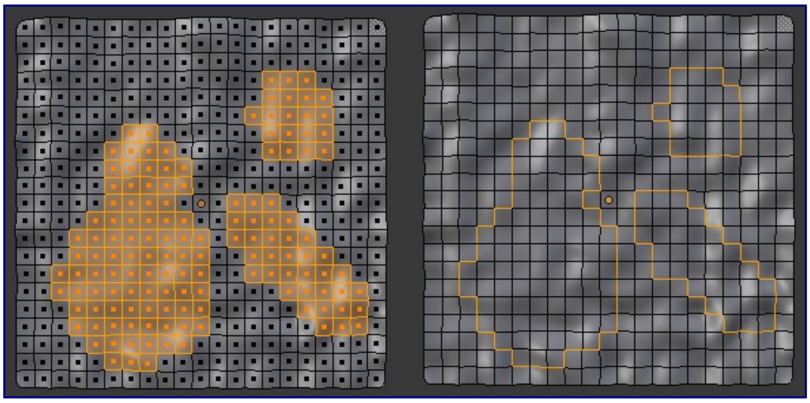
This tool handles “holes” just fine as well.

Boundary Loop

Reference
Mode: *Edit* mode –> *Edge* select mode Menu: Select ‣ Select Boundary Loop or Mesh ‣ Edges ‣ Select Boundary Loop

Select Boundary Loop does the opposite of *Select Loop Inner-Region*, based on all regions currently selected, it selects only the edges at the border of these regions. It can operate in any select mode, but will always switch to *Edge* select mode when run.

All this is much more simple to illustrates with examples:



Select Boundary Loop does the opposite and forces into Edge Select Mode

Selecting Edges

Buttons for the selection modes

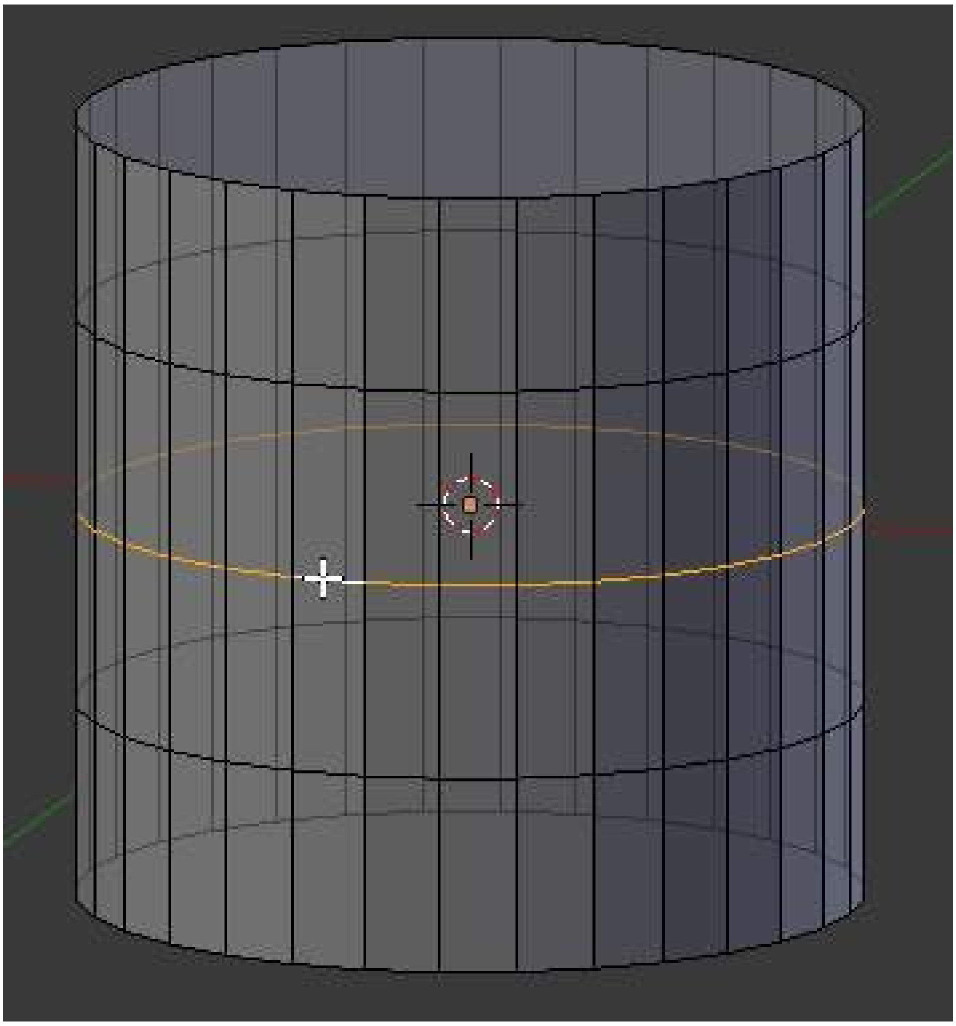
Edges can be selected in much the same way as vertices and faces - by right-clicking them while Edge Select Mode is activated. Pressing `Shift` while clicking will add/subtract to the existing selection.

Edge Loops

Reference
Mode: Edit Mode (Mesh) Menu: Select ‣ Edge Loop

Edge loops can be selected by first selecting an edge (vertex or edge selection mode), and then going to Select ‣ Edge Loop. The shortcut `Alt-RMB` on an edge (either vertex or edge select mode) is a quicker and more powerful way of doing so. More powerful, because you can add/remove loops from an existing selection if you press `Shift` too.

Note, that if you want to select a loop while being in vertex select mode, you still have to perform the shortcut on an edge - while you, for just selecting vertices, would rightclick on a vertex.



An edge loop

Note

`Alt` on Linux

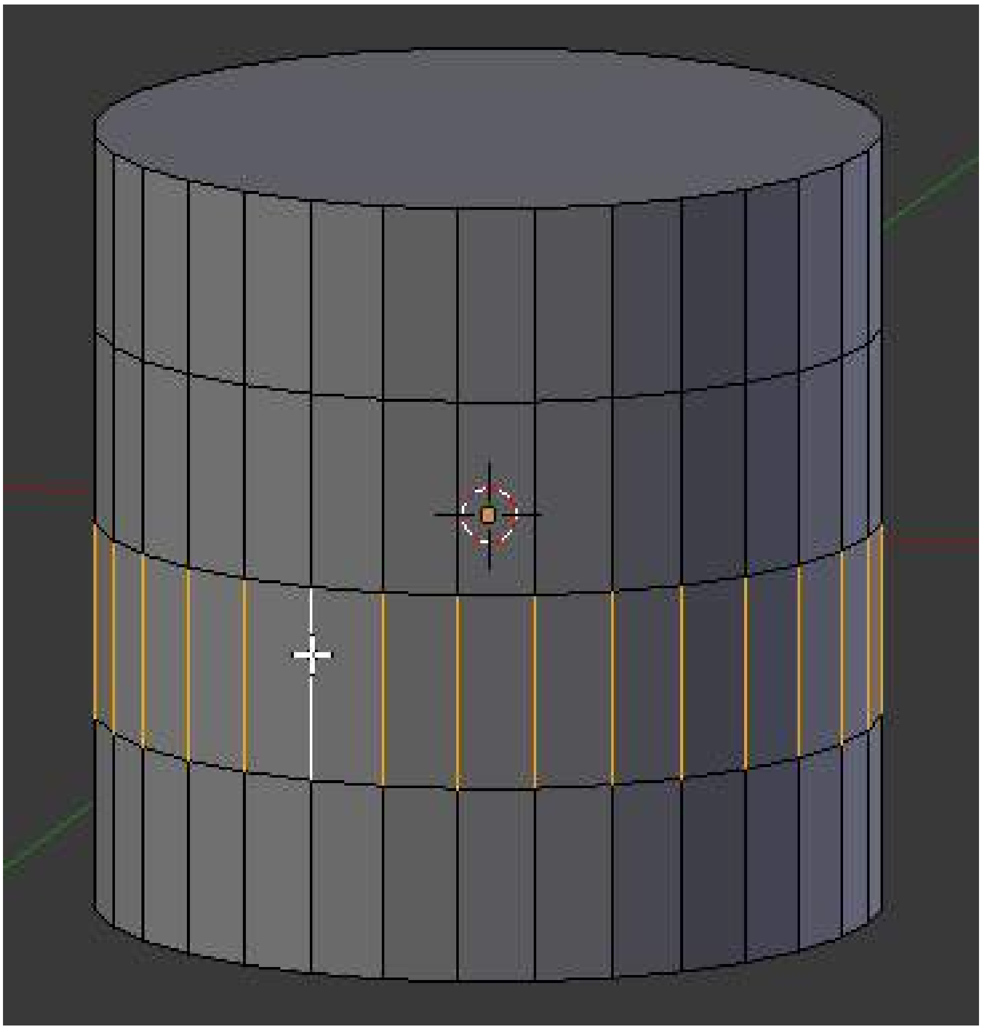
`Alt` is on some Linux distros caught by the windows manager. If you see the above shortcut not working, make sure that Bforartists can properly recognize the usage of `Alt`.

Edge Rings

Reference

Mode: Edit Mode (Mesh)
Menu: Select ‣ Edge Ring

Edge Rings are selected similarly. Based on the selection of an edge go to Select ‣ Edge Ring. Or use `Alt-Ctrl-RMB` on an edge.



An Edge Ring

Note

Convert selection to whole faces

If the edge ring selection happened in Edge Select Mode, switching to Face Select Mode will erase the selection.

This is because none of those faces had all its (four) edges selected, just two of them.

Instead of selecting the missing edges manually or by using `Shift-Alt-RMB` twice, it is easier to first switch to Vertex Select Mode, which will kind of “flood” the selection. A subsequent switch to Face Select Mode will then properly select the faces.

Selecting Faces

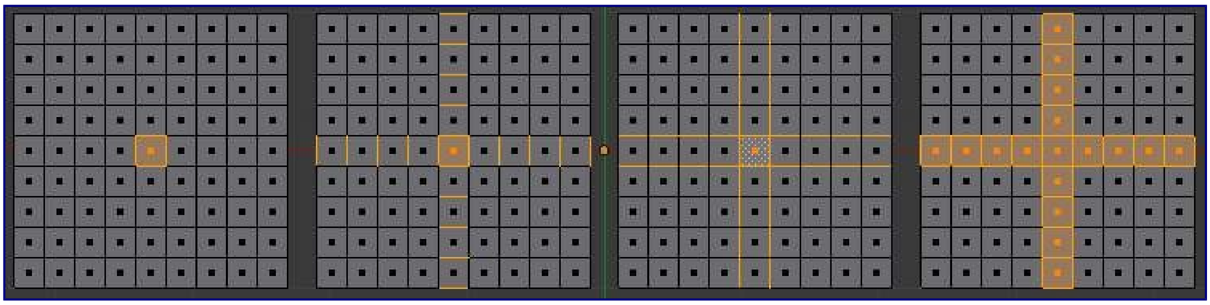
Activated the Face Select Mode

To select parts of a mesh face-wise, you have to switch to Face Select Mode. Do this by clicking the button shown above, or press `Ctrl-Tab` to spawn a menu. The selection works as usual with `RMB` ; to add/remove to an existing selection, additionally press `Shift`

Face Loops

Reference
Mode: Edit Mode (Mesh)

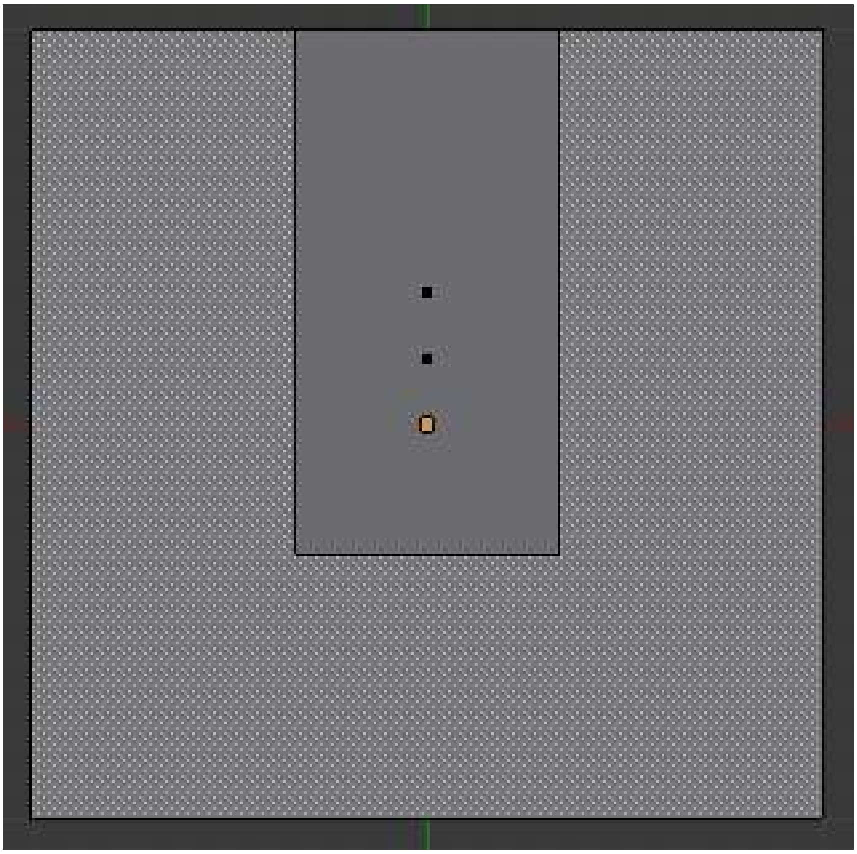
Face Loops are pretty much the same as Edge Rings. If you want to select a Face Loop, there is no menu entry that works based on a selected face. Using Select ‣ Edge Ring would select a “cross” with the prior selected face as the middle. If you want to avoid switching to Edge Select Mode to select a Face Loop, use the `Alt-RMB` shortcut.



Different Loopselect Operations on a grid in Face Select Mode

- Just the selected face.
- Select the face, then Select ‣ Edge Ring. See, how Bforartists selects edges, even if being in Face Select Mode. If these edges are desired and you want to work on them, switch in Edge Select Mode. Switching to Vertex Select Mode would flood the selection and leave you with the 4th image as result, after going back to Face Select Mode.
- Select the face, the Select ‣ Edge Loop. As in the example above, Bforartists pretends to be in Edge Select Mode and takes the four edges of the selected face as base for the selection operation.
- This selection was created by `Alt-RMB` on the left edge of the center face, followed by twice `Shift-Alt-RMB` on the top edge of the center face. Two times, because the first click will remove the selected face loop (in this case, just the original selected face), while the second click will add the whole vertical running loop to the selection, creating the cross.

Ngons in Face Select Mode



Ngon-Face having its center dot inside another face

As already known, faces are marked with a little square dot in the middle of the face. With ngons that can lead in certain cases to a confusing display. The example shows the center dot of the U-shaped ngon being inside of the oblong face inside the “U”. It is not easy to say which dot belongs to which face (the orange dot in the image is the object center). Luckily, you don’t need to care much - because to select a face, you don’t have to click the center dot, but the face itself.

Tip

Face selection

To select a face: Click the face, not the dot!

Editing

Mesh Editing

Bforartists provides a variety of tools for editing meshes. These are available through the *Mesh Tools* palette, the Mesh menu in the 3d view header, and context menus in the 3d view, as well as individual shortcut keys.

Note that all the “transform precision/snap” keys (`Ctrl` and/or `Shift`) work also for all these advanced operations... However, most of them do not have *axis locking* possibilities, and some of them do not take into account *pivot point* and/or *transform orientation* either.

These transform tools are available in the *Transform* section of the *Mesh* menu in the menu bar. Note that some of these can also be used on other editable objects, like curves, surfaces, and lattices.

Types of Tools

The mesh tools are found in various places, and available through shortcuts as well.

<table>
<tr>
<td>
Transform and Deform tools:

Translate
Rotate
Scale
Mirror
Shrink/Flatten/Along Normal
Push/Pull
To Sphere
Shear
Warp
Edge Slide
Vertex Slide
Noise
Smooth Vertex
Rotate Edge

Merge and Remove tools:

Delete
Dissolve
Merge
Auto-Merge
Remove Doubles
Tris to Quads
Unsubdivide

</td>
<td>
Add and Divide tools:

Make Edge/Face
Fill
Beauty Fill
Solidify
Quads to Tris
Extrude Region
Extrude Individual
Subdivide
Loop Cut/Slide
Knife tool
Vertex connect
Duplicate
Spin
Screw
Symmetrize
Inset
Bevel
Wireframe

Separate tools:

Rip
Rip fill
Split
Separate
Edge Split

</td>
</tr>
</table>

Accessing Mesh Tools

Mesh Tools Palette

When you select a mesh and `Tab` into edit mode, the *Tool Shelf* changes from *Object Tools* to *Mesh Tools*. These are only some of the mesh editing tools.

Menus

The *Mesh* is located in the Header bar.

Basics

Basic Mesh Editing

In this section we explain how to do basic editing on a mesh.

- *Translation, Rotation, Scale*
- *Adding Elements*
- *Deleting Elements*
- *Creating Faces and Edges*
- *Mirror editing*

Translation, Rotation, Scale

Reference
Mode: *Edit* mode Panel: *Mesh Tools* (*Editing* context) Menu: Mesh ‣ Transform ‣ Grab/Move, Rotate, Scale, ...

Once you have a selection of one or more elements, you can grab/move (`G`), rotate (`R`) or scale (`S`) them, like many other things in Bforartists, as described in the *Manipulation in 3D Space* section.

To move, rotate and scale selected components, either use the *Translate*, *Rotate*, and *Scale* buttons, the *transform manipulators*, or the shortcuts. This shortcuts depends of your keymap. See important hotkeys addon.

After moving a selection, the options in the Tool Shelf allow you to fine-tune your changes, limit the effect to certain axes, turn proportional editing on and off, etc.

Of course, when you move an element of a given type (e.g. an edge), you also modify the implicitly related elements of other kinds (e.g. vertices and faces).

You also have in *Edit* mode an extra option when using these basic manipulations: the *proportional editing*.

Adding Geometry

Adding Geometry

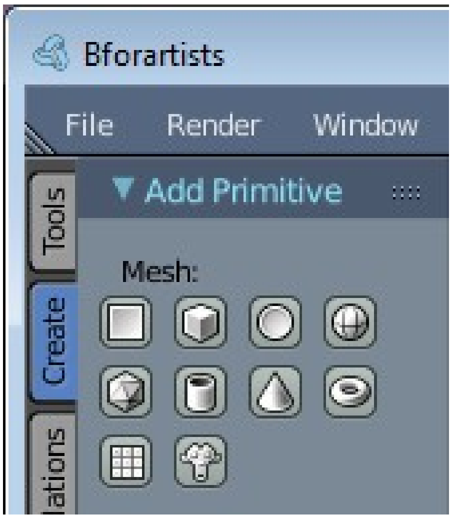
In Bforartists, for modeling, you have several ways of adding mesh elements. Some of them are basic objects that adds a starting block of data (called data-block in Bforartists) when adding their basic geometry to the scene. We have 10 available mesh Objects, and those starting meshes are also called mesh primitives. In Bforartists, we have a set of basic primitives so you can add a starting mesh to modify and model to suit your specific needs. Also, you have specific tools to add, duplicate, move and delete elements, which will be explained in other pages of the modeling section present in this manual.

This page explains how to add basic geometry creating objects from primitives and how to add more elements to your primitives, including the addition of other primitives and basic elements when you're modeling.

To enter Edit you can select Edit from the modes menu as explained in the Interface overview, or use `Tab` with a mesh object selected.

Bforartists's mesh primitives.

To select and add one of the primitives to work with press `Shift-A` in Edit mode. Bforartists automatically detects the appropriate context for the object type you are editing, and will show a list of compatible, combining elements. If you are editing Mesh types, Bforartists will show a list of primitive meshes to add to your object. Other contexts are also automatically detected for the correct element additions. (See Fig. Bforartists's mesh primitives., you can add primitives to already existing objects, in Edit Mode)



A dropdown menu opens from which you can select the primitive you wish to add to the object.

There are many cases when it is useful to directly add a mesh to an object. Maybe you want to model a teapot. It would be useful to model the cup and the handle as separate meshes and only combine them when you are done.

Adding elementary parts to meshes

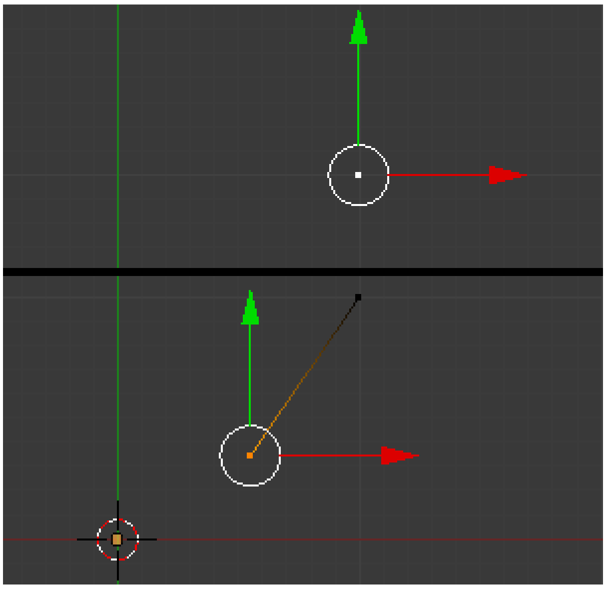
As explained before in Mesh Structures, meshes are objects formed from basic elements such as vertices, edges and faces.

The most elementary part of a mesh is the vertex, a point in 3D space; the line between two or more interconnected vertices is called an edge, and three or more edges can be connected to form a face. The geometry of the faces performing the model is called topology.

Creating vertices

The most basic element, a vertex, can be added with a left button mouse click while pressing `Ctrl` when no other vertices are selected, or `Ctrl-LMB`.

To create interconnected vertices, you can add a vertex and continuously make subsequent `Ctrl-LMB` operations with the last one vertex selected. This will link the last selected vertex with the vertex created at the mouse position with an edge (See Fig. Adding vertices one by one., and will continuously connect them creating vertices if you continue repeating this operation. (see Fig. 3 - Creating simple connected vertices with `Ctrl-LMB`.



Adding vertices one by one.

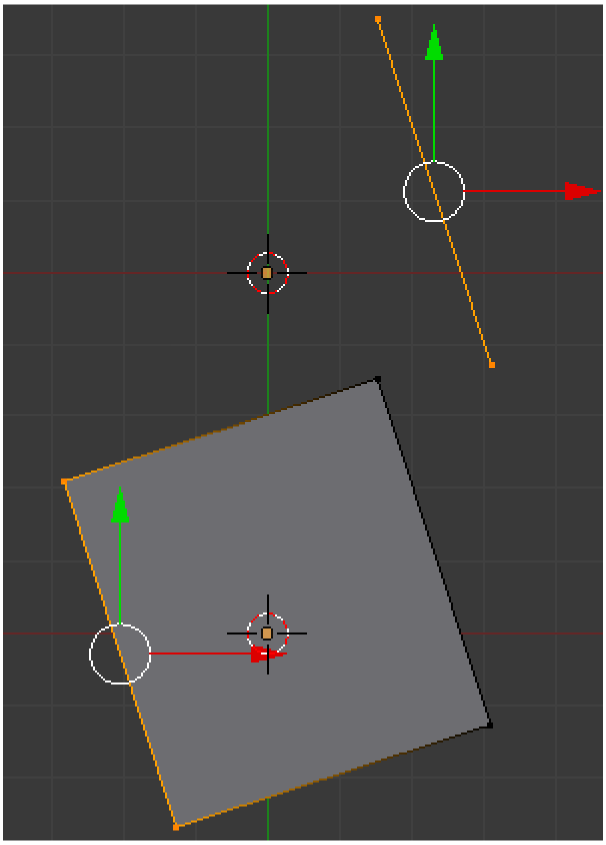
Creating Edges

In addition to automatically creating edges from vertices, if you have two vertices selected, you can connect them with and edge using the shortcut `F` (Fill). If you have more than two vertices selected, this will automatically create face(s).

Creating Faces

Creating Faces with the Mouse

Quad from an Edge with source automatically rotated.



If you have two vertices selected and already connected with an edge, left-click while pressing `Ctrl-LMB` will create a planar face, also known as a quad. Bforartists will follow your mouse cursor and will use the planar view from your viewport to create those quads.

For `Ctrl-LMB`, Bforartists will automatically rotate the last selected Edge (the source) for the subsequent operations if you have at least one face created, dividing the angles created between the newly-created edge and the last two edges, performing a smooth angle between them. Bforartists will calculate this angle using the last positive and negative position of the last X and Y coordinates and the last connected unselected edge. If this angle exceeds a negative limit (following a quadrant rule) between the recently created edge and the last two, Bforartists will wrap the faces. But if you do not want Bforartists rotating and smoothing edges automatically when extruding from `Ctrl-LMB`, you can also inhibit Bforartists from rotating sources using the shortcut

`Ctrl-Shift-LMB`. In this case, Bforartists won't rotate the source dividing the angle between those edges when creating a face.

For both cases, Bforartists will inform the user about the source rotation during the creation process. If you look at the Bottom of the Mesh Tools Panel, if you press `Ctrl-LMB`, you will see that the Rotate Source is automatically checked and if `Ctrl-Shift-LMB` is used, it will be automatically unchecked. Examples:

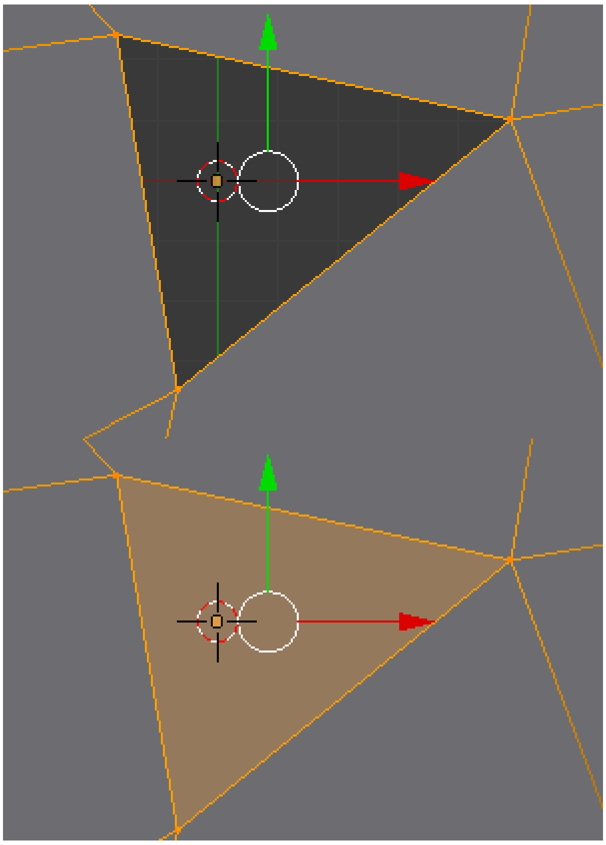
- Creating Faces with shortcut `Ctrl-LMB`, (see Fig. - Faces created with source automatically rotated)
- Creating Faces with shortcut `Ctrl-Shift-LMB`, (see Fig. Faces created with no source rotation)

If you have three or more vertices selected, and left click with mouse while pressing `Ctrl-LMB`, you will also create planar faces, but along the vertices selected, following the direction of the cursor. This operation is similar to an extrude operation, which is explained in the Extrude page.

Tip

When adding Objects with `Ctrl-LMB`, The extrusions of the selected elements, being vertices, edges and faces with the `Ctrl-LMB`, is viewport dependent. This means, once you change your viewport, for example, from top to left, bottom or right, the extrusion direction will also follow your viewport and align your extrusions with your planar view.

Filling Faces



Filling a triangle.

You can also create faces with at least three vertices selected, using `F` to fill them with edges and faces, or only fill edges with faces if they are already connected (Fill) (See Fig. Filling a triangle.). For four or more vertices, it's mandatory that you have coplanar vertices. four coplanar vertices will create a quad when filled, and more than four coplanar vertices will create a Ngon face.

Note

Note that you can only modify the mesh of the object you're editing. To modify other objects you need to leave, select them and re-enter Edit Mode.

Tip

When you're modeling, that, in order to facilitate the modeling, the best solution is to imagine what primitive type suits better for your model. If you will model a cuboid, the best solution is to start with a primitive cube, and so on.

Deleting and Merging

These tools can be used to remove components.

Delete

Delete

Deletes selected vertices, edges, or faces. This operation can also be limited to:

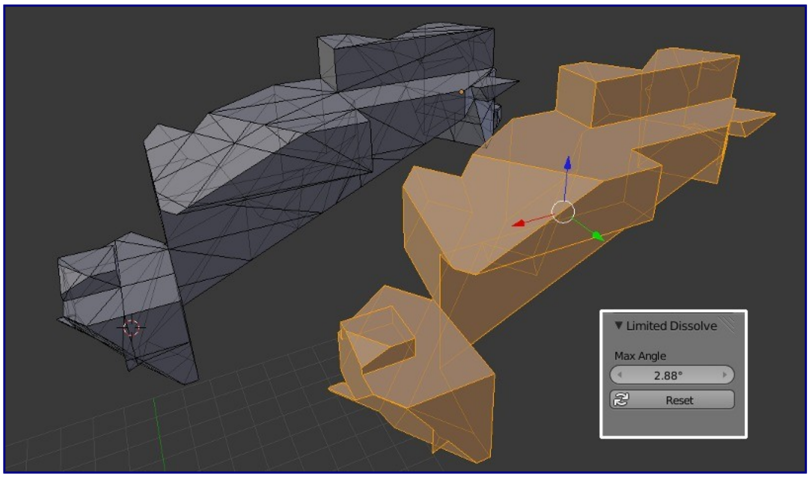
Vertices
Delete all vertices in current selection, removing any faces or edges they are connected to.
Edges
Deletes any edges in the current selection. Removes any faces that the edge shares with it.
Faces
Removes any faces in current selection.
Only Edges & Faces
Limits the operation to only selected edges and adjacent faces.
Only faces
Removes faces, but edges within face selection are retained.
Edge Collapse
Collapses edges into single vertices. This can be used to remove a loop of faces.
Edge Loop
Deletes an edge loop. If the current selection is not an edge loop, this operation does nothing.

Dissolve

Dissolve operations are also accessed from the delete menu. Instead of removing the geometry, which may leave holes that you have to fill in again, dissolve will remove the geometry and fill in the surrounding geometry.

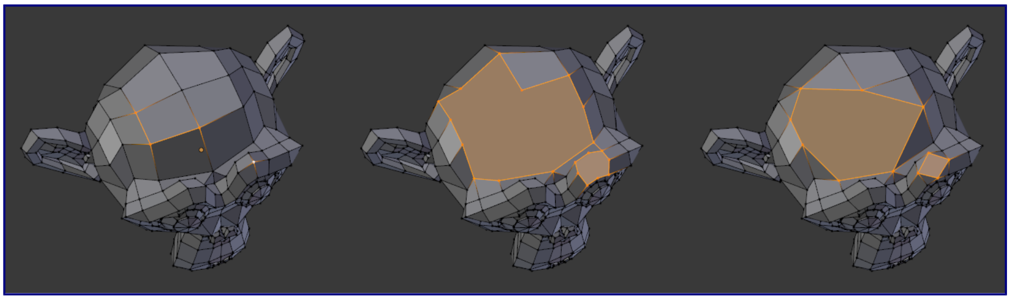
Dissolve
Removes selected geometry, but keeps surface closed, effectively turning the selection into a single n-gon. Dissolve works slightly different based on if you have edges, faces or vertices selected. You can add detail where you need it, or quickly remove it where you don’t.

Limited Dissolve
Limited Dissolve reduces detail on planar faces and linear edges with an adjustable angle threshold.



Example showing the how Limited Dissolve can be used.

Face Split - dissolve option.
When dissolving vertices into surrounding faces, you can often end up with very large, uneven ngons. The face split option limits dissolve to only use the corners of the faces connected to the vertex.



Dissolve Face Split option. Left - the input, middle - regular dissolve, right - Face Split enabled

Convert Triangles to Quads

Tris to Quads `Alt-J` This takes adjacent tris and removes the shared edge to create a quad. This tool can be performed on a selection of multiple triangles.

This same action can be done on a selection of just 2 tris, by selecting them and using the shortcut `F`, to create a face.

Unsubdivide

Reference
Mode: *Edit* mode Menu: Mesh ‣ Edges ‣ Unsubdivide

Unsubdivide functions as the reverse of subdivide by attempting to remove edges that were the result of a subdivide operation. If additional editing has been done after the subdivide operation, unexpected results may occur.

Iterations
How many subdivisions to remove.

Merging

Merging Vertices

Reference
Mode: *Edit* mode Menu: Mesh ‣ Vertices ‣ Merge..., Specials ‣ Merge or Vertex Specials ‣ Merge

This tool allows you to merge all selected vertices into an unique one, deleting all others. You can choose the location of the surviving vertex in the menu this tool pops up before executing:

At First
: Only available in *Vertex* select mode, it will place the remaining vertex at the location of the first one selected.

At Last
: Only available in *Vertex* select mode, it will place the remaining vertex at the location of the last one selected (the active one).

At Center
: Available in all select modes, it will place the remaining vertex at the center of the selection.

At Cursor
: Available in all select modes, it will place the remaining vertex at the 3D Cursor.

Collapse
: This is a special option, as it might let "live" more than one vertex. In fact, you will have as many remaining vertices as you had "islands" of selection (i.e. groups of linked selected vertices). The remaining vertices will be positioned at the center of their respective "islands". It is also available *via* the Mesh ‣ Edges ‣ Collapse menu option...

Merging vertices of course also deletes some edges and faces. But Bforartists will do everything it can to preserve edges and faces only partly involved in the reunion.

AutoMerge Editing

Reference
Mode: *Edit* mode Menu: Mesh ‣ AutoMerge Editing

The *Mesh* menu as a related toggle option: *AutoMerge Editing*. When enabled, as soon as a vertex moves closer to another one than the *Limit* setting (*Mesh Tools* panel, see below), they are automatically merged.

Remove Doubles

Reference
Mode: *Edit* mode Panel: *Editing* context –> *Mesh Tools* Menu: Mesh ‣ Vertices ‣ Remove Doubles, Specials ‣ Remove Doubles or Vertex Specials ‣ Remove Doubles

Remove Doubles is a useful tool to simplify a mesh by merging vertices that are closer than a specified distance to each other. An alternate way to simplify a mesh is to use the *Decimate modifier*.

Merge Distance
    Sets the distance threshold for merging vertices, in Bforartists units.
Unselected
    Allows vertices in a selection to be merged with unselected vertices. When disabled, selected vertices will only be merged with other selected ones.

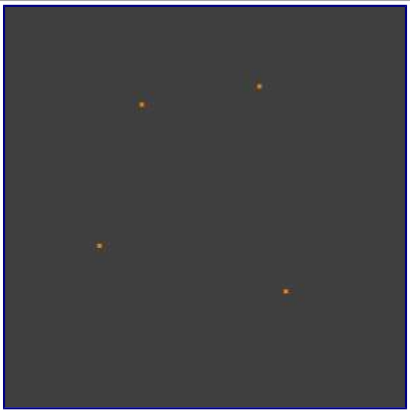
Make Edge/Face

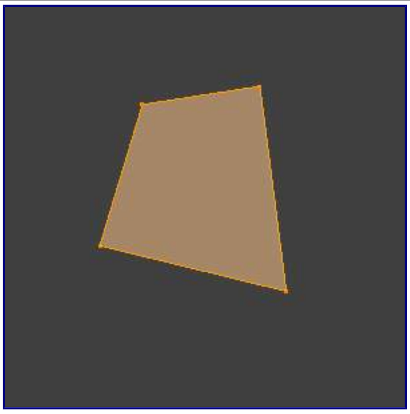
Reference
Mode: *Edit* mode Menu: Mesh –> Faces –> Make Face/Edge

This is a context sensitive tool which creates geometry by filling in the selection. When only 2 vertices are selected it will create an edge, otherwise it will create faces.

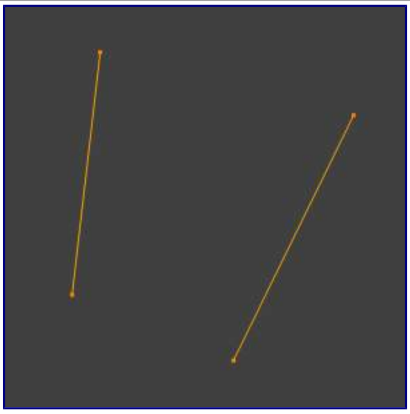
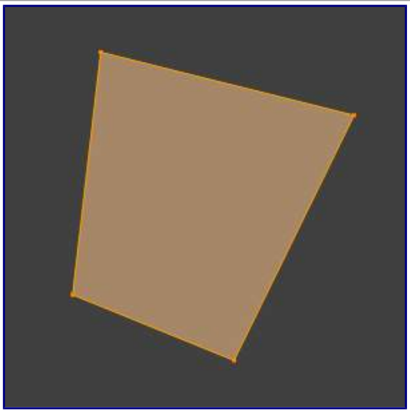
The following methods are used automatically depending on the context.

Isolated vertices.

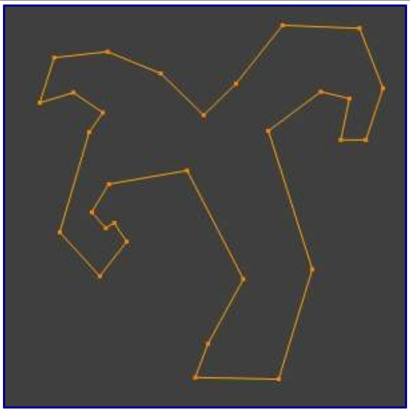

Before


After

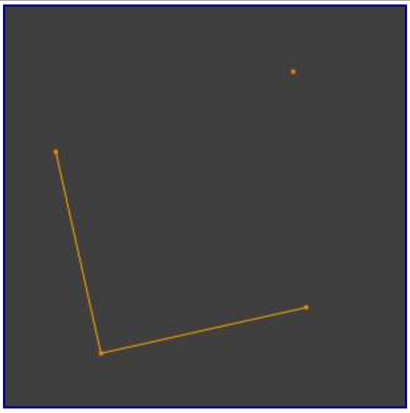
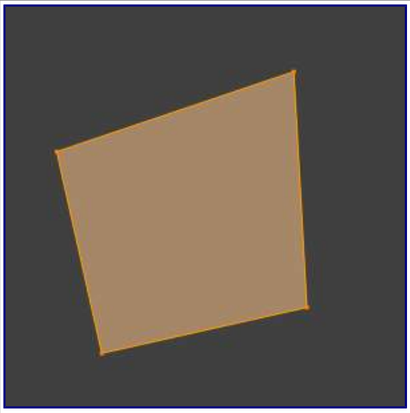
Isolated edges

	
Before	After

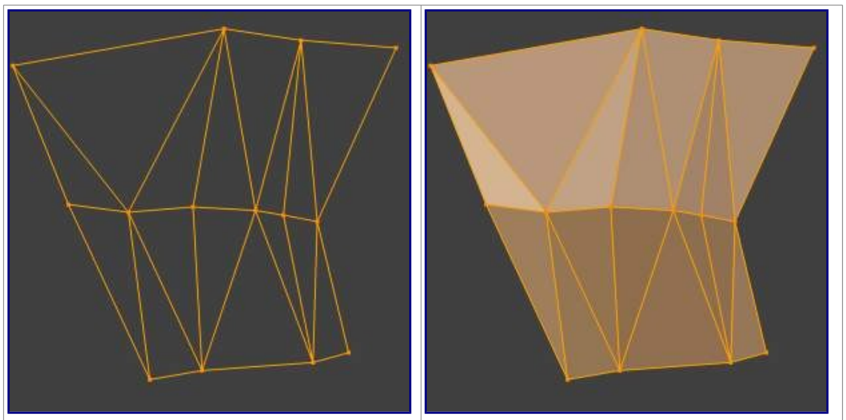
N-gon from edges: *When there are many edges Bforartists will make an ngon, note that this doesn't support holes, to support holes you need to use the* Fill *Faces tool.*

	
Before	After

Mixed vertices/edges: *existing edges are used to make the face as well as an extra vertex.*

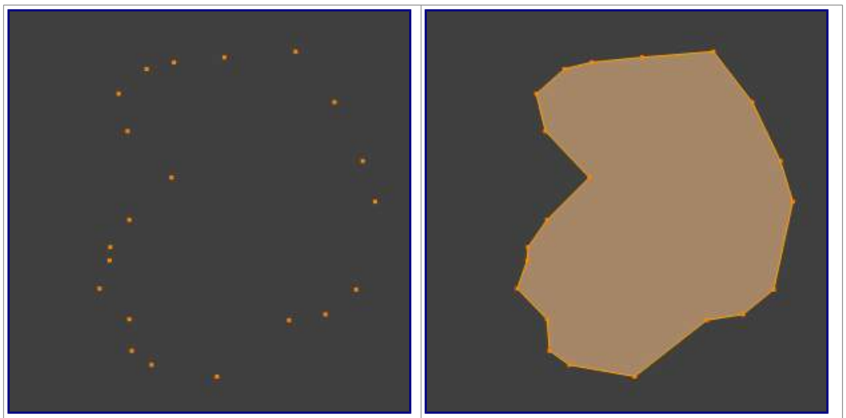
	
Before	After

Edge-Net: *sometimes you may have many connected edges without interior faces.*



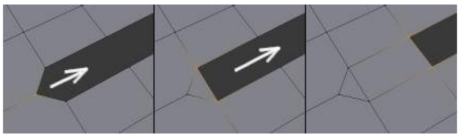
Before After

Point Cloud: *when there are many isolated vertices, Bforartists will calculate the edges for an n-gon.*



Before After

Single Vertex Selection: *with a single vertex selected on a boundary, the face will be created along the boundary, this saves manually selecting the other 2 vertices. Notice this tool can run multiple times to continue creating faces.’‘*



Further Reading

For other ways to create faces see:

- Fill
- Grid Fill
- Bridge Edge Loops

Mirror Editing

X-Mirror

Reference
Mode: *Edit* mode Panel: Mesh Options ‣ X-mirror

The *X-mirror* option of the *Mesh Options* panel allows you edit both “sides” of your mesh in a single action. When you transform an element (vertex, edge or face), if there is its *exact X-mirrored counterpart* (in local space), it will be transformed accordingly, *through a symmetry along the local X axis*.

Topology Mirror

The *Topology Mirror* option is available in the 3D View Editor ‣ Toolshelf Region ‣ Mesh Options Panel whilst in *Edit Mode*

For *Topology Mirror* to work the *X Mirror* option must be enabled.

When using the *X Mirror* option to work on mirrored Mesh Geometry the vertices that are mirrored must be perfectly placed. If they are not exactly positioned in their mirror locations then *X Mirror* will not treat those vertices as mirrored. This can be annoying because often the out of position vertices are only very slightly out of position.

Topology Mirror tries to solve this problem by determining which vertices are mirrored vertices not only by using their positions but also by looking at how those vertices are related to others in the Mesh Geometry. It looks at the overall Mesh Geometry topology to determine if particular vertices will be treated as mirrored. The effect of this is that mirrored vertices can be non-symetrical and yet still be treated as mirrored when *X Mirror* and *Topology Mirror* are both active.

Note that *Topology Mirror* functionality will work more reliably on Mesh Geometry which is more detailed. If you use very simple Mesh Geometry such as a Cube or UV Sphere for example the *Topology Mirror* option will often not work.

For an example of how to use *Topology Mirror* open up a new Bforartists scene, then delete Bforartists’s default cube and add a Monkey Object to the 3D Viewport.

Press the TAB Key to put the Monkey Object into *Edit Mode*.

With the *X Mirror* option disabled move one of the Monkey Object’s vertices slightly.

Then Turn *X Mirror* option on again but leave *Topology Mirror* disabled

If you now move that vertice again *X Mirror* will not work and the mirrored vertices will not be altered.

If you then enable *Topology Mirror* and move the same vertices again, then *X Mirror* should still mirror the other vertice, even though they are not perfectly positioned.

Mirror Modifier

The conditions for X-mirror to work are quite strict, which can make it difficult to use. To have an exact mirrored version of a (half) mesh, its easier and simpler to use the *Mirror modifier*

Snap to Symmetry

Reference
Mode: *Edit* mode Menu: Mesh ‣ Snap to Symmetry

The *Snap to Symmetry* tool works on meshes which are mostly symmetrical but have vertices which have been moved enough that Bforartists does not detect then as mirrored (when x-mirror option is enable for example).

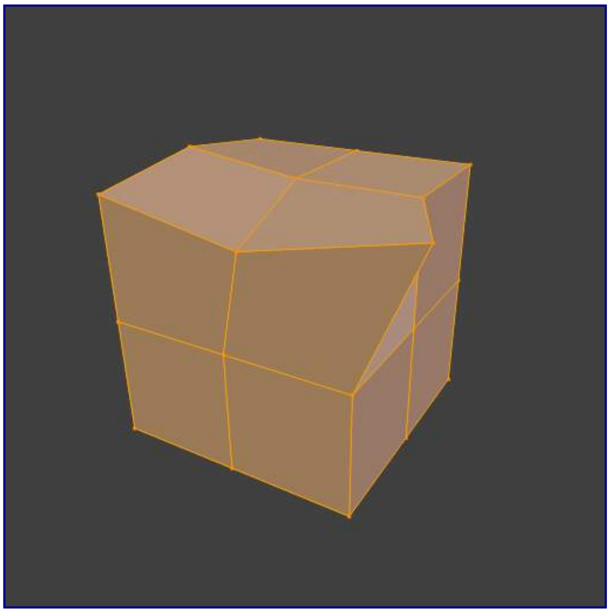
This can be caused by accident when editing without x-mirror enabled. Sometimes models imported from other applications are asymmetrical enough that mirror fails too.

Direction
: Specify the axis and direction to snap. Can be any of the 3 axes, and either positive to negative, or negative to positive.

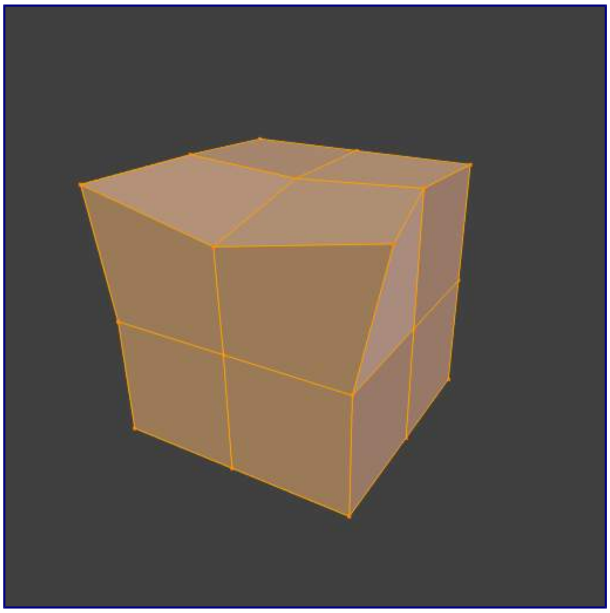
Threshold
: Specify the search radius to use when finding matching vertices.

Factor
: Support for blending mirrored locations from one side to the other (0.5 is an equal mix of both).

Center
: Snap vertices in the center axis to zero.



Before Snap to Symmetry



After Snap to Symmetry

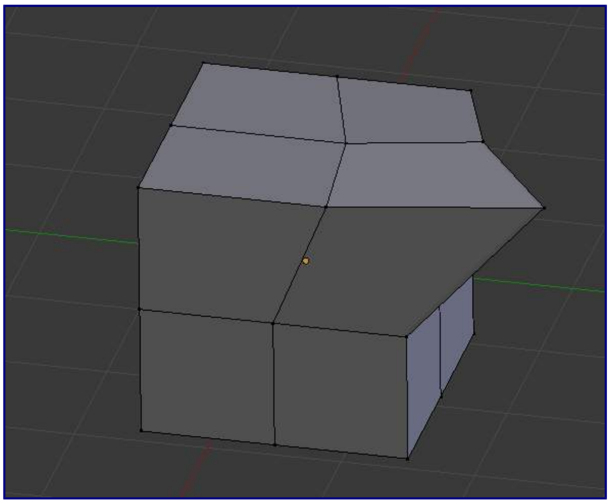
Symmetrize Mesh

Reference
Mode: *Edit* mode Menu: Mesh ‣ Symmetrize

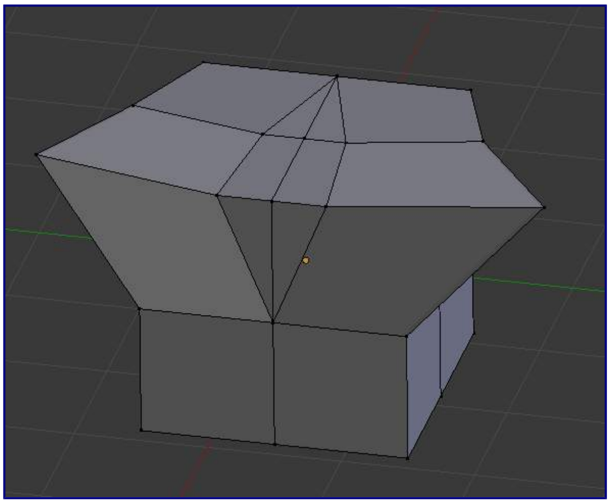
The *Symmetrize* tool is a quick way to make a mesh symmetrical. *Symmetrize* works by cutting the mesh at the pivot point of the object, and mirroring over the geometry in the specified axis, and merges the two halves together (if they are connected)

Direction

Specify the axis and direction of the effect. Can be any of the 3 axes, and either positive to negative, or negative to positive.



Mesh before Symmetrize



Mesh after Symmetrize

Mirroring Geometry

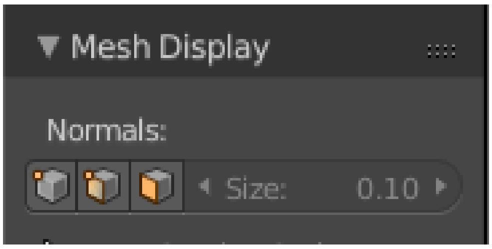
See *Mirror* for information on mirroring, which allows you to flip geometry across an axis

Normals

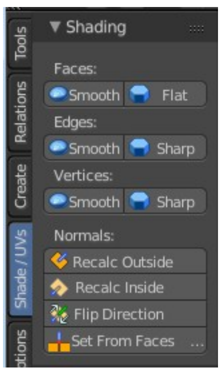
Introduction

Displaying Normals

Showing the normals is located in the Transform Panel, in the Mesh display tab. Here you can display the normals for edges, faces and vertices. You can also change the height of the axis that points the direction of the normal. The default is `0.1`.



Normal Display Options



Editing

Flip Direction

Reference
Mode: *Edit* mode
3D View > Tool Shelf > Shade UV's tab ‣ Shading panel > Normals ‣ Flip Direction

Flip direction will reverse the normals direction of all selected faces. It will not change the orientation.

Recalculate Normals

Reference
Mode: *Edit* mode 3D View > Tool Shelf > Shade UV's tab ‣ Shading panel > Normals ‣ Recalc Outside and 3D View > Tool Shelf > Shade UV's tab ‣ Shading panel > Normals ‣ Recalc Inside

The Recalc outside and Recalc inside commands will recalculate the normals of selected faces so that they point outside or inside the volume that the face belongs to. This volume does not need to be closed. In fact, this means that the face of interest must be adjacent with at least one non-coplanar other face. For example, with a *Grid* primitive, neither *Recalculate Outside* nor *Recalculate Inside* will never modify its normals.

Vertex Tools

This page covers many of the tools in the Mesh ‣ Vertices menu. These are tools that work primarily on vertex selections, however, some also work with edge or face selections.

Merging

Merging Vertices

Reference
Mode: *Edit* mode Menu: Mesh ‣ Vertices ‣ Merge..., Specials ‣ Merge or Vertex Specials ‣ Merge

This tool allows you to merge all selected vertices to an unique one, deleting all others. You can choose the location of the surviving vertex in the menu this tool pops up before executing:

At First
: Only available in *Vertex* select mode, it will place the remaining vertex at the location of the first one selected.

At Last
: Only available in *Vertex* select mode, it will place the remaining vertex at the location of the last one selected (the active one).

At Center
: Available in all select modes, it will place the remaining vertex at the center of the selection.

At Cursor
: Available in all select modes, it will place the remaining vertex at the 3D Cursor.

Collapse
: This is a special option, as it might let "live" more than one vertex. In fact, you will have as much remaining vertices as you had "islands" of selection (i.e. groups of linked selected vertices). The remaining vertices will be positioned at the center of their respective "islands". It is also available *via* the Mesh ‣ Edges ‣ Collapse menu option...

Merging vertices of course also deletes some edges and faces. But Bforartists will do everything it can to preserve edges and faces only partly involved in the reunion.

AutoMerge Editing

Reference
Mode: *Edit* mode Menu: Mesh ‣ AutoMerge Editing

The *Mesh* menu as a related toggle option: *AutoMerge Editing*. When enabled, as soon as a vertex moves closer to another one than the *Limit* setting (*Mesh Tools* panel, see below), they are automatically merged.

Remove Doubles

Reference
Mode: *Edit* mode Panel: *Editing* context –> *Mesh Tools* Menu: Mesh ‣ Vertices ‣ Remove Doubles, Specials ‣ Remove Doubles or Vertex Specials ‣ Remove Doubles

Remove Doubles is a useful tool to simplify a mesh by merging vertices that are closer than a specified distance to each other. An alternate way to simplify a mesh is to use the *Decimate modifier*.

Merge Distance
: Sets the distance threshold for merging vertices, in Bforartists units.

Unselected
: Allows vertices in selection to be merged with unselected vertices. When disabled, selected vertices will only be merged with other selected ones.

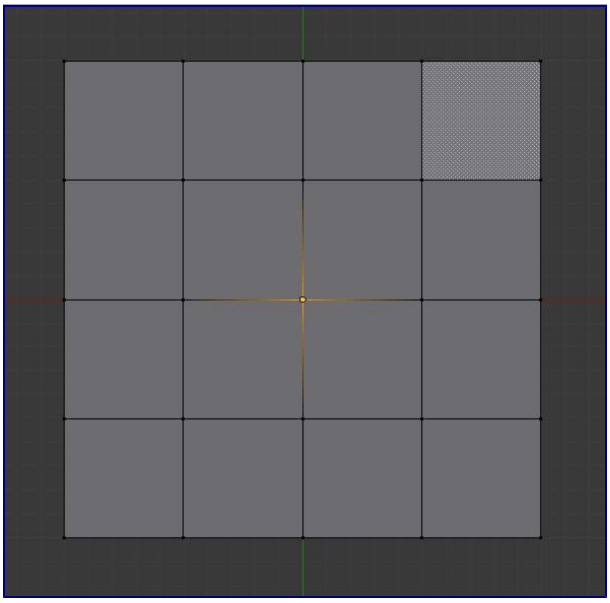
Separating

Rip

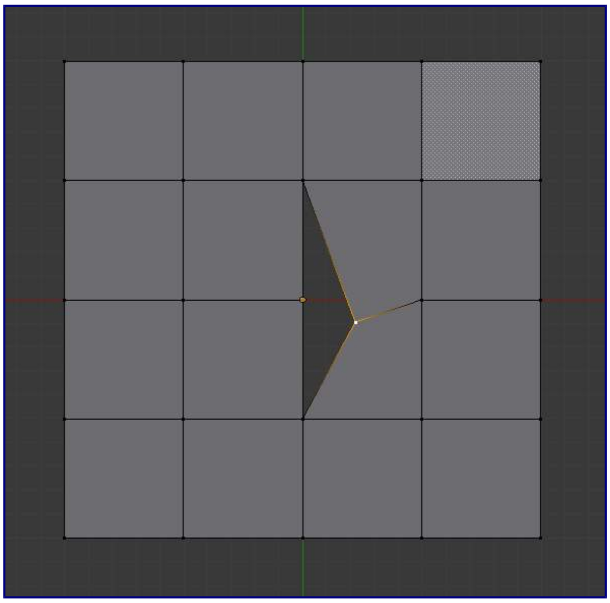
Reference
Mode: *Edit* mode Menu: Mesh ‣ Vertices ‣ Rip

Rip creates a "hole" into a mesh by making a copy of selected vertices and edges, still linked to the neighbor non-selected vertices, so that the new edges are borders of the faces on one side, and the old ones, borders of the faces of the other side of the rip.

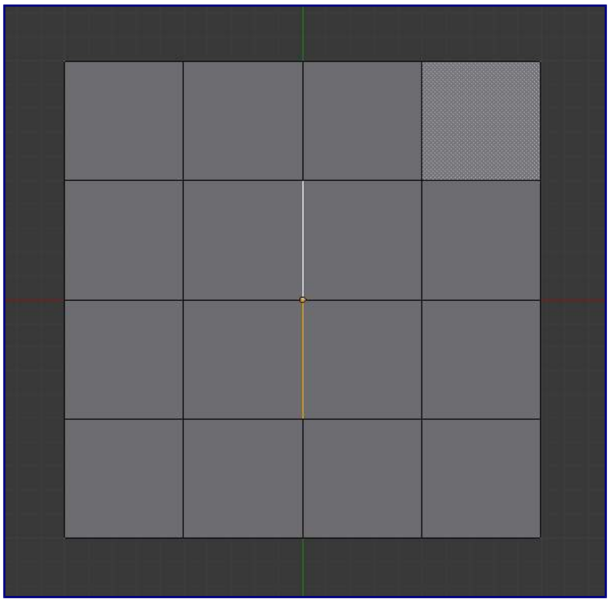
Examples



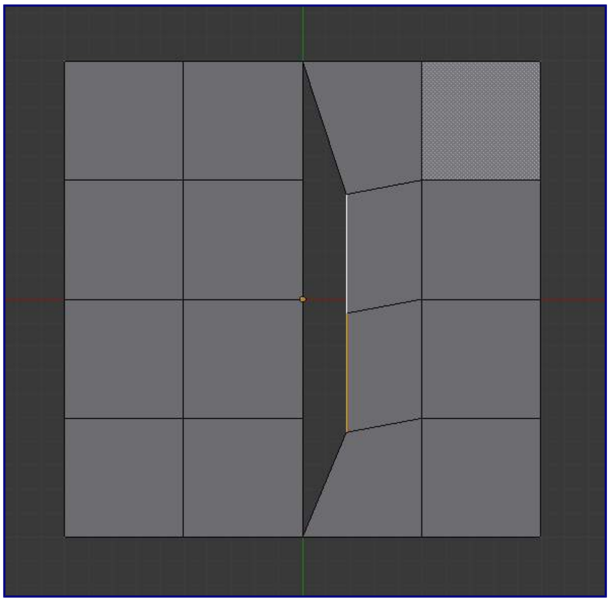
selected vertex



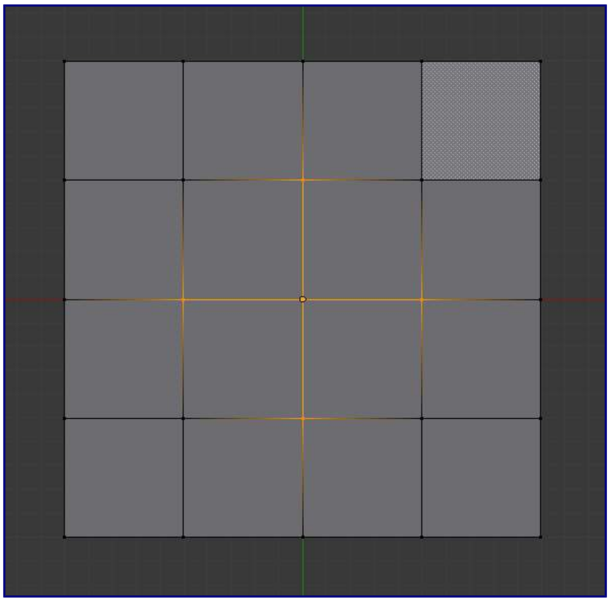
Hole created after using rip on vertex



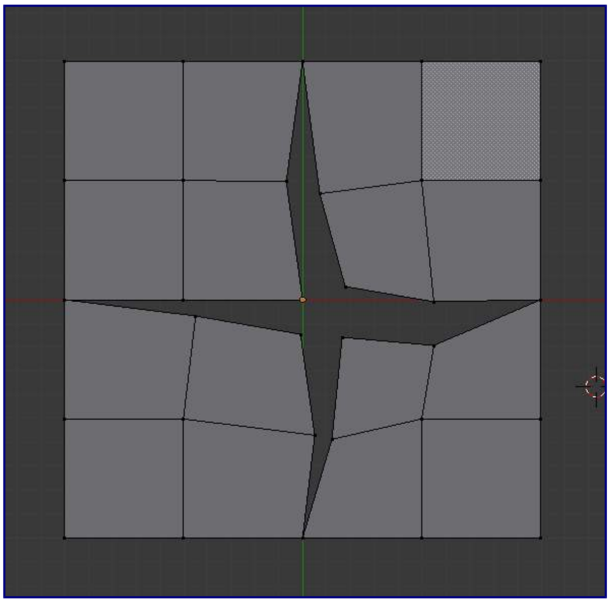
Edges selected



Result of rip with edge selection



A complex selection of vertices



Result of rip operation

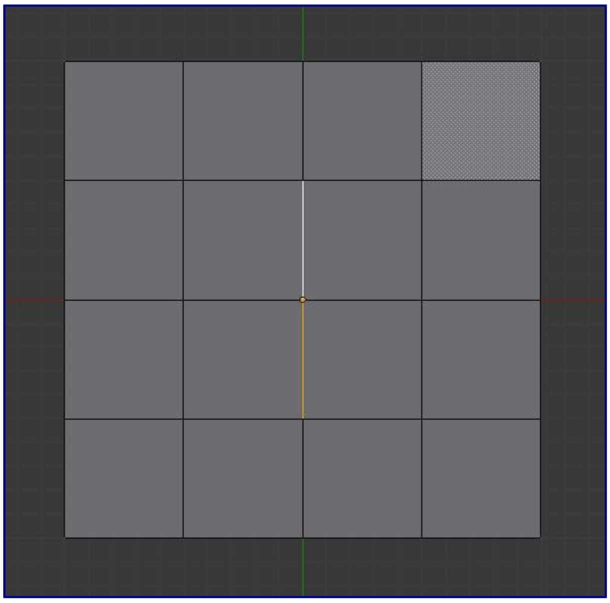
Limitations

Rip will only work when edges and/or vertices are selected. Using the tool when a face is selected (explicitly or implicitly), will return an error message *"Can't perform ripping with faces selected this way"* If your selection includes some edges or vertices that are not "between" two faces (manifold), it will also fail with message *"No proper selection or faces include"*.

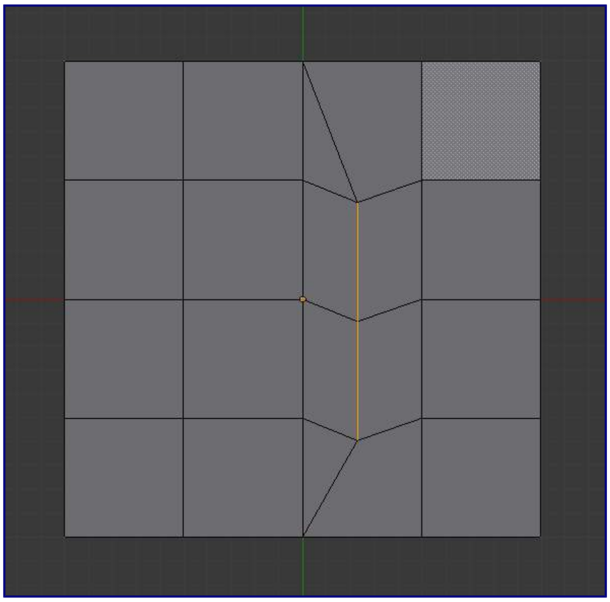
Rip Fill

Reference
Mode: *Edit* mode Menu: Mesh ‣ Vertices ‣ Rip Fill

Rip fill works the same as the Rip tool above, but instead of leaving a hole, it fills in the gap with geometry.



Edges selected



Result of rip fill

Split

Reference
Mode: *Edit* mode Menu: Mesh ‣ Vertices ‣ Split

A quite specific tool, it makes a sort of copy of the selection, removing the original data *if it is not used by any non-selected element*. This means that if you split an edge from a mesh, the original edge will still remain unless it is not linked to anything else. If you split a face, the original face itself will be deleted, but its edges and vertices remain unchanged. And so on.

Note that the “copy” is left exactly at the same position as the original, so you must move it (`G`) to see it clearly...

Separate

Reference
Mode: *Edit* mode Menu: Mesh ‣ Vertices ‣ Separate

This will separate the selection in another mesh object, as described *here*.

Connect Vertex Path

Reference
Mode: *Edit* mode Menu: Mesh ‣ Vertices ‣ Connect Vertex Path

This tool connects vertices in the order they’re selected, splitting the faces between them.

Runnign a second time will connect the first/last endpoints.

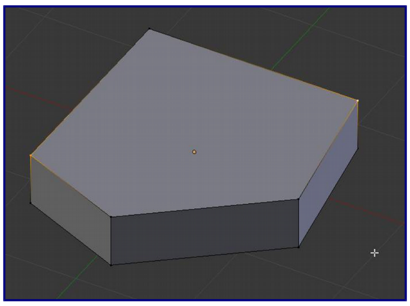
Vertices not connected to any faces will create edges, so this can be used as a way to quickly connect isolated vertices too.

Connect Vertices

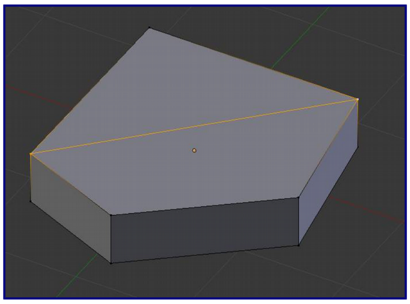
Reference
Mode: *Edit* mode Menu: Mesh ‣ Vertices ‣ Connect Vertices

This tool connects selected vertices by creating edges between them and splitting the face.

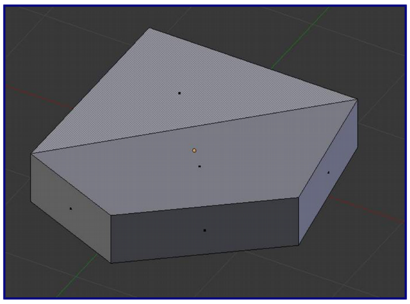
This tool can be used on many faces at once.



Selected vertices before connecting



After connecting vertices



Two faces created from vertex connect operation

Vertex Slide

Reference
Mode: *Edit* mode Panel: *Editing* context –> *Mesh Tools* Menu: Mesh ‣ Vertices ‣ Vertex Slide

Vertex Slide will transform a vertex along one of its adjacent edges. Use `Shift-V` to enter tool. Highlight the desired edge by moving the mouse, then confirm with `LMB`. Drag the cursor to specify the position along the line formed by the edge, then `LMB` again to move the vertex.

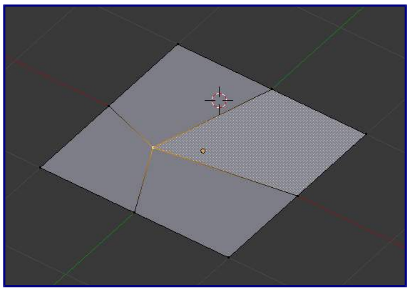
`Shift`
: Higher precision control.

`Ctrl`
: Snap to value (useful to combine with auto merge)

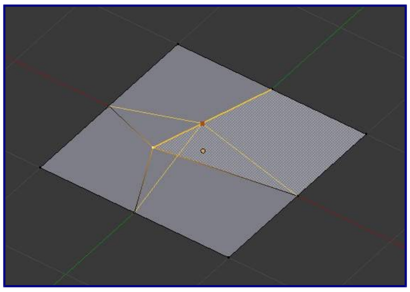
`LMB`
: confirms the tool

`RMB` or `Esc`
: Cancels.

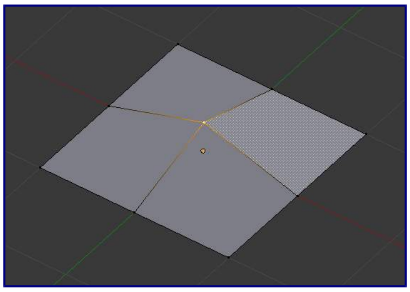
`Alt` or `C`
: Toggle clamping the slide within the edge extents.



Selected vertex



Positioning vertex interactively



Repositioned vertex

Smooth

Reference
Mode: *Edit* mode Panel: *Editing* context –> *Mesh Tools* Menu: Mesh ‣ Vertices ‣ Smooth, Specials ‣ Smooth or Vertex Specials ‣ Smooth

This will apply once the *Smooth Tool*.

Make Vertex Parent

Reference
Mode: *Edit* mode Menu: Mesh ‣ Vertices ‣ Make Vertex Parent

This will parent the other selected object(s) to the vertices/edges/faces selected, as described *here*.

Add Hook

Reference
Mode: *Edit* mode Menu: Mesh ‣ Vertices ‣ Add Hook

Adds a *Hook Modifier* (using either a new empty, or the current selected object) linked to the selection. Note that even if it appears in the history menu, this action cannot be undone in *Edit* mode - probably because it involves other objects...

Blend From Shape, Propagate Shapes

Reference
Mode: *Edit* mode Menu: (Vertex) Specials ‣ Blend From Shape and Mesh ‣ Vertices ‣ Shape Propagate

These are options regarding *shape keys*.

Edges

Make Edge/Face

Reference
Mode: *Edit* mode Menu: Mesh ‣ Edges ‣ Make Edge/Face

It will create an edge or some faces, depending on your selection.

See also *Make Edge/Face*.

Set Edge Attributes

Edges can have several different attributes that affect how certain other tools affect the mesh.

Mark Seam and Clear Seam

Reference
Mode: *Edit* mode (*Vertex* or *Edge* select modes) Menu: Mesh ‣ Edges ‣ Mark Seam/Clear Seam (or the same options in *Edge Specials* menu)

Seams are a way to create separations, “islands”, in UV maps. See the UVTexturing section for more details. These commands set or unset this flag for selected edges.

Mark Sharp and Clear Sharp

Reference
Mode: *Edit* mode (*Vertex* or *Edge* select modes) Menu: Mesh ‣ Edges ‣ Mark Seam/Clear Seam (or the same options in *Edge Specials* menu)

The *Sharp* flag is used by the *EdgeSplit modifier*, which is part of the smoothing technics. As seams, it is a property of edges, and these commands set or unset it for selected ones.

Adjust Bevel Weight

Reference
Mode: *Edit* mode (*Vertex* or *Edge* select modes) Menu: Mesh ‣ Edges ‣ Adjust Bevel Weight

This edge property (a value between **0.0** and **1.0**) is used by the *Bevel modifier* to control the bevel intensity of the edges. This command enters an interactive mode (a bit like transform tools), where by moving the mouse (or typing a value with the keyboard) you can set the (average) bevel weight of selected edges.

Crease SubSurf

Reference
Mode: *Edit* mode (*Vertex* or *Edge* select modes) Menu: Mesh ‣ Edges ‣ Crease SubSurf

This edge property (a value between **0.0** and **1.0**) is used by the *Subsurf modifier* to control the sharpness of the edges in the subdivided mesh. This command enters an interactive mode (a bit like transform tools), where by moving the mouse (or typing a value with the keyboard) you can set the (average) crease value of selected edges. To clear the crease edge property, enter a value of **-1**.

Edge Slide

Reference
Mode: *Edit* mode (*Vertex* or *Edge* select modes) Menu: Mesh ‣ Edges ‣ Slide Edge (or the same option in *Edge Specials* menu)

Slides one or more edges across adjacent faces with a few restrictions involving the selection of edges *(i.e. the* *selection must define a valid loop, see below.)*

Shift
: Higher precision control.

Ctrl
: Snap to value (useful to combine with auto merge)

LMB
: confirms the tool

RMB or Esc
: Cancels.

Even E
: Forces the edge loop to match the shape of the adjacent edge loop. You can flip to the opposite vertex using F. Use Alt-Wheel to change the control edge.

Flip F
: When Even mode is active, this flips between the two adjacent edge loops the active edge loop will match

Alt or C
: Toggle clamping the slide within the edge extents.

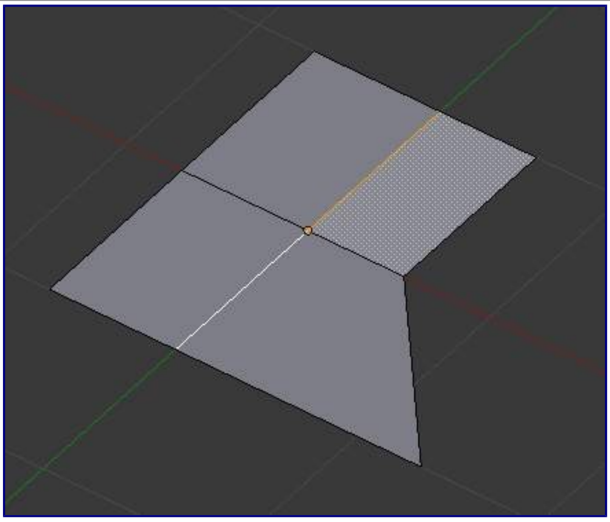
This tool has a factor, which is displayed in the 3D View footer and in the *Tool Shelf* (after confirmation). A numerical value between -1 and 1 can be entered for precision.

In *Proportional* mode, Wheel, or Left and Right changes the selected edge for calculating a proportion. Unlike *Percentage* mode, *Proportional*

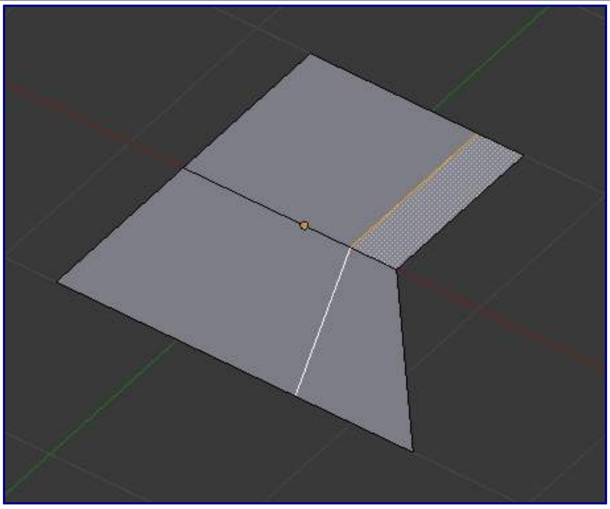
Holding Ctrl or Shift control the precision of the sliding. Ctrl snaps movement to 10% steps per move and Shift snaps movement to 1% steps. The default is 5% steps per move.

Usage

By default, the position of vertices on the edge loop move as a percentage of the distance between their original position and the adjacent edge loop, regardless of the edges' lengths.



Selected Edge Loop



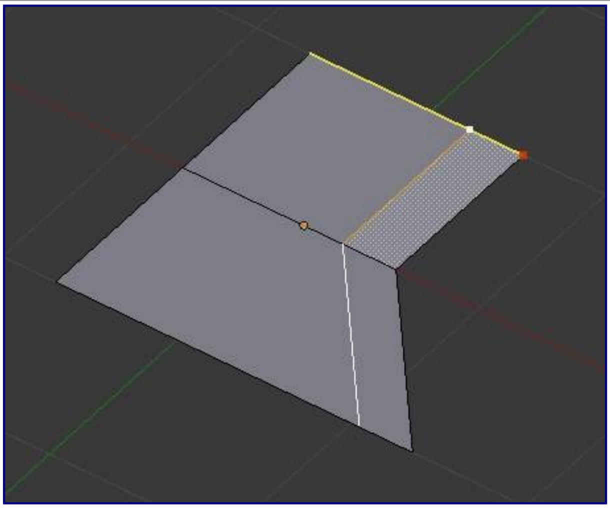
Repositioned Edge Loop

Even mode

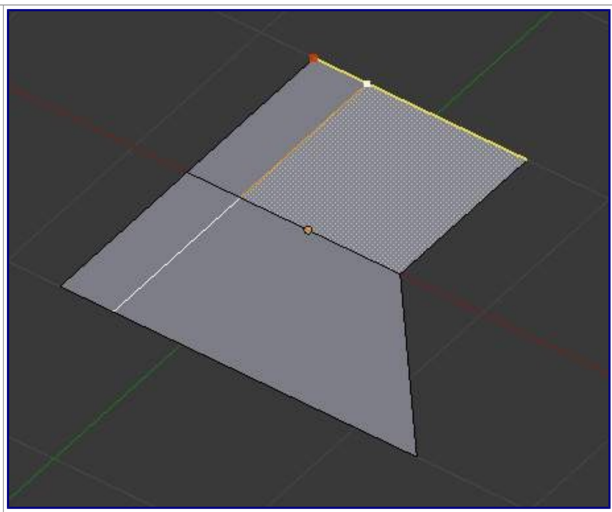
Even mode keeps the shape of the selected edge loop the same as one of the edge loops adjacent to it, rather than sliding a percentage along each perpendicular edge.

In *Even* mode, the tool shows the position along the length of the currently selected edge which is marked in yellow, from the vertex that as an enlarged red marker. Movement of the sliding edge loop is restricted to this length. As you move the mouse the length indicator in the header changes showing where along the length of the edge you are.

To change the control edge that determines the position of the edge loop, use the `Alt-Wheel` to scroll to a different edge.



Even Mode Enabled



Even Mode with Flip Enabled

Moving the mouse moves the selected edge loop towards or away from the start vertex, but the loop line will only move as far as the length of the currently selected edge, conforming to the shape of one of the bounding edge loops.

Limitations & Workarounds

There are restrictions on the type of edge selections that can be operated upon. Invalid selections are:

Loop crosses itself
: This means that the tool could not find any suitable faces that were adjacent to the selected edge(s). (*Loop crosses*) is an example that shows this by selecting two edges that share the same face. A face cannot be adjacent to itself.

Multiple edge loops
: The selected edges are not in the same edge loop, which means they don’t have a common edge. You can minimize this error by always selecting edges end to end or in a “Chain”. If you select multiple edges just make sure they are connected. This will decrease the possibility of getting looping errors.

Border Edge
: When a single edge was selected in a single sided object. An edge loop can not be found because there is only one face. Remember, edge loops are loops that span two or more faces.

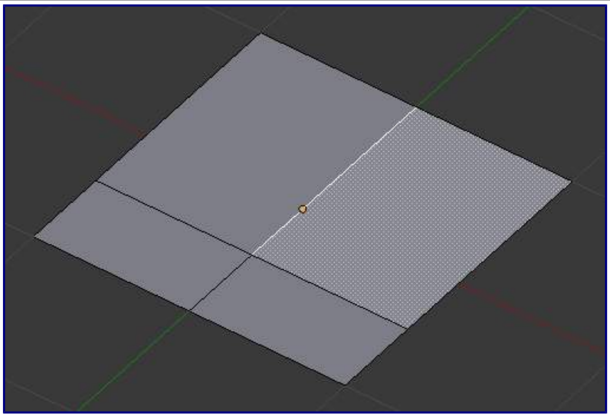
A general rule of thumb is that if multiple edges are selected they should be connected end to end such that they form a continuous chain. This is *literally* a general rule because you can still select edges in a chain that are invalid because some of the edges in the chain are in different edge loops.

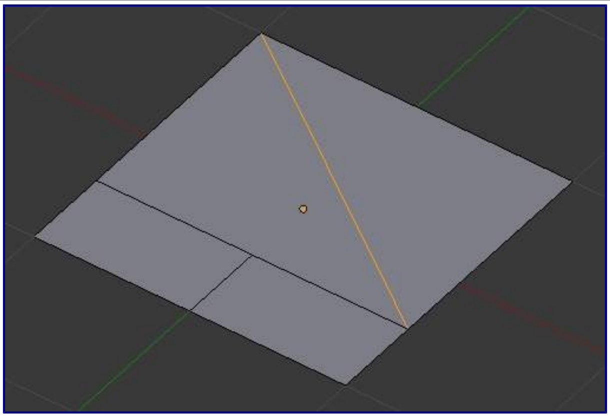
Rotate Edge

Reference
Mode: *Edit* mode (*Vertex* or *Edge* select modes)

Menu: Mesh ‣ Edges ‣ Rotate Edge CW / Rotate Edge CCW

Rotating an edge clockwise or counter-clockwise spins an edge between two faces around their vertices. This is very useful for restructuring a mesh’s topology. The tool can operate on one explicitly selected edge, or on two selected vertices or two selected faces that implicitly share an edge between them.


Selected Edge


Edge, rotated CW

Using Face Selection

To rotate an edge based on faces you must select two faces, (*Adjacent selected faces*), otherwise Bforartists notifies you with an error message, *“ERROR: Could not find any select edges that can be rotated”*. Using either *Rotate Edge CW* or *Rotate Edge CCW* will produce exactly the same results as if you had selected the common edge shown in (*Selected edge rotated CW and CCW.*).

Delete Edge Loop

Reference

Mode: *Edit* mode (*Vertex* or *Edge* select modes)
Menu: Mesh ‣ Delete ‣ Edge Loop

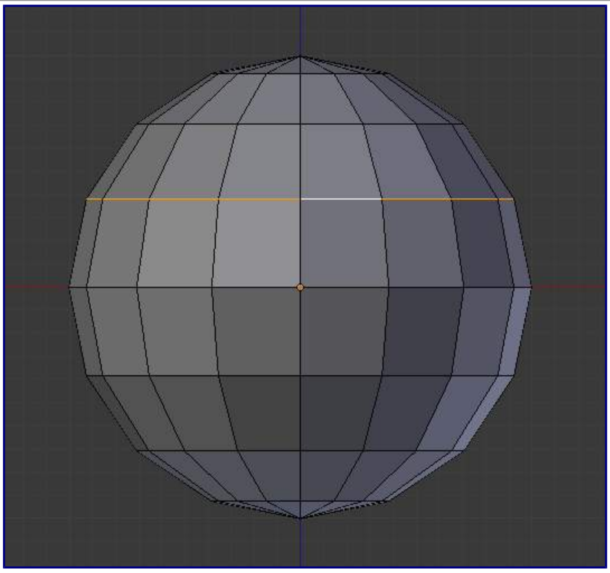
Delete Edge Loop allows you to delete a selected edge loop if it is between two other edge loops. This will create one face-loop where two previously existed.

Note

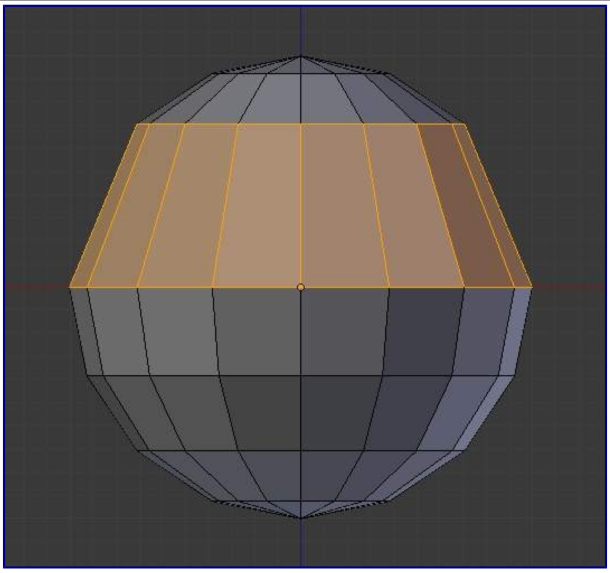
The *Edge Loop* option is very different to the *Edges* option, even if you use it on edges that look like an edge loop. Deleting an edge loop merges the surrounding faces together to preserve the surface of the mesh. By deleting a chain of edges, the edges are removed, deleting the surrounding faces as well. This will leave holes in the mesh where the faces once were.

Example

The selected edge loop on the UV Sphere has been deleted and the faces have been merged with the surrounding edges. If the edges had been deleted by choosing *Edges* from the (*Erase Menu*) there would be an empty band of deleted faces all the way around the sphere instead.



Selected Edge Loop

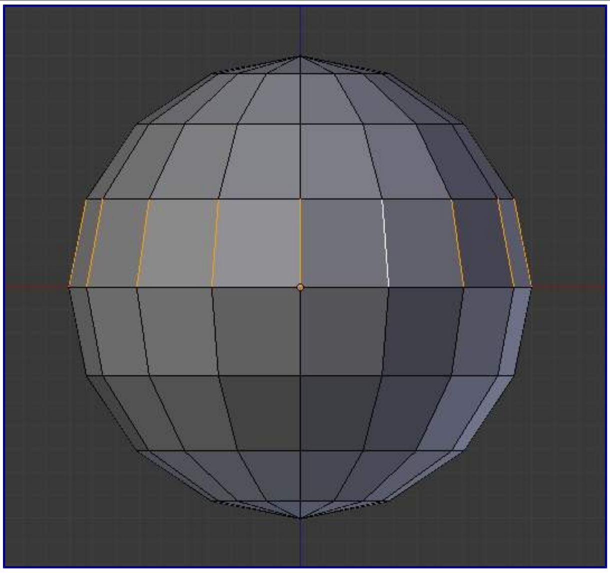


Edge Loop Deleted

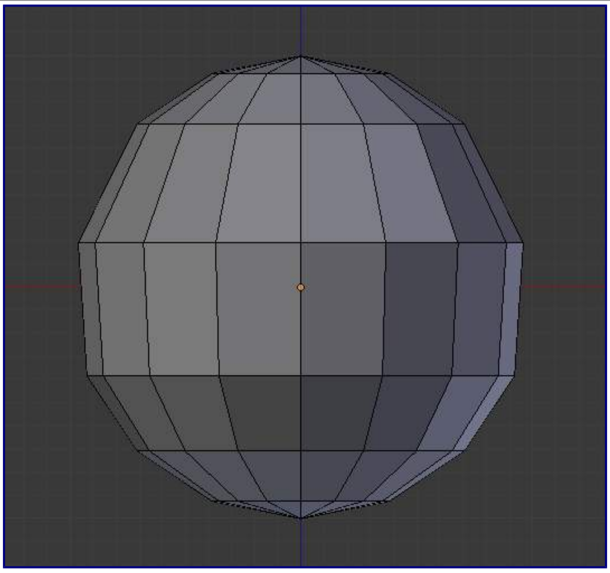
Collapse

Reference
Mode: *Edit* mode Menu: Mesh ‣ Delete ‣ Edge Collapse

This takes a selection of edges and for each edge, merges its two vertices together. This is useful for taking a ring of edges and collapsing it, removing the face loop it ran through.



Selected Edge Ring

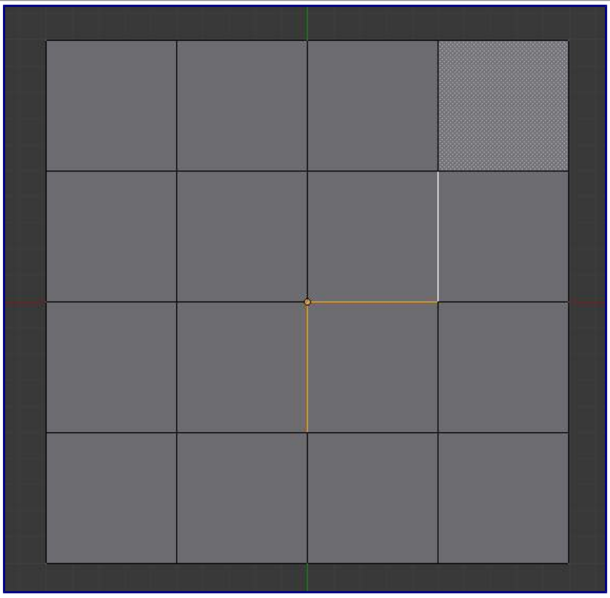


Edge Ring Collapsed

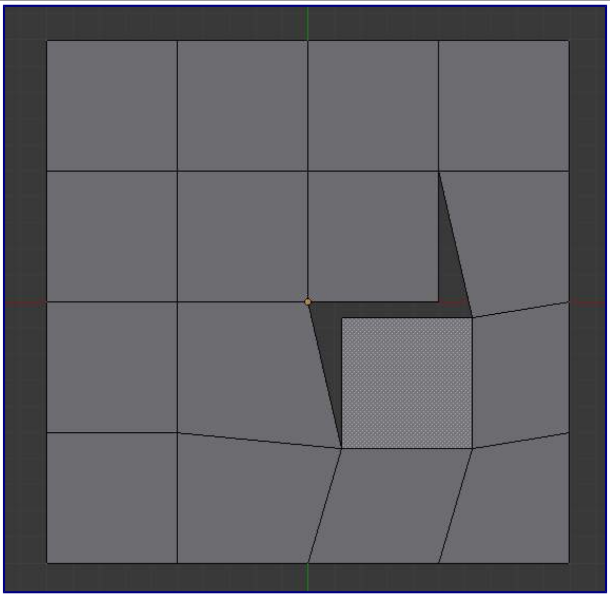
Edge Split

Reference
Mode: *Edit* mode Menu: Mesh ‣ Edges ‣ Edge Split

Edge split is similar to the rip tool. When two or more touching interior edges, or a border edge is selected when using *Edge split*, a hole will be created, and the selected edges are duplicated to form the border of the hole



Selected Edges



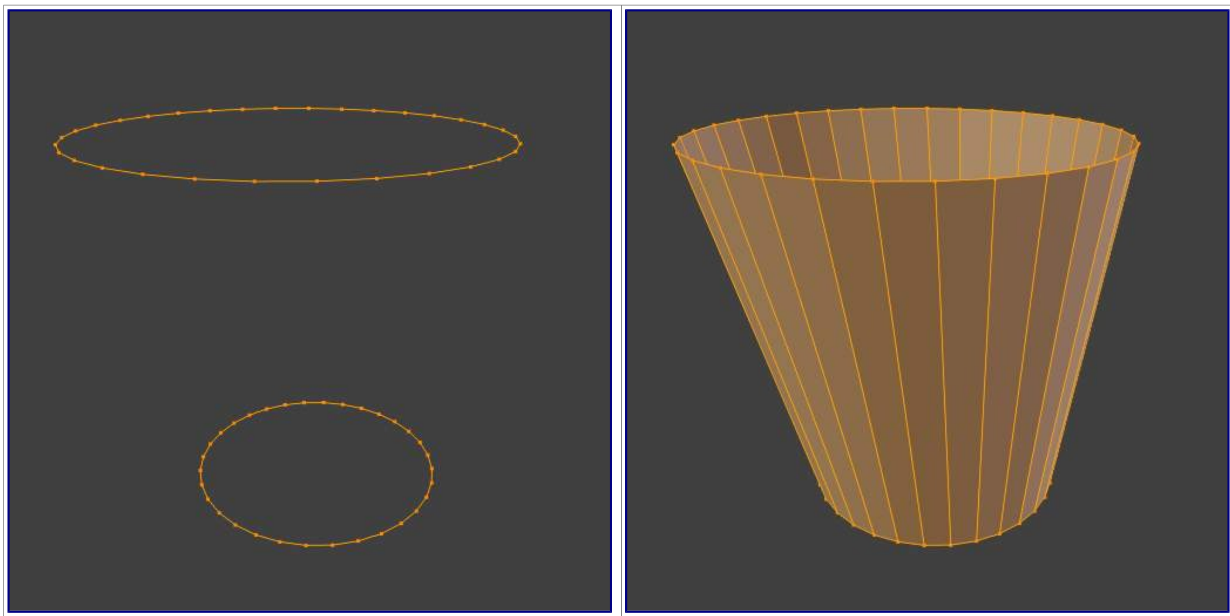
Adjacent face moved to reveal hole left by split

Bridge Edge Loops

Reference
Mode: *Edit* mode Menu: Mesh ‣ Edges ‣ Bridge Edge Loops

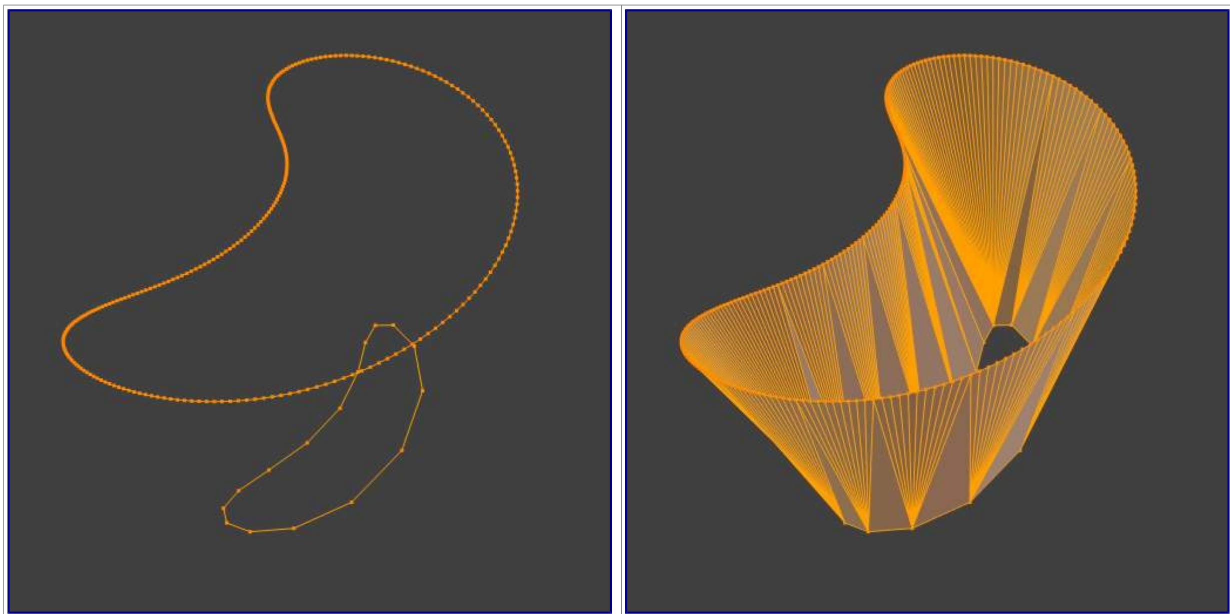
Bridge Edge Loops connects multiple edge loops with faces.

Simple example showing 2 closed edge loops.



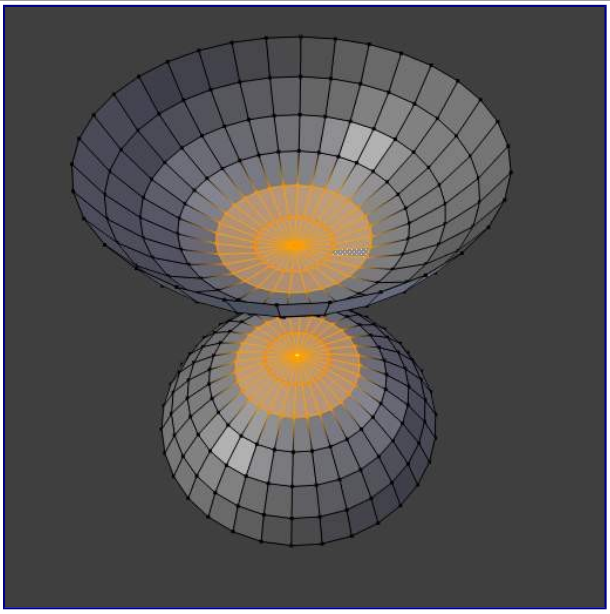
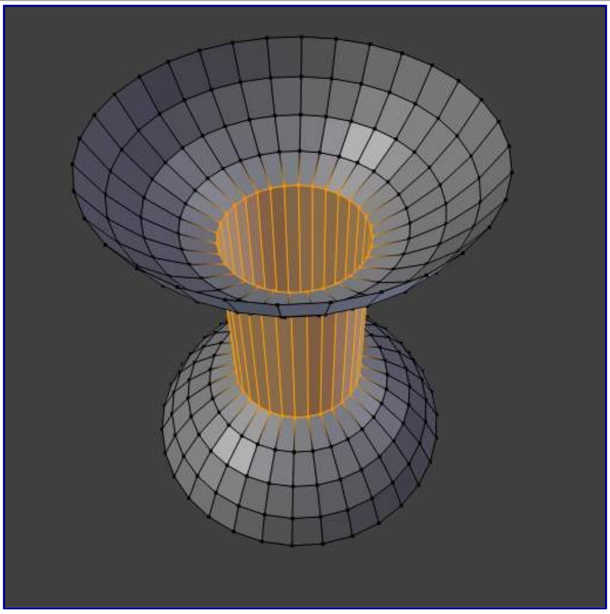
Input | Bridge Result

Example of bridge tool between edge loops with different numbers of vertices.

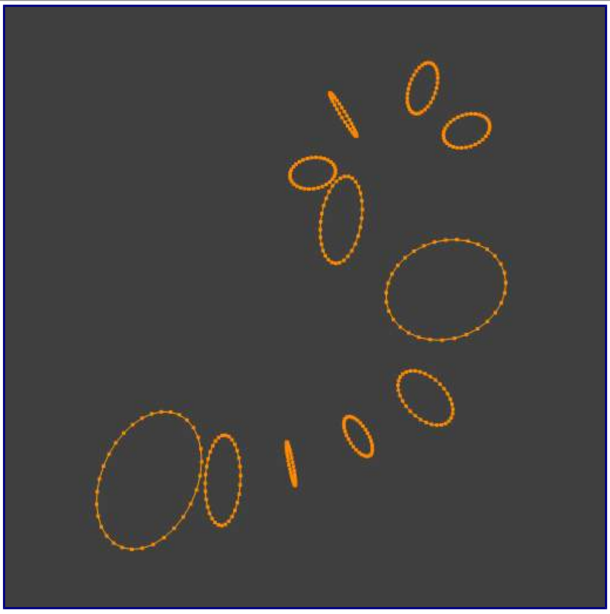
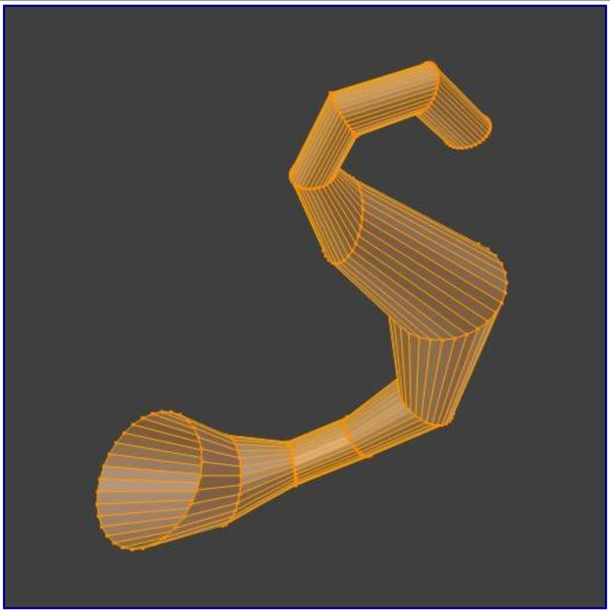


Input | Bridge Result

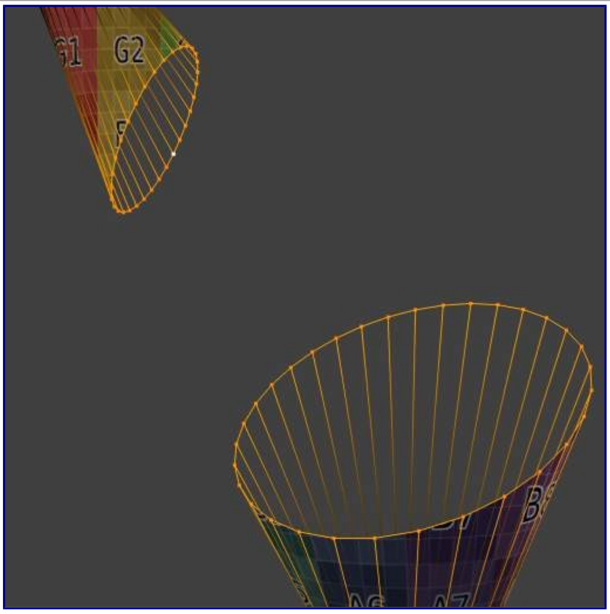
Example using the bridge tool to punch holes in face selections and connect them.

	
Input	Bridge Result

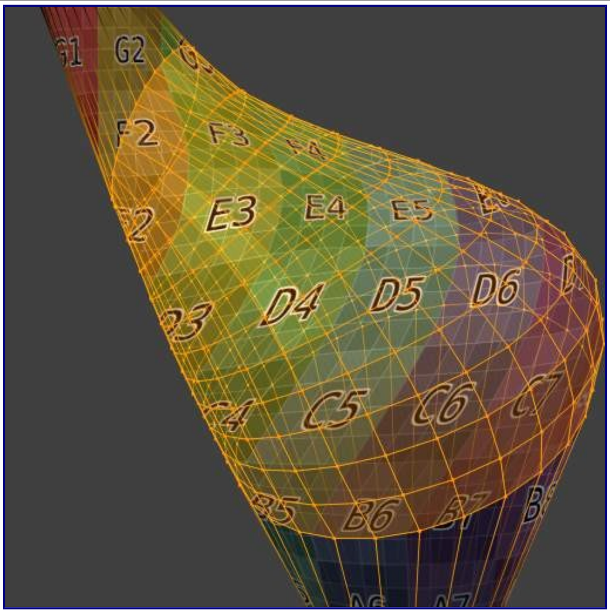
Example showing how bridge tool can detect multiple loops and loft them in one step.

	
Input	Bridge Result

Example of the subdivision option and surface blending with UV’s.



Input



Bridge Result

Face Tools

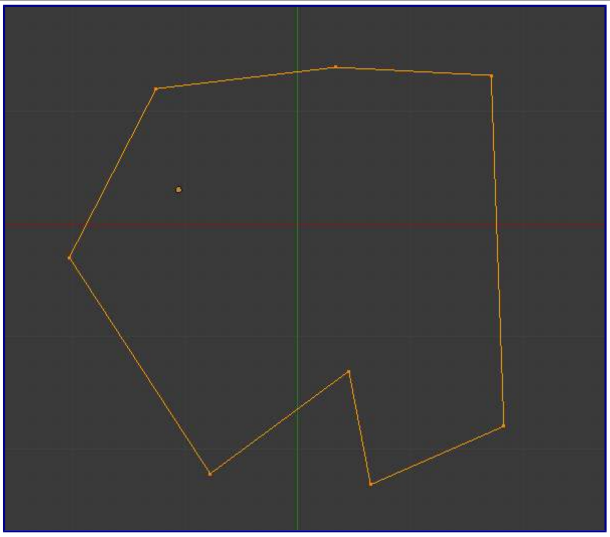
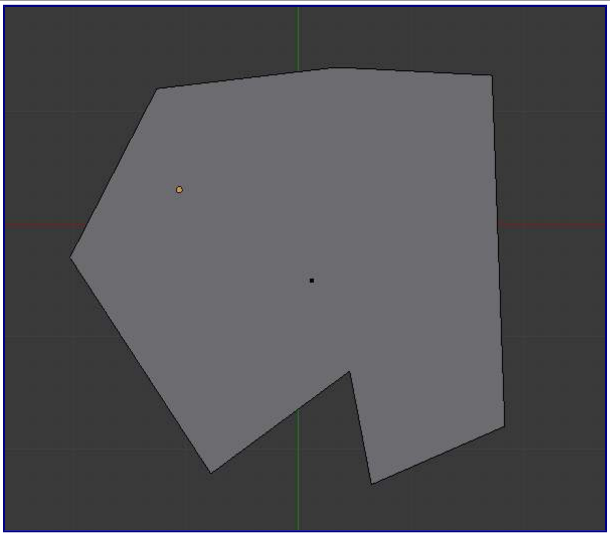
These are tools that manipulate faces.

Creating Faces

Make Edge/Face

Reference
Mode: *Edit* mode Menu: Mesh ‣ Faces ‣ Make Edge/Face

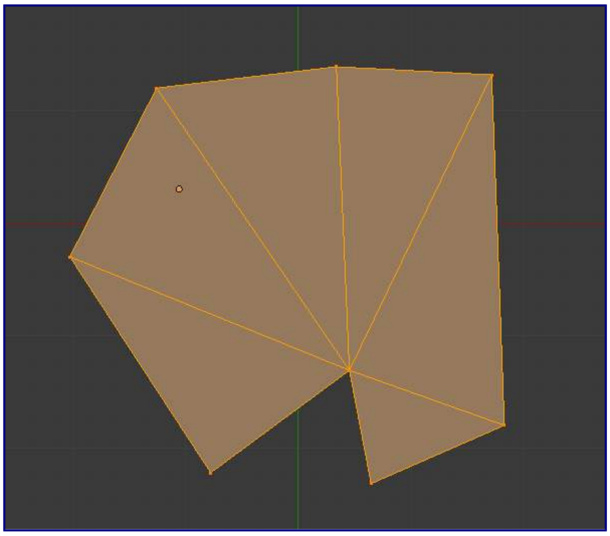
This will create an edge or some faces, depending on your selection. Also see *Make Edge/Face*.

	
A closed perimeter of edges	Filled using fill

Fill

Reference
Mode: *Edit* mode Menu: Mesh ‣ Faces ‣ Fill/Beautify Fill

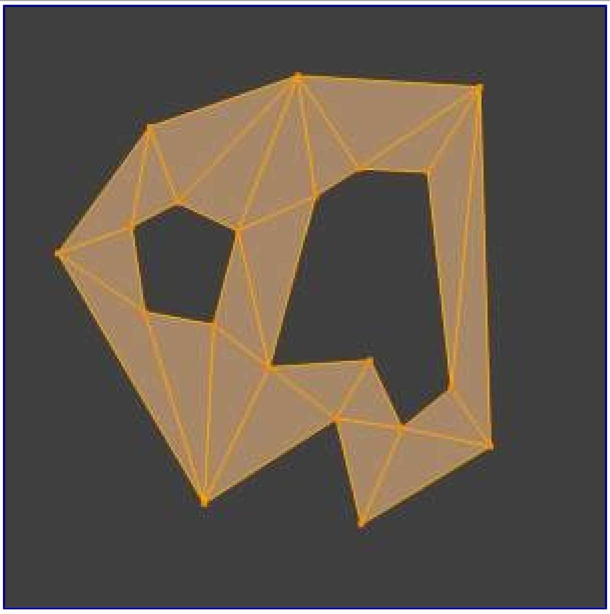
The *Fill* option will create *triangular* faces from any group of selected edges or vertices, *as long as they form one or more complete perimeters*.



Filled using fill

note, unlike creating n-gons, fill supports holes.

A closed perimeter of edges with holes

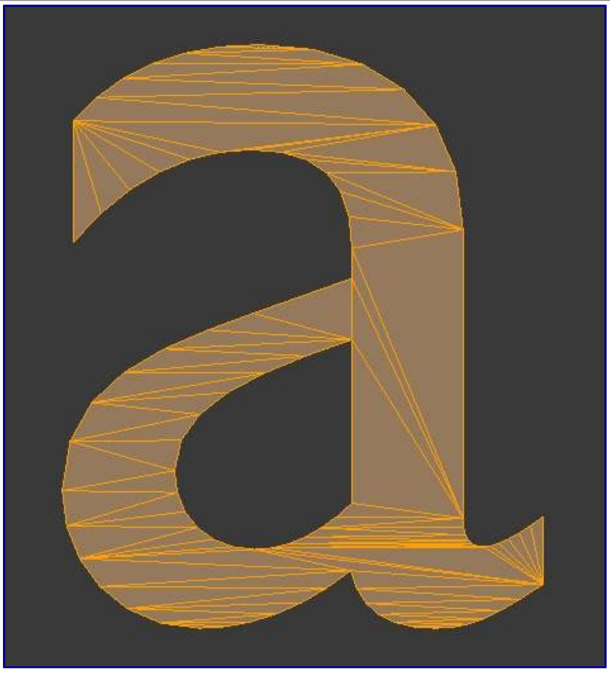


Filled using fill

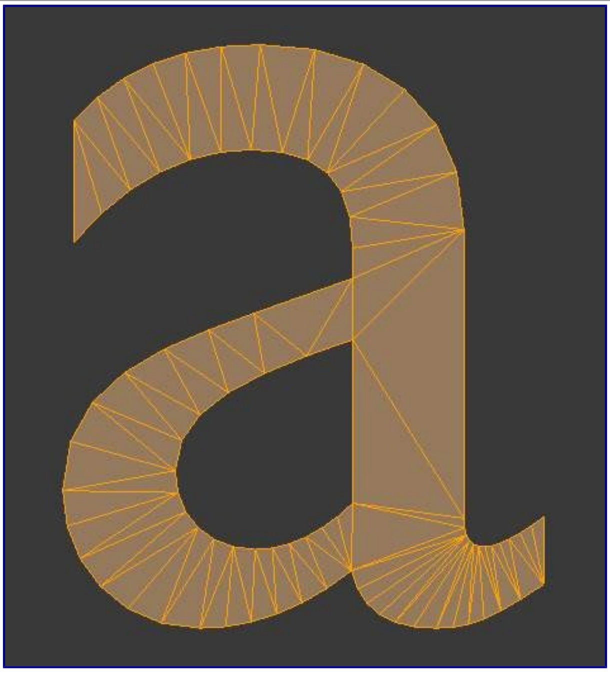
Beauty Fill

Reference
Mode: *Edit* mode Menu: Mesh ‣ Faces ‣ Fill/Beautify Fill

Beautify Fill works only on selected existing faces. It rearrange selected triangles to obtain more “balanced” ones (i.e. less long thin triangles).



Text converted to a mesh

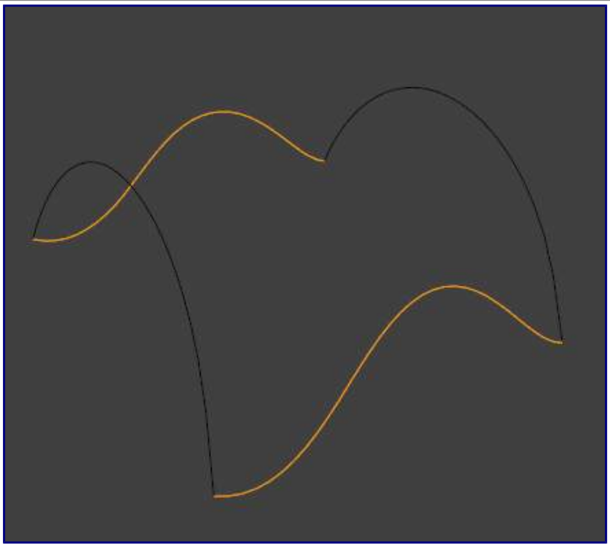


Result of Beauty Fill, Alt-Shift-F

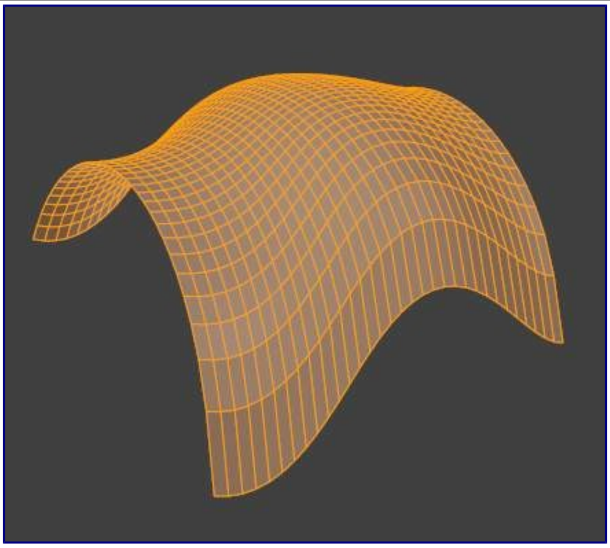
Grid Fill

Reference
Mode: *Edit* mode Menu: Mesh ‣ Faces ‣ Fill/Grid Fill

Grid Fill uses a pair of connected edge-loops to fill in a grid that follows the surrounding geometry.



Input



Grid Fill Result

Convert Quads to Triangles

Reference
Mode: *Edit* mode Menu: Mesh ‣ Faces ‣ Convert Quads to Triangles or Face Specials ‣ Triangulate

As its name intimates, this tool converts each selected quadrangle into two triangles. Remember that quads are just a set of two triangles.

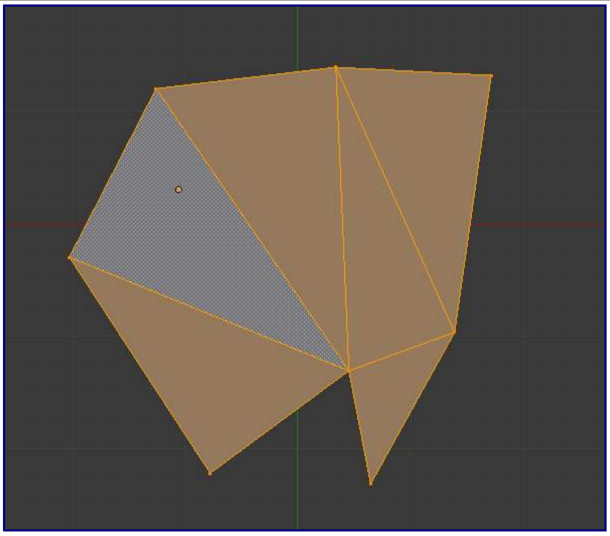
Convert Triangles to Quads

Reference
Mode: *Edit* mode Panel: *Mesh Tools* (*Editing* context) Menu: Mesh ‣ Faces ‣ Convert Triangles to Quads

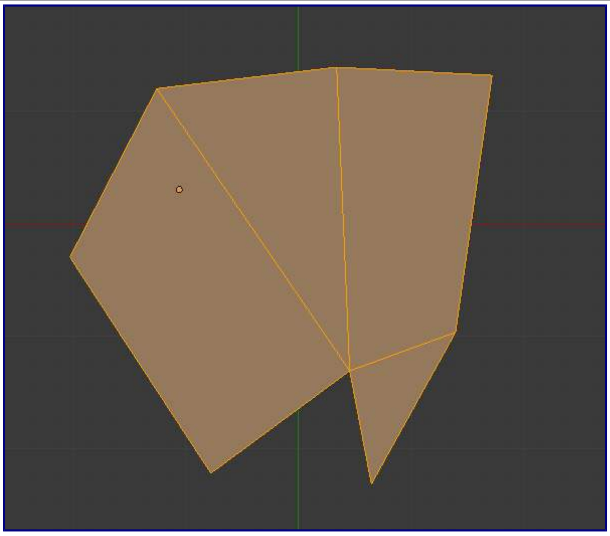
This tool converts the selected triangles into quads by taking adjacent tris and removes the shared edge to create a quad, based on a threshold. This tool can be performed on a selection of multiple triangles.

This same action can be done on a selection of 2 tris, by selecting them and using the shortcut F, to create a face, or by selecting the shared edge and dissolving it with the shortcut [X] ‣ Dissolve.

To create a quad, this tool needs at least two adjacent triangles. If you have an even number of selected triangles, it is also possible not to obtain only quads. In fact, this tool tries to create “squarishest” quads as possible from the given triangles, which means some triangles could remain.



Before converting tris to quads



After converting tris to quads

All the menu entries and hotkey use the settings defined in the *Mesh Tools* panel:

Max Angle
: This values (between **0** and **180**) controls the threshold for this tool to work on adjacent triangles. With a threshold of **0.0**, it will only join adjacent triangles that form a perfect rectangle (i.e. right-angled triangles sharing their hypotenuses). Larger values are required for triangles with a shared edge that is small, relative to the size of the other edges of the triangles.

Compare UVs
: When enabled, it will prevent union of triangles that are not also adjacent in the active UV map. Note that this seems to be the only option working...

Compare Vcol
: When enabled, it will prevent union of triangles that have no matching vertex color. I’m not sure how this option works - or even if it really works...

Compare Sharp
: When enabled, it will prevent union of triangles that share a “sharp” edge. I’m not sure either if this option works, and what is the “sharp” criteria - neither the *Sharp* flag nor the angle between triangles seem to have an influence here...

Compare Materials
: When enabled, it will prevent union of triangles that do not use the same material index. This option does not seem to work neither...

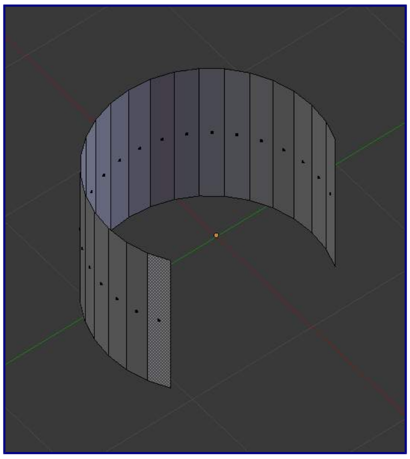
Solidify

Reference
Mode: *Edit* mode Menu: Mesh ‣ Faces ‣ Solidify

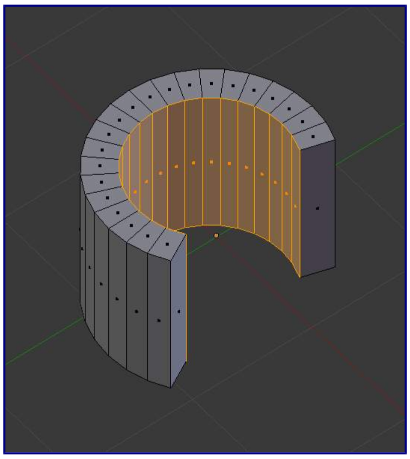
This takes a selection of faces and solidifies them by extruding them uniformly to give volume to a non-manifold surface. This is also available as a *Modifier*. After using the tool, you can set the offset distance in the Tool Palette.

Thickness

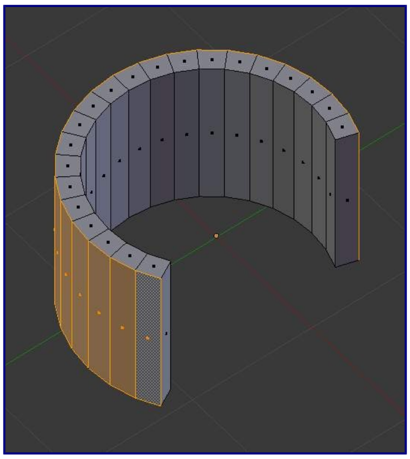
Amount to offset the newly created surface. Positive values offset the surface inward relative to the normals. Negative values offset outward.



Mesh before solidify operation



Solidify with a positive thickness



Solidify with a negative thickness

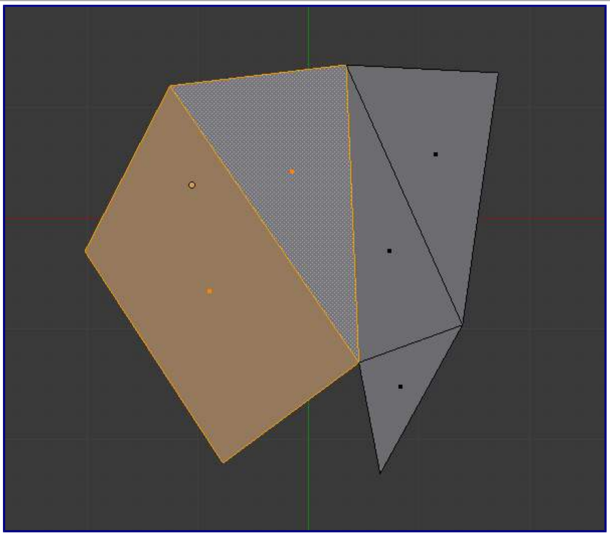
Rotate Edges

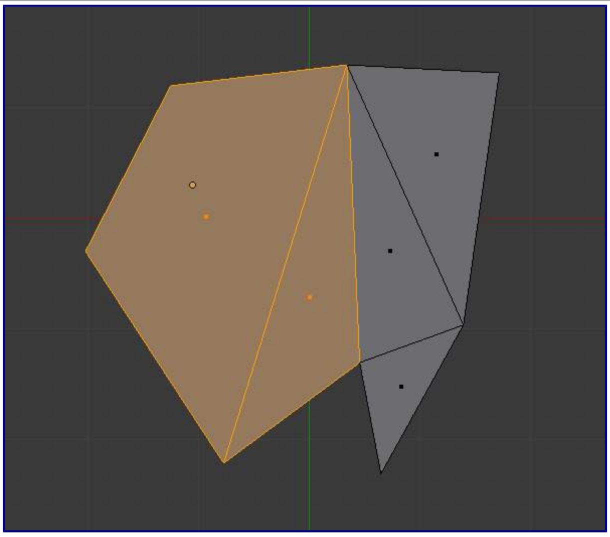
Reference
Mode: *Edit* mode

Menu: Mesh ‣ Faces ‣ Rotate Edge CW

This command functions the same edge rotation in edge mode.

It works on the shared edge between two faces and rotates that edge if the edge was selected.


Two Faces Selected


Full Render

See Rotate Edge for more information.

Normals

See Editing Normals for more information.

Deforming

Mirror

Reference

Mode: *Edit* mode
Menu: Mesh ‣ Mirror ‣ Desired Axis

The mirror tool mirrors a selection across a selected axis.

The mirror tool in *Edit* mode is similar to *Mirroring in Object mode*. It is exactly equivalent to scaling by -1 vertices, edges or faces around one chosen pivot point and in the direction of one chosen axis, only it is faster/handier.

After this tool becomes active, select an axis to mirror the selection on entering x,y, or z.

You can also interactively mirror the geometry by holding the `MMB` and dragging in the direction of the desired mirror direction.

Axis of symmetry

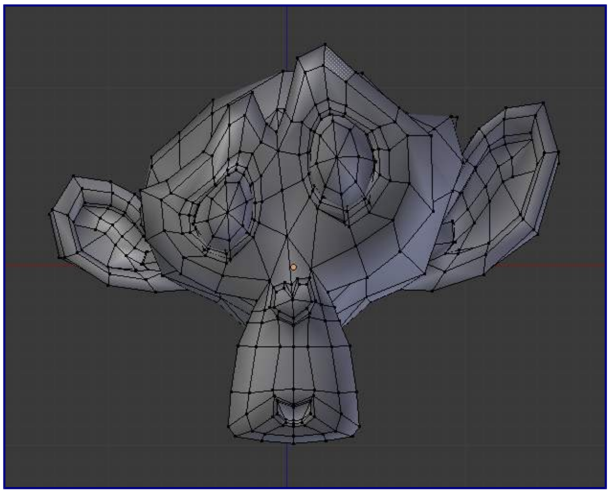
For each transformation orientation, you can choose one of its axes along which the mirroring will occur.

As you can see, the possibilities are infinite and the freedom complete: you can position the pivot point at any location around which we want the mirroring to occur, choose one transformation orientation and then one axis on it.

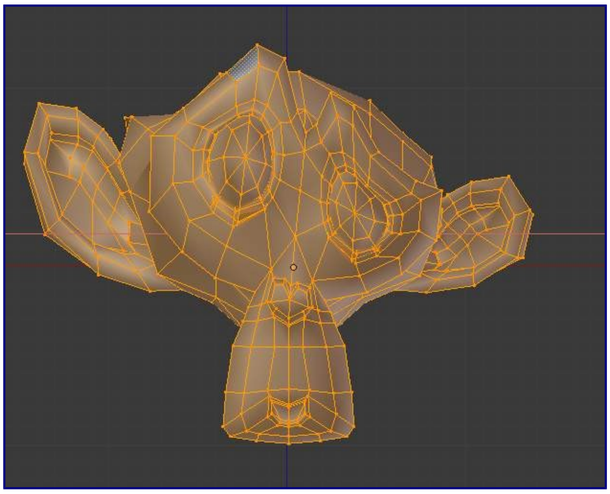
Pivot point

Pivot points must be set first. Pivot points will become the center of symmetry. If the widget is turned on it will always show where the pivot point is.

On (*Mirror around the Individual Centers* ...) the pivot point default to **median point of the selection of vertices** in *Edit* mode. This is a special case of the *Edit* mode as explained on the *pivot point page*.

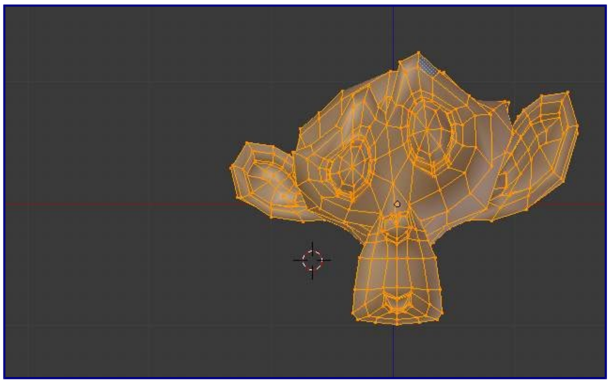


Mesh before mirror.

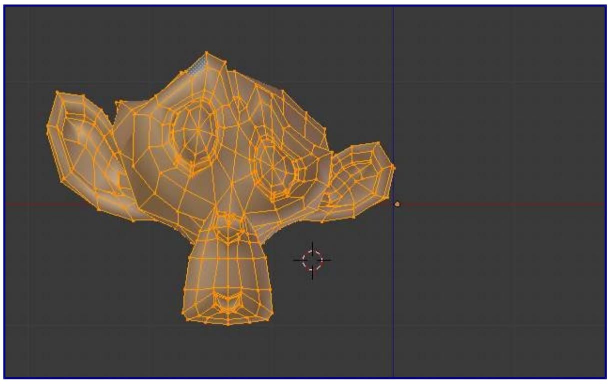


Mesh after mirrored along X axis

On (*Mirror around the 3D Cursor* ...) the pivot point is the *3D Cursor*, the transformation orientation is *Local*, a.k.a. the Object space, and the axis of transformation is X.



Mesh before mirror.



Mesh after mirrored along X axis using the 3d cursor as a pivot point

Transformation orientation

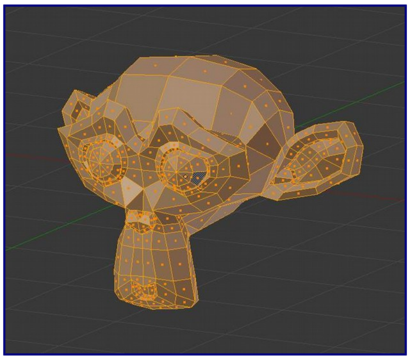
Transformation Orientations are found on the 3D area header, next to the *Widget* buttons. They decide which coordinate system will rule the mirroring.

Shrink/Fatten Along Normals

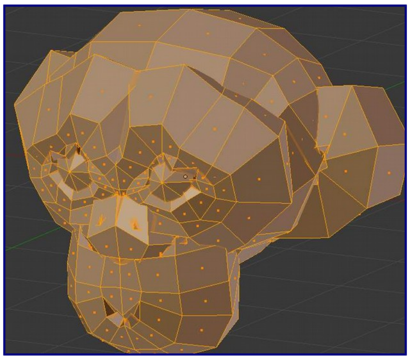
Reference
Mode: *Edit* mode Panel: *Mesh Tools* (*Editing* context) Menu: Mesh ‣ Transform ‣ Shrink/Fatten Along Normals

This tool translates selected vertices/edges/faces along their own normal (perpendicular to the face), which, on “standard normal meshes”, will shrink/fatten them.

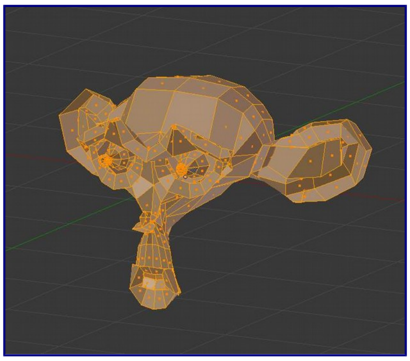
This transform tool does not take into account the pivot point or transform orientation.



mesh before shrink/flatten



Inflated using a positive value



Shrunk using a negative value

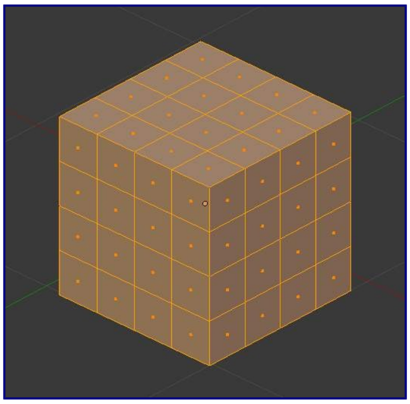
Smooth

Reference
Mode: *Edit* mode
Panel: *Mesh Tools* (*Editing* context)
Menu: Mesh ‣ Vertices ‣ Smooth vertex

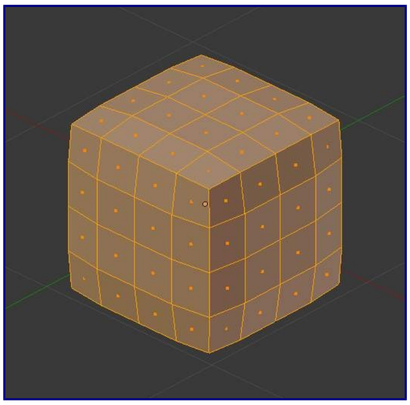
This tool smooths the selected components by averaging the angles between faces. After using the tool, options appear in the *Tool Shelf*:

Number of times to smooth
: The number of smoothing iterations

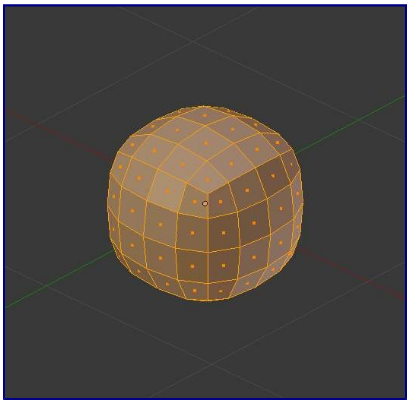
Axes
: Limit the effect to certain axes.



mesh before smoothing



mesh after 1 smoothing iteration



mesh after 10 smoothing iterations

Laplacian Smooth

Reference
Mode: *Edit* mode

See the *Laplacian Smooth Modifier* for details.

Laplacian smooth is uses an alternative smoothing algorithm that better preserves the overall mesh shape. Laplacian smooth exists as a mesh operation and as a non-destructive modifier.

Note

The *Smooth modifier*, which can be limited to a *Vertex Group*, is a non-destructive alternative to the smooth tool.

Note

Real Smoothing versus Shading Smoothing

Do not mistake this tool with the shading smoothing options described at *this page*, they do not work the same! This tool modifies the mesh itself, to reduce its sharpness, whereas *Set Smooth* / *AutoSmooth* and co. only control the way the mesh is shaded, creating an *illusion* of softness - but without modifying the mesh at all...

Noise

Reference

Mode: *Edit* mode
Panel: Mesh Tools (*Editing* context)

Note

Noise is an old feature. The *Displace Modifier* is a non-destructive alternative to the Noise tool and is a more flexible way to realize these sort of effects. The key advantages of the modifier are that it can be canceled at any moment, you can precisely control how much and in which direction the displacement is applied, and much more.... See also the ANT Landscape *add-on*.

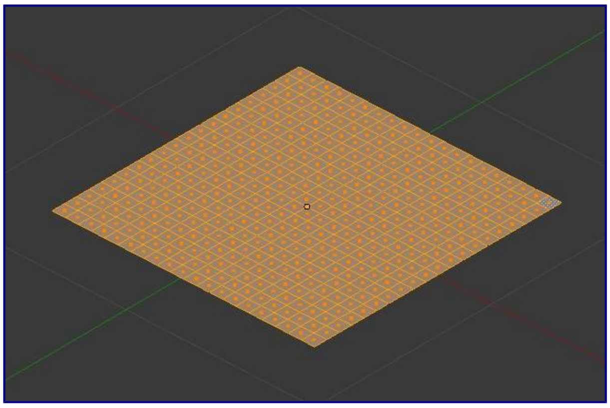
The *Noise* function allows you to displace vertices in a mesh based on the grey values of the first texture slot of the material applied to the mesh.

The mesh must have a material and a texture assigned to it for this tool to work. To avoid having the texture affect the material's properties, it can be disabled in the texture menu.

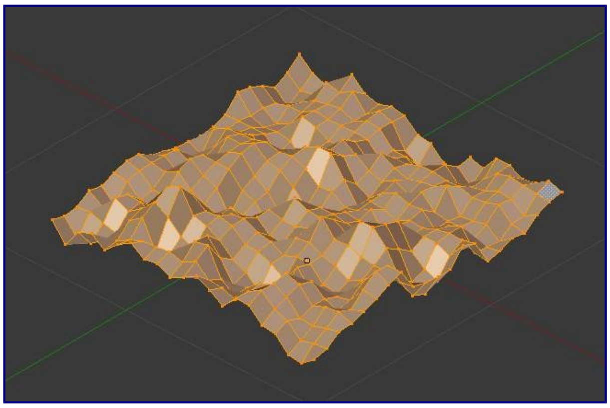
The *Noise* function displaces vertices along the object's ±Z-Axis only.

Noise permanently modifies your mesh according to the material texture. Each click adds onto the current mesh. For a temporary effect, map the texture to Displacement for a render-time effect. In *Object* / *Edit* mode, your object will appear normal, but will render deformed.

The deformation can be controlled by modifying the *Mapping* panel and/or the texture's own panel (e.g. *Clouds*, *Marble*, etc.).



mesh before noise is added

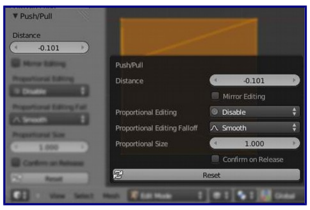


mesh after noise is added, using basic cloud texture

Push/Pull

Reference
Mode: *Object* and *Edit* modes
Menu: Object/Mesh ‣ Transform ‣ Push Pull

Description



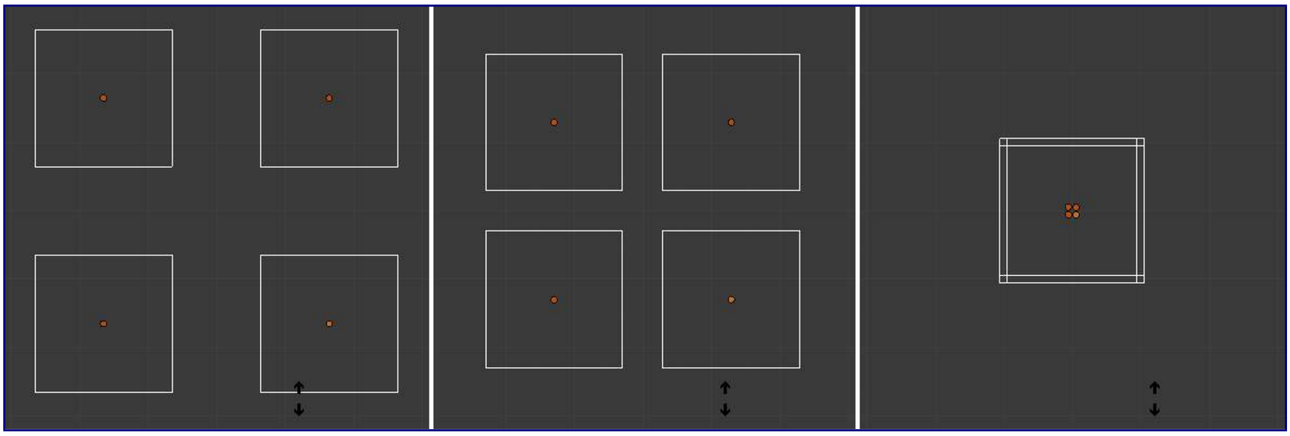
Push/Pull distance.

Push/Pull will move the selected elements (Objects, vertices, edges or faces) closer together (Push) or further apart (Pull). Specifically, each element is moved towards or away from the center by the same distance. This distance is controlled by moving the mouse up (Push) or down (Pull), numeric input or through slider control.

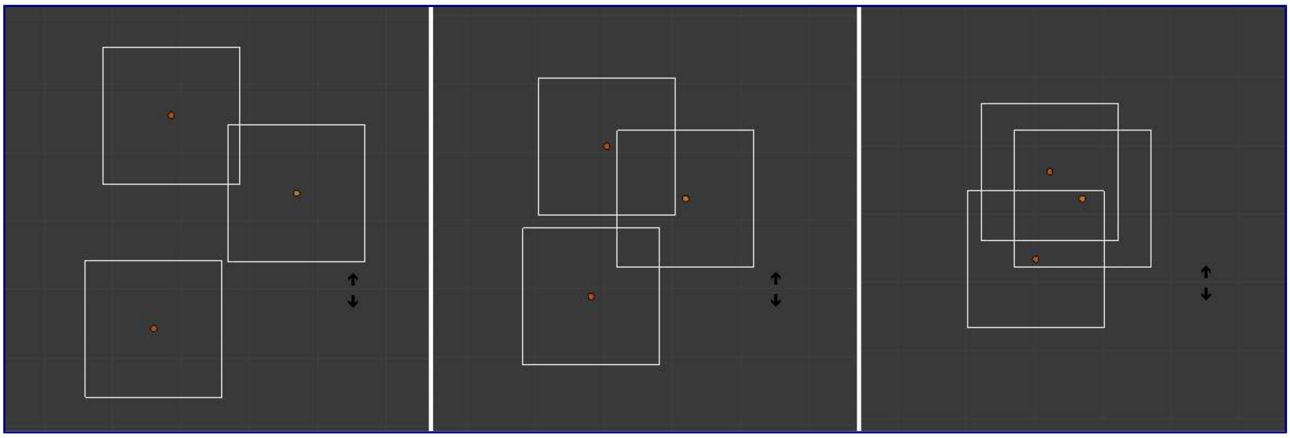
Usage

Select the elements you want to operate on and activate the Push/Pull transform function. The Push/Pull option can be invoked from the Object/Mesh ‣ Transform ‣ Push/Pull menu option or by pressing `Spacebar` and using the search menu to search for *Push* or *Pull*. The amount of movement given to the selection can be determined interactively by moving the mouse or by typing a number. Pressing `Return` will confirm the transformation. The confirmed transformation can be further edited by pressing F6 or by going into the Toolshelf and altering the Distance slider provided that no other actions take place between the *Push/Pull* transform confirmation and accessing the slider.

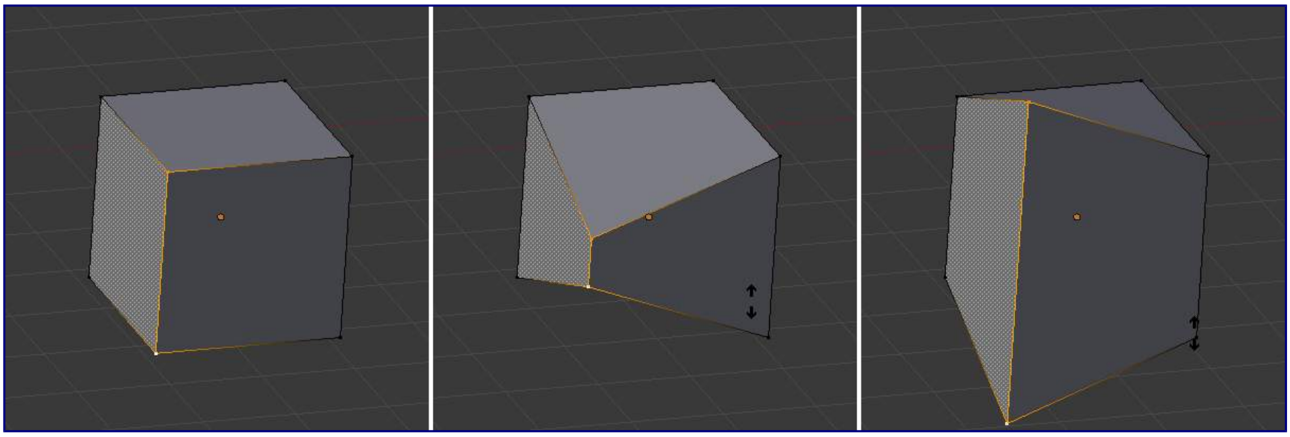
Note that the result of the *Push/Pull* transform is also dependant on the number and type of selected elements (Objects, vertices, faces etc). See below for the result of using *Push/Pull* on a number of different elements.



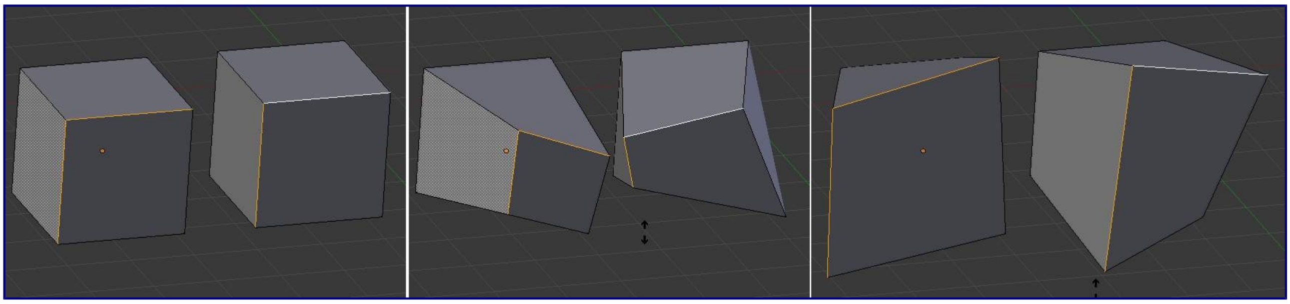
Equidistant Objects being pushed together.



Random Objects being pushed together.



Vertices being pushed together, then pulled apart.

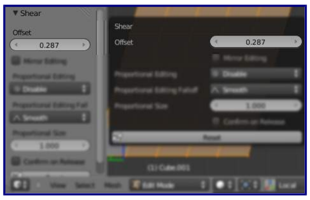


Edges on separate meshes being pushed together, then pulled apart.

Shear

Reference
Mode: *Object* and *Edit* modes
Menu: Object/Mesh/Curve/Surface ‣ Transform ‣ Shear

Description



Shear Offset Factor.

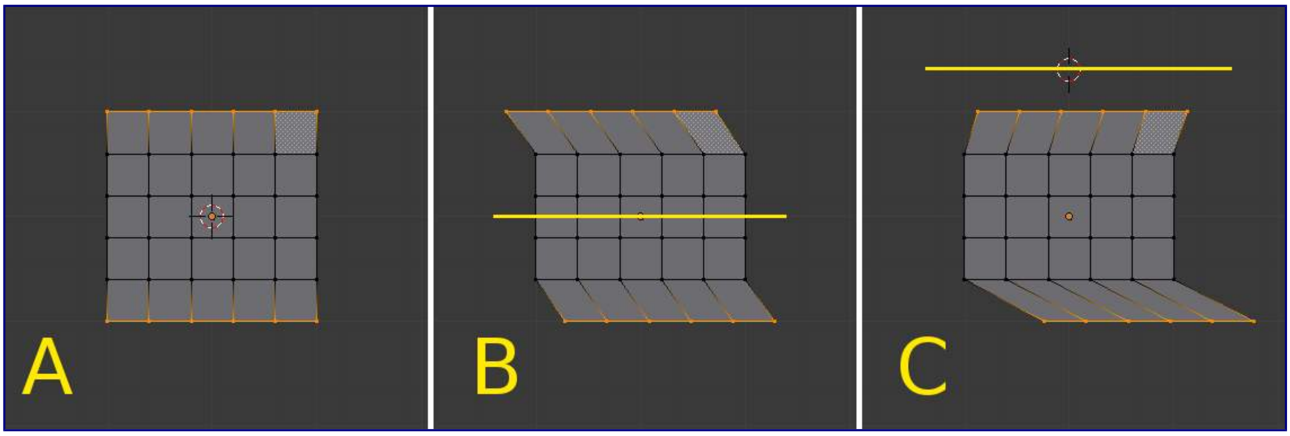
Shearing is a form of movement where parallel surfaces move past one another. During this transform, movement of the selected elements will occur along the horizontal axis of the current view. The axis location will be defined by the *Pivot Point*. Everything that is "above" this axis will move (Shear) in the same direction as your mouse pointer (but always parallel to the horizontal axis). Everything that is "below" the horizontal axis will move in the opposite direction.

Read more about Pivot Points

Usage

Select the elements you want to operate on and activate the *Shear* transform function. The *Shear* option can be invoked from the Object/Mesh/Curve/Surface ‣ Transform ‣ Shear menu option or by pressing `Shift-Ctrl-Alt-S`. The amount of movement given to the selection can be determined interactively by moving the mouse or by typing a number. Pressing `Return` will confirm the transformation. The confirmed transformation can be further edited by going into the Toolshelf and altering the Offset slider provided that no other actions take place between the *Shear* transform confirmation and accessing the slider.

Note that the result of the *Shear* transform is also dependant on the number and type of selected elements (Objects, vertices, faces etc). See below for the result of using *Shear* on a number of different elements.



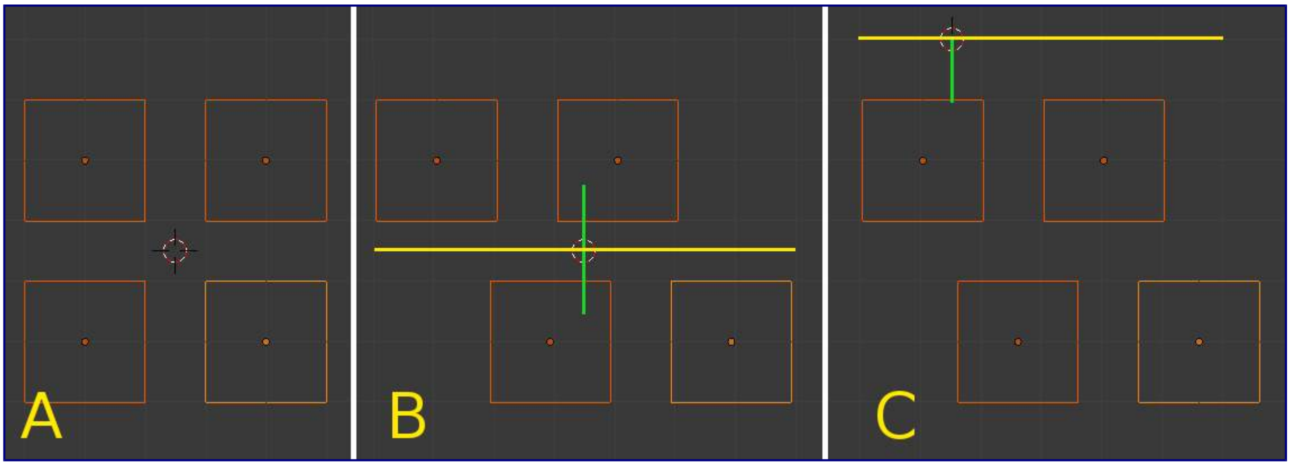
The effects of a Shear transform with different Pivot Points. See the text below for additional information.

The three frames of the image above show the effects of shearing on the selected vertices when the pivot point is altered. In frame B, the *Pivot Point* is set to *Median Point* (indicated by the yellow line) and the mouse was moved to the left during the transform. In frame C, the *Pivot Point* is set to the 3D cursor which is located above the mesh (indicated again by the yellow line). When the mouse is moved to the left during a *Shear* transform the selected vertices are moved to the right as they are below the horizontal axis.

Tip

Shear transform magnitude

The magnitude of the *Shear* transform applied to the selected elements is directly proportional to the distance from the horizontal axis. i.e. the further from the axis, the greater the movement.



The effects of a Shear transform on Objects with different Pivot Points. See the text below for additional information.

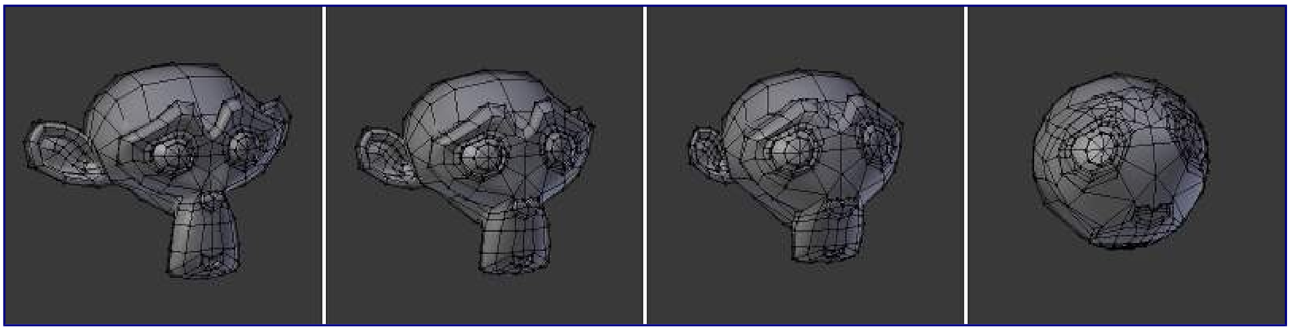
The three frames of the image above show the effects of shearing on the selected Objects when the *Pivot Point* is altered. In frame B, the *Pivot Point* is set to *Median Point* (indicated by the yellow line) and the mouse was moved to the left during the transform. In frame C, the *Pivot Point* is set to the 3D cursor which is located above the Objects (indicated again by the yellow line). When the mouse is moved to the left during a *Shear* transform all of the selected Objects are moved to the right as they are below the horizontal axis. Again, note that the magnitude of the transform is proportional to the distance from the horizontal axis. In this case, the lower Objects move further than the upper ones.

To Sphere

Reference
Mode: *Edit* mode
Menu: Mesh ‣ Transform ‣ To Sphere

Description

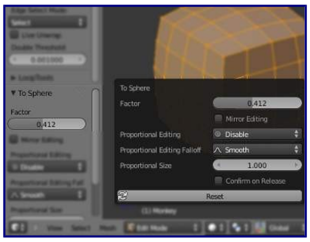
The *To Sphere* transformation will give the selection spherical qualities. The *Suzanne with increasing sphericity* image below shows the results of applying the *To Sphere* transformation to the Suzanne mesh.



Suzanne with increasing sphericity.

The sequence above shows a Suzanne mesh with a 0, 0.25 (25%), 0.5 (50%) and 1 (100%) To Sphere transform applied.

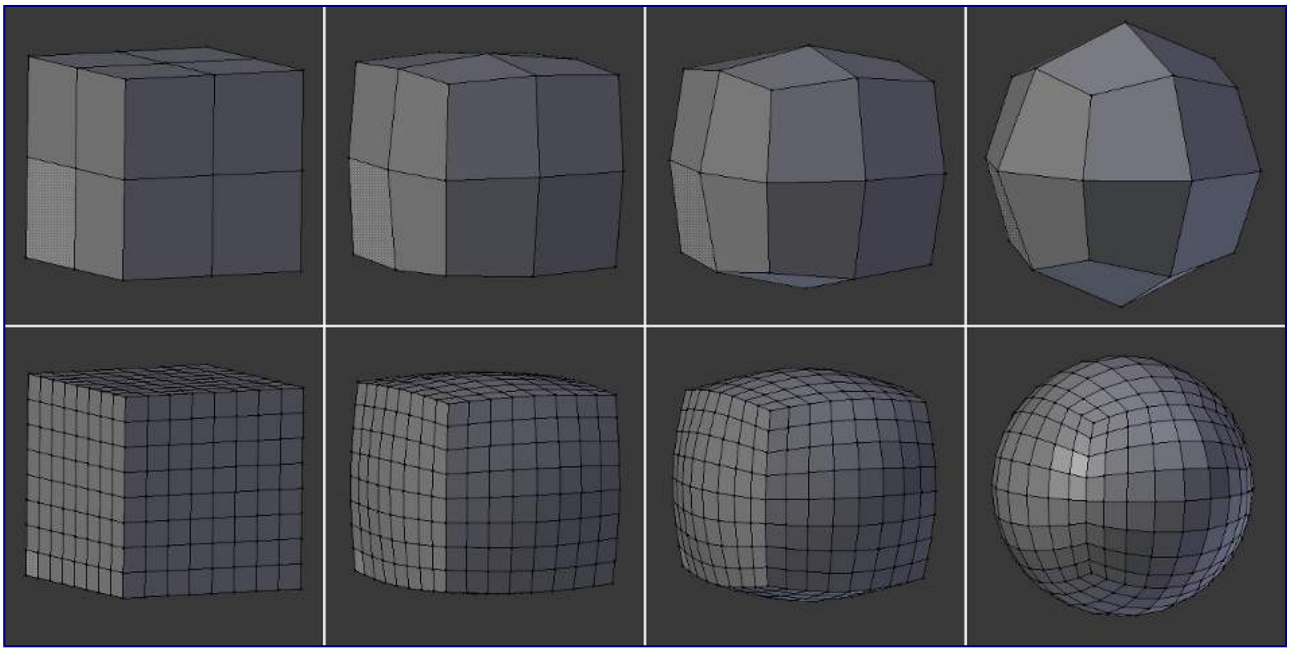
Usage



To Sphere Factor.

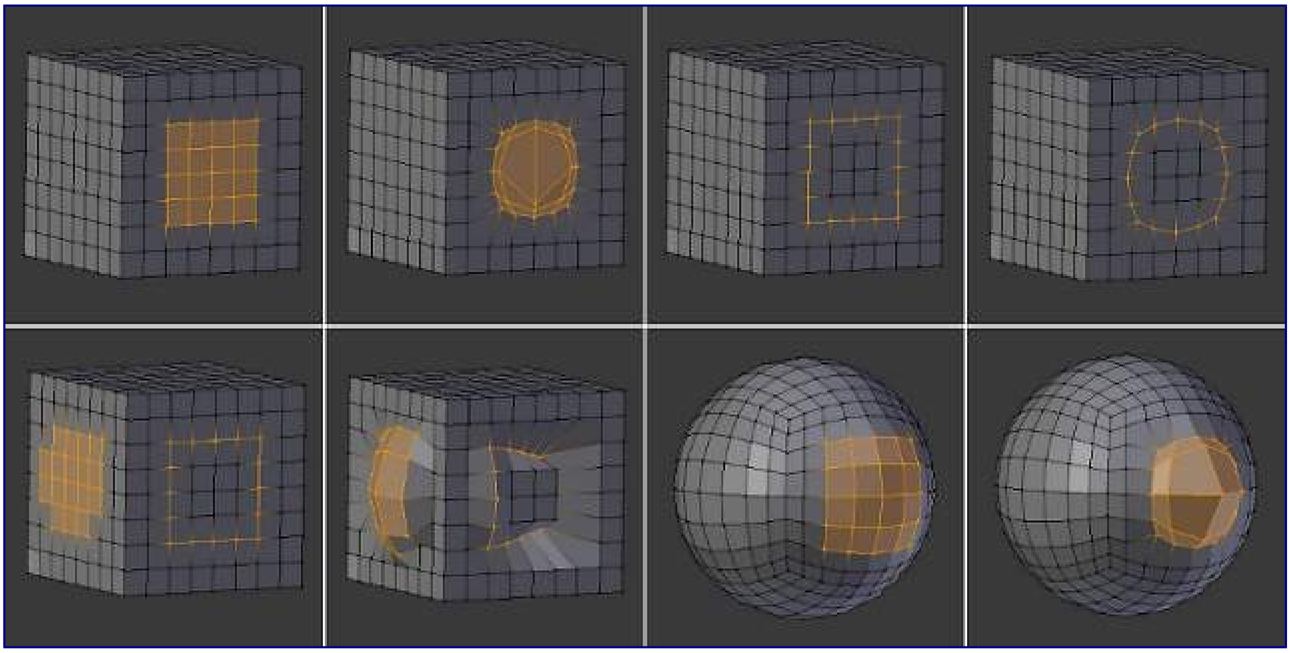
Select the elements you want to operate on and activate the *To Sphere* transform function. The *To Sphere* option can be invoked from the Mesh ‣ Transform ‣ To Sphere menu option or by pressing `Shift-Alt-S`. The amount of sphericity given to the selection can be determined interactively by moving the mouse or by typing a number between 0 and 1. Pressing `Return` will confirm the transformation. The confirmed transformation can be further edited by pressing `F6` or by going into the *Toolshelf* and altering the *Factor* slider provided that no other actions take place between the *To Sphere* transform confirmation and accessing the slider.

Note that the result of the *To Sphere* transform is also dependant on the number of selected mesh elements (vertices, faces etc). As can be seen in the below image, the result will be smoother and more spherical when there are more mesh elements available to work with.



To Sphere applied to cubes with different subdivision levels. In this image sequence, To Sphere was applied to the entire cube at levels of 0, 0.25 (25%), 0.5 (50%) and 1 (100%) respectively.

The *To Sphere* transform will generate different results depending on the number and arrangement of elements that were selected (as shown by the below image).



To Sphere applied to different selections.

Warp

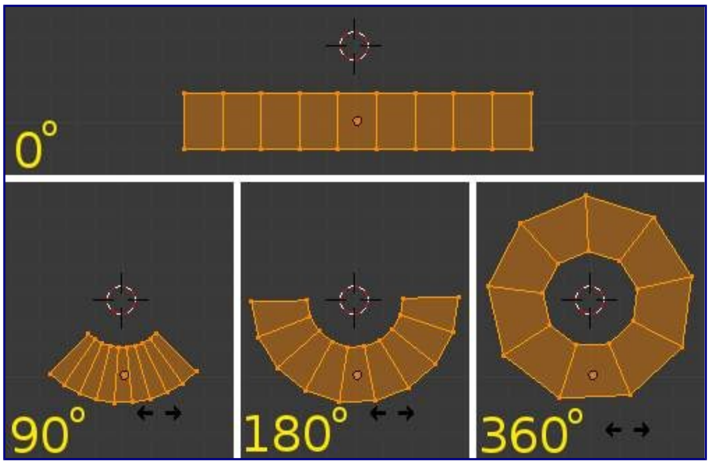
Reference
Mode: *Object* and *Edit* modes
Menu: Object/Mesh/Curve/Surface ‣ Transform ‣ Warp

warp tool options

In *Edit mode*, the *Warp* transformation takes selected elements and warps them around the 3D cursor by a certain angle. Note that this transformation is always dependent on the location of the 3D cursor. The Pivot Point is not taken into account. The results of the *Warp* transformation are also view dependent.

In *Object mode*, the *Warp* transformation takes the selected Objects and causes them to move in an orbit-like fashion around the 3D cursor. Similar to *Edit mode*, the Pivot Point is not taken into account and the results are view dependent.

Usage



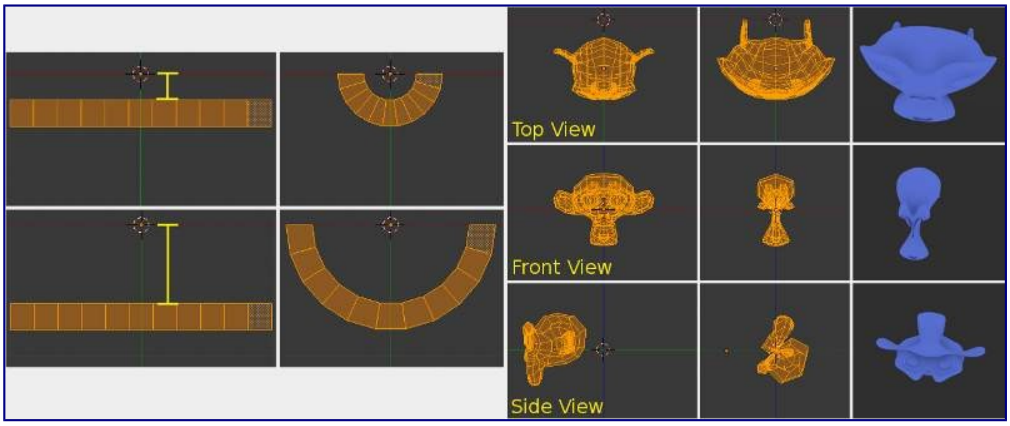
In this example, a plane is warped around the 3D cursor by the indicated number of degrees.

Select the elements you want to operate on and activate the *Warp* transform function. The *Warp* option can be invoked from the Object/Mesh/Curve/Surface ‣ Transform ‣ Warp menu option. The amount of warping given to the selection can be determined interactively by moving the mouse or by typing a number. Pressing `Return` will confirm the transformation. The confirmed transformation can be further edited by pressing `F6` or by going into the Toolshelf and altering the Angle slider provided that no other actions take place between the *Warp* transform confirmation and accessing the slider.

Cursor position and view

The location of the 3D cursor can be used to alter the results of the *Warp* transformation. As can be seen from the example in this section, the *Warp* radius is dependent on the distance of the cursor from the selected elements. The greater the distance, the greater the radius.

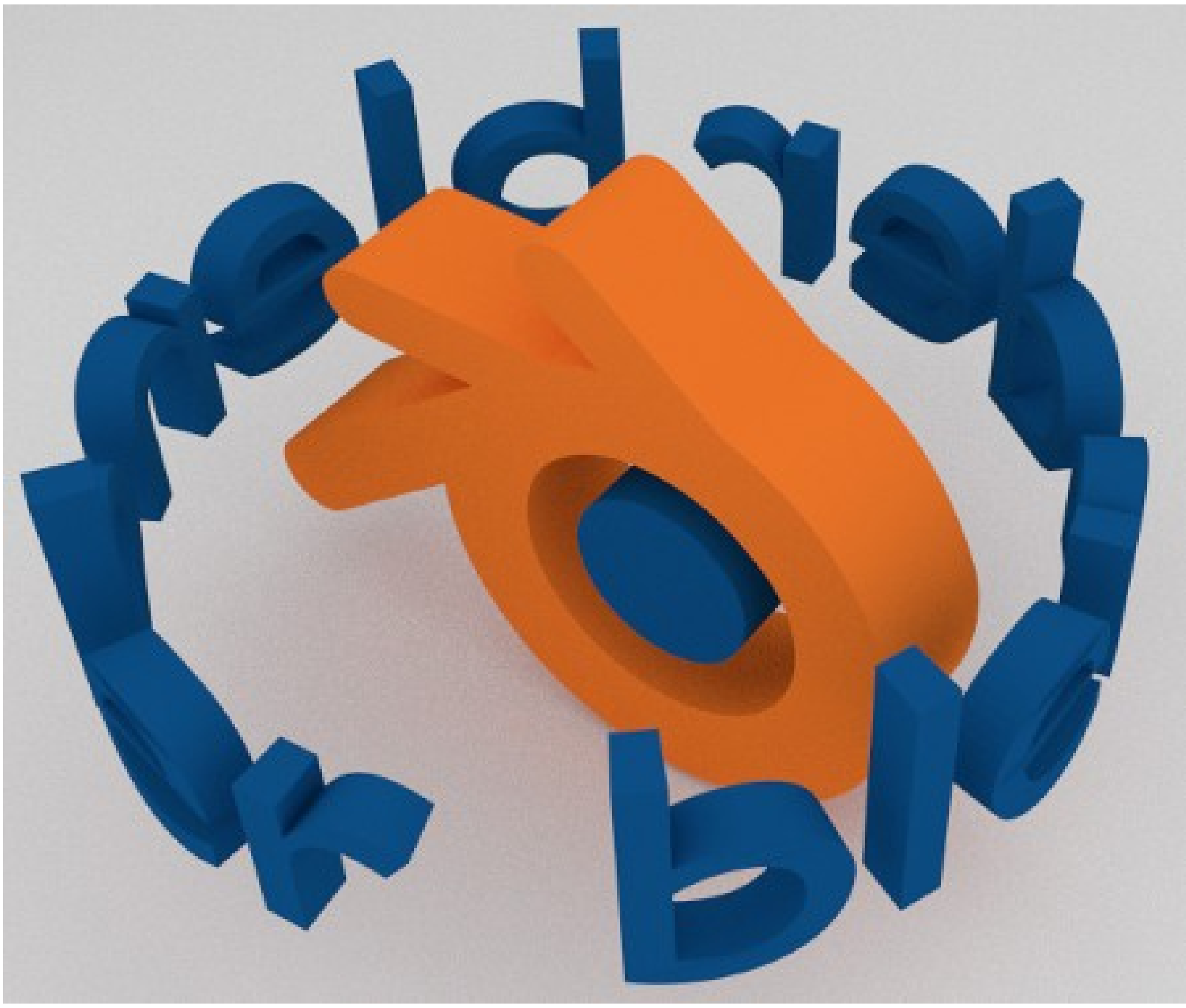
The result of the *Warp* transform is also influenced by your current view. The example in this section shows the results of a 180 degree *Warp* transform applied to the same Suzanne mesh when in different views. A 3D render is also provided for comparison.



The left side of this image shows how the Warp transform is influenced by the location of the cursor. The right hand side shows the influence of the current view.

Note
Warping text If you want to warp text, you will need to convert it from a Text Object to Mesh by pressing `Alt-C` and selecting the *Mesh from Curve/Meta/Surf/Text* option.

Example

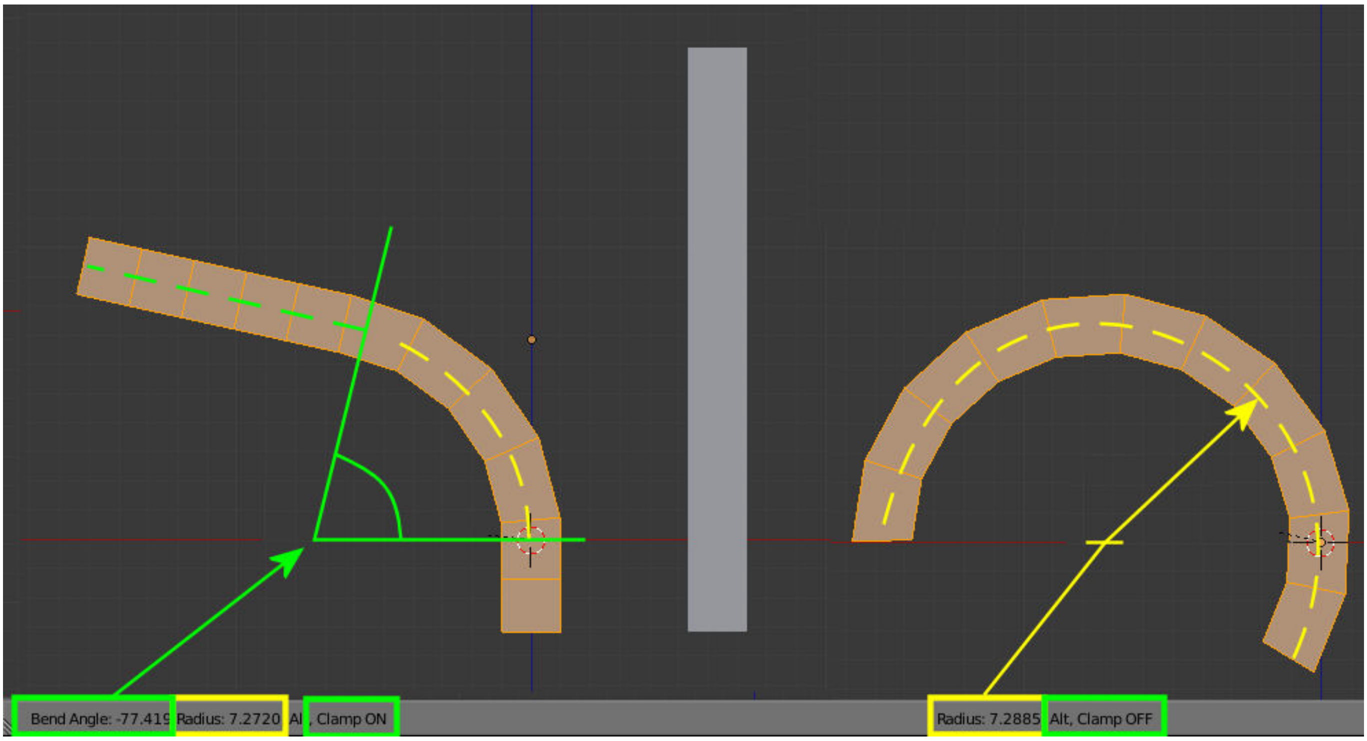


Text wrapped around logo. This was made by creating the Bforartists logo and text as separate Objects. The text was converted to a mesh and then warped around the Bforartists logo.

Bend

Reference
Reference

Mode: *Object* and *Edit* modes
Menu: Object/Mesh/Curve/Surface ‣ Transform ‣ Bend



Bend Transform with Clamp ON and OFF

This tool rotates a line of selected elements forming an arc between the mouse-cursor and the 3D-cursor.

Usage

The bend tool can be used in any case where you might want to bend a shape in two with a gradual transition between both sides.

This may take a little getting used to, the basics are listed below controls are noted here.

- The initial position of the cursors define the axis to bend on.
- The distance of the mouse-cursor to the 3d-cursor controls how sharp the bend will be.
- The relative angle of the mouse-cursor to the initial axis defines the bend angle.

If this seems overly complicated, its probably best to try the tool where it becomes quickly apparent how the tool reacts to your input.

Bend Angle
    The amount of rotation.
Radius
    The sharpness of the bend.
Clamp

Normally the arc turns through a clamped rotation angle with the selected elements extended along a tangent line beyond that (see above left). When the clamp is OFF, the arc continues around aligning the selected elements into a circle (right).

When OFF (`Alt`) all selected elements follow a circle, even when outside the segment between the 3d cursor and the mouse.

Note

Unlike most other transform modes *Bend* isn't effected by *Pivot Point* or *Transform Orientation*, always using the View Plane instead.

Hint

You can turn the bend angle through multiple rotations potentially forming a spiral shape.

Duplicating

Mesh Duplicating Tools

This section covers mesh editing tools that add additional geometry by duplicating existing geometry in some way.

- *Duplicate Geometry*.
- *Extrusion*.
- *Spin*.
- *Screw*.

Note

Multiple Viewports

When you use one of the duplication tools in the *Mesh Tools* panel, Bforartists cannot guess which view you want to work in - if you have more than one opened, of course... As the view is often important for these tools, once you have activated one, your cursor turns into a sort of question mark - click with it inside the window you want to use.

Duplicate

Reference

Mode: *Edit* mode
Menu: Mesh ‣ Duplicate

This tool simply duplicates the selected elements, without creating any links with the rest of the mesh (unlike extrude, for example), and places the duplicate at the location of the original. Once the duplication is done, *only the new duplicated elements are selected*, and you are automatically placed in grab/move mode, so you can translate your copy elsewhere...

In the *Tool Shelf* are settings for *Vector* offset, *Proportional Editing*, *Duplication Mode* (non-functional?), and

Axis Constraints.

Note that duplicated elements belong to the same *vertex groups* as the “original” ones. The same goes for the *material indices*, the edge’s *Sharp* and *Seam* flags, and probably for the other vertex/edge/face properties...

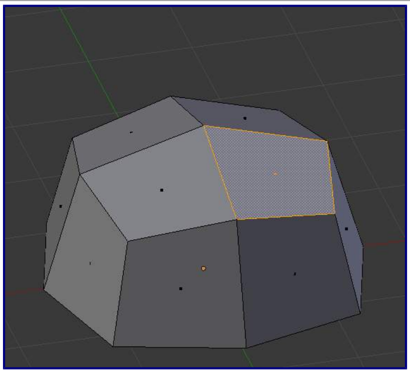
Extrude

Extrude Region

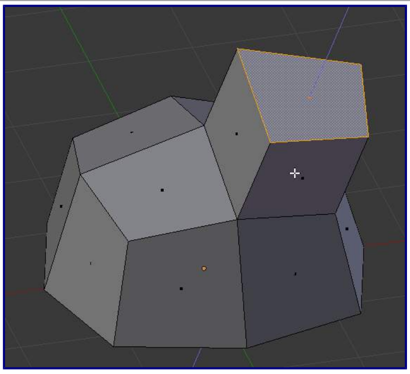
Reference
Mode: *Edit* mode Panel: Mesh Tools ‣ Extrude Menu: Mesh ‣ Extrude Region

One tool of paramount importance for working with meshes is the *Extrude* tool. It allows you to create parallelepipeds from rectangles and cylinders from circles, as well as easily create such things as tree limbs. *Extrude* is one of the most frequently used modeling tools in Bforartists. It’s simple, straightforward, and easy to use, yet very powerful.

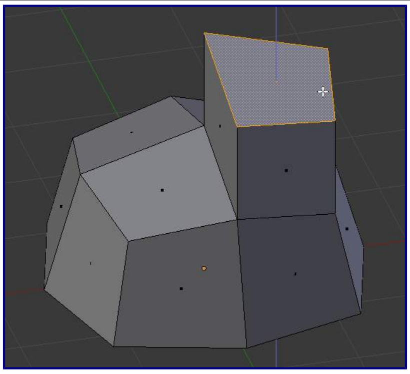
The selection is extruded along the common normal of selected faces. In every other case the extrusion can be limited to a single axis by specifying an axis (e.g. `X` to limit to the X axis or `Shift-X` to the YZ plane. When extruding along the face normal, limiting movement to the global Z axis requires pressing `Z` twice, once to disable the face normal Z axis limit, and once to enable the global Z axis limit.



Selected face



During extrude



Set to Z axis

Although the process is quite intuitive, the principles behind *Extrude* are fairly elaborate as discussed below:

- First, the algorithm determines the outside edge-loop of the extrude; that is, which among the selected edges will be changed into faces. By default (see below), the algorithm considers edges belonging to two or more selected faces as internal, and hence not part of the loop.
- The edges in the edge-loop are then changed into faces.
- If the edges in the edge-loop belong to only one face in the complete mesh, then all of the selected faces are duplicated and linked to the newly created faces. For example, rectangles will result in parallelepipeds during this stage.
- In other cases, the selected faces are linked to the newly created faces but not duplicated. This prevents

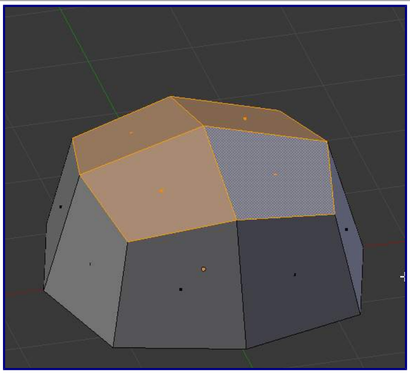
undesired faces from being retained “inside” the resulting mesh. This distinction is extremely important since it ensures the construction of consistently coherent, closed volumes at all times when using *Extrude*.

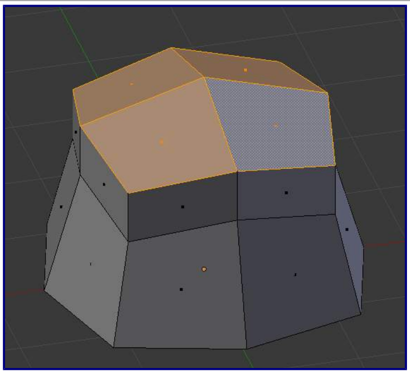
- When extruding completely closed volumes (like e.g. a cube with all its six faces), extrusion results merely in a duplication, as the volume is duplicated, without any link to the original one.
- Edges not belonging to selected faces, which form an “open” edge-loop, are duplicated and a new face is created between the new edge and the original one.
- Single selected vertices which do not belong to selected edges are duplicated and a new edge is created between the two.

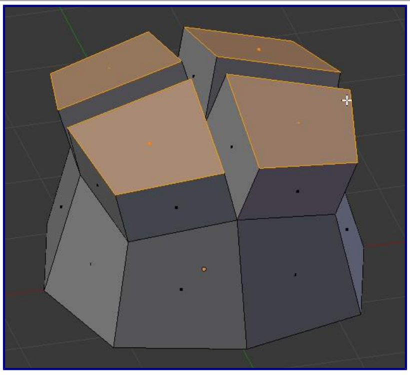
Extrude Individual

Reference
Mode: *Edit* mode
Panel: Mesh Tools ‣ Extrude Individual
Menu: Mesh ‣ Extrude Individual

Extrude Individual allows you to extrude a selection of multiple faces as individuals, instead of as a region. The faces are extruded along their own normals, rather than their average. This has several consequences: first, “internal” edges (i.e. edges between two selected faces) are no longer deleted (the original faces are).


Selection of multiple faces

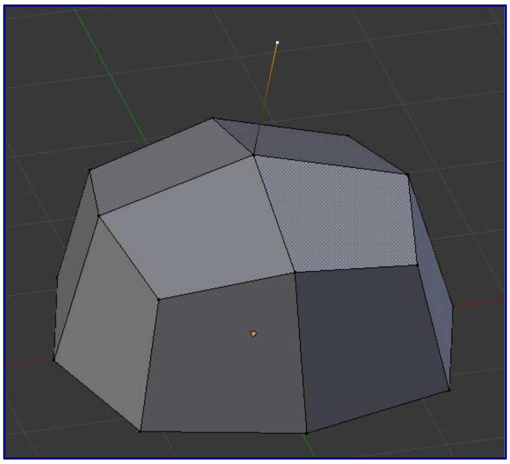

Extruded using extrude region


Extruded using Extrude Individual

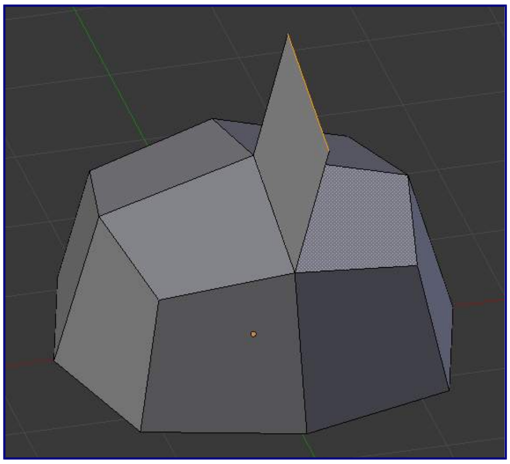
Extrude Edges and Vertices Only

Reference
Mode: *Edit* mode, Vertex and Edge

If vertices are selected while doing an extrude, but they do not form an edge or face, they will extrude as expected, forming a non-manifold edge. Similarly, if edges are selected that do not form a face, they will extrude to form a face.



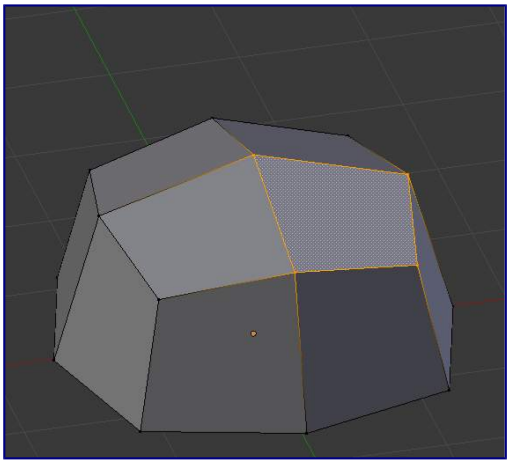
Single vertex extruded



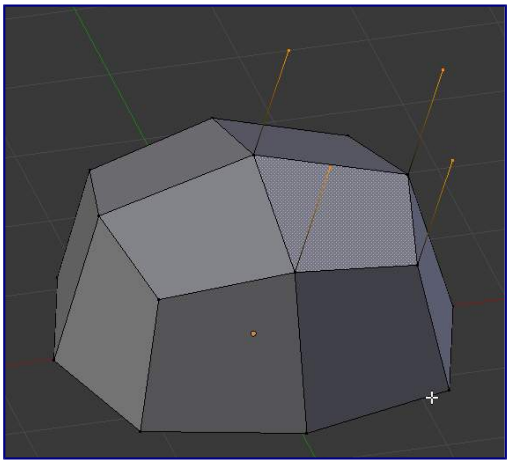
Single edge extruded

When a selection of vertices forms an edge or face, it will extrude as if the edge was selected. Likewise for edges that form a face.

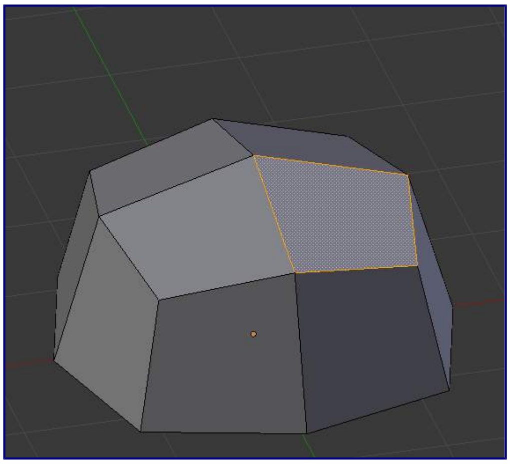
To force a vertex or edge selection to extrude as a vertex or edge, respectively, use `Alt-E` to access the Extrude *Edges Only* and *Vertices Only*.



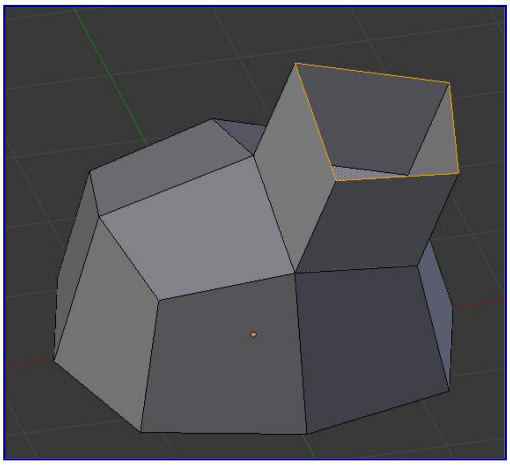
Vertex selected



Vertices Only extrude



Edge selected

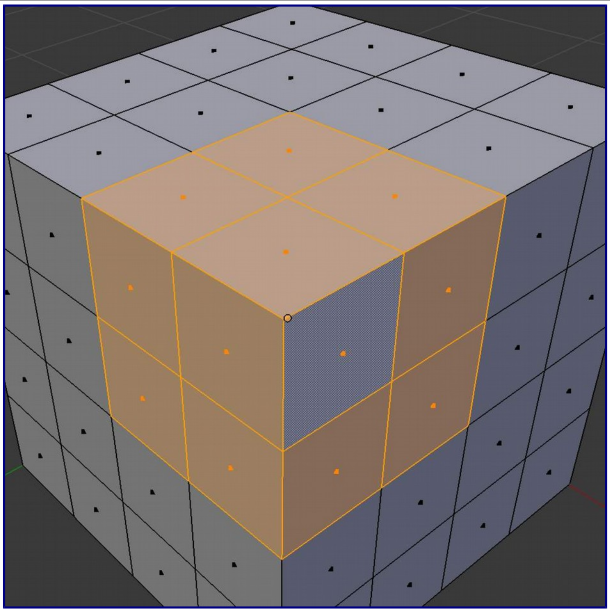


Edge Only extrude

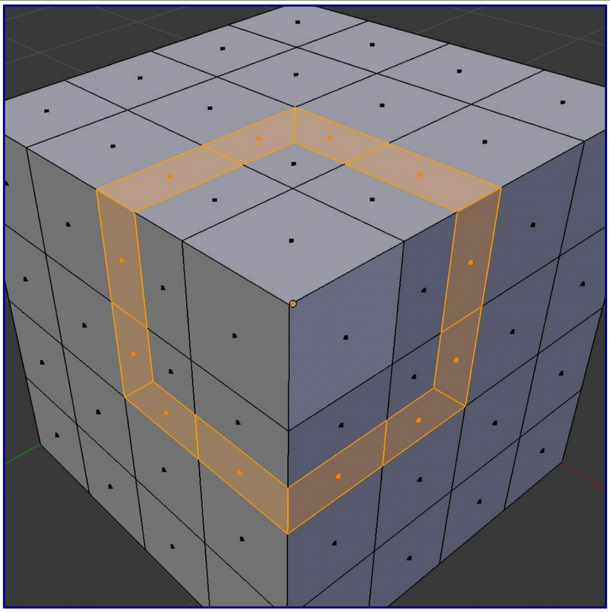
Inset

Reference
Mode: *Edit* mode Tool Shelf > Tools tab > Mesh Tools Panel

This tool takes the currently selected faces and creates an inset of them, with adjustable thickness and depth. The tool is modal, such that when you activate it, you may adjust the thickness with your mouse position.

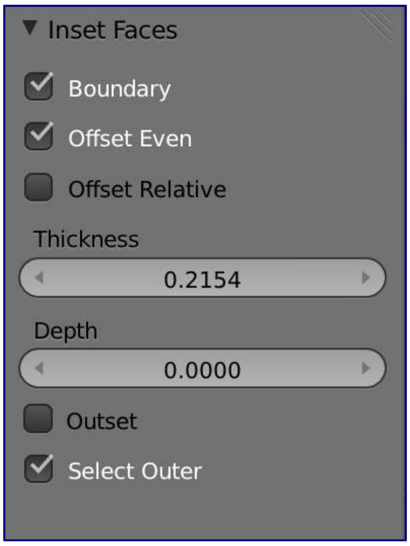


Selection to inset



Selection with inset

Options



Inset Operator Settings

Boundary
Determines whether open edges will be inset or not.

Offset Even
Scale the offset to give more even thickness.

Offset Relative
Scale the offset by surrounding geometry.

Thickness
Set the size of the inset.

Depth
Raise or lower the newly inset faces to add depth.

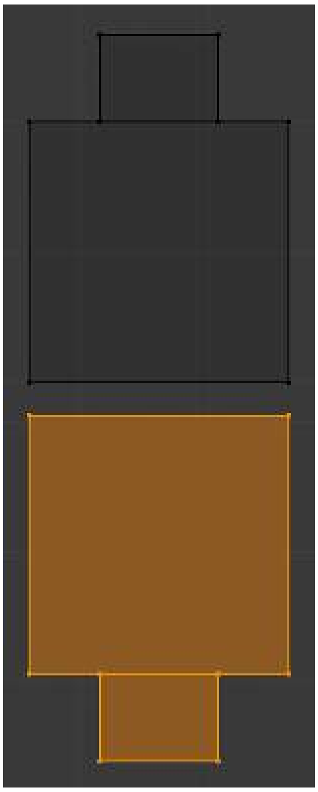
Outset
: Create an outset rather than an inset.

Select Outer
: Toggle which side of the inset is selected after operation.

Mirror

Reference
Mode: *Object* and *Edit* modes
Menu: Object/Mesh ‣ Mirror

Description



Mirroring a selection.

Mirroring an Object or Mesh selection will create a reversed version of the selection. The position of the mirrored version of the selection is determined by the *Pivot Point*. A common use of mirroring is to model half an object, duplicate it and then use the mirror transform to create a reversed version to complete the model. Note that mirrored duplicates can also be created with a *Mirror modifier.*

Read more about the Pivot Point

Read more about the Mirror Modifier

Usage

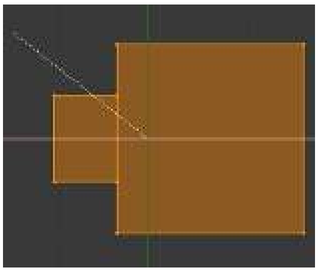
To mirror a selection along a particular global axis use the mirror tool, followed by X, Y or Z.

The image *Mirroring a selection* shows the results of this action after a mesh element has been duplicated.

In Mesh mode, you can mirror the selection on the currently selected Transform Orientation by pressing the appropriate axis key a second time. For example, if the Transform Orientation is set to *Normal*, use the mirror tool, followed by `X` and then `X` again

will mirror the selection along the X-axis of the *Normal Orientation.*

Read more about Transform Orientations



Interactive mirror.

You can alternatively hold the `MMB` to interactively mirror the object by moving the mouse in the direction of the mirror axis.

Spin

Reference
Mode: *Edit* mode Panel: *Mesh Tools* (*Editing* context)

Use the *Spin* tool to create the sort of objects that you would produce on a lathe (this tool is often called a “lathe”-tool or a “sweep”-tool in the literature, for this reason). In fact, it does a sort of circular extrusion of your selected elements, centered on the 3D cursor, and around the axis perpendicular to the working view...

- The point of view will determine around which axis the extrusion spins...
- The position of the 3D cursor will be the center of the rotation.

Here are its settings:

Steps
: Specifies how many copies will be extruded along the “sweep”.

Dupli
: When enabled, will keep the original selected elements as separated islands in the mesh (i.e. unlinked to the result of the spin extrusion).

Angle
: specifies the angle “swept” by this tool, in degrees (e.g. set it to `180` for half a turn).

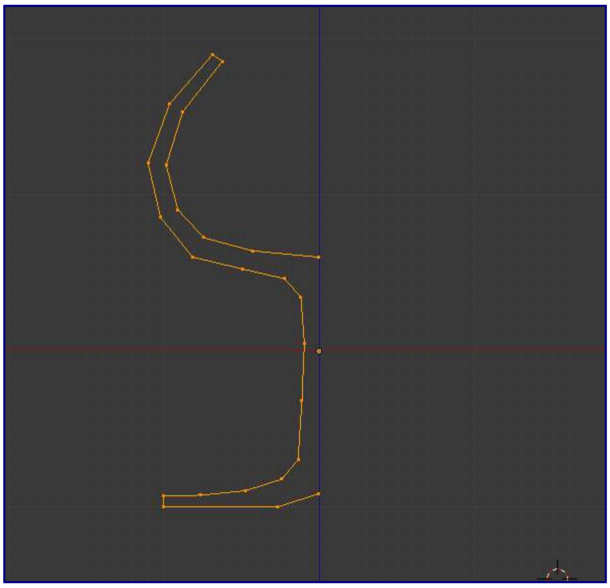
Center

Specifies the center of the spin. By default it uses the cursor position.

Axis

Specify the spin axis as a vector. By default it uses the view axis.

Example

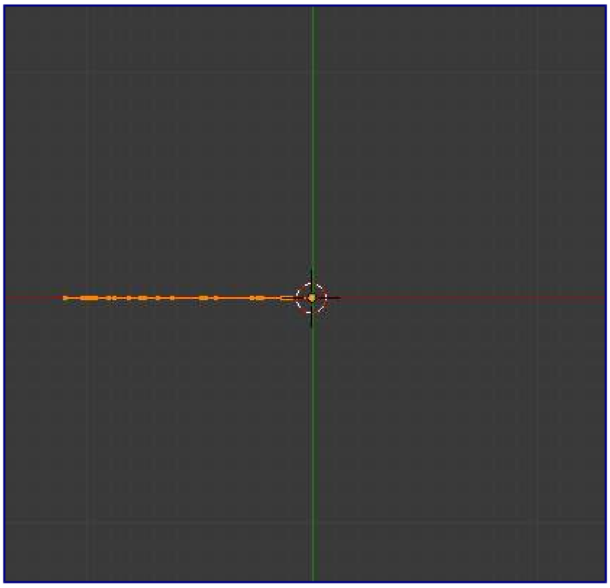


Glass profile.

First, create a mesh representing the profile of your object. If you are modeling a hollow object, it is a good idea to thicken the outline. (*Glass profile*) shows the profile for a wine glass we will model as a demonstration.

Go to the *Edit* mode and select all the vertices of the Profile with `A`.

We will be rotating the object around the cursor in the top view, so switch to the top view with `Numpad7`.

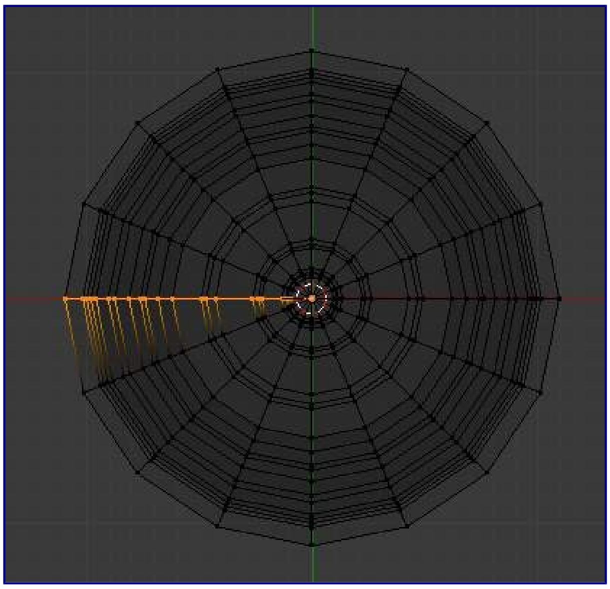


Glass profile, top view in Edit mode, just before spinning.

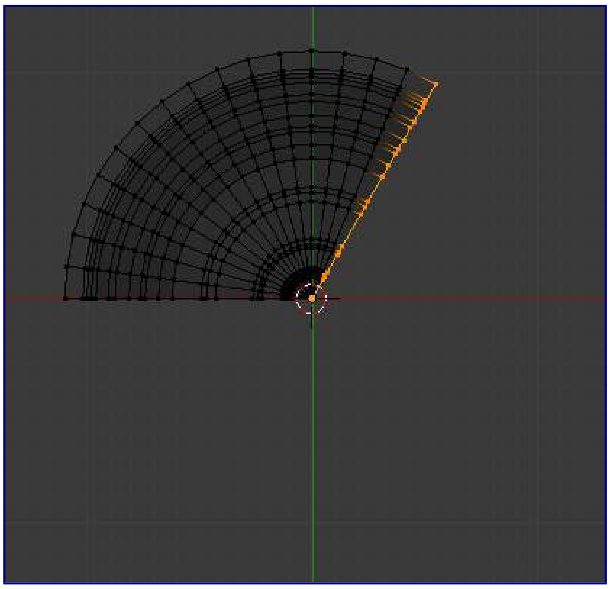
Place the cursor along the center of the profile by selecting one of the vertices along the center, and snapping the 3D cursor to that location with Mesh ‣ Cursor ‣ Selection. (*Glass profile, top view in Edit mode, just before spinning*) shows the wine glass profile from top view, with the cursor correctly positioned.

Click the *Spin* button. If you have more than one 3D view open, the cursor will change to an arrow with a question mark and you will have to click in the window containing the top view before continuing. If you have only one 3D view open, the spin will happen immediately. (*Spun profile*) shows the result of a successful spin.

Angle

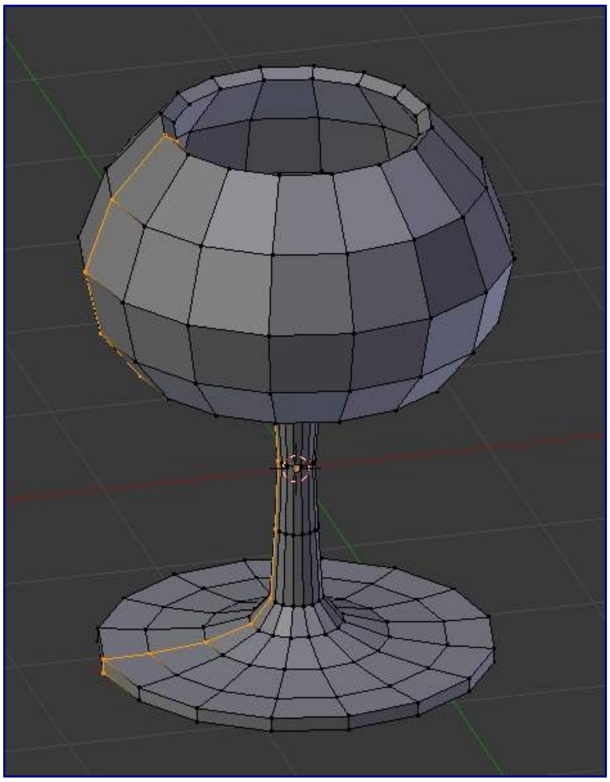


Spun profile using an angle of 360

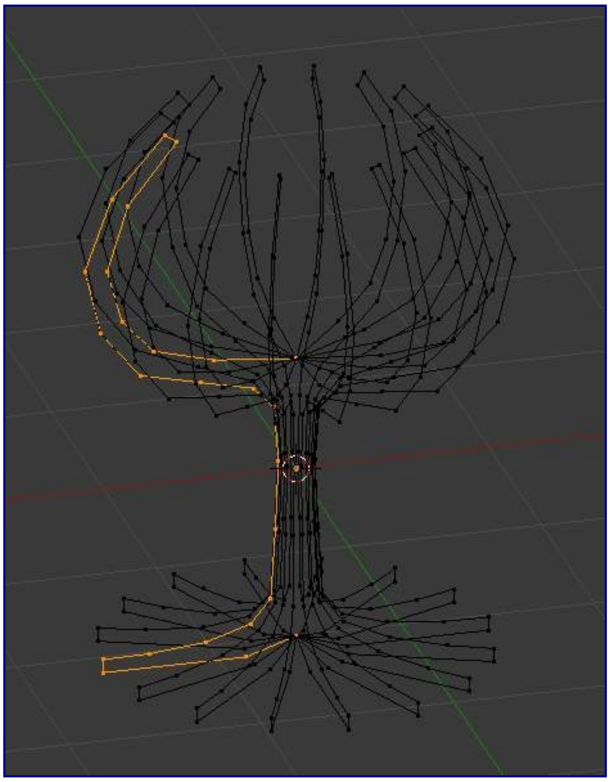


Spun profile using an angle of 120

Dupli

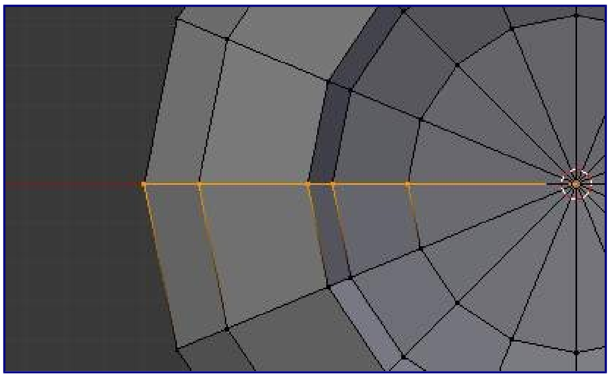


Result of spin operation



Result of Dupli enabled

Merge Duplicates



Duplicate vertices

The spin operation leaves duplicate vertices along the profile. You can select all vertices at the seam with Box select (`B`) shown in (*Seam vertex selection*) and perform a *Remove Doubles* operation.

Notice the selected vertex count before and after the *Remove Doubles* operation (*Vertex count after removing doubles*). If all goes well, the final vertex count (38 in this example) should match the number of the original profile noted in (*Mesh data - Vertex and face numbers*). If not, some vertices were missed and you will need to weld them manually. Or, worse, too many vertices will have been merged.

Note

Merging two vertices in one

To merge (weld) two vertices together, select both of them by `Shift-RMB` clicking on them. Scale and hold down `Ctrl` while scaling to scale the points down to 0 units in the X, Y and Z axis. `LMB` to complete the scaling operation and click the *Remove Doubles* button in the *Buttons* window, *Editing* context.

Recalculate Normals

All that remains now is to recalculate the normals to the outside by selecting all vertices, and validating *Recalc Normals Outside.*

Screw Tool

Reference

Mode: *Edit Mode*

Introduction

The *Screw* Tool is an effective way to revolve a profile, giving similar results to what you would expect from a lathe, with the option to offset the operation to give a screw effect.

You can see some examples of Meshes generated with the *Screw* tool in Fig. 1 - Wood Screw tip done with the screw tool and Fig. 2 - Spring done with the screw tool.

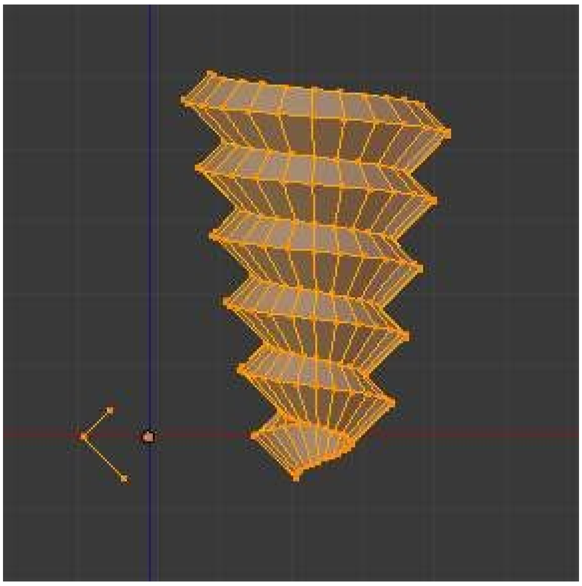


Fig. 1 - Wood Screw tip done with the screw tool

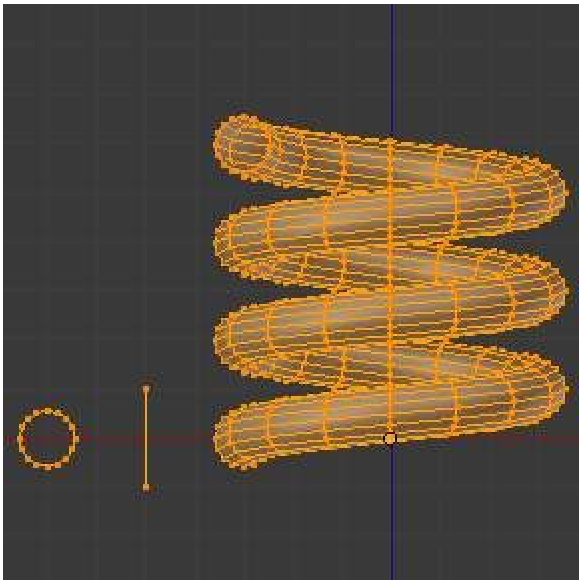


Fig. 2- Spring done with the screw tool

Description

The *Screw* tool combines a repetitive *Spin* with a translation, to generate a screw-like, or spiral-shaped, object. Use this tool to create screws, springs, or shell-shaped structures (Sea shells, Wood Screw Tips, Special profiles, etc).

The main difference between the Screw Tool and the *Screw Modifier* is that the Screw Tool can calculate the angular progressions using the basic profile angle automatically. Or it can adjusting the Axis angular vector without using a second modifier (for example, using the Screw Modifier with a Bevel Modifier, Curve Modifier, etc...), resulting in a much cleaner approach for vertex distribution and usage.

This tool works using open or closed profiles, as well as profiles closed with faces. You can use profiles like an open-edge part that is a part of a complete piece, as well as a closed circle or a half-cut sphere, which will also close the profile end.

Usage

- This tool works only with Meshes.
- In *Edit Mode*, the button for the *Screw* tool operation is located in the *Mesh Tools* Panel, –> Add –> Screw Button.
- To use this tool, you need to create at least one open profile or line to be used as a vector for the height, angular vector and to give Bforartists a direction.
- The *Screw* function uses two points given by the open line to create an initial vector to calculate the height and basic angle of the translation vector that is added to the “Spin” for each full rotation (see examples below). If the vector is created with only two vertices at the same **X**, **Y** and **Z** location (which won’t give Bforartists a vector value for height), this will create a normal “Spin”.
- Having at least one vector line, you can add other closed support profiles that will follow this vector during the extrusions (See limitations).
- The direction of the extrusions is calculated by two determinant factors, your point of view in Global Space and the position of your cursor in the 3DView Space using Global coordinates.
- The profile and the vector must be fully selected in *Edit Mode* before you click the *Screw Button* (See Limitations.)
- When you have the vector for the open profile and the other closed profiles selected, click the *Screw* Button.

Limitations

There are strict conditions about your profile selection when you want to use this tool. You must have at least one open line or open profile, giving Bforartists the starting Vector for extrusion, angular vector and height. (e.g. a simple edge, a half circle, etc...). You need only to ensure that at least one reference line has two “free” ends. If two open Lines are given, Bforartists won’t determine which of them is the vector, and will then show you an error message, *“You have to select a string of connected vertices too”*. You need to select all of the profile vertices that will participate in the *Screw* Tool operation; if they are not properly selected, Bforartists will also show you the same message.

Note that the open line is always extruded, so if you only use it to “guide” the screw, you will have to delete it after the tool completion (use linked-selection to select the whole extrusion of the open line).

If there is any problem with the selection or profiles, the tool will warn you with the error message: *“You have to select a string of connected vertices too”* as seen in Fig. 3 and 4, both in the info Window and at the place where you clicked to start performing the operation (when you click the Screw Button).

Fig. 3 - Screw Error message in the Header of the Info Window

Fig. 4 - Error message when clicking in the Screw Tool with an incorrect or bad selection

You may have as many profiles as you like (like circles, squares, and so on) - Note that not all vertices in a profile need to be in the same plane, even if this is the most common case. You may also have other, more complex, selected closed islands, but they have to be closed profiles because Bforartists will seek for only one open profile for the translation, height and angular vector. Some closed meshes that overlap themselves may not screw correctly (for example: Half UVsphere = OK, more than half = could cause the Screw Tool to have wrong behavior or errors), and profiles that are closed with faces (like a cone or half sphere) will be closed automatically at their ends, like if you were extruding a region.

Tip
Simple way to not result in error Only one open Profile, all of the others can be closed, avoid volumes and some profiles closed with faces...

Options

This tool is an interactive and modal tool, and only works in the *Edit Mode*.

Once you click in the *Screw* tool in the Mesh Tools Panel, Bforartists will enter in the *Screw* interactive mode, and the Operator Panel at the end of the Mesh Tools Panel will be replaced so you can adjust the values explained below. To show the Mesh Tools Panel, use the shortcut `T` in the Edit Mode of the 3D View Window.

Once you perform any other operation, Bforartists leaves the interactive mode and accepts all of the values. Because it's modal, you can't return to the interactive mode after completing/leaving the operation or changing from *Edit Mode* to *Object Mode*. If you want to restart the operation from its beginning, you can press `Ctrl-Z` at any time in *Edit Mode*.

- The basic location of the cursor at the point of view (using Global coordinates) will determine around which axis the selection is extruded and spun at first (See Fig. 6 - Cursor Basic Location - Transform Panel). Bforartists will copy your cursor location coordinates to the values present in the *Center* values of the *Screw* interactive Panel. Depending on the Global View position, Bforartists will automatically add a value of **1** to one of the Axis Vectors, giving the profiles a starting direction for the Screw Operation and also giving a direction for the extrusions. (See examples below.)
- The position of the 3D cursor will be the starting center of the rotation. Subsequent operations (e.g. pressing the Screw button again), will start from the last selected element. Continuous operations without changing the selection will repeat the operation continuously from the last point.

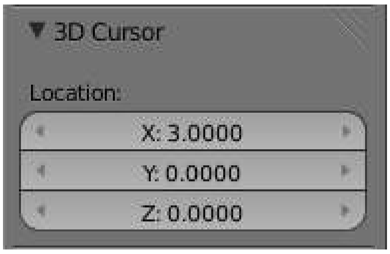


Fig. 6 - Cursor Basic Location - Transform Panel

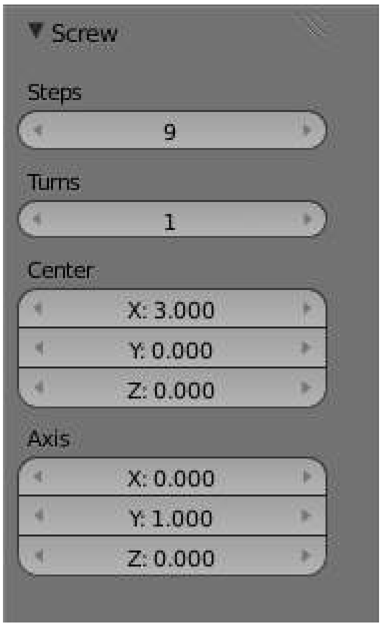


Fig. 7 - Screw Interactive Panel - Mesh Tools Panel (Edit Mode)

Center

These numeric fields specify the center of the spin. When the tool is called for the first time, it will copy the X, Y and Z location (Global Coordinates) of the cursor presently in the 3D View to start the operation. You can specify the cursor coordinates using the Transform Panel in 3D View, using shortcut T to toggle the Panel, and typing in the 3D Cursor Location coordinates. You can adjust these coordinates interactively and specify another place for the spin center during the interactive session. (See Fig. 7 - Screw Interactive Panel - Mesh Tools Panel (Edit Mode))

Steps

This numeric field specifies how many extrusion(s) will be done for each 360 turn. The steps are evenly distributed by dividing 360 by the number of steps given. The minimum value is 3; the maximum is 256 (See Fig. 7)

Turns:

This numeric field specifies how many turns will be executed. Bforartists will add a new full 360 turn for each incremental number specified here. The minimum value is 1; the maximum is 256. (See Fig. 7)

Axis

These 3 numeric fields vary from -1.0 to 1.0 and are clamped above those limits. These values correspond to angular vectors from -90 to 90 degrees. Depending on the position where you started your cursor location and Object operation in the viewport and its axis positions in Global View space and coordinates, Bforartists will give the proper Axis vector a value of 1, giving the angular vector of the profile a starting direction and giving the extrusions a starting direction based on your view. Bforartists will let you adjust your axis angular vectors and you can tweak your object such that you can revert the direction of the screw operation (by reverting the angular vector of the height), meaning you can revert the clockwise and counterclockwise direction of some operations, and also adjust the angular vectors of your profile, bending it accordingly. (See Fig. 7)

Examples

The Spring example

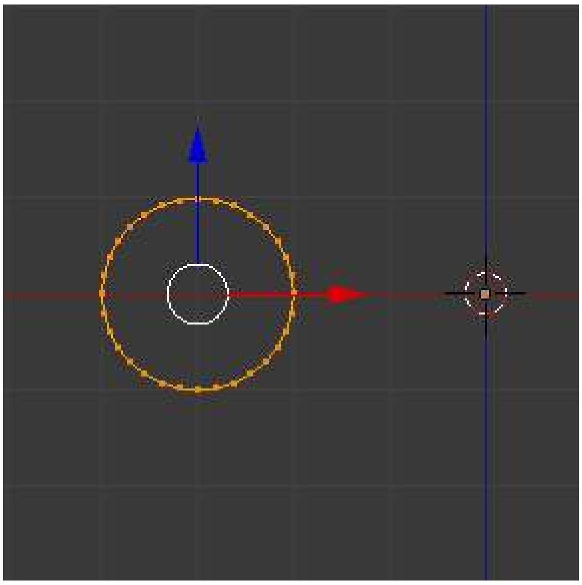


Fig. 8 - Circle placed at X -3,0,0

- Open Bforartists and delete the default Cube.
- Change from perspective to orthographic view using shortcut `Numpad5`.
- Change your view from *User Ortho* to *Front Ortho*, using the shortcut `Numpad1`. You will see the X (red) and Z (blue) coordinate lines.
- In case you have moved your cursor by clicking anywhere in the screen, again place your cursor at the Center
- Add a circle
- Rotate this circle by 90
- Apply the Rotation
- Grab and move this circle to the left `3` Bforartists Units on the `X` Axis
- You will have to scale your circle by 5
- Now enter *Edit Mode*
- De-select all vertices

Now we will create a height vector for Bforartists:

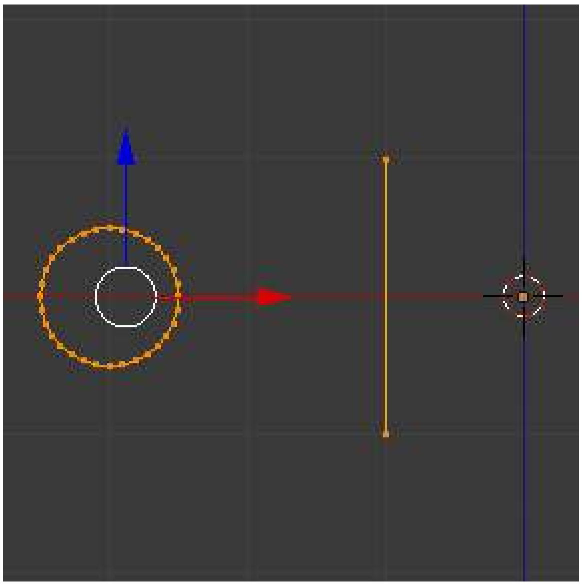


Fig. 9 - Profile and vector created

To Do

Removed original explanation text. for the upper image. It was a spelling lesson with press this press that hotkey. Not a single hint of what tool was used. No way to convert this one into a useful text that explains what tools are in use and how to reach the goal by menu. Bollocks. To Do!

Clockwise and Counterclockwise using the Spring Example

Still in the interactive session of the *Screw Tool*, you will see that the **Z** Axis Value of the *Screw* Panel is set to **1.000**. Left click `LMB` in the middle of the Value and set this value to **-1.000**. At first, the Spring was being constructed in a Counterclockwise direction, and you reverted the operation **180** degrees in the **Z** Axis. This is because you have changed the angular vector of the height you have given to Bforartists to the opposite direction (remember, **-90** to **90** = **180** degrees ?). See Fig. 10 - Counterclockwise direction and Fig. 11 - Flipped to Clockwise direction.

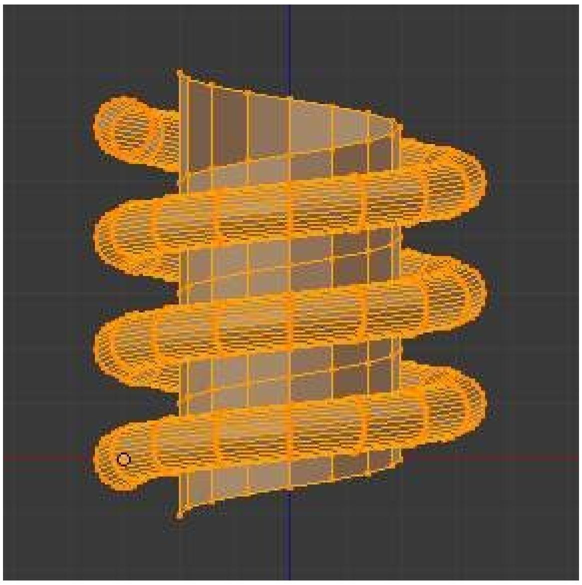


Fig. 10 - Counterclockwise direction

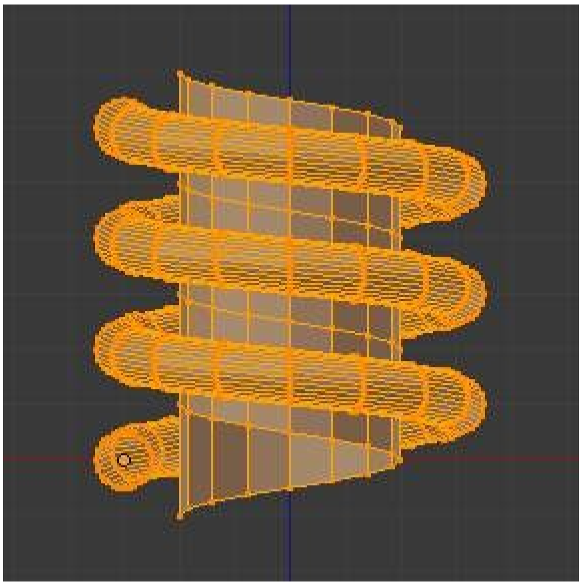


Fig. 11 - Flipped to Clockwise direction.

It’s also important to note that this vector is related to the same height vector axis used for the extrusion and we have created a parallel line with the **Z** Axis, so, the sensibility of this vector is in practical sense reactive only to negative and positive values because it’s aligned with the extrusion axis. Bforartists will clamp the positive and negative to its maximum values to make the extrusion follow a direction, even if the profile starts reverted. The same rule applies to other Global axes when creating the Object for the *Screw* Tool; this means if you create your Object using the Top View, the vector that gives the height for extrusion will also change abruptly from negative to positive and vice versa to give the extrusion a direction, and you will have to tweak the corresponding Axis accordingly to achieve the Clockwise and Counterclockwise effect.

Note

Vectors that aren’t parallel with Bforartists Axis

The high sensibility for the vector doesn’t apply to vectors that give the Screw Tool a starting angle (Ex: any non-parallel vector), meaning Bforartists won’t need to clamp the values to stabilize a direction for the extrusion, as the inclination of the vector will be clear for Bforartists and you will have the full degree of freedom to change the vectors. Our example is important because it only changes the direction of the profile without the tilt and/or bending effect, as there is only one direction for the extrusion, parallel to one of the Bforartists Axes

Bending the Profiles using the Spring Example

Still using the Spring Example, we can change the remaining vector for the angles that aren’t related to the extrusion Axis of our Spring, thus bending our spring with the remaining vectors and creating a profile that will also open and/or close because of the change in starting angular vector values. What we are really doing is changing the starting angle of the profile prior to the extrusions. It means that Bforartists will connect each of the circles inclined with the vector you have given. Below we show two bent Meshes using the Axis vectors and the Spring example. See Fig. 12 and Fig. 13. These two Meshes generated with the *Screw* tool were created using the Top Ortho View.

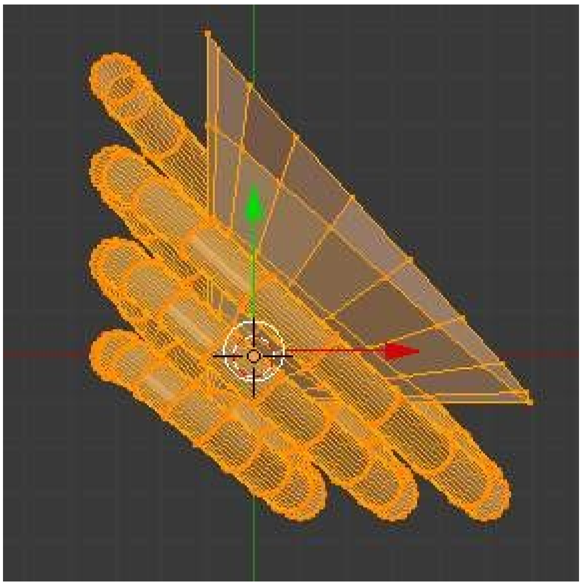


Fig. 12 - Bended Mesh, Example 1 - The Axis will give the profile a starting vector angle

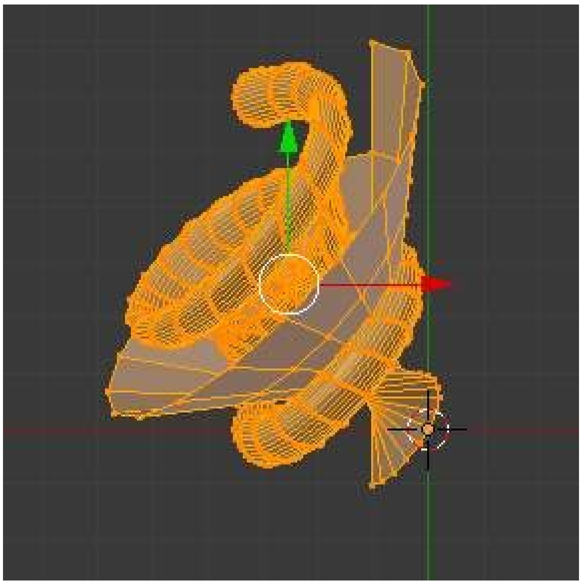


Fig. 13 - Bended Mesh Example 2 - The vector angle is maintained along the extrusions

Creating perfect Screw Spindles

Using the Spring Example, it’s easy to create perfect Screw Spindles (like the ones present in normal screws that we can buy in hardware stores). Perfect Screw Spindles use a profile with the same height as its vector, and the beginning and ending vertex of the profile are placed at a straight parallel line with the axis of extrusion. The easiest way of achieving this effect is to create a simple profile where the beginning and ending vertices create a straight parallel line. Bforartists won’t take into account any of the vertices present in the middle but those two to take its angular vector, so the spindles of the screw (which are defined by the turns value) will assembly perfectly with each other.

To Do
Removed original explanation text. for the upper image. It was a spelling lesson with press this press that hotkey. Not a single hint of what tool was used. No way to convert this one into a useful text that explains

what tools are in use and how to reach the goal by menu. Bollocks. To Do!

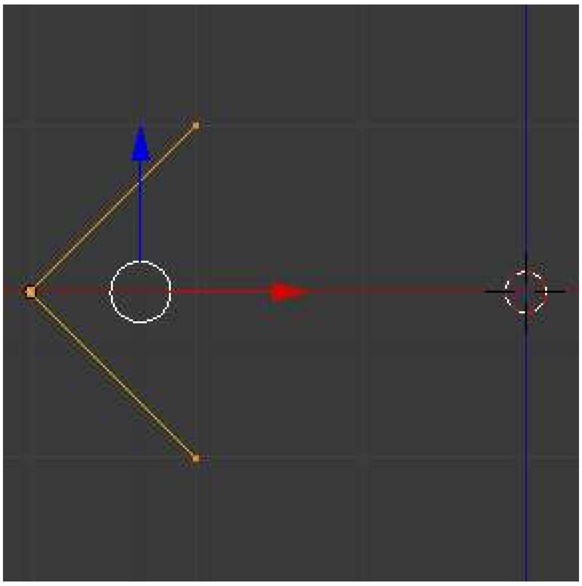


Fig. 14 - Profile for a perfect screw spindle. The starting and ending vertices are forming a parallel line with the Bforartists Axis

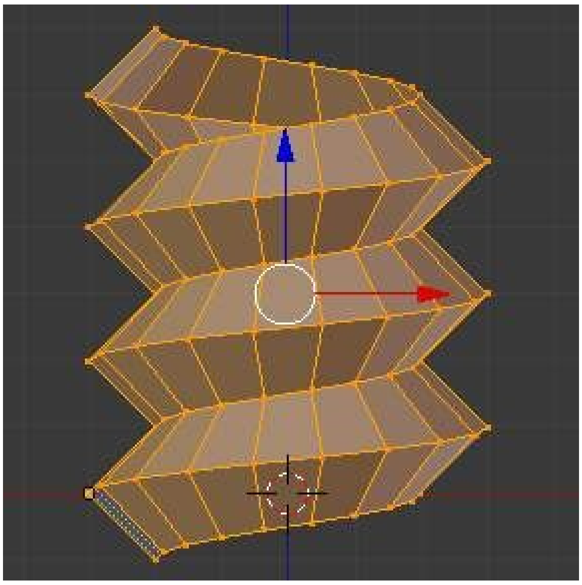


Fig. 15 - Generated Mesh. You can use this technique to perform normal screw modeling.

Here, in Fig. 16 and Fig. 17, we show you an example using a different profile, but maintaining the beginning and ending vertices at the same position. The generated mesh looks like a medieval ramp!

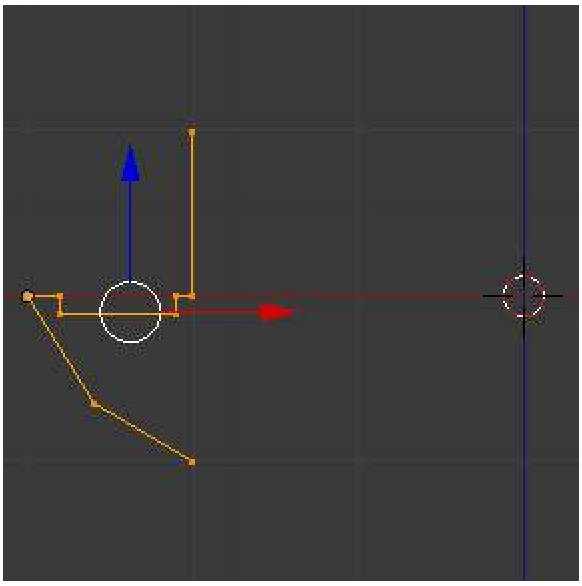


Fig. 16 - Profile with starting and ending vertices forming a parallel line with the Bforartists Axis

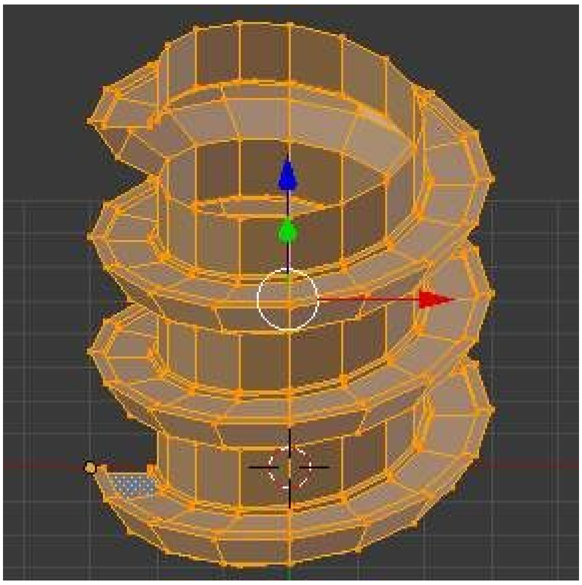


Fig. 17 - Generated Mesh with the profile at the left. We have inclined the visualization a bit.

As you can see, the Screw spindles are perfectly assembled with each other, and they follow a straight line from top to bottom. You can also change the Clockwise and Counterclockwise direction using this example, to create right and left screw spindles. At this point, you can give the screw another dimension, changing the Center of the Spin Extrusion, making it more suitable to your needs or calculating a perfect screw and merging its vertices with a cylinder, modeling its head, etc.

A Screw Tip

As we have explained before, the *Screw* tool generates clean and simple meshes to deal with; they are light, well-connected and are created with very predictable results. This is due to the Bforartists calculations taking into account not only the height of the vector, but also its starting angle. It means that Bforartists will connect the vertices with each other in a way that they follow a continuous cycle along the extruded generated profile.

In this example, you will learn how to create a simple Screw Tip (like the ones we use for wood; we have shown an example at the beginning of this page). To make this new example as short as possible, we will recycle our last example (again).

- Open Bforartists and click in *File* located in the header of the Info Window again; choose *Open Recent* and the file we saved for this exercise. All of the things will be placed exactly the way you saved before. Choose the last saved Bforartists file; in the last exercise, we gave it the name *Screw Hardware Example.blend*.
- Grab the upper vertex and move a bit to the left, but no more than you have moved your last vertex. (See Fig. 18 - Profile With Starting Vector Angle)
- Press the shortcut A twice to de-select and select all.
- *Set Cursor to Center*
- Press Screw.

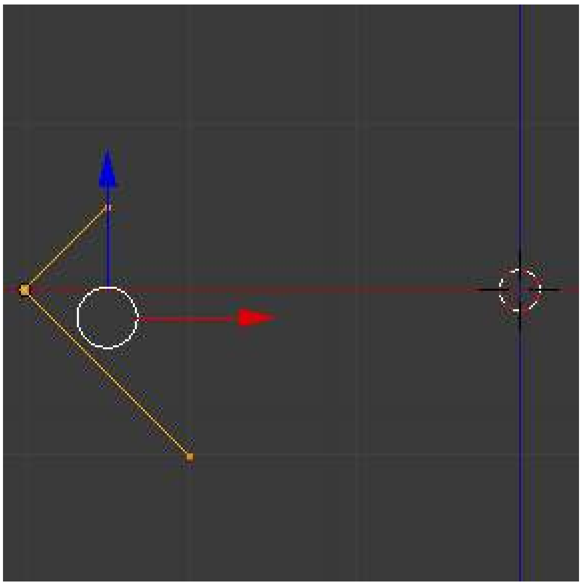


Fig. 18 - Profile With Starting Vector Angle

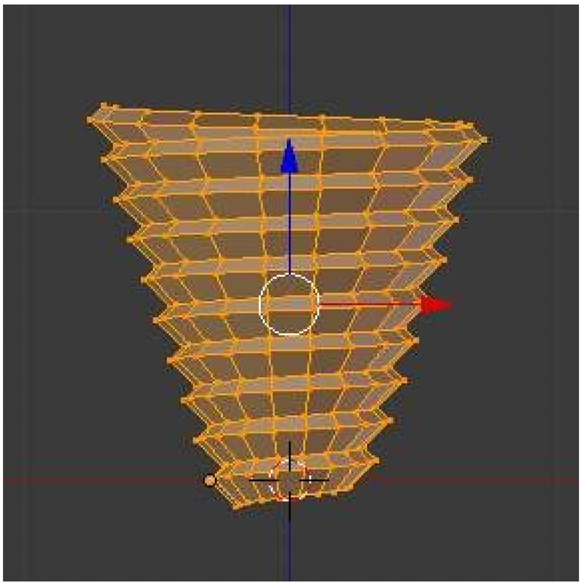


Fig. 19 - Generated Mesh with the Profile

As you can see in Fig. 19, Bforartists follows the basic angular vector of the profile, and the profile basic angle determines whether the extruded subsequent configured turns will open or close the resulting mesh following this angle. The vector of the extrusion angle is determined by the starting and ending Vertex of the profile.

Subdividing

Mesh Subdividing Tools

Subdividing adds resolution by cutting existing faces and edges into smaller pieces. There are several tools that allow you to do this:

Subdivide
Divide a face or edge into smaller units, adding resolution.
Loop Subdivide
Insert a loop of edges between existing ones
Vertex Connect
Connects selected vertices with edges that split faces.
Knife Subdivide
Cut edges and faces interactively
Bevel
Subdivides edges or vertices, making them faceted or rounded

Subdivide

Reference
Mode: *Edit* mode
Panel: *Mesh Tools* (*Editing* context)
Menu: Mesh ‣ Edges ‣ Subdivide, Specials ‣ Subdivide/Subdivide Smooth

Subdividing splits selected edges and faces by cutting them in half or more, adding necessary vertices, and subdividing accordingly the faces involved, following a few rules, depending on the settings:

- When only one edge of a face is selected (Tri mode), triangles are subdivided into two triangles, and quads, into three triangles.
- When two edges of a face are selected:
  - If the face is a triangle, a new edge is created between the two new vertices, subdividing the triangle in a triangle and a quad.
  - If the face is a quad, and the edges are neighbors, we have **three** possible behaviors, depending on the setting of *Corner Cut Type* (the drop-down menu next to the *Subdivide* button, in *Mesh Tools* panel) See below for details.
  - If the face is a quad, and the edges are opposite, the quad is just subdivided in two quads by the edge linking the two new vertices.
- When three edges of a face are selected:
  - If the face is a triangle, this means the whole face is selected - it is then sub-divided in four smaller triangles.

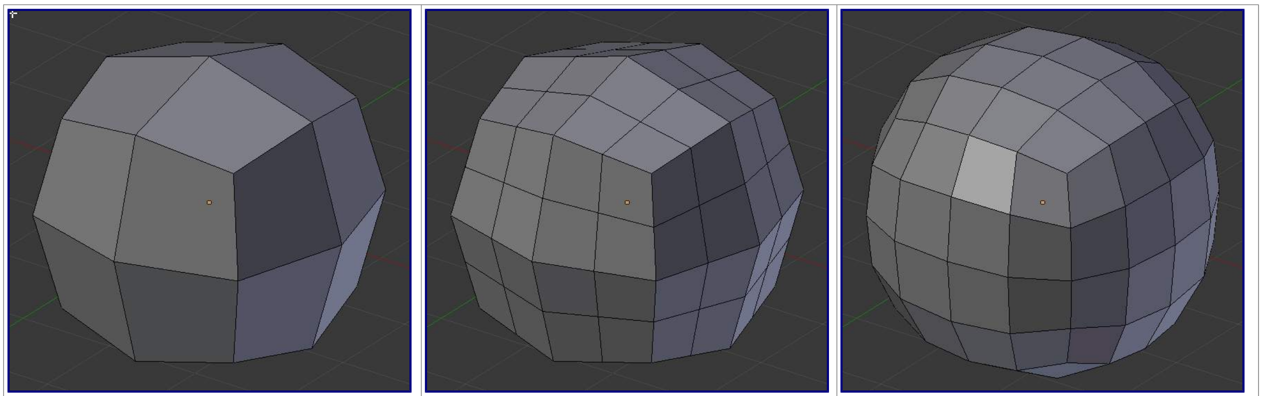
    - If the face is a quad, first the two opposite edges are subdivided as described above. Then, the “middle” edge is subdivided, affecting its new “sub-quad” as described above for only one edge.
- When four edges of a face (a quad) are selected, the face is subdivided into four smaller quads.

Options

These options are available in the *Tool Panel* after running the tool;

Number of Cuts
: Specifies the number of cuts per edge to make. By default this is 1, cutting edges in half. A value of 2 will cut it into thirds, and so on.

Smoothness
: Displaces subdivisions to maintain approximate curvature, The effect is similar to the way the subdivision modifier might deform the mesh.



Mesh before subdividing | Subdivided with no smoothing | Subdivided with smoothing of 1

Quad/Tri Mode
: Forces subdivide to create triangles instead of ngons, simulating old behavior (see examples below)

Corner Cut Type

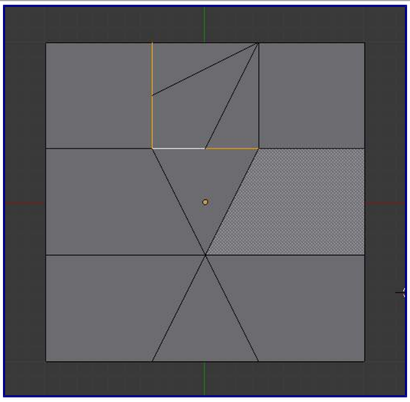
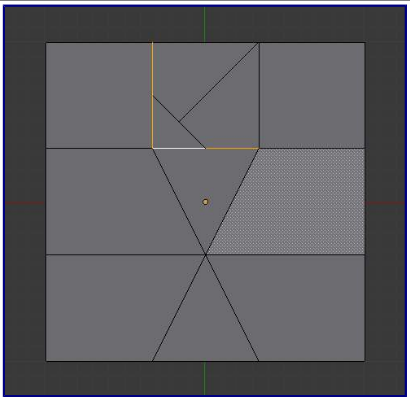
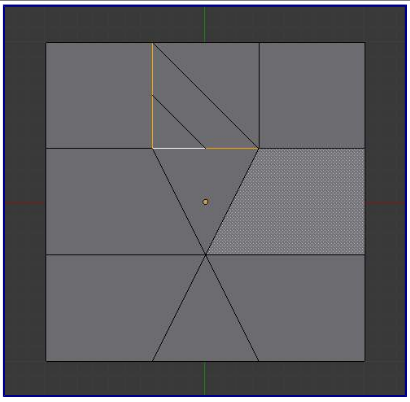
This drop-down menu controls the way quads with only two adjacent selected edges are subdivided

Fan
: the quad is sub-divided in a fan of four triangles, the common vertex being the one opposite to the selected edges.

Innervert
: (i.e. “inner vertex”), The selected edges are sub-divided, then an edge is created between the two new vertices, creating a small triangle. This edge is also sub-divided, and the “inner vertex” thus created is linked by another edge to the one opposite to the original selected edges. All this results in a quad sub-divided in a triangle and two quad.

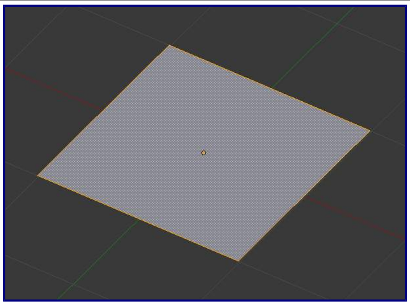
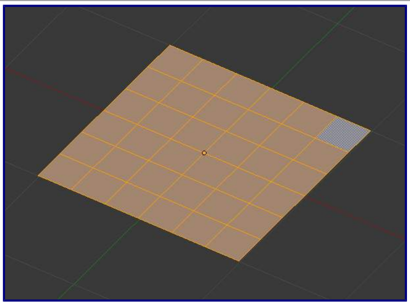
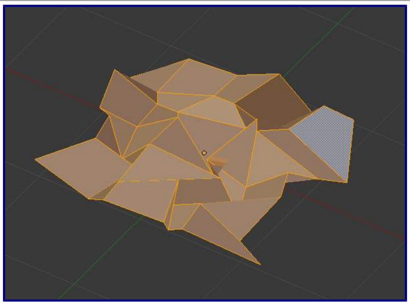
Path
: First an edge is created between the two opposite ends of the selected edges, dividing the quad in two triangles. Then, the same goes for the involved triangle as described above.

Straight Cut
: Currently non functioning...

		
Fan cut type	Innervert cut type	Path cut type

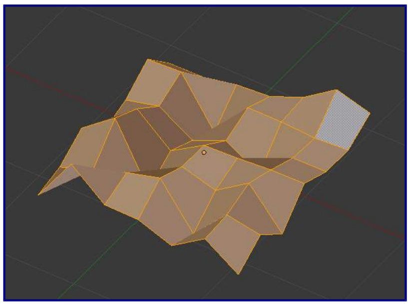
Fractal

Displaces the vertices in random directions after the mesh is subdivided

		
Plane before subdivision	Regular subdivision	Same mesh with fractal added

Along Normal

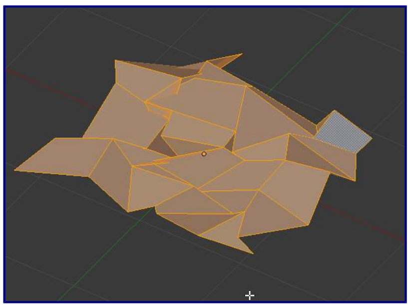
Causes the vertices to move along the their normals, instead of random directions



Along normal set to 1

Random Seed

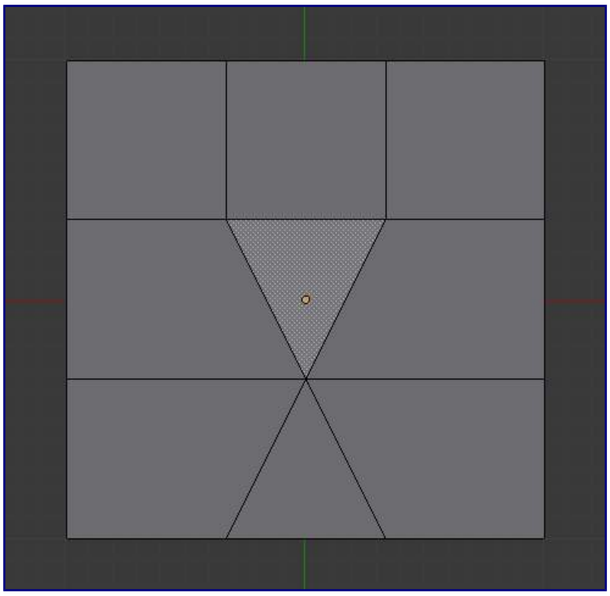
Changes the random seed of the noise function, producing a different result for each seed value.



Same mesh with a different seed value

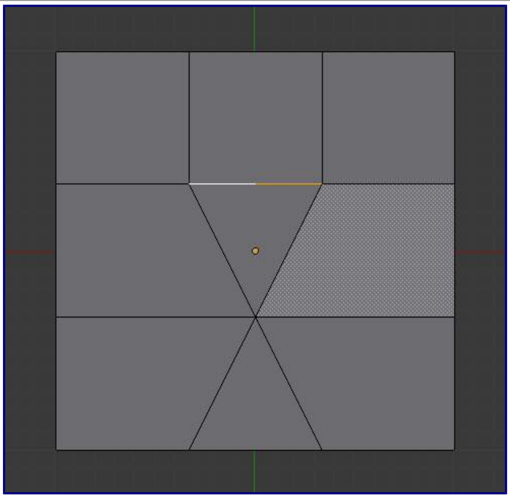
Examples

Below are several examples illustrating the various possibilities of the *Subdivide* and *Subdivide Multi* tools. Note the selection after subdivision.

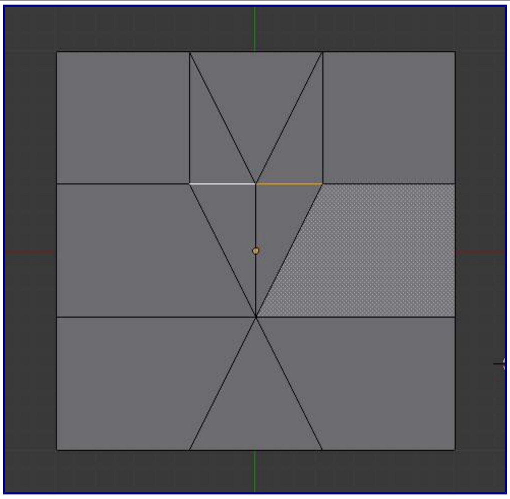


The sample mesh.

One Edge

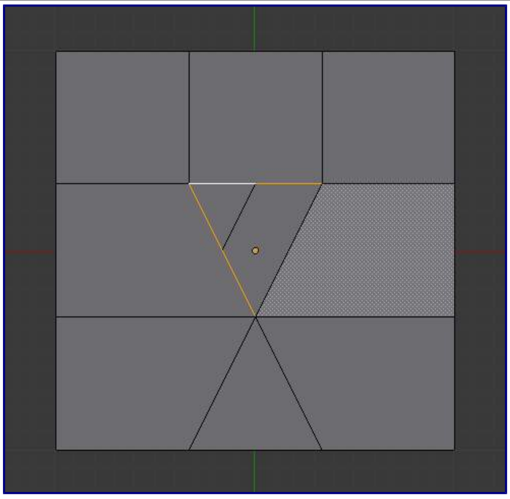


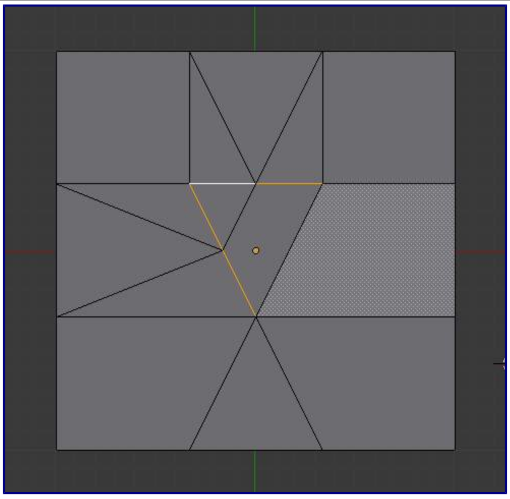
One Edges



Quad/Tri Mode

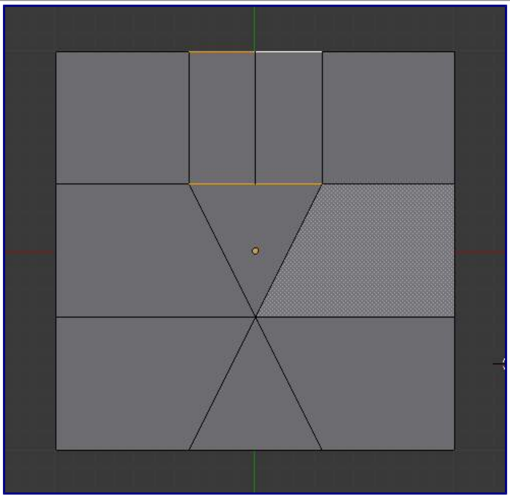
Two Tri Edges

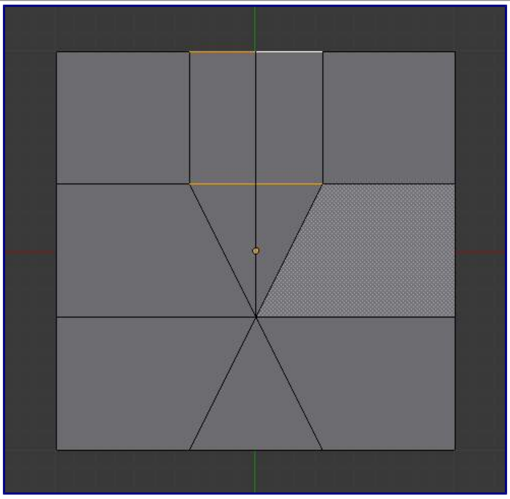




Quad/Tri Mode

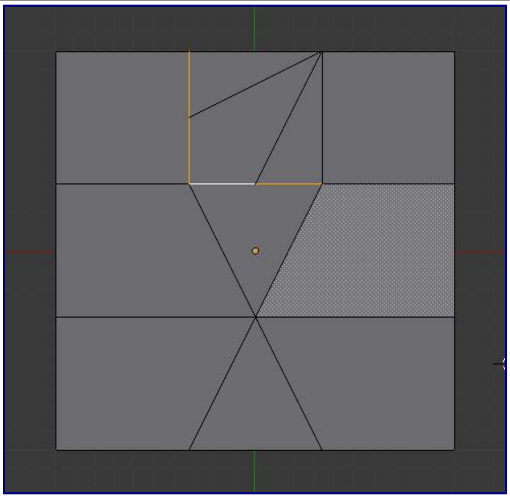
Two Opposite Quad Edges



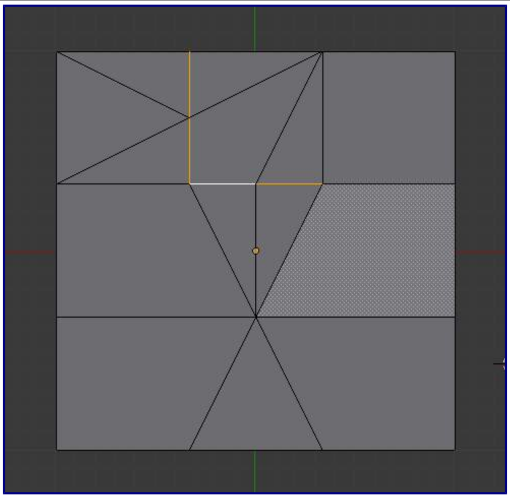


Quad/Tri Mode

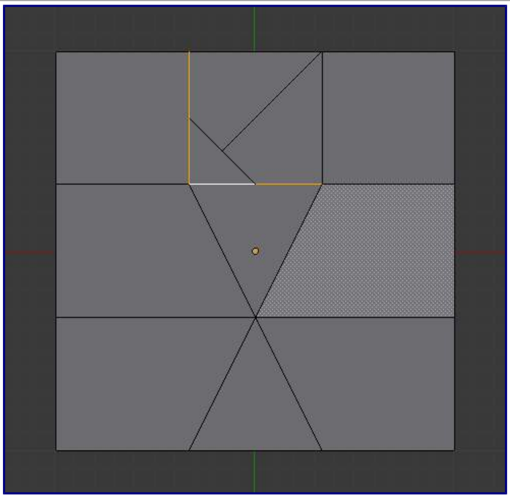
Two Adjacent Quad Edges

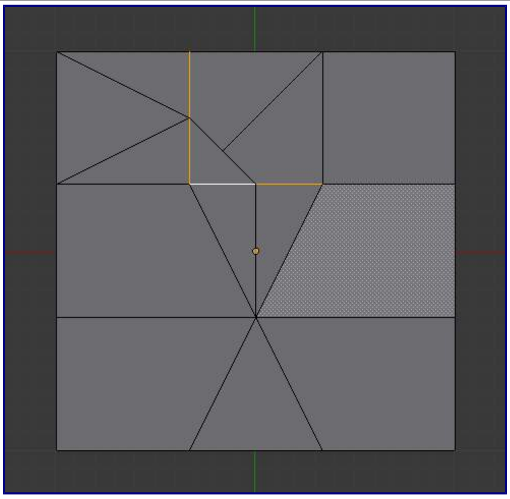


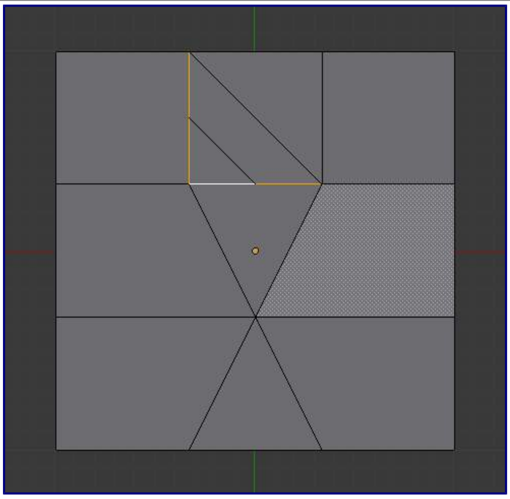
Fan cut type

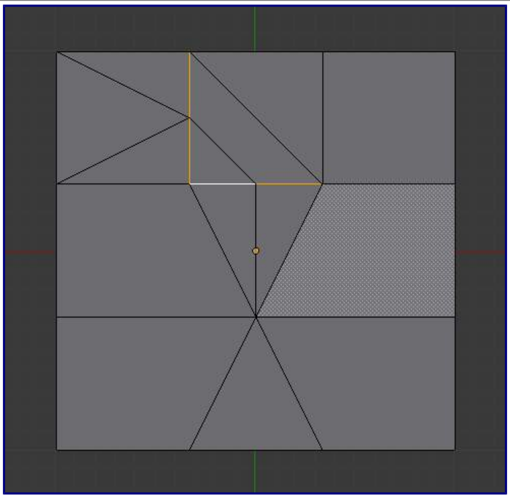


Quad/Tri Mode

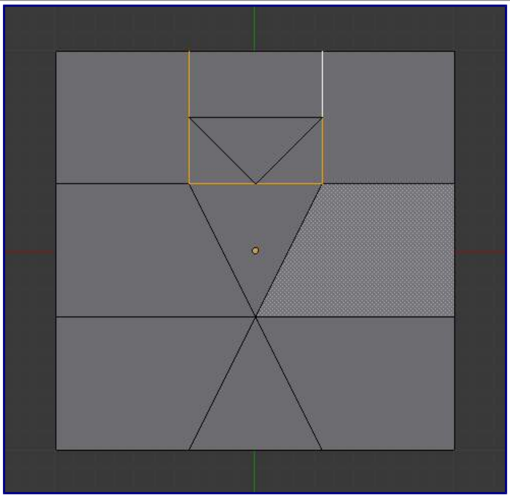

Innervert cut type

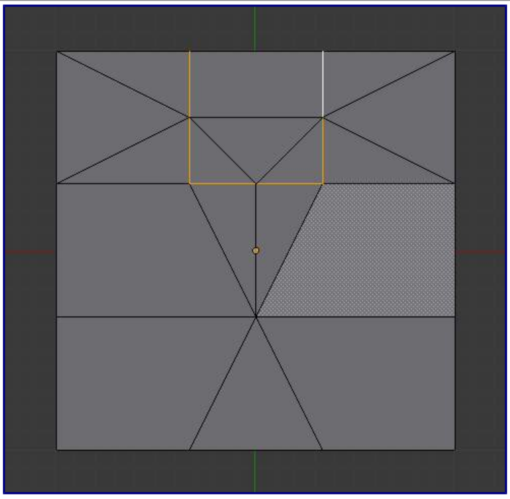

Quad/Tri Mode


Path cut type

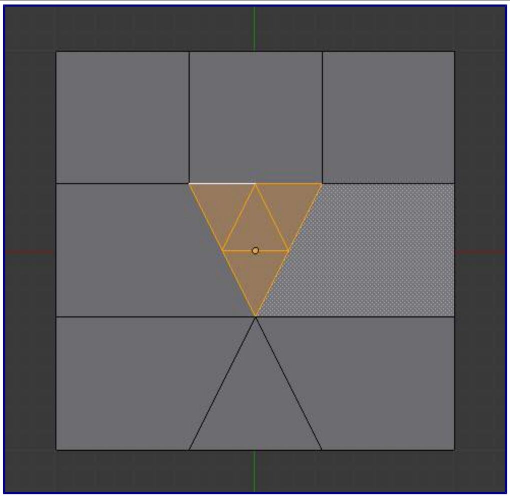

Quad/Tri Mode

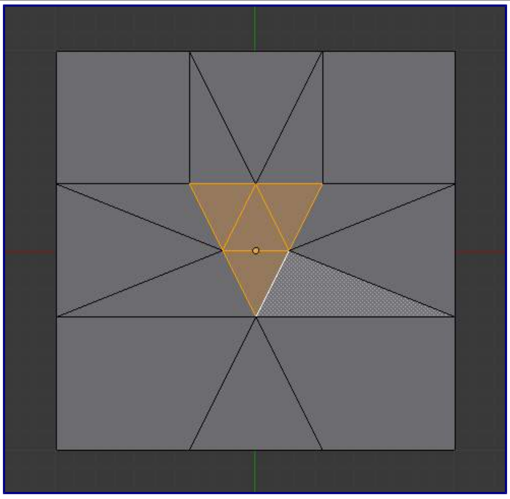
Three Edges




Quad/Tri Mode

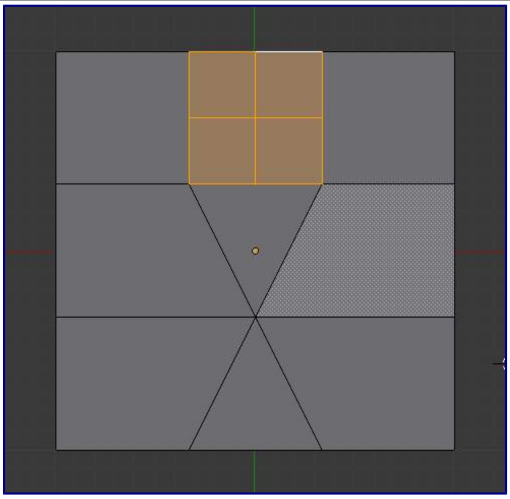
Tri

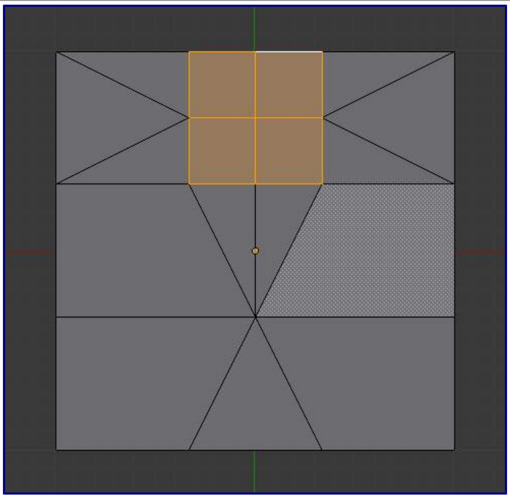




Quad/Tri Mode

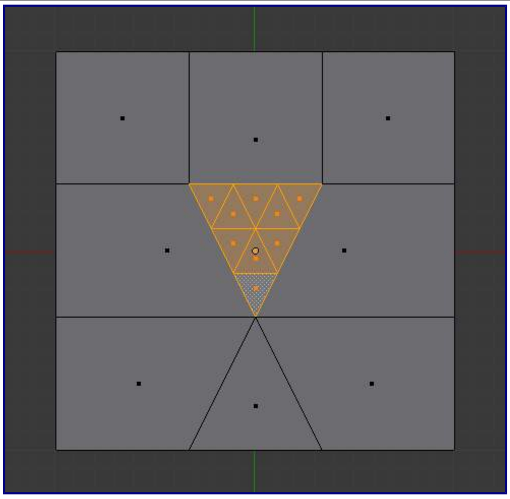
Quad/Four Edges



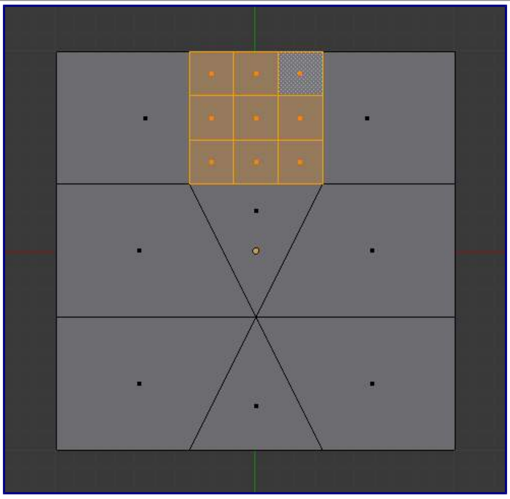


Quad/Tri Mode

Multicut



Tri with two cuts



Quad with two cuts

Loop Subdivide

Reference
Mode: *Edit* mode Panel: *Editing* context –> *Mesh Tools*

Loop Cut splits a loop of faces by inserting a new edge loop intersecting the chosen edge. The tool is interactive and has two steps:

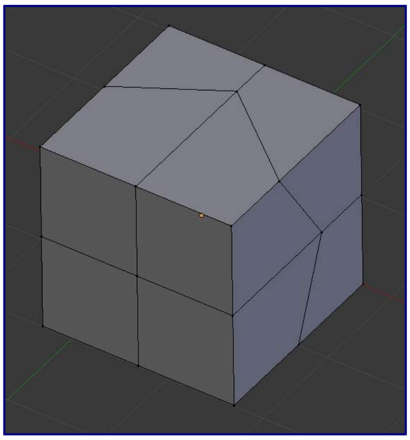
Usage

Pre-visualizing the cut

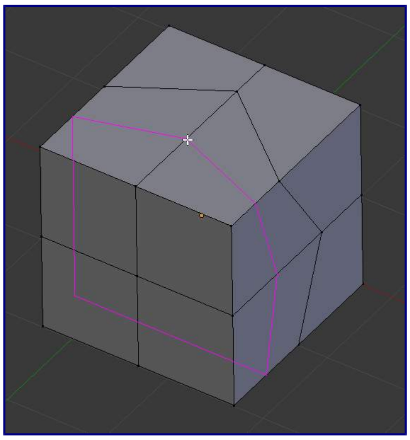
After the tool is activated, move the cursor over a desired edge. The cut to be made is marked with a magenta colored line as you move the mouse over the various edges. The to-be-created edge loop stops at the poles (tris and ngons) where the existing face loop terminates.

Sliding the new edge loop

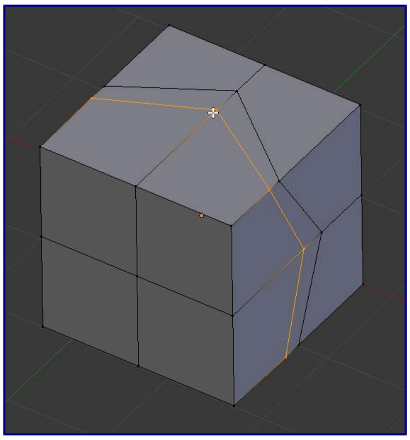
Once an edge is chosen via `LMB`, you can move the mouse along the edge to determine where the new edge loop will be placed. This is identical to the Edge Slide tool. Clicking `LMB` again confirms and makes the cut at the pre-visualized location, or clicking `RMB` forces the cut to exactly 50%. This step is skipped when using multiple edge loops (see below)



mesh before inserting edge loop



Preview of edge loop location



Interactive placement of edge loop between adjacent loops

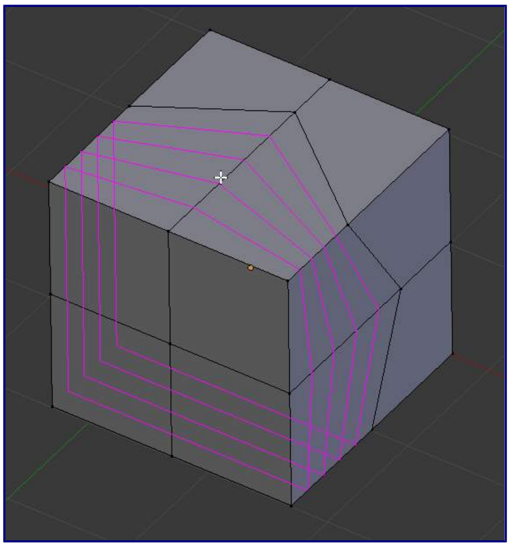
Options

Options are only available while the tool is in use, and are displayed in the 3d view header

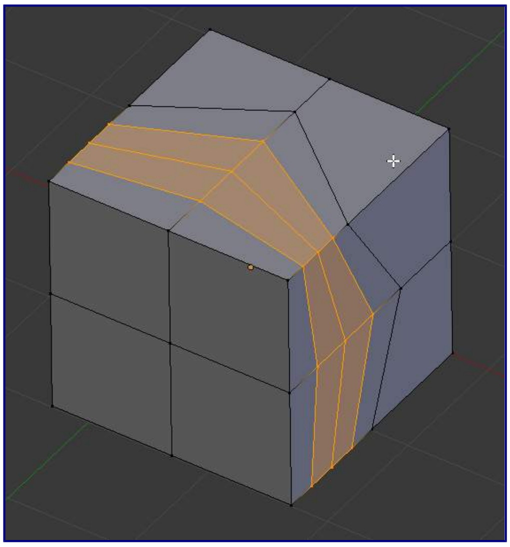
Even
: Only available for single edge loops. This matches the shape of the edge loop to one of the adjacent edge loops. (See Edge Slide tool for details)

Flip
: When Even is enabled, this flips the target edge loop to match. (See Edge Slide tool for details)

Number of Cuts `Wheel` or `NumpadPlus` / `NumpadMinus`
: After activating the tool, but before confirming initial loop location, you can increase and decrease the number of cuts to create, by entering a number with the keyboard, scrolling `Wheel` or using `NumpadPlus` and `NumpadMinus`. Note that when creating multiple loops, these cuts are uniformly distributed in the original face loop, and *you will not be able to control their positions*.



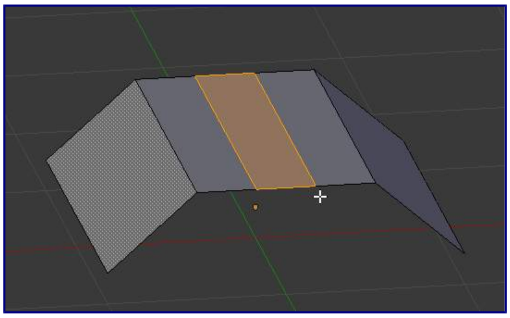
Preview of multiple edge loops



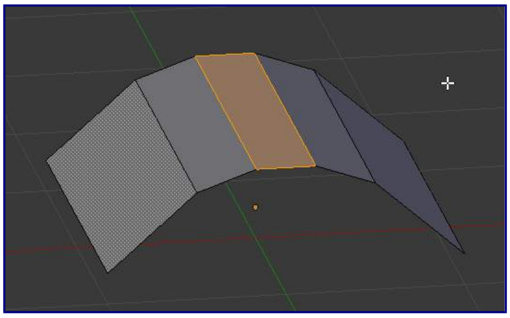
Result of using multiple cuts

Smoothing `Alt-Wheel`

Smoothing causes edge loops to be placed in an interpolated position, relative to the face it is added to, causing them to be shifted outwards or inwards by a given percentage, similar to the *Subdivide Smooth* command. When not using smoothing, new vertices for the new edge loop are placed exactly on the pre-existing edges. This keeps subdivided faces flat, but can distort geometry, particularly when using *Subdivision Surfaces*. Smoothing can help maintain the curvature of a surface once it is subdivided.



Added edge loops without smoothing



Same edge loops, but with smoothing value

Knife Tool

Reference

Mode: *Edit* mode
Panel: *Mesh Tools* (*Editing* context)

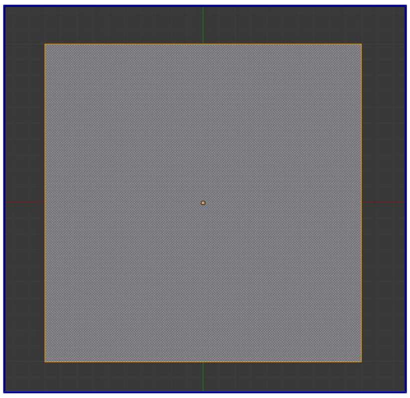
The knife tool can be used to interactively cut up geometry by drawing lines or closed loops to create holes.

Usage

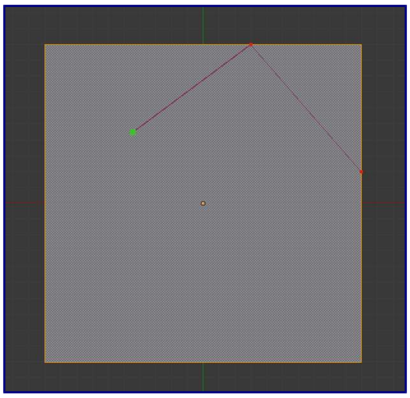
Click at the button, the Knife tool becomes active.

Drawing the cut line

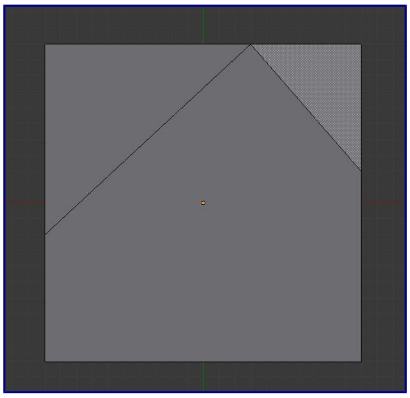
When using *Knife*, the cursor changes to an icon of a scalpel and the header changes to display options for the tool. You can draw connected straight lines by clicking `LMB`.



Mesh before knife cut



Knife cut active



After confirming knife cut

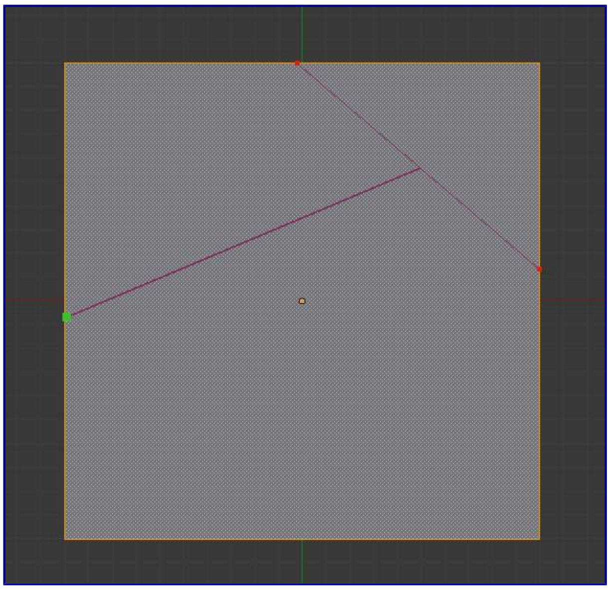
Options

Knife selection

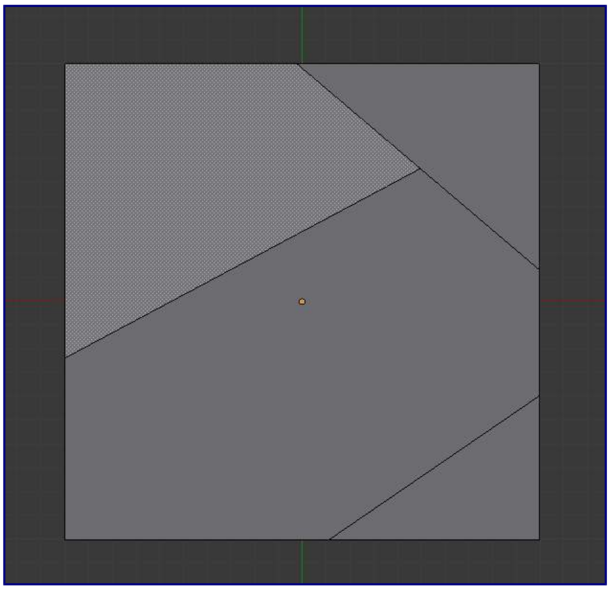
Activates the knife so only selected faces are cut.

New cut

Begins a new cut. This allows you to define multiple distinct cut lines. If multiple cuts have been defined, they are recognized as new snapping points.



Creating multiple cuts



Result of starting new cuts while in the tool

Midpoint snap

Hold to snap the cursor to the midpoint of edges

Ignore snap

Hold to make the tool ignore snapping.

Cut through

Allow the cut tool to cut through to obscured faces, instead of only the visible ones.

Angle constrain

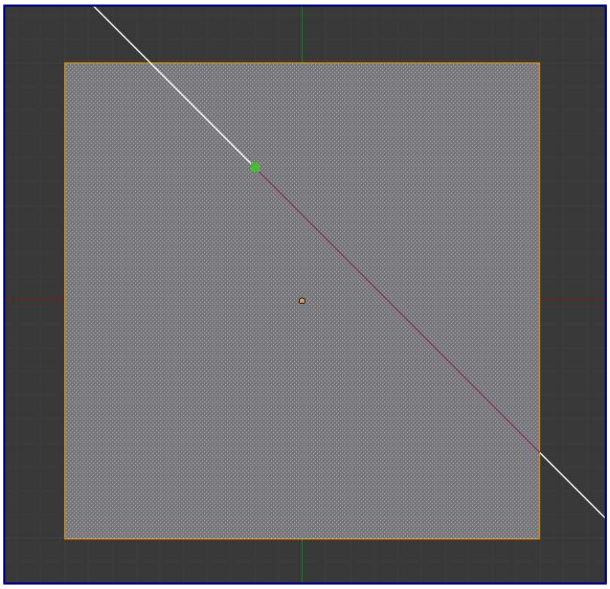
Constrains the cut to 45 degree increments.

Close loop

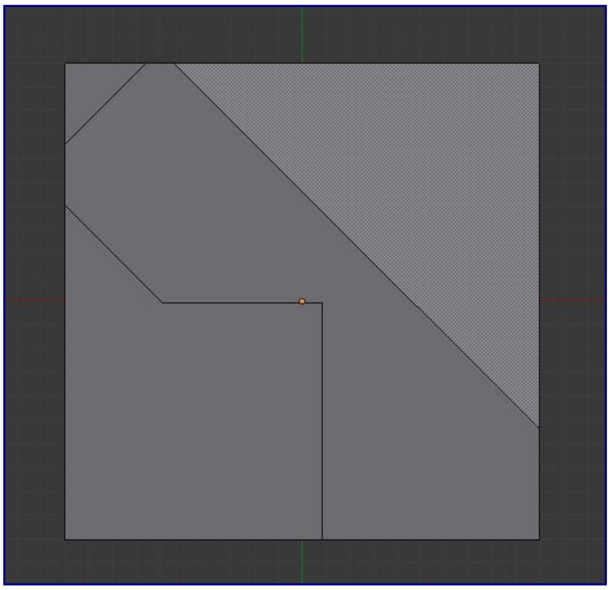
This is a quick way to close the loop you're currently cutting.

Draw a continuous line

So you can draw a freehand line over a surface, points will be created at edge intersections.



Constraining cut angle



Result of constraining cut angle

Confirming and selection

Pressing `Esc` or `RMB` at any time cancels the tool, and pressing `LMB` or `Return` confirms the cut, with the following options:

`Return` will leave selected every edge except the new edges created from the cut.

Limitations

Cuts that begin or end in the middle of a face, will be ignored. This is a limitation of the current geometry that can be modeled in Bforartists.

Knife Project

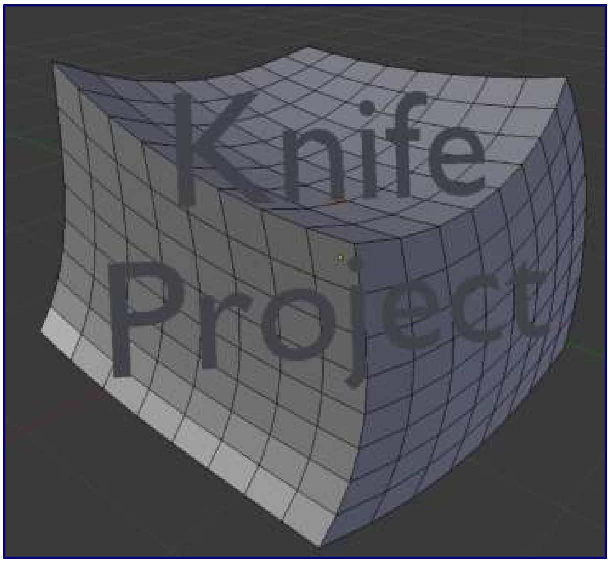
Knife projection is a non-interactive tool where you can use objects to cookie-cut into the mesh rather than hand drawing the line.

This works by using the outlines of other selected objects in edit-mode to cut into the mesh, resulting geometry inside the cutters outline will be selected.

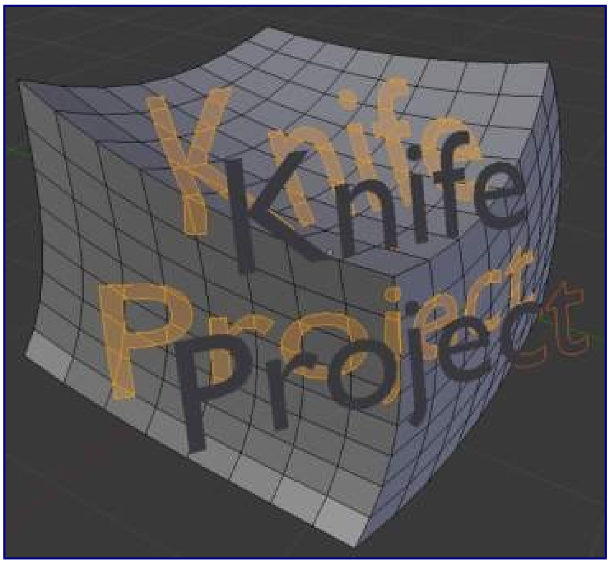
Outlines can be wire or boundary edges.

To use Knife Project, in 'object' mode select the "cutting object" first then shift select the "object to be cut". Now tab into edit mode and press "knife project".

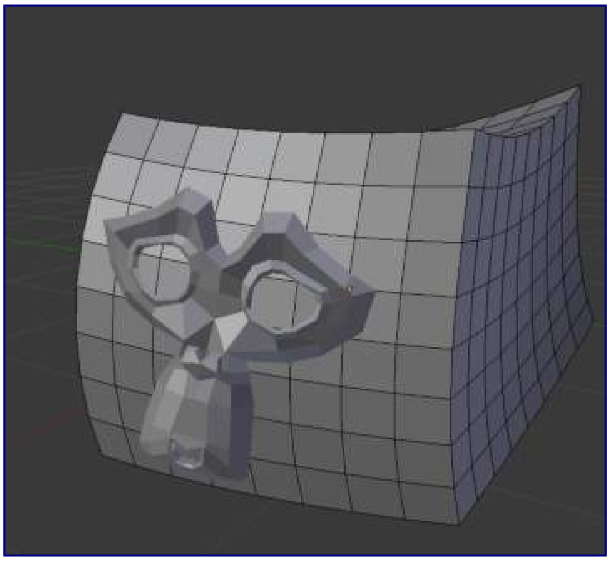
Examples



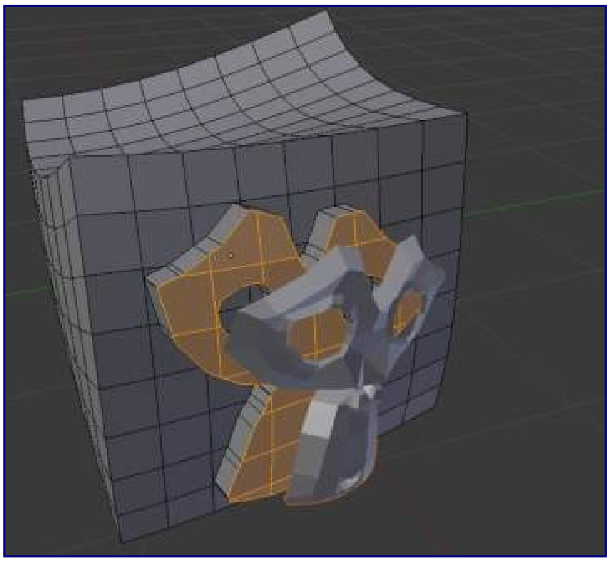
Before projecting from a text object



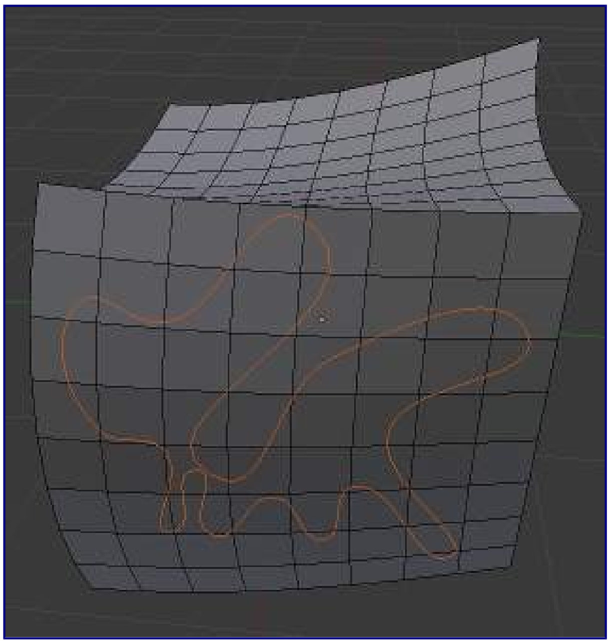
Resulting knife projection



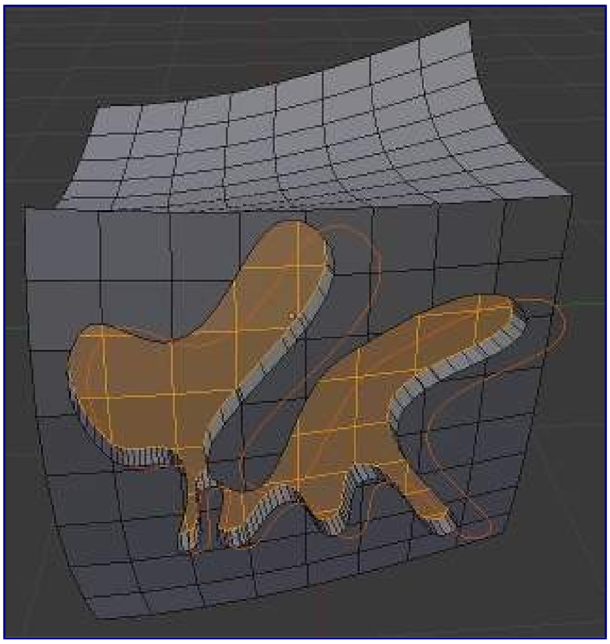
Before projecting from a mesh object



Resulting knife projection (extruded after)



Before projecting from a 3D curve object



Resulting knife projection (extruded after)

Known Issues

Cutting holes into single faces may fail, this is the same limitation as with the regular knife tool but more noticeable for text, this can be avoided by projecting onto more highly subdivided geometry.

Mesh Bisect

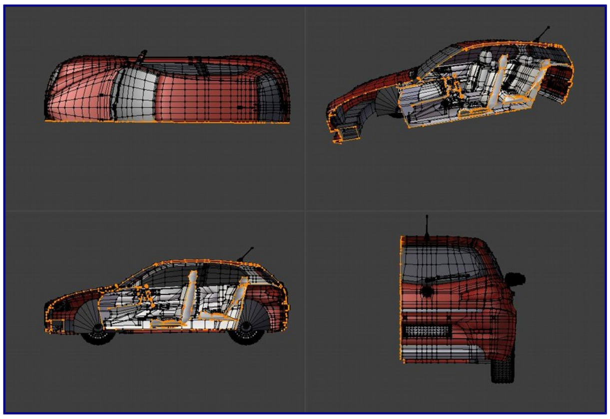
Reference
Mode: *Edit* mode Menu: Mesh ‣ Bisect

The bisect tool is a quick way to cut a mesh in-two along a custom plane.

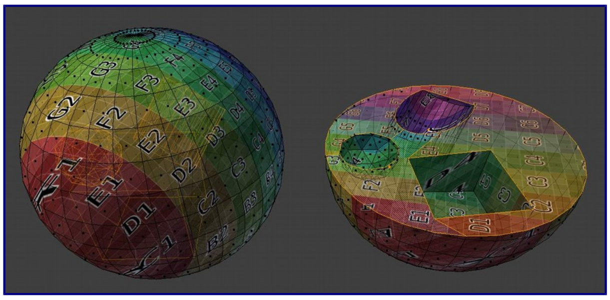
There are three important differences between this and the knife tool.

- The plane can be numerically adjusted in the operator panel for precise values.
- Cuts may remove geometry on one side.
- Cuts can optionally fill in the holes created, with materials and UV's & vertex-colors based on the surrounding geometry.

This means the bisect tool can cut off parts of a mesh without creating any holes.



Example of a common use of bisect



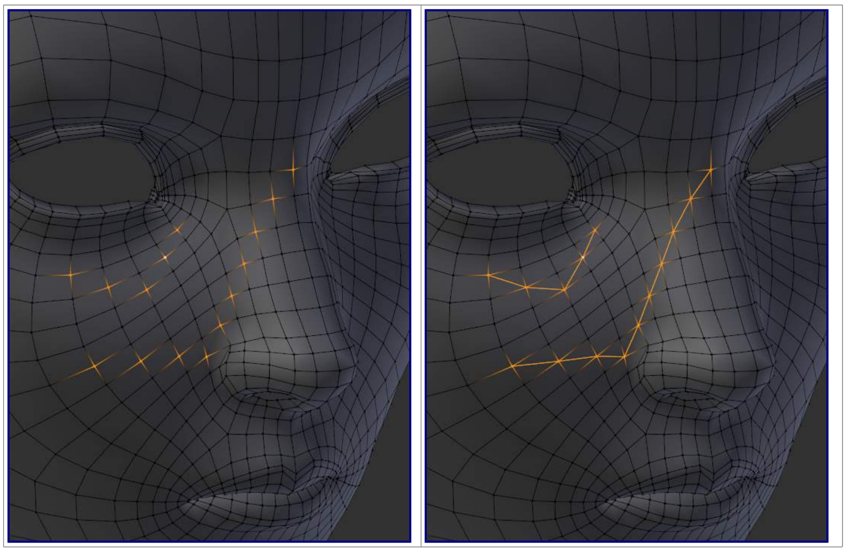
Example of bisect with fill option

Vertex Connect

Reference
Mode: *Edit* mode Menu: Mesh –> Vertices –> Connect

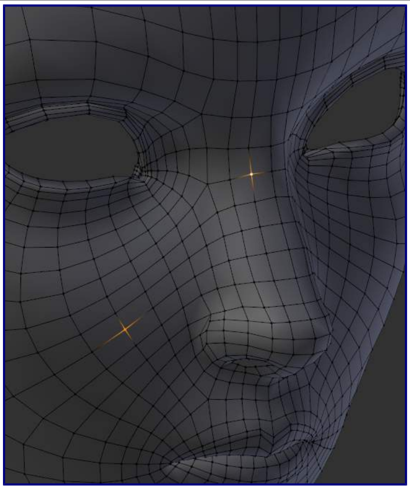
This tool joins selected vertices by edges, The main difference between this and creating edges is that faces are split by the newly joined vertices.

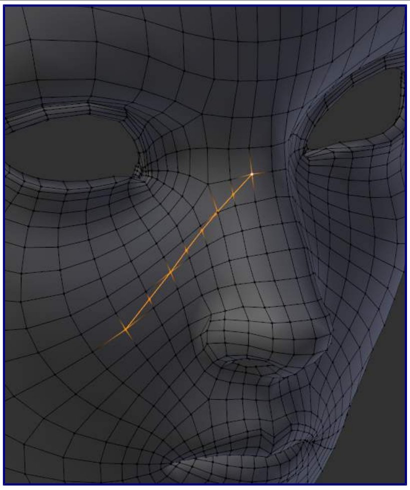
When many vertices are selected, faces will be split by their selected vertices.



Before	After

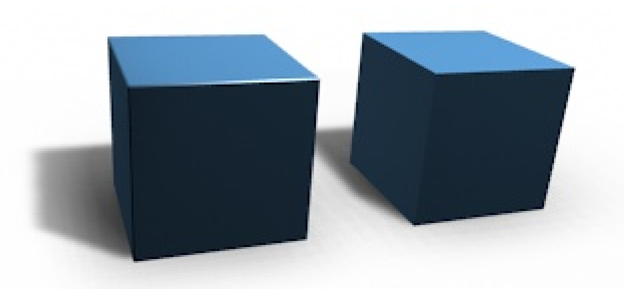
When there are only 2 vertices selected, a cut will be made across unselected faces, a little like the knife tool; however this is limited to straight cuts across connected faces.


Before


After

Bevel

Reference
Mode: *Edit* mode
Menu: Mesh ‣ Edges ‣ Bevel or [Ctrl][E] ‣ Bevel
Menu (vertex-only): Mesh ‣ Vertices ‣ Bevel or [Ctrl][V] ‣ Bevel



With bevel and without bevel.

The bevel tool allows you to create chamfered or rounded corners to geometry. A bevel is an effect that smooths out edges and corners. True world edges are very seldom exactly sharp. Not even a knife blade edge can be considered perfectly sharp. Most edges are intentionally beveled for mechanical and practical reasons.

Bevels are also useful for giving realism to non-organic models. In the real world, the blunt edges on objects catch the light and change the shading around the edges. This gives a solid, realistic look, as opposed to un-beveled objects which can look too perfect.

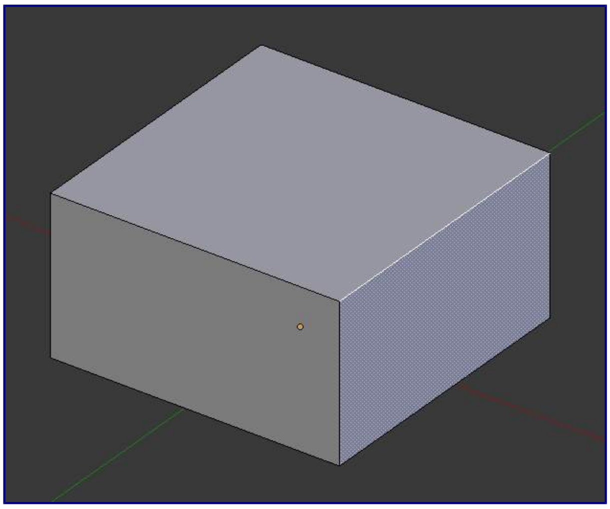
Bevel Modifier

The *Bevel Modifier* is a non destructive alternative to the bevel tool. It gives you the same options, with additional goodies, like the bevel width controlled by the vertices weight, and all the modifiers general enhancements (non-destructive operations, ...).

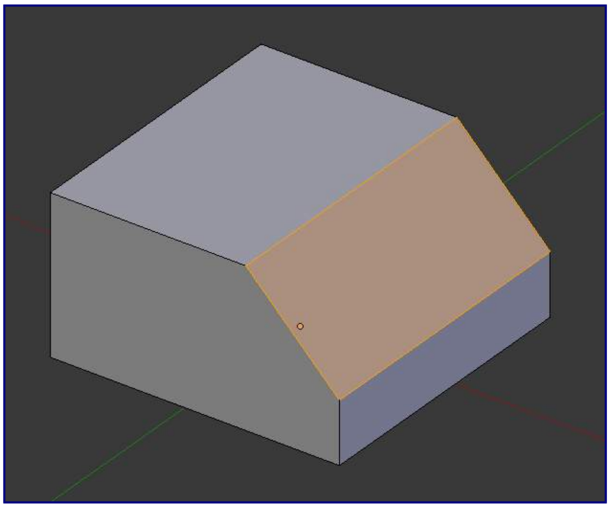
Usage

The *Bevel* tool works only on selected edges. It will recognize any edges included in a vertex or face selection as well, and perform the bevel the same as if those edges were explicitly selected. In “vertex only” mode, the *Bevel* tool works on selected vertices instead of edges. The *Bevel* tool smooths the edges and/or “corners” (vertices) by replacing them with faces making smooth profiles with a specified number of *segments* (see the options below for details about the bevel algorithm).

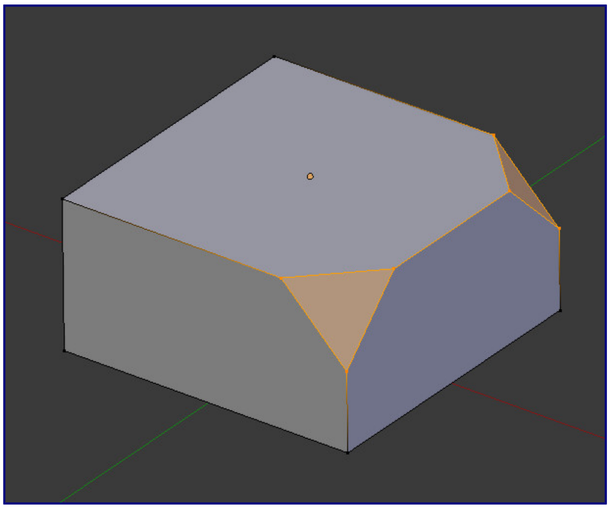
Move the mouse to interactively specify the bevel offset, and scroll the `Wheel` to increase or decrease the number of segments. (see below)



Selected edge before beveling



Result of bevel (one segment)

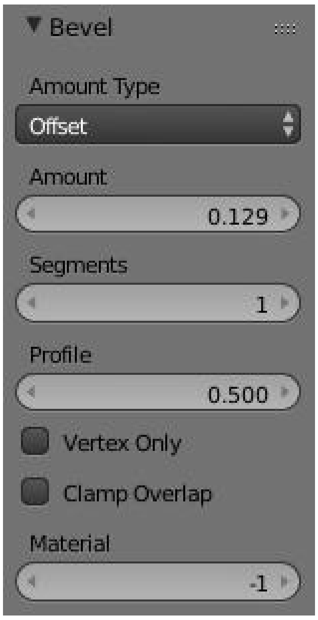


Result of bevel (vertex only)

Note

Normal (edge) beveling only works on edges that have exactly two faces attached to them. Vertex bevel has no such restriction.

Options



Amount
: You can change the bevel amount by moving the mouse towards and away from the object, a bit like with transform tools. The exact meaning of the value depends on the *Amount Type* option (see below). As usual, the scaling can be controlled to a finer degree by holding `Shift` to scale in 0.001 steps. `LMB` finalizes the operation, `RMB` or `Esc` aborts the action.

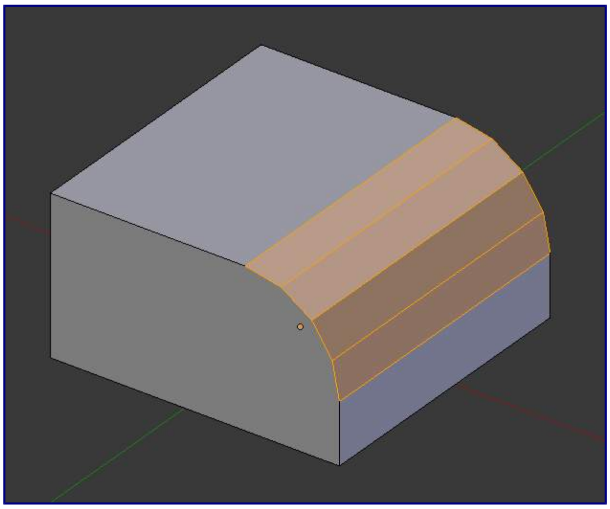
Amount Type
: Selects how the *Amount* value controls the size of the bevel. According to the selection, the amount is: - **Offset** - the distance of a new edge from the original - **Width** - the width of the bevel face - **Depth** - the perpendicular distance from the original edge to the bevel face - **Percent** - the percentage of the length of

adjacent edges that the new edges slide

Segments

The number of segments in the bevel can be defined by scrolling the mouse `Wheel` to increase or decrease this value. The greater the number of segments, the smoother the bevel.

Alternatively, you can manually enter a segment number value while using the tool, or in the Mesh Tool options panel after using the tool.



Bevel with 4 segments

Profile

This is a number between 0 and 1 that controls the shape of the profile (side view of a beveled edge). The default value, 0.5, gives a circular arc (if the faces meet at right angles). Values less than that give a flatter profile, with 0.25 being exactly flat, and values less than that giving a concave bevel. Values more than 0.5 give a more “bulged-out” profile.

Vertex Only

When selected, the tool is in “vertex only” mode, and only vertices will be beveled.

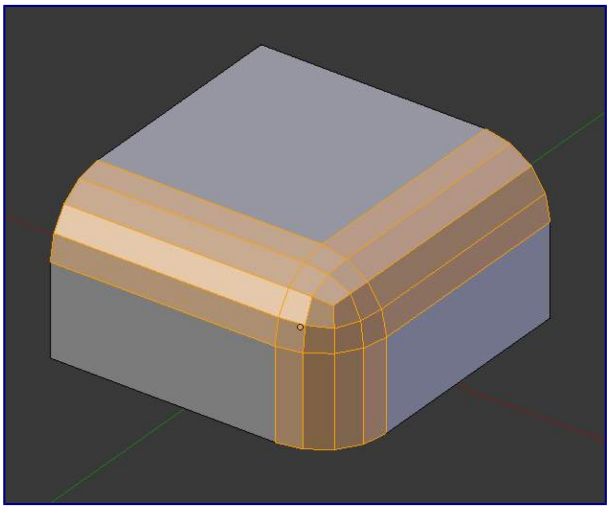
Clamp Overlap

When selected, the bevel amount is not allowed to go larger than an amount that causes overlapping collisions with other geometry.

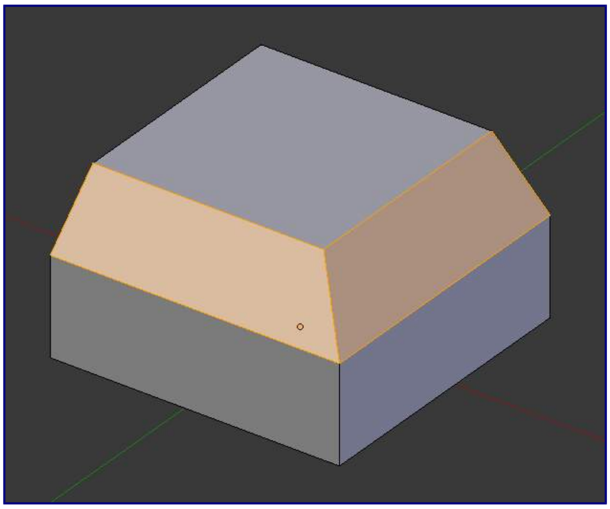
Material

The *Material* number specifies which material should be assigned to the new faces created by the *Bevel* tool. With the default, -1, the material is inherited from the closest existing face (“closest” can be a bit ambiguous). Otherwise, the number is the slot index of the material to use for all newly created faces.

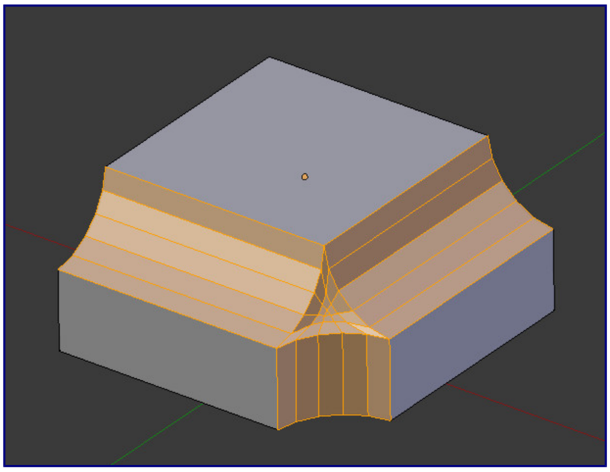
Examples



Result of beveling multiple edges



Another example of beveling multiple edges



An example using Profile=0.150

Miscellaneous Editing Tools

Sort Elements

This tool (available from the *Specials*, *Vertices*, *Edges* and *Faces* menus) allows you to reorder the matching selected mesh elements, following various methods. Note that when called from the *Specials* menu, the affected element types are the same as the active select modes.

View Z Axis
: Sort along the active view's Z axis, from farthest to nearest by default (use *Reverse* if you want it the other way).

View X Axis
: Sort along the active view's X axis, from left to right by default (again, there's the *Reverse* option).

Cursor Distance
: Sort from nearest to farthest away from the 3D cursor position (*Reverse* also available).

Material
: **Faces only!** Sort faces from those having the lowest material's index to those having the highest. Order of faces inside each of those "material groups" remains unchanged. Note that the *Reverse* option only reverses the order of the materials, *not* the order of the faces inside them.

Selected
: Move all selected elements to the beginning (or end, if *Reverse* enabled), without affecting their relative orders. **Warning: this option will also affect unselected elements' indices!**

Randomize
: Randomizes indices of selected elements (*without* affecting those of unselected ones). The seed option allows you to get another randomization - the same seed over the same mesh/set of selected elements will always give the same result!

Reverse
: Simply reverse the order of the selected elements.

Vertex Groups

The Vertex Group Panel

Vertex Groups are mainly used to tag the vertices belonging to parts of a Mesh Object or Lattice. Think of the legs of a chair or the hinges of a door, or hands, arms, limbs, head, feet, etc. of a character. In addition you can assign different *weight values* (in the range [0.0, 1.0]) to the vertices within a Vertex Group. Hence Vertex Groups are sometimes also named *Weight Groups*.

Vertex Groups are most commonly used for Armatures (See also *Skinning Mesh Objects*). But they are also used in many other areas of Bforartists, like for example:

- Shape keys

- Modifiers
- Particle Generators
- Physics Simulations

Many more usage scenarios are possible. Actually you can use Vertex Groups for whatever makes sense to you. In some contexts Vertex Groups can also be automatically generated (i.e. for rigged objects). However in this section we will focus on manually created (user-defined) Vertex Groups.

Note

Vertex groups only apply to Mesh and Lattice Objects

Any other Object type has no vertices, hence it can not have Vertex Groups.

Typical usage scenarios for Vertex groups

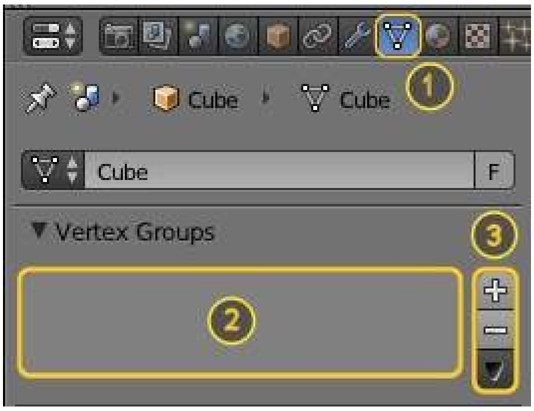
Skinning an armature
: If you want to animate your mesh and make it move, you will define an armature which consists of a bunch of bones. Vertex Groups are used to associate parts of the Mesh to Bones of the Armature, where you can specify an influence *weight* in the range [0.0 ... 1.0] for each vertex in the Vertex Group.

Working with Modifiers
: Many modifiers contain the ability to control the modifier influence on each vertex separately. This is also done via Vertex Groups and the weight values associated to the vertices.

Quickly select/edit/hide parts of a mesh
: By defining mesh regions with Vertex Groups you can easily select entire parts of your mesh with 3 clicks and work on them in isolation without having to create separate objects. With the hide function you can even remove a vertex group from the view (for later unhide).

Cull out and duplicate parts of a mesh
: Consider modeling a Lego block. The most simple brick consists of a base and a stud (the bump to connect the bricks together). To create a four-stud block, you would want to be able to easily select the stud vertices, and, still in *Edit mode*, duplicate them and position them where you want them.

Creating Vertex Groups



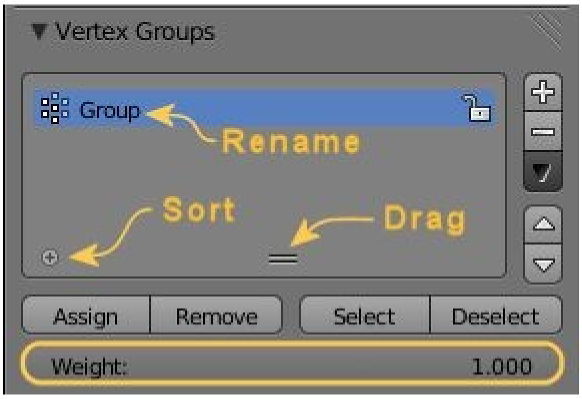
Empty Vertex Group Panel

Vertex Groups are maintained within the *Object Data Properties* window (1), and there in the *Vertex Groups* panel. As long as no Vertex groups are defined (the default for new Mesh Objects), the Panel is empty (2).

You create a vertex group by `LMB` + on the right Panel border (3). Initially the group is named *Group* (or

Group.nnn when the name already exists) and gets displayed in the Panel (2) (see next image).

Vertex Groups Panel Controls



One Vertex Group

Once a new Vertex Group has been added, the new Group appears in the vertex Groups panel. There you find 3 clickable elements:

Group Name
: The Groupname can be changed by double clicking `LMB` on the name itself. Then you can edit the name as you like.

Plus Icon
: When the little icon in the left lower corner can be clicked, a new row opens up where you can enter a search term. This becomes handy when the number of vertex groups gets big.

Drag Handle
: If you have a large number of vertex groups and you want to see more then a few Groups, you can `LMB` on the small drag handle to tear the vertex groups list larger or smaller.

Active Group
: When a Vertex Group is created, then it is also automatically marked as the *Active Group*. This is indicated by setting the background of the panel entry to a light blue color. If you have two or more groups in the list, then you can change the active group by `LMB` on the corresponding entry in the Vertex Group panel.

Deleting vertex Groups

Delete a Vertex Group

You delete a Vertex Group by first making it the active group (select it in the panel) and then `LMB` the `-` button at the right Panel border.

Deleting a Vertex Group only deletes the vertex assignments to the Group. The vertices themselves are not deleted.

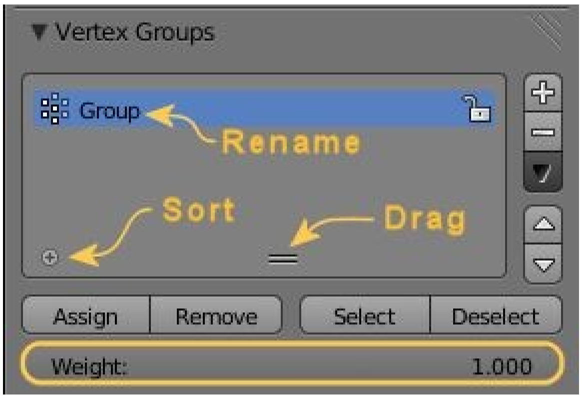
Locking Vertex Groups

Lock a Vertex Group

Right after creation of a Vertex Group, an open lock icon shows up on the right side of the Vertex Group List entry. This icon indicates that the Vertex Group can be edited. You can add vertex assignments to the group or remove assignments from the group. And you can change it with the weight paint brushes, etc.

When you click on the icon, it changes to a closed lock icon and all vertex group modifications get disabled. You can only rename or delete the group, and unlock it again. No other operations are allowed on locked Vertex Groups, thus all corresponding function buttons become disabled for locked Vertex Groups.

Working with Content of Vertex Groups



Vertex Group Panel in Edit Mode

When you switch either to *Edit-Mode* or to *Weight-Paint* Vertex Selection Mode, then the Vertex Group panel expands and displays 2 more rows:

The first row contains 4 buttons for maintaining the Assign- and Select- status of vertices of the active Vertex Group:

Assign
: To assign the Selected vertices to the Group with the weight as defined in the “Weight:” input field (see below)

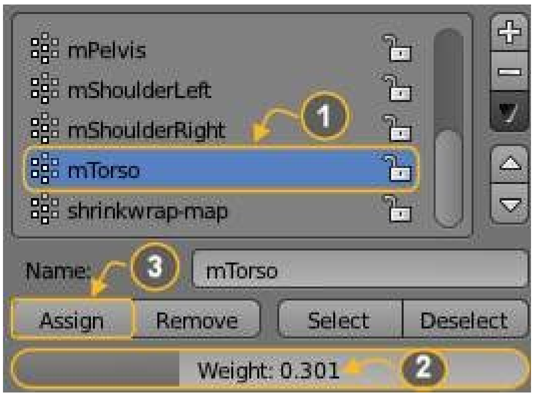
Remove
: To Remove the selected vertices from the Group (and thus also delete their weight values)

Select
: To Select all vertices contained in the Group

Deselect
: To deselect all verts contained in the group

Below this row of buttons you see a numeric “Weight:” input field where you specify the weight value that gets assigned to the selected verts when you press the Assign Button.

Assigning verts to a Group



Assign weights to active group

You add vertices to a group as follows:

- Select the group from the group list, thus make it the Active Group (1).
- From the 3D Viewport select `Shift-RMB` all vertices that you want to add to the group.
- Set the weight value that shall be assigned to all selected verts (2).
- `LMB` the *Assign* button to assign the selected verts to the active group using the given weight (3).

Note that weight Assignment is not available for locked Vertex Groups. The Assign button is grayed out in that case.

Note
Assign is additive The *Assign* button only adds the currently selected vertices to the active group. Vertices already assigned to the group are not removed from the group. Also keep in mind that a vertex can be assigned to multiple groups.

Checking Assignments

To be sure the selected verts are in the desired Vertex Group, you can try press the deselect button. If the vertices remain selected then they're not yet in the current Vertex Group.

At this point you may assign then, but take care since all selected vertices will have their weight set to the value in the *Weight:* field.

Removing assignments from a Group

You remove vertices from a group as follows:

- Select the group from the group list (make it the active group).
- Select all vertices that you want to remove from the group.
- Press the *Remove* button.

Note that Removing weight Assignments is not available for locked Vertex Groups. The Remove button is grayed out in that case.

Using groups for Selecting/Deselecting

You can quickly select all assigned vertices of a group:

- (optionally) press A once or twice to unselect all vertices.
- Select the group from the group list (make it the active group).
- When you now LMB click the *Select* button, then the vertices assigned to the active group will be selected and highlighted in the 3D Viewport.
- When you LMB click the *Deselect* button instead, then the vertices assigned to the active group will be deselected in the 3D Viewport.

Note

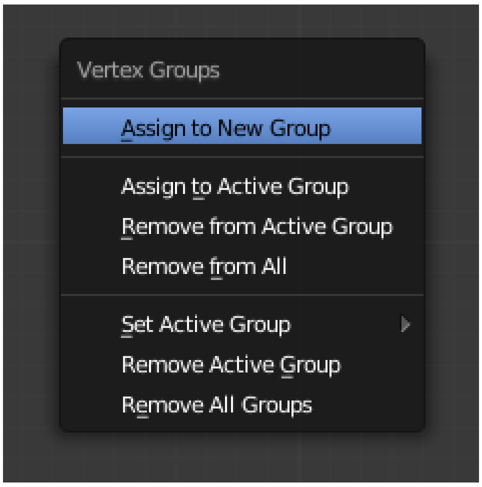
Selecting/Deselecting is additive

If you already have verts selected in the 3D View, then selecting the verts of a group will add the verts but also keep the already-selected verts selected. Vice versa, deselecting the verts of a vertex group will only deselect the verts assigned to the group and keep all other verts selected.

Finding ungrouped verts

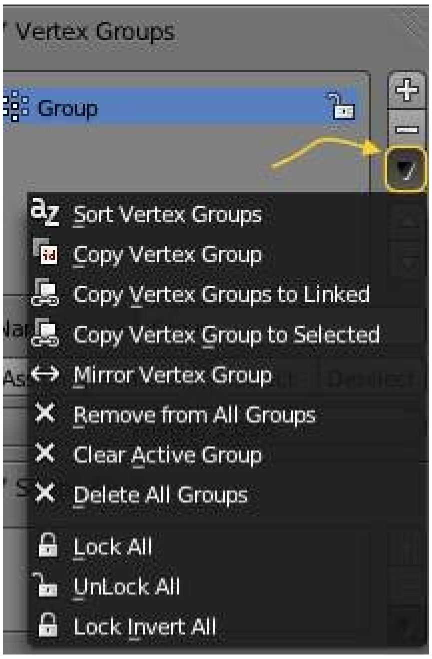
You can find ungrouped vertices as follows:

- Press A once or twice to unselect all vertices.
- In the footer of the 3D Viewport: Navigate to Select –> Ungrouped verts



Vertex Groups pop-up menu

Vertex Group Management



Vertex groups panel’s dropdown menu

Vertex Groups provide a more complex set of functions inside a Pull down menu. This menu is accessible from the Vertex Group Panel by clicking on the dark gray *arrow down* icon on the right panel border.

The following functions of the Pulldown Menu operate on the assigned vertices:

Sort Vertex Groups:
: Sorts Vertex Groups Alphabetically

Copy Vertex Group:
: Add a Copy of the active Vertex Group as a new Group. The new group will be named like the original group with “_copy” appended at the end of its name. And it will contain associations to exactly the same verts with the exact same weights as in the source vertex group.

Copy Vertex Groups to Linked:
: Copy Vertex Groups of this Mesh to all linked Objects which use the same mesh data (all users of the data).

Copy Vertex Group to Selected:
: Copy all Vertex Groups to other Selected Objects provided they have matching indices (typically this is true for copies of the mesh which are only deformed and not otherwise edited).

Mirror Vertex Group:
: Mirror all Vertex Groups, flip weights and/or names, editing only selected vertices, flipping when both sides are selected; otherwise copy from unselected. Note this function will be reworked (and fully documented) in a future release.

Remove from All Groups:
: (not available for locked groups) Unassigns the selected Vertices from all groups. After this operation has been performed, the verts will no longer be contained in any vertex group.

Clear Active group (not available for locked groups):
: Remove all assigned vertices from the active Group. The group is made empty. Note that the vertices may still be assigned to other Vertex Groups of the Object.

Delete All Groups:
: Remove all Vertex Groups from the Object.

The following functions operate only on the lock state settings:

Lock All
: Lock all groups

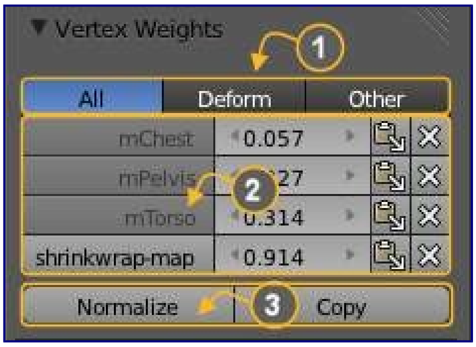
Unlock All
: Unlock all groups

Lock_Invert All
: Invert Group Locks

Hints

- Multiple objects sharing the same mesh data have the peculiar property that the group names are stored on the object, but the weights in the mesh. This allows you to name groups differently on each object, but take care because removing a vertex group will remove the group from all objects sharing this mesh.

Weight Editing



Vertex Weights Panel

As mentioned before in *Vertex Groups* each entry in a Vertex Group also contains a weight value in the range of [0.0,1.0]. Bforartists provides a *Vertex Weights* panel from where you can get (and edit) information about the weight values of each Vertex of a mesh. That is: to which Vertex Groups the vertex is assigned with which weight value.

The Vertex Weights panel can be found in the right property sidebar of the 3D Viewport. It is available in Edit mode and in Weight Paint mode (when Vertex Selection masking is enabled as well). The panel is separated into the sections

- Vertex Group Categories (1)
- Weight Table (2)
- function bar (3)

Vertex Group Categories

Actually we do not have any strict categories of Vertex Groups in Bforartists. Technically they all behave the same way. However we can identify 2 implicit categories of Vertex Groups:

The `Deform` Groups

These Vertex groups are sometimes also named *Weight Groups*. They are used for defining the weight tables of

Armature bones. All Deform Groups of an Object are strictly related to each other via their weight values.

Strictly speaking, the sum of all deform weights for any vertex of a mesh should be exactly 1. 0. In Bforartists this constraint is a bit relaxed (see below). Nevertheless, Deform Groups should always be seen as related to each other. Hence we have provided a filter that allows restricting the Vertex Weight panel to display only the Deform bones of an Object.

The `Other Groups`

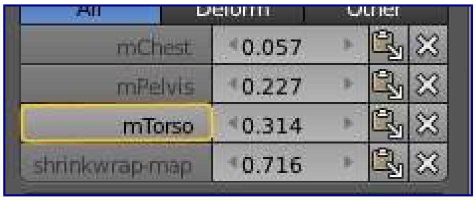
All other usages of Vertex Groups are summarized into the *Other* category. These vertex groups can be found within Shape keys, Modifiers, etc... There is really no good name for this category, so we kept it simple and named it *Other*.

The Weight Table

The Weight Table shows all weights associated to the *active vertex*. Note that a vertex does not necessarily have to be associated to any vertex groups. In that case the Vertex Weights Panel is not displayed.

Tip
The active Vertex That is the most recently selected vertex. This vertex is always highlighted so that you can see it easily in the mesh. If the active Vertex does not have weights, or there is no active vertex selected at the moment, then the Vertex Weights Panel disappears.

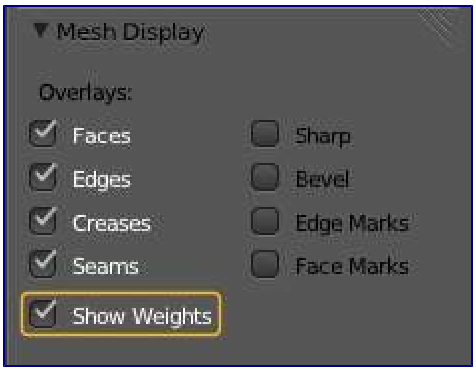
Each row in the Weight table contains 4 active elements:



Change Active Group

Set the Active Group

As soon as you select any of the Vertex Group Names in the Weight table, the referenced Vertex Group becomes the new Active group.

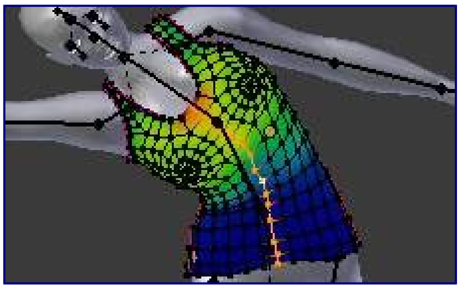


Enable display of Weights in Edit Mode

Display Weights in Edit Mode

When you are in edit mode, you can make the Weights of the active Group visible on the mesh:

Search the *Mesh Display* panel in the Properties sidebar. And there enable the *Show Weights* option. Now you can see the weights of the active Vertex Group displayed on the mesh surface.



Weights in Edit Mode

Edit Weights in Edit Mode

It is now very easy to work with weightmaps in Edit mode. All edit options of the mesh are available and you have direct visual control over how your Weights change when you edit the weight values.

Change Weight Value

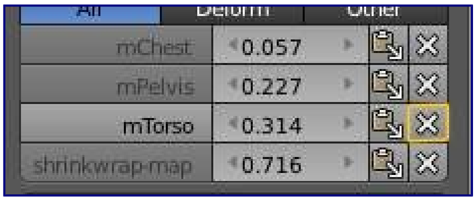
Change a weight

You can either enter a new weight value manually (click on the number and edit the value), or you can change the weight by `LMB` and while holding down the mouse button, drag right or left to increase/decrease the weight value. You also can use the right/left arrows displayed around the weight value to change the weight in steps.

Paste weights

Paste a weight to other verts

`LMB` the Paste Icon allows you to forward a single weight of the active Vertex to all selected vertices. But note that weights are only pasted to verts which already have a weight value in the affected Vertex Group.

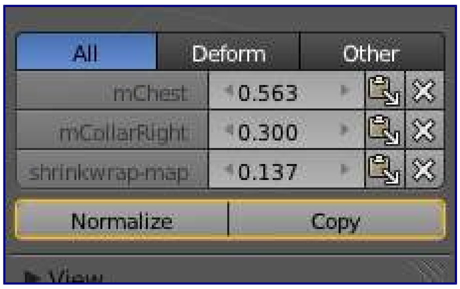


Delete weights

Delete a weight from a Group

`LMB` the Delete Icon will instantly remove the weight from the active vertex. Thus the entire row disappears when you click on the delete icon.

The Function bar



Vertex Weights panel Function Bar

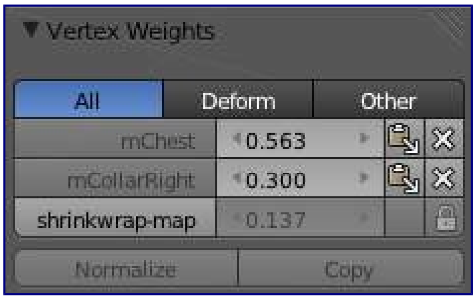
The function bar contains 2 functions:

Normalize
: Normalizes the weights of the active Vertex. That is all weights of the active vertex are recalculated such that their relative weight is maintained and the weight sum is 1.0.

Copy
: Copies all weights defined for the active Vertex to all selected Verts. Thus all previously defined weights are overwritten.

Tip
The filter setting is respected Note that both functions only work on the Vertex Groups currently displayed in the Weights Table. So if for example only the *Deform weights* are displayed, then Normalize and Copy only affect the Deform bones.

About locked Vertex Groups



Vertex Weights panel Locked

Whenever a Weight Group is locked, all data changing functions get disabled:

- Normalize the vertex Weights.
- Copy the Vertex weights.
- Change the Weight of the active vert.
- Paste to selected verts.

Tip

The filter setting is respected

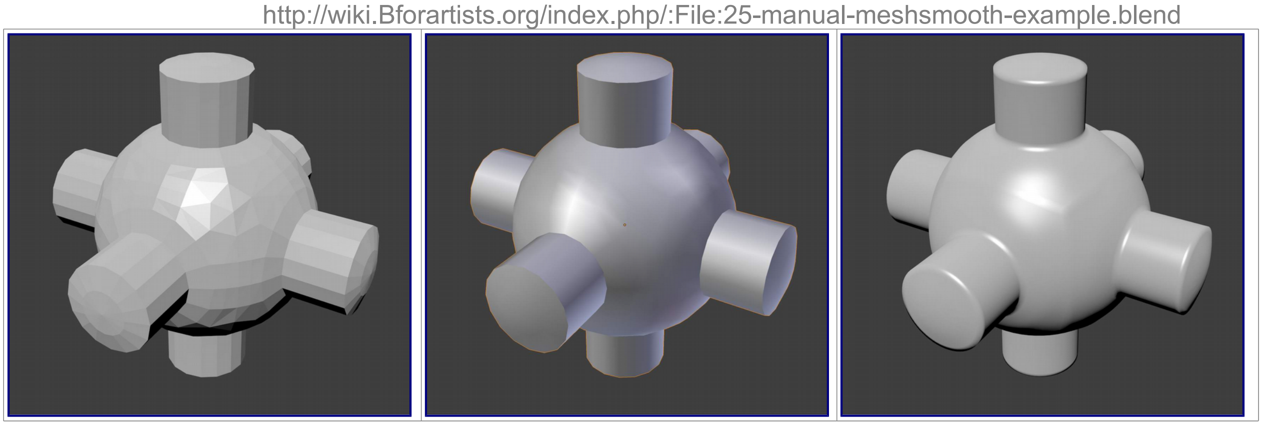
If you have for example all deform weight groups unlocked and all other vertex groups locked, then you can safely select *Deform* from the Filter row and use all available functions from the Weight table again.

Smoothing

Mesh Shading

Example mesh rendered flat, smoothed using edge split, and using Subdivision Surface. Note how edges are rendered differently. Sample .blend

http://wiki.Bforartists.org/index.php/:File:25-manual-meshsmooth-example.blend



As seen in the previous sections, polygons are central to Bforartists. Most objects are represented by polygons and truly curved objects are often approximated by polygon meshes. When rendering images, you may notice that these polygons appear as a series of small, flat faces.

Sometimes this is a desirable effect, but usually we want our objects to look nice and smooth. This section shows you how to visually smooth an object, and how to apply the *Auto Smooth* filter to quickly and easily combine smooth and faceted polygons in the same object.

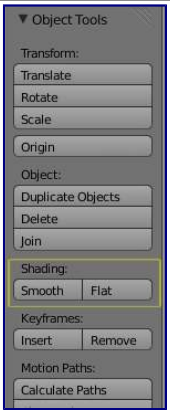
The last section on this page shows possibilities for smoothing a mesh’s geometry, not only its appearance.

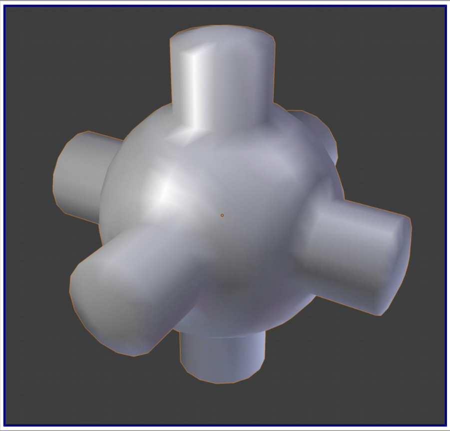
Smooth shading

Reference

Mode: *Edit* and *Object* mode
Panel: *Mesh Tools* (*Editing* context)
Menu: Mesh ‣ Faces ‣ Shade Smooth / Shade Flat

Same mesh smooth shaded





The easiest way is to set an entire object as smooth or faceted by selecting a mesh object, and in *Object* mode, click *Smooth* in the *Tool Shelf*. This button does not stay pressed; it forces the assignment of the “smoothing” attribute to each face in the mesh, including when you add or delete geometry.

Notice that the outline of the object is still strongly faceted. Activating the smoothing features doesn’t actually modify the object’s geometry; it changes the way the shading is calculated across the surfaces, giving the illusion of a smooth surface. Click the *Flat* button in the *Tool Shelf* ‘s *Shading panel* to revert the shading back to that shown in the first image above.

Smoothing parts of a mesh

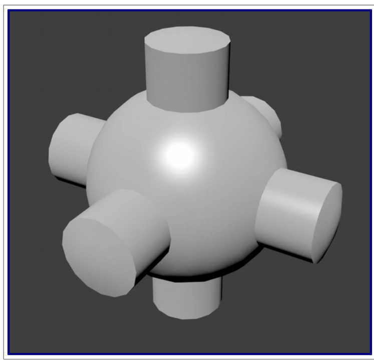
Alternatively, you can choose which edges to smooth by entering *Edit mode*, then selecting some faces and clicking the *Smooth* button. The selected edges are marked in yellow.

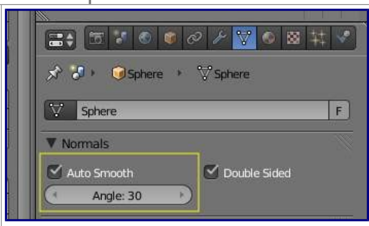
When the mesh is in *Edit mode*, only the selected edges will receive the “smoothing” attribute. You can set edges as flat (removing the “smoothing” attribute) in the same way by selecting edges and clicking the *Flat* button.

Auto Smooth

Reference
Panel: *Properties* (*Object Data* context)

Example mesh with *Auto Smooth* enabled





It can be difficult to create certain combinations of smooth and solid faces using the above techniques alone.

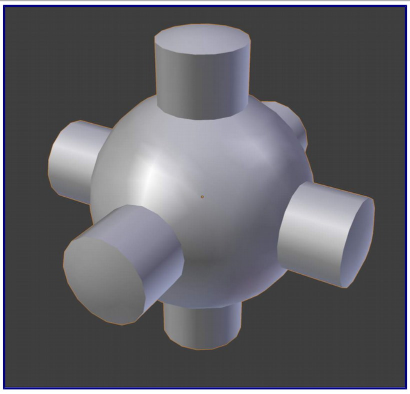
Though there are workarounds (such as splitting off sets of faces by selecting them and pressing Y), there is an easier way to combine smooth and solid faces, by using *Auto Smooth*.

Auto smoothing can be enabled in the mesh’s panel in the *Properties* window. Angles on the model that are smaller than the angle specified in the *Angle* button will be smoothed during rendering (i.e. not in the 3D view) when that part of the mesh is set to smooth. Higher values will produce smoother faces, while the lowest setting will look identical to a mesh that has been set completely solid.

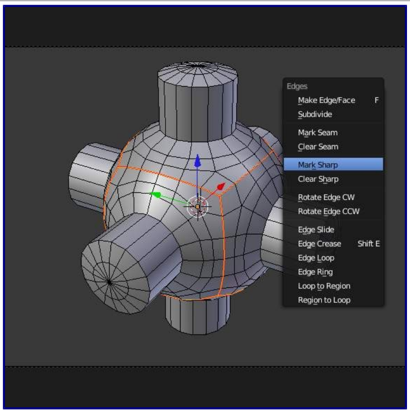
Note that a mesh, or any faces that have been set as *Flat*, will not change their shading when *Auto Smooth* is activated: this allows you extra control over which faces will be smoothed and which ones won’t by overriding the decisions made by the *Auto Smooth* algorithm.

Edge Split Modifier

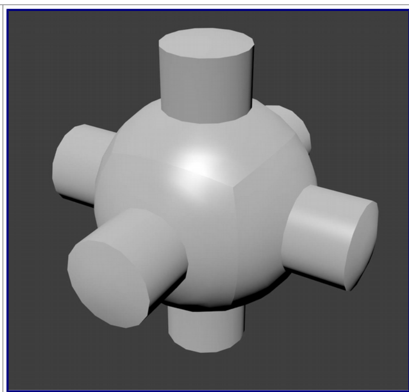
With the *Edge Split Modifier* we get a result similar to *Auto Smooth* with the ability to choose which edges should be split, based on angle - those marked as sharp.



Edge Split modifier enabled, based on angle



Edges marked as sharp



Resulting render with sharp edge weighting

Smoothing the mesh geometry

The above techniques do not alter the mesh itself, only the way it is displayed and rendered. Instead of just making the mesh look like a smooth surface, you can also physically smooth the geometry of the mesh with these tools:

Mesh editing tools

You can apply one of the following in *Edit mode*:

Smooth
This relaxes selected components, resulting in a smoother mesh.

Laplacian Smooth
Smooths geometry by offers controls for better preserving larger details.

Subdivide Smooth
Adjusting the *smooth* parameter after using the *subdivide* tool results in a more organic shape. This is similar to using the subdivide modifier.

Bevel
This Bevels selected edged, causing sharp edges to be flattened.

Modifiers

Alternatively, you can smooth the mesh non-destructively with one or several of the following modifiers:

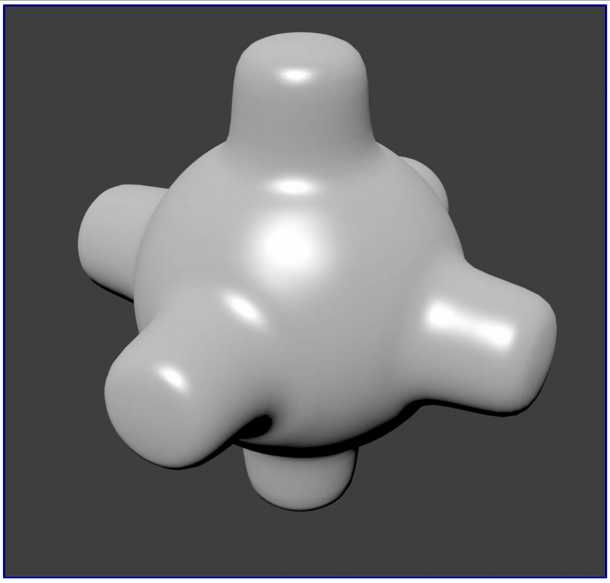
Smooth Modifier
: Works like the *Smooth* tool in *Edit mode*; can be applied to specific parts of the mesh using vertex groups.

Laplactian Smooth Modifier
: Works like the *Laplacian Smooth* tool in *Edit mode*; can be applied to specific parts of the mesh using vertex groups.

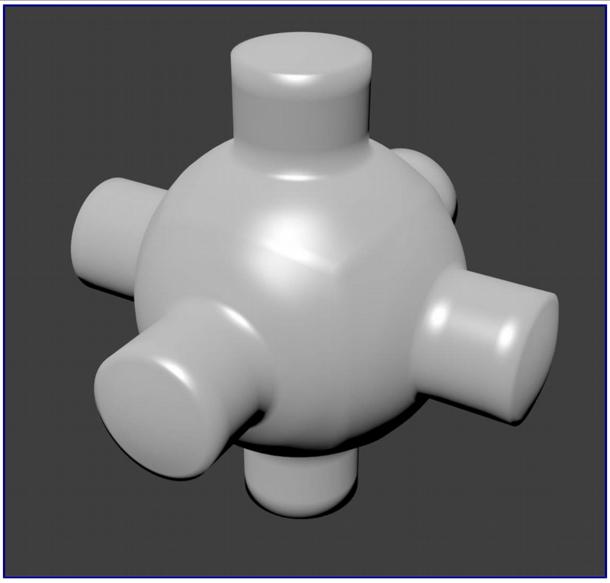
Bevel Modifier
: Works like the *Bevel* tool in *Edit mode*; Bevel can be set to work on an angle threshold, or on edge weight values.

Catmull-Clark subdivision produces smooth results. Sharp edges can be defined with subdivision creases or by setting certain edges to “sharp” and adding an *EdgeSplit modifier* (set to *From Marked As Sharp*) before the *Subsurf* modifier.

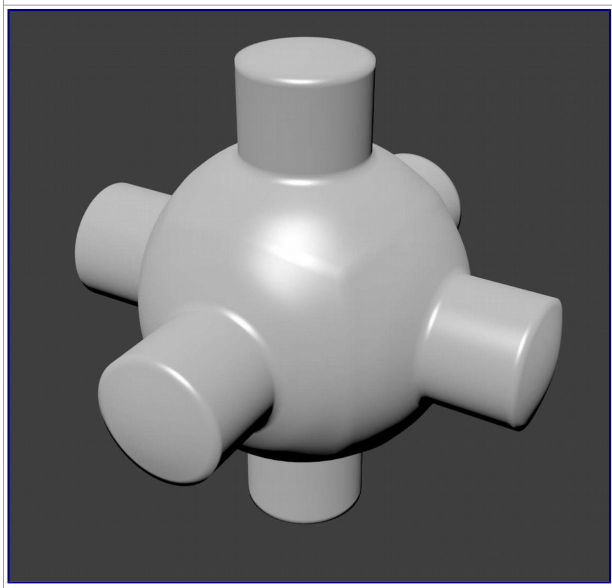
Example mesh with *Auto Smooth* enabled



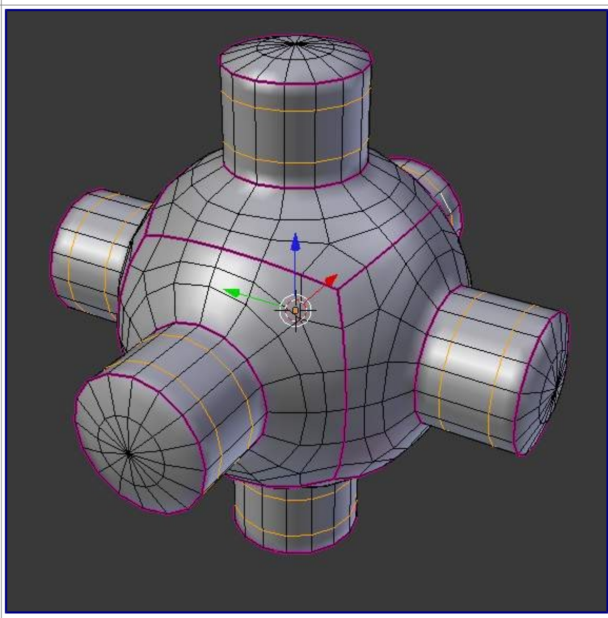
Subsurf



Using creased edges, and resulting subsurf artifacts



Extra edge loops added



	3D view showing creased edges (pink) and added edges loops (yellow)

Mesh Clean-up

These tools are to help cleanup degenerate geometry and fill in missing areas of a mesh.

Fill Holes

Reference
Mode: *Edit* mode Menu: Mesh ‣ Clean up ‣ Fill Holes

This tool is can take a large selection and detect the holes in the mesh, filling them in.

This is different from the face creation operator in three important respects.

- holes are detected, so there is no need to manually find and select the edges around the holes.
- holes can have a limit for the number of sides (so only quads or tris are filled in for example).
- mesh data is copied from surrounding geometry (UV’s, vertex-colors, multi-res, all layers), since manually creating this data is very time consuming.

Split Non-Planar Faces

Reference
Mode: *Edit* mode Menu: Mesh ‣ Clean up ‣ Split Non-Planar Faces

This tool avoids ambiguous areas of geometry by splitting non-flat faces when they are bent beyond a given limit.

Delete Loose Geometry

Reference
Mode: *Edit* mode Menu: Mesh ‣ Clean up ‣ Delete Loose

This tool removes disconnected vertices and edges (optionally faces - off by default).

Degenerate Dissolve

Reference
Mode: *Edit* mode

Menu: Mesh ‣ Clean up ‣ Degenerate Dissolve

This tool collapses / removes geometry which you typically won’t want.

- Edges with no length.
- Faces with no areas (faces on a point or thin faces).
- Face corners with no area.

5.2 Modeling - Curves

Curves

Bird logo made from Bezier curves.

Curves and *Surfaces* are particular types of Bforartists Objects. They are expressed by mathematical functions rather than a series of points.

Bforartists offers both Bezier Curves and Non-Uniform Rational B-Splines (NURBS). Both Bezier curves and NURBS curves and surfaces are defined in terms of a set of “control points” (or “control vertices”) which define a “control polygon”.

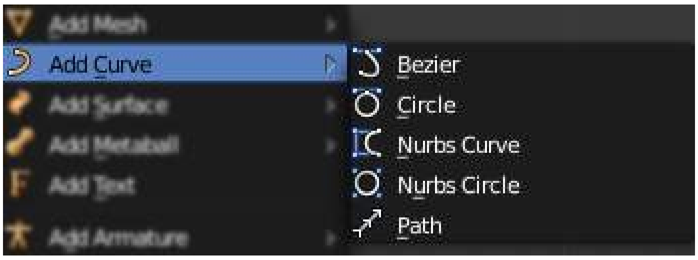
Both bezier and NURBs curves are named after their mathematical definitions, and choosing between them is often more a matter of how they are computed behind the scenes than how they appear from a modeler’s perspective. Bezier curves are generally more intuitive because they start and end at the control points that you set, but NURBs curves are more efficient for the computer to calculate when there are many twists and turns in a curve.

The main advantage to using curves instead of polygonal meshes is that curves are defined by less data and so can produce results using less memory and storage space at modeling time. However, this procedural approach to surfaces can increase demands at render time.

Certain modeling techniques, such as *extruding a profile along a path*, are possible only using curves. On the other hand, when using curves, vertex-level control is more difficult and if fine control is necessary, *mesh editing* may be a better modeling option.

Bezier curves are the most commonly used curves for designing letters or logos. They are also widely used in animation, both as *paths* for objects to move along and as *F-curves* to change the properties of objects as a function of time.

Curve Primitives



Add Curve menu.

In Object mode, the *Add Curve* menu, Bforartists provides five different curve primitives:

Bezier Curve
: Adds an open 2D Bezier curve with two control points.

Bezier Circle
: Adds a closed, circle-shaped 2D Bezier curve (made of four control points).

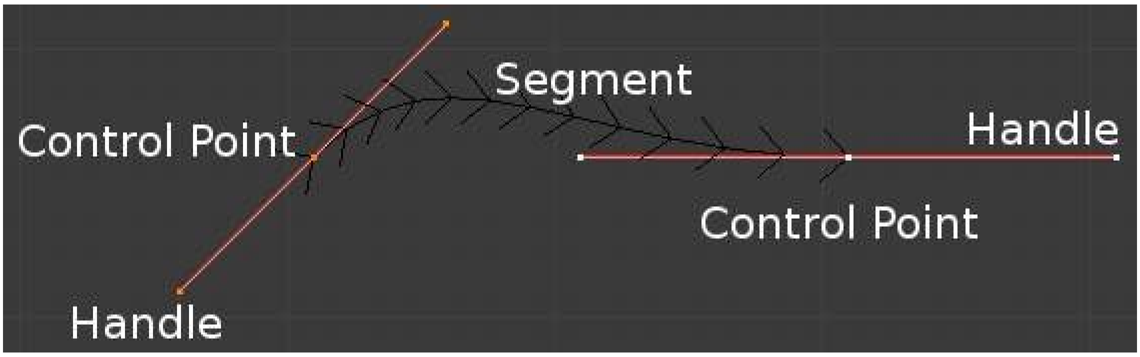
NURBS Curve
: Adds an open 2D NURBS curve, with four control points, with *Uniform* knots.

NURBS Circle
: Adds a closed, circle-shaped 2D NURBS curve (made of eight control points).

Path
: Adds a NURBS open 3D curve made of five aligned control points, with *Endpoint* knots and the *CurvePath* setting enabled.

Bezier Curves

The main elements used in editing Bezier Curves are the Control Points and Handles. A Segment (the actual Curve) is found between two Control Points. In the image below, the Control Points can be found in the middle of the pink line while the Handles comprise the extensions from the Control Point. By default the arrows on the Segment represents the direction and **relative** speed and direction of movement Objects will have when moving along the curve. This can be altered by defining a custom *Speed* Ipo.



Bezier Curve in Edit mode.

Editing Bezier Curves

A Bezier curve can be edited by moving the locations of the Control Points and Handles.

- Add a Curve by `Shift-A` to bring up the *Add* menu, followed by Curve ‣ Bezier.
- Press `Tab` to enter *Edit mode*.
- Select one of the Control Points and move it around. Use `LMB` to confirm the new location of the Control Point, or use `RMB` to cancel.
- Now select one of the Handles and move it around. Notice how this changes the curvature of the curve.

To add more Control Points

- Select at least two adjacent Control Points.
- Press `W` and select *Subdivide*.
- Optionally, you can press `F6` immediately after the subdivision to modify the number of subdivisions.

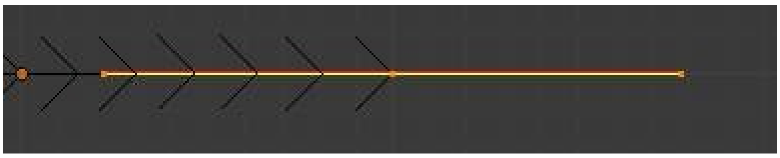
Note that while in *Edit mode* you cannot directly select a Segment. To do so, select all of the Control Points that make up the Segment you want to move.

There are four Bezier curve handle types. They can be accessed by pressing `V` and selecting from the list that appears, or by pressing the appropriate hotkey combination. Handles can be rotated, moved, scaled and shrunk/fattened like any vertex in a mesh.

Bezier Curve Handle Types

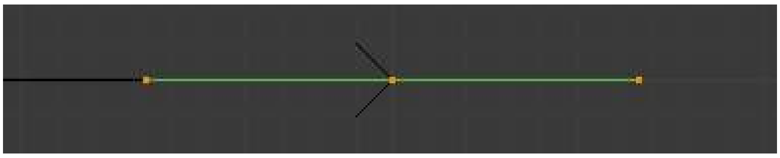
Automatic `V-A`

This handle has a completely automatic length and direction which is set by Bforartists to ensure the smoothest result. These handles convert to *Aligned* handles when moved.



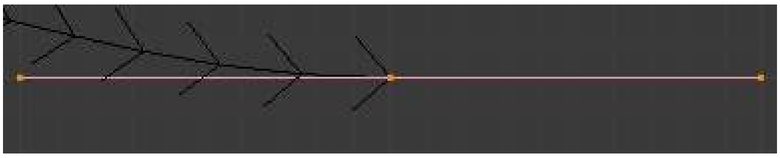
Vector `V-V`

Both parts of a handle always point to the previous handle or the next handle which allows you to create curves or sections thereof made of straight lines or with sharp corners. Vector handles convert to *Free* handles when moved.



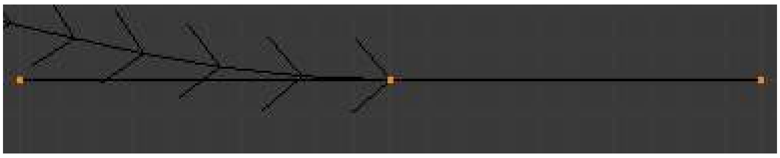
Aligned **V - L**

These handles always lie in a straight line, and give a continuous curve without sharp angles.



Free **V - F**

The handles are independent of each other.

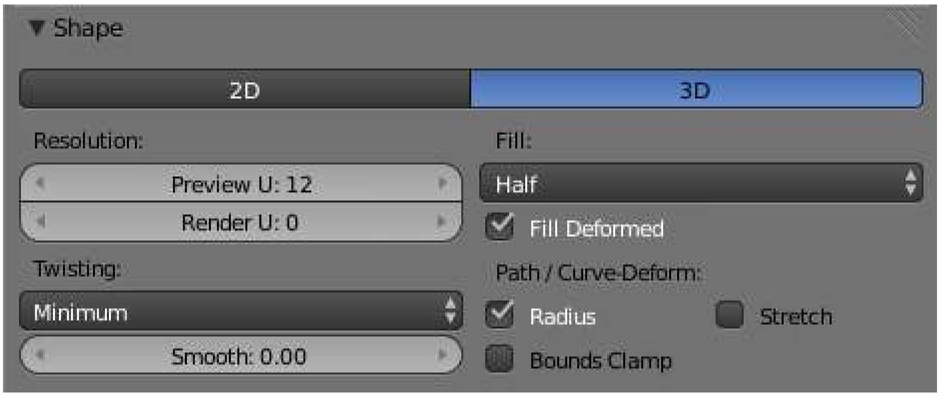


Additionally, the V - T shortcut can be used to toggle between Free and Aligned handle types.

Curve Properties

Curve Properties can be set from the *Object Data* option in the *Properties Header* (shown below in blue).

Shape



Curves Shape panel.

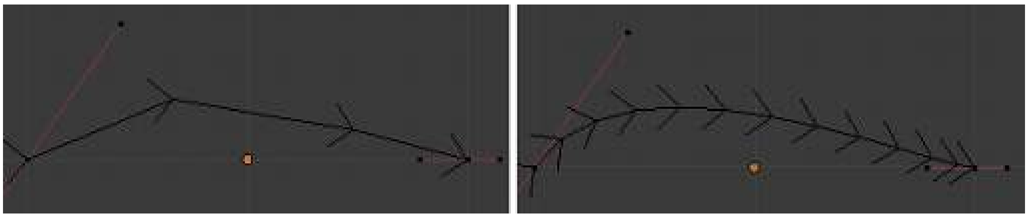
2D and 3D Curves

By default, new curves are set to be 3D, which means that Control Points can be placed anywhere in 3D space. Curves can also be set to 2D which constrain the Control Points to the Curve’s local XY axis.

Resolution

The *resolution* property defines the number of points that are computed between every pair of Control Points. Curves can be made more or less smooth by increasing and decreasing the resolution respectively.

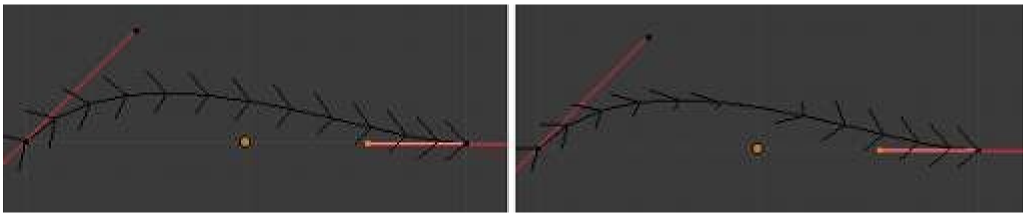
The *Preview U* setting determines the resolution in the 3D viewport while the *Render U* setting determines the Curve's render resolution. If *Render U* is set to zero (0), then the *Preview U* setting is used for both the 3D viewport and render resolution.



Curves with a resolution of 3 (left) and 12 (right).

Twisting

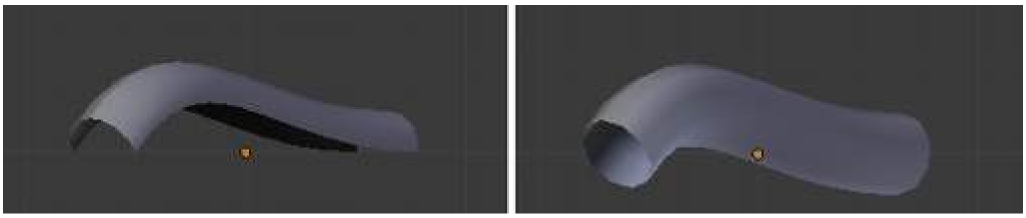
A 3D Curve has Control Points that are not located on the Curve's local XY plane. This gives the Curve a twist which can affect the Curve normals. You can alter how the twist of the Curve is calculated by choosing from *Minimum*, *Tangent* and *Z-Up* options from the drop-down menu.



Curves with a twist of minimum (left) and tangent (right).

Fill

Fill determines the way a Curve is displayed when it is Beveled (see below for details on Beveling). When set to *Half* (the default) the Curve is displayed as half a cylinder. The *Fill Deformed* option allows you to indicate whether the Curve should be filled before or after (default) applying any Shape Keys or Modifiers.



Curves with a fill of half (left) and full (right).

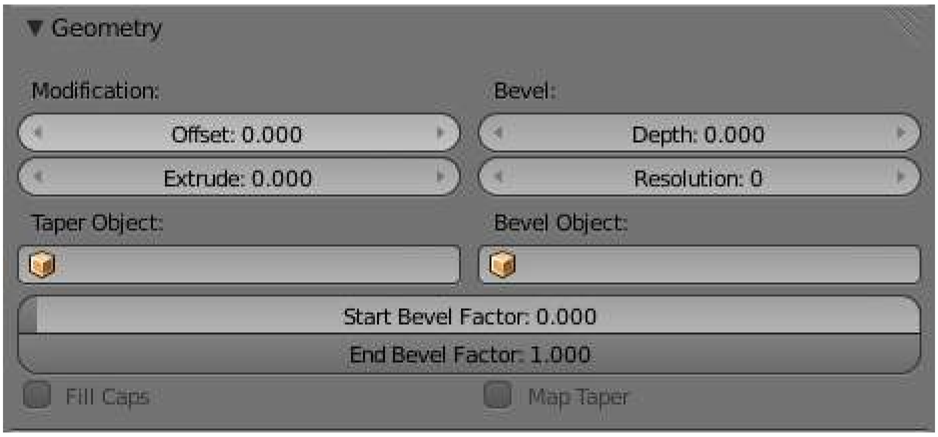
Path/Curve-Deform

These options are primarily utilized when using a Curve as a Path or when using the Curve Deform property. The *Radius, Stretch* and *Bounds Clamp* options control how Objects use the Curve and are dealt with in more detail in the appropriate links below.

See also

- *Basic Curve Editing*
- *Animation Paths*

Geometry



Curves Geometry panel.

Modification

Offset

By default, text Objects are treated as curves. The Offset option will alter the space between letters.

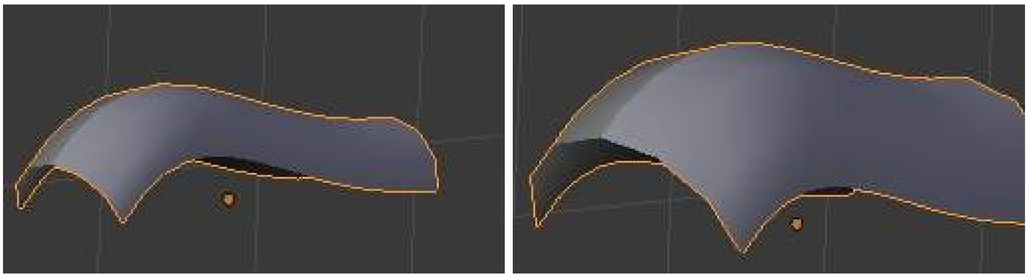
Extrude

Will extrude the curve along both the positive and negative local Z axes.

Bevel

Depth

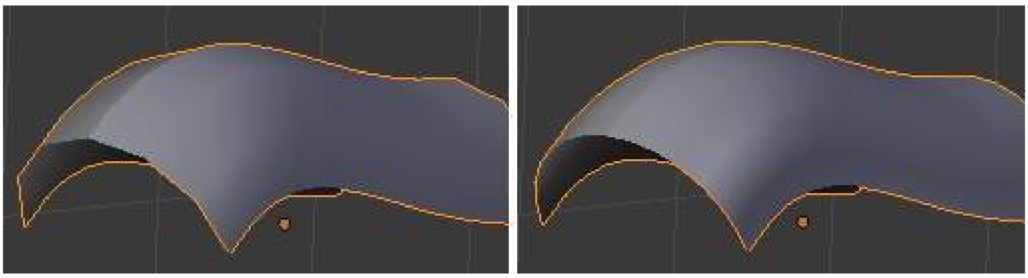
Changes the size of the bevel



A Curve with different Bevel depths applied.

Resolution

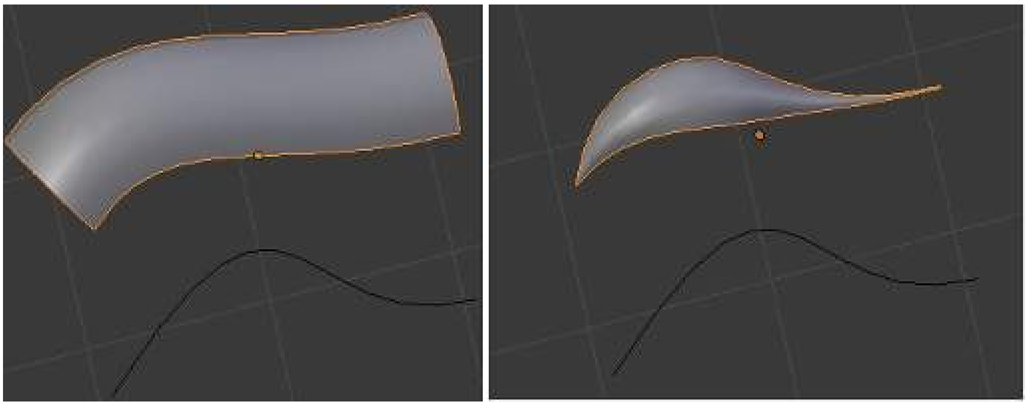
Alters the smoothness of the bevel



A Curve with different resolutions applied.

Taper Object

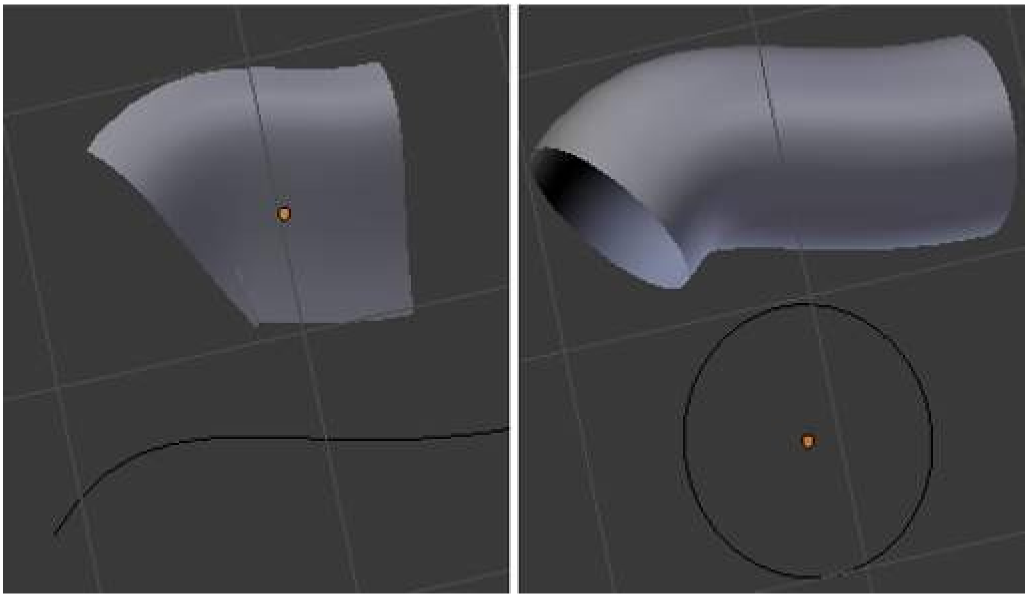
Tapering a Curve causes it to get thinner towards one end. You can also alter the proportions of the Taper throughout the tapered object by moving/scaling/rotating the Control Points of the Taper Object. The Taper Object can only be another Curve. Editing the Handles and Control Points of the Taper Object will cause the original Object to change shape.



A Curve before (left) and after (right) a Bezier Curve Taper Object was applied.

Bevel Object

Beveling a Bezier Curve with a Bezier Curve as the Bevel Object generally gives it the appearance of a plane, while using a Bezier Circle as the Bevel Object will give it the appearance of a cylinder. The Bevel Object can only be another Curve. Editing the Handles and Control Points of the Bevel Object will cause the original Object to change shape. Given the options available, it is best to experiment and see the results of this operation.



A Curve with the Bevel Object as a Bezier Curve (left) and as a Bezier Circle (right).

Fill Caps

Seals the ends of a beveled Curve.

Map Taper

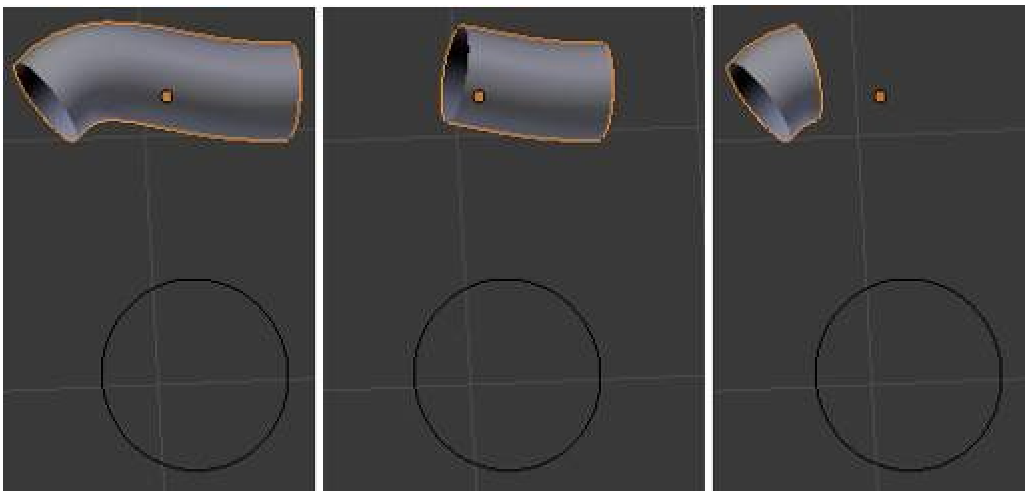
For Curves using a Taper Object and with modifications to the *Start/End Bevel Factor* the *Map Taper* option will apply the taper to the beveled part of the Curve (not the whole Curve).

A Curve without (left) and with (right) Map Taper applied.

Start Bevel Factor and End Bevel Factor

These options determine where to start the Bevel operation on the Curve being beveled. Increasing the

Start Bevel Factor to 0.5 will start beveling the Curve 50% of the distance from the start of the Curve (in effect shortening the Curve). Decreasing the *End Bevel Factor* by 0.25 will start beveling the Curve 25% of the distance from the end of the Curve (again, shortening the Curve).



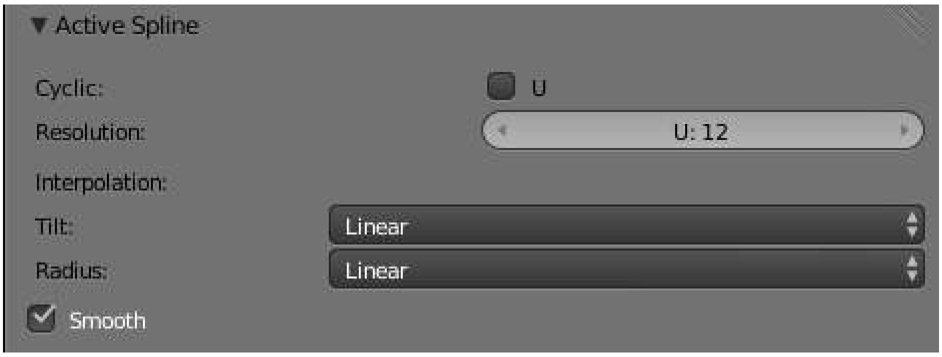
A Curve with no Bevel factor applied (left), with a 50% Start Bevel Factor (middle) and with a 25% End Bevel Factor (right).

Path Animation

The Path Animation settings can be used to determine how Objects move along a certain path. See the link below for further information.

Read more about utilizing Curves for paths during animation

Active Spline



Curves Active Spline panel.

The *Active Spline* panel becomes available during *Edit mode*.

Cyclic
: Closes the Curve.

Resolution
: Alters the smoothness of each segment by changing the number of subdivisions.

Interpolation

Tilt
: Alters how the tilt of a segment is calculated.

Radius
: Alters how the radius of a Beveled Curve is calculated. The effects are easier to see after Shrinking/Fattening a control point `Alt-S`.

Smooth
Smooths the normals of the Curve

Non-Uniform Rational B-Splines (NURBS)

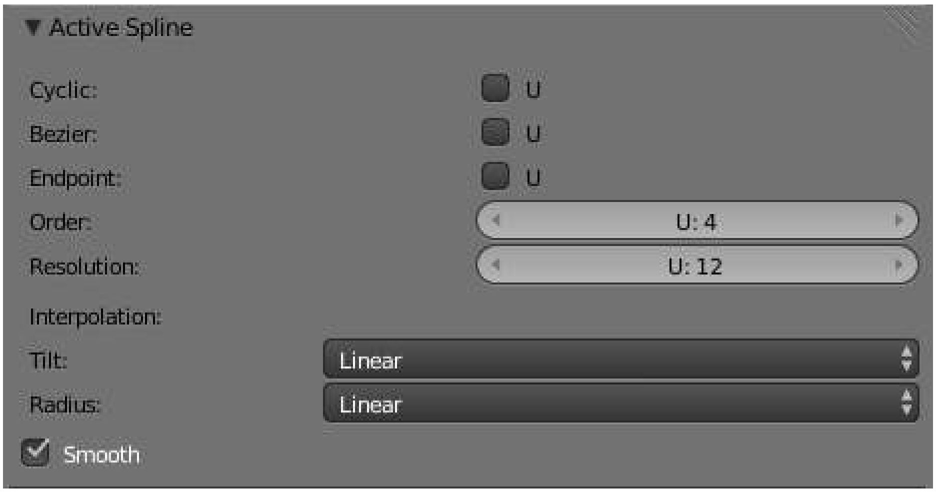
One of the major differences between Bezier Objects and NURBS Objects is that Bezier Curves are approximations. For example, a Bezier circle is an *approximation* of a circle, whereas a NURBS circle is an *exact* circle. NURBS theory can be a *very* complicated topic. For an introduction, please consult the Wikipedia page. In practice, many of the Bezier curve operations discussed above apply to NURBS curves in the same manner. The following text will concentrate only on those aspects that are unique to NURBS curves.

Editing NURBS Curves

A NURBS Curve is edited by moving the location of the Control Points.

- Place a Curve by `Shift-A` to bring up the Add menu, followed by Curve ‣ NURBS curve.
- Press `Tab` to enter *Edit mode*.
- Select one of the Control Points and move it around. Use `LMB` to confirm the new location of the Control Point, or use `RMB` to cancel.
- If you want to add additional Control Points, select both of them, press `W` and select *Subdivide*. Press `F6` immediately after to determine how many subdivisions to make.

Active Spline

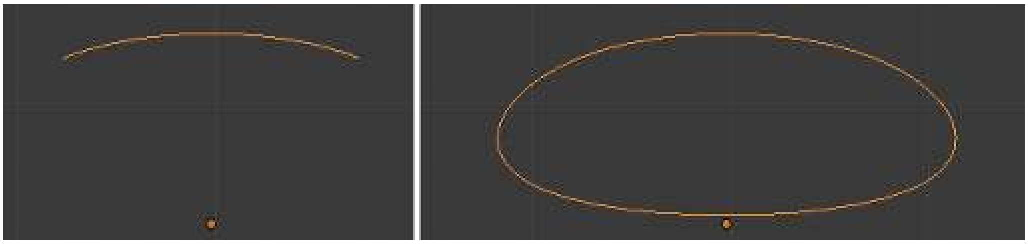


NURBS Active Spline panel.

Knots

One of the characteristics of a NURBS object is the *knot vector*. This is a sequence of numbers used to determine the influence of the control points on the curve. While you cannot edit the knot vectors directly, you can influence them through the *Endpoint* and *Bezier* options in the Active Spline panel. Note that the *Endpoint* and *Bezier* settings only apply to open NURBS curves.

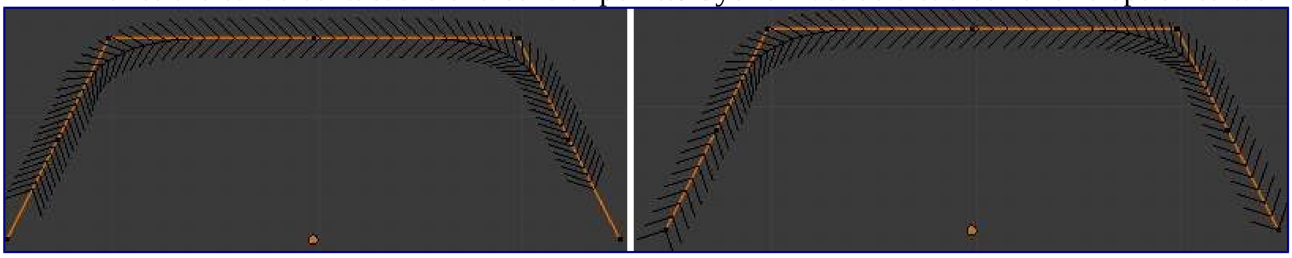
Cyclic
Makes the NURBS curve cyclic.



A NURBS curve with Cyclic applied.

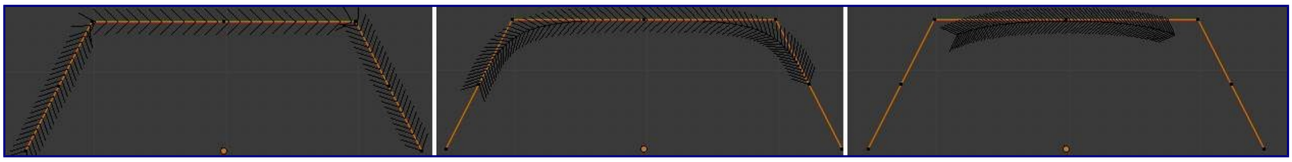
Bezier
Makes the NURBS curve act like a Bezier curve.

Endpoint
Makes the curve contact the end control points. Cyclic must be disabled for this option to work.



A NURBS curve with Endpoint enabled.

Order
The order of the NURBS curve determines the area of influence of the control points over the curve. Higher order values means that a single control point has a greater influence over a greater relative proportion of the curve. The valid range of *Order* values is 2-6 depending on the number of control points present in the curve.



NURBS curves with orders of 2 (left), 4 (middle) and 6 (right).

Weight

TODO.

Path

As mentioned above, Curves are often used as *paths*. Any curve can be used as a Path if the *Path Animation* option is selected.

The Path option available from the *Add Curve* menu is identical to a 3D NURBS curve, except that you do not have access to the *Active Spline* panel.

Curve Selection

Curve selection in *Edit* mode is much less complex than with meshes! Mainly this is because you have only one selectable element type, the control points (no select mode needed here...). These points are a bit more complex than simple vertices, however, especially for Béziers, as there is the central vertex, and its two handles...

The basic tools are the same as with *meshes*, so you can select a simple control point with a `LMB` -click, add to current selection with `Shift-LMB` -clicks, `B` order-select, and so on.

One word about the Bézier control points: when you select the main central vertex, the two handles are automatically selected too, so you can grab it as a whole, without creating an angle in the curve. However, when you select a handle, only this vertex is selected, allowing you to modify this control vector...

`L` (or `Ctrl-L`) will add to the selection the cursor's nearest control point, and all the linked ones, i.e. all points belonging to the same curve. Note that for Bézier, using `L` with a handle selected will select the whole control point and all the linked ones.

Select Menu

With curves, all "advanced" selection options are regrouped in the *Select* menu of the 3D views header. Let's detail them.

Random... Inverse Select/Deselect All

Border Select
: All these options have the same meaning and behavior as in *Object mode* (and the specifics of *Border Select* in *Edit* mode have already been discussed *here*).

Every Nth

Reference
Mode: *Edit* mode Menu: Select ‣ Every Nth

This only works if you already have at least one control point selected. Using the current selection, it will add to it every nth control point, before and after the initial selection. The "selection step" is specified in the *N* pop-up numeric field shown during the tool start.

Select/Deselect First/Last

Reference
Mode: *Edit* mode Menu: Select ‣ Select/Deselect First, Select ‣ Select/Deselect Last

These commands will toggle the selection of the first or last control point(s) of the curve(s) in the object. This is useful to quickly find the start of a curve (e.g. when using it as path...).

Select Next/Previous

Reference
Mode: *Edit* mode Menu: Select ‣ Select Next, Select ‣ Select Previous

These commands will select the next or previous control point(s), based on the current selection (i.e. the control points following or preceding the selected ones along the curve).

Select More / Less

Reference
Mode: *Edit* mode Menu: Select ‣ More/Less

Their purpose, based on the currently selected control points, is to reduce or enlarge this selection.

More
: for each selected control point, select **all** its linked points (i.e. one or two...).

Less
: for each selected control point, if **all** points linked to this point are selected, keep this one selected. Otherwise, de-select it.

This implies two points:

- First, when **all** control points of a curve are selected, nothing will happen (as for *Less*, all linked points are always selected, and of course, *More* can’t add any). Conversely, the same goes when no control points are selected.
- Second, these tools will never “go outside” of a curve (they will never “jump” to another curve in the same object).

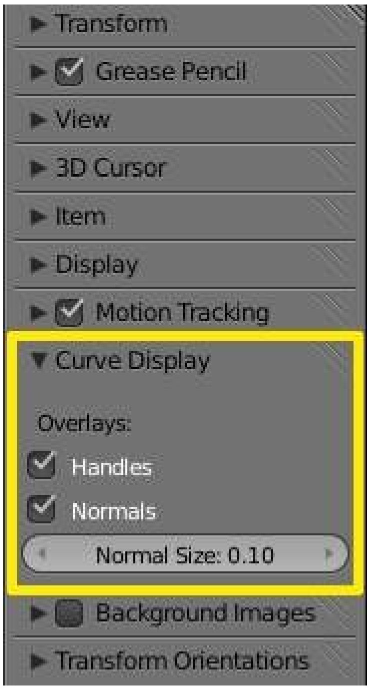
Curve Editing

This page covers the basics of curve editing. Curve basics, selecting and advanced editing are covered in the following pages:

- *Curve basics*
- *Curve Selecting*

Curve Display

Display Options



Curve Display panel

When in Edit mode, the Properties Shelf (`N`) contains options in the *Curve Display* panel for how curves are displayed in the 3D viewport.

Handles
: Toggles the display of Bezier handles while in edit mode. This does not affect the appearance of the curve itself.

Normals
: Toggles the display of Curve Normals.

Normal Size
: Sets the display scale of curve normals.

Hiding Elements

When in *Edit* mode, you can hide and reveal elements from the display. This can be useful in complex models with many elements on the Screen.

Hide Selected elements
: Use `H`, or the Curve ‣ Show/Hide ‣ Hide Selected menu option from the 3D window header.

Show Hidden elements
: Use `Alt-H`, or the Curve ‣ Show/Hide ‣ Show Hidden menu option from the 3D window header.

Hide Unselected elements
: Use `Shift-H`, or the Curve ‣ Show/Hide ‣ Hide Unselected menu option from the 3D window header.

Basic Curve Editing (translation, rotation, scale)

Reference
Mode: *Edit* mode Menu: Curve ‣ Transform ‣ Grab/Move, Rotate, Scale, ...

Like other elements in Bforartists, Curve control points can be grabbed/moved (G), rotated (R) or scaled (S) as described in the *Basic Transformations* section. When in *Edit* mode, *proportional editing* is also available for transformation actions.

Snapping

Reference
Mode: *Edit* mode Panel: *Curve Tools* (*Editing* context)

Mesh snapping also works with curve components. Both control points and their handles will be affected by snapping, except for within itself (other components of the active curve). Snapping works with 2D curves but points will be constrained to the local XY axes.

Deforming Tools

Reference
Mode: *Edit* mode Menu: Curve ‣ Transform

The *To Sphere*, *Shear, Wrap* and *Push/Pull* transform tools are described in the *Transformations* sections. The two other tools, *Tilt* and *Shrink/Fatten Radius* are related to *Curve Extrusion*.

Smoothing

Reference
Mode: *Edit* mode

Curve smoothing is available through the specials menu. For Bézier curves, this smoothing operation currently only smooths the positions of control points and not their tangents. End points are also constrained when smoothing.

Mirror

Reference
Mode: *Edit* mode Menu: Curve ‣ Mirror

The *Mirror* tool is also available, behaving exactly as with *mesh vertices*,

---

Set Bézier Handle Type

Reference
Mode: *Edit* mode
Panel: Curve Tools ‣ Handles
Menu: Curve ‣ Control Points ‣ Set Handle Type

Handle types are a property of *Bézier curves.* and can be used to alter features of the curve. For example, switching to *Vector handles* can be used to create curves with sharp corners. Read the *Bézier curves* page for more details.

Extending Curves

Reference
Mode: *Edit* mode
Menu: Curve ‣ Extrude

Once a curve is created you can add new segments (in fact, new control points defining new segments), either by extruding, or placing new handles with `Ctrl-LMB` clicks. Each new segment is added to one end of the curve. A new segment will only be added if a single vertex, or handle, at one end of the curve is selected. If two or more control points are selected, a new Bézier closed curve is started.

Subdivision

Reference
Mode: *Edit* mode
Panel: *Curve Tools* (*Editing* context)
Menu: Curve ‣ Segments ‣ Subdivide

Curve subdivision simply subdivides all selected segments by adding one or more control points between the selected segments. To control the number of cuts, press `W` to make a single subdivision. Then press `F6` to bring up the *Number of Cuts* menu.

Duplication

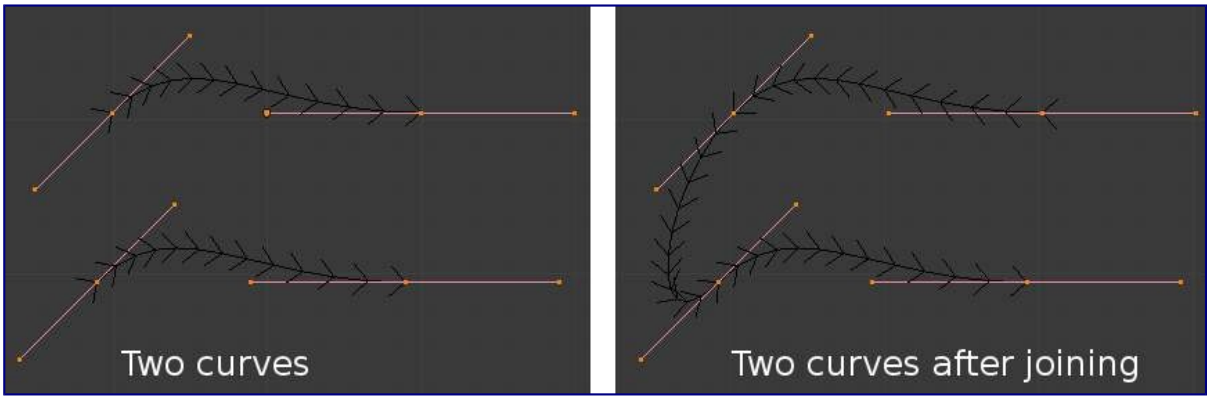
Reference
Mode: *Edit* mode
Menu: Curve ‣ Duplicate

This command duplicates the selected control points, along with the curve segments implicitly selected (if any). The copy is selected and placed in *Grab* mode, so you can move it to another place.

Joining Curve Segments

Reference
Mode: *Edit* mode
Menu: Curve ‣ Make Segment

Two open curves can be combined into one by creating a segment between the two curves. To join two separated curves, select one end control point from each curve then press F. The two curves are joined by a segment to become a single curve.



Curves before and after joining

Additionally, you can close a curve by joining the endpoints but note that you can only join curves of the same type (i.e. Bézier with Bézier, NURBS with NURBS)

Separating Curves

Reference
Mode: *Edit* mode
Menu: Curve ‣ Separate

Curve objects that are made of multiple distinct curves can be separated into their own objects by selecting the desired segments and pressing P. Note, if there is only one curve in a Curve object, pressing P will create a new Curve object with no control points.

Deleting Elements

Reference
Mode: *Edit* mode
Menu: Curve ‣ Delete...

The *Erase* pop-up menu of curves offers you three options:

Selected
: This will delete the selected control points, *without* breaking the curve (i.e. the adjacent points will be directly linked, joined, once the intermediary ones are deleted). Remember that NURBS order cannot be higher than its number of control points, so it might decrease when you delete some control point. Of

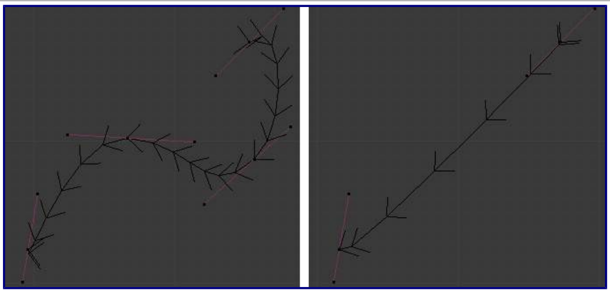
course, when only one point remains, there is no more visible curve, and when all points are deleted, the curve itself is deleted.

Segment

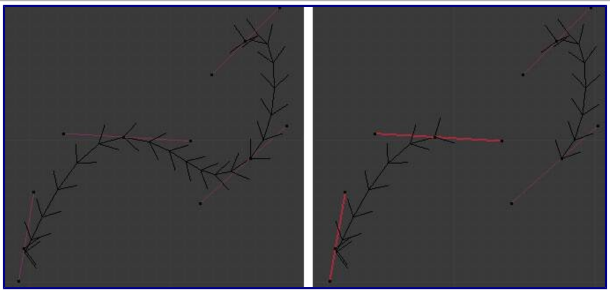
This option is somewhat the opposite to the preceding one, as it will cut the curve, without removing any control points, by erasing one selected segment. This option always removes *only one segment* (the last “selected” one), even when several are in the selection. So to delete all segments in your selection, you’ll have to repetitively use the same erase option...

All

As with meshes, this deletes everything in the object!



Deleting Curve Selected



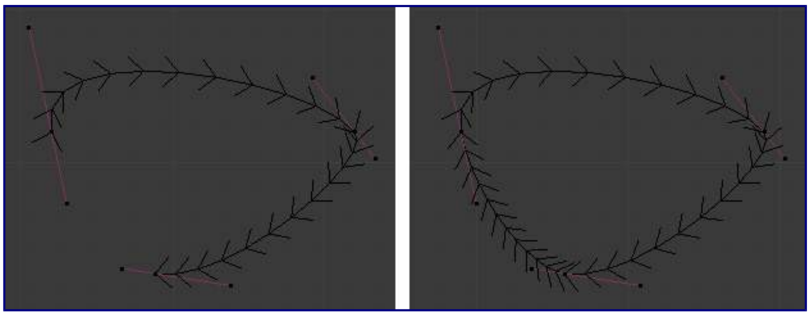
Deleting Curve segments

Opening and Closing a Curve

Reference
Mode: *Edit* mode Menu: Curve ‣ Toggle Cyclic

This toggles between an open curve and closed curve (Cyclic). Only curves with at least one selected control point will be closed/open. The shape of the closing segment is based on the start and end handles for Bézier curves, and as usual on adjacent control points for NURBS. The only time a handle is adjusted after closing is if the handle is an *Auto* one. (*Open curve*) and (*Closed curve*) is the same Bézier curve open and closed.

This action only works on the original starting control-point or the last control-point added. Deleting a segment(s) doesn’t change how the action applies; it still operates only on the starting and last control-points. This means that `Alt-C` may actually join two curves instead of closing a single curve! Remember that when a 2D curve is closed, it creates a renderable flat face.



Open and Closed curves.

Switch Direction

Reference

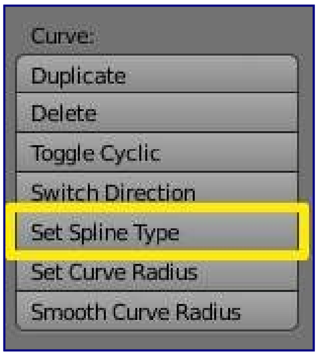
Mode: *Edit* mode Menu: Curve ‣ Segments ‣ Switch Direction, Specials ‣ Switch Direction

This command will “reverse” the direction of any curve with at least one selected element (i. e. the start point will become the end one, and *vice versa*). This is mainly useful when using a curve as path, or using the bevel and taper options.

Converting Tools

Converting Curve Type

Reference
Panel: Curve Tools –> Set Spline type Mode: *Edit* mode



Set Spline Type button

You can convert splines in a curve object between Bézier, NURBS, and Poly curves. Press T to bring up the Toolshelf. Clicking on the *Set Spline Type* button will allow you to select the Spline type (Poly, Bézier or NURBS).

Note, this is not a “smart” conversion, i.e. Bforartists does not try to keep the same shape, nor the same number of control points. For example, when converting a NURBS to a Bézier, each group of three NURBS control points become a unique Bézier one (center point and two handles).

Convert Curve to Mesh

Reference
Mode: *Object* mode Menu: Object ‣ Convert to

There is also an “external” conversion, from curve to mesh, that only works in *Object* mode. It transforms a *Curve* object in a *Mesh* one, using the curve resolution to create edges and vertices. Note that it also keeps the faces and volumes created by closed and extruded curves.

Convert Mesh to Curve

Reference
Mode: *Object* mode Menu: Object ‣ Convert to

Mesh objects that consist of a series of connected vertices can be converted into curve objects. The resulting curve will be a Poly curve type, but can be converted to have smooth segments as described above.

Curve Parenting

Reference
Mode: *Edit* mode

You can make other selected objects children of one or three control points `Ctrl-P`, as with mesh objects.

Select either 1 or 3 control points, then `Ctrl-RMB` another object and use `Ctrl-P` to make a vertex parent.

Hooks

Reference
Mode: *Edit* mode Menu: Curve ‣ control points ‣ hooks

Hooks can be added to control one or more points with other objects.

Set Goal Weight

Reference
Mode: *Edit* mode Menu: W ‣ Set Goal Weight

Set Goal Weight

This sets the "goal weight" of selected control points, which is used when a curve has Soft Body physics, forcing the curve to "stick" to their original positions, based on the weight.

Curve Deform

Curve Deform provides a simple but efficient method of defining a deformation on a mesh. By parenting a mesh object to a curve, you can deform the mesh up or down the curve by moving the mesh along, or orthogonal to, the dominant axis. This is a most useful tool to make an object follow a complex path, like e.g. a sheet of paper inside a printer, a film inside a camera, the water of a canal...

The *Curve Deform* works on a (global) dominant axis, X, Y, or Z. This means that when you move your mesh in the dominant direction, the mesh will traverse along the curve. Moving the mesh in an orthogonal direction will move the mesh object closer or further away from the curve. The default settings in Bforartists map the Y axis to the dominant axis. When you move the object beyond the curve endings the object will continue to deform based on the direction vector of the curve endings.

If the “curve path” is *3D*, the *Tilt* value of its control points will be used (see the *Extrusion* section above) to twist the “curved” object around it. Unfortunately, the other *Radius* property is not used (it would have been possible, for example, to make it control the size of the “curved” object...).

Tip

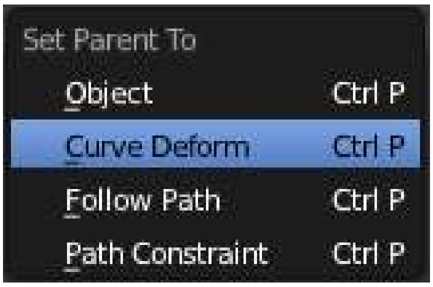
Try to position your object over the curve immediately after you have added it, before adding the curve deform. This gives the best control over how the deformation works.

Note

Use modifiers!

The *Curve Deform* relationship is now also a modifier, called *Curve*. The *Curve* modifier function acts the same as its counterpart, except that when the modifier is used, the “dominant axis” is set inside its properties - and the *Track X* / *Y* / *Z* buttons no longer have an effect on it. And you have some goodies, like the possibility, if “curving” a mesh, to only curve one of its vertex groups...

Interface



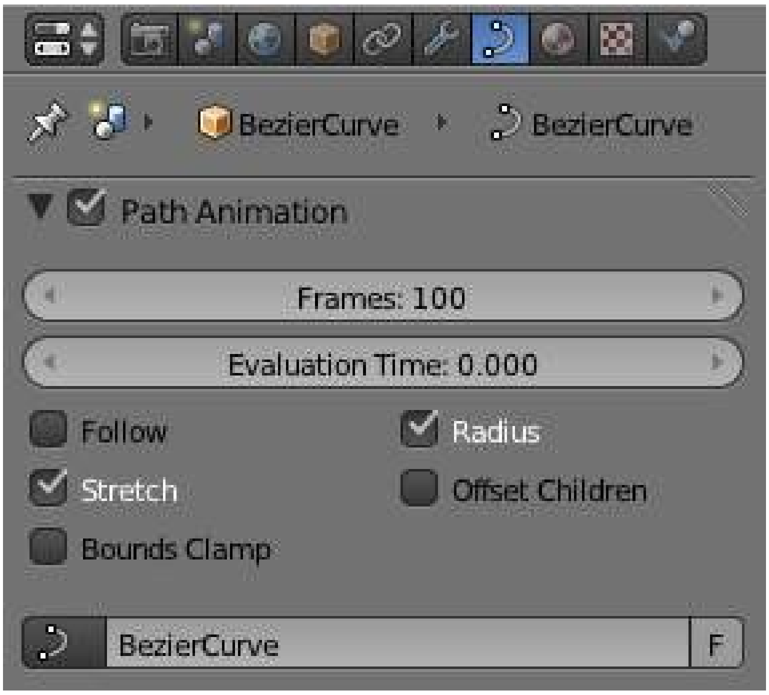
Make Parent menu.

When parenting an object (mesh, curve, meta, ...) to a curve (`Ctrl-P`), you will be presented with a menu (*Make Parent menu*).

By selecting *Curve Deform*, you enable the curve deform function on the mesh object.

Anim settings panel.

The dominant axis setting is set on the mesh object. By default the dominant axis in Bforartists is *Y*. This can be changed by selecting one of the *Track X*, *Y* or *Z* buttons in the *Anim* Panel, (*Anim settings panel*), in *Object* context.



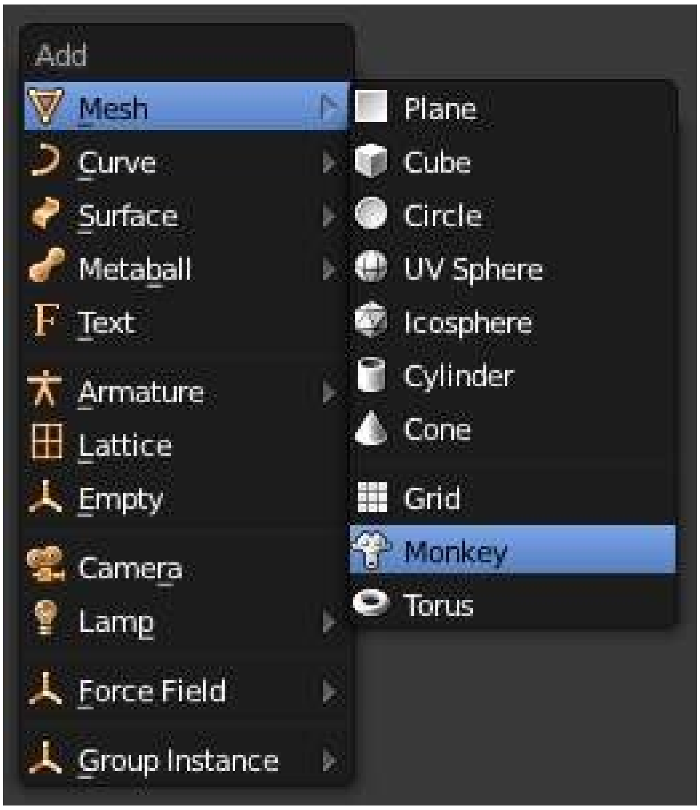
Curve and Surface panel.

Cyclic (or closed) curves work as expected where the object deformations traverse along the path in cycles. Note however that when you have more than one curve in the “parent” object, its “children” will only follow the first one.

The *Stretch* curve option allows you to let the mesh object stretch, or squeeze, over the entire curve. This option is in *Object Data* properties, for the "parent" curve. See (*Curve and Surface panel*).

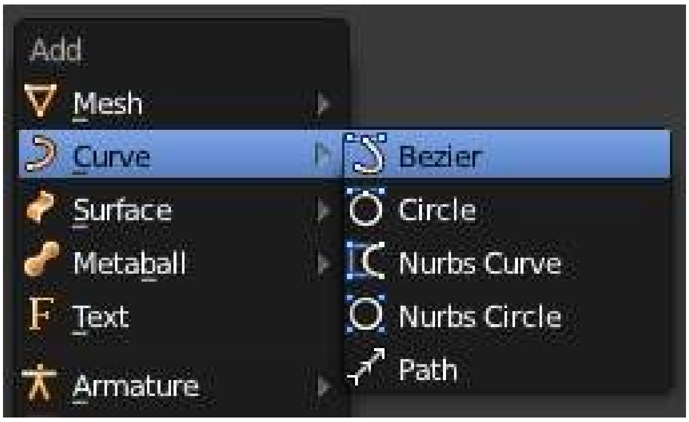
Example

Let's make a simple example:



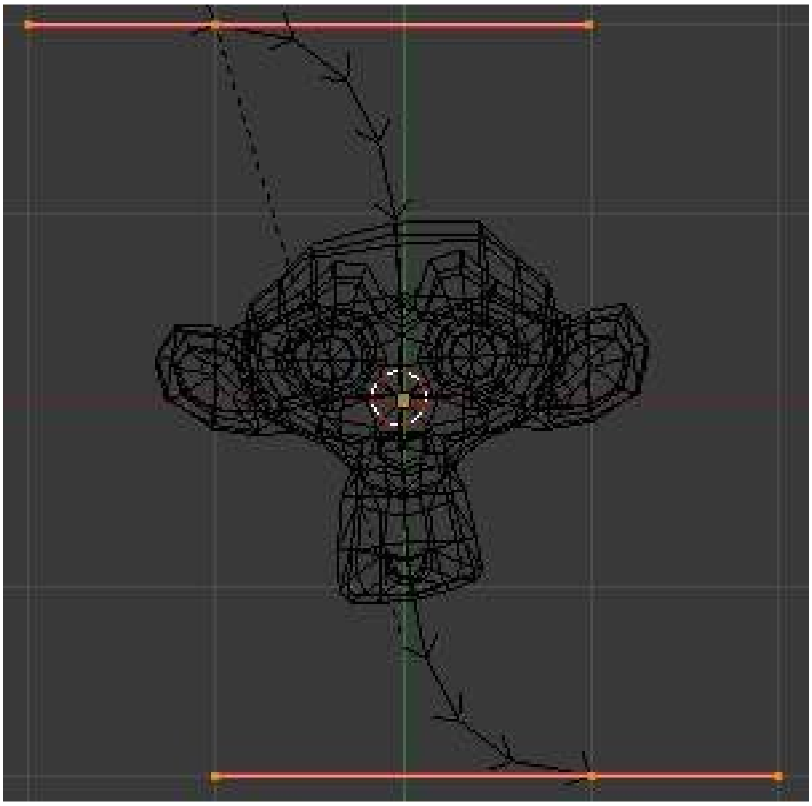
Add a Monkey!

- Remove default cube object from scene and add a Monkey (Add ‣ Mesh ‣ Monkey, *Add a Monkey!*)!
- Press `Tab` to exit *Edit* mode.



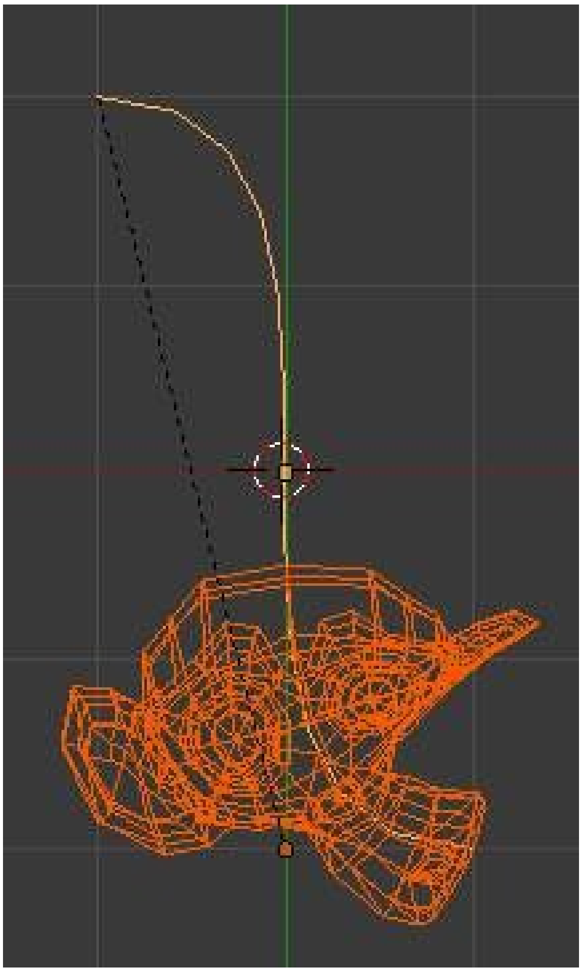
Add a Curve.

- Now add a curve (Add ‣ Curve ‣ Bezier Curve, *Add a Curve*).



Edit Curve.

- While in *Edit* mode, move the control points of the curve as shown in (*Edit Curve*), then exit *Edit* mode (`Tab`).



Monkey on a Curve.

- Now, you can use the new, modern, modifier way of “curving” the Monkey:
    - Select the Monkey (`RMB`).
    - In the *Object Modifiers* properties, *Modifiers* panel, add a *Curve* modifier.
    - Type the name of the curve (should be `Curve`) in the *Ob* field of the modifier, and optionally change the dominant axis to *Y.*
- Or you can choose the old, deprecated method (note that it creates a “virtual” modifier...):
    - Select the Monkey (`RMB`), and then shift select the curve (`Shift-RMB`).
    - Press `Ctrl-P` to open up the *Make Parent* menu.
    - Select *Curve Deform* (*Make Parent menu*).
- The Monkey should be positioned on the curve, as in (*Monkey on a Curve*).
- Now if you select the Monkey (`RMB`), and move it (`G`), in the Y-direction (the dominant axis by default), the monkey will deform nicely along the curve.

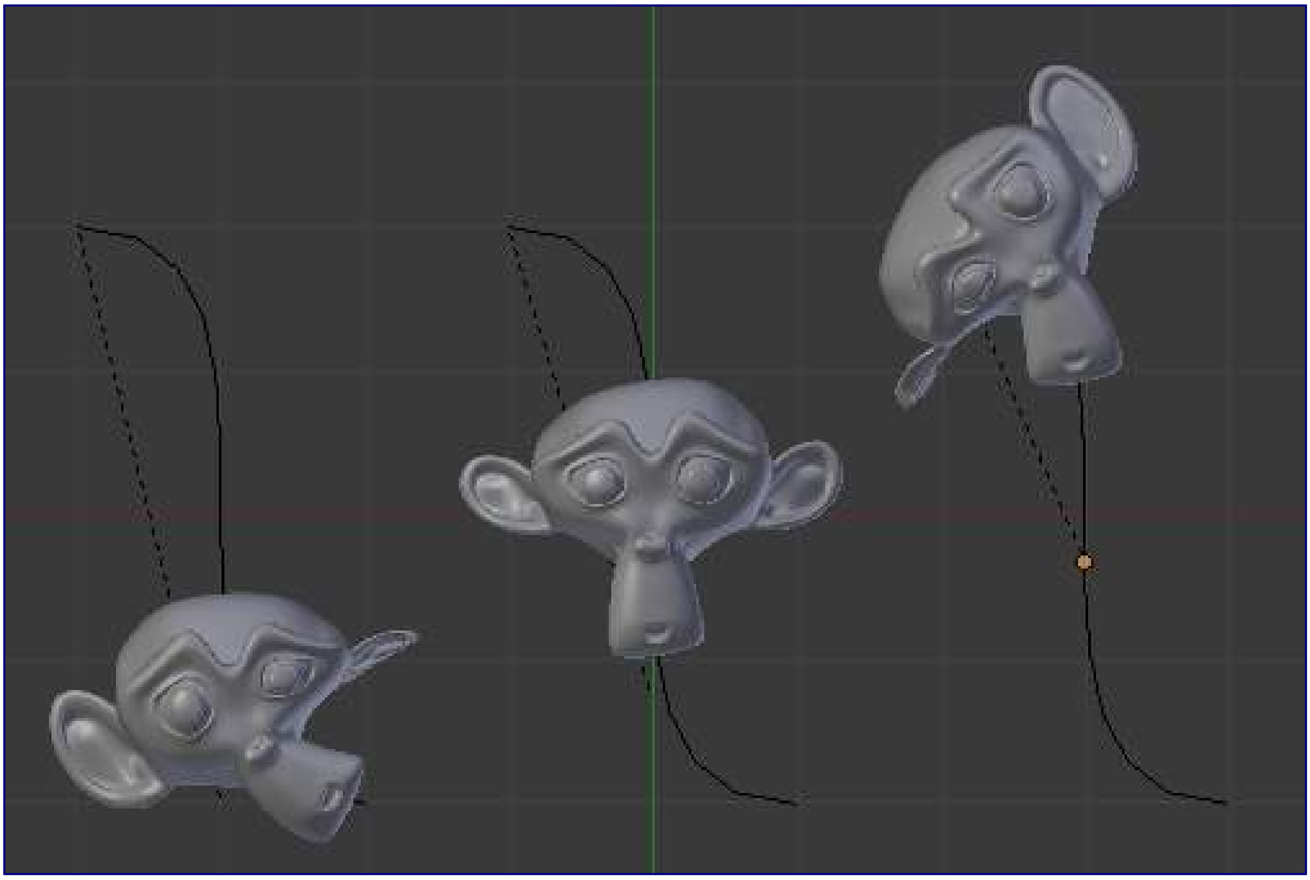
Tip

If you press `MMB` (or one of the `X` / `Y` / `Z` keys) while moving the Monkey you will constrain the movement to one axis only.

- In (*Monkey deformations*), you can see the Monkey at different positions along the curve. To get a cleaner view over the deformation I have activated *SubSurf* with *Subdiv* to **2**, and *Set Smooth* on the Monkey mesh.

Tip

Moving the Monkey in directions other than the dominant axis will create some odd deformations. Sometimes this is what you want to achieve, so you'll need to experiment and try it out!



Monkey deformations.

Curve Extrusion

This section covers methods for extruding curves, or giving them thickness, and how to control the thickness along the path.

Extrusion

Reference

Mode: *Object* or *Edit* mode
Panel: *Curve and Surface*

Extrusion can be especially with the bevel/taper/Tilt/Radius options. Note that this isn't related to *Extrude* used in mesh edit-mode.

We will see the different settings, depending on their scope of action:

Width

This controls the position of the extruded "border" of the curve, relative to the curve itself. With closed 2D curves (see below), it is quite simple to understand - with a *Width* greater than **1.0**, the extruded volume is wider, with a *Width* of **1.0**, the border tightly follows the curve, and with a *Width* lower than **1.0**, the volume is narrower? The same principle remains for open 2D and 3D curves, but the way the "outside" and "inside" of the curve is determined seems a bit odd?

It has the same effect with extruded "bevel" objects...

Tilt

This setting - unfortunately, you can never see its value anywhere in Bforartists - controls the "twisting angle" around the curve for each point - so it is only relevant with 3D curves! You set it using the *Tilt* transform tool (`T`, or Curve ‣ Transform ‣ Tilt), and you can reset it to its default value (i.e. perpendicular to the original curve plane) with `Alt-T` (or Curve ‣ Control Points ‣ Clear Tilt). With NURBS, the tilt is always smoothly interpolated. However, with Bézier, you can choose the interpolation algorithm to use in the *Tilt Interpolation* drop-down list of the *Curve Tools* panel (you will find the classical *Linear*, *Cardinal*, *B Spline* and *Ease* options...).

Simple Extrusion

Let's first see the "simple" extrusion of curves, without additional bevel/taper objects.

Extrude

This controls the width (or height) of the extrusion. The real size is of course dependent on the scale of the underlying object, but with a scale of one, an *Extrusion* of **1.0** will extrude the curve one BU in both directions, along the axis perpendicular to the curve's plane (see below for specifics of 3D curves?).

If set to **0.0**, there is no "simple" extrusion!

Bevel Depth

This will add a bevel to the extrusion. See below for its effects... Note that the bevel makes the extrusion wider and higher. If set to **0.0**, there is no bevel (max value: **2.0**).

Bev Resol

Controls the resolution of the bevel created by a *Bevel Depth* higher than zero. If set the **0** (the default), the bevel is a simple "flat" surface. Higher values will smooth, round off the bevel, similar to the resolution settings of the curve itself...

We have three sub-classes of results, depending on whether the curve is open or closed or 3D:

Open 2D Curve

The extrusion will create a "wall" or "ribbon" following the curve shape. If using a *Bevel Depth*, the wall becomes a sort of slide or gutter. Note the direction of this bevel is sometimes strange and unpredictable, often the reverse of what you would get with the same curve closed? You can inverse this direction by switching the direction of the curve.

This allows you, e.g., to quickly simulate a marble rolling down a complex slide, by combining an extruded beveled curve, and a sphere with a *Follow Path* constraint set against this curve?

Closed 2D Curve

This is probably the most useful situation, as it will quickly create a volume, with (by default) two flat and parallel surfaces filling the two sides of the extruded “wall”. You can remove one or both of these faces by disabling the *Back* and/or *Front* toggle buttons next to the *3D* one.

The optional bevel will always be “right-oriented” here, allowing you to smooth out the “edges” of the volume.

3D Curve

Here the fact that the curve is closed or not has no importance - you will never get a volume with an extruded 3D curve, only a wall or ribbon, like with open 2D curves.

However, there is one more feature with 3D curves: the *Tilt* of the control points (see above). It will make the ribbon twist around the curve ? to create a M?bius strip, for example!

Advanced Extrusion

These extrusions use one or two additional curve objects, to create very complex organic shapes.

To enable this type of extrusion, you have to type a valid curve object name in the *BevOb* field of the curve you are going to use as the “spinal column” of your extrusion. The “bevel” curve will control the cross section of the extruded object. Whether the *BevOb* curve is 2D or 3D has no importance, but if it is closed, it will create a “tube-like” extrusion; otherwise you will get a sort of gutter or slide object...

The object is extruded along the whole length of all internal curves. By default, the width of the extrusion is constant, but you have two ways to control it, the *Radius* property of control points, and the “taper” object.

The *Radius* of the points is set using the *Shrink/Fatten Radius* transform tool (`Alt-S`, or Curve ‣ Transform ‣ Shrink/Fatten Radius), or with the *Set Radius* entry in the *Specials* menu (`W`). Here again, you unfortunately cannot visualize anywhere the *Radius* of a given control point...

The *Radius* allows you to directly control the width of the extrusion along the “spinal” curve. As for *Tilt* (see above), you can choose the interpolation algorithm used for Bézier curves, in the *Radius Interpolation* drop-down list of the *Curve Tools* panel.

But you have another, more precise option: the “taper” object. As for the “bevel” one, you set its name in the *TaperOb* field of the main curve - it must be an *open curve*. The taper curve is evaluated along *the local X axis*, using *the local Y axis* for width control. Note also that:

- The taper is applied independently to all curves of the extruded object.
- Only the first curve in a *TaperOb* is evaluated, even if you have several separated segments.
- The scaling starts at the first control-point on the left and moves along the curve to the last control-point on the right.
- Negative scaling, (negative local Y on the taper curve) is possible as well. However, rendering artifacts may appear.
- It scales the width of normal extrusions based on evaluating the taper curve, which means sharp corners on the taper curve will not be easily visible. You’ll have to heavily level up the resolution (*DefResolU*) of the base curve.

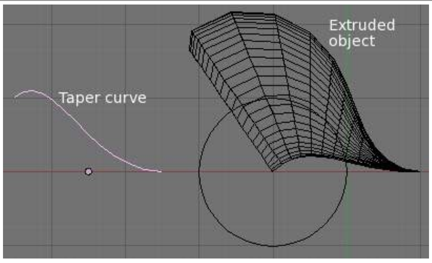
- With closed curves, the taper curve in *TaperOb* acts along the whole curve (perimeter of the object), not just the length of the object, and varies the extrusion depth. In these cases, you want the relative height of the *TaperOb* Taper curve at both ends to be the same, so that the cyclic point (the place where the endpoint of the curve connects to the beginning) is a smooth transition.

Last but not least, with 3D "spinal" curves, the *Tilt* of the control points can control the twisting of the extruded "bevel" along the curve!

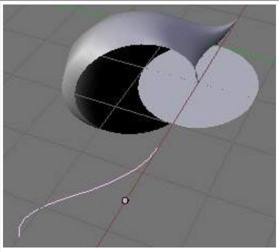
Examples

Let's taper a simple curve circle extruded object using a taper curve. Add a curve, then exit *Edit* mode. Add another one (a closed one, like a circle); call it `BevelCurve`, and enter its name in the *BevOb* field of the first curve (*Editing* context *Curve and Surface* panel). We now have a pipe. Add a third curve while in *Object* mode and call it `TaperCurve`. Adjust the left control-point by raising it up about 5 units.

Now return to the *Editing* context, and edit the first curve's *TaperOb* field in the Curve and Surface panel to reference the new taper curve which we called *TaperCurve*. When you hit enter the taper curve is applied immediately, with the results shown in (*Taper extruded curve*).

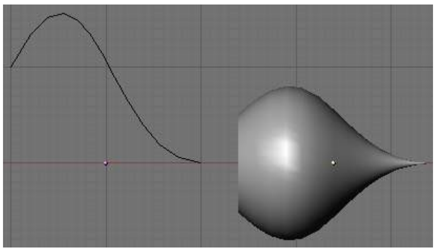


Taper extruded curve.



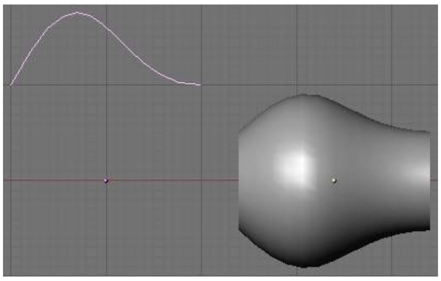
Taper solid mode.

You can see the **taper curve** being applied to the **extruded object**. Notice how the pipe's volume shrinks to nothing as the taper curve goes from left to right. If the taper curve went below the local Y axis the pipe's inside would become the outside, which would lead to rendering artifacts. Of course as an artist that may be what you are looking for!



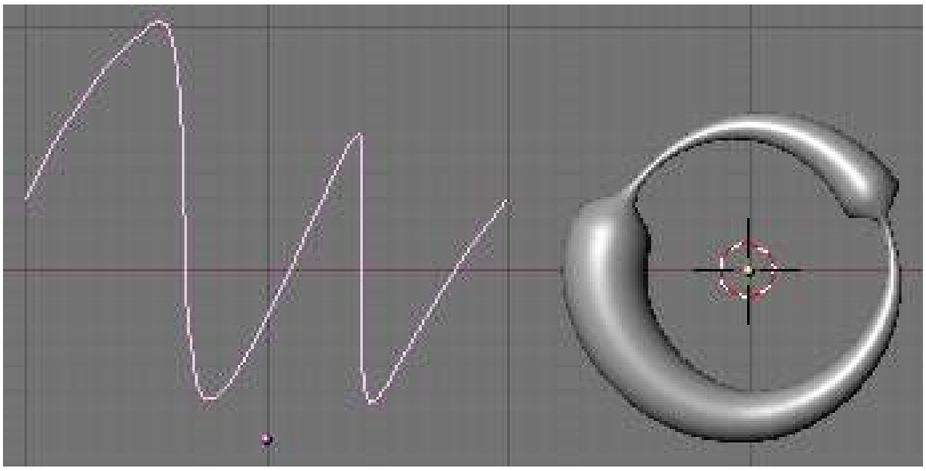
Taper example 1.

In (*Taper example 1*) you can clearly see the effect the left taper curve has on the right curve object. Here the left taper curve is closer to the object center and that results in a smaller curve object to the right.



Taper example 2.

In (*Taper example 2*) a control point in the taper curve to the left is moved away from the center and that gives a wider result to the curve object on the right.



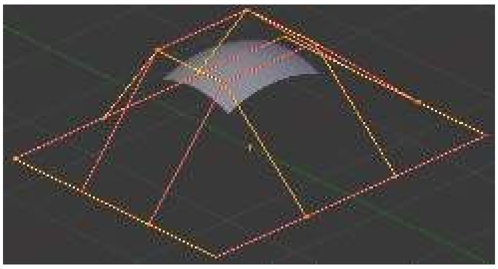
Taper example 3.

In (*Taper example 3*), we see the use of a more irregular taper curve applied to a curve circle.

TODO: add some “bevel” extrusion with *Tilt* examples.

5.3 Modeling - Surfaces

Surfaces



Surface.

Curves are 2D objects, and surfaces are their 3D extension. Note however that in Bforartists, you only have

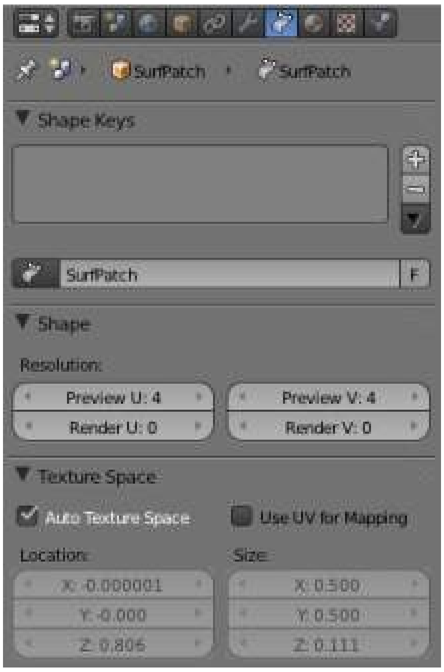
NURBS surfaces, no Bézier (you have the *Bezier* knot type, though; see below), nor polygonal (but for these, you have meshes!). Even though curves and surfaces share the same object type (with texts also...), they are not the same thing; for example, you cannot have in the same object both curves and surfaces.

As surfaces are 2D, they have two interpolation axes, U (as for curves) and V. It is important to understand that *you can control the interpolation rules (knot, order, resolution) independently for each of these two dimensions* (the *U* and *V* fields for all these settings, of course).

You may ask yourself “but the surface appears to be 3D, why is it only 2D?”. In order to be 3D, the object needs to have “Volume,” and a surface, even when it is closed, doesn’t have volume; it is infinitely thin. If it had a volume the surface would have a thickness (its third dimension). Hence, it’s only a 2D object, and has only two interpolation dimensions or axes or coordinates (if you know a bit of math, think of non-euclidean geometry - well, surfaces are just non-euclidean 2D planes...). To take a more “real life” example, you can roll a sheet of paper to create a cylinder; well, even if it “draws” a volume, the sheet itself will remain a (nearly...) 2D object!

In fact, surfaces are very similar to the results you get when *extruding a curve*

Finding Surface Tools



Surface Tools.

The panels of the *Editing* context are the same as for *curves*, just with fewer options... And as usual, you have the *Select* and *Surface* menus in the 3D view headers, and the *Specials* (`W`) pop-up one.

Visualization

There is nearly no difference from NURBS curves, except that the `U` direction is indicated by yellow grid lines, and the `V` one is materialized by pink grid lines, as you can see in (*Surface*).

You can hide and reveal control points just as with curves.

Surface Structure

Many of the concepts from *curves*, especially NURBS ones, carry directly over to NURBS surfaces, such as control points, *Order*, *Weight*, *Resolution*, etc. Here we will just talk about the differences.

It is very important to understand the difference between NURBS curves and NURBS surfaces: the first one has one dimension, the latter has two. Bforartists internally treats NURBS surfaces and NURBS curves completely differently. There are several attributes that separate them but the most important is that a NURBS curve has a single interpolation axis (U) and a NURBS surface has two interpolation axes (U and V).

However, you can have "2D" surfaces made of curves (using the *extrusion tools*, or, to a lesser extent, the filling of closed 2D curves. And you can have "1D" curves made of surfaces, like a NURBS surface with only one row (either in U or V direction) of control points produces only a curve...

Visually you can tell which is which by entering *Edit* mode and looking at the 3D window's header: either the header shows *Surface* or *Curve* as one of the menu choices. Also, you can *extrude* a whole NURBS surface curve to create a surface, but you can't with a simple NURBS curve (we talk here about the "standard" *Extrude* tool, the one activated with the *E* shortcut, not the quite-specific curve extrusion tools - yes, I know, it's not easy to follow...).

Control Points, Rows and Grid

Control points for NURBS surfaces are the same as for NURBS curves. However, their layout is quite constraining. The concept of "segment" disappears, replaced by "rows" and the overall "grid".

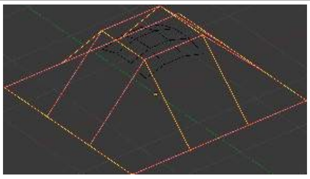
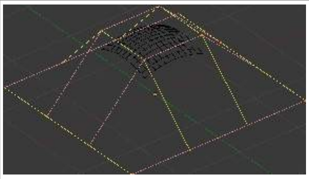
A "row" is a set of control points forming one "line" in one interpolation direction (a bit similar to edge loops for meshes). So you have "U-rows" and "V-rows" in a NURBS surface. The key point is that *all rows of a given type (U or V) have the same number of control points*. Each control point belongs to exactly one U-row and one V-row.

All this forms a "grid", or "cage", the shape of which controls the shape of the NURBS surface. A bit like a *lattice* ...

This is very important to grasp: you cannot add a single control point to a NURBS surface; you have to add a whole U- or V-row at once (in practice, you will usually use the Extrude tool, or perhaps the Duplicate one, to add those...), containing exactly the same number of points as the others. This also means that you will only be able to "merge" different pieces of surfaces if at least one of their rows match together.

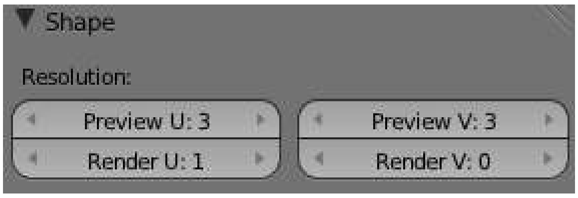
Surface Resolution

Just like NURBS curves, *Resolution* controls the detail of the surface. The higher the *Resolution* the more detailed and smoother the surface is. The lower the *Resolution* the rougher the surface. However, here you have two resolution settings, one for each interpolation axis (U and V). Note that unlike with curves, you have only one resolution (the *Resol U* and *V* fields, in the *Curve Tools* panel)...

Resolution 1x1.	Resolution 3x3.

(*Resolution 1x1*) is an example of a surface resolution of 3 for both U and V. (*Resolution 3x3 surface*) is an example of a surface resolution of 12 for both U and V.



Resolution panel.

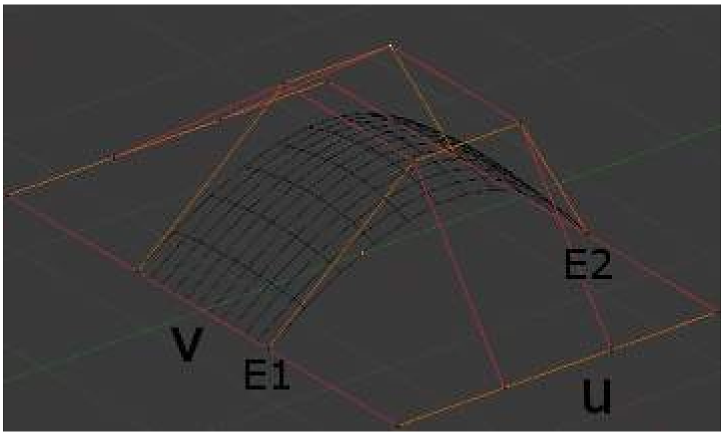
You can adjust the resolution separately for both preview and render, to not slow things down in the viewport, but still get good render results.

Closed and Open Surfaces

Like curves, surfaces can be closed (cyclical) or open, independently in both directions, allowing you to easily create a tube, donut or sphere shape, and they can be drawn as "solids" in *Edit* mode. This makes working with surfaces quite easy.

Knots

Just like with NURBS curves, NURBS surfaces have two knot vectors, one for each U and V axis. Here again, they can be one of *Uniform*, *Endpoint*, or *Bezier,* with the same properties as for curves. And as with curves, only open surfaces (in the relevant direction) are affected by this setting...



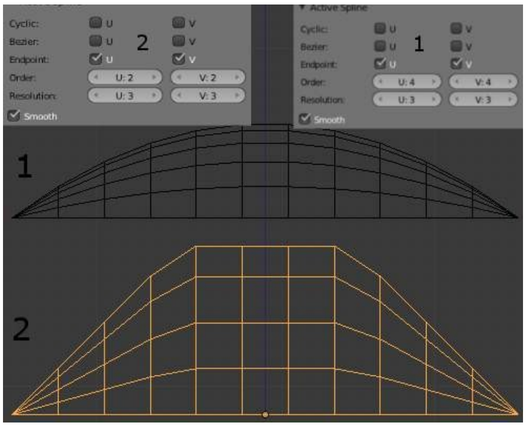
Endpoint U.

In (*Endpoint U*), the U interpolation axis is labeled as U and the V interpolation axis is labeled as V. The U 's interpolation axis has been set to *Endpoint* and as such the surface now extends to the outer edges from E1 to E2 along the U interpolation axis.

To cause the surface to extend to all edges you would set the V 's axis to *Endpoint* as well.

Order

One more time, this property is the same as with NURBS Curves; it specifies how much the control points are taken into account for calculating the curve of the surface shape. For high *Orders*, (*1*), the surface pulls away from the control points, creating a smoother surface - assuming that the Surface Resolution is high enough. For lowest *Orders*, (*2*), the surface follows the control points, creating a surface that tends to follow the grid cage.

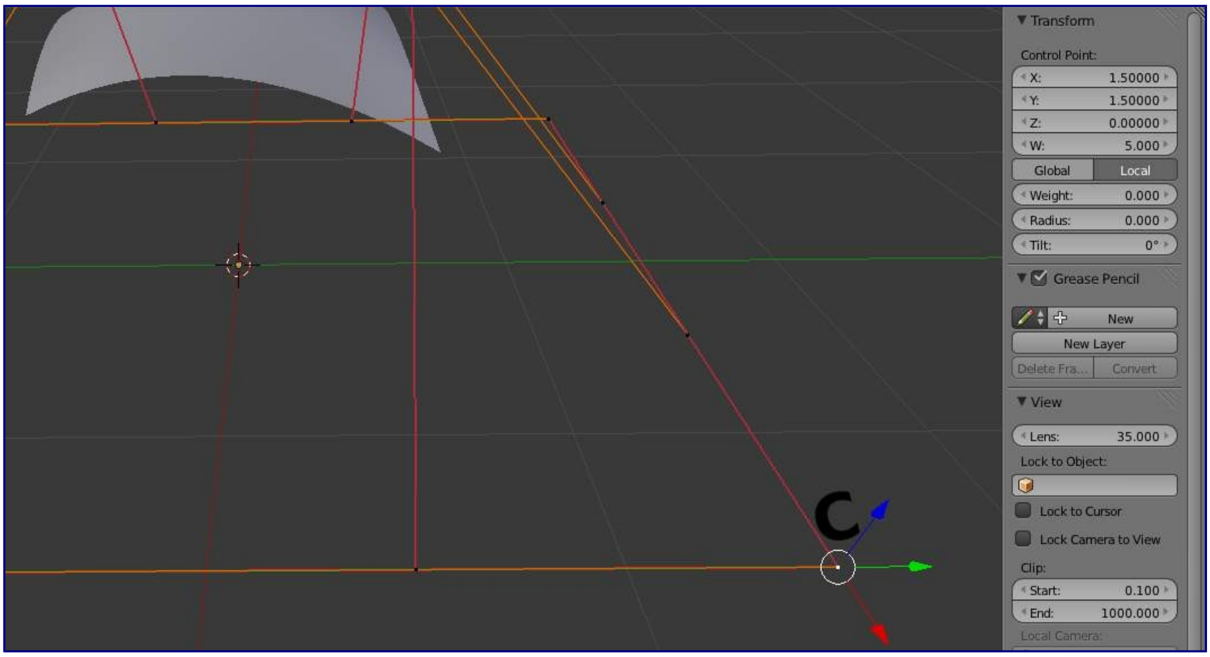


Order 2 and order 4 surface.

For illustration purposes, in both (*Order 4 surface*) and (*Order 2 surface*), the knot vectors were set to *Endpoint*, causing the surface to extend to all edges.

You can set independently the order for each interpolation axis, and like curves, it cannot be lower than **2**, and higher than **6** or the number of control points on the relevant axis.

Weight



Surface Weight 5.

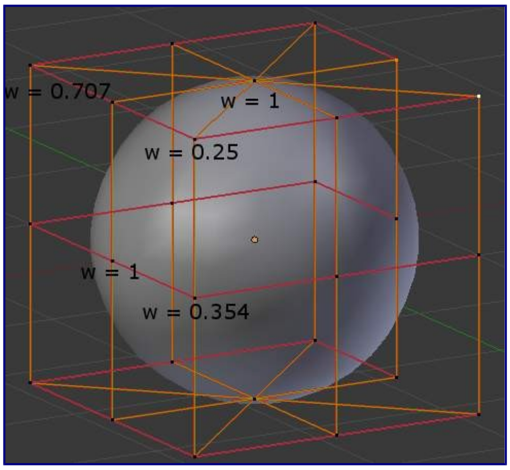
Guess what? Yes, it works exactly like NURBS Curves ! *Weight* specifies how much each control point “pulls” on the curve.

In (*Surface Weight 5*), a single control point, labeled `C`, has had its *Weight* set to **5.0** while all others are at their default of **1. 0**. As you can see, that control point *pulls* the surface towards it.

If all the control points have the same *Weight* then each effectively cancels each other out. It is the difference in the weights that cause the surface to move towards or away from a control point.

The *Weight* of any particular control point is visible in the *Transform Properties panel* (`N`), *in the W field* (and not the *Weight* field...).

Preset Weights



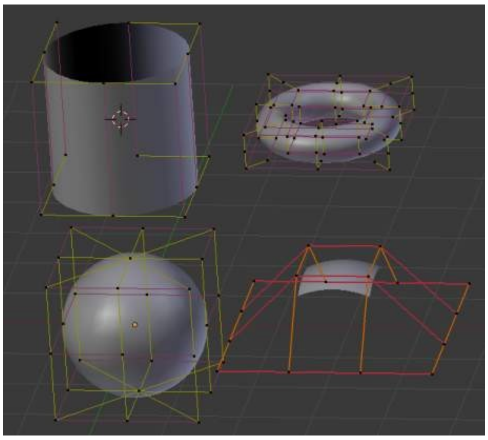
A sphere surface.

NURBS can create pure shapes such as circles, cylinders, and spheres (note that a Bézier circle is not a pure circle). To create pure circles, globes, or cylinders, you must set to specific values the weights of the control points - some of which are provided as presets in the *Curve Tools* panel (lower right corner). This is not intuitive, and you should read more on NURBS before trying this.

To create a sphere with 2D surfaces, its the same principle as with a 2D circle - you'll note that the four different weights needed for creating a sphere (**1.0**, **0.707** = `sqrt(0.5)`, **0.354** = `sqrt(2)/4`, and **0.25**).

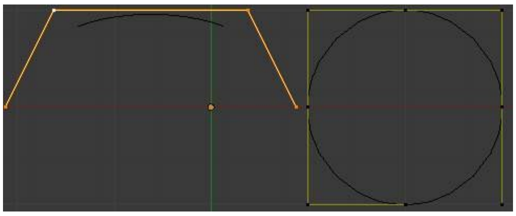
Primitives

To help get started in creating surfaces there are four preset NURBS surfaces, found in the Add ‣ Surface menu: *NURBS Surface*, *NURBS Tube*, *NURBS Sphere* and *NURBS Torus*.



NURBS surface primitives.

There are also two preset NURBS surface curves (with only one control point on each V-row): *NURBS Curve* and *NURBS Circle*.



NURBS curve primitives.

Note how a circle NURBS surface is never filled, unlike its “real” curve counterpart...

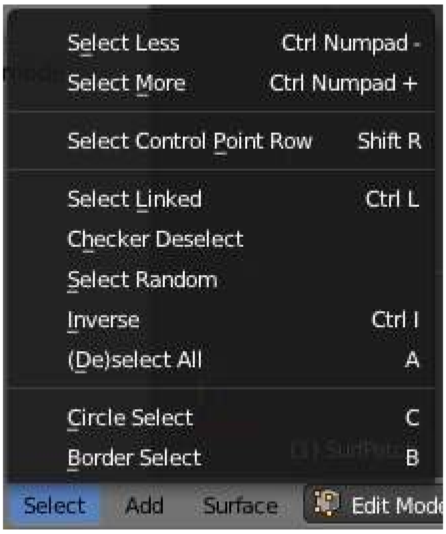
Surface Selection

Surface selection in *Edit* mode is very similar to *NURBS curve selection*. The basic tools are the same as with *meshes*, so you can select a simple control point with a `LMB` -click, add to current selection with `Shift-LMB` -clicks, Border-select, and so on.

Select Menu

The *Select* menu (3D view headers) is even simpler than for curves...

> All these options have the same meaning and behavior as in *Object mode* (and the specificities of *Border Select* in *Edit* mode have already been discussed *here*).



frame[left].

Every Nth

Reference
Mode: *Edit* mode Menu: Select ‣ Every Nth

This is the same option as for curve selection. However, the behavior of the *N* (“selection step”) parameter in the 2D of a NURBS surface “cage” seems quite difficult to understand...

Control Point Row

Reference
Mode: *Edit* mode Menu: Select ‣ Control Point Row

This option works a bit like edge loop selection for meshes, inasmuch it selects a whole row of control points, based on the active (the last selected) one. The first time you press `Shift-R`, the V-row passing through (containing) the active point will be *added to the current selection*. If you use again this shortcut, you will toggle between the U- and V-row of this point, *removing everything else from the selection*.

More and Less

Reference
Mode: *Edit* mode Menu: Select ‣ More/Less

These two options are complementary and very similar to *those for meshes*. Their purpose, based on current selected control points, is to reduce or enlarge this selection.

The algorithm is the same as with meshes:

More
: for each selected control point, select **all** its linked points (i.e. two, three or four).

Less
: for each selected control point, if **all** points linked to this point are selected, keep it selected. For all other selected control points, de-select them.

This implies two points:

- First, when **all** control points of a surface are selected, nothing will happen (as for *Less*, all linked points are always selected, and of course, *More* can't add any). Conversely, the same goes when no control point is selected.
- Second, these tools will never "go outside" of a surface (they will never "jump" to another surface in the same object).

Surface Editing

Surface editing has even fewer tools and options than its curve counterpart - and has many common points with it... So this page covers (or tries to cover) all the subjects, from the basics of surface editing to more advanced topics, like retopology.

Basic Surface Editing (translation, rotation, scale)

Reference
Mode: *Edit* mode Menu: Surface ‣ Transform ‣ Grab/Move, Rotate, Scale, ...

Once you have a selection of one or more control points, you can grab/move, rotate or scale them, like many other things in Bforartists, as described in the *Manipulation in 3D Space* section.

You also have in *Edit* mode an extra option when using these basic manipulations: the *proportional editing*.

Advanced Transform Tools

Reference
Mode: *Edit* mode Menu: Surface ‣ Transform

The *To Sphere*, *Shear*, *Warp* and *Push/Pull* transform tools are described in the *Mesh Deforming* section. Surfaces have no specific transform tools.

NURBS Control Points Settings

Reference
Mode: *Edit* mode Panel: *Curve Tools* (*Editing* context), and *Transform Properties*

We saw in a previous page that NURBS control points have a weight, which is the influence of this point on the surface. You set it either using the big *Set Weight* button in the *Curve Tools* panel (after having defined the weight in the numeric field to the right), or by directly typing a value in the *W* numeric field of the *Transform Properties* panel.

Adding or Extruding

Reference
Mode: *Edit* mode Menu: Surface ‣ Extrude

Unlike meshes or curves, you cannot generally directly add new control points to a surface (with `Ctrl-LMB` clicks), as you can only extend a surface by adding a whole U- or V-row at once. The only exception is when working on a NURBS surface curve, i.e. a surface with only one control point on each U- or V-row. In this special case, all works exactly as with curves.

Most of the time, only extrusion is available. As usual, once the tool is activated the extrusion happens immediately and you are placed into *Grab mode*, ready to drag the new extruded surface to its destination.

There are two things very important to understand:

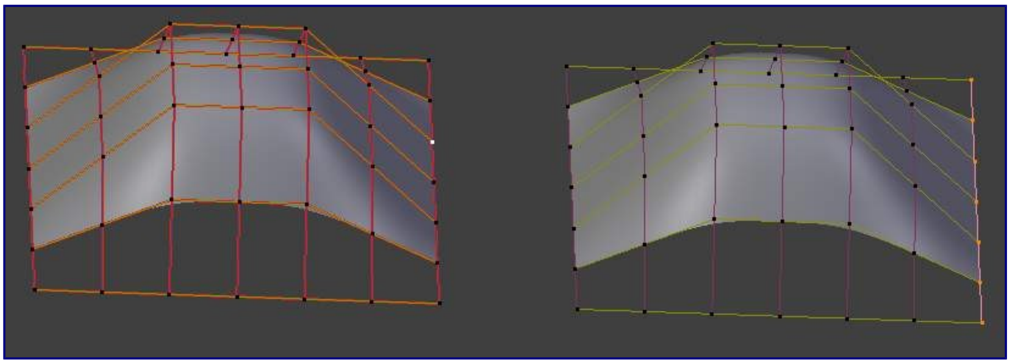
- Surfaces are **2D** objects - so you can't extrude anything *inside* a surface (e.g. "inner" row); it wouldn't make any sense!
- The control "grid" *must remain "squarish"*, which means that you can only extrude a whole row, not parts of rows here and there...

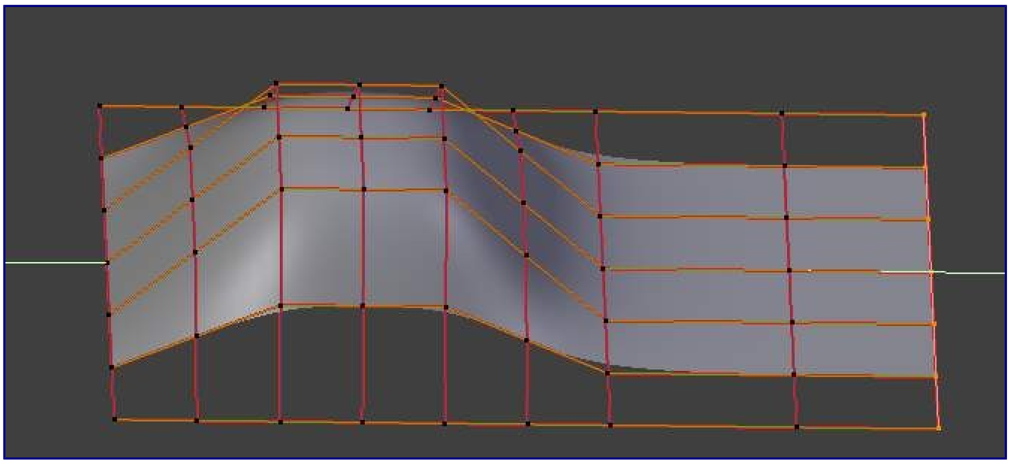
To summarize, the *Extrude* tool will only work when one and only one whole border row is selected - otherwise nothing happens.

As for curves, you cannot create a new surface in your object out of nowhere, by just `Ctrl-LMB` -clicking with nothing selected. However, unlike for curves, there is no “cut” option allowing you to separate a surface into several parts, so you only can create a new surface by copying (Duplication) an existing one (`Shift-D`), or adding a new one (*Add* menu...).

Examples

Images (*Selecting control-point*) to (*Complete*) show a typical extrusion along the side of a surface.





You can continue this process of extruding - or adding - new surface sections until you have reached the final shape for your model.

Opening or Closing a Surface

Reference
Mode: *Edit* mode
Menu: Surface ‣ Toggle Cyclic

As in curves, surfaces can be closed (cyclic) or open. However, as surfaces are 2D, you can control this property independently along the U and V axes.

To toggle the cyclic property of a surface along one axis, use `C` and choose either *cyclic U* or *cyclic V* from the *Toggle pop-up menu*. The corresponding surface’s outer edges will join together to form a “closed” surface.

Note

Inner and Outer

Surfaces have an "inner" and "outer" face, the first being black whereas the latter is correctly shaded - there does not seem to be any "double sided" shading option for surfaces...). When you close a surface in one or two directions, you might get an entirely black object! In this case, just Switch Direction of your surface...

Duplication

Reference
Mode: *Edit* mode Menu: Curve ‣ Duplicate

Well, as with meshes and curves, this command just duplicates the selection. As usual, the copy is selected and placed in *Grab* mode, so you can move it to another place.

However, with surfaces there are some selections that can't be duplicated, in which case they will just be placed in *Grab* mode... In fact, only selections forming *a single valid sub-grid* are copyable; let's see this in practice:

- You can copy a single control point. From it, you will be able to "extrude" a "surface curve" along the U axis, and then extrude this unique U-row along the V axis to create a real new surface.
- You can copy a single continuous part of a row (or a whole row, of course). This will give you a new **U-row**, even if you selected (part of) a V-row!
- You can copy a single whole sub-grid.

Note that trying to duplicate several valid "sub-grids" (even being single points) at once won't work; you'll have to do it one after the other...

Deleting Elements

Reference
Mode: *Edit* mode Menu: Curve ‣ Delete...

The *Erase* pop-up menu of surfaces offers you two options:

Selected

This will delete the selected rows, *without* breaking the surface (i.e. the adjacent rows will be directly linked, joined, once the intermediary ones are deleted). The selection must abide by the following rules:

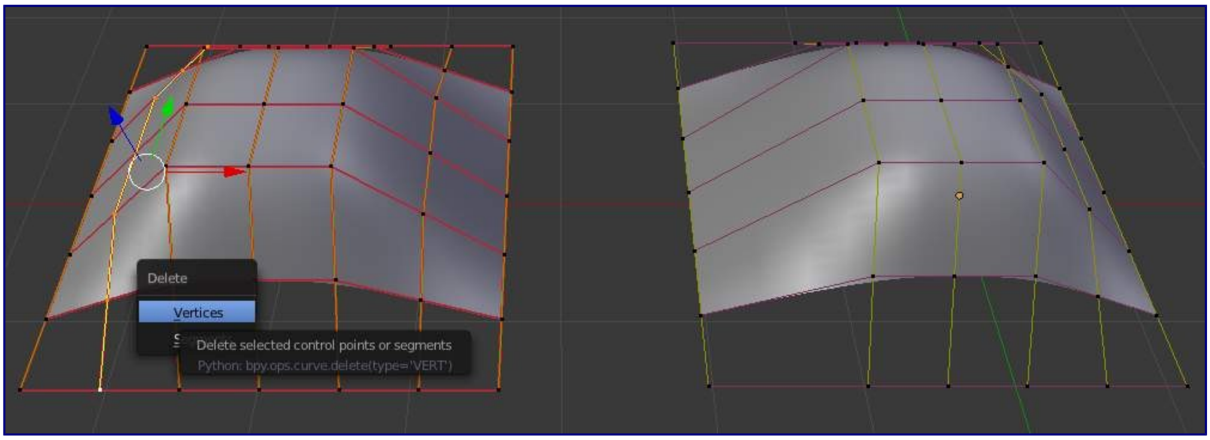
- Whole rows, and only whole rows must be selected.
- Only rows along the same axis must be selected (i.e. you can't delete both U- and V-rows at the same time).

Also remember that NURBS order cannot be higher than its number of control points in a given axis, so it might decrease when you delete some control points... Of course, when only one row remains, the surface becomes a "surface curve"; when only one point remains, there is no more visible surface; and when all points are deleted, the surface itself is deleted.

All

As with meshes or curves, this deletes everything in the object!

Example



Before and after

In (*Before*) a row of control points has been selected by initially selecting the control point labeled A and using `Shift-R` to select the remaining control points. Then, using the *Delete Menu* (X), the *selected* row of control points is erased, resulting in (*After*).

Joining or Merging Surfaces

Reference
Mode: *Edit* mode
Menu: Surface ‣ Make Segment

Just like curves, merging two surfaces requires that a single edge, a border row of control points, from two separate surfaces are selected. This means that the surfaces must be part of the same object. For example, you can't join two surfaces while in *Object* mode - but you can of course, as with any objects of the same type, join two or more *Surface* objects into one object. They just won't be "linked" or merged in a single one... Yes, it's a bit confusing!

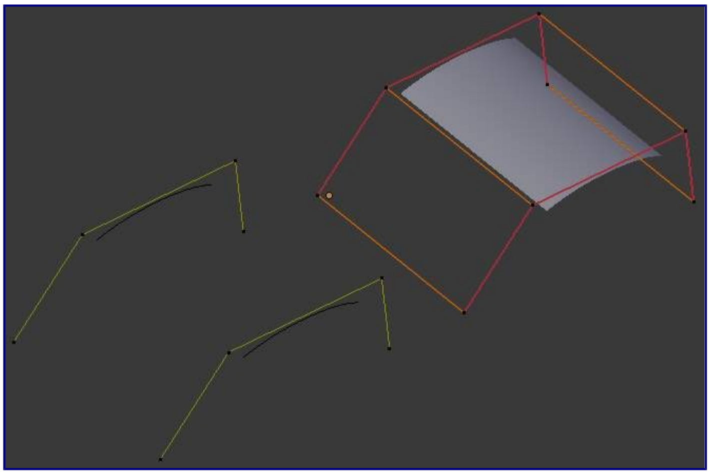
This command is equivalent to creating edges or F aces for meshes (hence its shortcut), and so it only works in *Edit* mode. The selection must contains only border rows of the same resolution (with the same number of control points), else Bforartists will try to do its best to guess what to merge with what, or the merge will fail (either silently, or stating that `Resolution doesn't match` if rows with different number of points are selected, or that there is `Too few selections to merge` if you only selected points in one surface...).

So to avoid problems, you should always only select border rows with the same number of points... Note that you can join a border U-row of one surface with a border V-row of another one, Bforartists will automatically "invert" the axis of one surface for them to match correctly.

NURBS surface curves are often used to create objects like hulls, as they define cross sections all along the object, and you just have to "skin" them as described above to get a nice, smooth and harmonious shape.

Examples

(*Joining ready*) is an example of two NURBS surface curves, **not** NURBS curves, in *Edit* mode, ready to be joined. (*Joining complete*) is the result of joining the two curves.



Joining ready.

Subdivision

Reference
Mode: *Edit* mode Panel: *Curve Tools1* (*Editing* context) Menu: Surface ‣ Segments ‣ Subdivide, Specials ‣ Subdivide

Surface subdivision is most simple: using either the *Subdivide* entry in the *Specials* menu (`W`), or the *Subdivide* button of the *Curve Tools1* panel, you will subdivide once all *completely selected grids* by subdividing each “quad” into four smaller ones.

If you apply it to a 1D surface (a “surface curve”), this tool works exactly as with curves.

Spin

Reference
Mode: *Edit* mode Panel: *Curve Tools1* (*Editing* context)

This tool is a bit similar to its *mesh counterpart* - but with less control and options (in fact, there’s none!).

It only works on selected “surfaces” made of *one U-row* (and not with one V-row), so-called “surface curves”, by “extruding” this “cross section” in a square pattern, automatically adjusting the weights of control points to get a perfect circular extrusion (this also implies closing the surface along the V axis), following exactly the same principle as for the *NURBS Tube* or *NURBS Donut* primitives.

Switch Direction

Reference

Mode: *Edit* mode
Menu: Surface ‣ Segments ‣ Switch Direction, Specials ‣ Switch Direction

This command will “reverse” the direction of any curve with at least one selected element (i. e. the start point will become the end one, and *vice versa*). Mainly useful when using a curve as path, or the bevel and taper options...

Conversion

As there are only NURBS surfaces, there is no “internal” conversion here.

However, there is an “external” conversion available, from surface to mesh, that only works in *Object* mode. It transforms a *Surface* object into a *Mesh* one, using the surface resolutions in both directions to create faces, edges and vertices.

Misc Editing

You have some of the same options as with meshes, or in *Object* mode. You can separate a given surface (`P`), make other selected objects children of one or three control points (`Ctrl-P` - note however that parenting to three control points has a strange behavior with curves...), or *add hooks* to control some points with other objects.

The *Mirror* tool is also available, behaving exactly as with *mesh vertices*.

5.4 Modeling - Text

Text

Reference
Mode: *Edit* mode (*Text*)
Panel: *Curve and Surface*, *Font* and *Char* (*Editing* context)
Menu: Add ‣ Text

Text Examples.

Text objects are exactly what they sound like: they contain some text. They share the same object type as curves and surfaces, as modern fonts (OpenType, TrueType, etc.) are vectorial, made of curves (generally Béziers).

Bforartists uses a “Font System” to manage mapping “letter codes –> objects representing them in 3D views”. This implies that not only does the font system have its own *built-in* font, but it can use external fonts too, including *PostScript Type 1*, *OpenType* and *TrueType* fonts. And last but not least, it can use any objects existing in the current .blend file as letters...

Texts in Bender allow you to create/render 2D or 3D text, shaded as you want, with various advanced layout options (like justifying and frames), as we will see below. By default, letters are just flat filled surfaces, exactly like any closed 2D curve. But you can of course extrude them... And texts can follow other curves.

Of course, once you are happy with the shape of your text, you can convert it (with `Alt-C`, in *Object* mode), either to a curve, or directly to a mesh, allowing you to use all the powerful features of these types of objects on it...

(*Text Examples*) shows some examples of various fonts in action, including the “blue” font that has been applied to a curve path.

Note

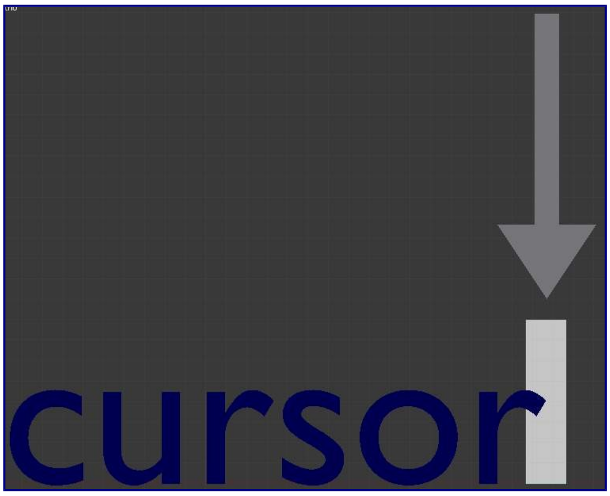
A maximum of `50000` characters is allowed per text object; however, be forewarned that the more characters a single text object has, the slower the object will respond interactively.

As you can see when you switch between *Object* and *Edit* modes, the *Font* panel remains the same. This means that its settings can be applied equally in both modes ... and this implies that you cannot apply them to just a part of the mesh. So font, size, and so on, are common to all letters in a *Text* object. There is just one exception: the *Bold* / *Italic* buttons control properties specific to each letter (this is a way to use up to four different fonts in a text).

For optimum resource usage, only characters that are being used consume memory (rather than the entire character set).

Editing Text

Reference
Mode: *Edit* mode



Text in Edit mode.

Editing text is quite different from other object types in Bforartists, and happens mainly in two areas. First, the 3D view, of course, where you type your text, and have a few shortcuts, e.g. for applying styles (see Character) - note however that most Bforartists hotkeys you know in *Edit* mode do not exist for texts! The second place is the *Button* window (*Editing* context), especially the *Font* panel.

The menu of the 3D view header has nearly no use, and there is no *Specials* menu... You have no transform nor mirror tools, and so on. However, you can apply to texts the same modifiers as for curves.

Editing *Text* is similar to using a standard text editor but is not as full-featured and has some differences:

Exit *Edit* mode
: `Tab` doesn't insert a tab character in the text, but rather enters and exits *Edit* mode, as with other object types.

Copy
: To copy text to the buffer, use `Ctrl-C` or the *Copy* button in the tool shelf.

Cut and Copy
: To cut and copy text to the buffer, use `Ctrl-X` or the *Cut* button in the tool shelf.

Paste
: To paste text from the buffer, use `Ctrl-V` or the *Paste* button in the tool shelf.

Delete all text
: To completely erase or delete all text, use `Ctrl-Backspace`.

Home/End
: `Home` and `End` move the cursor to the beginning and end of a line respectively.

Next/Previous word
: To move the cursor on a word's boundary, use `Ctrl-Left` or `Ctrl-Right`.

The text buffer does not communicate with the desktop. It only works within Bforartists. To insert text from outside Bforartists, see Inserting Text below.

Inserting Text

You can insert text in three different ways: from the internal text buffer (Editing Text), or from a text file.

To load text from a text file, use the Text ‣ Paste File tool. This will bring up a *File Browser* window for navigating to a valid UTF-8 file. As usual, be careful that the file doesn't have too many characters, as interactive response will slow down.

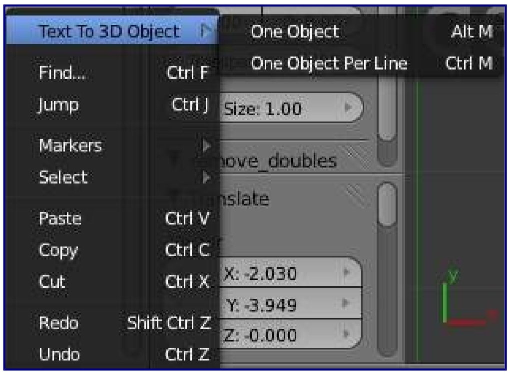
Special Characters

Reference
Mode: *Edit* mode Menu: Text ‣ Special Characters

If you need special characters (such as accented chars, which aren't on your keyboard) you can produce many of them using a combination of two other characters. To do so, type the main char, press `Alt-Backspace`, and then press the desired "modifier" to produce the special character. Some examples are given below:

A, `Alt-Backspace`, `~`	ã	A, `Alt-Backspace`, `'`	á	A, `Alt-Backspace`, `` ` ``	à
A, `Alt-Backspace`, `O`	å	E, `Alt-Backspace`, `"`	ë	O, `Alt-Backspace`, `/`	ø

Convert Text to Text Object

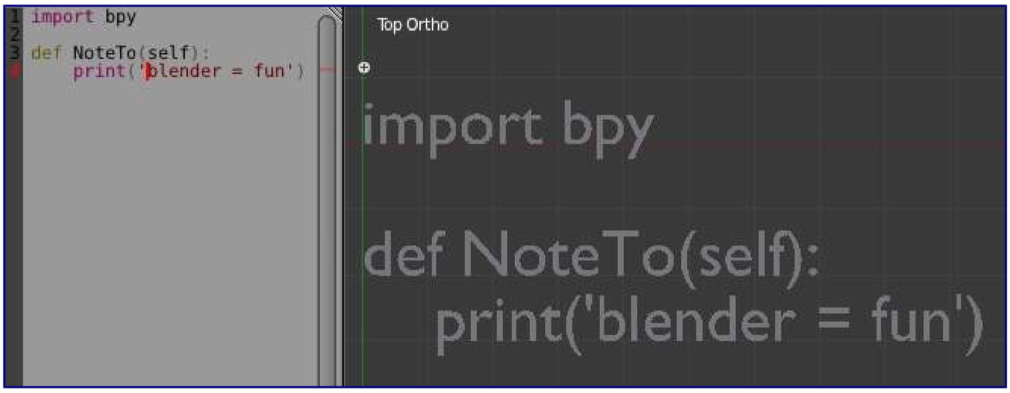


Using an existing text-block, you can convert it to an object from the text editor's header, select Edit ‣ Text to 3D Object, *One Object* or *One Object per Line* depending on your needs.

It is also possible to paste from the clipboard or a file from the *Edit* menu, while editing 3D Text.

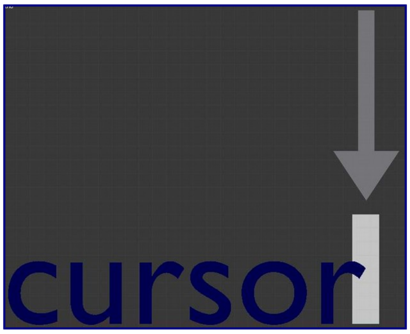
3D Mesh

It is possible to convert a Text Object to a 3D Mesh object. This can be useful so that you may edit the vertices in *Edit Mode*, but you will lose the ability to edit the text itself. To do this, go to *Object Mode* and select your Text Object. Press `Alt-C` and select *Mesh From Curve/Meta/Surf/Text*. Now you can return to *Edit Mode* and manually edit the vertices. They are usually a bit messy, so it may be useful to use a *Limited Dissolve* deletion or *Remesh* Object *Modifier* at a low threshold to clean up your mesh.



left normal text, right the made text object.

Text Selection



Text in Edit mode.

In *Edit* mode, your text has a white cursor, and as in any text editor, it determines where new chars will be inserted! You move this cursor with the arrow keys or `PageUp` / `PageDown` and `Home` / `End` keys.

Hold `Shift` while using the arrow keys to select a part of the text. You can use it to specify different materials, the normal/bold/italic state, and not much more...

Formatting Text

Fonts

Reference
Mode: *Edit* mode Panel: *Font* (*Editing* context)

The *Font* panel has several options for changing the look of characters.

Loading and Changing Fonts

Loading a Type 1 font file.

Bforartists comes with a *built-in* font by default and is displayed in each of the four font style choosers. The *built-in* font is always present and shows in this list as `Bfont`. The first icon contains a drop-down list displaying currently loaded fonts. Select one for each font style.

To load a different *Font*, click one of the *Load* buttons in the *Font* panel and navigate to a *valid* font. The *File Browser* window will give all valid fonts a capital F icon, as seen in *Loading a Type 1 font file*.

> **Note**
>
> Unix note
>
> Fonts are typically located under `/usr/lib/fonts`, or some variant like `/usr/lib/X11/fonts`, but not always. They may be in other locations as well, such as `/usr/share/local` or `/usr/local/share`, and possibly related sub-trees.

If you select a font that Bforartists can't understand, you will get the error `Not a valid font`.

Remember the same font will be applied to all chars with same style in a text, but that a separate font is required for each style. For example, you will need to load an *Italics* font in order to make characters or words italic. Once the font is loaded you can apply that font "Style" to the selected characters or the whole object. In all, you would need to load a minimum of four different types of fonts to represent each style (**Normal**, **Italics**, **Bold**, **Bold-Italics**).

It is important to understand that Bforartists does not care what font you load for "normal", "bold", etc., styles. This is how you can have up to four different fonts in use in the same text - but you have to choose between different styles of a same font, or different fonts. Bforartists has a number of typographic controls for changing the style and layout of text, found in the *Font* panel.

Size and Shear

Size

Controls the size of the whole text (no way to control each char size independently). Note however that chars with different fonts (different styles, see below) might have different visible sizes.

shear: ‘Bforartists’ has a shear value of 1, ‘2.59’ a shear value of 0

Shear

Controls the inclination of the whole text. Even if this seems similar to italics style, *this is not the same thing* !

Objects as Fonts

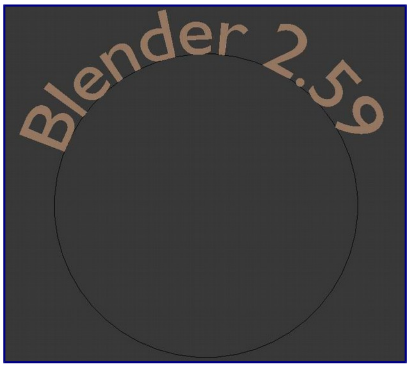
You can also “create” your own “font” inside Bforartists! This is quite a complex process, so let’s detail it:

- First, you must create your chars. Each char is an object *of any type* (mesh, curve, meta...). They all must have a name following the schema: `common prefix` followed by the `char name` (e.g. `ft.a`, `ft.b`, etc.).
- Then, for the *Text* object, you must enable the *Dupli Verts* button (*Object* context - *Anim Settings* panel).
- Back in *Editing* context, in the *Font* panel, fill the *Ob Family* field with the *common prefix* of your “font” objects.

Now, each time a char in your text matches the *suffix part* of a “font” object’s name, this object is duplicated on this char. *The original chars remain visible*. The objects are duplicated so that their center is positioned at the *lower right corner* of the corresponding chars.

Text on Curve

With the *curve modifier* you can let text follow a curve.



Text on curve.

In (*Text on curve*) you can see a text deformed by a curve (a 2D Bézier circle).

To apply the curve modifier, the text object first has to be converted to a mesh, using `Alt-C` and click mesh.

Note
There is also a Text on Curve feature, but the curve modifier offers more options.

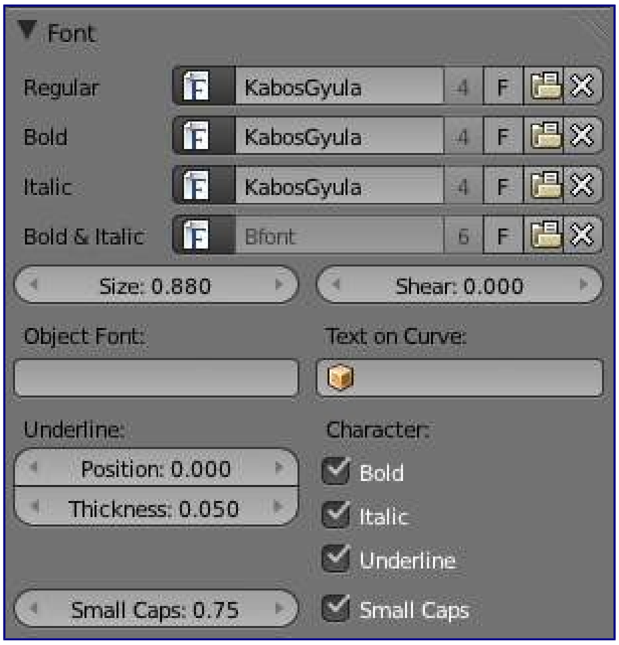
Underline

Underline

Toggled with the *Underline* button before typing. Text can also be set to Underlined by selecting it then using the *Underline* button in the Tool Shelf.

Position
This allows you to shift vertically the position of the underline.

Thickness
This controls the thickness of the underline.



check a character option to, for example, type bold text

Character

Bold text.

Bold
Toggled with the *Bold* button before typing. Text can also be set to Bold by selecting it then using the *Bold* button in the Tool Shelf.

Italics

Toggled with the *Italic* button before typing. Text can also be set to Italic by selecting it then using the *Italic* button in the Tool Shelf.

Underline

Enables underlining, as controlled by the Underline settings above.

Small Caps

type small capital text.

Bforartists's *Bold* and *Italic* buttons don't work the same way as other applications, as they also serve as placeholders for you to load up other fonts manually, which get applied when you define the corresponding style; see Fonts.

To apply the Bold/Italics/Underline attribute to a set of characters, you either turn on *Bold* / *Italics* / *Underline* prior to typing characters, or highlight (select) first and then toggle Bold/Italics/Underline.

Setting Case

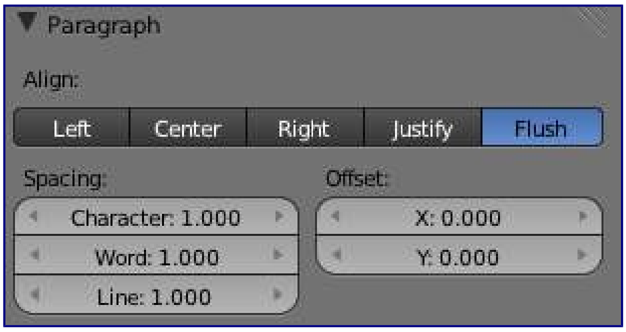
You can change the text case by selecting it then clicking the *To Upper* or *To Lower* in the tool shelf.

Enable the *Small Caps* option to type characters as small caps.

The size of the *Small Caps* can be changed with the *Small Caps Scale* setting. Note that the *Small Caps Scale* is applied the same to all *Small Caps* formatted characters.

Paragraph

The *Paragraph* Panel has settings for the alignment and spacing of text.



the paragraph tab

Align

Left

Aligns text to left of frames when using them, else uses the center point of the *Text* object as the starting point of the text (which grows to the right).

Center

Centers text in the frames when using them, else uses the center point of the *Text* object as the mid-point of the text (which grows equally to the left and right).

Right

Aligns text to right of frames when using them, else uses the center point of the *Text* object as the ending point of the text (which grows to the left).

Justify

Only flushes a line when it is **terminated** by a wordwrap (**not** by `Return`), it uses *whitespace* instead of *character spacing* (kerning) to fill lines.

Flush

Always flushes the line, even when it’s still being entered; it uses character spacing (kerning) to fill lines.

Both *Justify* and *Flush* only work within frames.

Spacing

Character

A factor by which space between each character is scaled in width

Word

A factor by which whitespace between words is scaled in width. You can also control it by pressing `Alt-Left` or `Alt-Right` to decrease/increase spacing by steps of `0.1`.

Line

A factor by which the vertical space between lines is scaled.

Offset

X offset and Y offset

Well, these settings control the X and Y offset of the text, regarding its “normal” positioning. Note that with frames (see *Text Boxes*), it applies to all frames’ content...

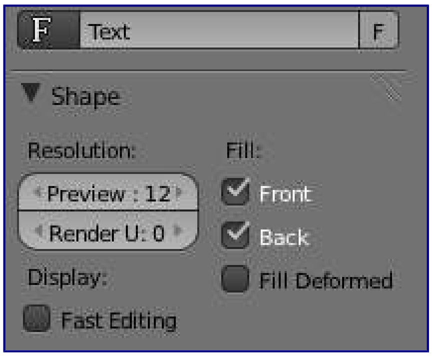
Shape

Reference
Mode: *Object* or *Edit* modes Panel: *Curve and Surface* (*Editing* context)

As you can see in the *Curve and Surface* panel, texts have most of the same options as curves.

Resolution

Preview, Render resolution. See curve resolution.



the shape settings

Fast Editing

disables curve filling while in edit mode.

Fill

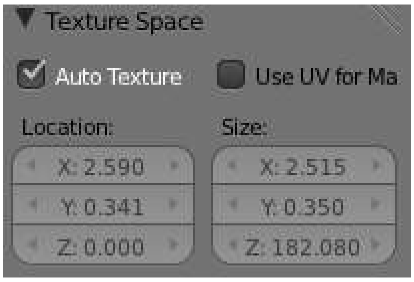
The fill options control how the text curves are filled in when text is *Extruded* or *Beveled* in the *Geometry* Panel.

Front
: Fills in the front side of the surface.

Back
: Fills in the back side of the surface.

Fill Deformed
: Fills the curves after applying shape keys and modifiers.

Textures



Texture Settings

Use UV for Mapping
: Use UV values as generated texture coordinates.

Auto Texture Space
: Adjusts the active object's texture space automatically when transforming object.

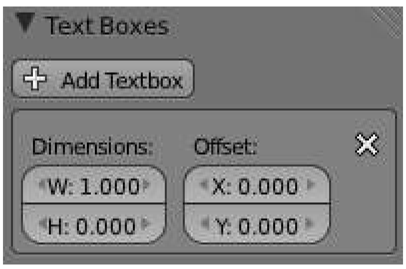
Geometry

Text objects have all the *curves extrusion features*.

Text Editing

Text Boxes

Reference
Mode: *Object* or *Edit* modes Panel: *Font* (*Editing* context)



Text frame.

Text “Boxes” allow you to distribute the text amongst rectangular areas within a single text object. An arbitrary number of freely positionable and re-sizable text frames are allowed per text object.

Text flows continuously from the lowest-numbered frame to the highest-numbered frame with text inside each frame word-wrapped. Text flows between frames when a lower-numbered frame can’t fit any more text. If the last frame is reached, text overflows out of it.

Text frames are very similar to the concept of *frames* from a desktop publishing application, like Scribus. You use frames to control the placement and flow of text.

Frames are controlled in the *Text Boxes* panel.

Frame size

By default the first frame for a new text object, and any additional frames, has a size of **zero** for both *Width* and *Height*, which means the frame is initially not visible.

Frames with a width of **0.0** are ignored completely during text flow (no wordwrap happens), and frames with a height of **0.0** flow forever (no flowing to the next text frame).

In order for the frame to become visible, the frame’s *Width* must be greater than **0.0**.

Note
Technically the height is never actually **0.0** because the font itself always contributes height.

Frame width.

(*Frame width*) is a text object with a width of `5.0`. And because the frame width is greater than `0.0` it is now visible and is drawn in the active theme color as a dashed rectangle. The text has overflowed because the text has reached the end of the last frame, the default frame.

Adding/Deleting a Frame

To add a frame click the *Add Textbox* button on the *Text Boxes* panel. A new frame is inserted just after (in text flow order) the current one, with its attributes (position and size). Be sure to modify the offset for the new frame in the *X* and/or *Y* fields. Just an *X* modification will create a new column.

To delete the current frame, click the `Delete` button. Any text in higher frames will be re-flowed downward into lower frames.

Example: Text Flow

wrapping

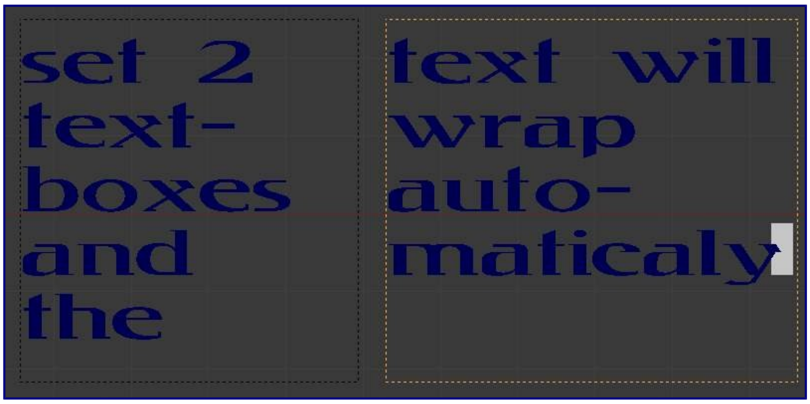
With two or more frames you can organize text to a finer degree. For example, create a text object and enter `Bforartists is super duper`. This text object has a frame; it just isn't visible because its *Width* is **0.0**.

Set the width to **5.0**. The frame is now visible and text is wrapping according to the new width, as shown in (*Text 2*). Notice that the text has overflowed out of the frame. This is because the text has reached the end of the last frame, which just happens to be the default/initial frame.

text flowing from box 1 to box 2

When we add another frame and set its width and height, the text will flow into the new frame.

Example: Multiple columns



Text 5.

To create two columns of text just create a text object and adjust the initial frame's *Width* and *Height* to your requirements, then insert a new frame. The new frame will have the same size as the initial frame. Set the *X* position to something greater or less than the width of the initial frame; see (*Text 5*).

Assigning Materials

Reference
Mode: *Edit* mode Panel: *Link and Materials* (*Editing* context)

Each character can have a different *Material index* in order to have different materials on different characters.

You can assign indices either as you type, or after by selecting blocks of text and clicking on the *Assign* button in the Materials panel.

Red Green Blue.

For example, to create (*Red Green Blue*) you would need to create three separate materials and three separate material indices. Each word would be assigned a *Material index* by selecting the characters for each word and clicking the *Assign* button. (*Red Green Blue*) is still one single *Text* object.

5.5 Modeling - Metas

Metas

Reference
Mode: *Object* or *Edit* modes
Menu: Add ‣ Meta

Meta objects are *implicit surfaces*, meaning that they are *not explicitly* defined by vertices (as meshes are) or control points (as surfaces are): they exist *procedurally*. Meta objects are literally mathematical formulas that are calculated on-the-fly by Blender.

A very distinct visual characteristic of metas is that they are fluid *mercurial*, or *clay-like* forms that have a “rounded” shape. Furthermore, when two meta objects get close to one another, they begin to interact with one another. They “blend” or “merge”, as water droplets do, especially in zero-g (which, by the way, makes them very handy for modeling streams of water when you don’t want to do a fluid simulation). If they subsequently move away from one another, they restore their original shape.

Each of these is defined by its own underlying mathematical structure (Technical Details), and you can at any time switch between them using the *Active Element* panel.

Typically *Meta* objects are used for special effects or as a basis for modeling. For example, you could use a collection of metas to form the initial shape of your model and then convert it to another object type (well, only meshes are available...) for further modeling. Meta objects are also very efficient for ray-tracing.

Note that *Meta* objects have a slightly different behavior in *Object* mode.

Primitives

There are five predefined meta “primitives” (or configurations) available in the Add ‣ Meta sub-menu:

Meta Ball
: adds a meta with a point underlying structure.

Meta Tube
: adds a meta with a line segment underlying structure.

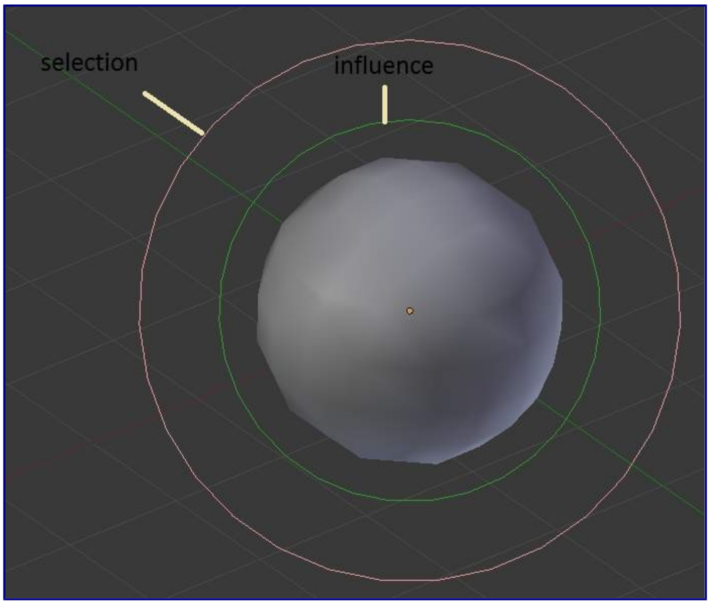
Meta Plane
: adds a meta with a planar underlying structure.

Meta Ellipsoid
: adds a meta with an ellipsoidal underlying structure.

Meta Cube
: adds a meta with a volumetric cubic underlying structure.

Visualization

In Object mode, the calculated mesh is shown, along with a black “selection ring” (becoming pink when selected).

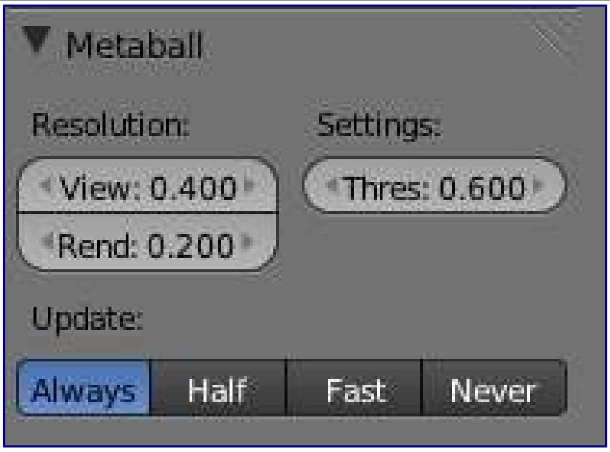


Meta Ball example.

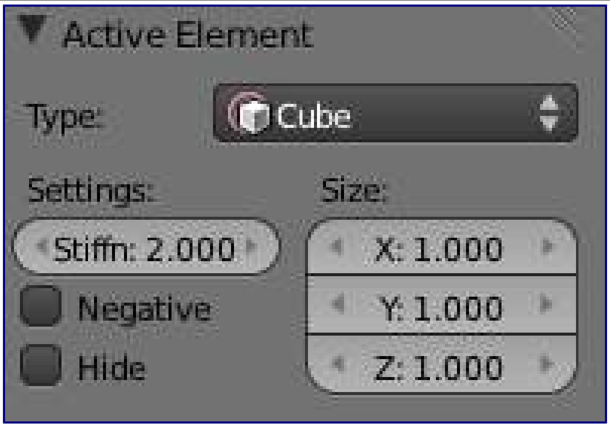
In *Edit* mode (*Meta Ball example*), a meta is drawn as a mesh (either shaded or as black wireframe, but without any vertex of course), with two colored circles: a red one for selection (pink when selected), and a green one for a direct control of the meta’s stiffness (light green when active). Note that except for the *Scale* (S) transformation, having the green circle highlighted is equivalent to having the red one.

Meta Ball Options

All Meta objects in a scene interact with each other. The settings in the *MetaBall* section apply to all meta objects. In *Edit* mode, the *Active Element* panel appears for editing individual meta elements.



global meta properties.



individual meta properties.

Resolution

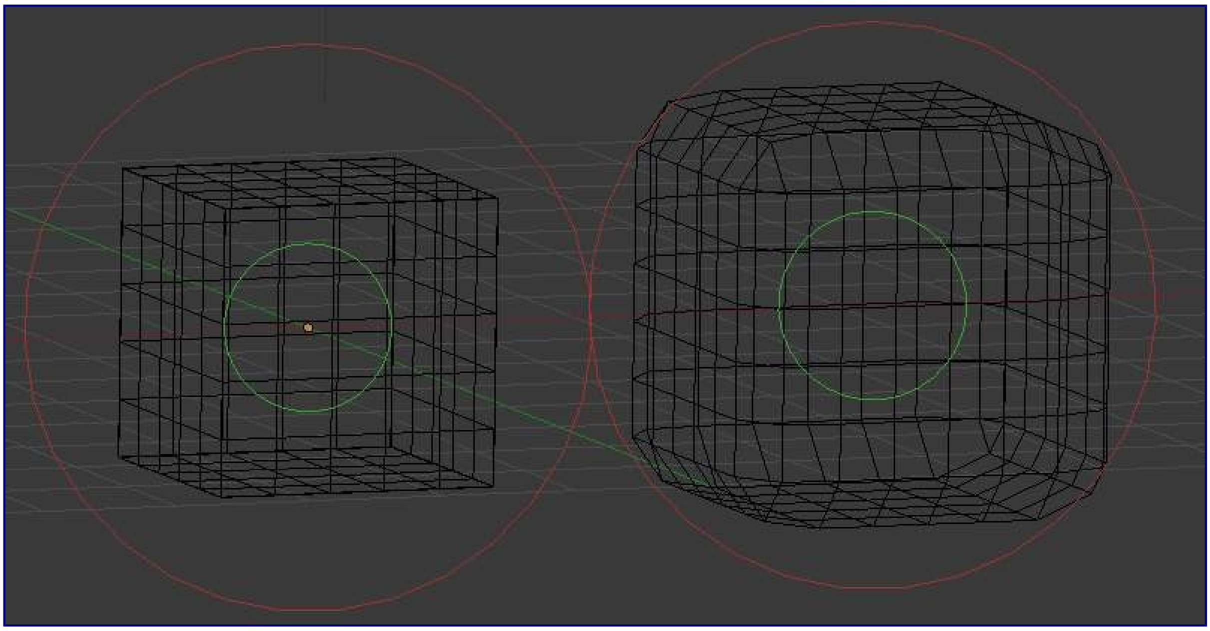
The *Resolution* controls the resolution of the resultant mesh as generated by the

Meta
: object.

View
: The 3D View resolution of the generated mesh. The range is from **0.05** (finest) to **1.0** (coarsest).

Render
: The rendered resolution of the generated mesh. The range is from **0.05** (finest) to **1.0** (coarsest).

One way to see the underlying mathematical structure is to lower the *Resolution*, increase the *Threshold* and set the *Stiffness* (see below) a fraction above the *Threshold*. (*Underlying structure*) is a (*Meta cube*) with the above mentioned configuration applied as follows: *Resolution* of **0.410**, *Threshold* of **5.0** and *Stiffness* a fraction above at **5.01**.



Left: Underlying structure, Right: the shape.

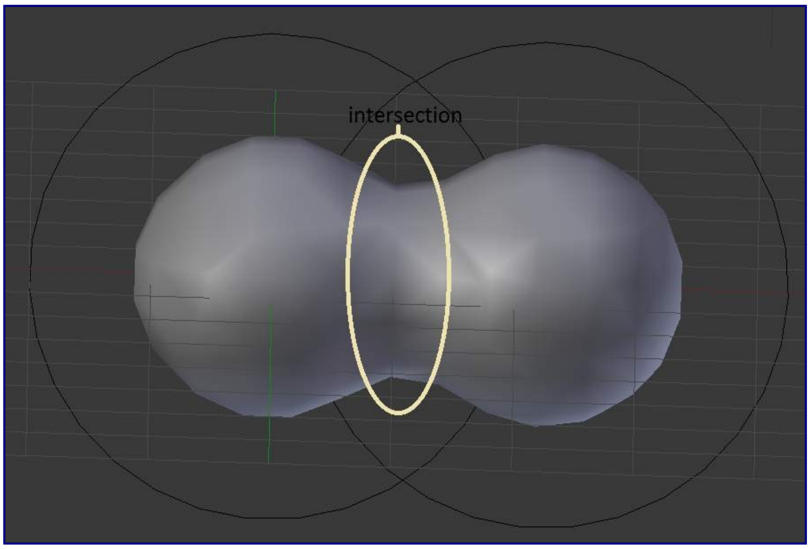
You can clearly see the underlying cubic structure that gives the meta cube its shape.

Threshold (Influence)

Reference
Mode: *Object* or *Edit* modes Panel: *MetaBall* (*Editing* context)

Threshold defines how much a meta's surface "influences" other metas. It controls the *field level* at which the surface is computed. The setting is global to a group of *Meta* objects. As the threshold increases, the influence that each meta has on each other increases.

There are two types of influence: **positive** or **negative**. The type can be toggled on the *Active Element* panel while in *Edit* mode, using the *Negative* button. You could think of **positive** as attraction and **negative** as repulsion of meshes. A negative meta will push away or repel the meshes of positive *Meta* objects.



Positive.

A *positive* influence is defined as an attraction, meaning the meshes will stretch towards each other as the *rings of influence* intersect. (*Positive*) shows two meta balls' *rings of influence* intersecting with a *positive* influence.

Notice how the meshes have pulled towards one another. The area circled in white shows the green *influence* rings intersecting.

Update

While transforming metas (grab/move, scale, etc.), you have four "modes" of visualization, located in the *Update* buttons group of the *MetaBall* panel:

Always
: fully draw the meta during transformations.

Half Res
: During transformations, draw the meta at half its *Wiresize* resolution.

Fast
: Do not show meta mesh during transformations.

Never
: Never show meta mesh (not a very recommended option, as the meta is only visible at render time!).

This should help you if you experience difficulties (metas are quite compute-intensive...), but with modern computers, this shouldn't happen, unless you use many metas, or very high resolutions...

Meta Structure

Technical Details

A more formal definition of a meta object can be given as a *directing structure* which can be seen as the source of a static field. The field can be either positive or negative and hence the field generated by neighboring directing structures can attract or repel.

The implicit surface is defined as the surface where the 3D field generated by all the directing structures assume a given value. For example a meta ball, whose directing structure is a point, generates an isotropic (i.e. identical in all directions) field around it and the surfaces at constant field value are spheres centered at the directing point.

Meta objects are nothing more than mathematical formulae that perform logical operations on one another (AND, OR), and that can be added and subtracted from each other. This method is also called **Constructive Solid Geometry** (CSG). Because of its mathematical nature, CSG uses little memory, but requires lots of processing power to compute.

Underlying Structure

Reference
Mode: *Edit* mode Panel: *MetaBall tools* (*Editing* context), *Transform Properties*

Bforartistshas five types of metas, each determined by its underlying (or directing) structure. In *Edit* mode, you can change this structure, either using the relevant buttons in the *MetaBall tools* panel, or the drop-down list in the *Transform Properties* panel (N). Depending on the structure, you might have additional parameters, located in both *Transform Properties* and *MetaBall tools* panels.

Ball (point, zero-dimensional structure)
This is the simplest meta, without any additional setting. As it is just a point, it generates an isotropic field, yielding a spherical surface (this is why it is called *Meta Ball* or *Ball* in Blender).

Tube (straight line, uni-dimensional structure)

This is a meta which surface is generated by the field produced by a straight line of a given length. This gives a cylindrical surface, with rounded closed ends. It has one additional parameter:

dx
The length of the line (and hence of the tube - defaults to **1.0**).

Plane (rectangular plane, bi-dimensional structure)

This is a meta which surface is generated by the field produced by a rectangular plane. This gives a parallelepipedal surface, with a fixed thickness, and rounded borders. It has two additional parameters:

dx, dy

The length, width of the rectangle (defaults to **1.0**).

Note that by default, the plane is a square.

Elipsoid (ellipsoidal volume, tri-dimensional structure)

This is a meta which surface is generated by the field produced by an ellipsoidal volume. This gives an ellipsoidal surface. It has three additional parameters:

dx, dy, dz
The length, width, height of the ellipsoid (defaults to **1.0**).

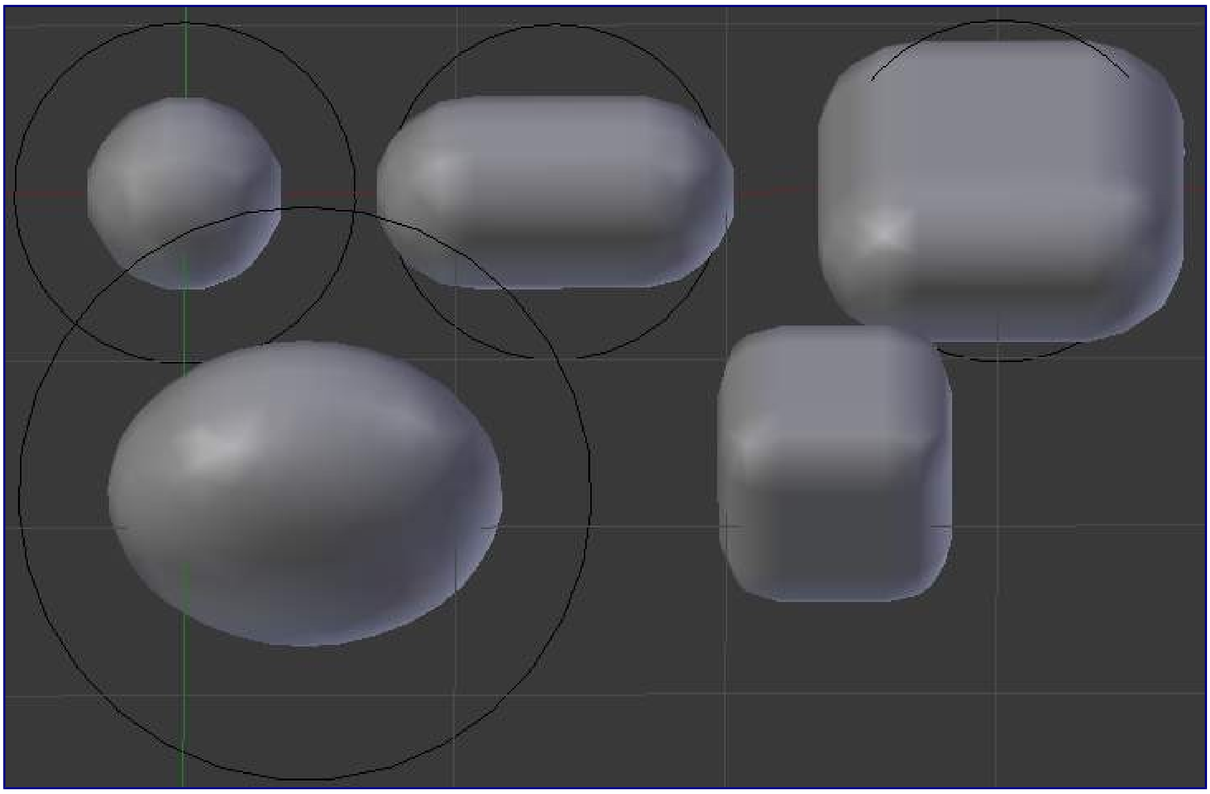
Note that by default, the volume is a sphere, producing a spherical meta, as the *Ball* option...

Cube (parallelepipedal volume, tri-dimensional structure)

This is a meta which surface is generated by the field produced by a parallelepipedal volume. This gives a parallelepipedal surface, with rounded edges. As you might have guessed, it has three additional parameters:

dx, dy, dz
The length, width, height of the parallelepiped (defaults to **1.0**).

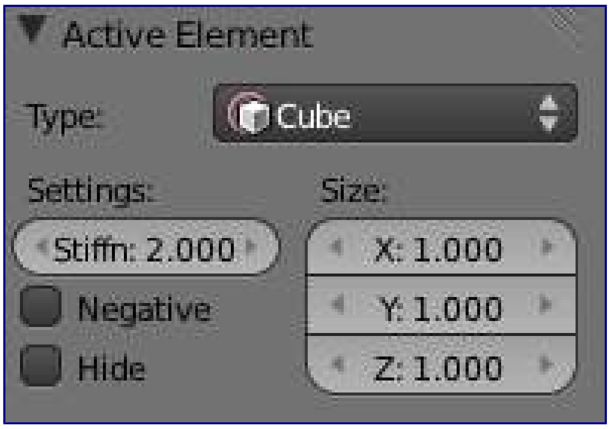
Note that by default, the volume is a cube.



the 5 meta primitives.

Editing Metas

When in *Edit* mode, the *Active Element* panel appears. These settings apply only to the selected meta element.



the active element panel.

Meta Shape

The *Type* menu lets you change the shape of the meta object, as explained above.

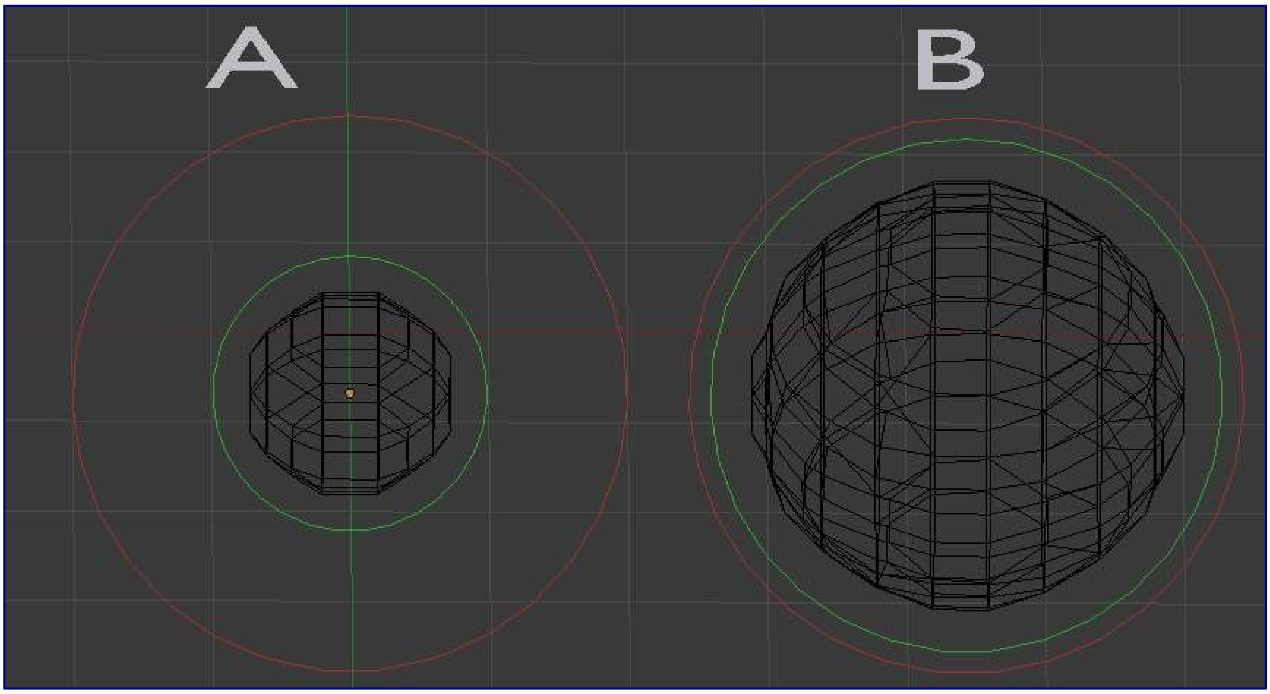
Stiffness

Together with *Threshold*, *Stiffness* controls the influencing range. While the threshold is common to all metas in the same object (or even the same Object Families), the stiffness is specific to each meta.

Scaling the inner green circle changes the *Stiffness* value. Stiffness defines how much the meta object is filled. This essentially defines how sensitive a meta is to being affected by other metas. With a low stiffness, the meta will begin to deform from further away. A higher value means the meta needs to be close to another one to begin merging.

When a *Meta* object comes within “range” of another meta, the two will begin to interact with each other. They don’t necessarily need to intersect, and depending on the *Threshold* and *Stiffness* settings, they most likely won’t need to. *Stiffness* is materialized by the *green ring*

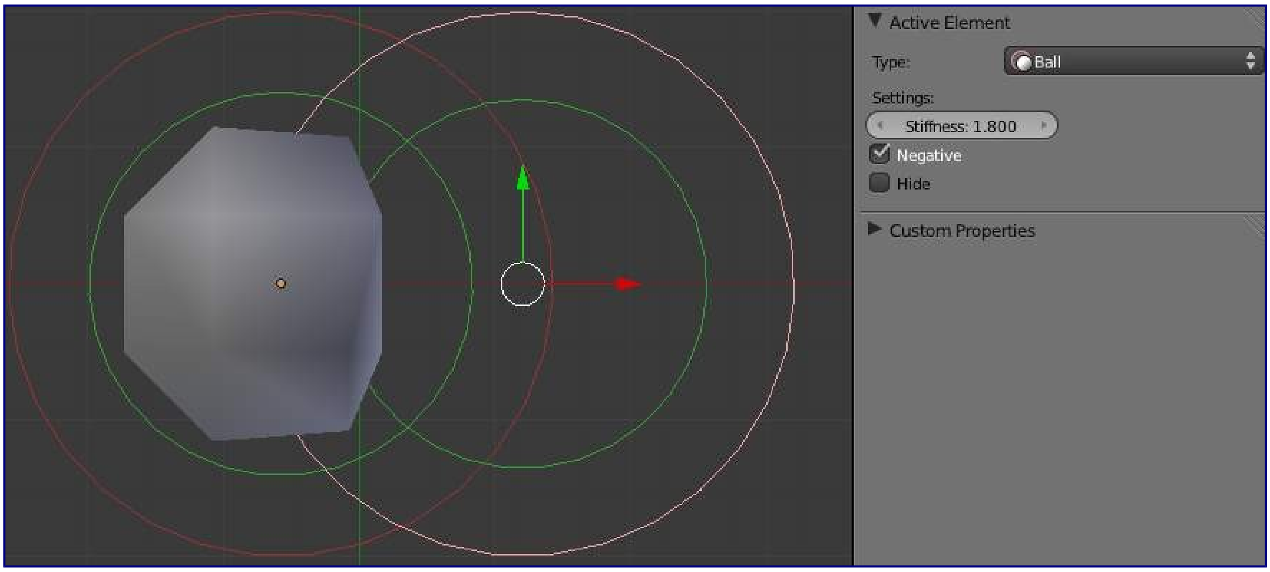
The range is from **0.0** to **10.0**. But to be visible, the *Stiffness* must be slightly larger than the *Threshold* value. You can also visually adjust the *Stiffness* ring by using the `RMB` to select it and activate *Scale* mode with `S`.



Stiffness.

In (*Stiffness*), the meta ball labeled A, has a smaller *Stiffness* value than the one labeled B. As you can see, the *green ring* radius is different for each of them.

Negative Influence



Negative.

The opposite effect of a *positive* influence would be a *negative* influence: the objects repel each other. (*Negative*) shows a meta ball and a meta plane where the first is negative and the second, positive. Notice how the negative meta is not visible: only the surrounding circles appear. This is how Bforartistsindicates that the object is negative.

Moving the sphere to the plane causes the plane’s mesh to “cave in” or collapse inward. If you move the plane away from the sphere, the plane’s mesh will restore itself.

To make a meta *negative*, just select the meta in edit mode, and check *negative* in the *active element* panel.

Hiding Elements

As in *Object* mode, you can hide the selected meta(s), and then reveal what was hidden. This is very handy for cleaning your views up a bit... Note that the two red and green rings always remain visible in *Edit* mode, as well as the select circle (in *Object* mode...).

To hide the current selection, use `H`, the *Hide* toggle button in the *MetaBall tools*, or the Metaball ‣ Hide MetaElems ‣ Hide Selected menu option.

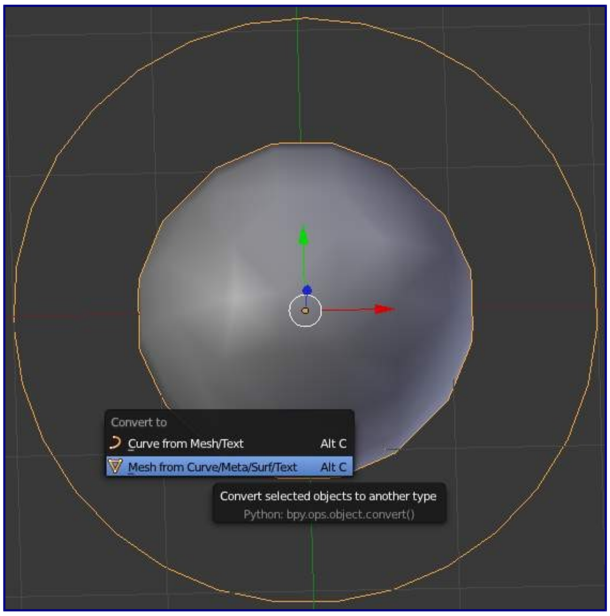
To hide everything but the current selection, press `Shift-H` or use Metaball ‣ Hide MetaElems ‣ Hide Deselected.

To reveal what was hidden, use `Alt-H`, or the relevant option in the same Metaball ‣ Hide MetaElems menu. You can also un-toggle the *Hide* button in the (*MetaBall tools* panel).

Deleting Elements

There is no *Erase* menu for metas, just a confirmation pop-up asking you if you want to delete the selected metas. Clear and simple!

Conversion



the convert menu

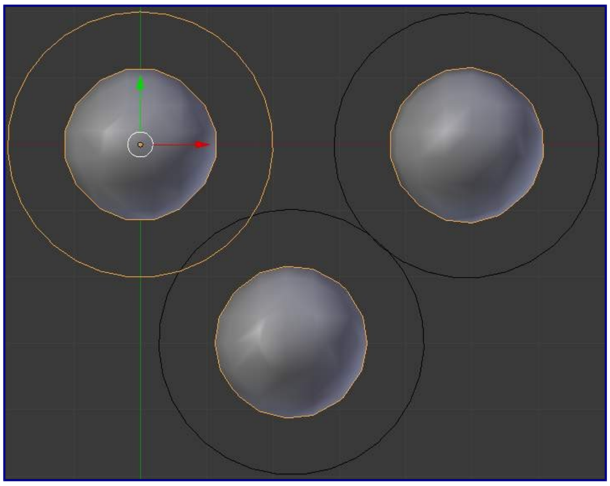
You can only convert metas to meshes, but here you have the option to keep the original *Meta* object (i.e. create a new *Mesh* one, instead of a “real” conversion...). Note that the resolution used for the new mesh is the *Wiresize* one, not the *Rendersize* one.

Object Families

Meta objects have different behavior in *Object* mode than other object types - they can be “regrouped” into so-called “families”.

A “family” is a way to regroup several meta objects, producing something very similar to having several metas inside the same object.

A family is defined by the left part of an object’s name (the one before the dot). Remember, an object’s name is the one in the *OB* field, in most panels, **not** the *MB* field, which is the meta data-block’s name... For example, the *family* part of `MetaPlane.001` is `MetaPlane`. Each meta object in the same “family” is associated with one another as discussed below.



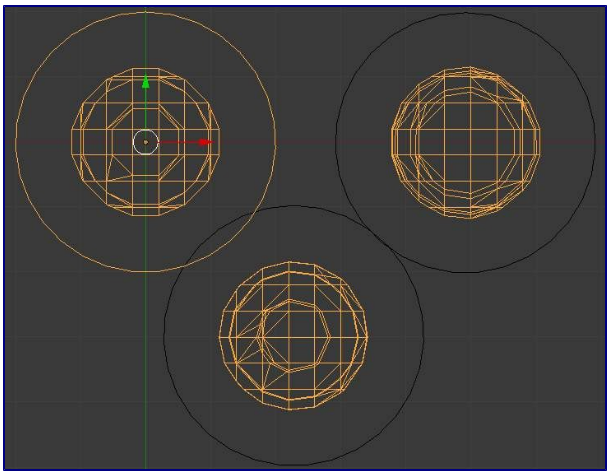
Meta ball base.

Families of metas are controlled by a *base Meta* object which is identified by an *Object* name **without** a right part. For example, if we have five metas called `MetaThing` ”, `MetaThing.001`, `MetaThing.002`, `MetaThing.003` and `MetaThing.004`, the *base Meta* object would be `MetaThing`.

The *base Meta* object determines the basis, the resolution, the threshold, *and* the transformations. It also has the material and texture area. The *base* meta is effectively the parent of (or perhaps a better word to use is “the owner of”) the other metas in the group (i.e. it is as if the other metas were “included” or joined into the base one).

Examples

(*Meta ball base*) shows the *base* meta labeled `B`. The other two *Meta* objects are *children*. Children’s selection rings are always black, while the group’s mesh is orange. Because the metas are grouped, they form a unified mesh which can always be selected by selecting the mesh of any meta in the group. For example, in the example (*Meta ball base*), only the lower sphere (the parent) has been selected, and you see that both the parent’s mesh *and* all of the children’s meshes are now highlighted.



Scaling the “base”.

The *base Meta* object controls the **polygonalization** (mesh structure) for the group, and as such, also controls the polygonalization for the children (*non-base*) metas. If we transform the *base* meta, the children’s polygonalization changes. However, if we transform the children, the polygonalization remains unchanged.

Hints

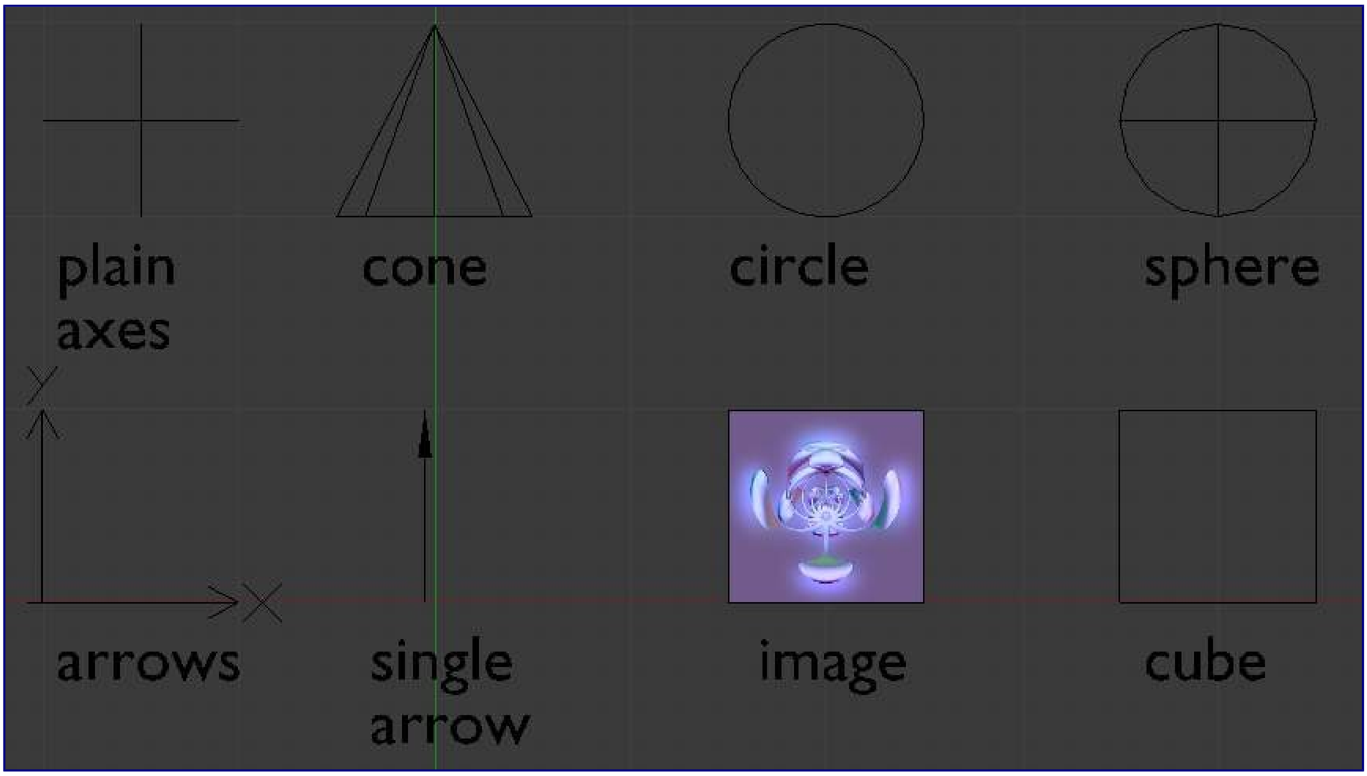
This discussion of “polygonization” *doesn’t* mean that the various meshes don’t deform towards or away from each other (meta objects always influence one another in the usual way, whether or not they are members of the same family). Rather, it means that the underlying mesh structure changes only when the *base* object transforms. For example, if you scale the *base*, the children’s mesh structure changes. In (*Scaling the “base”*), the *base* has been scaled down, which has the effect of scaling the mesh structure of each of the children. As you can see, the children’s mesh resolution has increased, while the *base* decreased. *The children did not change size!*

5.6 Modeling - Empties

Empties

The “Empty” is a null object. It contains no real Geometry, but can be used as a handle for many purposes.

Settings



Empty Draw Types.

Display

Plain Axes
Draws as six lines, initially with one pointing in each of the +X,-X,+Y,-Y,+Z,and -Z axis directions.

Arrows
Draws as arrows, initially pointing in the positive X,Y, and Z axis directions, each with a label.

Single Arrow
Draws as a single arrow, initially pointing in the +Z axis direction.

Circle
Draws as a circle initially in the XZ plane.

Cube
Draws as a cube, initially aligned to the XYZ axes.

Sphere
Draws as an implied sphere defined by 3 circles. Initially, the circles are aligned, one each, to the X, Y, and Z axes.

Cone

Draws as a cone, initially pointing in the +Y axis direction.

Image

Empties can display images. This can be used to create reference images, including blueprints or character sheets to model from, instead of using background images. The image is displayed regardless of the 3D display mode. The settings are the same as in *Background Image Settings*

Note

While alpha-images can be used, there is a known limitation with object draw order, where alphas won't always draw on top of other objects when unselected.

Size

Controls the local size of the empty. This does not change its scale, but simply resizes the shape.

Usage and functions

Empties can serve as transform handles which cannot be edited and do not render. Empties are important and useful objects. Some examples of ways to use them include: *Parent object for a group of objects*

- An Empty can be parented to any number of other objects - This gives the user the ability to control a group of objects easily, and without affecting a render.

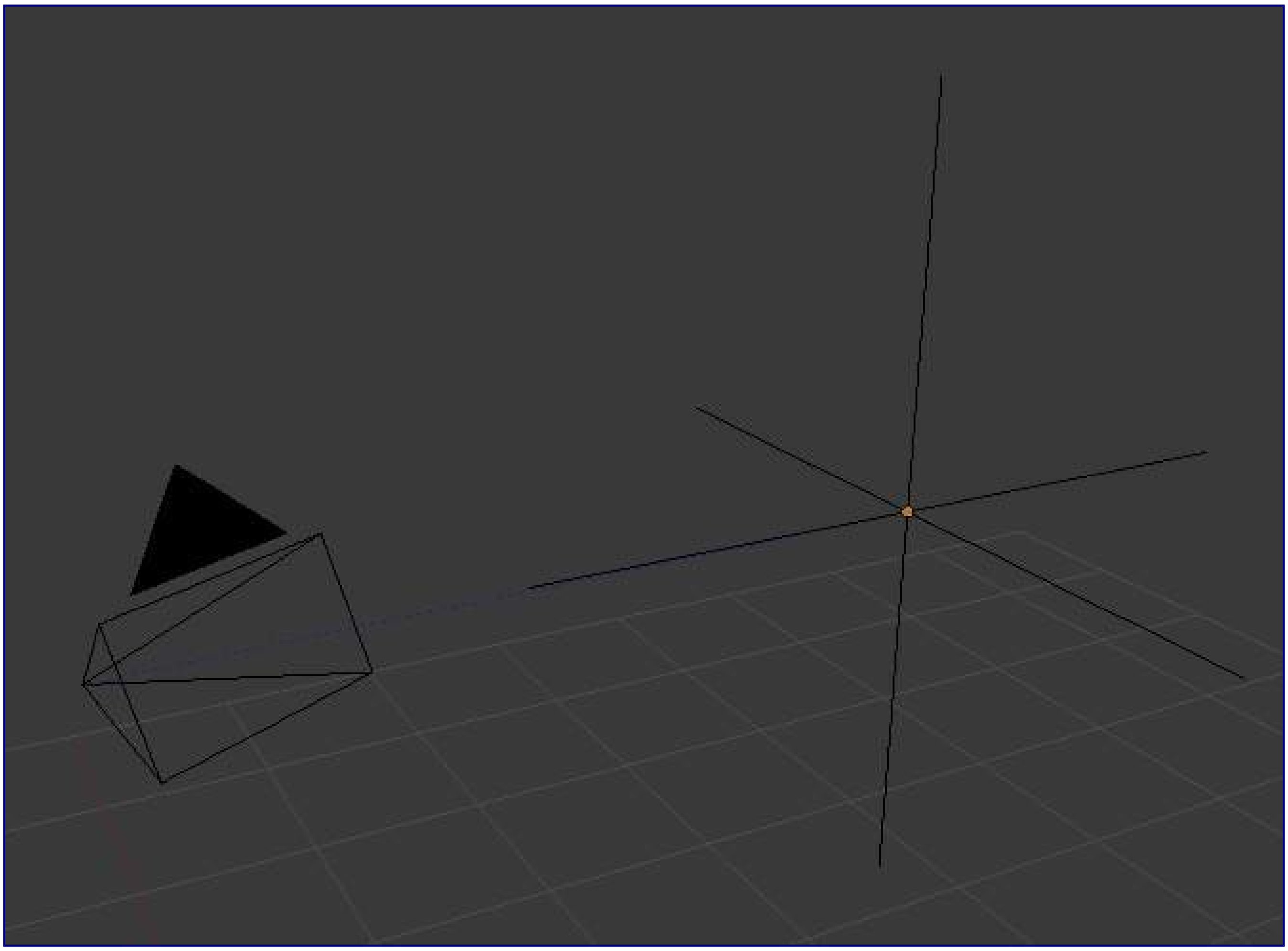
Target for constraints

- An empty can also be used as a target for normal, or bone constraints.
- This gives the user far more control; for instance, a rig can easily be set up to enable a camera to point towards an empty using the **Track to** constraint

Array offset

- An empty can be used to offset an array modifier, meaning complex deformations can be achieved by only moving a single object.

An example of an empty being used to control an array



An example of an empty being used to control the track to constraint

Other common uses.

- Placeholders
- Rigging controls
- DOF distances
- Reference Images

5.7 Modeling - Modifiers

Modifiers

Reference
Modifiers are added from the *Modifiers* context of the Properties Editor.

Modifiers

Modifiers are automatic operations that affect an object in a non-destructive way. With modifiers, you can perform many effects automatically that would otherwise be too tedious to do manually (such as subdivision surfaces) and without affecting the base geometry of your object.

They work by changing how an object is displayed and rendered, but not the geometry which you can edit directly. You can add several modifiers to a single object to form a *Modifier Stack* and *Apply* a modifier if you wish to make its changes permanent.

Modifiers menu

There are four types of modifiers:

Modify

The *Modify* group of modifiers are tools similar to the *Deform Modifiers* (see below), but which do not directly affect the shape of the object; rather they affect some other data, such as vertex groups.

Mesh Cache
Apply animated mesh data (from external file) to a mesh.
UV Project
Project UV coordinates on your mesh.
UV Warp
Dynamically edit the UV coordinates on your mesh.
Vertex Weight
Edit a vertex group of your mesh, in various ways.

Generate

The *Generate* group of modifiers are constructive tools that either change the general appearance of or automatically add new geometry to an object.

Array
Create an array out of your basic mesh and similar (repeating) shapes.

Bevel
Create a bevel on a selected mesh object.
Boolean
Combine/subtract/intersect your mesh with another one.
Build
Assemble your mesh step by step when animating.
Decimate
Reduce the polygon count of your mesh.
Edge Split
Add sharp edges to your mesh.
Mask
Allows you to hide some parts of your mesh.
Mirror
Mirror an object about one of its own axes, so that the resultant mesh is symmetrical.
Multiresolution
Sculpt your mesh at several levels of resolution.
Remesh
Can fix heavily triangulated meshes, and other issues, with careful Threshold adjustments.
Screw
Generate geometry in a helix-pattern from a simple profile. Similar to the *Screw Tool* in edit mode.
Skin
Automatically generate topology.
Solidify
Give depth to mesh faces.
Subdivision Surface
Subdivides your mesh using Catmull-Clark or Simple algorithms.
Triangulate
Converts all faces to Triangles.
Wireframe
Converts all faces into a wireframe.

Deform

The *Deform* group of modifiers only change the shape of an object without adding new geometry, and are available for meshes, and often texts, curves, surfaces and/or lattices.

Armature
Use bones to deform and animate your object.
Cast
Shift the shape of a mesh, surface or lattice to a sphere, cylinder or cuboid.
Curve
Bend your object using a curve as guide.
Displace
Deform your object using a texture.
Hook
Add a hook to your vertice(s) (or control point(s)) to manipulate them from the outside.
Laplacian Smooth
Allows you to reduce noise on a mesh’s surface with minimal changes to its shape.
Laplacian Deform
allows you to pose a mesh while preserving geometric details of the surface.
Lattice
Use a Lattice object to deform your object.

Mesh Deform
Allows you to deform your object by modifying the shape of another mesh, used as a "Mesh Deform Cage" (like when using a lattice).

Shrinkwrap
Allows you to shrink/wrap your object to/around the surface of a target mesh object.

Simple Deform
Applies some advanced deformations to your object.

Smooth
Smooth the geometry of a mesh. Similar to the *Smooth* tool in the mesh editing context.

Warp
Warp a mesh by specifying two points the mesh stretches between.

Wave
Deform your object to form (animated) waves.

Simulate

The *Simulate* group of modifiers activate simulations. In most cases, these modifiers are automatically added to the modifiers stack whenever a *Particle System* or *Physics* simulation is enabled. Their only role is to define the place in the modifier stack used as base data by the tool they represent. Generally, the attributes of these modifiers are accessible in separate panels.

Cloth
Simulates the properties of a piece of cloth. It is inserted in the modifier stack when you designate a mesh as Cloth.

Collision
Simulates a collision between objects.

Dynamic Paint
Makes an object or a particle system paint a material onto another object.

Explode
Blows up your mesh using a particle system.

Fluid
The object is part of a fluid simulation... The modifier added when you designate a mesh as Fluid.

Particle Instance
Makes an object act similar to a particle but using the mesh shape instead.

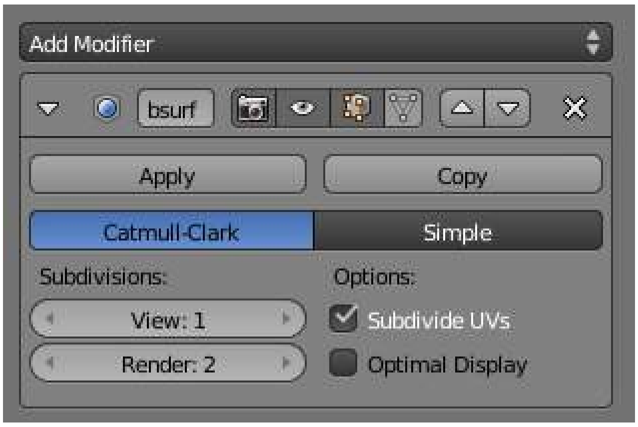
Particle System
Represents a particle system in the stack, so it is inserted when you add a particle system to the object.

Smoke
Simulates realistic smoke.

Soft Body
The object is soft, elastic... Modifier added when you designate a mesh as Softbody.

Ocean
Quickly creates a realistic, animated ocean.

Interface



Panel Layout (Subsurf as an example)

Each modifier has been brought in from a different part of Bforartists, so each has its own unique settings and special considerations. However, each modifier's interface has the same basic components, see (*Panel Layout (Subsurf as an example)*).

At the top is the *panel header*. The icons each represent different settings for the modifier (left to right):

Arrow
: Collapse modifier to show only the header and not its options.

Icon
: A quick visual reference of the modifier's type.

Name
: Every modifier has a unique name per object. Two modifiers on one object must have unique names, but two modifiers on different objects can have the same name. The default name is based off the modifier type.

Camera
: Toggles visibility of the modifier effect in the render.

Eye
: Toggles visibility of the modifier effect in the 3D view.

Box
: Displays the modified geometry in edit mode, as well as the original geometry which you can edit.

Triangle
: When enabled, the final modified geometry will be shown in edit mode and can be edited directly.

Up arrow
: Moves modifier up in the stack.

Down arrow
: Moves modifier down in the stack.

Cross
: Deletes the modifier.

Reference

The *Box* and *Triangle* icons may not be available depending on the type of modifier.

Below the header are two buttons:

Apply

Makes the modifier “real” - converts the object’s geometry to match the applied modifier, and deletes the modifier.

Copy

Creates a duplicate of the modifier at the bottom of the stack.

Reference
Applying a modifier that is not first in the stack will ignore the stack order and could produce undesired results.

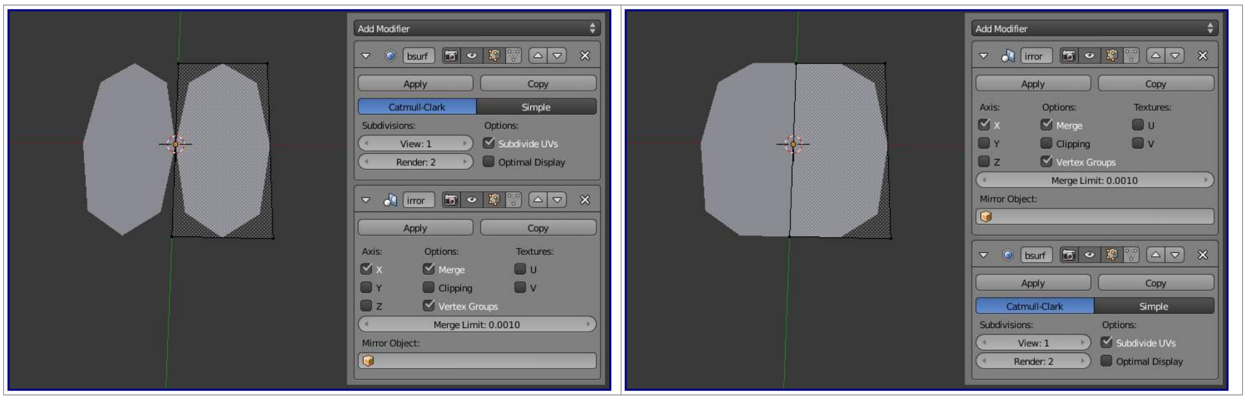
Below this header, all of the options unique to each modifier will be displayed.

The Stack

Modifiers are a series of non-destructive operations which can be applied on top of an objects geometry. They can be applied in just about any order the users chooses.

This kind of functionality is often referred to as a “modifier stack” and is also found in several other 3D applications.

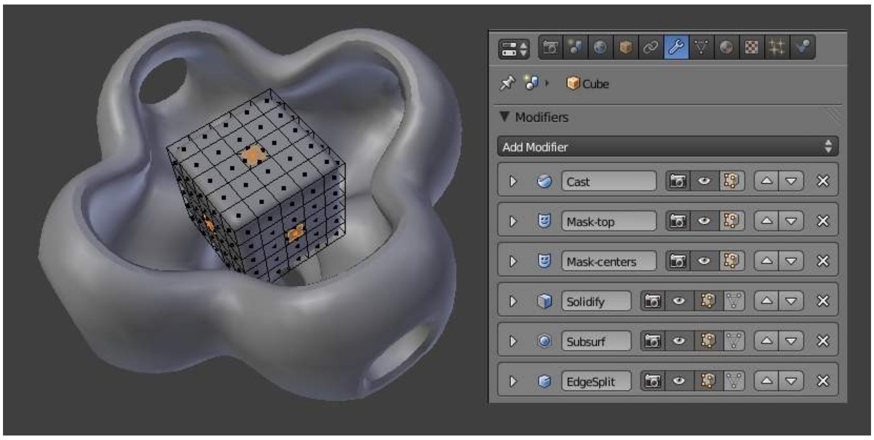
In a modifier stack the order in which modifiers are applied has an effect on the result. Fortunately modifiers can be rearranged easily by clicking the convenient up and down arrow icons. For example, the image below shows *SubSurf* and *Mirror* modifiers that have switched places.



On the left, the *Mirror* modifier is the last item in the stack and the result looks like two surfaces. On the right, the *Subsurf* modifier is the last item in the stack and the result is a single merged surface.

Modifiers are calculated from top to bottom in the stack. In this example, the desired result (on right) is achieved by first mirroring the object, and then calculating the subdivision surface.

Example

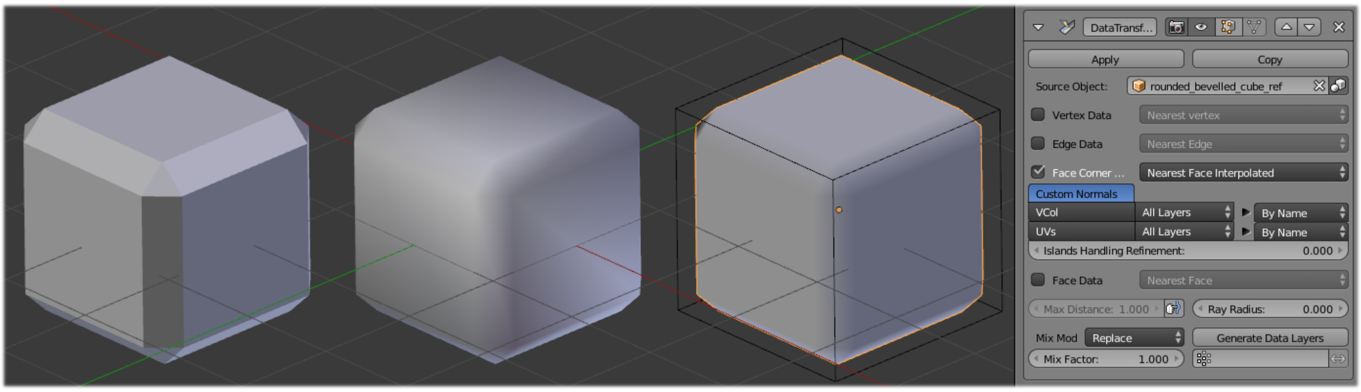


In this example a simple subdivided cube has been transformed into a rather complex object using a stack of modifiers.

Data Transfer Modifier

The **Data Transfer** modifier transfers several types of data from one mesh to another. Data types include vertex groups, UV layers, vertex colors, custom normals...

Transfer works by generating a mapping between source mesh's items (vertices, edges, etc.) and destination ones, either on a one-to-one basis, or mapping several source items to a single destination one - interpolated mapping.



From left to right, a flat-shaded beveled cube, a smooth-shaded beveled cube, and an autosmooth-shaded beveled cube copying its normals from the reference, flat-shaded cube shown as wire here, to achieve the 'fake round corners' effect.

Options

Data Transfer modifier.

Source Object

Mesh object to copy data from.

If the button to the right of the field is unset, source and destination geometries are considered in global space when generating the mapping, otherwise they are evaluated in local space (i.e. as if both object’s centers were at the same place).

Max Distance

When the icon “finger” button to the right is enabled, this is the maximum distance between source and destination to get a successful mapping. If a destination item cannot find a source one withing that range, then it will get no transfered data.

This allows to transfer a small sub-detailed mesh onto a more complete one (e.g. from a “hand” mesh towards a “full body” one).

Ray Radius

For ray-casting-based mapping methods, the radius of the cast rays. Especially important for 1D and 2D items (i.e. vertices and edges), without some width there would be nearly no ray-casting matches...

Mix Mode

Controls how destination data are affected:

All
Replaces everything in destination (note that *Mix Factor* is still used).

Above Threshold
Only replaces destination value if it’s above given threshold (*Mix Factor*). How that threshold is interpreted depends on data type, note that for boolean values this option fakes a logical AND.

Below Threshold
Only replaces destination value if it’s below given threshold (*Mix Factor*). How that threshold is interpreted depends on data type, note that for boolean values this option fakes a logical OR.

Mix, Add, Subtract, Multiply
Apply that operation, using mix factor to control how much of source or destination value to use. Only available for a few types (vertex groups, vertex colors).

Mix Factor
How much of the transfered data gets mixed into existing one (not supported by all data types).

Vertex Group
Allows per-item fine control of the mix factor. Vertex group influence can be reverted using the small “arrow” button to the right.

Generate Data Layers
This modifier cannot generate needed data layers itself. Once the set of source data to transfer is selected, this button shall be used to generate matching destination layers.

Selection of Data to Transfer

To keep the size of the modifier reasonable, the kind of items to be affected must be selected first (vertices, edges, face corners and/or faces).

Mapping Type
How is generated the mapping between those source and destination items. Each type has its own options, see Geometry Mapping below for details.

Data Types
The left column of toggle buttons, to select which data types to transfer.

Multi-layers Data Types Options
In those cases (vertex groups, vertex colors, UVs), one can select which source layers to transfer (usually, either all of them, or a single specified one), and how to affect destination (either by matching names, matching order/position, or, if a single source is selected, by specifying manually destination layer).

Islands Handling Refinement
This setting only affects UV transfer currently. It allows to avoid a given destination face to get UV coordinates from different source UV islands. Keeping it at 0.0 means no island handling at all. Typically, small values like 0.02 are enough to get good results, but if you are mapping from a very high poly source towards a very low poly destination, you may have to raise it quite significantly.

Usage

First key thing to keep in mind when using this modifier is that **it will not create destination data layers**. *Generate Data Layers* button shall always be used for this purpose, once set of source data to transfer is selected. It should also be well understood that creating those data layers on destination mesh is **not** part of the modifier stack, which means e.g. that they will remain even once the modifier is deleted, or if source data selection is modified.

Geometry Mapping

Geometry mapping is the process by which a given destination vertex/edge/... knows **which part** of the source mesh to get its data from. It is crucial to understand this topic well to get good results with this modifier.

Topology
: The simplest option, expects both meshes to have identical number of items, and match them by order (indices). Useful e.g. between meshes that were identical copies, and got deformed differently.

One-To-One Mappings

Those always select only one source item for each destination one, often based on shortest distance.

Vertices

Nearest Vertex
: Uses source's nearest vertex.

Nearest Edge Vertex
: Uses source's nearest vertex of source's nearest edge.

Nearest Face Vertex
: Uses source's nearest vertex of source's nearest face.

Edges

Nearest Vertices
: Uses source's edge which vertices are nearest from destination edge's vertices.

Nearest Edge
: Uses source's nearest edge (using edge's midpoints).

Nearest Face Edge
: Uses source's nearest edge of source's nearest face (using edge's midpoints).

Face Corners

A face corner is not a real item by itself, it's some kind of split vertex attached to a specific face. Hence both vertex (location) and face (normal, ...) aspects are used to match them together.

Nearest Corner and Best Matching Normal
: Uses source's corner having the most similar **split** normal with destination one, from those sharing the nearest source's vertex.

Nearest Corner and Best Matching Face Normal
: Uses source's corner having the most similar **face** normal with destination one, from those sharing the nearest source's vertex.

Nearest Corner of Nearest Face
: Uses source's nearest corner of source's nearest face.

Faces

Nearest Face
: Uses source's nearest face.

Best Normal-Matching:
: Uses source's face which normal is most similar with destination one.

Interpolated Mappings

Those use several source items for each destination one, interpolating their data during the transfer.

Vertices

Nearest Edge Interpolated
: Uses nearest point on nearest source's edge, interpolates data from both source edge's

vertices.

Nearest Face Interpolated

Uses nearest point on nearest source's face, interpolates data from all that source face's vertices.

Projected Face Interpolated

Uses point of face on source hit by projection of destination vertex along its own normal, interpolates data from all that source face's vertices.

Edges

Projected Edge Interpolated

This is a sampling process. Several rays are cast from along the destination's edge (interpolating both edge's vertex normals), and if enough of them hit a source's edge, all hit source edges' data are interpolated into destination one.

Face Corners

A face corner is not a real item by itself, it's some kind of split vertex attached to a specific face. Hence both vertex (location) and face (normal, ...) aspects are used to match them together.

Nearest Face Interpolated

Uses nearest point of nearest source's face, interpolates data from all that source face's corners.

Projected Face Interpolated

Uses point of face on source hit by projection of destination corner along its own normal, interpolates data from all that source face's corners.

Faces

Projected Face Interpolated

This is a sampling process. Several rays are cast from the whole destination's face (along its own normal), and if enough of them hit a source's face, all hit source faces' data are interpolated into destination one.

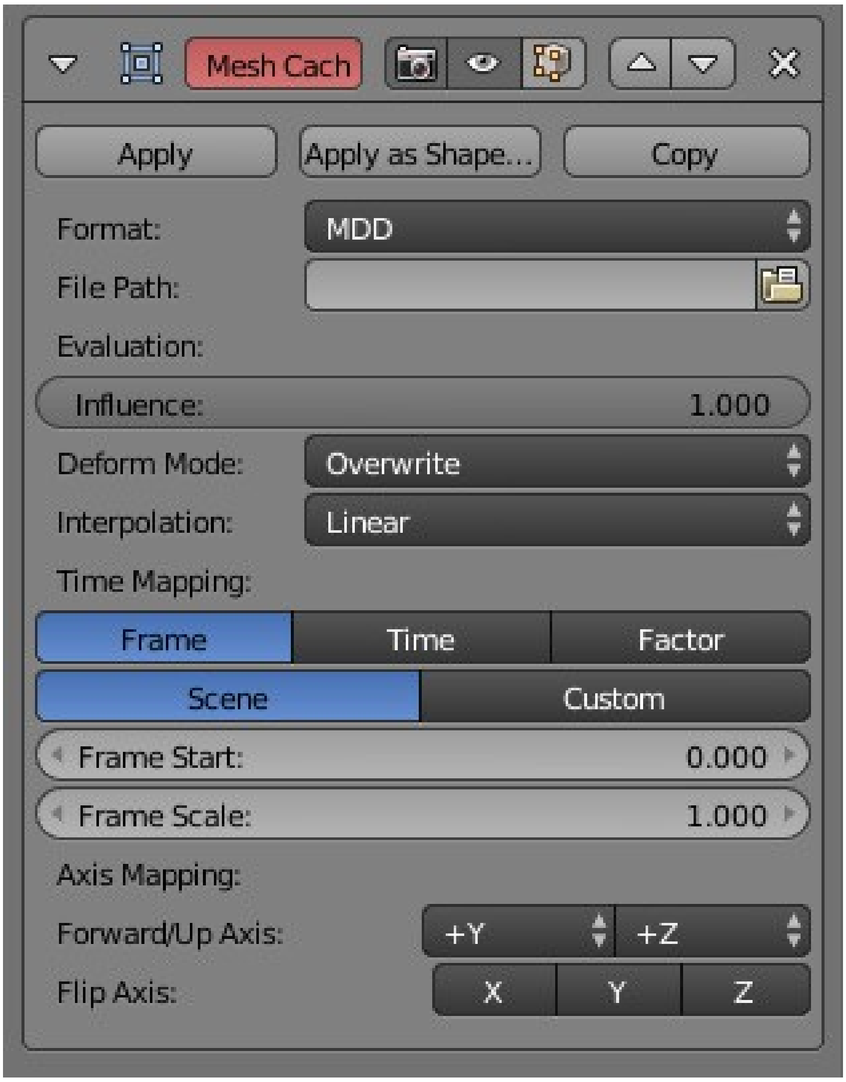
Mesh Cache Modifier

The **Mesh Cache** modifier is used so animated mesh data can be applied to a mesh and played back, deforming the mesh.

This works in a similar way to shape-keys but is aimed at playing back external files and is often used for interchange between applications.

When using this modifier, the vertex locations are overwritten.

Options



Mesh Cache modifier

Format
: The input file format (currently **MDD** and **PC2** are supported).

File Path
: Path to the cache file.

Evaluation:

Influence
: Factor to adjust the influence of the modifiers deformation, useful for blending in/out from the cache data.

Deform Mode

This setting defaults to 'Overwrite' which will replace the vertex locations with those in the cache file. However you may want to use shape-keys, for example, and mix them with the mesh-cache. In this case you can select the 'Deform' option which integrates deformations with the mesh-cache result.

> **Note**
> This feature is limited to making smaller, isolated edits and won't work for larger changes such as re-

posing limbs

Interpolation

None or Linear which will blend between frames; use linear when the frames in the cache file don't match up exactly with the frames in the blend file.

Time Mapping:

Time Mode

Select how time is calculated.

Frame

Allows you to control the frames, which will ignore timing data in the file but is often useful since it gives simple control.

Time

Evaluates time in seconds, taking into account timing information from the file (offset and frame-times).

Factor

Evaluates the entire animation as a value from [0 - 1].

Play Mode

Select how playback operates.

Scene

Use the current frame from the scene to control playback.

Frame Start

Play the cache starting from this frame.

Frame Scale

Scale time by this factor (applied after the start value).

Custom

Control animation timing manually.

Evaluation Value

Property used for animation time, this gives more control of timing - typically this value will be animated.

Axis Mapping:

Forward/Up Axis

The axis for forward and up used in the source file. *Often different applications have different axis defaults for up/down front/back, so it's common to have to switch these on import.*

Flip Axis

In rare cases you may also need to flip the coordinates on an axis.

Hints

- Both MDD and PC2 depend on the vertex order on the mesh remaining unchanged; this is a limitation with the method used so take care not to add/remove vertices once this modifier is used.

Array Modifier

The Array modifier creates an array of copies of the base object, with each copy being offset from the previous one in any of a number of possible ways. Vertices in adjacent copies can be merged if they are nearby, allowing smooth *subsurf* frameworks to be generated.

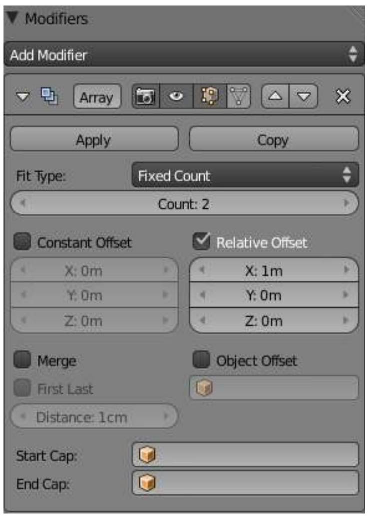
This modifier can be useful when combined with tileable meshes for quickly developing large scenes. It is also useful for creating complex repetitive shapes.

Multiple array modifiers may be active for an object at the same time (e.g. to create complex three dimensional constructs).

Options

Fit Type menu

Controls how the length of the array is determined. There are three choices, activating respectively the display of the *Curve*, *Length* or *Count* settings explained below:.



Fit Curve
: Generates enough copies to fit within the length of the curve object specified in *Curve*.

Fit Length
: Generates enough copies to fit within the fixed length given by *Length*.

Fixed Count
: Generates the number of copies specified in *Count*.

Curve
: The Curve object to use for *Fit Curve*.

Length
: The length to use for *Fit Length*.

Count
: The number of duplicates to use for *Fixed Count*.

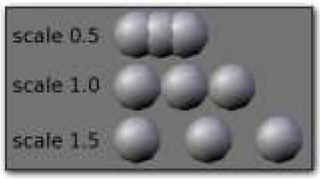
Note

- Both *Fit Curve* and *Fit Length* use the local coordinate system size of the base object, which means that scaling the base object in *Object* mode will not change the number of copies generated by the *Array* modifier.
- *Fit Length* uses the local coordinate system length of the curve, which means that scaling the curve in *Object* mode will not change the number of copies generated by the *Array* modifier.
- Applying the scale with `Ctrl-A` can be useful for each one.

Constant Offset, X, Y, Z

Adds a constant translation component to the duplicate object's offset. X, Y and Z constant components can be specified.

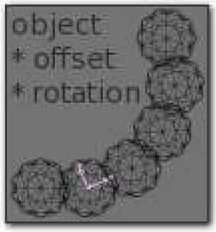
Relative Offset, X, Y, Z



Relative offset example.

Adds a translation equal to the object's bounding box size along each axis, multiplied by a scaling factor, to the offset. X, Y and Z scaling factors can be specified.

Object Offset



Object offset example.

Adds a transformation taken from an object (relative to the current object) to the offset. It is good practice to use an Empty object centered or near to the initial object. E.g. by rotating this Empty a circle or helix of objects can be created.

Merge

If enabled, vertices in each copy will be merged with vertices in the next copy that are within the given *Distance*.

First Last

If enabled **and** *Merge* is enabled, vertices in the first copy will be merged with vertices in the last copy (this is useful for circular objects).

First Last merge example.

	
Subsurf discontinuity caused by not merging vertices between first and last copies (*First Last* off).	Subsurf discontinuity eliminated by merging vertices between first and last copies (*First Last* on).

Distance

Controls the merge distance for *Merge*.

Start Cap / End Cap

This allows either endpoints of the array to have a different mesh subsisted.

For the *start*: as if it was in position `-1`, i.e. one “array step” before the first “regular” array copy. For the *end*: as if it was in position `n+1`, i.e. one “array step” after the last “regular” array copy.

When *Merge* is activated, and the *cap* vertices are within the distance threshold, they will be merged.

Note
The start/end cap objects currently don’t support the *First Last* option.

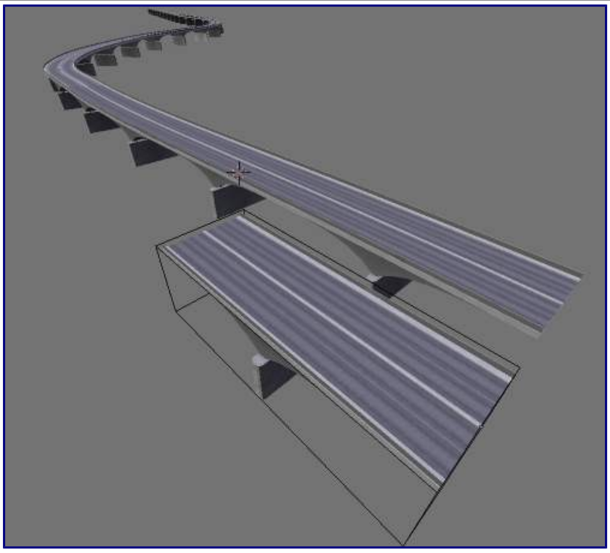
Hints

Offset Calculation

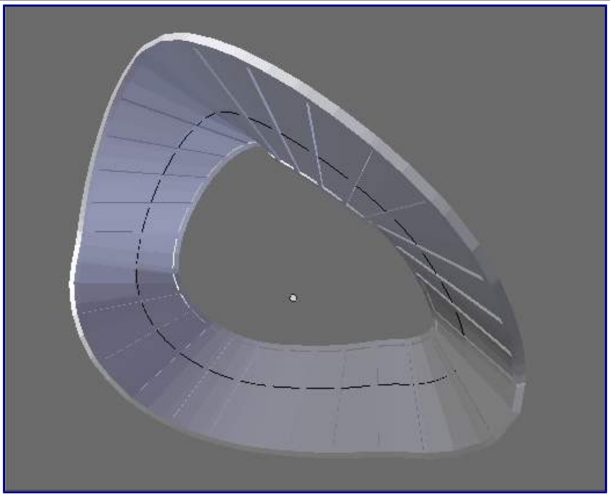
The transformation applied from one copy to the next is calculated as the sum of the three different components (*Relative*, *Constant* and *Object*), all of which can be enabled/disabled independently of the others. This allows, for example, a relative offset of `1.0, 0.0, 0.0` and a constant offset of `0.1, 0.0, 0.0`, giving an array of objects neatly spaced along the X axis with a constant `0.1` units between them, whatever the original object’s size.

Examples

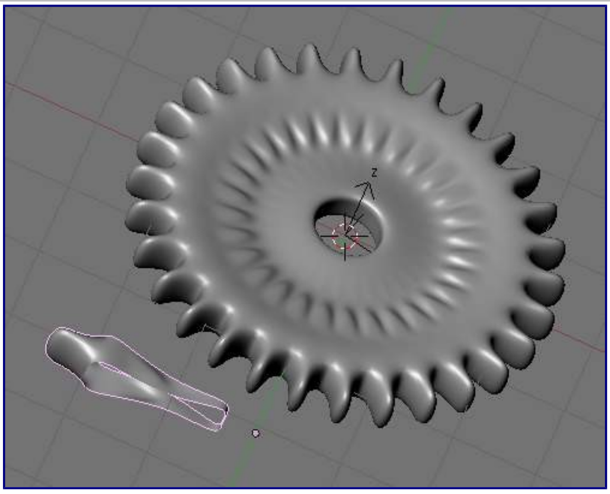
Mechanical



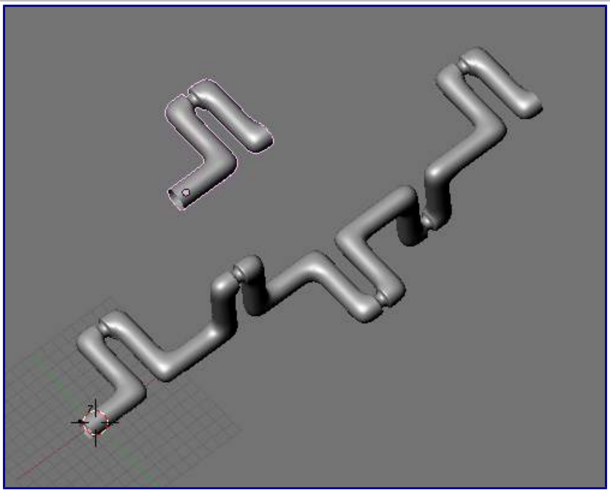
A bridge made from a tileable mesh.



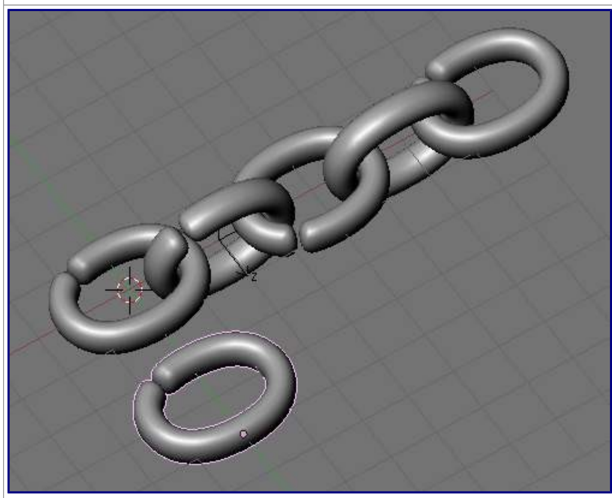
A track. Sample blend file



A cog created from a single segment. Blend



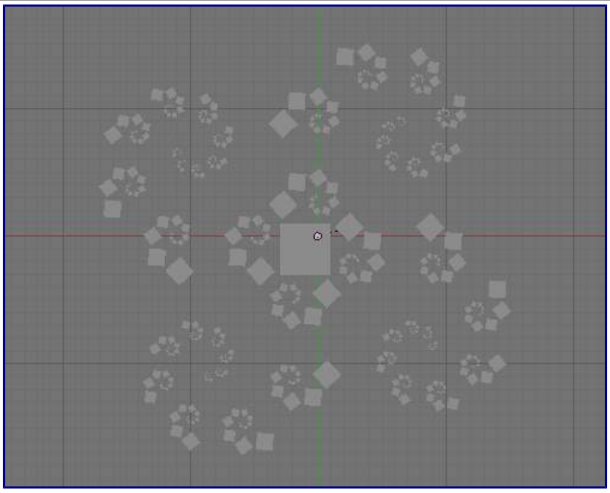
A crankshaft. Sample blend file



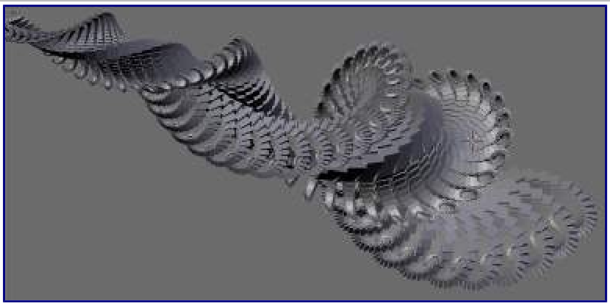
A chain created from a single link. Sample blend file

Fractal

Multi-level array animated with motion blur.



Fractal created with multiple arrays. Blend



A fractal fern image created with 2 array modifiers and 1 mirror applied to a cube.

Organic

Fig 01

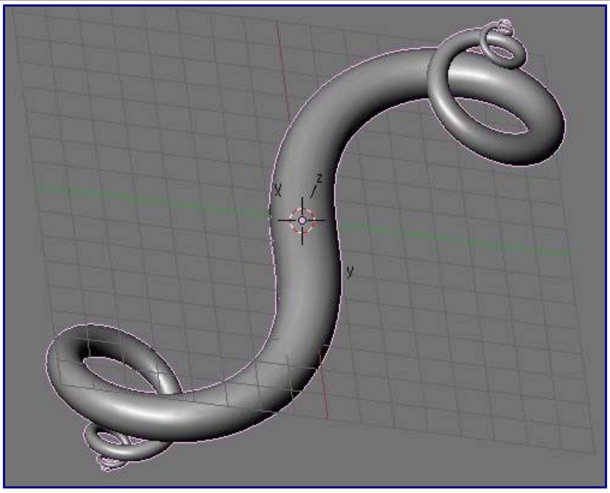


Fig 02

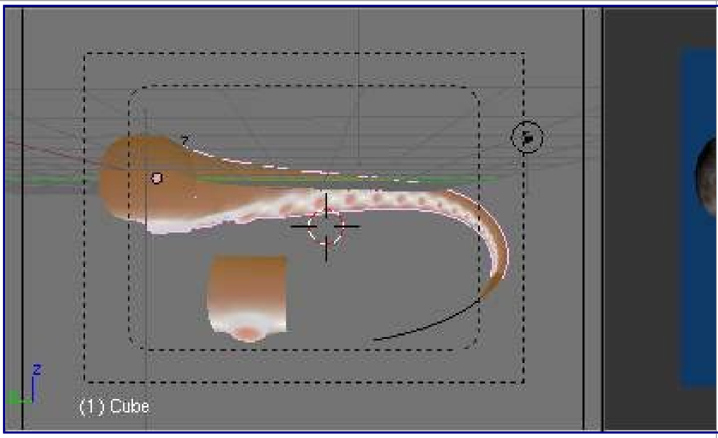


Fig 03

Fig 01

Subsurfed cube array with 1 object offset, 4 cubes and a high vertex merge setting to give the effect of skinning.

Fig 02

A double spiral created with two array modifiers and one subsurf modifier applied to a cube. As above, the vertex merge threshold is set very high to give the effect of skinning. Sample blend file

Fig 03

A tentacle created with an Array modifier followed by a Curve modifier. The segment in the foreground is the base mesh for the tentacle; the tentacle is capped by two specially-modeled objects deformed by the same Curve object as the main part of the tentacle. Sample blend file

Tutorials

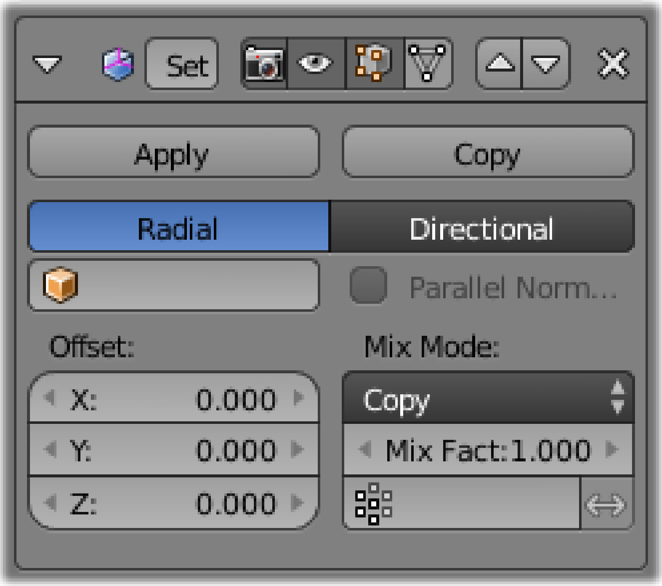
- Neal Hirsig’s Array Modifier Screencast on Vimeo
- Creating A Double Helix With Modifiers

The ‘Double Helix’ tutorial explains the Array modifier. It is for an old Bforartists Version (2.44) but except for the keyboard shortcuts it is still valid.

Normal Edit Modifier

The **Normal Edit** modifier affects (or generates) custom normals. It uses a few simple parametric methods to compute normals (quite useful in game development and architecture areas), and mixes back those generated normals with existing ones.

Options



Normal Edit modifier.

Radial/Directional

The two modes currently available to generate normals.

Radial aligns normals with the (origin, vertex coordinates) vector, in other words all normals seems to radiate from the given center point, as if they were emitted from an ellipsoid surface.

Directional makes all normals point (converge) towards a given target object.

Target Object

Uses this object's center as reference point when generating normals.

Optional in *Radial* mode, mandatory in *Directional* one.

Parallel Normals

Makes all normals parallel to the line between both objects' centers, instead of converging towards target's center.

Only relevant in *Directional* mode

Offset

Gives modified object's center an offset before using it to generate normals.

Only relevant in *Radial* mode if no *Target Object* is set, and in *Directional* mode when *Parallel Normals* is set.

Mix Mode

How to affect existing normals with newly generated ones.

Note the *Multiply* option is **not** a cross product, but a mere component-by-component multiplication.

Mix Factor
: How much of the generated normals get mixed into existing ones.

Vertex Group
: Allows per-item fine control of the mix factor. Vertex group influence can be reverted using the small “arrow” button to the right.

Usage

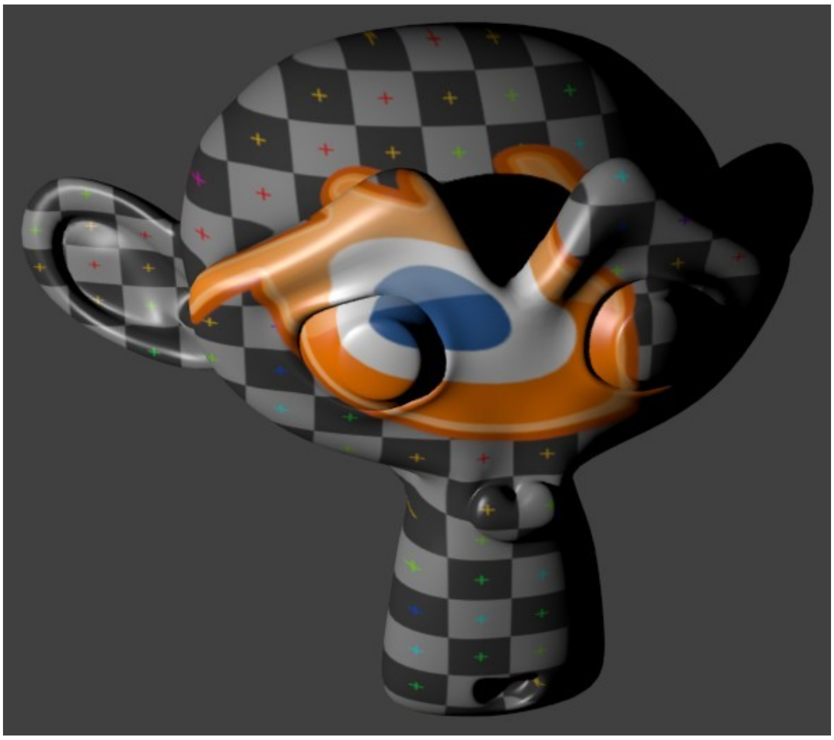
This modifier can be used to quickly generate radial normals for low-poly tree foliage, or “fix” shading of toon-like rendering by partially bending default normals...

The only mandatory prerequisite to use it is to enable *Auto Smooth* option in Mesh properties, *Normals* panel.

Tip

More complex normal manipulations can be achieved by copying normals from one mesh to another, see the *Data Transfer modifier*.

UV Project Modifier

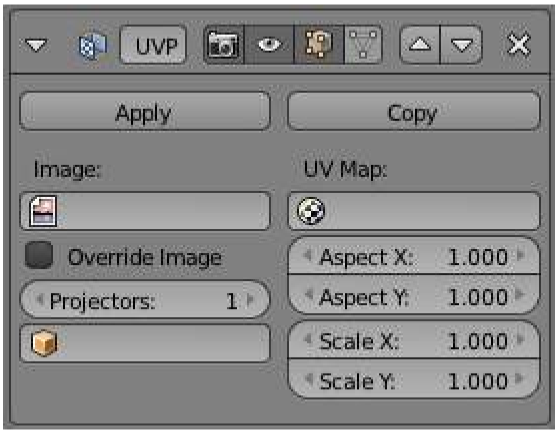


Projecting the Bforartists logo onto Suzanne.

The **UV Project** Modifier acts like a slide projector. It emits a UV map from the negative Z-axis of a controller object (such as an *empty*), and applies it to the object as the “light” hits it. It can optionally override the objects face texture.

Download an example

Options



UV layer
: Which UV layer to modify. Defaults to the active rendering layer.

Image
: The image associated with this modifier. Not required; you can just project a UV for use elsewhere. *Override Image*, below, defines how the image is used.

Override Image
- When true, the Face Texture of all vertices on the mesh is replaced with the Image. This will cause the image to repeat, which is usually undesirable.
- When false, the modifier is limited to faces with the Image as their Face Texture.

Projectors
: Up to ten projector objects are supported. Each face will choose the closest and aligned projector with it's surface normal. Projections emit from the negative Z-axis (i.e. straight down a camera or lamp). If the projector is a camera, the projection will adhere to its perspective/orthographic setting.

Objects
: Specify the projector Object

Aspect X/Y and Scale X/Y
: These allow simple manipulation of the image. Only apply when a camera is used as projector Object.

Usage

General

UV Project is great for making spotlights more diverse, and also for creating decals to break up repetition.

The modifier's Image property is not generally used - instead, a texture mapped to the UV layer that the modifier targets is added to the object's Material. This allows you to prevent the image from repeating by setting *Texture –> Image Mapping –> Extension* to *Clip*.

Perspective Cameras

When using perspective cameras or spot lamps, you will likely want to enable the **UV Project** Material Option (available in the materials panel), This uses a different UV interpolation to prevent distortion.

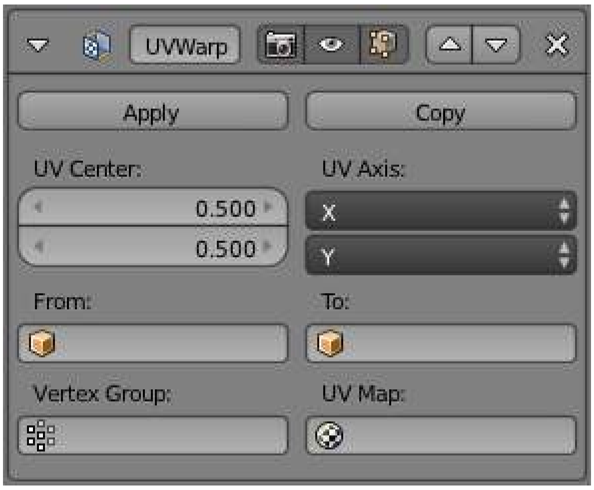
Note
This option is not yet available for Cycles

UV Warp Modifier

The **UV Warp** modifier uses two objects to define a transformation which is applied to the chosen UV coordinates.

Its purpose is to give you direct control over the object’s UVs in the 3D View, allowing you to directly translate, rotate and scale existing UV coordinates using controller objects or bones.

Options



UV Center
: The center point of the UV map to use when applying scale or rotation. With (0, 0) at the bottom left and (1, 1) at the top right. Defaults to (0.5, 0.5).

UV Axis
: The axes to use when mapping the 3D coordinates into 2D.

From/To
: The two objects used to define the transformation. See *Usage* below.

Vertex Group
: The vertex group can be used to scale the influence of the transformation per-vertex.

UV Map
: Which UV map to modify. Defaults to the active rendering layer.

Usage

How the UVs are warped is determined by the difference between the transforms (location, rotation and scale) of the *from* and *to* objects.

If the *to* object has the same transforms as the *from* object, the UVs will not be changed.

Assuming the *UV Axis* of the modifier is X/Y and the scale of the objects are (1, 1, 1), if the *to* object is one unit away from the *from* object on the X-axis, the UVs will be transformed on the U-axis (horizontally) by one full UV space (the entire width of the image)

Vertex Weight Modifiers

The Vertex Weight modifiers work on a vertex group of the affected object, by modifying its weights and/or which vertices belong to the vertex group.

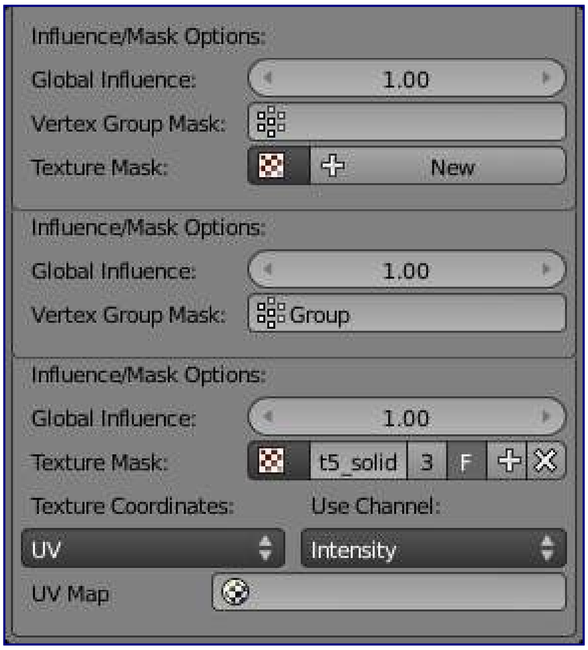
Warning

These modifiers do implicit clamping of weight values in the standard `[0.0, 1.0]` range. All values below `0.0` will be set to `0.0`, and all values above `1.0` will be set to `1.0`.

There are currently three Vertex Weight modifiers:

- Vertex Weight Edit Modifier
- Vertex Weight Mix Modifier
- Vertex Weight Proximity Modifier

Common Settings



The influence/masking part of Vertex Weight modifiers.

The three Vertex Weight modifiers share a few settings, controlling their influence on the affected vertex group.

Global Influence

The overall influence of the modifier (`0.0` will leave the vertex group's weights untouched, `1.0` is standard influence).

Warning

Influence only affects weights, adding/removing of vertices to/from vertex group is not prevented by setting this value to `0.0`.

Vertex Group Mask
An additional vertex group, the weights of which will be multiplied with the global influence value for each vertex. If a vertex is not in the masking vertex group, its weight will be not be affected.

Texture

An additional texture, the values of which will be multiplied with the global influence value for each vertex.

This is a standard texture *data-block* control. When set, it reveals other settings:

Texture Coordinates

How the texture is mapped to the mesh.

Local
Use local vertex coordinates.

Global
Use vertex coordinates in global space.

Object
Use vertex coordinates in another object's space.

UV
Use a UV layer's coordinates.

Use Channel

Which channel to use as weight factor source/

Red/Green/Blue/Alpha
One of the color channels' values.

Intensity
The average of the RGB channels (If RGB = `1.0, 0.0, 0.0`, value is `0.33`)

Value
The highest value of the RGB channels (If RGB = `1.0, 0.0, 0.0`, value is `1.0`)

Hue
Uses the hue value from the standard color wheel (e.g. blue has a higher hue value than yellow)

Saturation
Uses the saturation value (e.g. pure red's value is `1.0`, gray is `0.0`)

Note

All of the channels above are gamma corrected, except for *Intensity*.

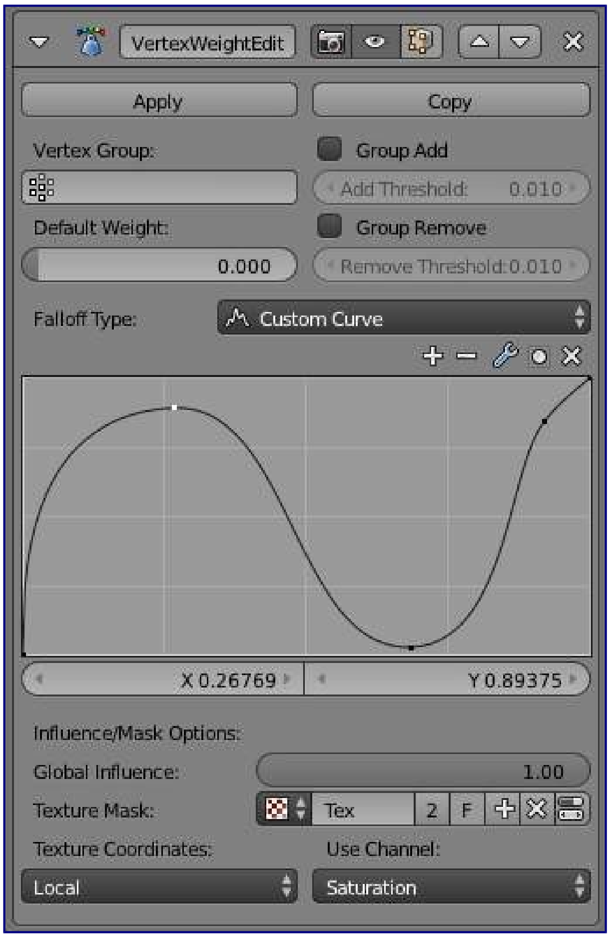
Object
The object to be used as reference for *Object* mapping.

UV Layer
The UV layer to be used for *UV* mapping.

Viewing Modified Weights

You can view the modified weights in *Weight Paint* mode. This also implies that you'll have to disable the Vertex Weight modifiers if you want to see the original weights of the vertex group you are editing.

Vertex Weight Edit Modifier



The Vertex Weight Edit modifier panel.

This modifier is intended to edit the weights of one vertex group.

The general process is the following, for each vertex:

- [Optional] It does the mapping, either through one of the predefined functions, or a custom mapping curve.
- It applies the influence factor, and optionally the vertex group or texture mask (`0.0` means original weight, `1.0` means fully mapped weight).
- It applies back the weight to the vertex, and/or it might optionally remove the vertex from the group if its weight is below a given threshold, or add it if it's above a given threshold.

Options

Vertex Group
The vertex group to affect.
Default Weight
The default weight to assign to all vertices not in the given vertex group.
Falloff Type

Type of mapping:

Linear
: No mapping.

Custom Curve
: Allows the user to manually define the mapping using a curve.

Sharp, Smooth, Root and Sphere
: These are classical mapping functions, from spikiest to roundest.

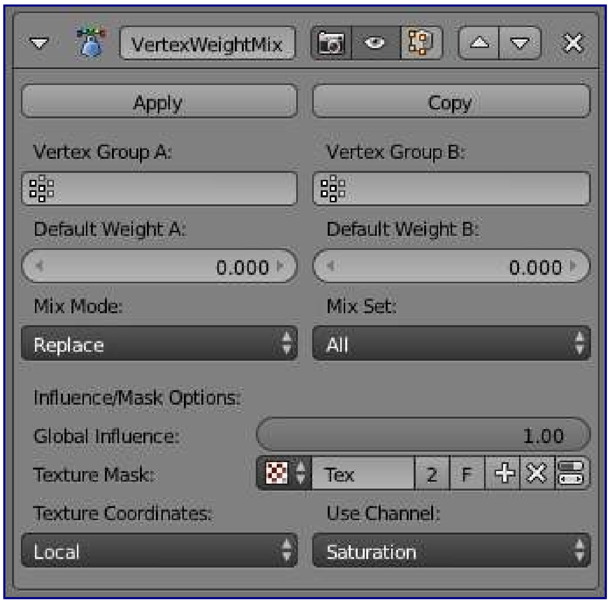
Random
: Uses a random value for each vertex.

Median Step
: Creates binary weights (`0.0` or `1.0`), with `0.5` as cutting value.

Group Add
: Adds vertices with a final weight over *Add Threshold* to the vertex group.

Group Remove
: Removes vertices with a final weight below *Remove Threshold* from the vertex group.

Vertex Weight Mix Modifier



The Vertex Weight Mix modifier panel.

This modifier mixes a second vertex group (or a simple value) into the affected vertex group, using different operations.

Options

Vertex Group A
: The vertex group to affect.

Default Weight A
: The default weight to assign to all vertices not in the given vertex group.

Vertex Group B
: The second vertex group to mix into the affected one. Leave it empty if you only want to mix in a simple value.

Default Weight B
: The default weight to assign to all vertices not in the given second vertex group.

Mix Mode

How the vertex group weights are affected by the other vertex group’s weights.

Replace weights
: Replaces affected weights with the second group’s weights.

Add to weights
: Adds the values of *Group B* to *Group A*.

Subtract from weights
: Subtracts the values of *Group B* from *Group A*.

Multiply weights
: Multiplies the values of *Group B* with *Group A*.

Divide weights
: Divides the values of *Group A* by *Group B*.

Difference
: Subtracts the smaller of the two values from the larger.

Average
: Adds the values together, then divides by 2.

Mix Set

Choose which vertices will be affected.

All vertices
: Affects all vertices, disregarding the vertex groups content.

Vertices from group A
: Affects only vertices belonging to the affected vertex group.

Vertices from group B
: Affects only vertices belonging to the second vertex group.

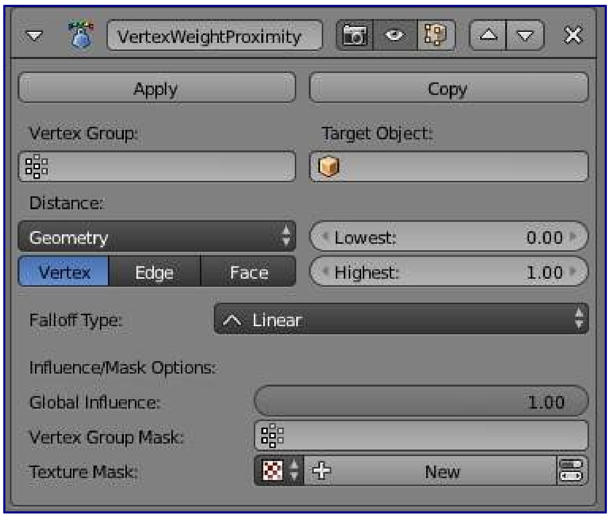
Vertices from one group
: Affects only vertices belonging to at least one of the vertex groups.

Vertices from both groups
: Affects only vertices belonging to both vertex groups.

Warning

When using *All vertices*, *Vertices from group B* or *Vertices from one group*, vertices might be added to the affected vertex group.

Vertex Weight Proximity Modifier



The Vertex Weight Proximity modifier panel.

This modifier sets the weights of the given vertex group, based on the distance between the object (or its vertices), and another target object (or its geometry).

Options

Vertex Group
: The vertex group to affect.

Target Object
: The object from which to compute distances.

Proximity mode

Object Distance
: Use the distance between the modified mesh object and the target object as weight for all vertices in the affected vertex group.

Geometry Distance
: Use the distance between each vertex and the target object, or its geometry.

The *Geometry Distance* mode has three additional options, *Vertex*, *Edge* and *Face*. If you enable more than one of them, the shortest distance will be used. If the target object has no geometry (e.g. an empty or camera), it will use the location of the object itself.

Vertex
: This will set each vertex's weight from its distance to the nearest vertex of the target object.

Edge
: This will set each vertex's weight from its distance to the nearest edge of the target object.

Face
: This will set each vertex's weight from its distance to the nearest face of the target object.

Lowest
: Distance mapping to `0.0` weight.

Highest
: Distance mapping to `1.0` weight.

Falloff Type
: Some predefined mapping functions, see Vertex Weight Edit Modifier.

Tip

Lowest can be set above *Highest* to reverse the mapping.

Examples

Using Distance from a Target Object

As a first example, let’s dynamically control a *Wave* modifier with a modified vertex group.

Add a *Grid* mesh, with many vertices (e.g. a **100×100** vertices), and `10` BU side-length. Switch to *Edit* mode (`Tab`), and in the *Object Data* properties, *Vertex Groups* panel, add a vertex group. Assign to it all your mesh’s vertices (with e.g. a `1.0` weight). Go back to *Object* mode.

Then, go to the *Modifiers* properties, and add a *Vertex Weight Proximity* modifier. Set the mode to *Object Distance*. Select your vertex group, and the target object you want (here I used the lamp).

You will likely have to adjust the linear mapping of the weights produced by the *Vertex Weight Proximity* modifier. To do so, edit *Lowest Dist* and *Highest Dist* so that the first corresponds to the distance between your target object and the vertices you want to have lowest weight, and similarly with the second and highest weight...

Now add a *Wave* modifier, set it to your liking, and use the same vertex group to control it.

Animate your target object, making it move over the grid. As you can see, the waves are only visible around the reference object! Note that you can insert a *Vertex Weight Edit* modifier before the *Wave* one, and use its *Custom Curve* mapping to get larger/narrower “wave influence’s slopes”.

Using Distance from a Target Object’s Geometry

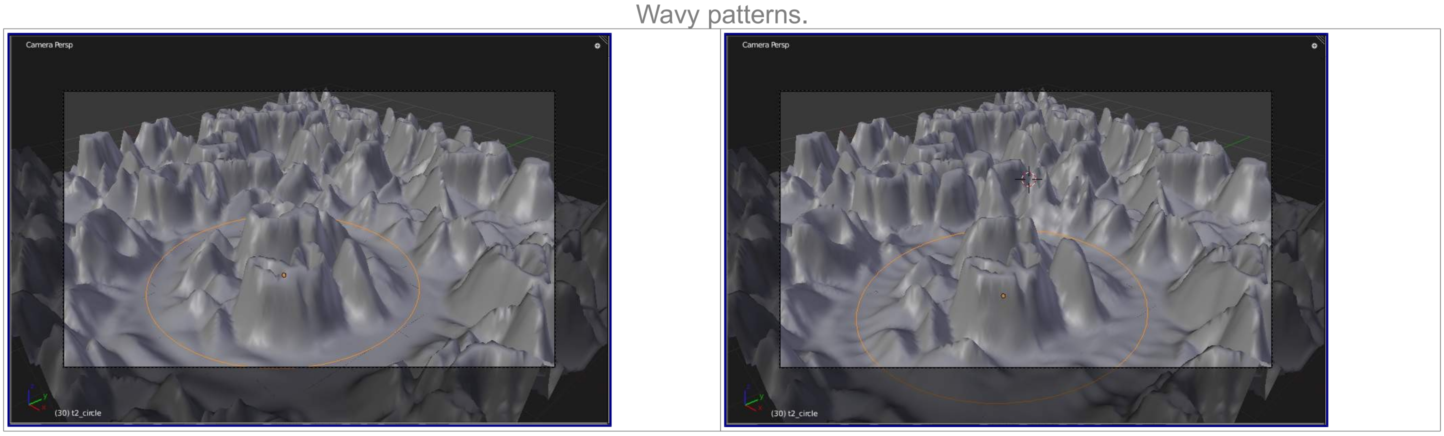
We’re going to illustrate this with a *Displace* modifier.

Add a **10×10** BU **100×100** vertices grid, and in *Edit* mode, add to it a vertex group containing all of its vertices, as above. You can even further sub-divide it with a first *Subsurf* modifier.

Now add a curve circle, and place it `0.25` BU above the grid. Scale it up a bit (e.g. `4.0`).

Back to the grid object, add to it a *Vertex Weight Proximity* modifier, in *Geometry Distance* mode. Enable *Edge* (if you use *Vertex* only, and your curve has a low U definition, you would get wavy patterns, see (*Wavy patterns*)).

Wavy patterns.



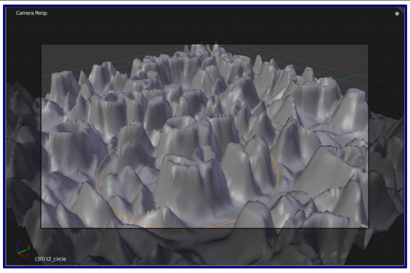
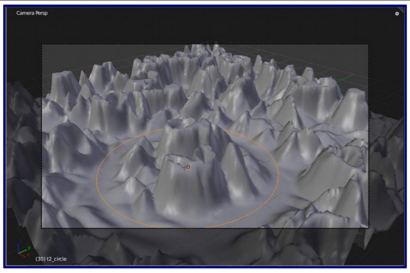
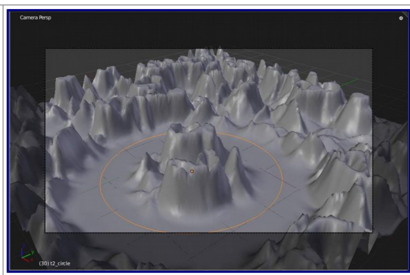
Distance from edges.	Distance from vertices.

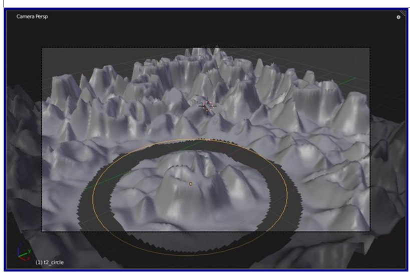
Set the *Lowest Dist* to `0.2`, and the *Highest Dist* to `2.0`, to map back the computed distances into the regular weight range.

Add a third *Displace* modifier and affect it the texture you like. Now, we want the vertices of the grid nearest to the curve circle to remain undisplaced. As they will get weights near zero, this means that you have to set the *Midlevel* of the displace to `0.0`. Make it use our affected vertex group, and that's it! Your nice mountains just shrink to a flat plane near the curve circle.

As in the previous example, you can insert a *Vertex Weight Edit* modifier before the *Displace* one, and play with the *Custom Curve* mapping to get a larger/narrower "valley"...

Curve Map variations.

 Concave-type mapping curve.	 No mapping curve (linear).	 Convex-type mapping curve.



Vertices with a computed weight below 0.1 removed from the vertex group.

You can also add a fifth *Mask* modifier, and enable *Vertex Weight Edit* 's *Group Remove* option, with a *Remove Threshold* of `0.1`, to see the bottom of your valley disappear.

https://vimeo.com/30188564

The Bforartists file, `TEST_2` scene.

Using a Texture and the Mapping Curve

Here we are going to create a sort of strange alien wave (yes, another example with the *Wave* modifier... but it's a highly visual one; it's easy to see the vertex group effects on it...).

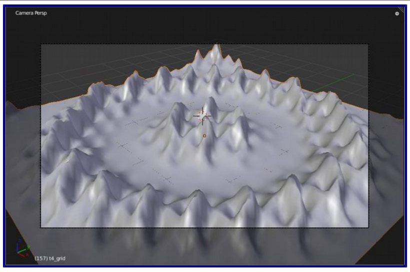
So as above, add a **100×100** grid. This time, add a vertex group, but without assigning any vertex to it - we'll do this dynamically.

Add a first *Vertex Weight Mix* modifier, set the *Vertex Group A* field with a *Default Weight A* of `0.0`, and set *Default Weight B* to `1.0`. Leave the *Mix Mode* to *Replace weights*, and select *All vertices* as *Mix Set*. This way, all vertices are affected. As none are in the affected vertex group, they all have a default weight of `0.0`, which is replaced by the second default weight (`1.0`). And all those vertices are also added to the affected vertex group.

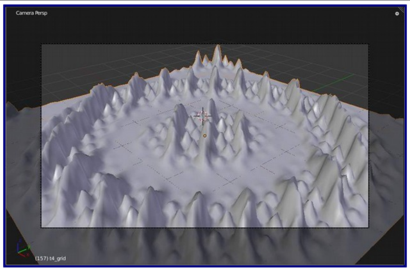
Now, select or create a masking texture - here I chose a default *Magic* one. The values of this texture will control how much of the “second weight” (`1.0`) replaces the “first weight” (`0.0`)... In other words, they are taken as weight values!

You can then select which texture coordinates and channel to use. Leave the mapping to the default *Local* option, and play with the various channels...

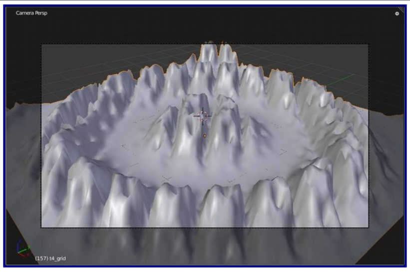
Texture channel variations.



Using intensity.



Using Red.



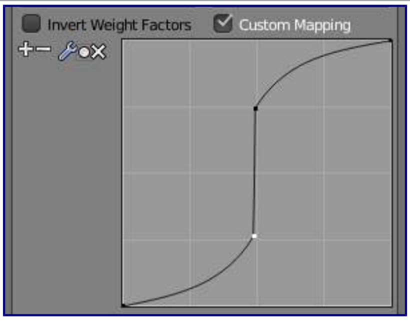
Using Saturation.

Don’t forget to add a *Wave* modifier, and select your vertex group in it!

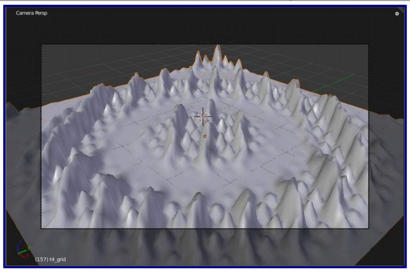
You can use the weights created this way directly, but if you want to play with the curve mapping, you must add the famous *Vertex Weight Edit* modifier, and enable its *Custom Curve* mapping.

By default, it’s a one-to-one linear mapping - in other words, it does nothing! Change it to something like in (*A customized mapping curve*), which maps `[0.0, 0.5]` to `[0.0, 0.25]` and `[0.5, 1.0]` to `[0.75, 1.0]`, thus producing nearly only weights below `0.25`, and above `0.75` : this creates great “walls” in the waves...

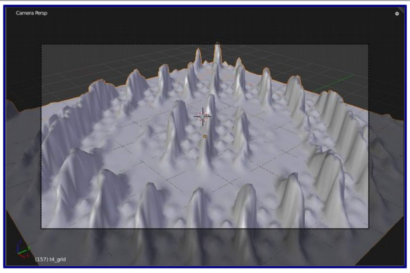
Custom mapping curve.



A customized mapping curve.



Custom Mapping disabled.



Custom Mapping enabled.

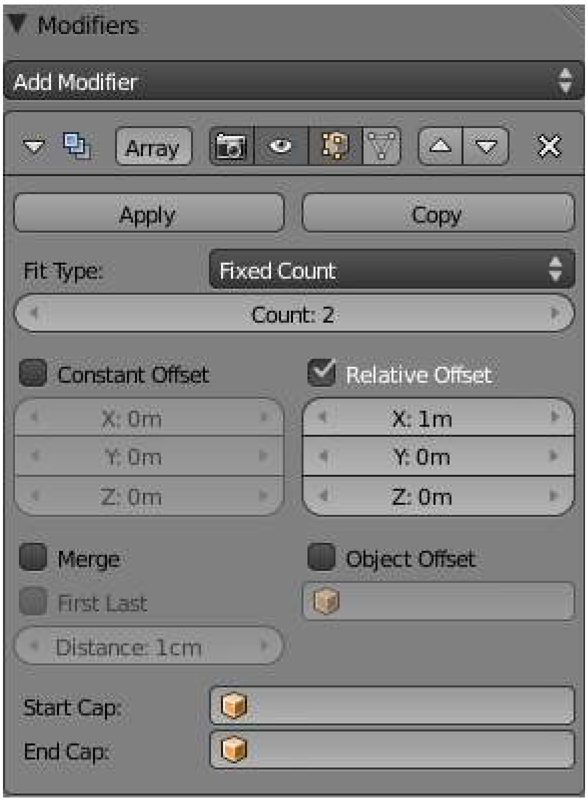
Array Modifier

The Array modifier creates an array of copies of the base object, with each copy being offset from the previous one in any of a number of possible ways. Vertices in adjacent copies can be merged if they are nearby, allowing smooth *subsurf* frameworks to be generated.

This modifier can be useful when combined with tileable meshes for quickly developing large scenes. It is also useful for creating complex repetitive shapes.

Multiple array modifiers may be active for an object at the same time (e.g. to create complex three dimensional constructs).

Options



Array modifier.

Fit Type menu

Controls how the length of the array is determined. There are three choices, activating respectively the display of the *Curve*, *Length* or *Count* settings explained below:.

Fit Curve
Generates enough copies to fit within the length of the curve object specified in *Curve*.

Fit Length
Generates enough copies to fit within the fixed length given by *Length*.

Fixed Count
Generates the number of copies specified in *Count*.

Curve
The Curve object to use for *Fit Curve*.

Length
The length to use for *Fit Length*.

Count
The number of duplicates to use for *Fixed Count*.

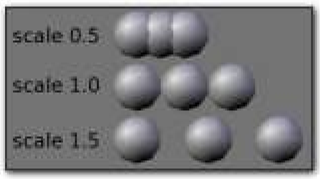
Note

- Both *Fit Curve* and *Fit Length* use the local coordinate system size of the base object, which means that scaling the base object in *Object* mode will not change the number of copies generated by the *Array* modifier.

- *Fit Length* uses the local coordinate system length of the curve, which means that scaling the curve in *Object* mode will not change the number of copies generated by the *Array* modifier.
- Applying the scale with `Ctrl-A` can be useful for each one.

Constant Offset, X, Y, Z
Adds a constant translation component to the duplicate object's offset. X, Y and Z constant components can be specified.

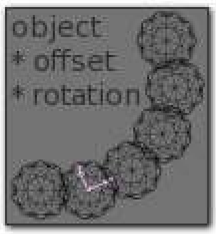
Relative Offset, X, Y, Z



Relative offset example.

Adds a translation equal to the object's bounding box size along each axis, multiplied by a scaling factor, to the offset. X, Y and Z scaling factors can be specified.

Object Offset



Object offset example.

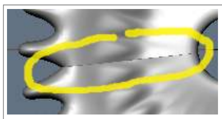
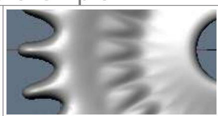
Adds a transformation taken from an object (relative to the current object) to the offset. It is good practice to use an Empty object centered or near to the initial object. E.g. by rotating this Empty a circle or helix of objects can be created.

Merge
If enabled, vertices in each copy will be merged with vertices in the next copy that are within the given *Distance*.

First Last

If enabled **and** *Merge* is enabled, vertices in the first copy will be merged with vertices in the last copy (this is useful for circular objects).

First Last merge example.

	
Subsurf discontinuity caused by not merging vertices between first and last copies (*First Last* off).	Subsurf discontinuity eliminated by merging vertices between first and last copies (*First Last* on).

Distance

Controls the merge distance for *Merge*.

Start Cap / End Cap

This allows either endpoints of the array to have a different mesh subsisted.

For the *start*: as if it was in position `-1`, i.e. one "array step" before the first "regular" array copy. For the *end*: as if it was in position `n+1`, i.e. one "array step" after the last "regular" array copy.

When *Merge* is activated, and the *cap* vertices are within the distance threshold, they will be merged.

Note

The start/end cap objects currently don't support the *First Last* option.

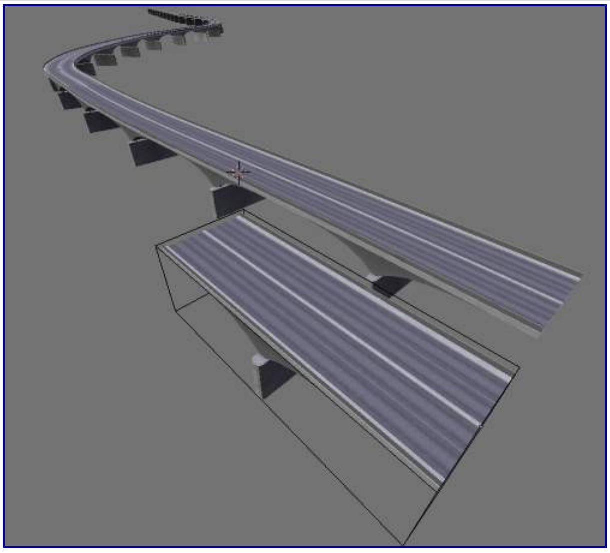
Hints

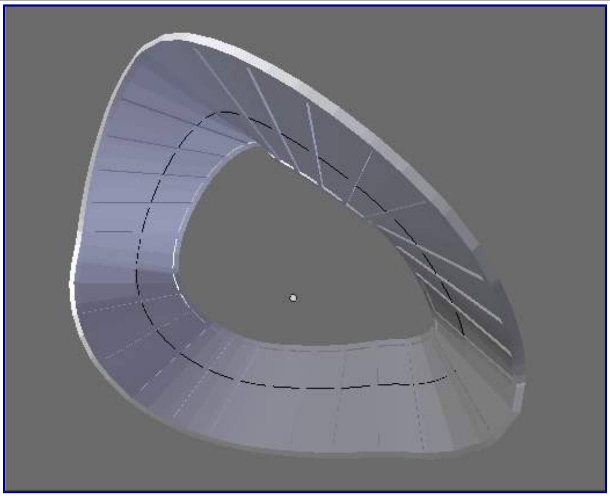
Offset Calculation

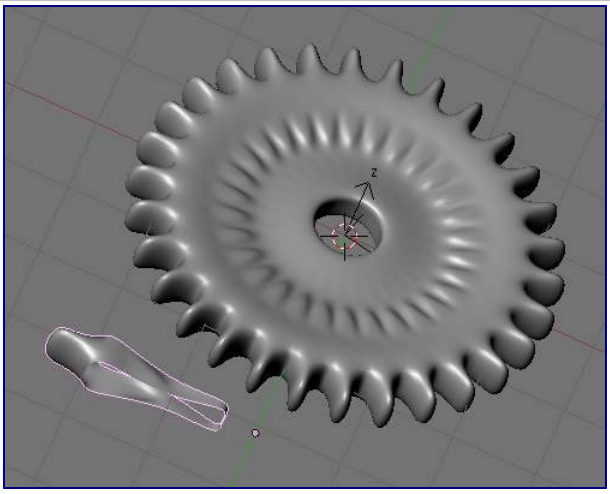
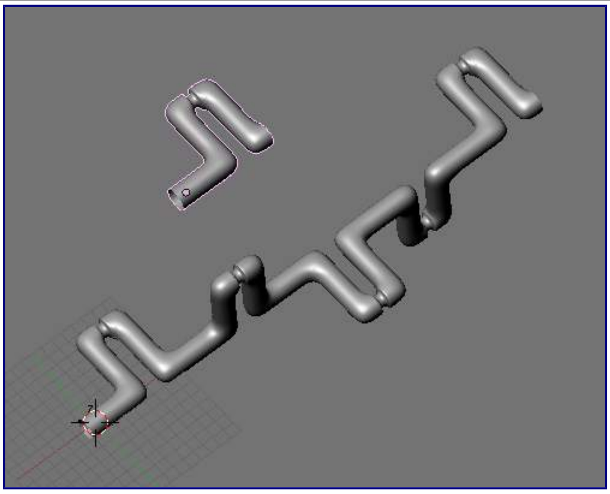
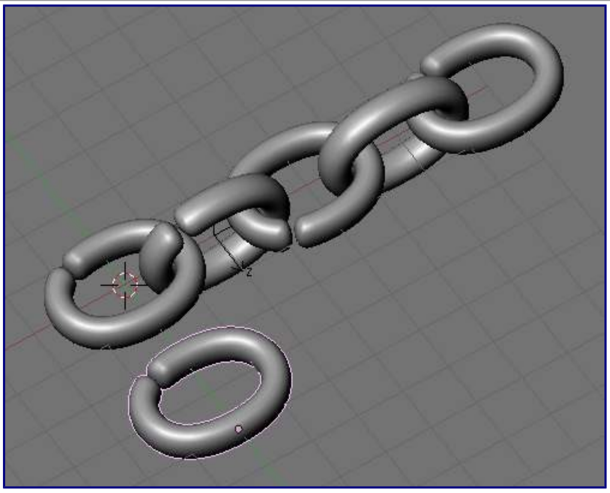
The transformation applied from one copy to the next is calculated as the sum of the three different components (*Relative*, *Constant* and *Object*), all of which can be enabled/disabled independently of the others. This allows, for example, a relative offset of `1.0, 0.0, 0.0` and a constant offset of `0.1, 0.0, 0.0`, giving an array of objects neatly spaced along the X axis with a constant `0.1` units between them, whatever the original object's size.

Examples

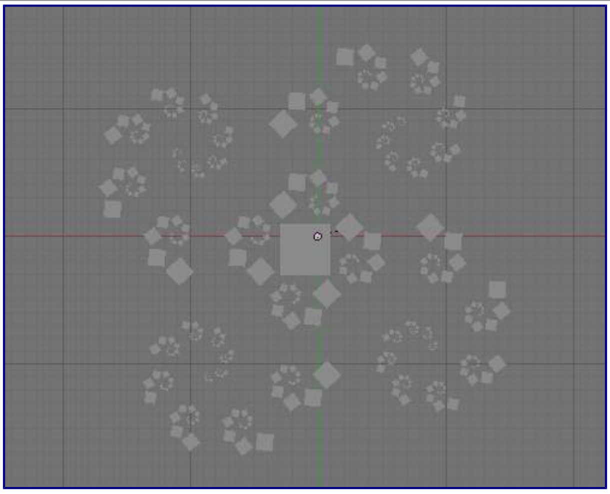
Mechanical

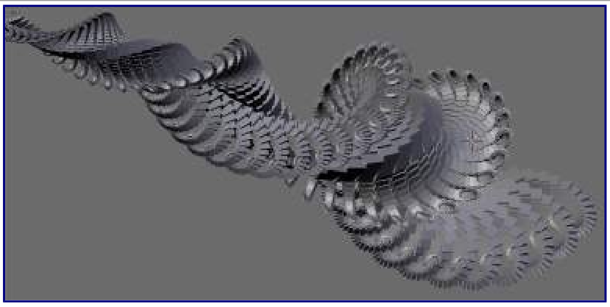

A bridge made from a tileable mesh.


A track. Sample blend file

 A cog created from a single segment. Blend	 A crankshaft. Sample blend file
 A chain created from a single link. Sample blend file	

Fractal

 Multi-level array animated with motion blur.	 Fractal created with multiple arrays. Blend



A fractal fern image created with 2 array modifiers and 1 mirror applied to a cube.

Organic

Fig 01

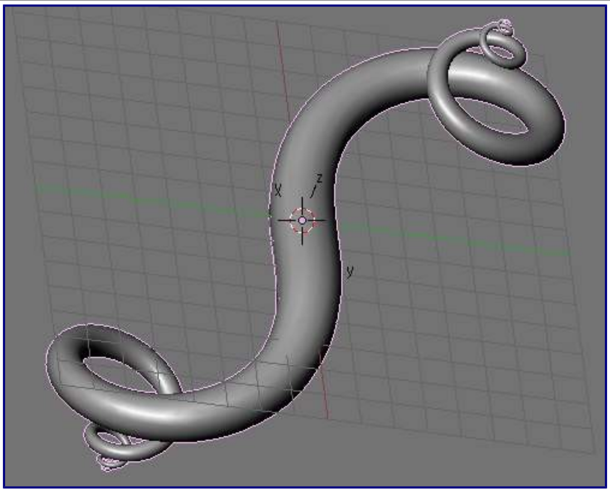


Fig 02

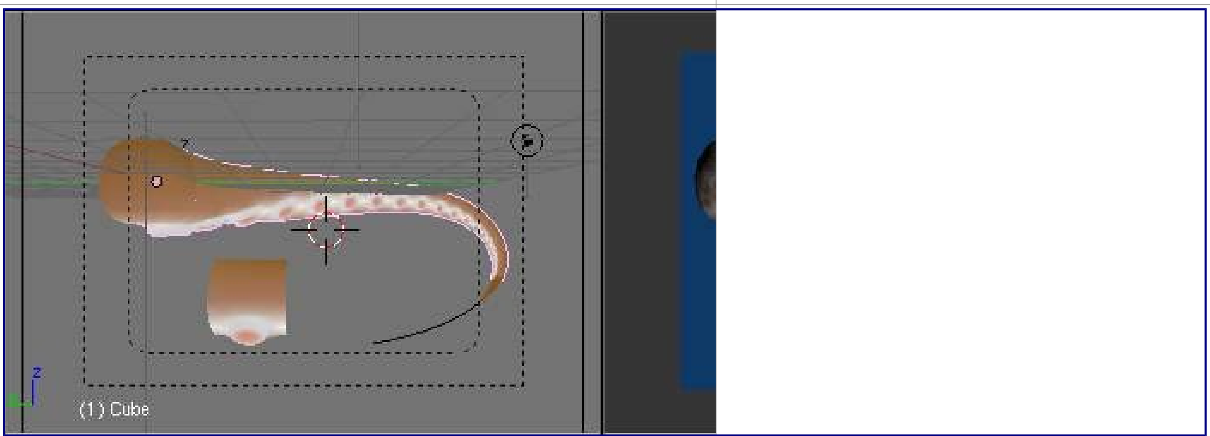


Fig 03

Fig 01

Subsurfed cube array with 1 object offset, 4 cubes and a high vertex merge setting to give the effect of skinning.

Fig 02

A double spiral created with two array modifiers and one subsurf modifier applied to a cube. As above, the vertex merge threshold is set very high to give the effect of skinning. Sample blend file

Fig 03

A tentacle created with an Array modifier followed by a Curve modifier. The segment in the foreground is the base mesh for the tentacle; the tentacle is capped by two specially-modeled objects deformed by the same Curve object as the main part of the tentacle. Sample blend file

Tutorials

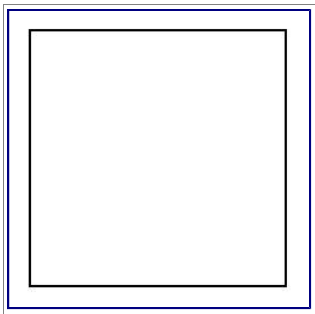
- Neal Hirsig’s Array Modifier Screencast on Vimeo
- Creating A Double Helix With Modifiers

The ‘Double Helix’ tutorial explains the Array modifier. It is for an old Bforartists Version (2.44) but except for the keyboard shortcuts it is still valid.

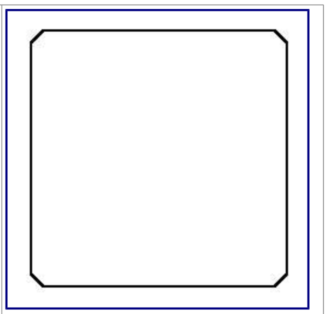
Bevel Modifier

The Bevel modifier adds the ability to bevel the edges of the mesh it is applied to, allowing control of how and where the bevel is applied to the mesh.

The Bevel modifier is a non-destructive alternative to the *Bevel Operation* in edit mode.



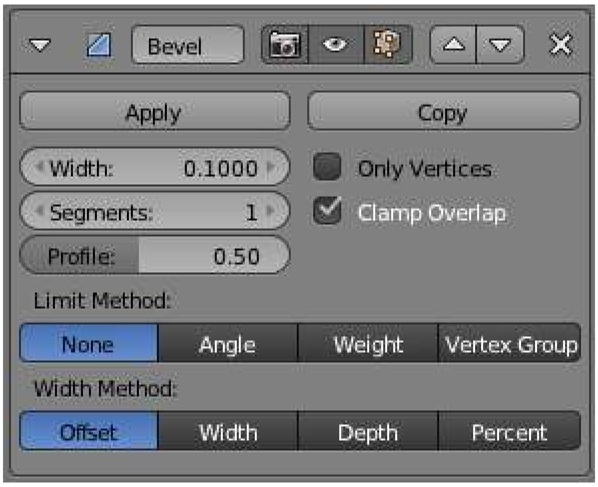
Unbeveled



Beveled

The images above show the side views of a plain (unbeveled) cube and a beveled one.

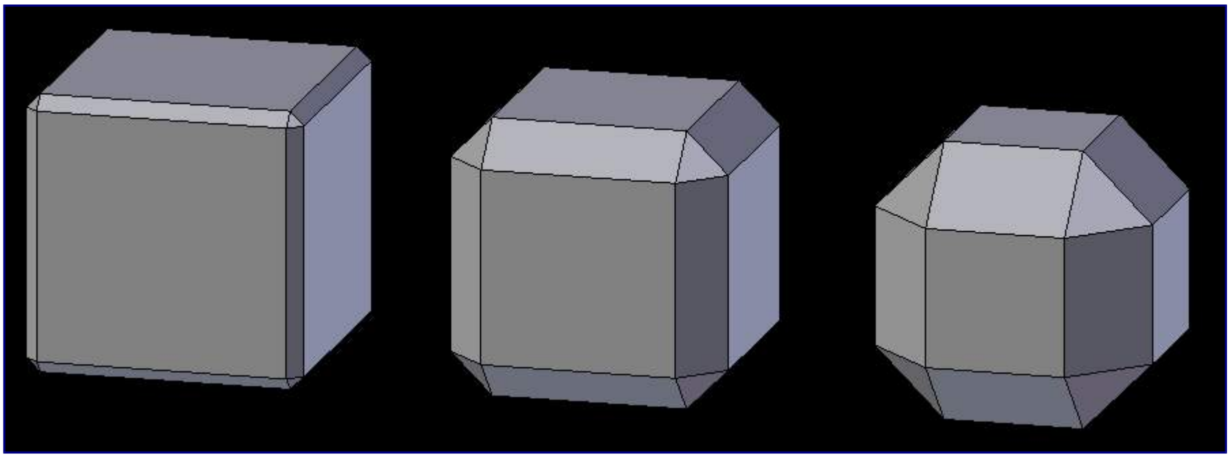
Options



Bevel modifier panel.

Width

The size of the bevel affect. See *Width Method* below.



Three Cubes with 0.1, 0.3 and 0.5 bevel Widths.

Segments

The number of edge loops added along the bevel’s face.

Profile

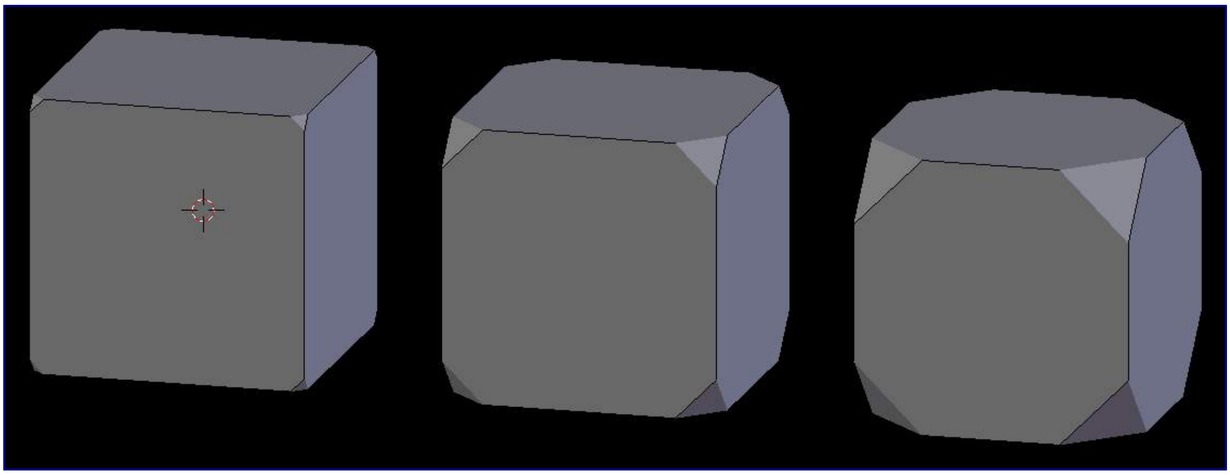
The shape of the bevel, from concave to convex - has no effect if *Segments* is less than `2`.

Material

The index of the material slot to use for the bevel. When set to `-1`, the material of the nearest original face will be used.

Only Vertices

When enabled, only the areas near vertices are beveled; the edges are left unbeveled.



Three cubes with 0.1, 0.3 and 0.5’ bevel Widths, with Only Vertices option enabled.

Clamp Overlap

When enabled, the width of each beveled edge will be limited such that they cannot intersect each other. Edges that are far apart will still bevel with the full width, only edges too close to each other are affected.

Limit Method

Used to control where a bevel is applied to the mesh.

None

No limit, all edges will be beveled.

Angle

Only edges where the adjacent faces form an angle smaller than the defined threshold will be beveled. Intended to allow you to bevel only the sharp edges of an object without affecting its smooth surfaces.

Weight

Use each edge's bevel weight to determine the width of the bevel. When the bevel weight is `0.0`, no bevel is applied. See *here* about adjusting bevel weights.

Vertex Group

Use weights from a vertex group to determine the width of the bevel. When the vertex weight is `0.0`, no bevel is applied. An edge is only beveled if both of its vertices are in the vertex group. See *here* about adjusting vertex group weights.

Width Method

Used to control how the *Width* is measured.

Offset

Amount is offset of new edges from original.

Width

Amount is width of new face.

Depth

Amount is perpendicular distance from original edge to bevel face.

Percent

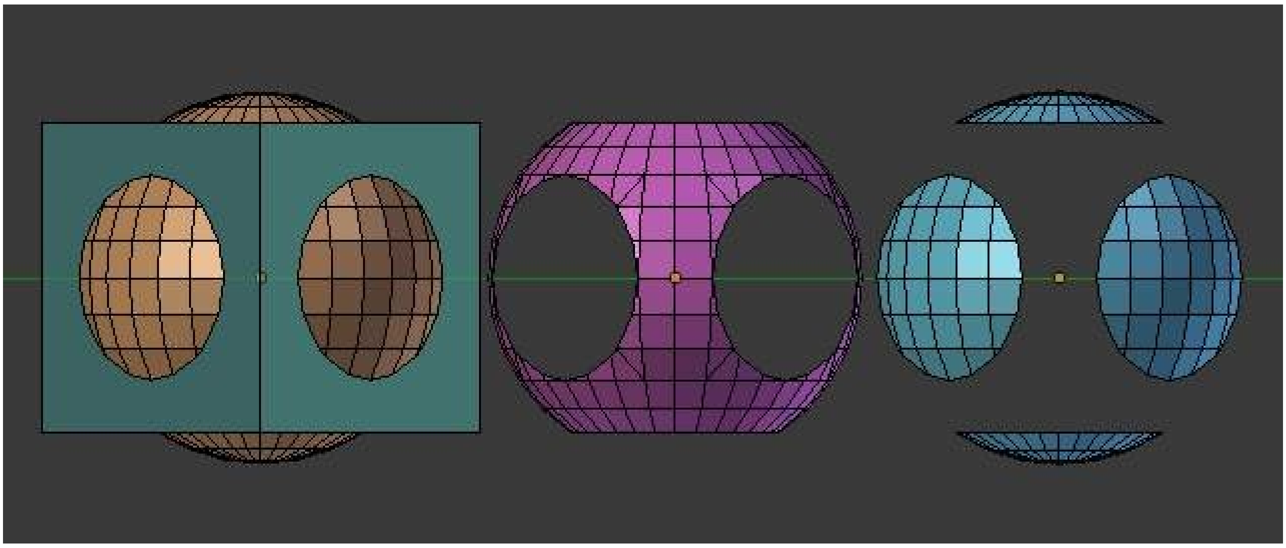
Amount is percent of adjacent edge length.

Boolean Modifier

Introduction

The Boolean modifier performs operations on meshes that are otherwise too complex to achieve with as few steps by editing meshes manually, meaning you can achieve results with little effort to make mesh operations like Unions, Differences and Intersections.

The Boolean modifier uses one of three Boolean operations (*Difference* (negation), *Union* (conjunction), and *Intersect* (disjunction)) to create a single compound object out of two mesh objects.



The Union, Intersection and Difference between a Cube and a UV Sphere, with the modifier applied to the Sphere and using the cube as target.

Description

The Boolean modifier can only be used on mesh objects.

It performs one of the three Boolean Operations for the faces of open or closed volumes that creates a complete topology in the faces it's being used. This means that this modifier will only work properly for the intersection of faces of the two meshes that will result in another closed loop of edges (filled with faces), creating a new resulting face topology.

The Boolean modifier is non-destructive for the target; it uses the topology of the target to make the calculations, but you will still have the target in the scene. In normal conditions, using face normals pointed outside, when you apply the Boolean modifier operation, the modified mesh will receive changes in topology, and you will have to move or hide the target to see the resulting mesh. The only exception is when you are using inverted normals; in this case, depending on the calculations, you will also change the topology of the target. You can see one example of a target being modified in the Materials section in this page.

The results of the mesh operation will only be shown in Object Mode of the 3D View.

Note

- The Boolean modifier works with open and closed volumes.
- The Boolean modifier doesn't work on edges without faces.
- The target topology determines the new topology of the modified mesh.
- The face normals are taken into account for the calculations.
- Whether faces are marked for smooth or flat for shading doesn't affect the calculations of this modifier.
- The line at which this modifier is calculated is delimited by the first tangential contact between faces of the modified mesh and target.

Tip

This is a dynamic real-time modifier!

If you have marked your Objects to show the Edges (in Properties Window, Object context, Display panel, enable *Wire*), you will see the Edge creation process while you're moving your Objects. Depending on your mesh topology, you can also enable X-Ray and Transparency and see the topology being created in real time.

Usage

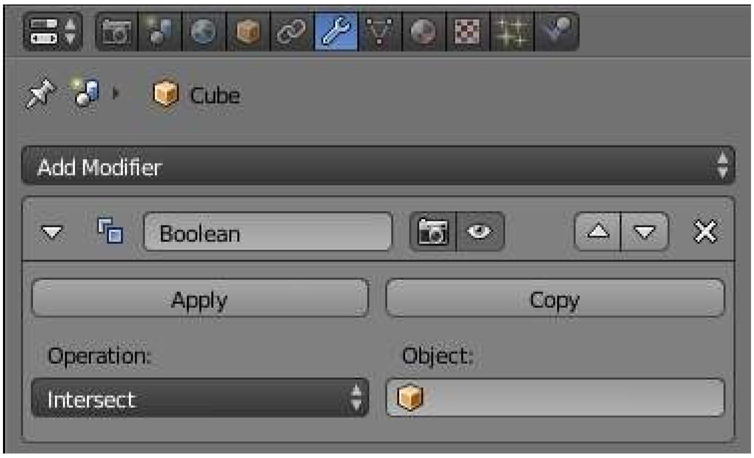
Using the default Bforartists install, with the desired mesh Object selected, go to the *Properties Window* which is located at the right of your Bforartists Screen, below the Outliner. Click on the Modifiers Context, which is represented by a wrench - The Boolean modifier. Then, click on the *Add Modifier* Button and Bforartists will show you a list of all of the available Modifiers. The Boolean modifier is located on the third row in the *Generate* Column.

You can also click on the *Add Modifier* Button and use `N` to add the Boolean modifier, or use Bforartists search with the shortcut `Spacebar` and type "Add Modifier", click on *Add Modifier* and press `N`.

When you add the Boolean modifier for an Object, Bforartists will need a second Object to perform the operation. You can use open or closed Meshes, as long as they have faces for calculations.

You can add one or more modifiers of this type for an Object but you can only apply one operation for the Boolean modifier at a time.

Options



Boolean Modifier Options

Operations

Operation

Which boolean operation will be used.

Difference

The modified mesh is subtracted from the target mesh.

- If the target Mesh has inverted normals, Bforartists will Intersect the modified mesh.
- If the modified Mesh has inverted normals, Bforartists will add both meshes (Union).
- If both Meshes use inverted normals, Bforartists will Intersect the target Mesh.

Union

The target mesh is added to the modified mesh.

- If the target Mesh has inverted normals, Bforartists will Intersect the target Mesh.
- If the modified Mesh has inverted normals, Bforartists will subtract the target Mesh.
- If both Meshes use inverted normals, Bforartists will Intersect the modified Mesh.

Intersect

The target mesh is subtracted from the modified mesh.

- If the target Mesh has inverted normals, Bforartists will subtract the target Mesh.
- If the modified Mesh has inverted normals, Bforartists will intersect the target Mesh.
- If both Meshes use inverted normals, Bforartists will add both meshes (Union).

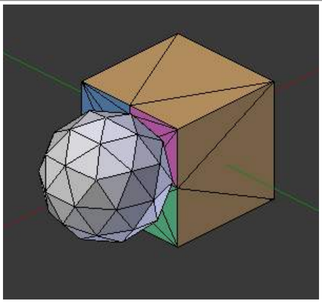
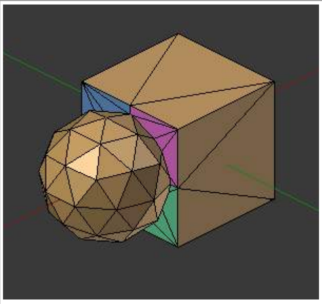
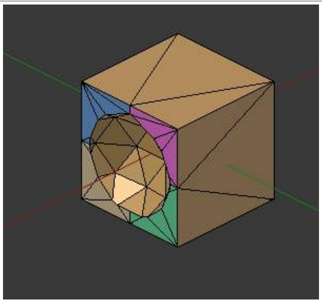
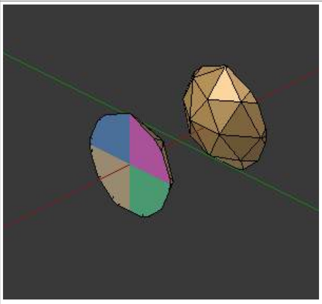
Object

The name of the target mesh object.

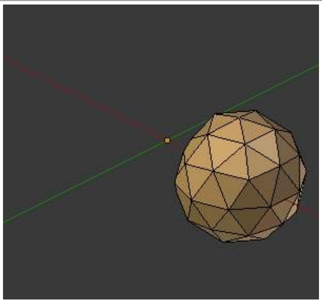
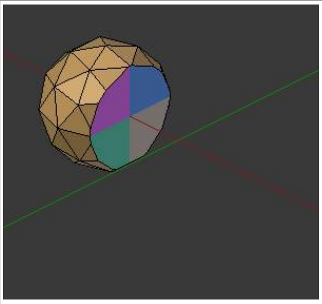
Materials

The Boolean modifier preserves the Materials of the participant Meshes, including their basic textures and mappings, and the modified mesh will receive its first active material index assigned to its new topology (the first active material).

Below, some examples are shown to exemplify how materials work with the Boolean modifier; we took the cube as the modified mesh, and the icosphere as the target with one material (white). We added four different indexes to one of the faces of the cube, leaving another basic material in the other faces. The top left image shows how the Boolean modifier interacts with the materials. The other three images show the three different Boolean operations applied to the modified mesh. In all the images the meshes have normals pointed outwards with the Icosphere as the target, and the Cube being the modified mesh.

 Cube with Multi-Materials and Icosphere with basic Material	 Union: The first active Material of the Cube is added to the new topology
 Difference: The Icosphere was subtracted from the Cube	 Intersect: The resulting Mesh was copied and rotated 180

The only exception is the difference operation when the normals of the target and modified mesh are inverted. In this case, Bforartists will project the textures in an inverted direction over the target using the center contact of the meshes as a pivot and the resulting mesh will have the modified mesh subtracted from the target. For complex target meshes in some particular cases, you may have to reassign materials to faces because Bforartists will use the possible projection, and this may result in a sub-optimal texture assignment. You can see this in the last example below.

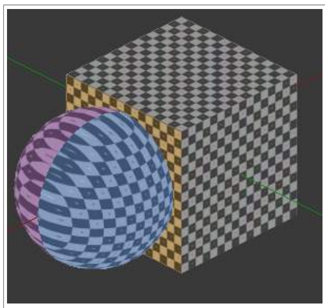
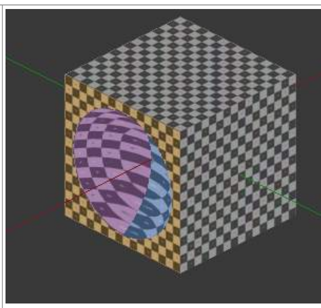
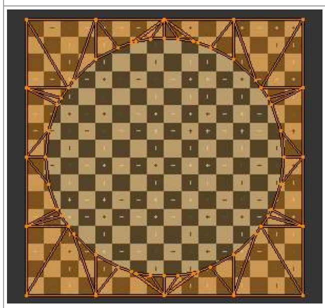
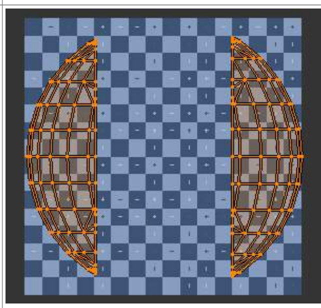
 Front of the target with the modified mesh materials	 Back of the target with the modified mesh materials

UV Mappings

When you map UV Images to your target, Bforartists will add a map for each of the faces of the target. When you apply the Boolean modifier, Bforartists will follow the UV maps already assigned to the faces of the target topology that will be the result of the operation on the modified mesh. Bforartists will also use the same image mapped to the target faces in the modified mesh.

Warning
Depending on the way you have assigned textures to the faces during the UV unwrap, and the complexity of your meshes, the boolean operation may generate imperfect UVs for the new faces.

Below we have four Images, a UV sphere mapped with a test grid tinted blue and the other face tinted in purple, one face of the cube tinted in a light orange and the other faces using the normal test grid. The firat image shows the operation at the start (difference), and on to the right of that shows the resulting mesh. And in the bottom row we show the unwrap in the Bforartists UV/Image Editor Window.

 A UV Sphere and a Cube with different UV Maps	 Difference operation applied
 Faces of the modified mesh mapped	 New topology mapped and UV faces assigned

Other Modifiers

The Boolean modifier calculation is performed using the target modified mesh topology and dimensions. Other modifiers added to the modified mesh are bypassed. It means that if a target is using another modifier, like subsurf, the resulting topology for the modified mesh will take into account the subsurf of the target; but for the modified mesh, the basic topology is used anyway (see examples).

If you add subsurf to the modified mesh with a Boolean modifier, Bforartists will visually add the subsurf for the modified mesh, but not for its calculations; it will only take into account its basic mesh topology. If you want to have a subsurf added to the modified mesh, you have to apply the subsurf to the Boolean modified mesh before applying the Boolean operation.

The Boolean modifier can be added together with other modifiers in the modified mesh, but depending on the modifier, the calculations can't be done and/or the modifier cannot execute. When the modifier cannot execute, it will show the message `"Cannot execute boolean operation"`, and when the modifier cannot be applied to the mesh, Bforartists will show the message `"Modifier is disabled, Skipping Apply."`. In this case, you either have to remove some modifiers or apply the necessary ones.

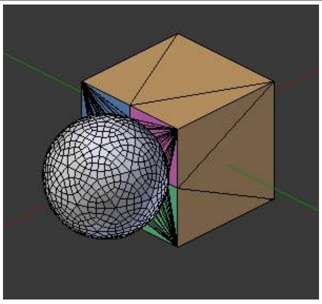
Boolean Modifier with error message

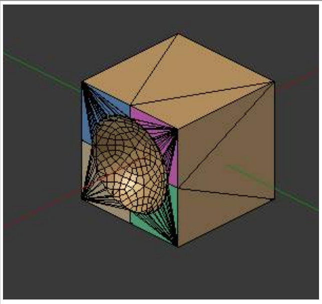
The most common case is when you add or copy a Boolean modifier to use the modified mesh in conjunction with another target later; Bforartists will place the warning in the subsequent Boolean modifiers in the stack depending on the operation, because you may be creating concurrent Boolean operations for the same modified mesh, which in most cases is impossible to execute depending on the chosen target. In this case, you can apply the first Boolean modifier of the stack for the target and then use the other Boolean modifier(s) in the stack for subsequent operations.

Also, if some other modifiers are placed above this modifier and you click on Apply, Bforartists will warn you with the message `"Applied Modifier was not first, results may not be as expected"`. The best usage scenario for this modifier is to prepare your modified mesh and target to work with the Boolean modifier.

When the Boolean modifier is the first of the stack and is applied, the other Modifiers will act over the resulting meshes using the resulting topology and will remain in the modifiers stack.

Below are two images: one with the subsurf added to the target, and another with the resulting topology.





Modifier with Subsurf Target	The Resulting Topology

As you can see, the added (not applied) subsurf to the target was taken into consideration. The topology of the Icosphere with subsurf (Level 2) was completely transferred to the modified mesh.

Tip

The target topology determines the resulting topology

The target topology determines the results of the Boolean modifier operation. It means that any modifier added to the target which modifies its topology will affect the resulting mesh of the operation.

Concurrent Operations

For the modified meshes, you can only apply one operation at a time, but you can use the same target for other modified meshes and use modified meshes as a target for other meshes as well. Also, you can copy or add the same modifier to the modifiers stack as many times as you wish to suit the number of operations you need, but be aware that if you choose concurrent targets which are, at the same time, modified meshes pointing to each other, you can cause Bforartists to crash with closed loops!

Hints

Be aware that other modifiers and their stack position could cause this modifier to fail in certain circumstances.

Tip

The best way to work with this modifier when you need to make lots of sequential operations of the same modifier is to define the target at the time you need to apply the changes to the topology.

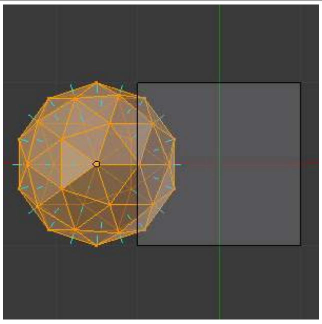
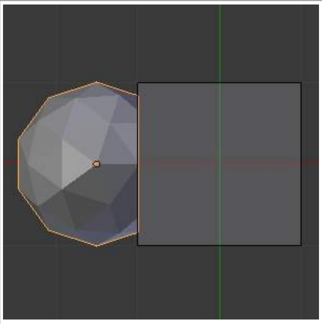
Face Normals

When using the Boolean modifier, Bforartists will use the face normal directions to calculate the three Boolean operations. The direction of the normals will define the result of the three available operations. When one of the participants has inverted normals, you’re in fact multiplying the operation by `-1` and inverting the calculation order. You can, at any time, select your modified mesh, enter Edit Mode and flip the normals to change the behavior of the Boolean modifier. See *Tips for Fixing Mixed Normals* below.

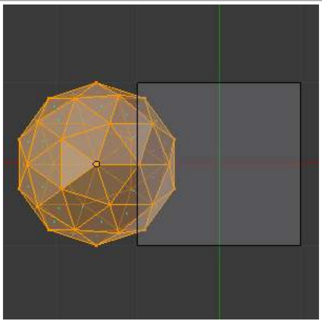
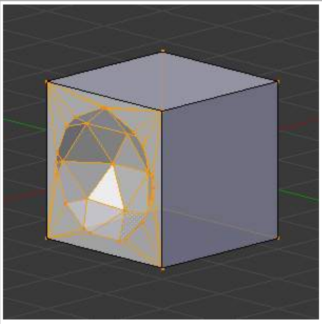
Bforartists also cannot perform any optimal Boolean operation when one or more of the mesh Normals of the participants that are touching has outwards/inwards normals mixed.

This means you can use the normals of the meshes pointed completely towards the inside or outside of your participants in the operation, but you cannot mix normals pointed inwards and outwards for the faces of the topology used for calculations. In this case, Bforartists will enable the modifier and you may apply the modifier, but with bad to no effects. We made some examples with a cube and an icosphere showing the results.

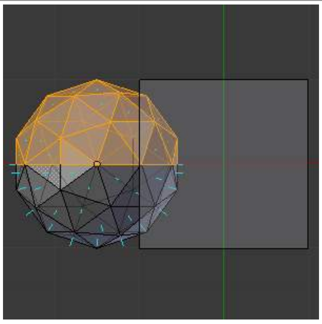
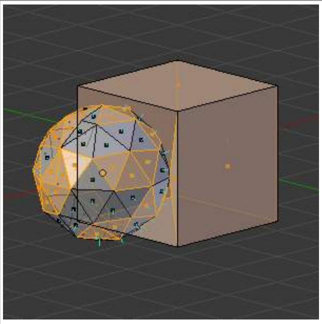
In the images below, all face normals are pointing outwards (Normal meshes).

 Faces with normals pointing outwards	 Normal Boolean modifier operation (Difference operation)

In the images below, all face normals are inverted and using the intersection operation

 Boolean Operation with inverted normals	 Normal Boolean modifier operation

Now, let’s see what happens when the normal directions are mixed for one of the participants in the Boolean modifier operation. The images below show face normals mixed, pointed to different directions and the resulting operation, you can see that the modifier has bad effects when applied, leaving faces opened:

 Face normals mixed, pointed to different directions	 Resulting operation leaves faces opened

As you can see, the normal directions can be pointing to any of the Mesh sides, but can’t be mixed in opposite directions for the faces of the participants. The Library can’t determine properly what’s positive and negative for the operation, so the results will be bad or you will have no effect when using the Boolean modifier operation.

A quick way to fix this is to use Bforartists’s *Recalculate Normals* operation in Edit Mode.

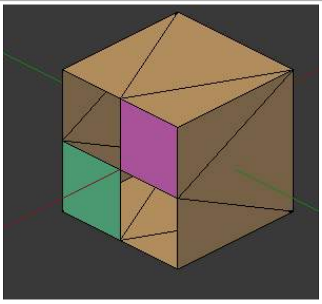
If you still have some ugly black gouges you will have to *Manually Flip the Normals*.

Empty or Duplicated Faces

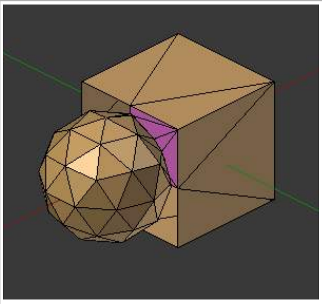
This modifier doesn’t work when the modified and/or the target mesh uses empty faces in the topology used for calculations. If the modifier faces a situation where you have empty faces mixed with normal faces, the modifier will try, as much as possible, to connect the faces and apply the operation. For situations where you have two concurrent faces at the same position, the modifier will operate on the target mesh using both faces, but the resulting normals will get messed. To avoid duplicated faces, you can remove doubles for the vertices before recalculating the normals outside or inside. The button for remove doubles is located in the *Mesh Tools* Panel in the 3D View, while in Edit Mode.

The best usage scenario for this modifier is when you have clean meshes with faces pointing clearly to a direction (inwards/outwards)

Below we show an example of meshes with open faces mixed with normal faces being used to create a new topology. In this example, a difference between the cube and the icosphere is applied, but Bforartists connected a copy of the icosphere to the Cube mesh, trying to apply what was possible.



Mesh with two empty faces mixed with normal faces



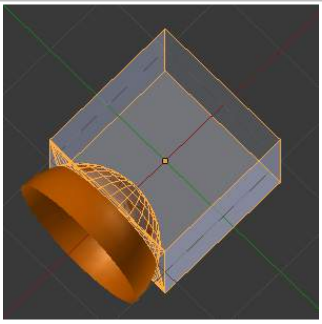
Result of a difference operation applied

Open Volumes

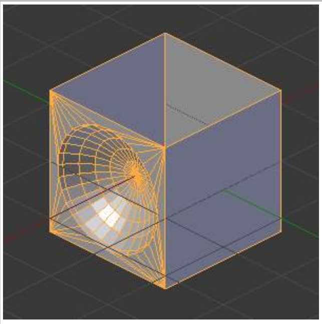
The Boolean Modifier permits you to use open meshes or non-closed volumes (not open faces).

When using open meshes or non-closed volumes, the Boolean modifier won’t perform any operation in faces that don’t create a new topology filled with faces using the faces of the target.

In the images below, is the resulting operation when using two non-closed volumes with faces forming a new topology.



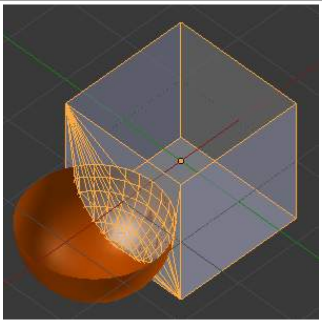
Non-closed volumes forming a new topology



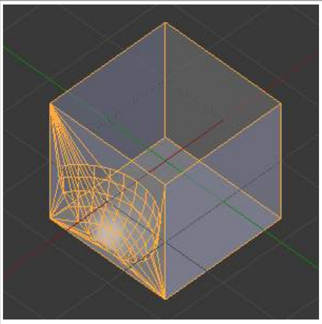
Resulting operation using two open volumes

Now, let’s see what happens when we use meshes that are partially open, incomplete, or meshes that aren’t forming a new topology.

As you can see in the images below the faces of one participant in the Boolean operation gives incomplete information to the modifier. The resulting edges get messy and there is not enough information to create faces for the resulting Mesh. This example uses a smooth shaded UVsphere cut in half. As explained before, the shading (smooth/flat) doesn’t affect the calculations of the modifier.



Open volumes that aren't forming a new topology



Resulting Operation of image on the left

Build Modifier

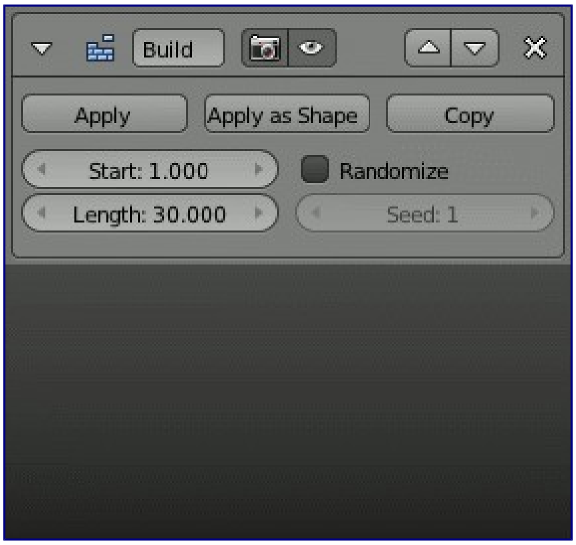
The Build modifier causes the faces of the mesh object to appear one after the other over time.

By default, faces appear in the order in which they are stored in memory (by default, the order of creation). The face/vertex order can be altered in Edit Mode by selecting *Sort Faces* from the *Search Menu* (`Spacebar`)

Note

When using Bforartists Render, if the material of the mesh is a halo rather than a standard one, then the vertices of the mesh, not the faces, appear one after another.

Options



Build modifier in action

Start
: The start frame of the building process.

Length
: The number of frames over which to rebuild the object.

Randomize
: Randomizes the order in which the faces are built.

Seed

The random seed. Changing this value gives a different “random” order when *“Randomize”* is checked - this order is always the same for a given seed/object set.

Decimate Modifier

The Decimate modifier allows you to reduce the vertex/face count of a mesh with minimal shape changes.

This is not usually used on meshes which have been created by modeling carefully and economically (where all vertices and faces are necessary to correctly define the shape). But if the mesh is the result of complex modeling, sculpting and/or applied subsurf/multires modifiers, the Decimate modifier can be used to reduce the polygon count for a performance increase, or simply remove unnecessary vertices and edges.

The Decimate modifier is a quick and easy way of reducing the polygon count of a mesh non-destructively. This modifier demonstrates the advantages of a mesh modifier system because it shows how an operation which is normally permanent and destroys original mesh data, can be done interactively and safely using a modifier.

Unlike the majority of existing modifiers, the Decimate modifier does not allow you to visualize your changes in Edit Mode.

Options

decimate modifier

Decimate Type

Collapse

Merge vertices together progressively, taking the shape of the mesh into account.

Ratio

The ratio of faces to keep after decimation.

- On `1.0`, the mesh is unchanged.
- On `0.5`, edges have been collapsed such that half the number of faces remain (See *Note* below).
- On `0.0`, all faces have been removed.

Note
Although the *Ratio* is directly proportional to the number of remaining faces, triangles

are used when calculating the ratio.

This means that if your mesh contains quads, the number of remaining faces will be larger than expected, because quads remain unchanged if their edges are not collapsed.

This is only true if the *Triangulate* option is disabled.

Un-Subdivide

Can be thought of as the reverse of subdivide. Attempts to remove edges that were the result of a subdivide operation. If additional editing has been done after the subdivide operation, the results may be unexpected.

Iterations
The number of times to perform the un-subdivide operation. Two iterations is the same as one subdivide operation, so you will usually want to use even numbers.

Planar

Dissolve geometry on the same plane.

Angle Limit
Dissolve geometry which form angles lower than this setting.

All Boundaries
When enabled, all vertices along the boundaries of faces are dissolved. This can give nicer results when using a high *Angle Limit*.

Delimit

Prevent dissolving geometry in certain places.

Normal
Does not dissolve edges on the borders of areas where the face normals are reversed.

Material
Does not dissolve edges on the borders of where different materials are assigned.

Seam
Does not dissolve edges marked as seams.

Face Count
This field shows the number of remaining faces as a result of applying the Decimate modifier.

Known Limitations

N-Gons
N-Gons are currently not supported when collapsing edges, the operation will still succeed, but edges attached aren't considered for reduction.

Edge Split Modifier

The Edge Split modifier splits edges within a mesh. The edges to split can be determined from the edge angle (i.e. angle between faces forming this edge), and/or edges marked as sharp.

Splitting an edge affects vertex normal generation at that edge, making the edge appear sharp. Hence, this modifier can be used to achieve the same effect as Auto Smooth, making edges appear sharp when their angle is above a certain threshold. It can also be used for manual control of the smoothing process, where the user defines which edges should appear smooth or sharp (see *Mesh Smoothing* for other ways to do this). If desired, both modes can be active at once.

The output of the Edge Split modifier is available to export scripts, making it quite useful for creators of game content.

Options

Edge Split modifier.

Edge Angle

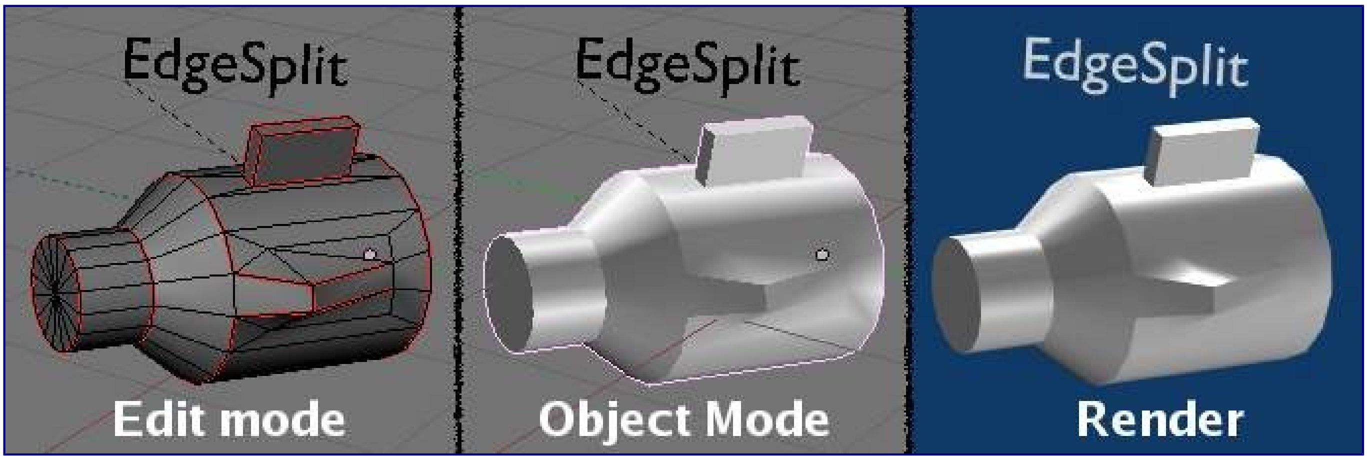
When enabled, edges will be split if the angle between its two adjacent faces is greater than the *Split Angle*.

Split Angle
On `0`, all edges are split. On `180`, no edges are split.

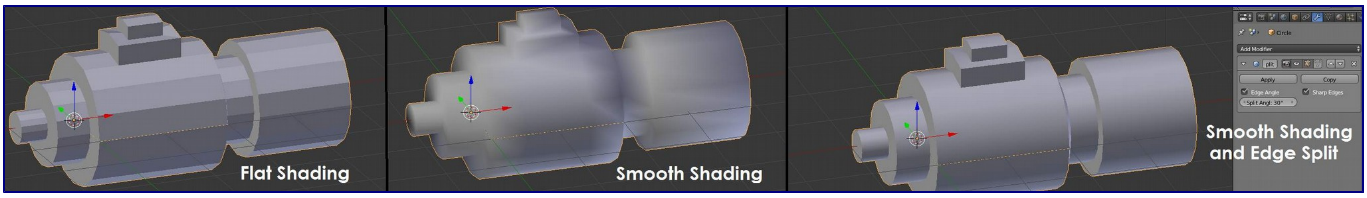
Sharp Edges
When enabled, edges will be split if they were marked as sharp using ‣ Mark Sharp

Note
Non-manifold edges (edges shared by more than two faces) will always be split.

Examples



Edge Split modifier output with From Marked As Sharp selected.



(From Left to right): Flat Shading, Smooth Shading, Smooth Shading with Edge Split.

Note

Splitting edges can also be performed manually in Edit Mode using: Edge Specials ‣ Edge Split

Mask Modifier

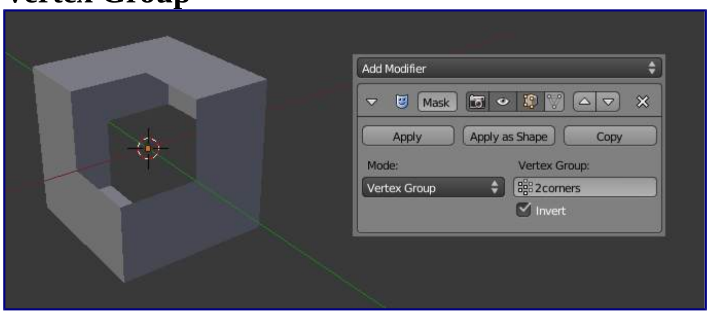
The Mask modifier allows vertices of an object to be hidden dynamically based on vertex groups.

Options

Mode

The Mask modifier can hide parts of a mesh based on two different modes, selectable from this drop-down list.

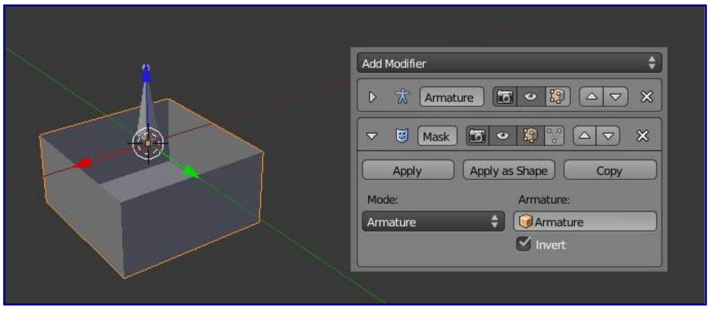
Vertex Group



Vertex Group

When the *Vertex Group* option is selected, all vertices belonging to the chosen Vertex Group (with a weight above zero) will be visible, and all other vertices will be hidden.

Armature



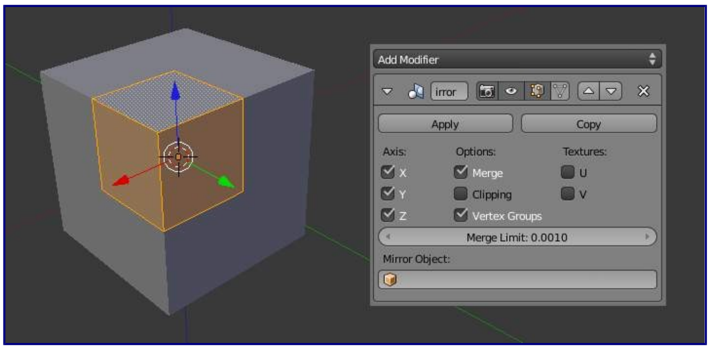
Armature

When in Pose Mode, vertices belonging to the Vertex Group associated with the active bone (same names) will be visible. Vertices not in that group will be hidden.

Inverse

Normally, vertices belonging to the selected Vertex Group (or group associated with the active pose-bone) will be shown. The *Invert* toggle allows you to reverse this behavior, instead showing all vertices which do not belong to the Vertex Group, and hiding those that do.

Mirror Modifier

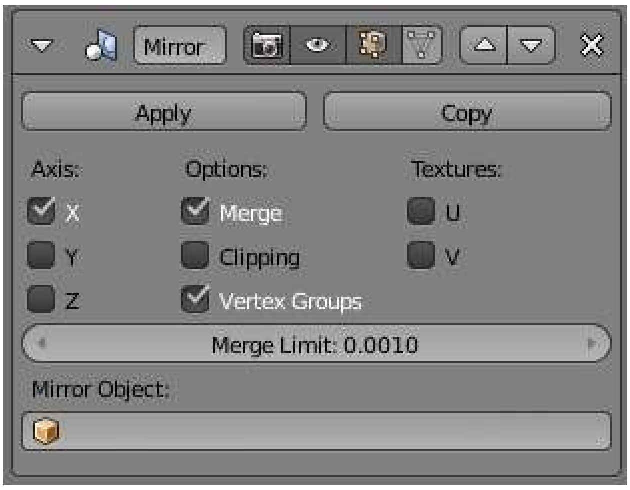


The corner of a cube mirrored across three axes to form... well... a cube.

The Mirror modifier mirrors a mesh along its **local** X, Y and/or Z axes, across the object’s center (the mirror plane is then defined by the two other axes).

It can also use another object as the mirror center, then use that object’s local axes instead of its own.

Options



Mirror modifier

Axis

The axis (*X*, *Y*, or *Z*) along which to mirror (i.e. the axis perpendicular to the mirror plane of symmetry).

To understand how the axis applies to the mirror direction, if you were to mirror on the X axis, the positive X values of the original mesh would become the negative X values on the mirrored side.

You can select more than one of these axes - you'll then get more mirrored copies. With one axis you get a single mirror, with two axes four mirrors, and with all three axes eight mirrors.

Options:

Merge

Where a vertex is in the same place (within the *Merge Limit* distance) as its mirror it will be merged with the mirrored vertex.

Clipping

Prevents vertices from moving through the mirror plane(s) while the user is transforming them in Edit Mode.

If *Clipping* is enabled but vertices are beyond the mirror plane and outside of the *Merge Limit*, the vertices will not be merged. But as soon as the vertices are within *Merge Limit* they are snapped together and cannot be moved beyond the mirror plane.

> **Note**
>
> Vertices on the mirror plane will be unable to move away from the mirror plane as long as *Clipping* is enabled. You must disable *Clipping* to be able to move the vertices along the mirror axis again.

Vertex Groups

When enabled, the Mirror modifier will try to mirror existing vertex groups.

A very nice feature, but one that has very specific prerequisites:

- The vertex groups you want to mirror must be named following the usual left/right pattern (i.e. suffixed by something like ".R", ".right", ".L", etc).

- The mirror side vertex group must already exist (it will not be created automatically). It must also be completely empty (no vertices assigned to it).

Textures

The *U* and *V* options allows you to mirror the UV texture coordinates across the middle of the image.

E.g. if you have a vertex with UV coordinates of (`0.3, 0.9`), its mirror copy will have UV coordinates of (`0.7, 0.1`).

Merge Limit
: The maximum distance between a vertex and its mirror copy before they are merged together. In other words, a vertex may be half this distance away from the mirror plane before it snaps to it.

Mirror Object
: The name of another object (usually an empty), to be used as the reference for the mirror process: its center and axes will drive the plane(s) of symmetry. You can of course animate its position/rotation to animate the mirror effect.

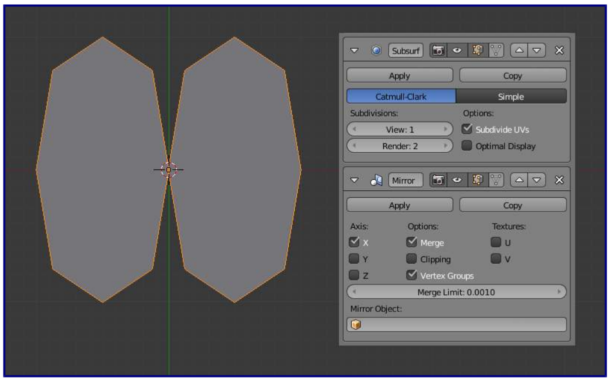
Hints

Many modeling tasks involve creating objects that are symmetrical. However, there used to be no quick way to model both halves of an object without using one of the workarounds that have been discovered by clever Bforartists artists over the years. A common technique was to model one half of an object and use `Alt-D` to create a linked duplicate which can then be scaled on one axis by `-1` to produce a perfect mirror-image copy which updates in real time as you edit.

The Mirror modifier offers a simpler way to do this. Once your modeling is completed you can either click *Apply* to make a real version of your mesh or leave it as is for future editing.

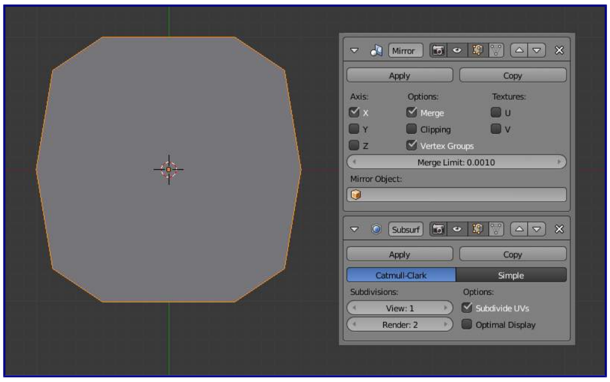
Using the Mirror Modifier with a Subdivision Surface Modifier

When using the Mirror modifier along with a *subsurf* modifier, the order in which the modifiers are placed is important.



Subsurf modifier before Mirror modifier

The above image shows the subsurf modifier placed before the Mirror one; as you can see the effect of this is that the mesh is split down the center line of the mirror effect. This is because the subsurf calculation moves vertices away from the mirror plane, too far away from the *Merge Limit*.



Mirror modifier before Subsurf modifier

The above image shows the Mirror modifier placed before the subsurf modifier. In this order, the mirror calculation is done and the vertices are merged together. Only after that does the subsurf modifier move any vertices.

Accurately Positioning the Mirror Plane

To apply a Mirror modifier, it is common to have to move the object's center onto the edge or face that is to be the axis for mirroring. This can be tricky when attempted visually.

A good technique to achieve an exact position is to select the edge, then choosing *Cursor to Selection*. This will position the 3D Cursor in the center of the edge. Finally, set *Origin to 3D Cursor*. This will move the object's center (and thus, the mirror plane) to where the 3D cursor is located, and the mirroring will be exact.

An alternative is to use an Empty as a *Mirror Object* that you move to the correct position.

Multiresolution Modifier

Multires modifier

The Multiresolution modifier (often shortened to *Multires*) gives you the ability to subdivide a mesh similarly to the *Subsurf Modifier*, but also allows you to edit the new subdivision levels in sculpt mode.

Note

The *Multiresolution Modifier* is the only modifier that cannot be repositioned in the stack if it means that there will be geometry or other object data created or removed before it (i.e. all *Generate*, some *Modify* and some *Simulate* modifiers cannot come before the Multiresolution modifier.)

Options

Catmull-Clark / Simple

Set the type of subdivision.

Simple
: Maintains the current shape, and simply subdivides edges.

Catmull-Clark
: Creates a smooth surface, usually smaller than the original, using the standard Catmull-Clark subdivision surface algorithm.

Preview
: Set the level of subdivisions to show in the 3D View.

Sculpt
: Set the number of subdivisions to use in Sculpt Mode.

Render
: Set the number of subdivisions to show when rendering.

Subdivide
: Add another level of subdivision.

Delete Higher
: Deletes all subdivision levels that are higher than the current one.

Reshape
: Copies vertex coordinates from another mesh. To use, first select a different mesh object with matching topology and vertex indexes, then `Shift` select the object you wish to copy vertex coordinates to and click *Reshape*.

Apply Base
: Modifies the original unsubdivided mesh to match the form of the subdivided mesh.

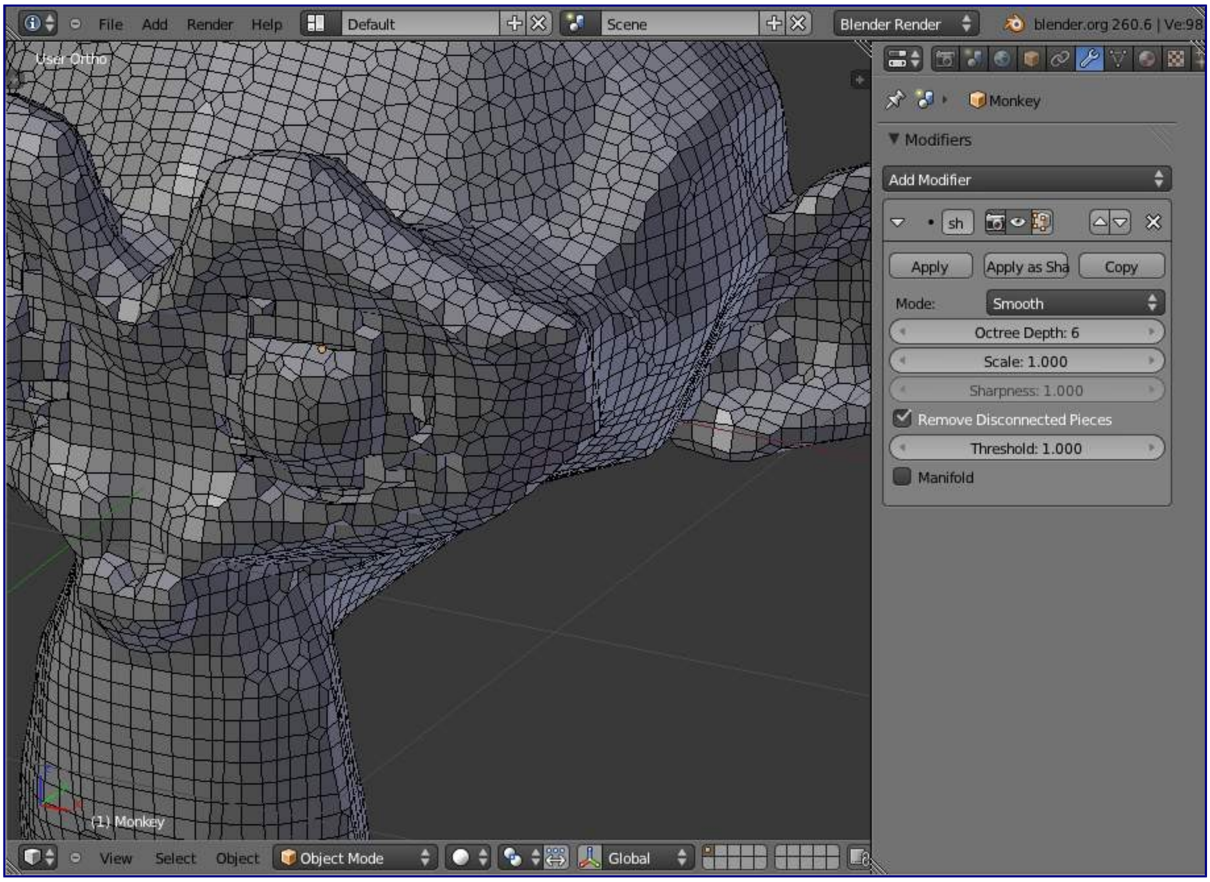
Subdivide UVs
: When enabled, the UV maps will also be subdivided. (i.e. Bforartists will add “virtual” coordinates for all sub-faces created by this modifier).

Optimal Display
: When drawing the wireframe of this object, the wires of the new subdivided edges will be skipped (only draws the edges of the original geometry).

Save External
: Saves displacements to an external .btx file.

Remesh Modifier

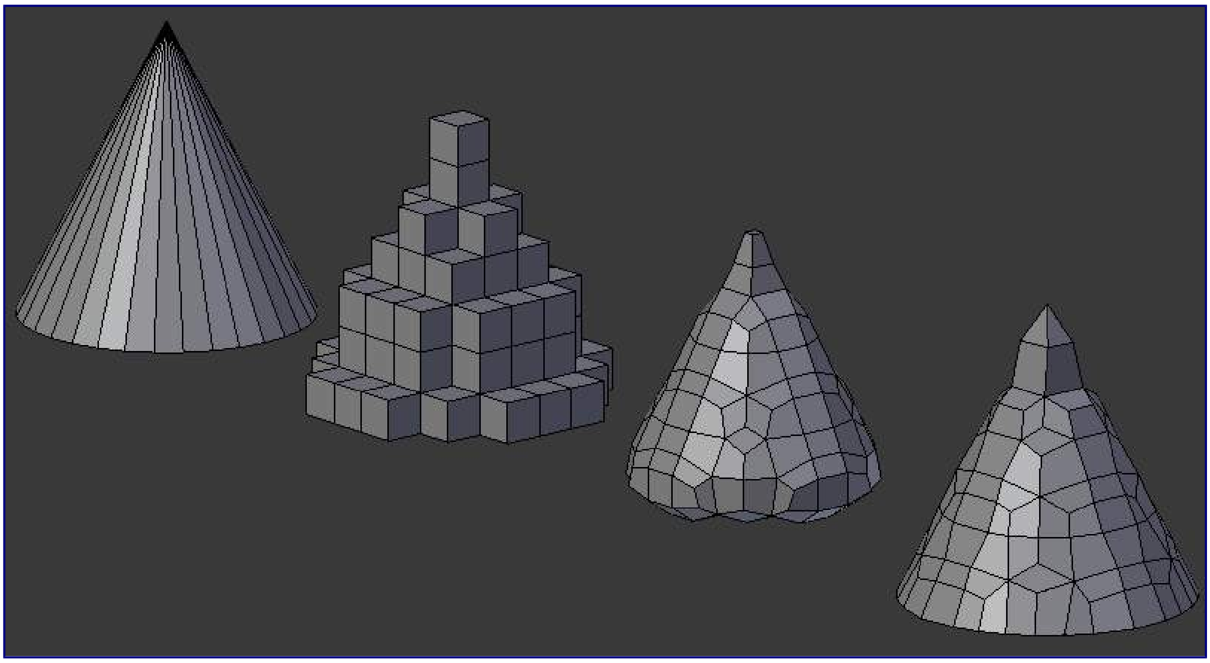
The Remesh modifier is a tool for generating new mesh topology. The output follows the surface curvature of the input, but its topology contains only quads.



Options

Mode

There are three basic modes available in the remesh modifier: Blocks, Smooth and Sharp.



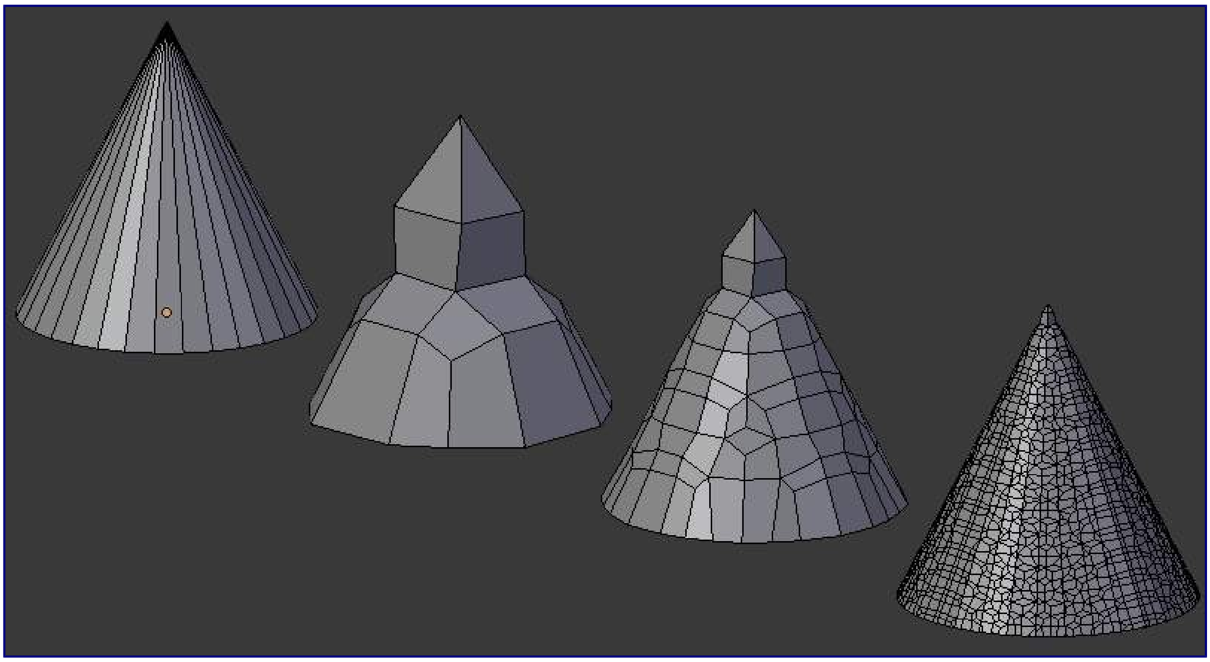
This example shows a cone with each of the different remesh modes. From left to right: original cone, Blocks, Smooth, and Sharp

The output topology is almost identical between the three modes; what changes is the smoothing.

Blocks
There is no smoothing at all.

Smooth
Output a smooth surface.

Sharp
Similar to *Smooth*, but preserves sharp edges and corners. In the above image, the circular bottom of the cone and the top point of the cone are more accurately reproduced in Sharp mode.



Input mesh, and the low to high resolution output meshes

Octree Depth
The Octree Depth sets the resolution of the output. Low values will generate larger faces relative to the input, higher values will generate a denser output.

Scale
The result can be tweaked further by setting the Scale; lower values effectively decrease the output resolution.

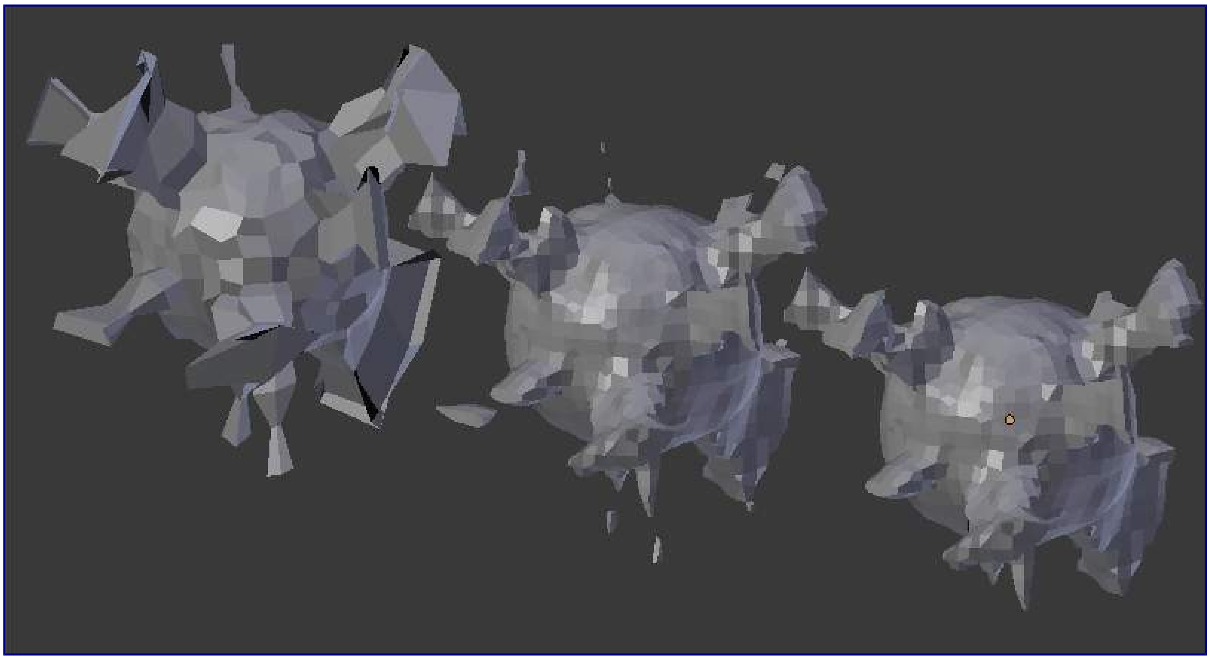
Sharpness
Shown when using the *Sharp Mode* - Higher values produce edges more similar to the input, while lower values filter out noise.

Smooth Shading
Output faces with smooth shading rather than flat shading. The smooth/flat shading of the input faces is not preserved.

Remove Disconnected Pieces

Filter out small disconnected pieces of the output.

Threshold
Use this to control how small a disconnected component must be to be removed.

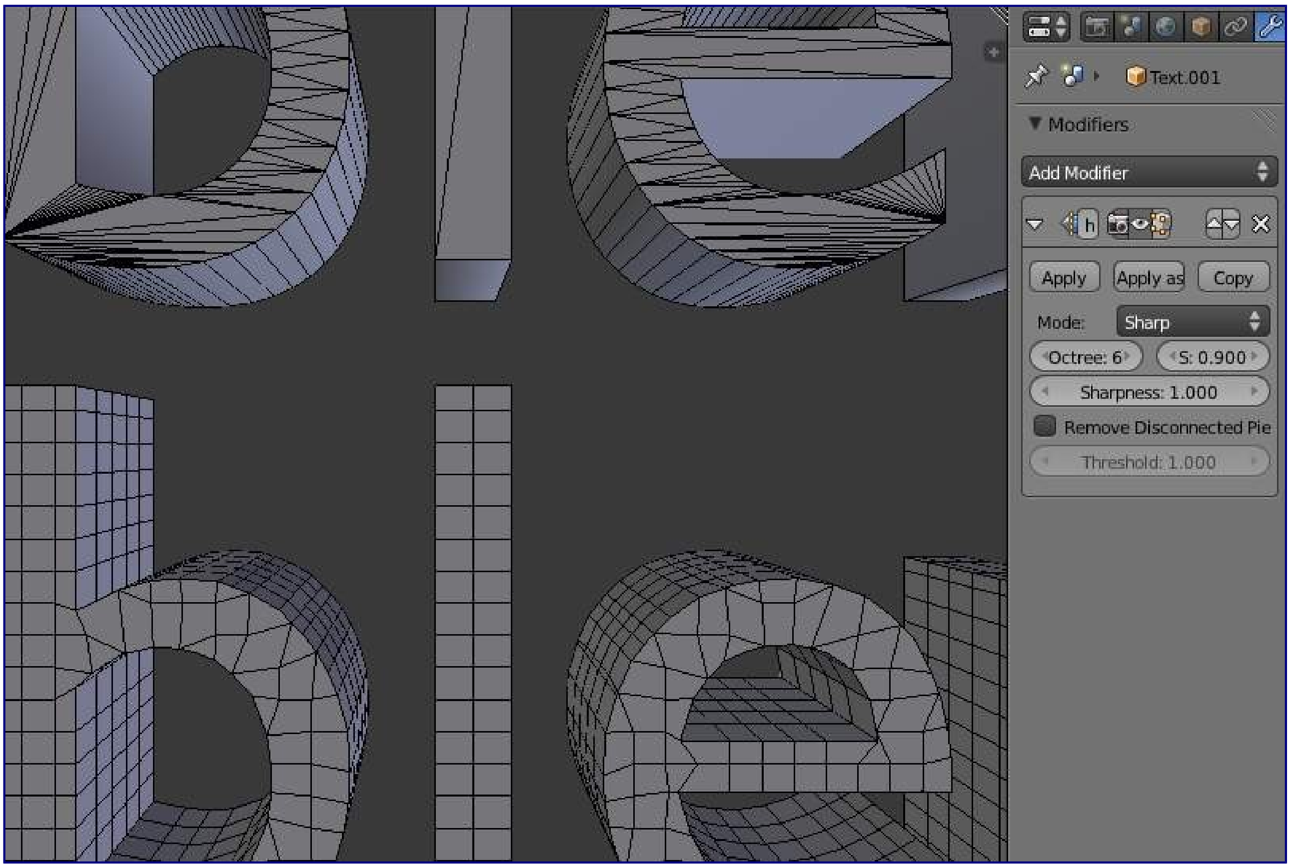


The input mesh (left) is fairly noisy, so the initial output of the remesh modifier (center) contains small disconnected pieces. Enabling Remove Disconnected Pieces (right) deletes those faces.

Usage

In the modifier panel, add a Remesh modifier. The input mesh should have some thickness to it; if the input is completely flat, add a *solidify* modifier above the remesh modifier.

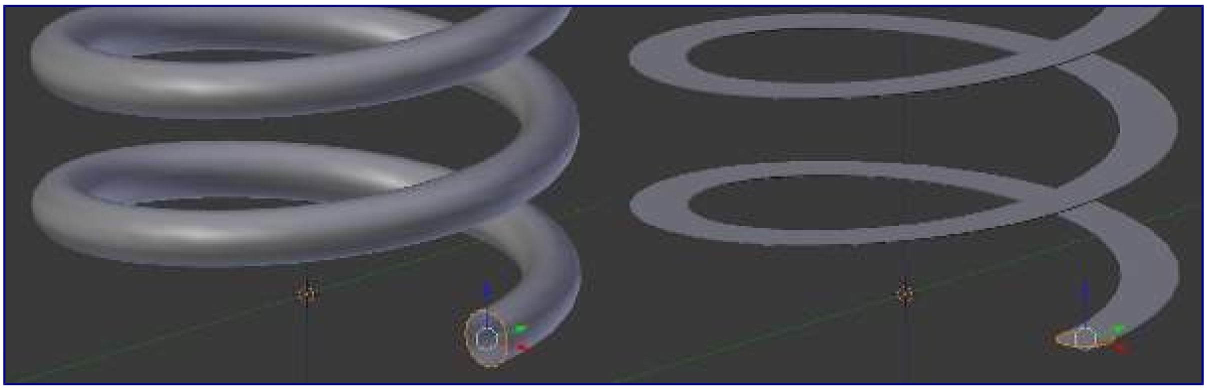
Examples



Remesh modifier applied to text to improve topology

Screw Modifier

The Screw modifier is similar to the *Screw tool* in the *Tool Shelf* in that it takes a profile object, a Mesh or a Curve, to create a helix-like shape.



Properly aligning the profile object is important

The profile should be properly aligned to the cardinal direction of the object rather than to the screw axis.

Options

Screw modifier

Axis

The axis along which the helix will be built.

Screw
The height of one helix iteration.

AxisOb

The name of an object to define the axis direction.

Object Screw
Use the distance from the *AxisOb* to define the height of one helix iteration.

Angle
Degrees for a single helix revolution.

Steps
Number of steps used for a single revolution displayed in the 3D view. Beware of setting this higher than *Render Steps*, which is the value used for rendering.

Render Steps
As above, but used during render time. Increase to improve quality.

Smooth Shading
Output faces with smooth shading rather than flat shading. The smooth/flat shading of the input geometry is not preserved.

Calc Order
Order of edges is calculated to avoid problems with normals and shading. Only needed for meshes, not curves.

Flip
Flip normals direction.

Iterations
Number of revolutions.

Stretch U/V
Stretch the UV coordinates from `0.0` to `1.0` when UVs are present.

Skin Modifier

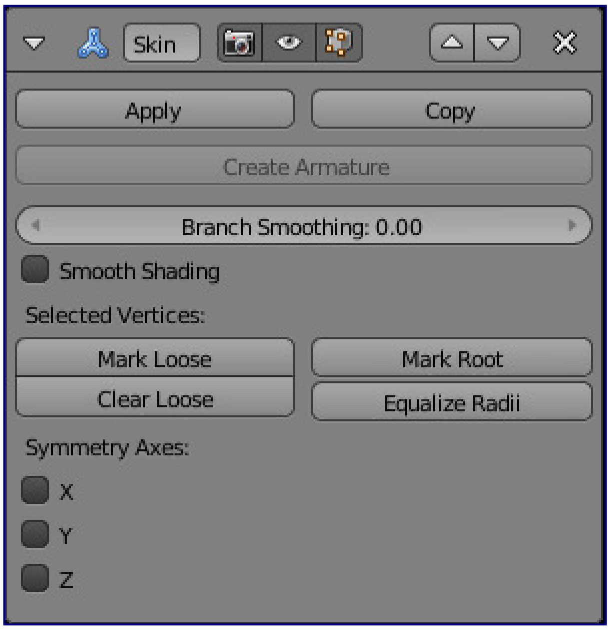
The Skin Modifier uses vertices and edges to create a skinned surface, using a per-vertex radius to better define the shape. The output is mostly quads, although some triangles will appear around intersections.

It is a quick way to generate base meshes for sculpting and/or smooth organic shapes with arbitrary topology.

Note

Faces in the original geometry are ignored by the Skin Modifier.

Options



Skin Modifier.

Create Armature

Create an armature on top of the object. Each edge becomes a bone.

Note
If the root vertex has more than one adjacent edge, an extra bone will be created to serve as the root.

This function does the following:

1. A new armature object is added with bones matching the input mesh. The active selection is switched to the new armature.
2. Weight groups are added to the input mesh. The Skin Modifier propagates these weights to the output as well.
3. An Armature Modifier is added directly below the Skin Modifier. Note that the Armature Modifier is being applied after the Skin Modifier because it should only deform the output, whereas if it were above the Skin Modifier it might change the resulting topology.

Smoothing

Branch Smoothing
: A branch point is a vertex with three or more connected edges. These areas tend to produce more complicated topology, some of which may overlap. The *Branch Smoothing* setting relaxes the surface around these points, with the side effect of shrinking the surface.

Smooth Shading
: Output faces with smooth shading rather than flat shading. The smooth/flat shading of the input geometry is not preserved.

Selected Vertices

Mark/Clear Loose
: By default, a branch vertex (vertex with three or more connected edges) will generate extra edge loops along adjacent edges in order to keep the output tight. Branches can be made loose by clicking *Mark Loose*, which will allow the output to stretch between all adjacent vertices. This can be disabled again by clicking *Clear Loose* with the vertex selected.

Mark Root

Marking a vertex as root causes that vertex to be used for calculating rotations for connected limbs. Root vertices also affect the armature output; they will be used as the origin for the root bones.

Roots are shown in the 3D View with a red dashed circle around the vertex.

Each set of connected vertices should have one root node. *Mark Root* enforces the one-root per set rule, so it is not necessary to manually unmark roots.

Equalize Radii
: Makes the skin radii of selected vertices equal on each axis.

Symmetry Axes

The Symmetry Axes checkboxes are used to keep the output topology symmetrical in their respective axes. In other words, using it avoids merging triangles across an axis unless the triangles form a symmetric quad.

Note

These symmetry axes checkboxes do not add geometry flipped across an axis. For that, the Mirror Modifier should be used, typically placed above the Skin Modifier.

Usage

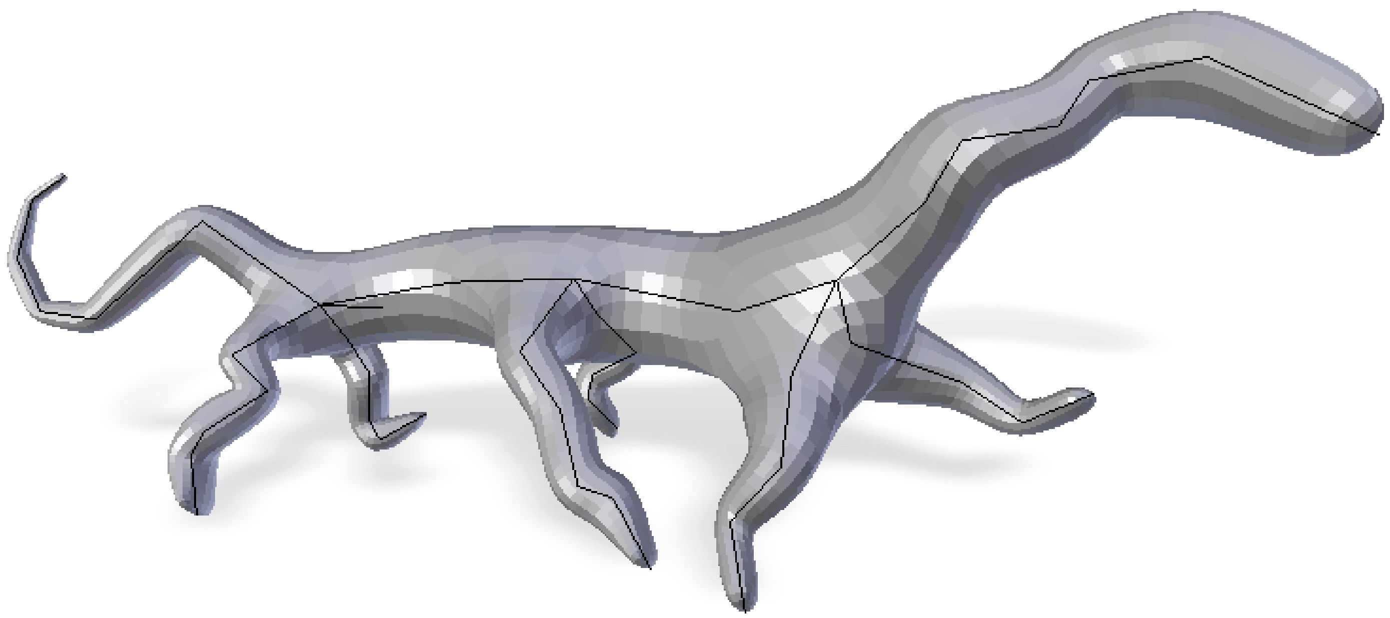
Add the Skin Modifier to a mesh. Disable *Limit selection to visible* in the 3D View so that you can see the vertices inside the new geometry. Ensure the modifier is enabled for display in Edit Mode (on by default).

The Skin Modifier uses ordinary vertices and edges as input. All of the regular Edit Mode tools (such as extrude, subdivide, grab, scale, and rotate) can be used when building a skinned mesh.

Skin Resize

The radii of input vertices can be individually scaled in Edit Mode to alter the thickness of the skin by pressing `Ctrl-A`. Non-uniform scaling of the X and Y axes is accessible by locking it with `X` or `Y`. The radius can also be adjusted in the *Transform* panel of the *Properties* region.

Examples



Simple creature, made with only the Skin Modifier.

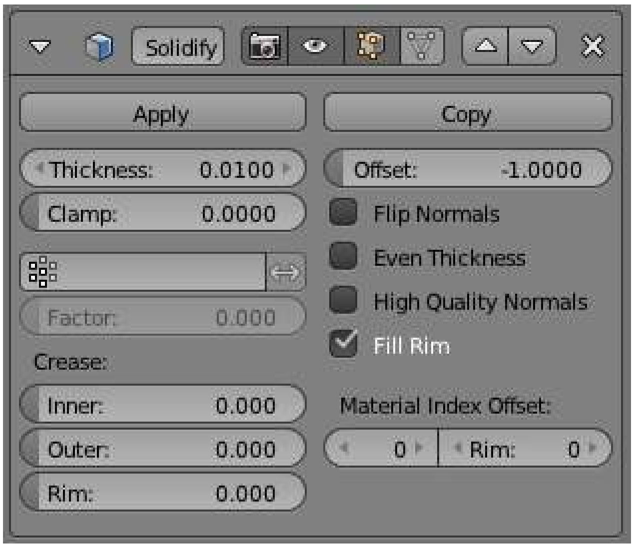
1. In the *modifiers* menu, add a Skin Modifier.
2. `Tab` into edit mode and start extruding.
3. Try to sketch results similar to Fig. Simple creature, made with only the Skin Modifier., through extruding the vertices of the object.

4. Use `Ctrl-A` to change the size of the different regions within the creature.
5. Use *Mark Loose* at regions like the neck, to merge these faces more together.
6. To get smoother results, activate *Smooth Shading* and add a Subdivision Surface

Solidify Modifier

The Solidify modifier takes the surface of any mesh and adds depth to it.

Options



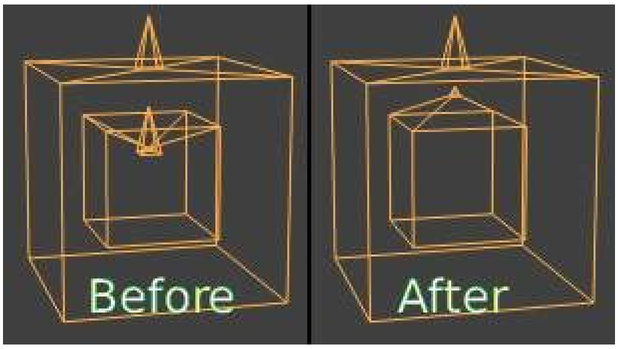
Solidify modifier

Thickness
: The depth to be solidified.

Offset
: A value between `-1` and `1` to locate the solidified output inside or outside the original mesh. Set to `0.0`, the solidified output will be centered on the original mesh.

Clamp

: A value between `0` and `2` to clamp offsets to avoid self intersection.



Clamp Offset

Vertex Group

Only vertices in this group are solidified - their weights are multiplied by the thickness, so vertices with lower weights will be less thick.

Invert
Reverses the vertex group, so that only vertices which are **not** in the vertex group are solidified.

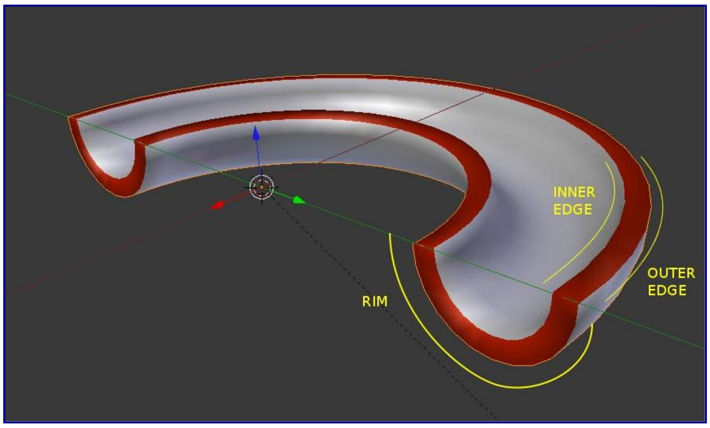
Factor

How much the vertex weights are taken into account.

- On `0.0`, vertices with zero weight will have no thickness at all.
- On `0.5`, vertices with zero weight will be half as thick as those with full weight.
- On `1.0`, the weights are ignored and the *thickness* value is used for every vertex.

Crease

These options are intended for usage with the *Subdivision Modifier*.



Rim and edges. In this example, the object was assigned a second material used to color the rim red.

Inner
Set a crease to the inner edges.

Outer
Set a crease to the outer edges.

Rim
Set a crease to the rim.

Flip Normals
Reverse the normals of all geometry (both the inner and outer surfaces).

Even Thickness
Maintain thickness by adjusting for sharp corners. Sometimes improves quality but also increases computation time.

High Quality Normals
Normals are calculated to produce a more even thickness. Sometimes improves quality but also increases computation time.

Fill Rim
Fills the gap between the inner and outer edges.

Only Rim
TODO

Note

Fill Rim and *Only Rim* only make a difference on non-manifold objects, since the “rims” are generated from the borders of the original geometry.

Material Index Offset

Choose a different material to use for the new geometry; this is applied as an offset from the original material of the face from which it was solidified.

- A value of `0` means it will use the same material.
- A value of `1` means it will use the material immediately below the original material.
- A value of `-2` means the material two positions above the original material will be used.

These are clamped to the top-most and bottom-most material slots.

Rim

Similarly, you can give another material to the rim faces.

Warning

The modifier thickness is calculated using local vertex coordinates. If the object has non-uniform scale, the thickness will vary on different sides of the object.

To fix this, either apply or clear scale.

Known Limitations

Even Thickness

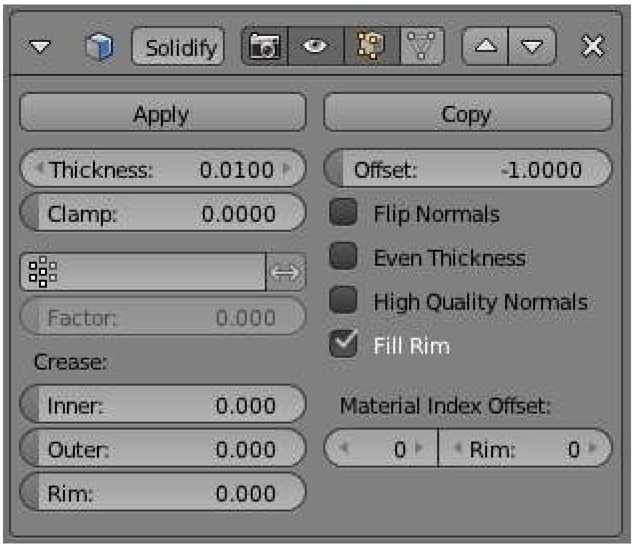
Solidify thickness is an approximation. While “Even Thickness” and “High Quality Normals” should yield good results, the final wall thickness isn’t guaranteed and may vary depending on the mesh topology.

In order to maintain precise wall thickness in every case, we would need to add/remove faces on the offset shell - something this modifier doesn’t do since this would add a lot of complexity and slow down the modifier.

Solidify Modifier

The Solidify modifier takes the surface of any mesh and adds depth to it.

Options



Solidify modifier

Thickness

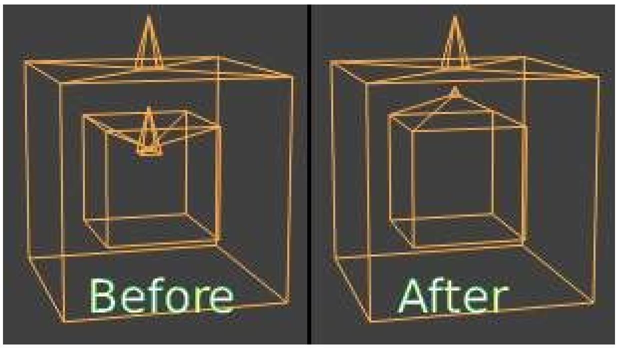
The depth to be solidified.

Offset

A value between `-1` and `1` to locate the solidified output inside or outside the original mesh. Set to `0.0`, the solidified output will be centered on the original mesh.

Clamp

A value between `0` and `2` to clamp offsets to avoid self intersection.



Clamp Offset

Vertex Group

Only vertices in this group are solidified - their weights are multiplied by the thickness, so vertices with lower weights will be less thick.

Invert

Reverses the vertex group, so that only vertices which are **not** in the vertex group are solidified.

Factor

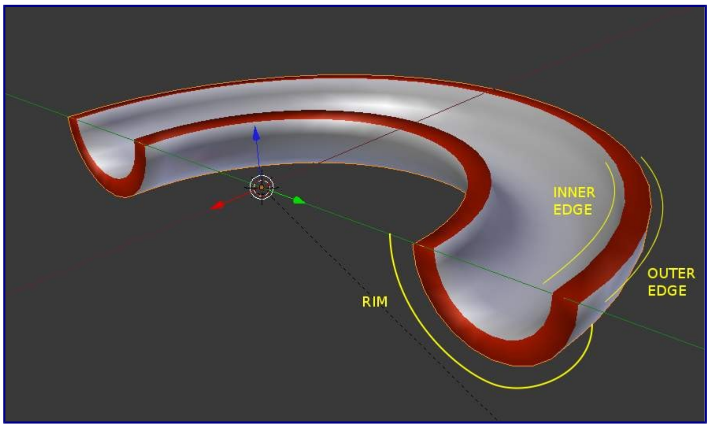
How much the vertex weights are taken into account.

- On `0.0`, vertices with zero weight will have no thickness at all.
- On `0.5`, vertices with zero weight will be half as thick as those with full weight.

- On `1.0`, the weights are ignored and the *thickness* value is used for every vertex.

Crease

These options are intended for usage with the *Subdivision Modifier*.



Rim and edges. In this example, the object was assigned a second material used to color the rim red.

Inner
: Set a crease to the inner edges.

Outer
: Set a crease to the outer edges.

Rim
: Set a crease to the rim.

Flip Normals
: Reverse the normals of all geometry (both the inner and outer surfaces).

Even Thickness
: Maintain thickness by adjusting for sharp corners. Sometimes improves quality but also increases computation time.

High Quality Normals
: Normals are calculated to produce a more even thickness. Sometimes improves quality but also increases computation time.

Fill Rim
: Fills the gap between the inner and outer edges.

Only Rim
: TODO

Note

Fill Rim and *Only Rim* only make a difference on non-manifold objects, since the "rims" are generated from the borders of the original geometry.

Material Index Offset

Choose a different material to use for the new geometry; this is applied as an offset from the original material of the face from which it was solidified.

- A value of `0` means it will use the same material.
- A value of `1` means it will use the material immediately below the original material.
- A value of `-2` means the material two positions above the original material will be used.

These are clamped to the top-most and bottom-most material slots.

Rim

Similarly, you can give another material to the rim faces.

Warning

The modifier thickness is calculated using local vertex coordinates. If the object has non-uniform scale, the thickness will vary on different sides of the object.

To fix this, either apply or clear scale.

Known Limitations

Even Thickness

Solidify thickness is an approximation. While “Even Thickness” and “High Quality Normals” should yield good results, the final wall thickness isn’t guaranteed and may vary depending on the mesh topology.

In order to maintain precise wall thickness in every case, we would need to add/remove faces on the offset shell - something this modifier doesn’t do since this would add a lot of complexity and slow down the modifier.

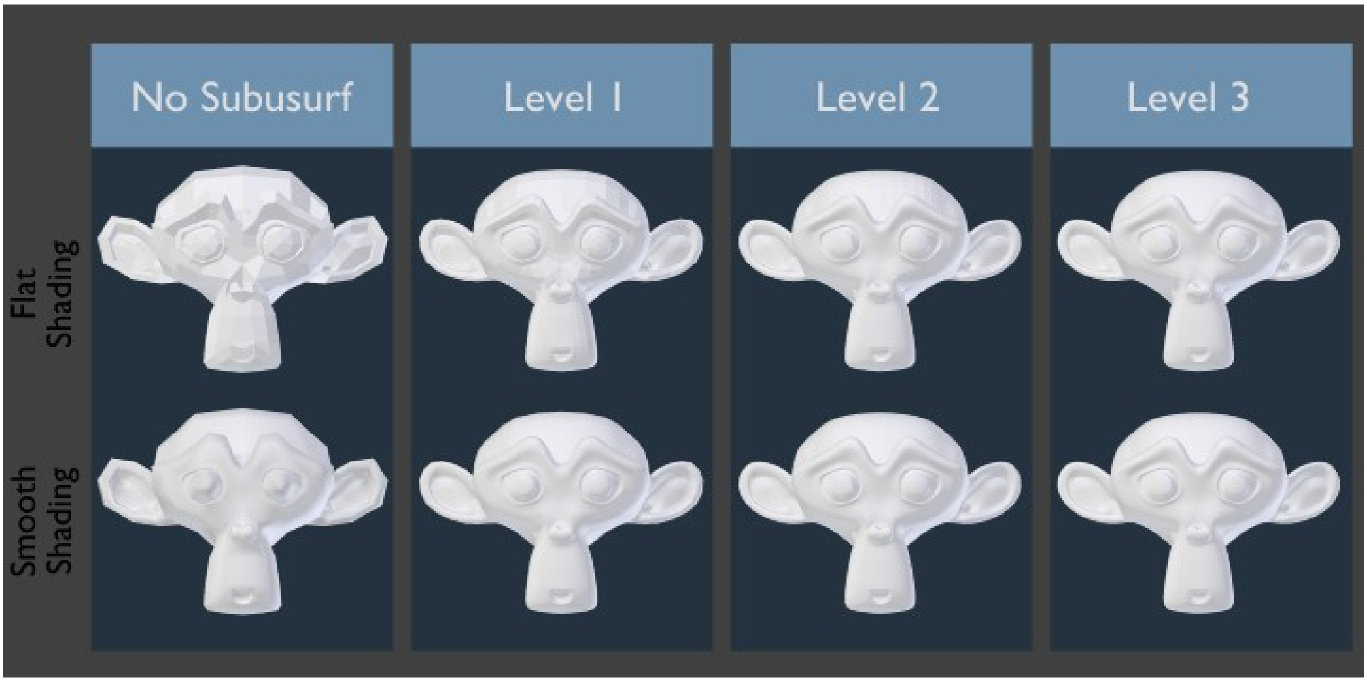
Subdivision Surface Modifier

Subdivision Surface (*Subsurf* in short) is a method of subdividing the faces of a mesh to give a smooth appearance, to enable modeling of complex smooth surfaces with simple, low-vertex meshes. This allows high resolution mesh modeling without the need to save and maintain huge amounts of data and gives a smooth *organic* look to the object.

This process creates virtual geometry that is generated non-destructively without modifying the original mesh, but it can be converted to real geometry that you could edit with the *Apply* button.

Also, like the rest of the Modifiers, order of execution has an important bearing on the results. For this, see the documentation on *The Stack*.

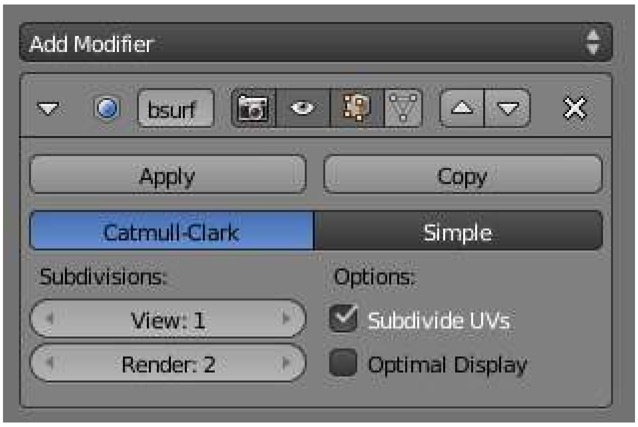
Keep in mind that this is a different operation than its companion, *Smooth Shading*. You can see the difference between the two in the grid image below.



Subsurfs levels 0 to 3, without and with Smooth Shading.

Tip
The Subsurf modifier does not allow you to edit the new subdivided geometry without applying it, but the *Multires* modifier does (in sculpt mode).

Modifier Settings



Modifier's Panel

Type

This toggle button allows you to choose the subdivision algorithm:

Catmull-Clark

The default option, subdivides and smooths the surfaces. According to its Wikipedia page, the "arbitrary-looking formula was chosen by Catmull and Clark based on the aesthetic appearance of the resulting surfaces rather than on a mathematical derivation."

Simple
Only subdivides the surfaces, without any smoothing (the same as `W` –> *Subdivide*, in Edit Mode). Can be used, for example, to increase base mesh resolution when using displacement maps.

Subdivisions

Recursively adds more geometry. For details on polygon counts, see the Performance Considerations section.

View
The number of subdivision levels shown in the 3D View.

Render
The number of subdivision levels shown in renders.

The right combination of these settings will allow you to keep a fast and lightweight approximation of your model when interacting with it in 3D, but use a higher quality version when rendering.

Note

Be careful not to set the *View* subdivisions higher than the *Render* subdivisions, this would mean the 3D View will be higher quality than the render.

Options:

Subdivide UVs
When enabled, the UV maps will also be subsurfed (i.e. Bforartists will add “virtual” coordinates for all sub-faces created by this modifier).

Subdivide UVs on and off

Optimal Display
When drawing the wireframe of this object, the wires of the new subdivided edges will be skipped (only draws the edges of the original geometry)

Opensubdiv
See the OpenSubdiv section.

OpenSubdiv

OpenSubdiv is a option of Subsurf modifier. When this option is enabled for Subsurf modifier from the very top of the modifier stack, evaluation will happen on the compute device selected in the User Preferences. Best performance will be achieved when using GLSL evaluation. As a result performance of the modifier will be much higher which is great for animations.

To enable OpenSubdiv you must first choose the fastest compute device. To do this see the OpenSubdiv Compute section. To find more on OpenSubdiv read the Release Notes.

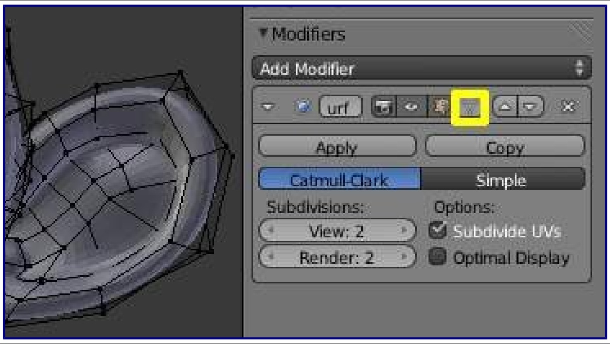
Improving Performance

In order to utilize maximum performance form OpenSubdiv the following things are required:

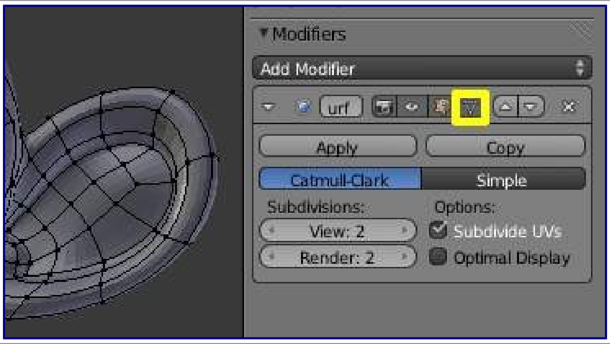
- Subsurf modifier must be last in the *modifier stack*.
- There should be no modifiers prior to Subsurf which changes mesh topology across the time.
- Other objects should not use geometry of OpenSubdiv mesh

Edit Cage

To view and edit the results of the subdivision while you're editing the mesh, you must enable the *Editing Cage* (the triangle button in the modifier's header). This lets you grab the vertices as they lie in their new smoothed locations, rather than on the original mesh.



Edit Cage Off (Default)



Edit Cage On

With the edit cage off, some vertices are buried under the subsurfed mesh. With dense vertex configurations, you might even have to temporarily disable the modifier or view *wireframe* shading so that you can see these vertices.

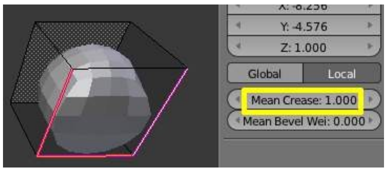
With the edit cage on, you do not have this problem. It does, however, have its own disadvantage—it can look *too* nice, hiding irregularities. Notice the three quads running in the middle of Suzanne's ear: you can only tell how crooked they are in the "edit cage off" version. When you are modeling, you will more often want to see your mesh deformities in their full ugliness so that you can apply your skills until it is sheer prettiness.

Control

Subsurf rounds off edges, and often this is not what you want. There are several solutions.

Weighted Edge Creases

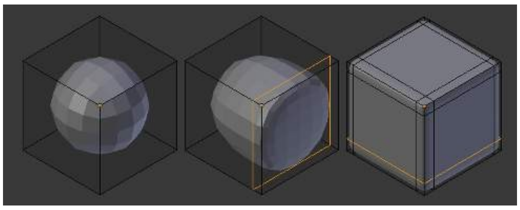
Weighted edge creases for subdivision surfaces allows you to change the way Subsurf subdivides the geometry to give the edges a smooth or sharp appearance.



A Subsurfed Cube with Creased Edges

The crease weight of selected edges can be changed in the *Transform* panel of the properties region, and moving the mouse closer or further from the selected edges to adjust the crease weight. A higher value makes the edge “stronger” and more resistant to the smoothing effect of subdivision surfaces.

Edge Loops



A Subsurf Level 2 Cube, the same with an extra Edge Loop, and the same with six extra Edge Loops

The Subsurf modifier demonstrates why good, clean topology is so important. As you can see in the figure, the Subsurf modifier has a drastic effect on a default Cube. Until you add in additional Loops, the shape is almost unrecognizable as a cube.

A mesh with deliberate topology has good placement of Edge Loops, which allow the placement of more Loops to control the sharpness/smoothness of the resultant mesh.

Performance Considerations

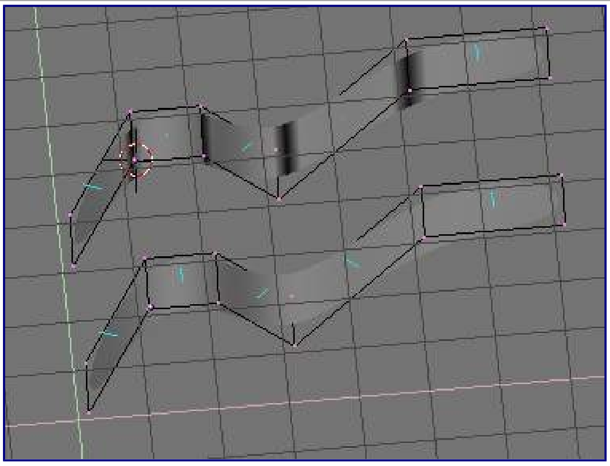
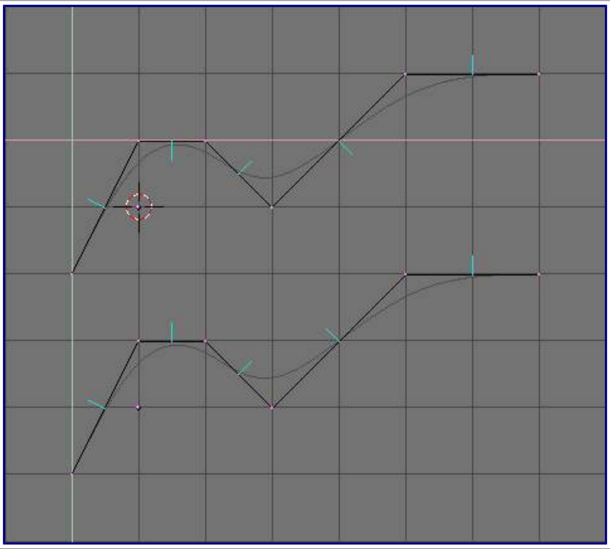
Higher levels of subdivisions mean more vertices, and more vertices means more memory will be used (both video memory for display, and system RAM for rendering). Bforartists could potentially crash or hang if you do not have enough memory.

When using high levels of subdivision with a graphics card that has a low total amount of Vram, some parts of the geometry will disappear visually. Your mesh will actually be OK, because the render is generated using your Object Data, (even though it cannot be shown by your graphics card).

Known Limitations

Non Contiguous Normals

Bforartists’s subdivision system produces nice smooth subsurfed meshes, but any subsurfed face (that is, any small face created by the algorithm from a single face of the original mesh), shares the overall normal orientation of that original face.

	
Comparison of good normals and bad normals	Side view of image on left

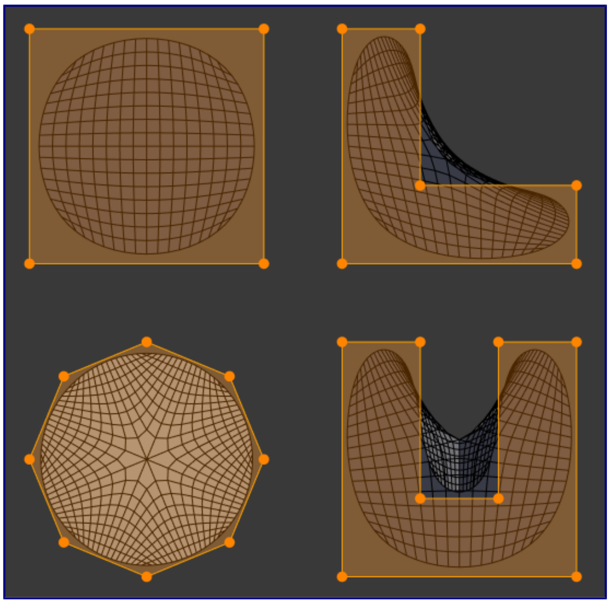
Abrupt normal changes can produce ugly black gouges even though these flipped normals are not an issue for the shape itself.

A quick way to fix this is to use Bforartists's *Recalculate Normals* operation in Edit Mode.

If you still have some ugly black gouges you will have to *Manually Flip the Normals*.

Concave NGons

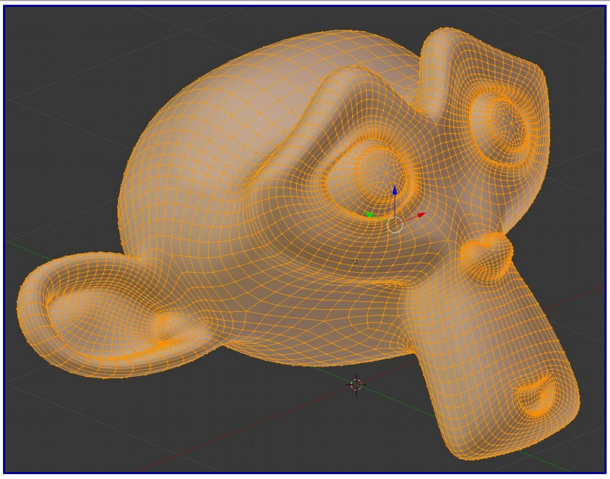
While NGons are supported, concave ngons may give ugly overlapping results.



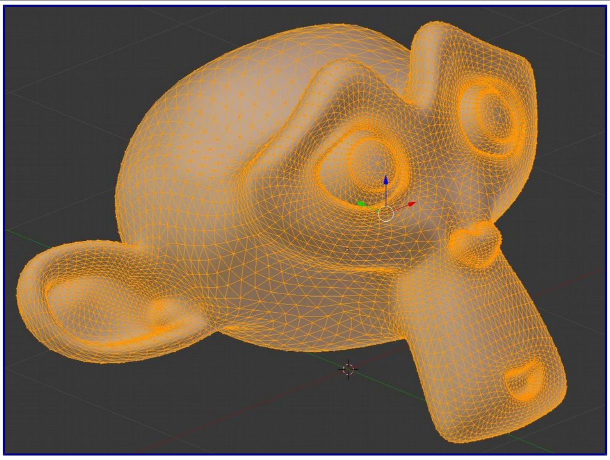
The ngons on the right show overlapping subsurf result.

Triangulate Modifier

The Triangulate modifier converts all faces in a mesh (whether it be quads or N-gons) to triangular faces. This modifier does the exact same function as the triangulate function in Edit Mode.



Mesh before Triangulate Modifier



Mesh after Triangulate Modifier

Options

Quad Method:

Beauty
: Split the quads in nice triangles, slower method.

Fixed
: Split the quads on the 1st and 3rd vertices.

Fixed Alternate
: Split the quads on the 2nd and 4th vertices.

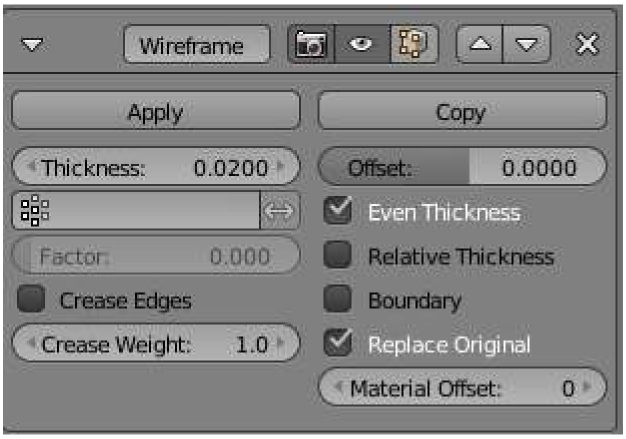
Shortest Diagonal
: Split the quads based on the distance between the vertices.

Ngon Method:

Beauty
: Arrange the new triangles nicely, slower method.

Scanfill
: Split the ngons using a scanfill algorithm.

Wireframe Modifier



Wireframe Modifier

The Wireframe modifier transforms a mesh into a wireframe by iterating over its faces, collecting all edges and turning those edges into 4 sided polygons. Be aware of the fact that your mesh needs to have faces to be wireframed. You can define the thickness, the material and several other parameters of the generated wireframe dynamically via the given modifier options.

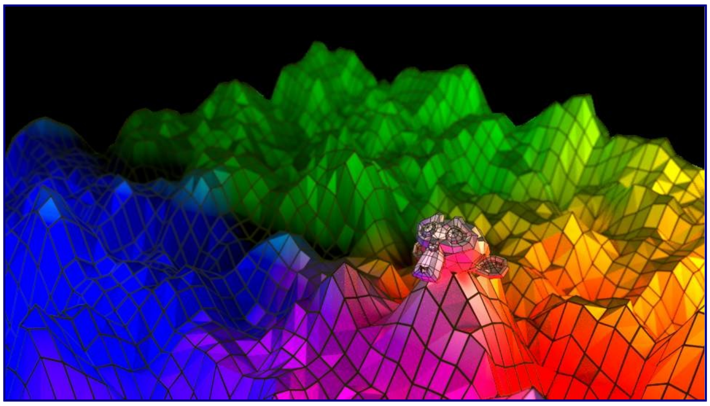
Options

Thickness
: The depth or size of the wireframes.

Offset
: A value between `-1` and `1` to change whether the wireframes are generated inside or outside the original mesh. Set to zero, *Offset* will center the wireframes around the original edges.

Vertex Group
: Restrict the modifier to only this vertex group.

  Invert
  : Inverts the vertex group weights.



Wireframes on a displaced plane. In this example, the wireframes carry a second (dark) material while the displaced plane uses its original one.

Crease Edges
: This option is intended for usage with the *Subdivision Modifier*. Enable this option to crease edges on their junctions and prevent large curved intersections.

  Crease Weight
  : Define how much crease (between `0` = no and `1` = full) the junctions should receive.

Even Thickness
: Maintain thickness by adjusting for sharp corners. Sometimes improves quality but also increases computation time.

Relative Thickness
: Determine edge thickness by the length of the edge - longer edges are thicker.

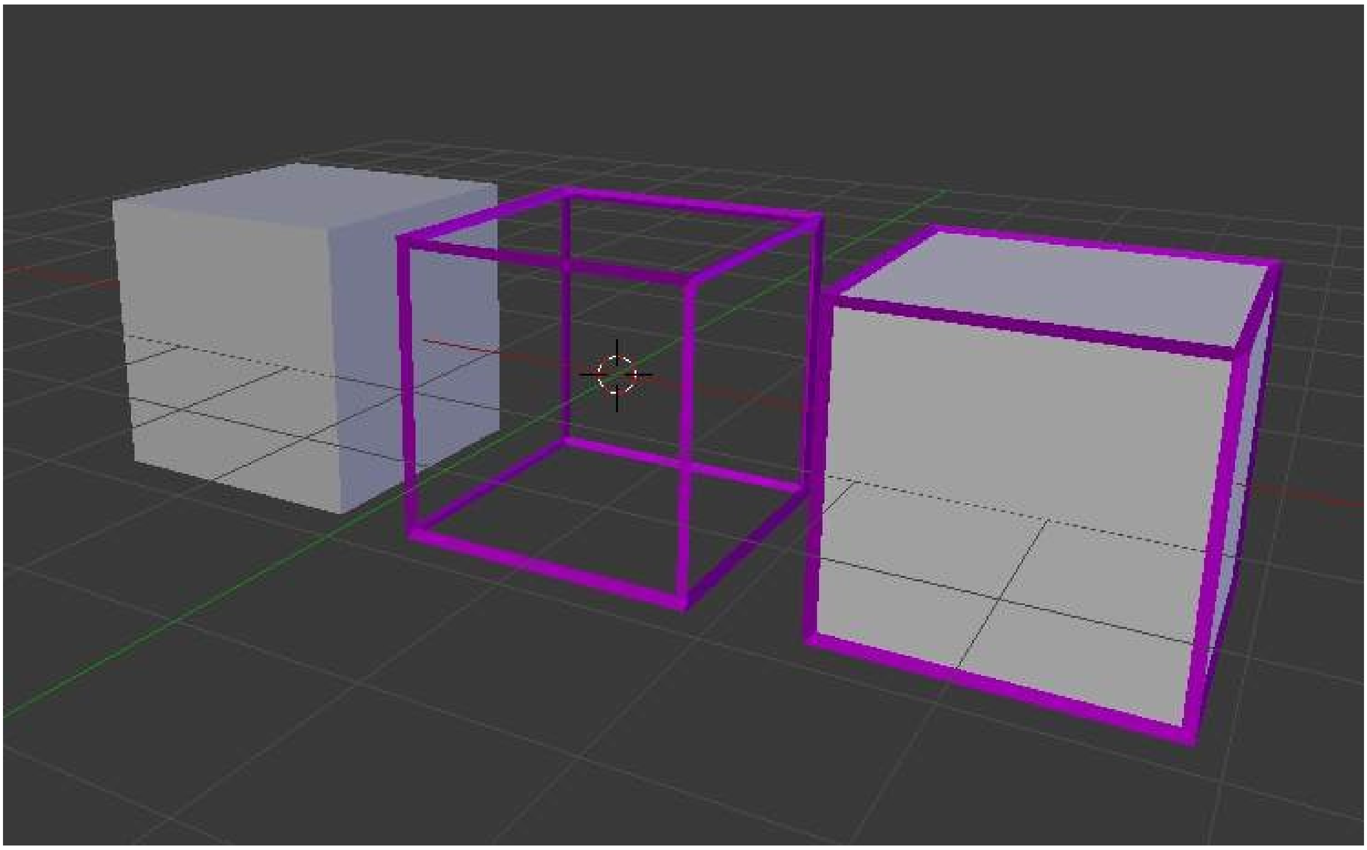
Boundary
: Creates wireframes on mesh island boundaries.

Replace Original
: If this option is enabled, the original mesh is replaced by the generated wireframe. If not, the wireframe is generated on top of it.

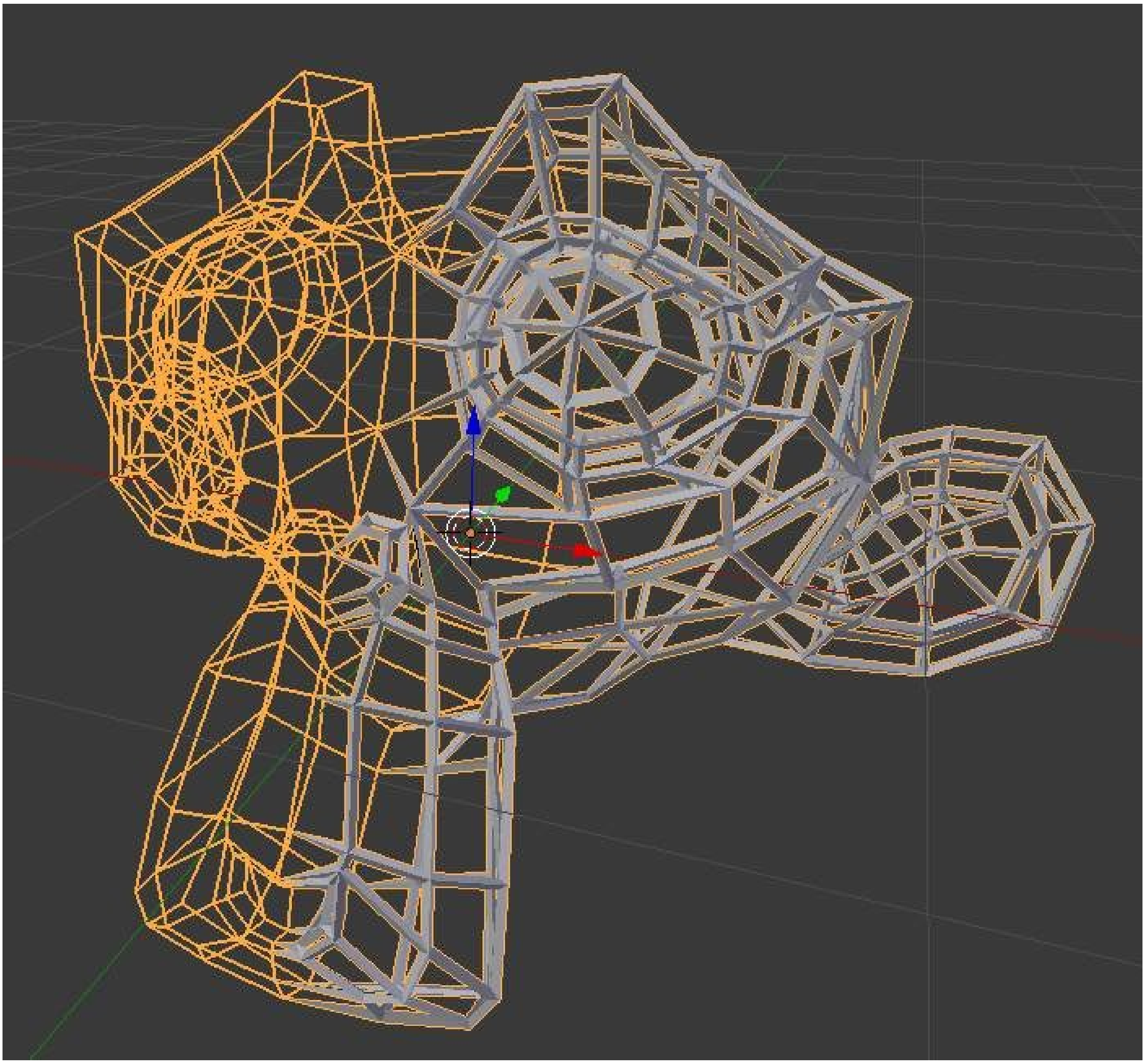
Material Offset
: Uses the chosen material index as the material for the wireframe; this is applied as an offset from the first material.

Examples

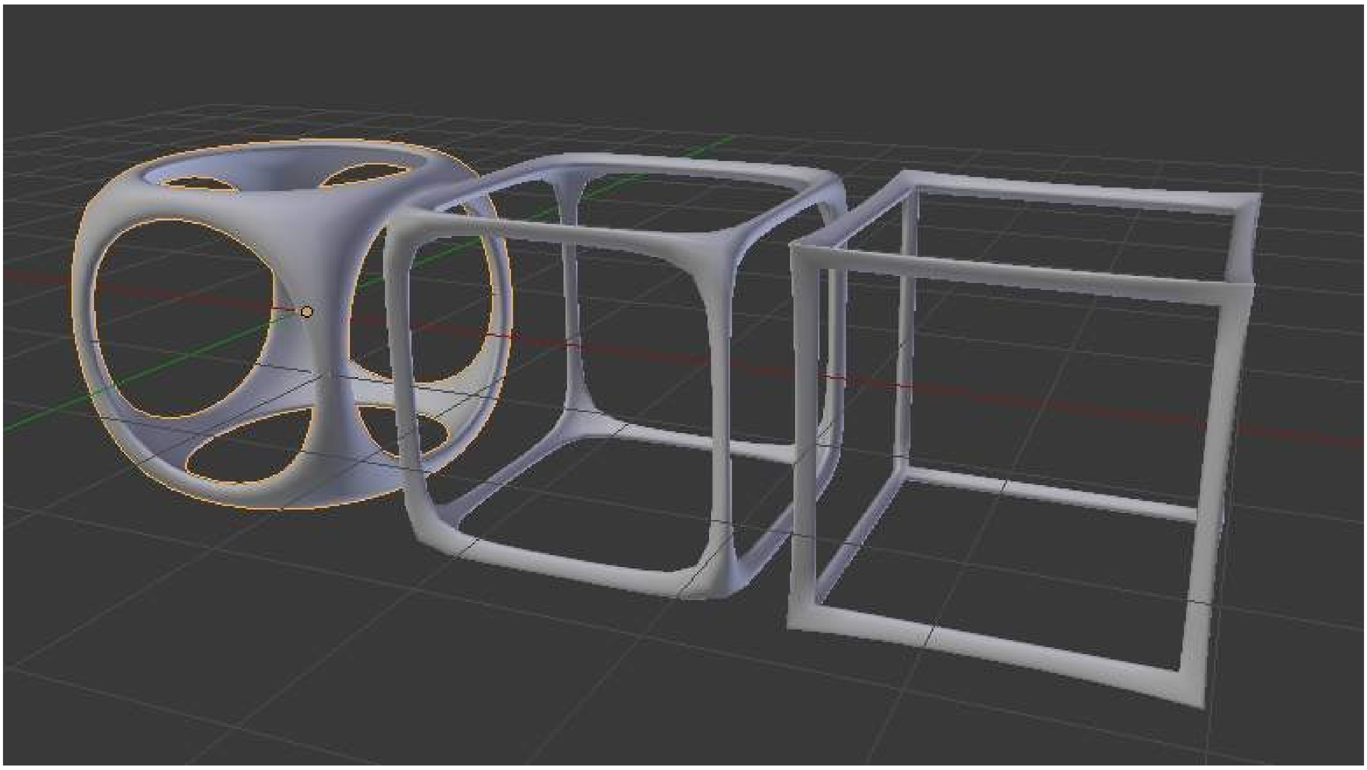
When you got more Faces that meet at one point they are forming a star like pattern like seen in the examples below.



Original / Wireframe / Original+Wireframe



VGroup weighting: One half 0 weighted, one half 1 weighted



Cube+Subsurf with 0 / 0.5 / 1 crease weight

Warning

Wireframe thickness is an approximation. While *Even Thickness* should yield good results in many cases, skinny faces can cause ugly spikes. In this case you can either reduce the extreme angles in the geometry or disable the *Even Thickness* option.

Armature Modifier

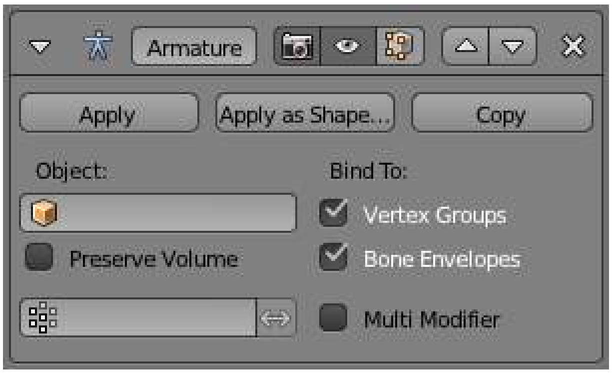
The *Armature* modifier is used for building skeletal systems for animating the poses of characters and anything else which needs to be posed.

By adding an armature system to an object, that object can be deformed accurately so that geometry doesn't have to be animated by hand.

Note

For more details on armatures usage, see *this chapter*.

Options



Armature modifier

Object
The name of the armature object used by this modifier.

Preserve Volume
Use quaternions for preserving volume of object during deformation. It can be better in many situations.

Vertex Group

The name of a vertex group of the object, the weights of which will be used to determine the influence of this *Armature* modifier's result when mixing it with the results from other *Armature* ones.

Only meaningful when having at least two of these modifiers on the same object, with *Multi Modifier* activated.

Invert
Inverts the influence set by the vertex group defined in previous setting (i.e. reverses the weight values of this group).

Multi Modifier

Use the same data as a previous modifier (usually also an *Armature* modifier) as input. This allows you to use several armatures to deform the same object, all based on the "non-deformed" data (i.e. this avoids having the second *Armature* modifier deform the result of the first one...).

The results of the *Armature* modifiers are then mixed together, using the weights of the *Vertex Group* as "mixing guides".

Bind To

Method to bind the armature to the mesh.

Vertex Groups
When enabled, bones of a given name will deform vertices which belong to vertex groups of the same name.

Bone Envelopes
When enabled, bones will deform vertices near them (defined by each bones envelope radius) Enable/Disable bone envelopes defining the deformation (i.e. bones deform vertices in their neighborhood).

Cast Modifier

This modifier shifts the shape of a mesh, curve, surface or lattice to any of a few pre-defined shapes (sphere, cylinder, cuboid).

It is equivalent to the *To Sphere* tool in *Edit Mode* (Mesh ‣ Transform ‣ To Sphere) and what other programs call “Spherify” or “Spherize”, but, as written above, it is not limited to casting to a sphere.

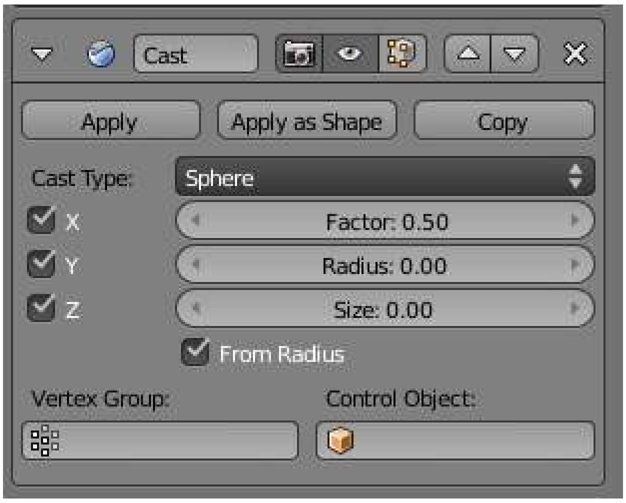
Tip

The *Smooth modifier* is a good companion to *Cast*, since the cast shape sometimes needs smoothing to look nicer or even to fix shading artifacts.

Note

For performance reasons, this modifier only works with local coordinates. If the modified object looks wrong, you may need to apply its rotation, especially when casting to a cylinder.

Options



Cast Modifier

Cast Type
: Menu to choose cast type (target shape): *Sphere*, *Cylinder* or *Cuboid*.

X, Y, Z
: Toggle buttons to enable/disable the modifier in the X, Y, Z axes directions (X and Y only for *Cylinder* cast type).

Factor
: The factor to control blending between original and cast vertex positions. It’s a linear interpolation: `0.0` gives original coordinates (i.e. modifier has no effect), `1.0` casts to the target shape. Values below `0.0` or above `1.0` exaggerate the deformation, sometimes in interesting ways.

Radius
: If non-zero, this radius defines a sphere of influence. Vertices outside it are not affected by the modifier.

Size
: Alternative size for the projected shape. If zero, it is defined by the initial shape and the control object, if any.

From radius

If activated, calculate *Size* from *Radius*, for smoother results.

Vertex Group

A vertex group name, to restrict the effect to the vertices in it only. This allows for selective, real-time casting, by painting vertex weights.

Control Object

The name of an object to control the effect. The location of this object’s center defines the center of the projection. Also, its size and rotation transform the projected vertices.

Hint
Animating (keyframing) this control object also animates the modified object.

Example

Top: Suzanne without modifiers. Middle: Suzanne with each type of Cast Modifier (Sphere, Cylinder and Cuboid). Bottom: Same as above, but now only X axis is enabled. Sample blend file

Corrective Smooth

This modifier is used to reduce highly distorted areas of a mesh by smoothing the deformations.

This is typically useful *after* an armature modifier, where distortion around joints may be hard to avoid, even with careful weight painting.

To use this modifier effectively, it’s useful to understand the basics of how it works.

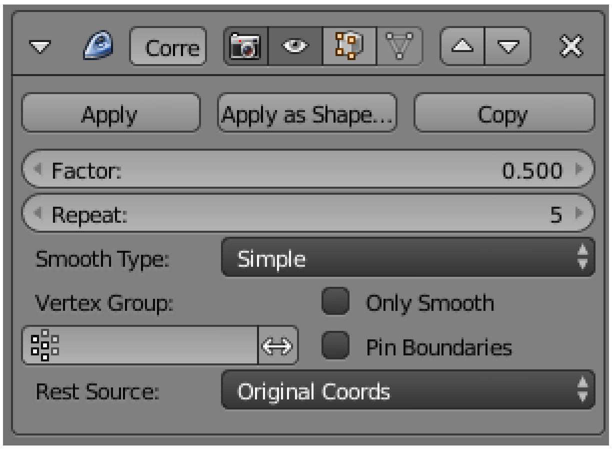
Rest State

Used as a reference to detect highly distorted areas.

The original vertex locations are used by default.

Smoothing
Many options for this modifier relate to smoothing which is used internally to correct the distorted regions.

Options



Corrective smooth modifier

The modifier also uses a *Rest* state, to use as a reference Internally this modifier uses smoothing, so some of the options adjust the kind of smoothing.

Factor
The factor to control the smoothing amount. Higher values will increase the effect. Values outside this range (above `1.0` or below `0.0`) distort the mesh.

Repeat

The number of smoothing iterations.

Higher values generally improve the quality of the smoothing but slow down the operation also.

Smooth Type

Select the smoothing method used.

Simple
This simply relaxes vertices to their connected edges.

Length Weight

Uses a method of relaxing that weights by the distance of surrounding vertices.

Can give higher quality smoothing in some cases, better preserving the shape of the original form.

Vertex Group
Use to manually select regions to smooth.

Only Smooth
This option is included to preview the smoothing used, before correction is applied.

Pin Boundaries
Prevent boundary vertices from smoothing.

Rest Source

Select the source for reference vertex positions that defines the undeformed state.

Original Coords

Use the original input vertex positions.

This relies on the original mesh having the same number of vertices as the original mesh

Bind Coords

Optionally you may bind the modifier to a specific state.

This is required if there are constructive modifiers such as subsurf or mirror being applied before this modifier in the stack.

Example

Here is an example of a character using a simple rig using only bone envelopes *(no weight painting)*.

Armature Only	Armature & Corrective Smooth
	

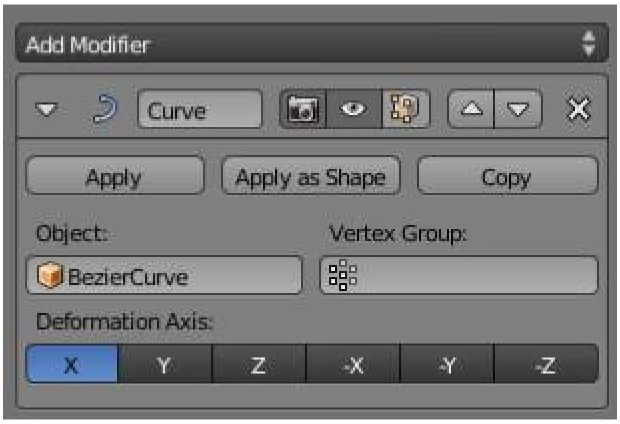
Curve Modifier

The Curve Modifier provides a simple but efficient method of deforming a mesh along a curve object.

The Curve Modifier works on a (global) dominant axis, X, Y, or Z. This means that when you move your mesh in the dominant direction (by default, the X-axis), the mesh will traverse along the curve. Moving the mesh perpendicularly to this axis, the object will move closer or further away from the curve.

When you move the object beyond the curve endings the object will continue to deform based on the direction vector of the curve endings.

Options



Curve modifier

Object
The name of the curve object that will affect the deformed object.

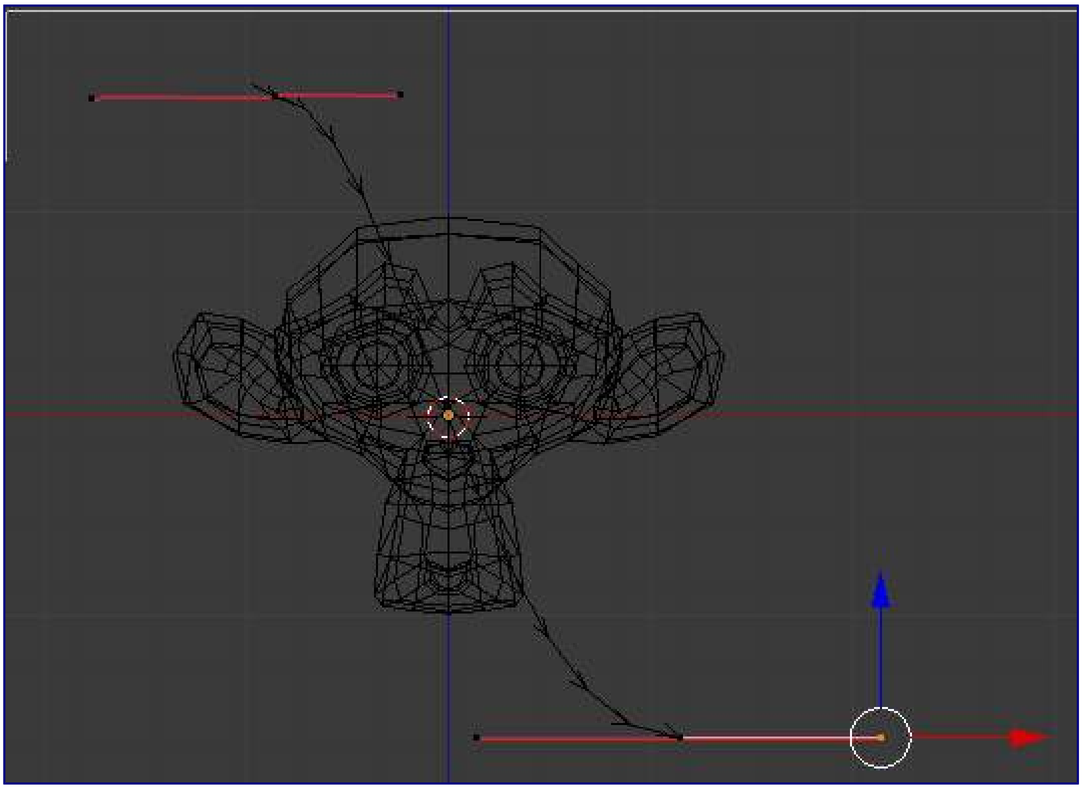
Vertex Group
A vertex group name within the deformed object. The modifier will only affect vertices assigned to this group.

Deformation Axis
X, *Y*, *Z*, -*X*, -*Y*, -*Z*: This is the axis that the curve deforms along.

Example

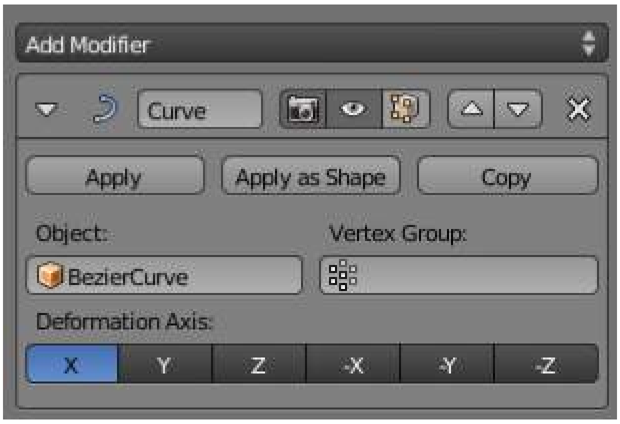
Let’s make a simple example:

- Remove default cube object from scene and add a Monkey (Add ‣ Mesh ‣ Monkey)
- Now add a curve (Add ‣ Curve ‣ Bezier Curve)

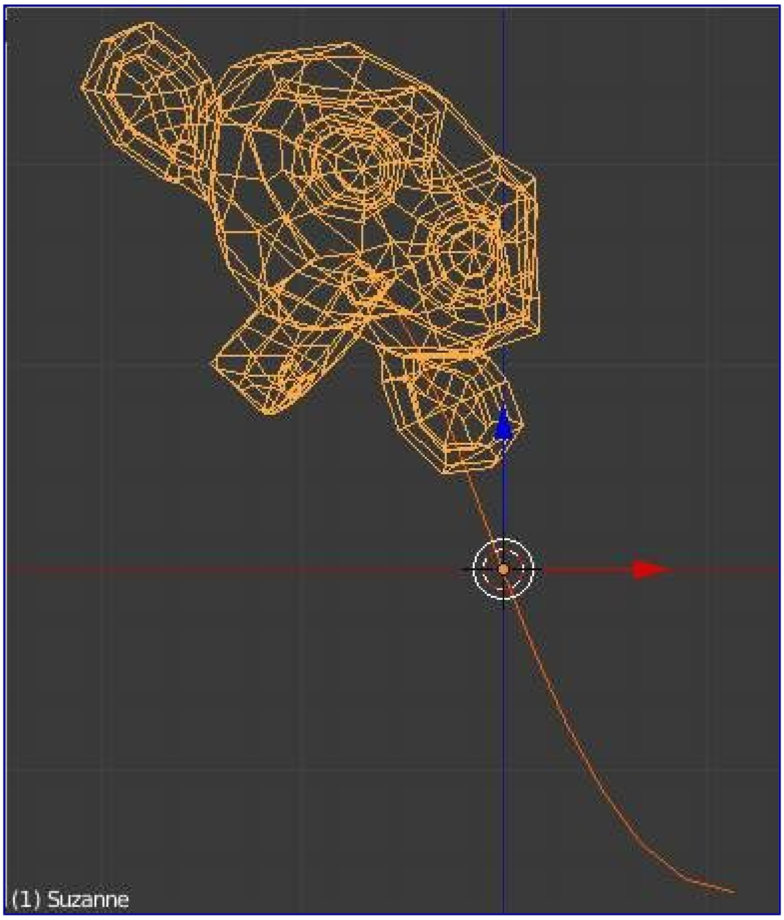


Edit Curve.

- While in Edit Mode, move the control points of the curve as shown in (*Edit Curve*), then exit Edit Mode (`Tab`).
- Select the Monkey (`RMB`) in *Object mode*
- Assign the curve to the modifier, as shown below. The Monkey should be positioned on the curve:



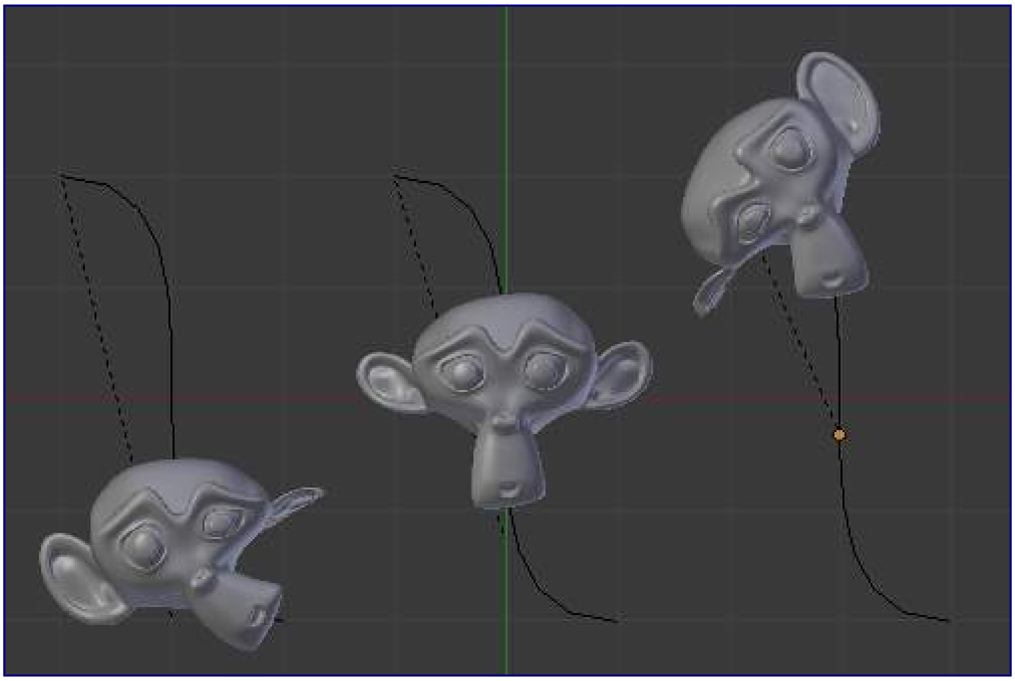
Assign the Bezier curve to the Curve modifier (for Monkey)



Monkey on a Curve.

- Now if you select the Monkey, and move it in the Y-direction (`G, Y`), the monkey will deform nicely along the curve.

Tip
If you press `MMB` while moving the Monkey you will constrain the movement to one axis only.



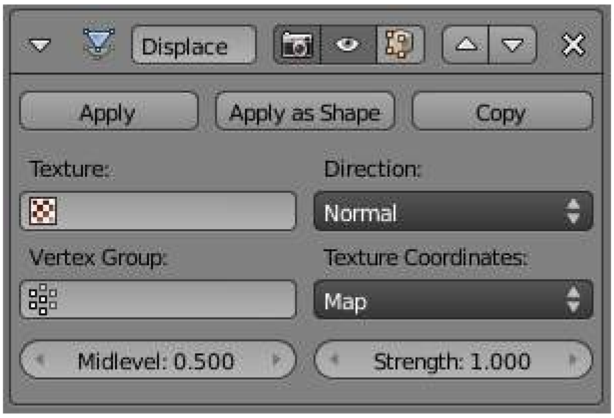
Monkey deformations.

- In the image above you can see the Monkey at different positions along the curve. To get a cleaner view over the deformation, a *Subsurf* modifier with two subdivision levels was applied, and *smooth* shading was used.

Displace Modifier

The Displace modifier displaces vertices in a mesh based on the intensity of a texture. Either procedural or image textures can be used. The displacement can be along a particular local axis, along the vertex normal, or the separate RGB components of the texture can be used to displace vertices in the local X, Y and Z directions simultaneously (sometimes referred to as *Vector Displacement*).

Options



Displace modifier

Texture
The name of the texture from which the displacement for each vertex is derived. If this field is empty, the

modifier defaults to `1.0` (white).

Direction

The direction along which to displace the vertices. Can be one of the following:

X, Y, Z
Displace along a local axis.

Normal
Displace along vertex normal.

RGB to XYZ
Displace along local XYZ axes individually using the RGB components of the texture (Red values displaced along the X-axis, Green along the Y, Blue along the Z). This is sometimes referred to as *Vector Displacement*.

Texture Coordinates

The texture coordinate system to use when retrieving values from the texture for each vertex. Can be one of the following:

UV

Take texture coordinates from face UV coordinates.

UV Map
The UV coordinate layer from which to take texture coordinates. If the object has no UV coordinates, it uses the *Local* coordinate system. If this field is blank, but there is a UV coordinate layer available (e.g. just after adding the first UV layer to the mesh), it will be overwritten with the currently active UV layer.

Note
Since UV coordinates are specified per face, the UV texture coordinate system currently determines the UV coordinate for each vertex from the first face encountered which uses that vertex; any other faces using that vertex are ignored. This may lead to artifacts if the mesh has non-contiguous UV coordinates.

Object

Take the texture coordinates from another object’s coordinate system (specified by the *Object* field).

Object

The object from which to take texture coordinates. Moving the object will therefore alter the coordinates of the texture mapping.

Take note that moving the original object will **also** result in a texture coordinate update. As such, if you need to maintain a displacement coordinate system while moving the modified object, consider parenting the coordinate object to the modified object.

If this field is blank, the *Local* coordinate system is used.

Global
Take the texture coordinates from the global coordinate system.

Local
Take the texture coordinates from the object’s local coordinate system.

Vertex Group

The name of a vertex group which is used to control the influence of the modifier. If left empty, the modifier affects all vertices equally.

Midlevel

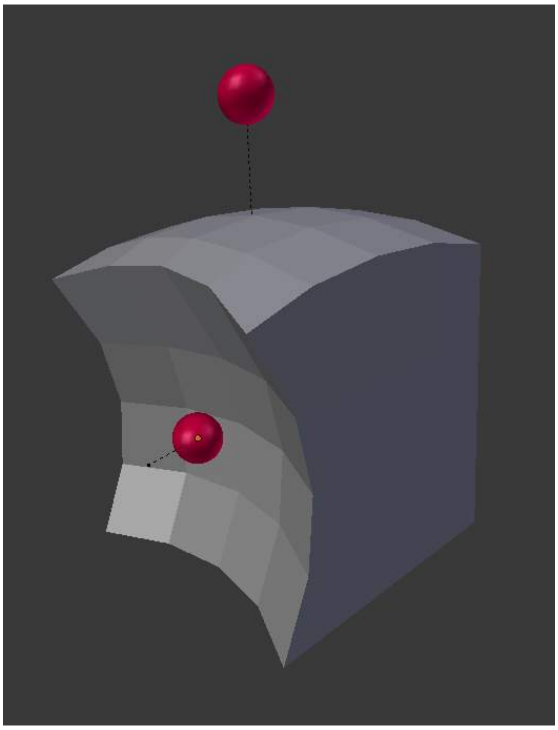
The texture value which will be treated as no displacement by the modifier. Texture values below this value will result in negative displacement along the selected direction, while texture values above this value will result in positive displacement.

This is achieved by the equation `displacement = texture_value - Midlevel`. Recall that color/luminosity values are typically between `0.0` and `1.0` in Bforartists, and not between `0` and `255`.

Strength

The strength of the displacement. After offsetting by the *Midlevel* value, the displacement will be multiplied by the *Strength* value to give the final vertex offset. This is achieved by the equation `vertex_offset = displacement * Strength`. A negative strength can be used to invert the effect of the modifier.

Hook Modifier



Two spheres used as Hooks to deform a subdivided cube.

The Hook modifier is used to deform a *Mesh*, *Curve* a *Lattice* using another object (usually an *Empty* or a *Bone* but it can be any object).

As the hook moves, it pulls vertices from the mesh with it. You can think of it as animated *proportional editing*.

While hooks do not give you the fine control over vertices movement that shape keys do, they have the advantage that you can grab vertices directly for manipulation.

Options

Hook modifier

Object
The name of the object to hook vertices to.

Vertex Group

Allows you to define the influence per-vertex.

Useful when you don't something other than a spherical field of influence.

Radius
The size of the hooks influence.

Strength

Adjust this hooks influance on the vertices, were `0.0` makes no change and `1.0` follows the hook.

Since multiple hooks can work on the same vertices, you can weight the influence of a hook using this property.

Falloff Type
This can be used to adjust the kind of curve that the hook has on the mesh, You can also define a custom-curve to get a much higher level of control.

Uniform Falloff

This setting is useful when using hooks on scaled objects, especially in cases where non-uniform scale would stretch the result of the hook.

This is especially useful for lattices, where its common to use non-uniform scaling.

The following settings are only available in Edit Mode:

Reset
Recalculate and clear the offset transform of hook.

Recenter
Set hook center to the 3D cursor position.

Select
Select the vertices affected by this hook.

Assign
Assigns selected vertices to this hook.

Note

The hook modifier stores vertex indices from the original mesh to determine what to effect; this means that modifiers that generate geometry, like subsurf, should always be applied **after** the hook modifier; otherwise the generated geometry will be left out of the hook's influence.

Laplacian Smooth Modifier

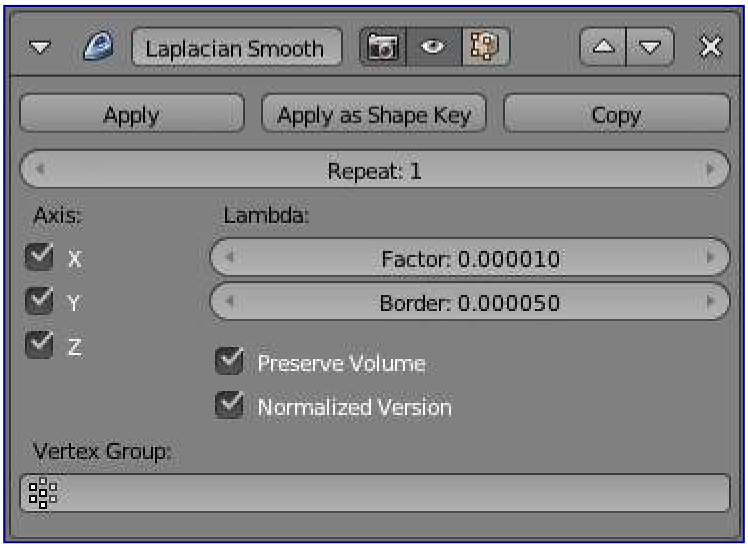
The Laplacian Smooth modifier allows you to reduce noise on a mesh's surface with minimal changes to its shape.

It can also exaggerate the shape using a negative *Factor*.

The Laplacian Smooth is useful for objects that have been reconstructed from the real world and contain undesirable noise. It removes noise while still preserving desirable geometry as well as the shape of the original model.

The Laplacian Smooth modifier is based on a curvature flow Laplace Beltrami operator in a diffusion equation.

Options



Laplacian Smooth modifier

Repeat

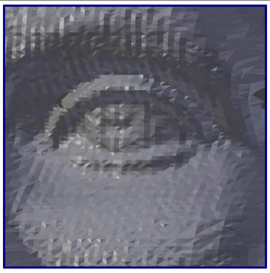
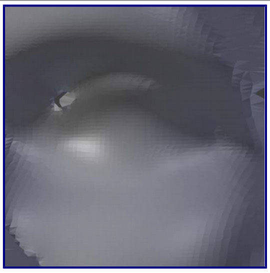
Repetitions allow you to run the Laplacian smoothing multiple times. Each repetition causes the flow curvature of the mesh to be recalculated again, and as a result it removes more noise with every new iteration using a small *Factor* < `1.0`.

When on `0`, no smoothing is done.

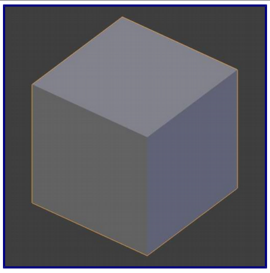
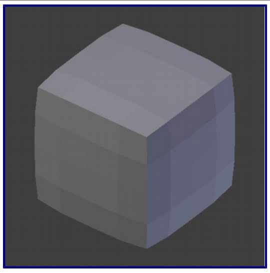
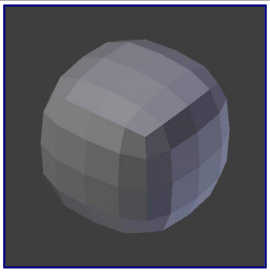
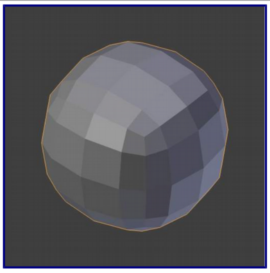
Note

More repetitions will take longer to calculate - beware of doing so on meshes with a large number of vertices.

(with a *factor* of 0.5)

 Repeat: 0	 Repeat: 1	 Repeat: 5	 Repeat: 10

(with a *factor* of 2.0)

 Repeat: 0	 Repeat: 1	 Repeat: 5	 Repeat: 10

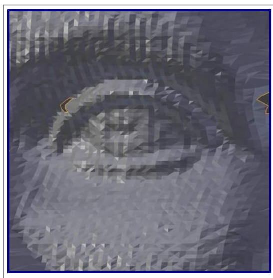
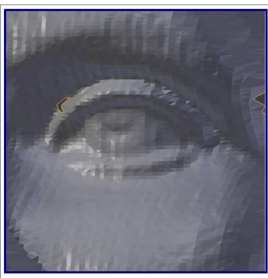
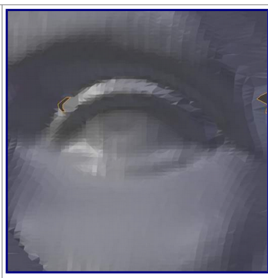
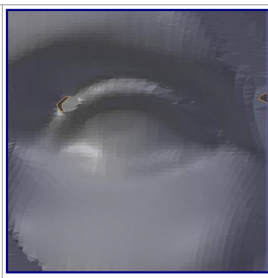
(with a *factor* of -0.5)

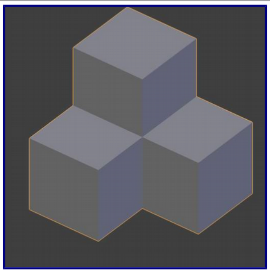
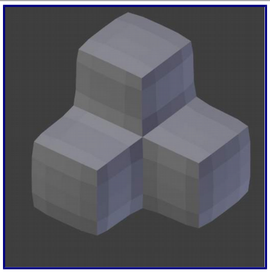
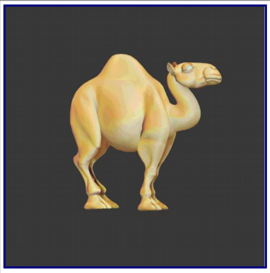
 Repeat: 0	 Repeat: 1	 Repeat: 5	 Repeat: 10

Factor

Controls the amount of displacement of every vertex along the curvature flow.

- Using a small *Factor*, you can remove noise from the shape without affecting desirable geometry.
- Using a large *Factor*, you get smoothed versions of the shape at the cost of fine geometry details.
- Using a negative *Factor*, you can enhance the shape, preserving desirable geometry.
- When the *Factor* is negative, multiple iterations can magnify the noise.

 Factor: 0.0	 Factor: 0.5	 Factor: 2.5	 Factor: 5.0

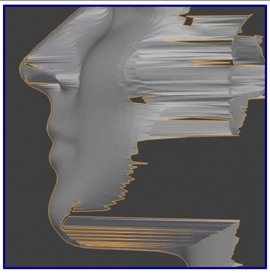
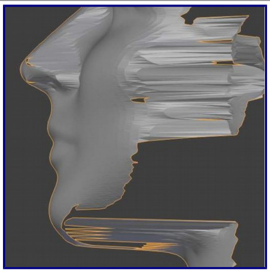
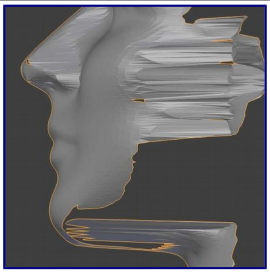
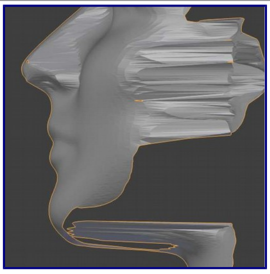
			
Factor: 0.0	Factor: 1.0	Factor: 10.0	Factor: 50.0
			
Factor: 0.0	Factor: -20.0	Factor: -50.0	Factor: -300.0

Border

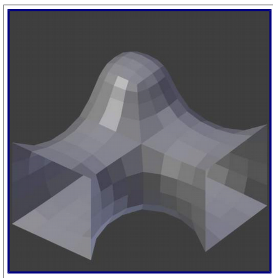
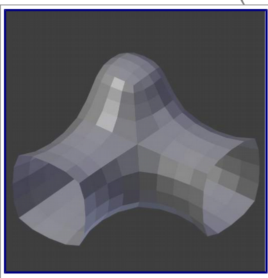
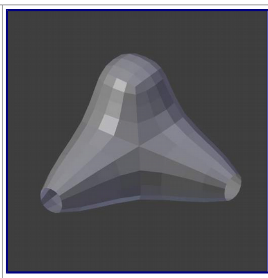
Since there is no way to calculate the curvature flow on border edges, they must be controlled separately. Border edges are smoothed using a much simpler method, using this property to control the influence.

Positive values will smooth the vertex positions, while negative values will “enhance” them by transforming them in the opposite direction.

(with a *factor* of 2.5)

			
Border: 0.0	Border: 1.0	Border: 2.5	Border: 10.0

(with a *factor* of 20.0)

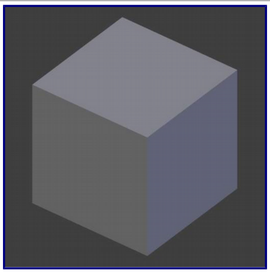
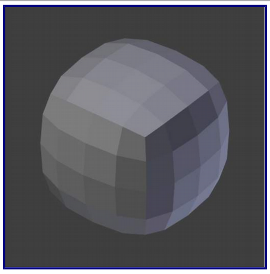
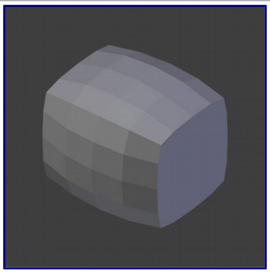
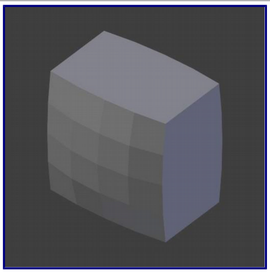
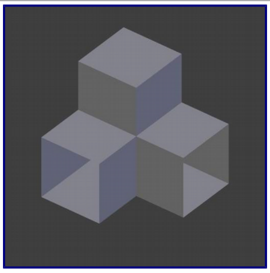
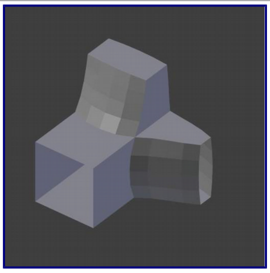
			
Border: 0.0	Border: 1.0	Border: 5.0	Border: 20.0

(with a *factor* of -30.0)

 Border: 0.0	 Border: -20.0	 Border: -50.0	 Border: -200.0

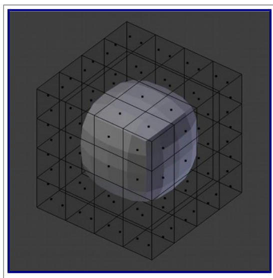
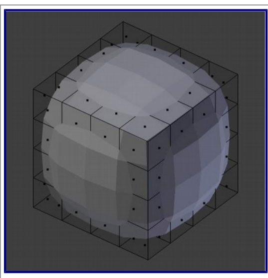
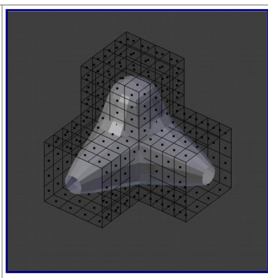
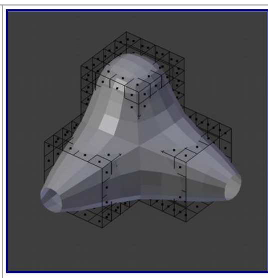
X, Y, Z

Toggle buttons to enable/disable deforming vertices in the X, Y and/or Z axis directions.

 X, Y, Z: Unselected	 X, Y, Z: Selected	 X, Y: Selected	 X: Selected
 X, Y, Z: Unselected	 X, Y, Z: Selected	 X, Y: Selected	 X: Selected

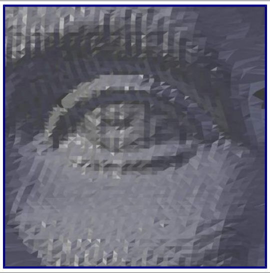
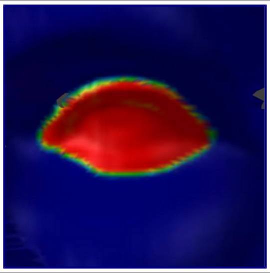
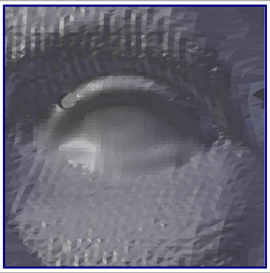
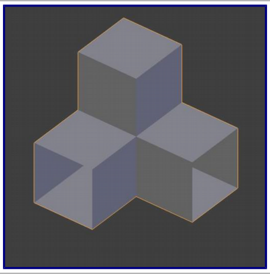
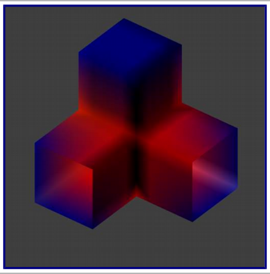
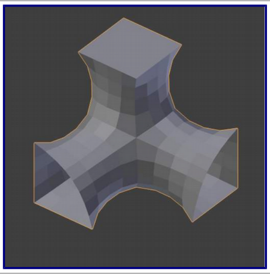
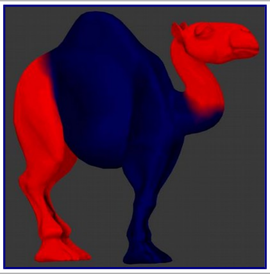
Preserve Volume

The smoothing process can produce shrinkage. That is significant for large *Factor* or large *Repeat* values; to reduce that effect you can use this option.

 Off	 On	 Off	 On

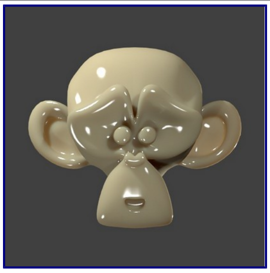
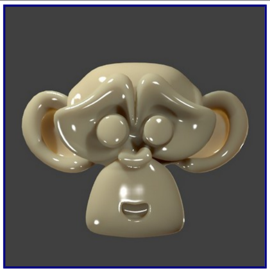
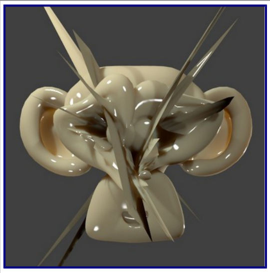
Vertex Group

A vertex group name, to constrain the effect to a group of vertices only. Allows for selective, real-time smoothing or enhancing, by painting vertex weights.

Original Geometry	No Group Chosen	Vertex Weights	Result
			
			
			

Normalized

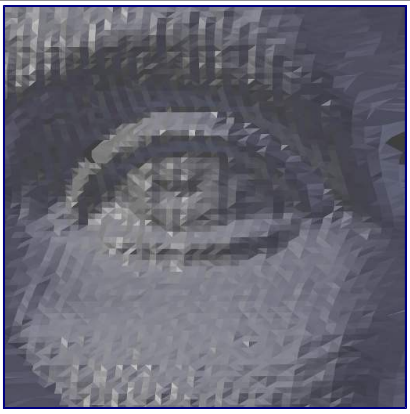
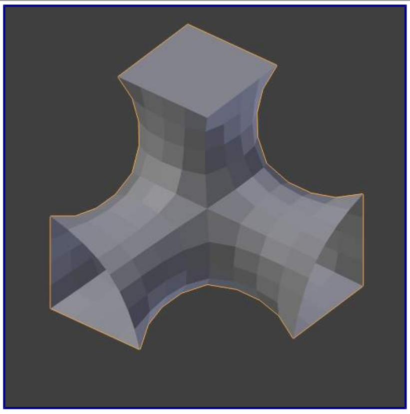
When enabled, the results will depend on face sizes. When disabled, geometry spikes may occur.

 Original Geometry	 On	 Off	 Off, High Factor

Hints

Meshes with a great number of vertices, more than ten thousand (10,000), may take several minutes for processing; you can use small portions of the mesh for testing before executing the modifier on the entire model.

Examples

 Femme Front blend file	 Cube Smooth blend file

See Also

- *Smooth Modifier*

Laplacian Deform Modifier

The Laplacian Deform modifier allows you to pose a mesh while preserving geometric details of the surface.

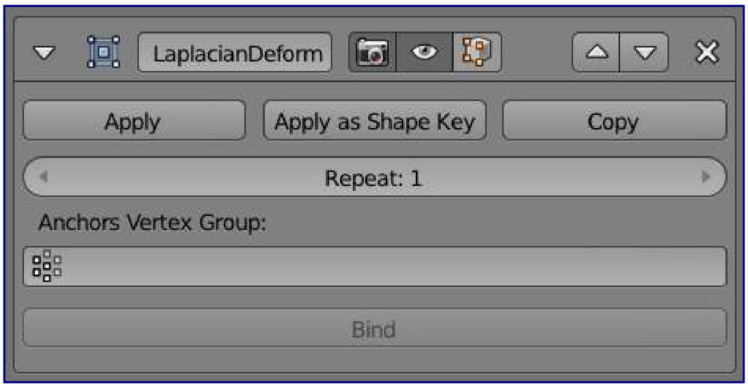
The user defines a set of ‘anchor’ vertices, and then moves some of them around. The modifier keeps the rest of the anchor vertices in fixed positions, and calculates the best possible locations of all the remaining vertices to preserve the original geometric details.

This modifier captures the geometric details with the uses of differential coordinates. The differential coordinates captures the local geometric information how curvature and direction of a vertex based on its neighbors.

Note

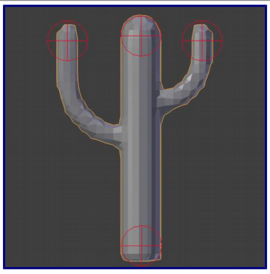
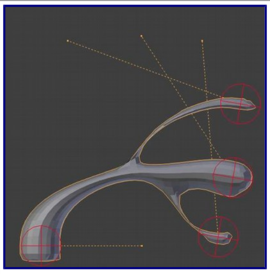
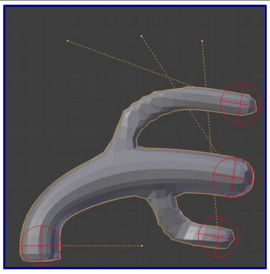
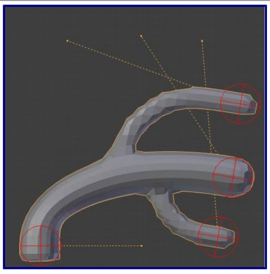
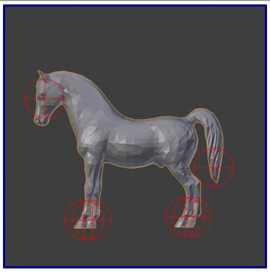
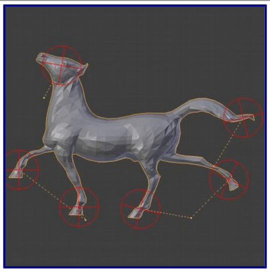
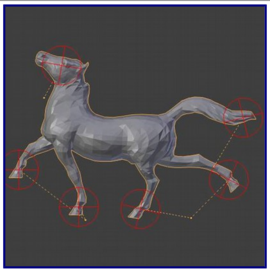
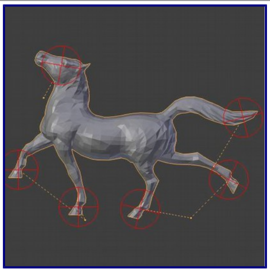
You must define a *Anchors Vertex Group*. Without a vertex group modifier does nothing.

Options



Repeat

Repetitions iteratively improve the solution found. The objective is to find the rotation of the differential coordinates preserving the best possible geometric detail. Details are retained better if more repetitions are used, however it will take longer to calculate.

 Original Model	 Repeat: 1	 Repeat: 2	 Repeat: 5
 Original Model	 Repeat: 1	 Repeat: 2	 Repeat: 10

Anchors Vertex Group

A vertex group name, to define the group of vertices that the user uses to transform the model. The weight of each vertex does not affect the behavior of the modifier; the method only takes into account vertices with weight greater than `0`.

Bind

The *Bind* button is what tells the Laplacian Deform modifier to actually capture the geometry details of the object, so that altering the anchors vertices actually alters the shape of the deformed object.

Unbind

After binding the modifier, you may later decide to make changes to the Anchors Vertex Group. To do so you will first need to *Unbind* the modifier before binding again.

Error Messages

Vertex group *group_name* is not valid

This message is displayed when a user deletes a Vertex Group or when the user changes the name of the Vertex Group.

Verts changed from *X* to *Y*

This message is displayed when a user add or delete verts to the mesh.

Edges changed from *X* to *Y*

This message is displayed when a user add or delete edges to the mesh.

The system did not find a solution

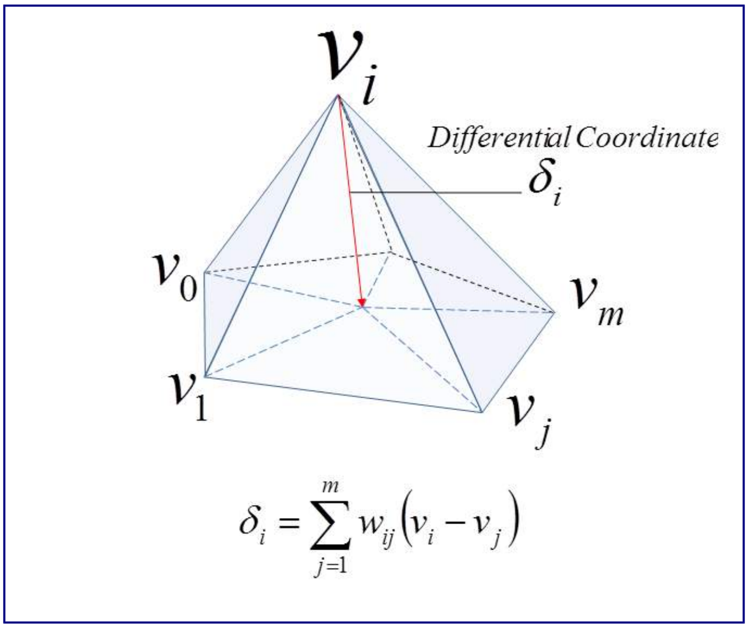
This message is displayed if the solver SuperLU did not find a solution for the linear system.

Note

If the mesh is dense, with a number of vertices greater than 100,000, then it is possible that the nonlinear optimization system will fail.

History

Laplacian Surface Editing is a method developed by Olga Sorkine and others in 2004. This method preserves geometric details as much as possible while the user makes editing operations. This method uses differential coordinates corresponding to the difference between a vector and the weighted average of its neighbors to represent the local geometric detail of the mesh.



Differential Coordinate

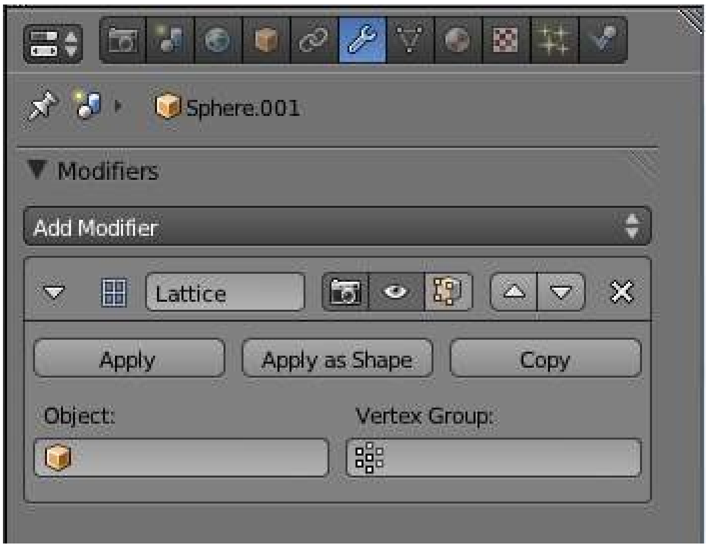
See Also

- Laplacian Surface Editing (Original paper)
- Differential Coordinates for Interactive Mesh Editing

Lattice Modifier

The Lattice modifier deforms the base object according to the shape of a Lattice object.

Options



Lattice modifier.

Object
: The Lattice object with which to deform the base object.

Vertex Group
: An optional vertex group name which lets you limit the modifier effect to a part of the base mesh.

Strength
: A factor to control blending between original and deformed vertex positions.

Usage

A lattice consists of a three-dimensional non-renderable grid of vertices. Its main use is to give extra deformation capabilities to the underlying object it controls (either *via* a modifier, or as its parent). Objects to be deformed can be meshes, curves, surfaces, text, lattices and even particles.

The lattice should be scaled and moved to fit around your object in object mode. Any scaling applied to the object in edit mode will result in the object deforming. This includes applying scale with `Ctrl-A` as this will achieve the same result as scaling the lattice in edit mode, and therefore the object.

Tip

A Lattice Modifier can quickly be added to selected objects by selecting them all, then selecting the lattice object last and parenting, and choosing *Lattice Deform*. This will both add Lattice modifiers to the selected objects and parent them to the lattice.

Hints

Why would you use a lattice to deform a mesh instead of deforming the mesh itself in Edit Mode ? There are a couple of reasons for that:

- If your object has a large number of vertices, it would be difficult to edit portions of it quickly in Edit Mode. Using a lattice will allow you to deform large portions efficiently.
- The smooth deformation you get from a lattice modifier can be hard to achieve manually in Edit Mode.

- Multiple objects can use the same lattice, thus allowing you to edit multiple objects at once.
- Like all modifiers, it is non-destructive. Meaning all changes happen on top of the original geometry, which you can still go back and edit without affecting the deformation.
- A lattice does not affect the texture coordinates of a mesh's surface.

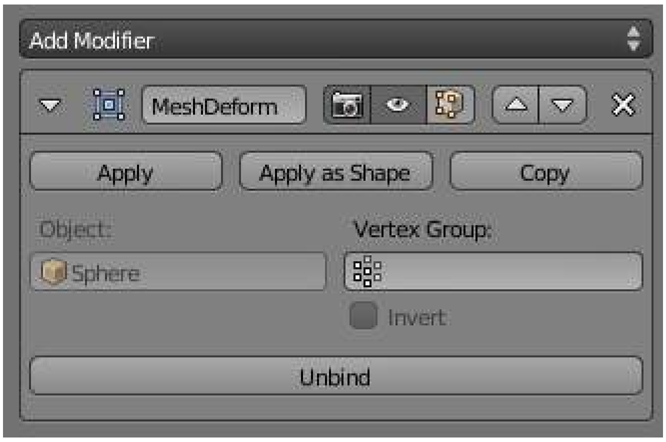
Note

When using a lattice to deform particles, always remember to place the Lattice Modifier after the Particle System Modifier. Read more about the importance of the modifier stack *here*.

Mesh Deform Modifier

The Mesh Deform modifier allows an arbitrary mesh (of any closed shape) to act as a deformation cage around another mesh.

Options



Mesh Deform modifier

The Mesh Deform modifier is reasonably easy to use but it can be very slow to do the calculations needed to properly map the deform mesh cage to the deformed object.

Object
: The name of the mesh object to be used as a deforming mesh cage.

Vertex Group
: An optional vertex group that will be affected by the deforming mesh cage. Vertices not in this group will not be deformed.

Invert
: Inverts the influence of the vertex group defined in the previous setting (reverses the weight values of this group).

Bind
: Links the current vertex positions of both the modified geometry and the deformer *Object* chosen together. An unbound Mesh Deform modifier has no effect - it must be bound so that altering the shape of the deform mesh cage actually alters the shape of the modified object.

Warning

Depending on the settings of the Mesh Deform modifier and complexity of the deform mesh cage and/or deformed object, it can take a long time for this operation to complete. This can result in Bforartists not responding to user’s actions until it has completed.

It is also possible that Bforartists will run out of memory and crash.

To be safe, save your blend file before proceeding!

Unbind

When a deformed object has been associated to a deform mesh cage, it can later be disassociated by clicking the *Unbind* button which replaced the *Bind* one. When *Unbind* is clicked, the *deform mesh cage* will keep its current shape; it will not reset itself back to its original start shape.

If you need its original shape, you will have to save a copy of it before you alter it.

The deformed object will, however,reset back to its original shape that it had before it was bound to the deform mesh cage.

Precision

The *Precision* numeric slider field controls the accuracy with which the deform mesh cage alters the deformed object, when the points on the cage are moved. Raising this value higher can greatly increase the time it takes the *Mesh Deform* modifier to complete its binding calculations, but it will get more accurate cage mapping to the deformed object.

This setting becomes unavailable once a cage has been bound.

Dynamic

When activated, other mesh altering features (such as other modifiers and shape keys) are taken into account when binding, increasing deformation quality.

It is deactivated by default to save memory and processing time when binding... Like with *Precision*, this setting is unavailable once a cage has been bound.

Warning

Significant changes to the entire change mesh *(such as rotating the cage upside down)* can cause noticable artifacts.

These can be reduced by binding with a higher *Precision*, however it is a known limitation with this modifier and can’t be avoided entirely.

Hints

- Ensure that the normals on the cage mesh point to the outside; they are used to determine the inside and outside of the cage.

- Besides the outer cage, more faces within the cage, either loose or forming another smaller cage, can be used for extra control. Such smaller cages may also overlap with the main cage; for example, to get extra control over eyes, two small sphere cages could be added around them.

See Also

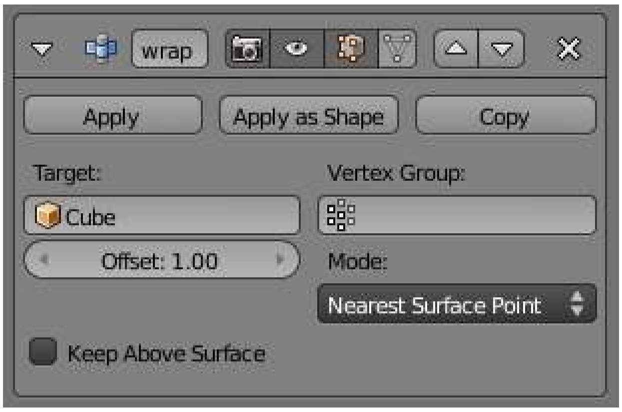
- The *Lattice modifier*.
- Original paper

Shrinkwrap Modifier

The *Shrinkwrap* modifier allows an object to “shrink” to the surface of another object. It moves each vertex of the object being modified to the closest position on the surface of the given mesh (using one of the three methods available).

It can be applied to meshes, lattices, curves, surfaces and texts.

Options



Nearest Surface Point

Target
: Shrink target, the mesh to shrink to/wrap around.

Vertex Group
: The vertex group to control whether and how much each vertex is displaced to its target position. If a vertex is not a member of this group, it is not displaced (same as weight 0).

Offset
: The distance that must be kept from the calculated target position, in Bforartists Units.

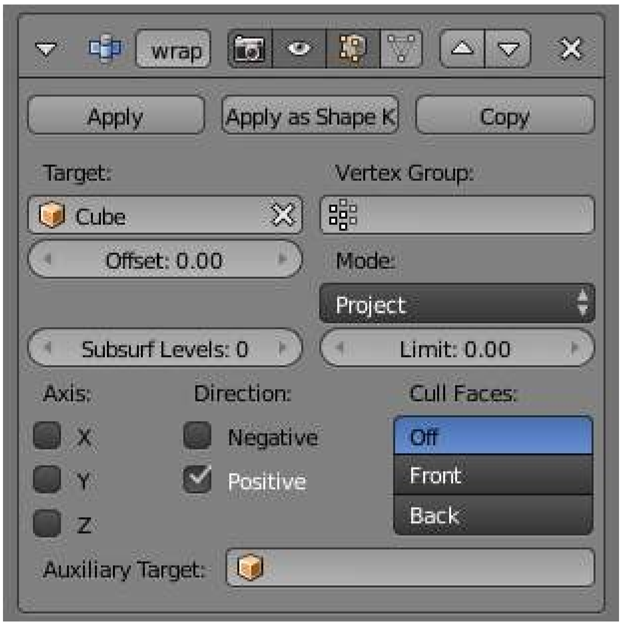
Mode

: This drop-down list specifies the method to be used to determine the nearest point on the target’s surface for each vertex of the modified object. Some options will add some extra, specific controls to the panel.

: **Nearest Surface Point**
: : This will select the nearest point over the surface of the shrink target. It adds the extra option *Above surface*, which always keep the computed vertices above their “floor faces”. This is only

meaningful when *Offset* is not null.

Projection



This will project vertices along a chosen axis until they touch the shrink target. Vertices that never touch the shrink target are left in their original position.

Subsurf Levels
: This applies a (temporary) *Catmull-Clark* subsurf to the modified object, before computing the wrap when using Projection mode.

Limit
: This is a distance limit between original vertex and surface. If the distance is larger than this limit vertex wouldn't be projected onto the surface,

X, Y, Z
: Along which local axis of the modified object the projection is done. These options can be combined with each other, yielding a "median axis" of projection.

Negative, Positive
: This allows you to select the allowed direction(s) of the shrink along the selected axis. With more than one *Shrinkwrap* modifier, negative and positive axes can be combined.

Cull Faces
: This allows you to prevent any projection over the "front side" (respectively the "back side") of the target's faces. The "side" of a face is determined by its normal (front being the side "from where" the normal "originates").

Auxiliary Target
: An additional object to project over.

Nearest Vertex

This will snap vertices to the nearest vertex of the shrink target. It adds no extra options.

See also

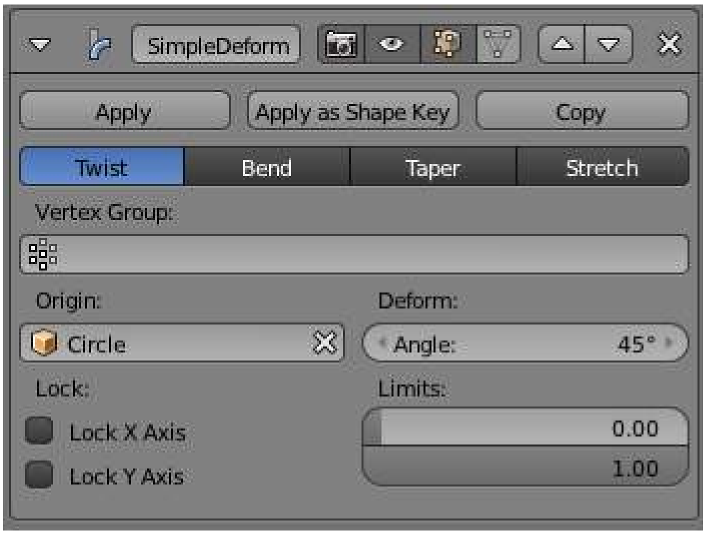
Shrinkwrap Constraint

Simple Deform Modifier

The Simple Deform modifier allows easy application of a simple deformation to an object (meshes, lattices, curves, surfaces and texts are supported).

Using another object, it’s possible to define the axis and origin of the deformation, allowing application of very different effects.

Options



Simple Deform

Mode

This drop-down list defines the deform function applied, among four available:

Twist
: Rotates around the Z axis.

Bend
: Bends the mesh over the Z axis.

Taper
: Linearly scales along Z axis.

Stretch
: Stretches the object along the Z axis (negative *Factor* leads to squash), preserving volume by scaling inversely on the X and Y axes..

Vertex Group
: The name of the vertex group that indicates whether and how much each vertex is influenced by the

deformation.

Origin

The name of an object that defines the origin of deformation (usually an empty). This object can be:

- Rotated to control the axis (its local Z-axis is now used as the deformation axis).
- Translated to control the origin of deformation.
- Scaled to change the deform factor.

> **Note**
>
> When the object controlling the origin (the one in the *Origin* field) is a child of the deformed object, this creates a cyclic dependency in Bforartists's data system. The workaround is to create a new empty and parent both objects to it.

Angle/Factor

The amount of deformation. Can be negative to reverse the deformation.

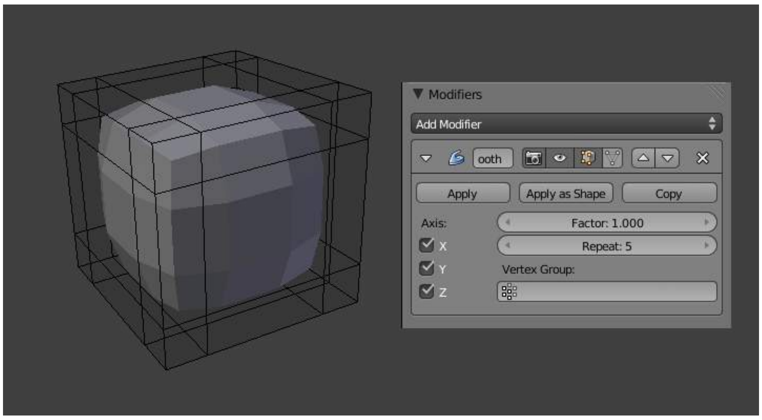
Limits

These settings allow you to set the lower and upper limits of the deformation. The upper limit can't be lower than lower limit.

Lock X Axis / Lock Y Axis (Taper and Stretch modes only)

These controls whether the X and/or Y coordinates are allowed to change or not. Thus it is possible to squash the X coordinates of an object and keep the Y coordinates intact.

Smooth Modifier



Smooth modifier applied to a subdivided cube

This modifier smooths a mesh by flattening the angles between adjacent faces in it, just like Specials ‣ Smooth in Edit Mode. It smooths without subdividing the mesh - the number of vertices remains the same.

This modifier is not limited to smoothing, though. Its control factor can be configured outside the `0.0 - 1.0` range (including negative values), which can result in interesting deformations.

Options

X, Y, Z

Toggle buttons to enable/disable the modifier in the X, Y and/or Z axes directions.

Factor

The factor to control the smoothing amount. Higher values will increase the effect. Values outside this range (above `1.0` or below `0.0`) distort the mesh.

Repeat

The number of smoothing iterations, equivalent to executing the smooth tool multiple times.

Vertex Group

A vertex group name, to restrict the effect to the vertices in it only. This allows for selective, real-time smoothing, by painting vertex weights.

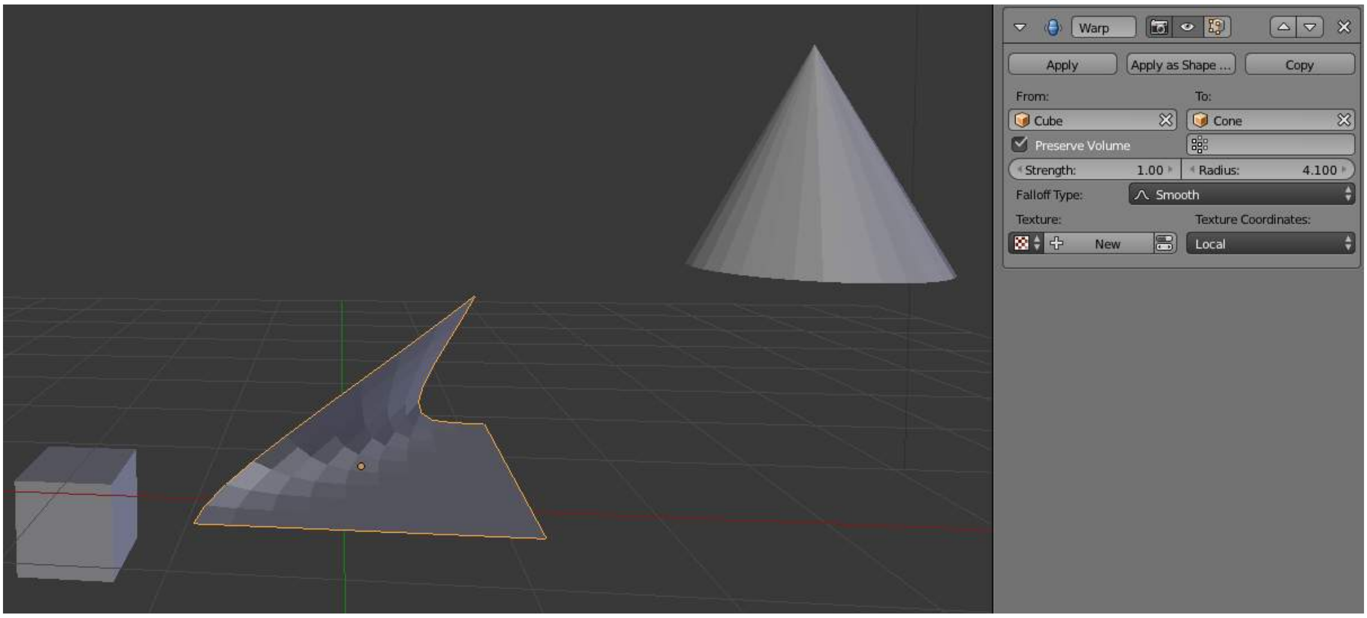
Algorithm

The calculation done by the Smooth Modifier is a simple and logical one, and can be thought of as the geometric equivalent of blurring images.

Each new vertex position is simply the average position of surrounding vertices (the vertices connected to the same edge as it).

Warp Modifier

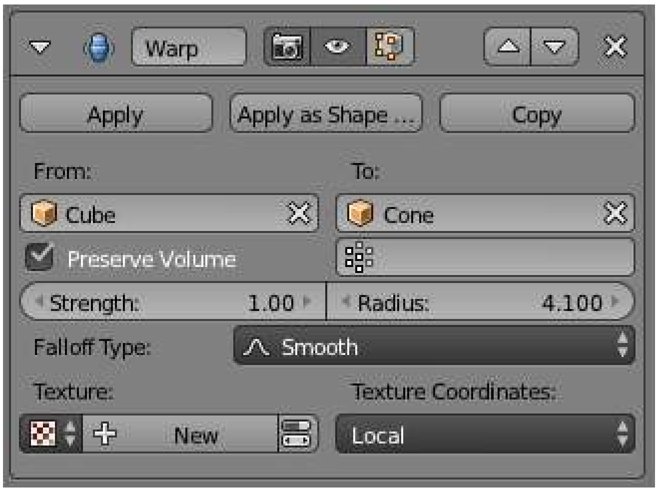
This deformation modifier can be used to warp parts of a mesh to a new location in a very flexible way by using 2 objects to select the “from” and “to” regions, with options for using a curve falloff, texture and vertex group.



Warp modifier applied to a grid

The Warp Modifier is a bit tricky at first, but it helps to understand how it works. The modifier requires two points, specified by object centers. The “from” point designates a point in space that is pulled toward the “to” point. It is akin to using the *Proportional Editing* in Edit Mode.

Options



Warp modifier

From:
: Specify the origin object transformation of the warp.

To:
: Specify the destination object transformation of the warp.

Preserve Volume
: Enables volume preservation when rotating one of the transforms.

Vertex Group
: Limit the deformation to a specific vertex group.

Strength
: Sets how strong the effect is.

Radius
: Sets the distance from the transforms that can be warped by the transform handles.

Falloff Type
: Sets the way the strength of the warp change as it goes from the center of the transform to the Radius value. See *Proportional Editing* for descriptions of the falloff types.

Texture
: Specify a texture the strength is offset by to create variations in the displacement.

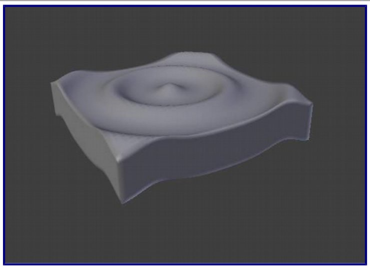
Texture Coordinates

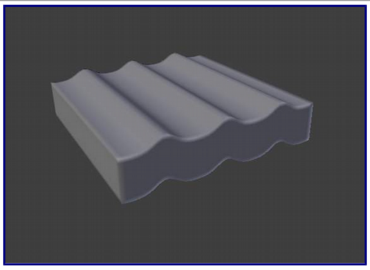
: Set the way textures are applied to the mesh when using a textured warp.

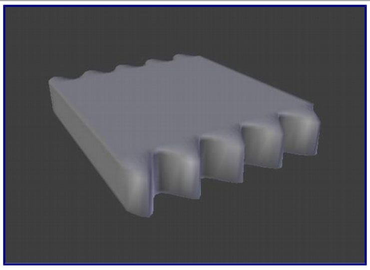
  Object
  : Specify an object to use when set to Object.

  UV Layer
  : Specify a UV layer when set to UV.

Wave Modifier


Circular wave front

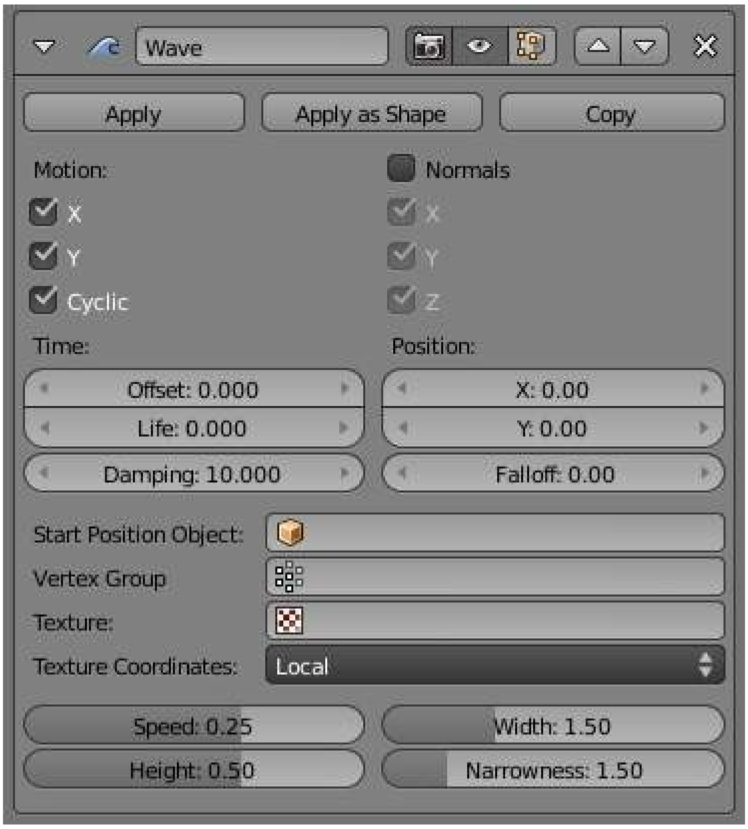

Linear wave front


Motion enabled for X, Normals enabled for Y.

The Wave modifier adds a ripple-like motion to an object's geometry.

This modifier is available for meshes, lattices, curves, surfaces and texts, with one restriction for non-mesh objects: Activating *Normals* or typing a name in *VGroup* will simply deactivate the modifier.

Options



Wave modifier

Motion

X, Y

The wave effect deforms vertices/control points in the Z direction, originating from the given starting point and propagating along the object with circular wave fronts (if both *X* and *Y* are enabled), or with rectilinear wave fronts (if only one axis is enabled), then parallel to the axis corresponding to the *X* or *Y* button activated.

Cyclic

Repeats the waves cyclically, rather than a single pulse.

Normals

For meshes only. Displaces the mesh along the surface normals (instead of the object's Z-axis).

Time

Settings to control the animation.

Offset
Time offset in frames. The frame at which the wave begins (if *Speed* is positive), or ends (if *Speed* is negative). Use a negative frame number to prime and pre-start the waves.

Life
Duration of animation in frames. When set to zero, loops the animation forever.

Damping
An additional number of frames in which the wave slowly damps from the *Height* value to zero after *Life* is reached. The dampening occurs for all the ripples and begins in the first frame after the *Life* is over. Ripples disappear over *Damping* frames.

Position

X, Y
Coordinates of the center of the waves, in the object's local coordinates.

Falloff
Controls how fast the waves fade out as they travel away from the coordinates above (or those of the *Start Position Object*).

Start Position Object
Use another object as the reference for the starting position of the wave. Note that you then can animate this object's position, to change the wave's origin across time.

Vertex Group
For meshes only. A vertex group name, used to control the parts of the mesh affected by the wave effect, and to what extent (using vertex weights).

Texture
Use this texture to control the object's displacement level. Animated textures can give very interesting results here.

Texture Coordinates

This menu lets you choose the texture's coordinates for displacement:

Local
Object's local coordinates.

Global
Global coordinates.

Object
Adds an additional field just below, to type in the name of the object from which to get the texture coordinates.

UV
Adds an extra *UV Layer* property, to select the UV layer to be used.

Speed
The speed, in BU (for "Bforartists Units") per frame, of the ripple.

Height
The height or amplitude, in BU, of the ripple.

Width
Half of the width, in BU, between the tops of two subsequent ripples (if *Cyclic* is enabled). This has an indirect effect on the ripple amplitude - if the pulses are too near to each other, the wave may not reach the `0` Z-position, so in this case Bforartists actually lowers the whole wave so that the minimum is zero and, consequently, the maximum is lower than the expected amplitude. See **Technical Details and Hints** below.

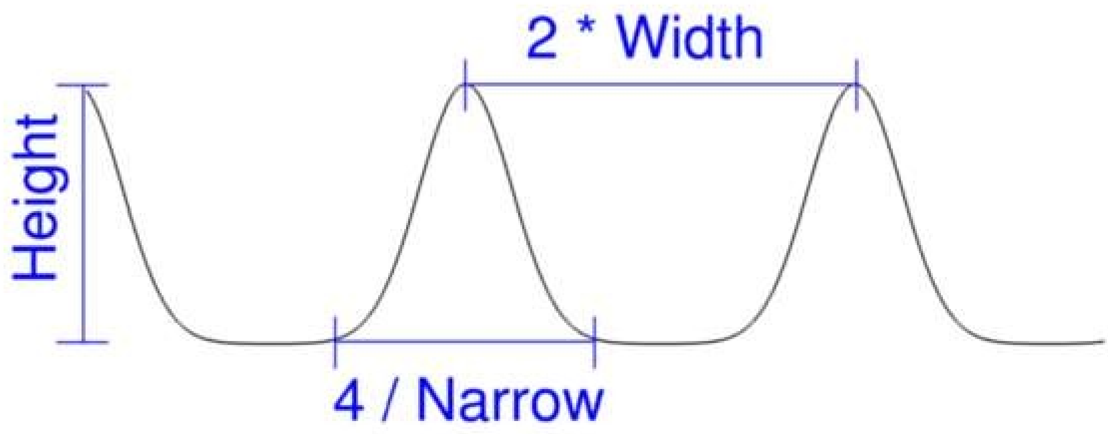
Narrowness
The actual width of each pulse: the higher the value the narrower the pulse. The actual width of the area in which the single pulse is apparent is given by `4/Narrowness`. That is, if *Narrowness* is `1` the pulse is `4` units wide, and if *Narrowness* is `4` the pulse is `1` unit wide.

Warning

All the values described above must be multiplied with the corresponding *Scale* values of the object to get the real dimensions.

Technical Details and Hints

The relationship of the above values is described here:



Wave front characteristics.

To obtain a nice wave effect similar to sea waves and close to a sinusoidal wave, make the distance between following ripples and the ripple width equal; that is, the *Narrowness* value must be equal to `2/Width`. E.g. for *Width* = `1`, set *Narrow* to `2`.

Explode Modifier

The Explode Modifier is used to alter the mesh geometry by moving/rotating its faces in a way that roughly tracks particles particles emitted by that object, making it look as if the mesh is being exploded (broken apart and pushed outward).

For the Explode Modifier to have a visible effect, there needs to be particle system on it. The particle system on the mesh is what controls how the mesh will be exploded, and therefore without the particle system the mesh won’t appear to alter.

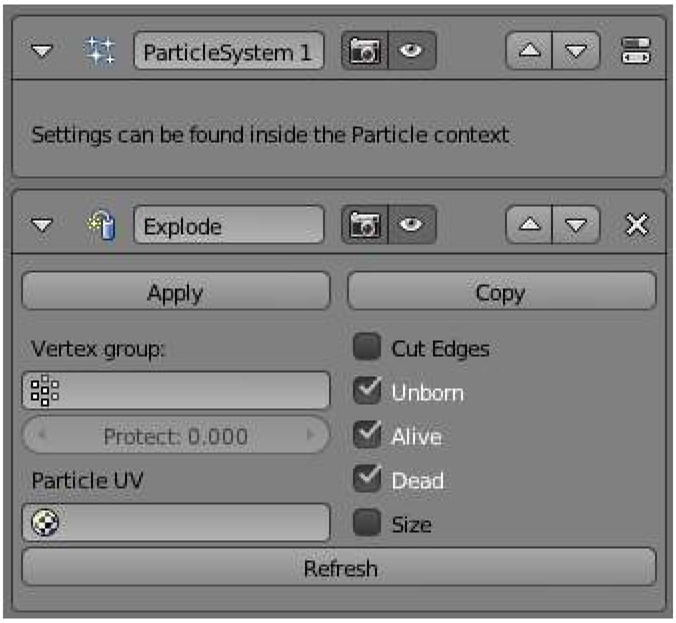
Both the number of emitted particles and number of faces determine how granular the Explode Modifier will be. More faces and more particles will mean more individual pieces.

Here is a demo video showing a cube with a particle system and Explode Modifier. (Blend file)

Note

The Explode modifier must come after the Particle System Modifier because the Particle System Modifier has the information needed to drive the Explode Modifier.

Options



Explode Modifier panel with Particle System Modifier above it

Vertex group

Vertices in this group may not be affected by the Explode Modifier. Vertices with full weight are not affected at all, while vertices with less weight have a higher chance of being affected.

Vertices with no weight will be treated like those which do not belong to the group at all and explode normally.

Protect
: Clean vertex group edges. Depending on the weights assigned to that vertex group; either completely protect those faces from being affected by the Explode Modifier (which would happen if the faces had a weight value of 1) or completely remove protection from those faces (which would happen if the faces had a weight value 0).

Particle UV
: UV map to change with particle age.

Cut Edges
: Cut face edges for nicer shrapnel

Unborn
: Show mesh when particles are unborn

Alive
: Show mesh when particles are alive

Dead
: Show mesh when particles are dead

Size
: Use particle size for shrapnel

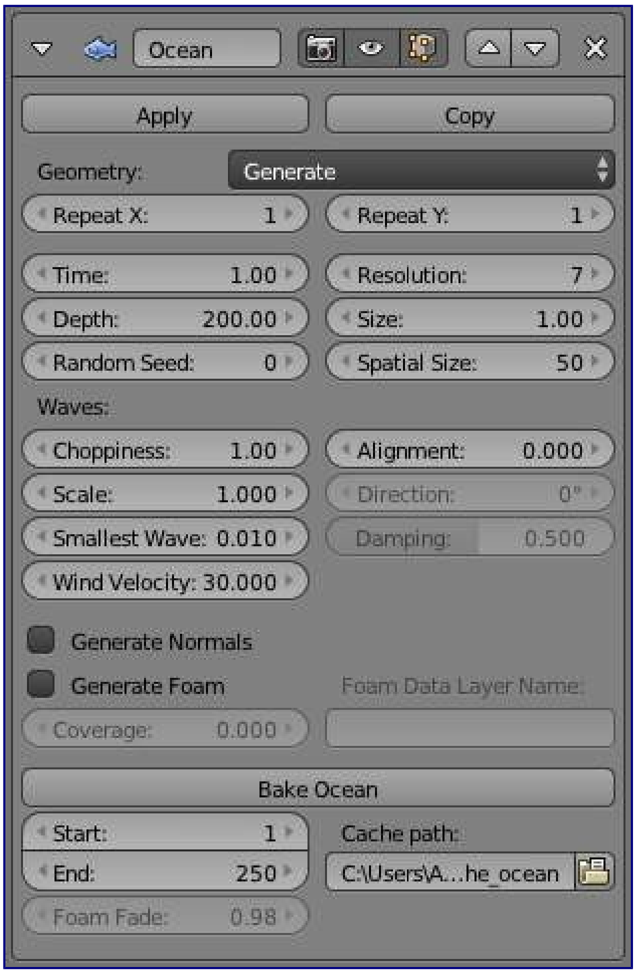
Refresh
: Refresh data in the explode modifier

Ocean Simulation

Bforartists's ocean simulation tools take the form of a modifier, to simulate and generate a deforming ocean surface, and associated texture, used to render the simulation data.

Ported from the open source Houdini Ocean Toolkit, it is intended to simulate deep ocean waves and foam.

Options



Ocean Modifier Panel

Geometry Options

Geometry

Generate

Creates a tiled mesh grid that exactly corresponds with the resolution of the simulation data

When generating a mesh surface, the existing mesh object is completely overridden with the ocean grid. A UV channel is also added, mapping the `0.0 - 1.0` UV space to the simulation grid.

Displace

Uses the existing geometry rather than replacing it. Vertices are displaced along the local Z-axis.

Repeat X, Repeat Y

When generating a mesh surface, controls the number of times the grid is tiled in X and Y directions. UVs for these tiled mesh areas continue outside of the `0.0 - 1.0` UV space.

Simulator Options

Time
The time at which the ocean surface is being evaluated. To make an animated ocean, you will need to insert keyframes (`RMB`) and animate this time value - the speed that the time value is changing will determine the speed of the wave animation

Depth
The constant depth of the ocean floor under the simulated area. Lower values simulate shallower waters by producing higher frequency details and smaller waves.

Random Seed
A different seed will produce a different simulation result.

Resolution

The main control of quality vs speed in the simulation engine. This determines the resolution of the internal 2D grids generated by the simulation.

The internal grids are powers of two of the resolution value, so a resolution value of `16` will create simulation data of size `256 x 256`. The higher the resolution, the more detail will be produced, but the slower it will be to calculate.

> **Note**
>
> When using the 'Generate' modifier geometry option, this resolution value also determines the resolution of the generated mesh surface, equal to the resolution of the internal simulation data.

Size
A simple scaling factor that does not affect the height of the waves or behavior of the simulation.

Spatial Size
The width of the ocean surface area being simulated, in meters. This also determines the size of the generated mesh, or the displaced area, in Bforartists units. Of course you can scale the object with ocean modifier in object mode to tweak the apparent size in your scene.

Wave Options

Choppiness
The choppiness of the wave peaks. With a choppiness of 0, the ocean surface is only displaced up and down in the Z direction, but with higher choppiness, the waves are also displaced laterally in X and Y, to create sharper wave peaks.

Scale
An overall scale control for the amplitude of the waves. It approximates the height or depth of the waves above or below zero. Rather than just scaling the ocean object in Z, it scales all aspects of the simulation, displacement in X and Y, and corresponding foam and normals too.

Alignment
The directionality of the wave shapes due to wind. At a value of 0, the wind and waves are randomly, uniformly oriented. With higher Alignment values, the wind is blowing in a more constant direction, making the waves appear more compressed and aligned to a single direction.

Direction
When using Alignment, the direction in degrees that the waves are aligned to.

Damping

When using Alignment, amount that inter-reflected waves are damped out. This has the effect of making the wave motion more directional (not just the wave shape). With damping of 0.0, waves are reflected off each other every direction, with damping of 1.0, these inter-reflected waves are damped out, leaving only waves traveling in the direction of the wind.

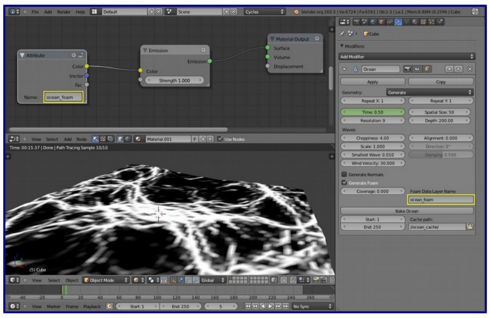
Smallest Wave

A minimum limit for the size of generated waves. Acts similarly to a low-pass filter, removing higher frequency wave detail.

Wind Velocity

Wind speed in meters/second. With a low velocity, waves are restricted to smaller surface waves.

Simulation Data Generation Options



Using foam vertex colors with a named data layer

By default, the simulator only generates displacement data, since it takes the least amount of work and gives the fastest feedback. Additional simulation data can be generated for rendering as well.

Generate Normals

Simulates additional normal map data. This can be used by the Ocean texture, when mapped to Normals, as a bump map, and enables generating normal map image sequences when baking.

Generate Foam

Simulates additional foam data. This can be retrieved by the Ocean texture for use in texturing (perhaps as a mask), and enables generating foam map image sequences when baking.

Coverage

Tweaks the amount of foam covering the waves, negative values will reduce the amount of foam (leaving only the topmost peaks), positive values will add it. Typically ranges from `-1.0` to `1.0`

Foam Data Layer Name

Optional name for the vertex data layer, used by the Ocean modifier to store foam maps as vertex colors. This is required for accessing the foam data in the renderer.

Baking

Rather than simulating the ocean data live, the ocean data can be baked to disk. When a simulation is baked, the simulator engine is completely bypassed, and the modifier/texture retrieves all information from the baked files.

Baking can be advantageous for a few reasons:

- It’s faster to use the stored data rather than re-calculating it
- Allows rendering ocean data in external renderers
- Enables more advanced foam maps

Data Files

Simulation data is stored in disk as sequences of OpenEXR image maps, one for each of displacement, normal and foam (if enabled to be generated). Upon loading the data from these baked files, when a frame of the bake sequence is read from disk, it is cached in memory. This means that accessing loaded frames subsequent times is fast, not incurring the overhead of disk access.

Since these baked files are plain OpenEXRs, they can also be opened and rendered in any other application or renderer that supports them.

Baking Foam

Baking also provides improved foam capabilities. When simulating live, the ocean simulator retrieves data for that current frame only. In the case of the foam map, this represents the tips of wave crests for that given frame. In reality, after foam is created by wave interactions, it remains sitting on the top of the wave surface for a while, as it dissipates. With baking, it’s possible to approximate that behaviour, by accumulating foam from previous frames, leaving it remaining on the surface.

https://vimeo.com/17517981

Baking Options

Start, End
: Frames of the simulation to bake (inclusive). The start and end frames of the bake are repeated when accessing frames outside the baked range.

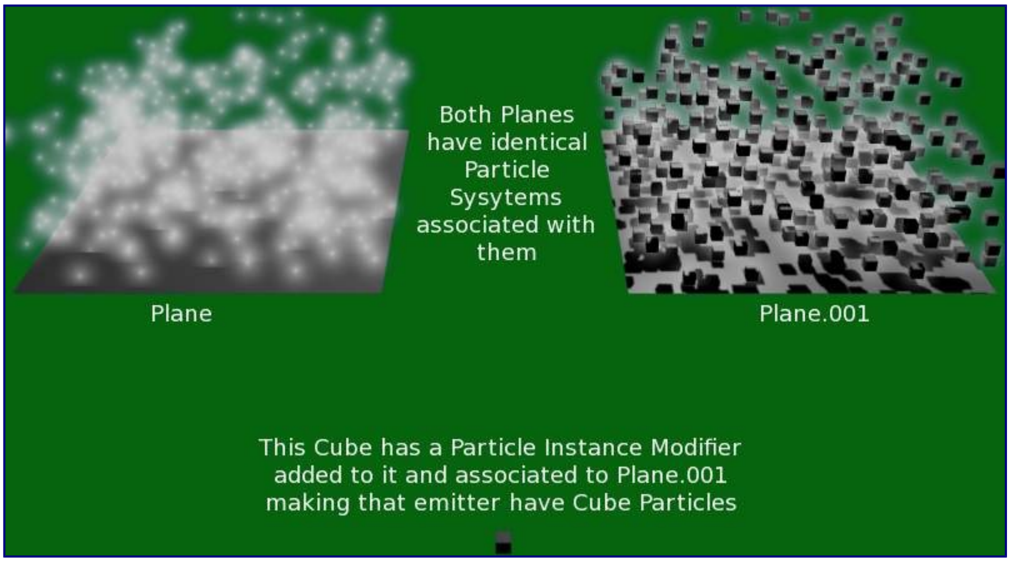
Cache Path
: Folder to store the baked EXR files in. The sequences will be in the form `disp_####.exr`, `normal_####.exr`, and `foam_####.exr` where #### is the four digit frame number. If the cache path folder does not exist, it will be created.

Simulation Internals

The simulator itself uses FFT methods to generate 2D grids of simulation information internally, very similar to 2D texture maps. The simulator can generate three types of data - displacement, normals, and extra data that is used to calculate wave crest intersections (i.e. foam). After simulation, these maps are used to displace the ocean surface geometry in 3D, and also can be used for shading via the Ocean texture. The internal simulation engine is multi threaded with OpenMP to take advantage of multiple cores.

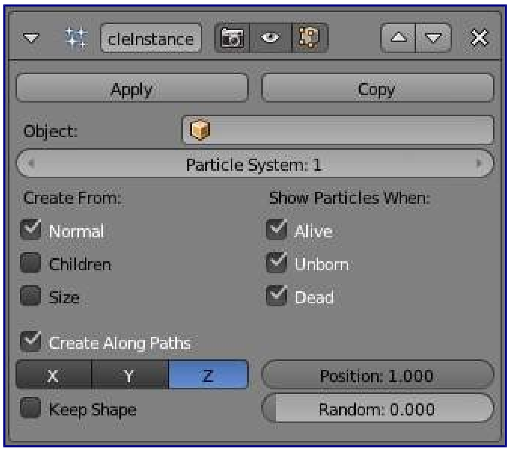
Particle Instance Modifier

When a *ParticleInstance* modifier is added to an object, that object will be used as a particle shape on an object which has a particle system associated with it. This means that to use this modifier you must also have another object which has a particle system on it, otherwise the *ParticleInstance* modifier will appear to do nothing.



Particle system on left has no ParticleInstance modified object associated with it. The one on the right is associated with cube shown by using a ParticleInstance modifier on the cube.

Options



Particle Instance Modifier

Because of the co-dependant way in which the *ParticleInstance* modifier is influenced by the underlying particle systems on other objects, some of the apparent effects generated by the *ParticleInstance* modifier can look and act vastly different, depending on the underlying settings of the particle systems it is associated with. This is worth taking account of if the *ParticleInstance* modifier settings don't appear to be giving the results expected, as it may indicate that the particle system settings may need altering rather than the *ParticleInstance* modifier settings.

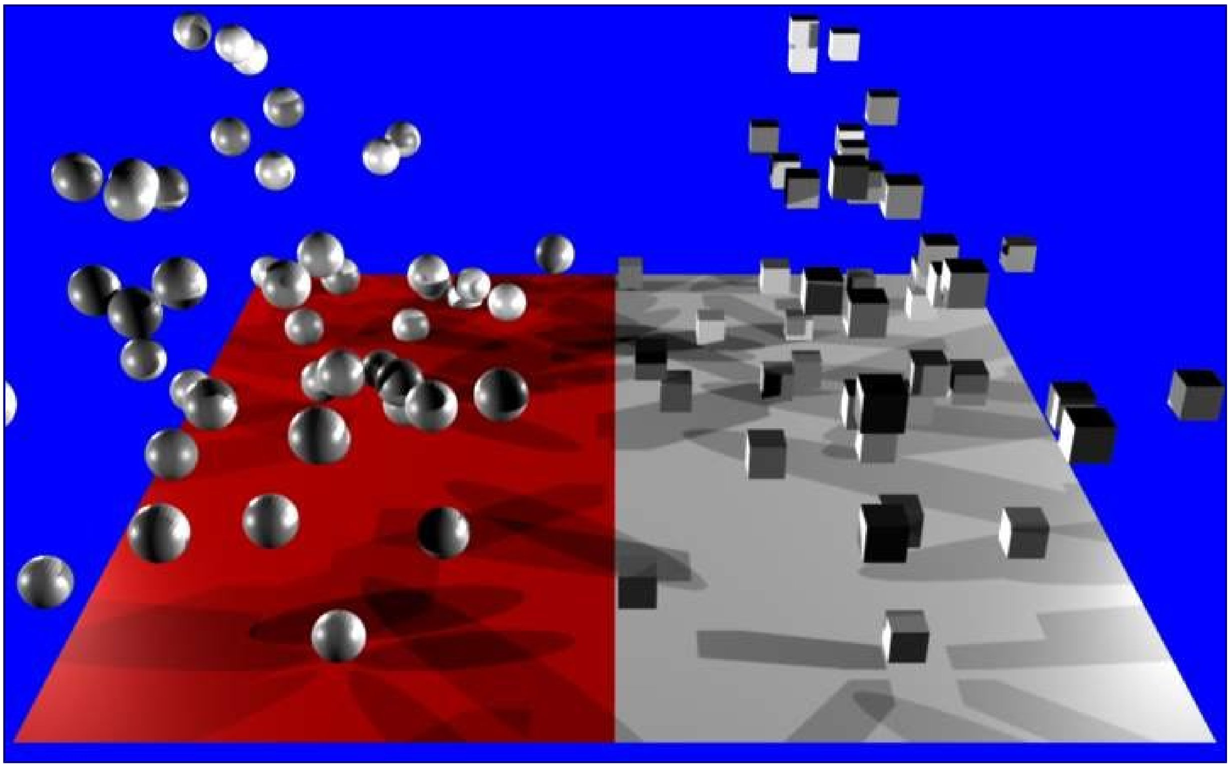
Object

The *Object* field, associates this *ParticleInstance* modifier with another object (usually an object having a particle system...). This indicates that when the object named in this field emits particles, those particles will have the mesh shape of the current *ParticleInstance* modifier's mesh. If for example a sphere has a *ParticleInstance* modifier added to it, when the *Object* field of this modifier is filled in with the name of an object that emits particles, those particle will be sphere shaped. Even though most of the time the *Object* field will have the name of an object with a particle system, this is not mandatory, you can enter an object's name which does not have a particle system, and it will be accepted by the *Object* field, as there do not appear to be any checks made to make sure the object's name entered into this field is "valid".

Particle System

The *Particle System* field is used to select which particle system number to apply the *ParticleInstance* modifier to, when the mesh which has the particle system on it has more than one of these. The *Particle System* field can have a value between `1` and `10`. It is possible to select any of the ten particle system numbers, however a check will **not** be made with the underlying particle emitting object specified previously in the *Object* field. If you select a particle system number which does not exist on the particle emitting object, then the particles on the emitting mesh will keep their normal particle shapes - no warning will be given that the chosen particle system does not exist on a particular particle emitting mesh.

As an example, below is a single plane mesh with two areas (the first area shown in red and the second in white), with different particle systems applied to each area. The left side using a *ParticleInstance* modifier which has the shape of a sphere and the right side having a *ParticleInstance* modifier which has the shape of a cube.



Render showing a single Plain mesh object assigned to two different vertex groups and each of those vertex groups is assigned a separate and independent particle system, with each particle system being assigned a different ParticleInstance modifier. In the case shown the ParticleInstance modifiers are a sphere and a cube. Example Blend file

Creation

Normal
: When selected, the *Normal* button tells the *ParticleInstance* modifier to draw instances of itself wherever normal particle types are emitted from the underlying particle system. So if the current *ParticleInstance* modifier is a sphere shape, when normal particles are emitted they will be spheres.

Children
: When selected, the *Children* button tells the *ParticleInstance* modifier to draw instances of itself wherever children/child particles are emitted/used on the underlying particle system. So if the current *ParticleInstance* modifier is a sphere shape, when children/child particles are emitted they will be spheres.

Size
: Scale the instanced objects by the particle size attribute. When this is disabled, all the copies appear the

same size as the origin.

Display

Unborn

When selected, the *Unborn* button tells the *ParticleInstance* modifier to draw instances of itself wherever unborn particles will be emitted/used on the underlying particle system. So if the current *ParticleInstance* modifier is a sphere shape, when unborn particles are present they will be spheres.

Alive

When selected, the *Alive* button tells the *ParticleInstance* modifier to draw instances of itself wherever alive particles will be emitted/used on the underlying particle system. So if the current *ParticleInstance* modifier is a sphere shape, when alive particles are present they will be spheres.

Dead

When selected, the *Dead* button tells the *ParticleInstance* modifier to draw instances of itself wherever dead particles will occur on the underlying particle system. So if the current *ParticleInstance* modifier is a sphere shape, when dead particles are present they will be spheres.

Using Paths

Create Along Paths

This option tries to make the underlying mesh object of the *Particle Instance* modifier deform its mesh shape in such a way as to try and match the path traveled by the particles/hair strands of the system associated with it. For example, below is a screen shot showing the path of a single keyed particle as it travels its way through each of the different way points `1` to `4` (target particle systems), when it reaches way point `4` the particle dies and ends its journey.

X,Y,X Rotation Axis

Specify which pole axis to use for the rotation.

Keep Shape

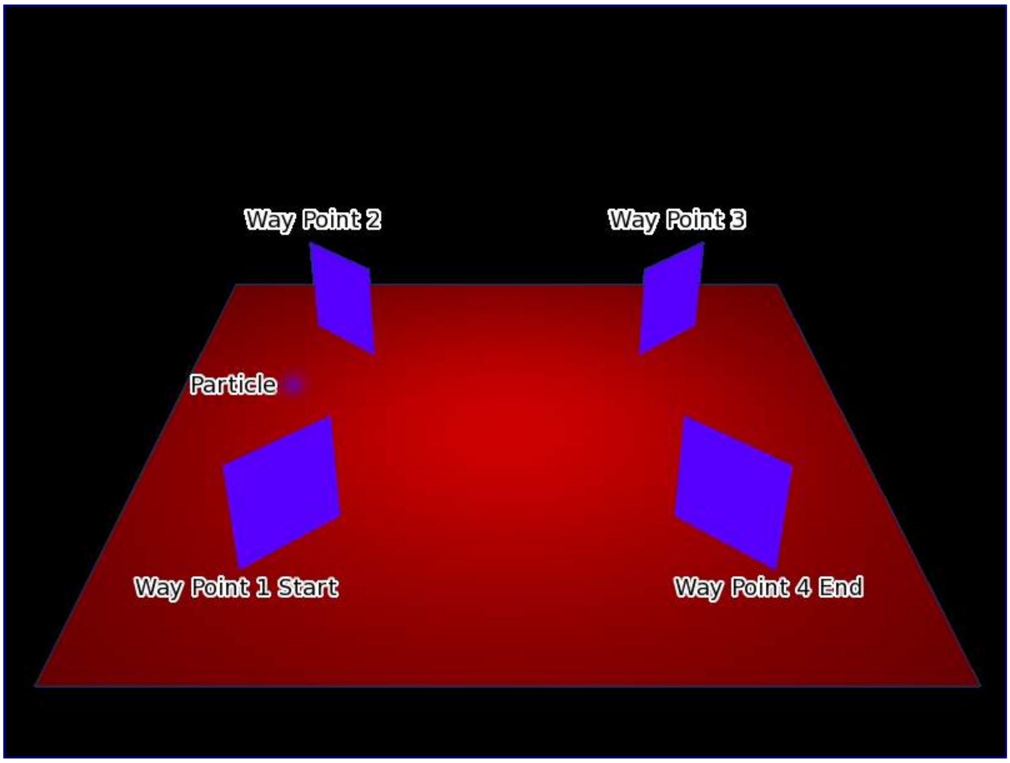
Enabling this prevents the object from being deformed. It instead simply aligns to the end of the path at the object’s center.

Position

Specify what percentage of the path the object fills. You could create a growing effect by animating this value over time.

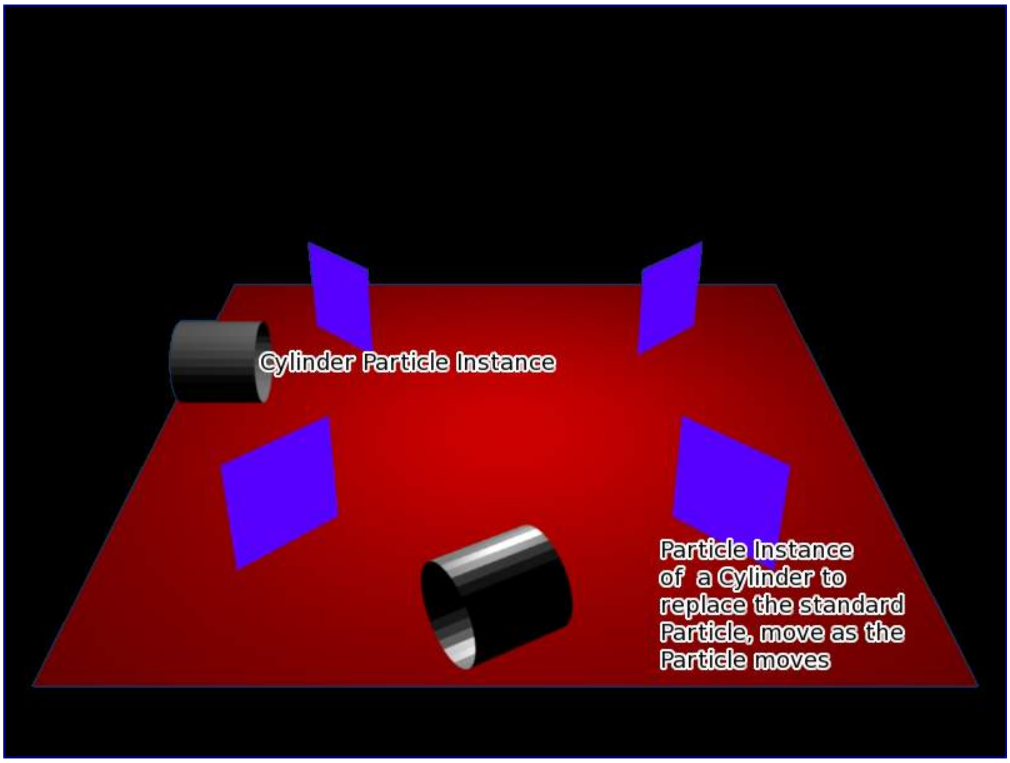
Random

Scales the position value of each instance a random value.



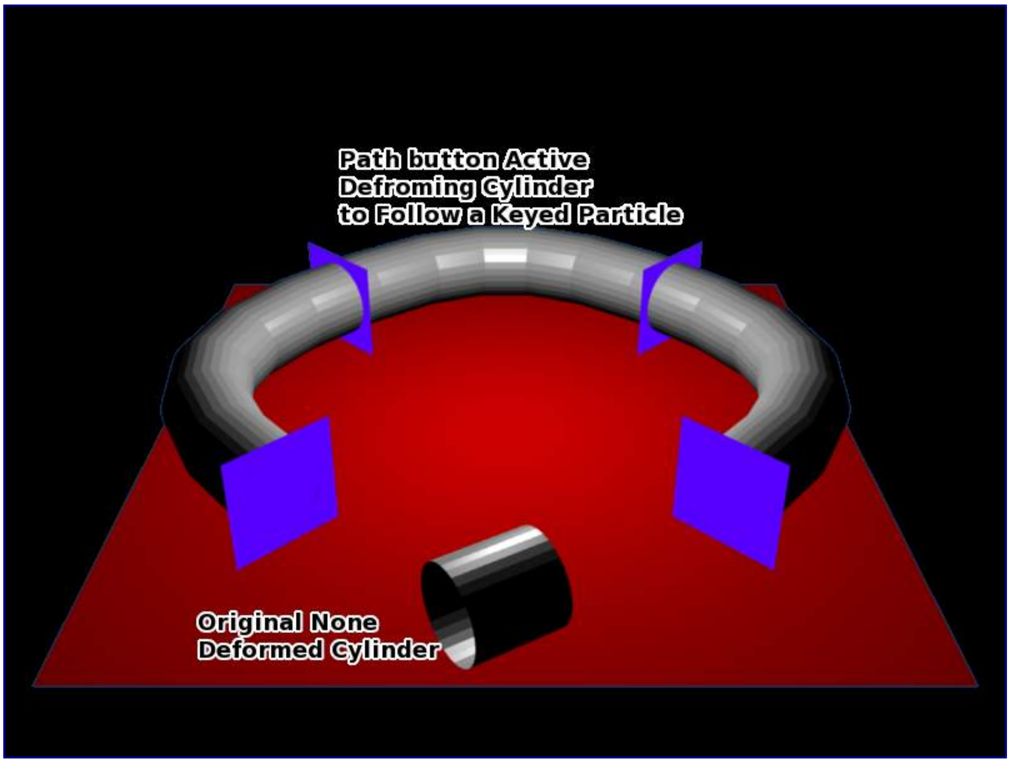
Keyed particle following way points (showing one particle). Example Blend file

When a *ParticleInstance* modifier is added to a cylinder object and then associated with the way point particle system, the particle position is copied by the cylinder and placed at the particles position. So the mesh object follows the location of the particle. The cylinder does not alter any of its other properties when following the particle, only the cylinders location gets altered, shape and rotation do not get altered. See screenshot below:



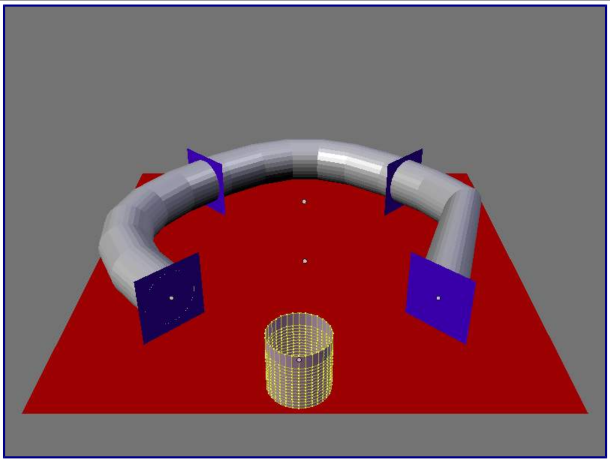
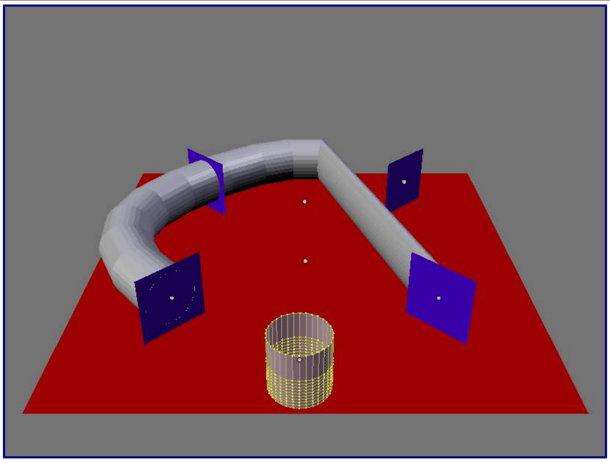
Keyed particle following way points showing a mesh object (ParticleInstance modifier) in place of the original particle. Example Blend file

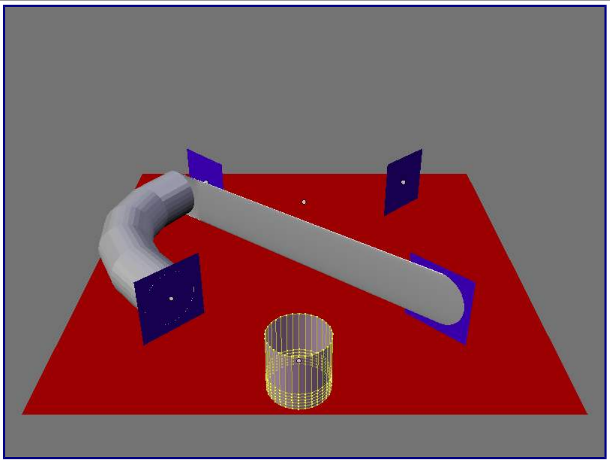
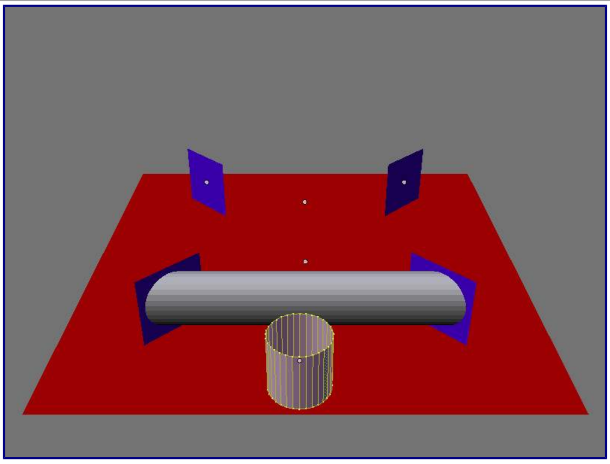
Both of the above examples had the *ParticleInstance* modifier *Path* button deactivated. When the *Path* button is activated the effect can be seen in the screenshot below:



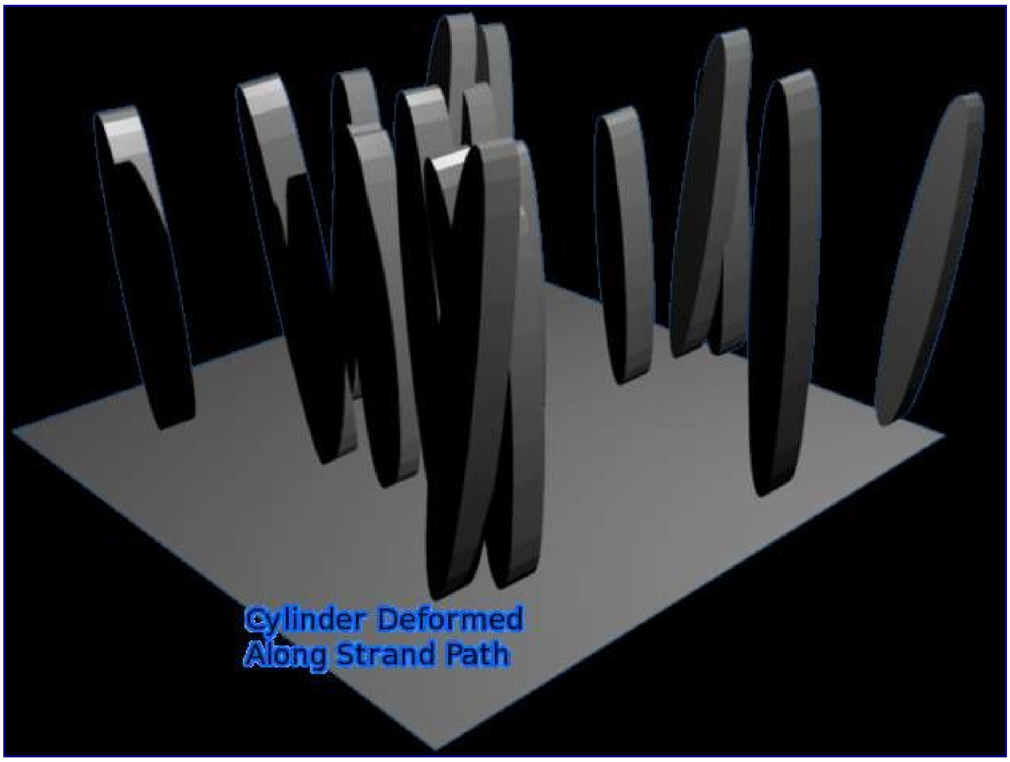
Keyed particle following way points showing a mesh object (ParticleInstance modifier) in place of the original particle, that is also being deformed to fit the travel path of the original particle. Example Blend file

Instead of the cylinder location just following the position of the particle (and not altering its shape), the cylinder tries to fit its mesh to the shape of the path followed by the particle. The mesh geometry of the object which is trying to deform can have an impact on how well the deformation is carried out. In the case of the cylinder, it has many loop cuts along its length so that it can bend at those points to deform along the particle path. For example here is the same scene with the number of loop cuts along the length of the cylinder reduced, showing the effect on the deformation of the cylinder along the particle path.

 The cylinder has most of its edge loops so most of the path deform is very regular apart from at the very end of the curve.	 The cylinder has some of its edge loops removed so the path of the deform starts to become less regular.

	
Now the deform path is very rough.	At this point there aren’t any vertices to bend the cylinder to follow the path, and instead the cylinder just goes directly to the last way point 4.

Once all the extra edge loops around cylinder are removed so that there is only the top and bottom vertices left, meaning that the cylinder doesn’t have enough geometry to bend, in that case it cannot follow the path of the particle, so it just goes from the start way point `1` to the ending way point `4`. The *ParticleInstance* modifier *Path* button works for hair (strand) particles as well as with keyed particles. In this case the mesh of the *ParticleInstance* modifier will follow the length and profile of the hair strands paths. Below is a screenshot showing the effect of the *Path* button on hair:



Strand with a ParticleInstance modifier associated with it and deforming the cylinder along the hair profile. Example Blend file

Note
Strands when they are generated instantly die when created so for the *Path* button to be of any use, you must also have the *Dead* button activated. Otherwise the path a mesh took will not be visible!

See also
Particles

6 Painting and Sculpting

Painting & Sculpting

TODO.

Painting

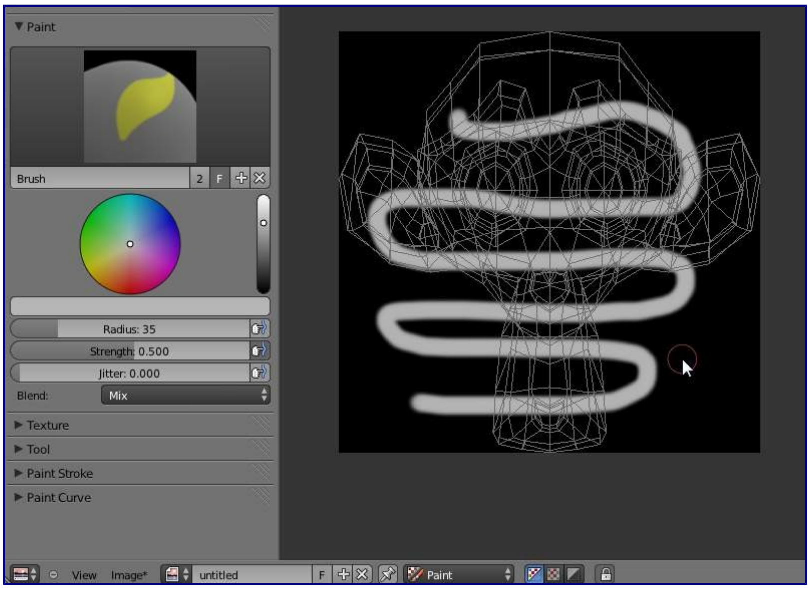
TODO.

Texture Paint

A UV Texture is a picture (image, sequence or movie) that is used to color the surface of a mesh. The UV Texture is mapped to the mesh through one or more UV maps. There are three ways to establish the image used by the UV Texture:

- Paint a flat image in the UV/Image Editor onto the currently selected UV Texture, using its UV map to transfer the colors to the faces of the mesh.
- Paint the mesh in the 3D View, and let Bforartists use the currently selected UV map to update the UV Texture (see Projection Painting).
- Use any image-editing (paint) program to create an image. In the UV/Image Editor, select the UV Texture and load the image. Bforartists will then use that texture's UV map to transfer the colors to the faces of the mesh

Bforartists features a built-in paint mode called Texture Paint which is designed specifically to help you edit your UV Textures and images quickly and easily in either the UV/Image Editor window or the 3D View window. Since a UV Texture is just a special-purpose image, you can also use any external paint program. For example, GIMP is a full-featured image manipulation program that is also open-source.



Texture painting in Bforartists

Since a mesh can have layers of UV Textures, there may be many images that color the mesh. However, each UV Texture only has one image.

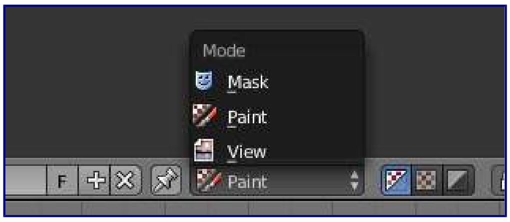
Texture Paint works in both a 3D window and the UV/Image Editor window. In the 3D window in Texture Paint mode, you paint directly on the mesh by projecting onto the UVs.

Getting Started

Once you have unwrapped your model to a UV Map (as explained in previous pages), you can begin the texturing process. You cannot paint on a mesh in Texture Paint mode without **first** unwrapping your mesh, **and** doing one of the following steps. Either:

See: *Applying Textures*.

After you have done one of these two things, you can modify the image using the Texture Paint mode:



Enabling paint mode

- In the 3D View window, select Texture Paint mode from the mode selector in the window header, and you can paint directly onto the mesh.
- In the UV/Image Editor window, switch the editing context from View to Paint (shown to the right).

Note
Square Power of 2 Texture paint is very fast and responsive when working in the 3D window and when your image is sized as a square where the side lengths are a power of two, e.g. 256x256, 512x512, 1024x1024, etc.

Once you enable Texture Painting, your mouse becomes a brush. To work with the UV layout (for example, to move coordinates) you must go back to “View” mode.

As soon as you enable Texture Painting or switch to Texture Paint mode, brush settings become available in the Toolbar Panel (T-key).

In the UV/Image Editor window, you paint on a flat canvas that is wrapped around the mesh using UV coordinates. Any changes made in the UV/Image Editor window show up immediately in the 3D window, and vice versa.

A full complement of brushes and colors can be selected from the Properties panel in the UV/Image Editor. Brush changes made in either panel are immediately reflected in the other panel. However, the modified texture will **not** be saved automatically; you must explicitly do so by Image–>Save in the UV/Image Editor window.

Texture Preview

If your texture is already used to color, bump map, displace, alpha-transparent, etc., a surface of a model in your scene (in other techie words, is mapped to some aspect of a texture via a texture channel using UV as a map input), you can see the effects of your painting in the context of your scene as you paint.

To do this, set up side-by-side windows, one window in 3D View set to Textured display mode, and the second UV/Image Editor window loaded with your image. Position the 3D View to show the object that is UV mapped to the loaded image. Open a Preview window (see 3D View Options for more info) and position it over the object. In the image to the right, the texture being painted is mapped to the “Normal” attribute, and is called “bump mapping”, where the gray-scale image is used to make the flat surface appear bumpy. See Texture Mapping Output for more information on bump mapping.

Brushes Settings

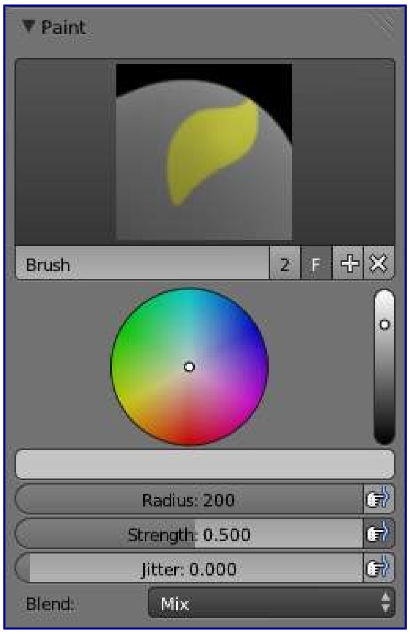
Press T in the UV/Image Editor to show the Toolbar panel. With this panel, you can create many brushes, each with unique settings (such as color and width). Use the Brush selector to switch between brushes, or to create a new brush. When you add a brush, the new brush is a clone of the current one. You can then change the setting for the new brush. Texture paint has an unlimited number of brushes and unique user-defined controls for those brushes which can be set in the Paint Tool panel.

To use a brush, click on its name. Use the selector up/down arrow, if there are more brushes on the flyout window than can be displayed at once. Name your brush by clicking on the name field and entering any name you wish, such as “Red Air” for a red airbrush. To toss out a brush, click the brush delete *X* button next to its name. If you want to keep this brush around for the next time you run Bforartists, click the Fake user button (F) next to the brush delete (X) button.

If you have a tablet pen with pressure sensitivity, toggle the small “P” button next to the opacity, size, falloff and spacing buttons to control these parameters using the pressure of the pen. Using your pen’s eraser end will toggle on the Erase Alpha mode.

Press S on any part of the image to sample that color and set it as the brush color.

Brush



Brush Settings

Brush presets
Select a preset brush. Most brushes have common settings.

Types of brushes

There are four different types of brushes

Draw
the normal brush; paints a swath of color

Soften
blends edges between two colors

Smear
when you click, takes the colors under the cursor, and blends them in the direction you move the mouse. Similar to the “smudge” tool of *Gimp*.

Clone
copies the colors from the image specified (Tex.Dirt in the example), to the active image. The background image is shown when this brush is selected; use the *B* lend slider to control how prominent the background image is.

Enable Pressure Sensitivity
The icon to the right of the following three settings will enable or disable tablet pressure sensitivity to control how strong the effect is.

Color
The color of the brush

Radius
The radius of the brush in pixels

Strength
How powerful the brush is when applied}}

Blend
Set the way the paint is applied over the underlying texture

- Mix: the brush color is mixed in with existing colors
- Add: the brush color is added to the existing color; green added to red gives yellow.

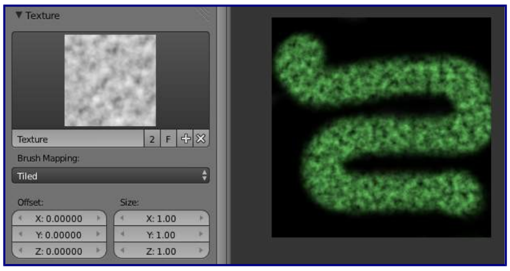
- Subtract: the brush color is subtracted; painting blue on purple gives red
- Multiply: the RGB value of the base is multiplied by the brush color
- Lighten: the RGB value of the base color is increased by the brush color
- Darken: tones down the colors
- Erase Alpha: makes the image transparent where painted, allowing background colors and lower-level textures to show through. As you ‘paint’, the false checkerboard background will be revealed
- Add Alpha: makes the image more opaque where painted

> In order to see the effects of the Erase and Add Alpha mix modes in the UV/Image Editor, you must enable the alpha channel display by clicking the Display Alpha or the Alpha-Only button. Transparent (no alpha) areas will then show a checkered background.

Image
: When using the clone brush, this allows you to select an image as a clone source.

Alpha
: Opacity of the clone image display

Texture



Texture options and example

Use the texture selector at the bottom of the paint panel to select a pre-loaded image or procedural texture to use as your brush pattern. Note that in order to use it, you must have a placeholder material defined, and that particular texture defined using the Material and Texture buttons. It is not necessary to have that material or texture applied to any mesh anywhere; it must only be defined. The example to the right shows the effects of painting with a flat (banded) wood texture. Switching the texture to Rings makes a target/flower type of brush painting pattern.

Note
In Clone paint mode, this field changes to indicate the picture image or texture that you are cloning from.

Brush Mapping

Sets how the texture is applied to the brush

View Plane
: In 2D painting, the texture moves with the brush

Tiled
: The texture is offset by the brush location

3D
Same as tiled mode
Stencil
Texture is applied only in borders of the stencil.
Random
Random applying of texture.

Angle

This is the rotation angle of the texture brush. It can be changed interactively via `Ctrl-F` in the 3D view. While in the interactive rotation you can enter a value numerically as well. Can be set to:

User
Directly input the angle value.
Rake
Angle follows the direction of the brush stroke. Not available with *3D* textures.
Random
Angle is randomized.

Offset
Offset the texture in x, y, and z.

Size
Set the scale of the texture in each axis.

Stroke

Stroke Method

Allows set the way applying strokes.

Airbrush

Flow of the brush continues as long as the mouse click is held, determined by the *Rate* setting. If disabled, the brush only modifies the color when the brush changes its location.

Rate
Interval between paints for airbrush

Space

Creates brush stroke as a series of dots, whose spacing is determined by the *Spacing* setting.

Spacing
Represents the percentage of the brush diameter. Limit brush application to the distance specified by spacing.

Dots
Apply paint on each mouse move step

Jitter
Jitter the position of the brush while painting

Smooth stroke

Brush lags behind mouse and follows a smoother path. When enabled, the following become active:

Radius
Sets the minimun distance from the last point before stroke continues.

Factor

Sets the amount of smoothing.

Input Samples

Average multiple input samples together to smooth the brush stroke.

Wrap

wraps your paint to the other side of the image as your brush moves off the OTHER side of the canvas (any side, top/bottom, left/right). Very handy for making seamless textures.

Curve

The paint curve allows you to control the falloff of the brush. Changing the shape of the curve will make the brush softer or harder.

Note

- Read more about using the Curve Widget.

Paint options

Overlay

Allows you to customize the display of curve and texture that applied to the brush.

Appearance

Allows you to customize the color of the brush radius outline, as well as specify a custom icon.

Saving

If the header menu item Image has an asterisk next to it, it means that the image has been changed, but not saved. Use the *Image–>Save Image* option to save your work with a different name or overwrite the original image.

Note

UV Textures

Since images used as UV Textures are functionally different from other images, you should keep them in a directory separate from other images.

The image format for saving is independent of the format for rendering. The format for saving a UV image is selected in the header of the Save Image window, and defaults to PNG (.png).

If Packing is enabled in the window header, or if you manually *Image–>Pack Image*, saving your images to a separate file is not necessary.

Using an External Image Editor

If you use an external program to edit your UV Texture, you must:

- run that paint program (GIMP, Photoshop, etc.)

- load the image or create a new one
- change the image, and
- re-save it within that program.
- Back in Bforartists, you reload the image in the UV/Image Editor window.

You want to use an external program if you have teams of people using different programs that are developing the UV textures, or if you want to apply any special effects that Texture Paint does not feature, or if you are much more familiar with your favorite paint program.

Known Limitations

UV Overlap

In general overlapping UVs aren't supported (as with texture baking).

However this is only a problem when a single brush stroke paints onto multiple faces that share a texture.

Perspective View & Faces Behind the View

When painting onto a face which is partially behind the view (in perspective mode), the face can't be painted on. To avoid, this zoom out or use an Ortho mode viewport.

Perspective View & Low Poly

When painting onto a face in perspective mode onto a low poly object with normals pointing away from the view, painting may fail; to workaround disable the **Normal** option in the paint panel.

Typically this happens when painting onto the side of a cube

Vertex Paint

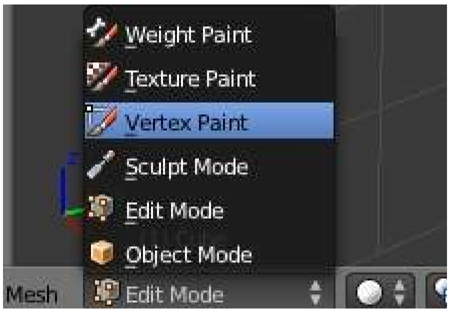
- Introduction
    - Settings
    - Options

Introduction

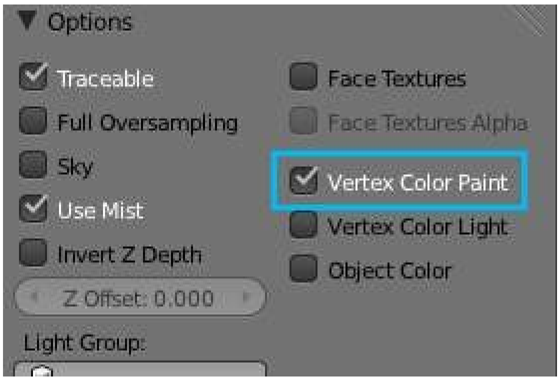
Vertex Painting is a simple way of painting color onto an object, by directly manipulating the color of vertices, rather than textures, and is fairly straightforward.

When a vertex is painted, the color of the vertex is modified according to the rules of the 'brush'. The color of all visible planes and edges attached to the vertex are then modified with a gradient to the color of the other connected vertices. (Note that the color of non-visible faces are not modified).

Vertex colors can be painted by first going into Edit Mode, then switching to *Vertex Paint Mode*; however, it will not show up in the render unless you check "Vertex Color Paint" in the Materials *Options* Panel.



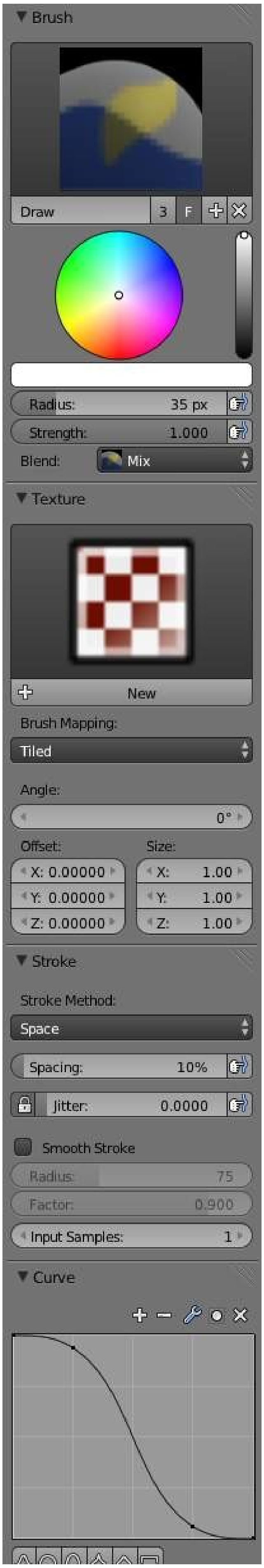
Vertex Painting Mode



Check this box

Settings

The Tools Shelf, shortcut T contains most of the options for vertex painting. The following sections describe the controls in each of the available panels.


Brush
Draw
3
F
Radius: 35 px
Strength: 1.000
Blend: Mix
Texture
New
Brush Mapping:
Tiled
Angle:
0°
Offset:
Size:
X: 0.00000
Y: 0.00000
Z: 0.00000
X: 1.00
Y: 1.00
Z: 1.00
Stroke
Stroke Method:
Space
Spacing: 10%
Jitter: 0.0000
Smooth Stroke
Radius: 75
Factor: 0.900
Input Samples: 1
Curve

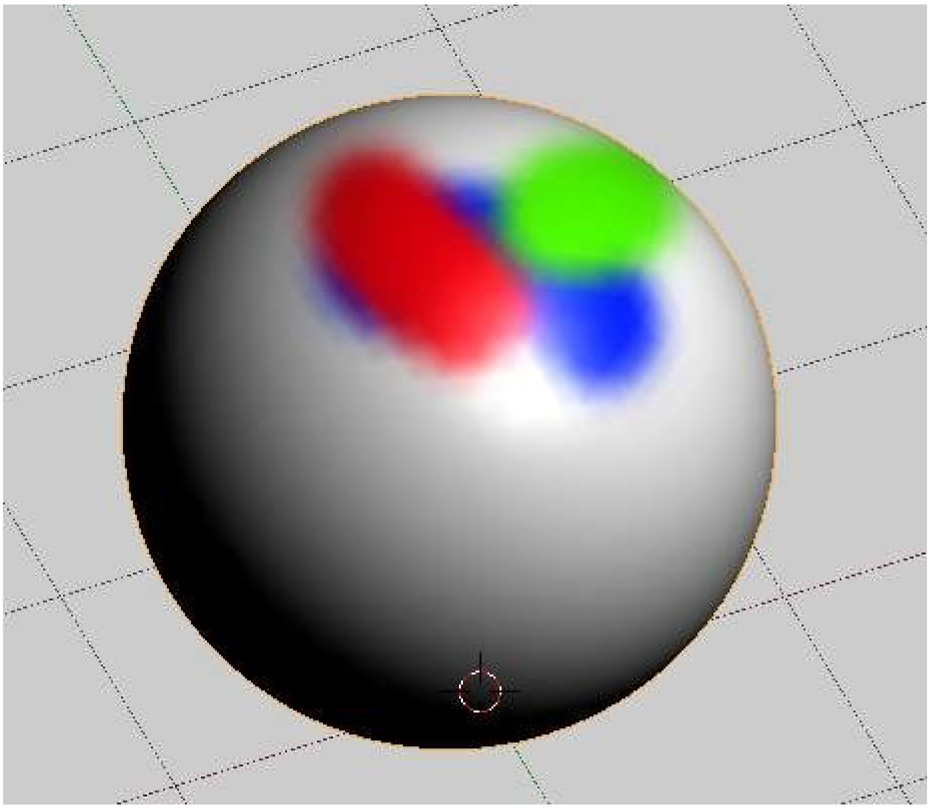
Settings for vertex painting

Brush

Brush Data-Block
: The image, name panel and color selector at the top allows you to select brush presets, rename brushes, as well as add custom brushes, and delete them.

Radius
: Set the radius of the brush

Strength
: Set the strength of the brush’s effect.



Mix overlay with full strength

Blend menu

Mix

Mixes RGB values. When set to a strength of 1.0, it will cover the underlying “paint”.

Add

Adds RGB values. Will eventually turn the entire object white as RGB values accumulate to 1.0-1.0-1.0: Pure White.

Subtract

Subtracts RGB values. Usually results in Black.

Multiply

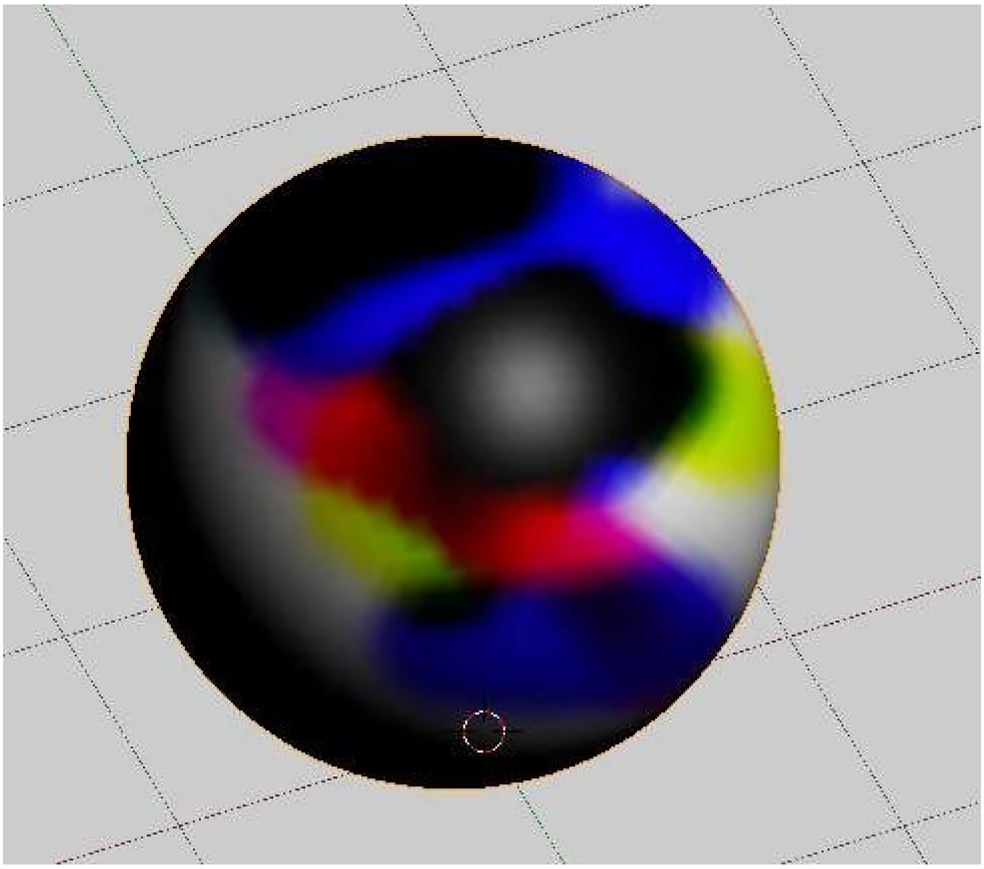
Multiplies brush colors by the vertex colors.

Blur

Blurs vertex colors.

Lighten

Lightens the color of the vertices.



Subtract with full strength

Darken

Darkens the color of the vertices.

Texture

Use the texture selector at the bottom of the paint panel to select a pre-loaded image or procedural texture to use as your brush pattern. Note that in order to use it, you must have a placeholder material defined, and that particular texture defined using the Material and Texture buttons. It is not necessary to have that material or texture applied to any mesh anywhere; it must only be defined.

Brush Mapping Mode

Sets how the texture is applied to the brush

View Plane

In 2D painting, the texture moves with the brush

Tiled
The texture is offset by the brush location
3D
Same as tiled mode
Stencil
Texture is applied only in borders of the stencil.
Random
Random applying of texture.

Angle

This is the rotation angle of the texture brush. It can be changed interactively via `Ctrl-F` in the 3D view. While in the interactive rotation you can enter a value numerically as well. Can be set to:

User
Directly input the angle value.
Rake
Angle follows the direction of the brush stroke. Not available with *3D* textures.
Random
Angle is randomized.

Offset
Offset the texture in x, y, and z.
Size
Set the scale of the texture in each axis.

Stroke

Stroke Method

Allows set the way applying strokes.

Airbrush

Flow of the brush continues as long as the mouse click is held, determined by the *Rate* setting. If disabled, the brush only modifies the color when the brush changes its location.

Rate
Interval between paints for airbrush

Space

Creates brush stroke as a series of dots, whose spacing is determined by the *Spacing* setting.

Spacing
Represents the percentage of the brush diameter. Limit brush application to the distance specified by spacing.

Dots
Apply paint on each mouse move step
Jitter
Jitter the position of the brush while painting

Smooth stroke

Brush lags behind mouse and follows a smoother path. When enabled, the following become active:

Radius

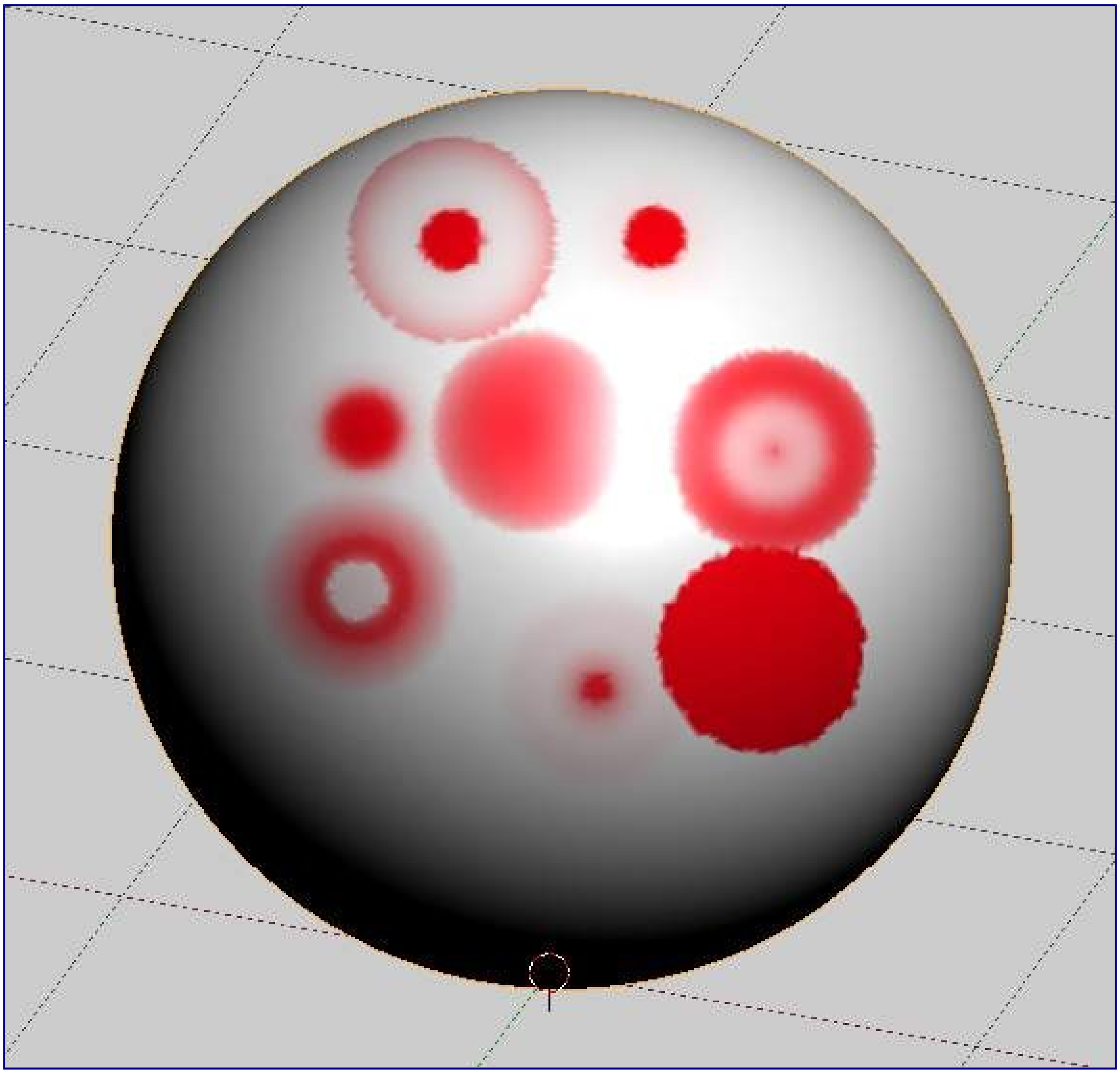
Sets the minimun distance from the last point before stroke continues.

Factor

Sets the amount of smoothing.

Input Samples

Average multiple input samples together to smooth the brush stroke.

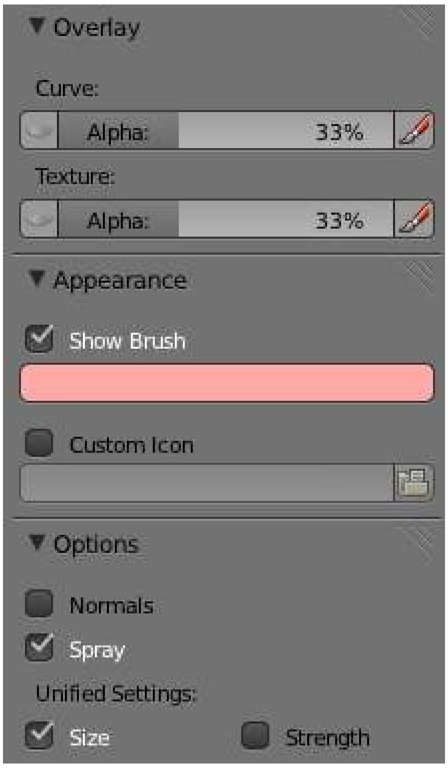


Various brush curves

Curve

Brush Curves affect how strongly the color is applied depending on distance from the center of the brush. In other words, they allow you to edit the Falloff of the brush intensity.

Options



Options for vertex painting

Overlay

Allows you to customize the display of curve and texture that applied to the brush.

Appearance

Allows you to customize the color of the brush radius outline, as well as specify a custom icon.

Options

Normals
: Applies the Vertex Normal before painting. This does not usually affect painting.

Spray
: Continues painting for as long as the mouse is held.

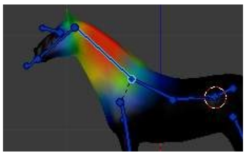
Unified Settings
: **Size**
: All brushes use the same size.
: **Strength**
: All brushes use the same strength.

Weight Paint

Vertex Groups can potentially have a very large number of associated vertices and thus a large number of weights (one weight per assigned vertex). *Weight Painting* is a method to maintain large amounts of weight information in a very intuitive way. It is primarily used for rigging meshes, where the vertex groups are used to define the relative bone influences on the mesh. But we use it also for controlling particle emission, hair density, many modifiers, shape keys, etc.

The basic principle of the method is: the weight information is literally *painted* on top of the Mesh body by using a set of Weight brushes. And since painting is always associated with color, we also need to define ...

Weight Paint in a nutshell



Weight Painted Vertex Group

- You enter *Weight Paint* mode from the Mode Menu (`Ctrl-Tab`). The selected Mesh Object is displayed slightly shaded with a rainbow color spectrum.
- The color visualizes the weights associated to each vertex in the active Vertex Group. Blue means unweighted; Red means fully weighted.
- You can customize the colors in the weight gradient by enabling *Custom Weight Paint Range* in the *System* tab of the *User Preferences*.
- You assign weights to the vertices of the Object by painting on it with weight brushes. Starting to paint on a mesh automatically adds weights to the active Vertex Group (a new Vertex Group is created if needed).

The weighting Color Code

Weights are visualized by using a cold/hot color system, such that areas of low influence (with weights close to 0.0) are drawn in blue (cold) and areas of high influence (with weights close to 1.0) are drawn in red (hot). And all in-between influences are drawn in rainbow colors, depending on their value (blue, green, yellow, orange, red)

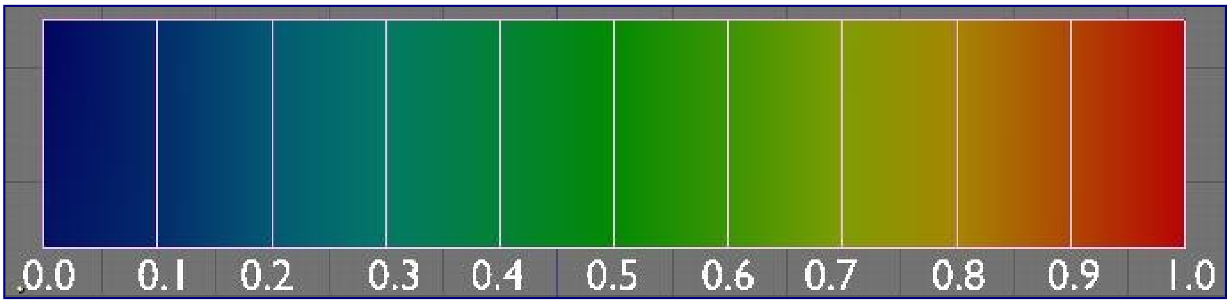
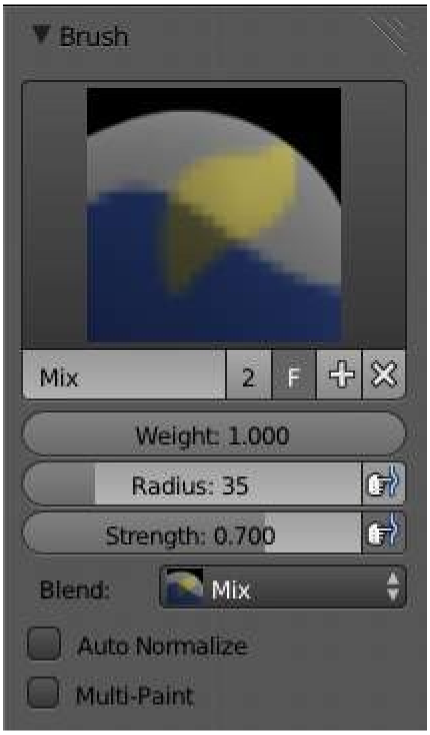


Image 3: The color spectrum and their respective weights.

In addition to the above described color code, Bforartists has added (as an option) a special visual notation for unreferenced vertices: They are drawn in black. Thus you can see the referenced areas (drawn in cold/hot colors) and the unreferenced areas (in black) at the same time. This is most practical when you look for weighting errors (we will get back to this later).

Brushes



The Brush panel in the Tool Shelf

Painting needs paint brushes and Bforartists provides a Brush Panel within the Tool Shelf when it operates in *Weight Paint Mode*. You find predefined Brush Presets when you click on the large Brush Icon at the top of the brush Panel. And you can make your own presets as needed. See below for the available brush presets and to create custom presets.

The main brush properties

The most important and frequently modified properties are:

Weight
: The weight (color) to be used by the brush. However, the weight value is applied to the Vertex Group in different ways depending on the selected Brush Blending mode (see below).

Strength
: This is the amount of paint to be applied per brush stroke. What that means exactly also depends on the Brush Blending mode.

Radius
: The radius defines the area of influence of the brush.

> **Note**
>
> You can also change the Brush radius with a keyboard shortcut while painting. Just press `F` at any time, then drag the mouse to increase/reduce the brush radius. Finally click `LMB` to use the new setting. Or press the `Esc` key at any time to return to the current settings.

Blend mode

The brush Blending mode defines in which way the weight value is applied to the Vertex Group while painting.

Mix
: In this Blend mode the Weight value defines the *target weight* that will eventually be reached when you paint long enough on the same location of the mesh. And the strength determines how many strokes you need to arrive at the target weight. Note that for strength = 1.0 the target weight is painted immediately, and for Weight = 0.0 the brush just does nothing.

Add
: In this blend mode the specified weight value is *added* to the vertex weights. The strength determines which fraction of the weight gets added per stroke. However, the brush will not paint weight values above 1.0.

Subtract
: In this blend mode the specified weight is *subtracted* from the vertex weights. The strength determines which fraction of the weight gets removed per stroke. However the brush will not paint weight values below 0.0.

Lighten
: In this blend mode the specified weight value is interpreted as the target weight very similar to the Mix Blend mode. But only weights below the target weight are affected. Weights above the target weight remain unchanged.

Darken
: This Blend mode is very similar to the Lighten Blend mode. But only weights above the target weight are affected. Weights below the target weight remain unchanged.

Multiply
: Multiplies the vertex weights with the specified weight value. This is somewhat like subtract, but the amount of removed weight is now dependent on the Weight value itself.

Blur
: tries to smooth out the weighting of adjacent vertices. In this mode the Weight Value is ignored. The strength defines how effectively the blur is applied.

Normalize Options

Bforartists also provides Options regarding the automatic normalizing of all affected Vertex groups:

Auto Normalize

Ensures that all deforming vertex groups add up to 1 while painting. When this option is turned off, then all weights of a vertex can have any value between 0.0 and 1.0. However, when Vertex Groups are used as Deform Groups for character animation then Bforartists always interprets the weight values relative to each other. That is, Bforartists always does a normalization over all deform bones. Hence in practice it is not necessary to maintain a strict normalization and further normalizing weights should not affect animation at all.

This option works most intuitively when used to maintain normalization while painting on top of weights that are already normalized with some other tool.

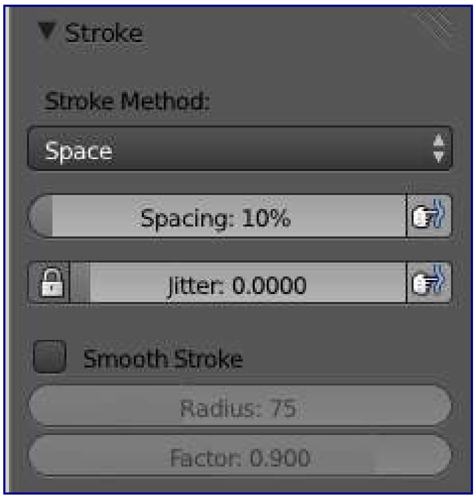
Multi-Paint

Paint on all selected Vertex Groups simultaneously, in a way that preserves their relative influence. This can be useful when tweaking weights in an area that is affected by more than 3 bones at once, e.g. certain areas on a character’s face.

This option is only useful in the context of Armatures, where you can select multiple Vertex Groups by selecting multiple Pose bones. Once at least two Vertex Groups are selected, viewport colors and paint logic switch to Multi-Paint mode, using the sum of the selected groups' weights if Auto Normalize is enabled, and the average otherwise. Any paint operations aimed at this collective weight are applied to individual Vertex Group weights in such way that their ratio stays the same.

Since the ratio is undefined if all weights are zero, Multi-Paint can't operate on vertices that don't have any weight assigned to the relevant Vertex Groups. For this reason it also doesn't allow reducing the weight all the way to zero. When used with X-Mirror, it only guarantees completely symmetrical result if weights are initially symmetrical.

The Brush stroke definition



Stroke Panel

Stroke Method

Airbrush

Keep applying paint effect while holding mouse down (spray)

Space

Limit brush application to the distance specified by spacing (see below)

Dots

Apply paint on each mouse move step

Rate (only for Airbrush)

Interval between paints for airbrush

Spacing (only for Space)

Limit brush application to the distance specified by spacing

Jitter

Jitter the position of the brush while painting

Smooth Stroke

Brush lags behind mouse and follows a smoother path

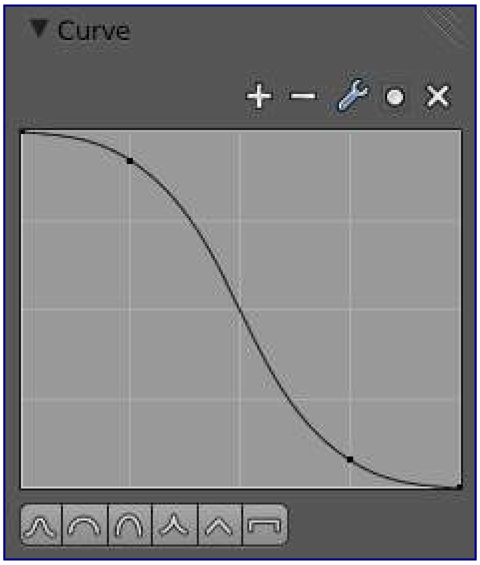
Radius

Minimum distance from last point before stroke continues

Factor

Higher values give a smoother stroke

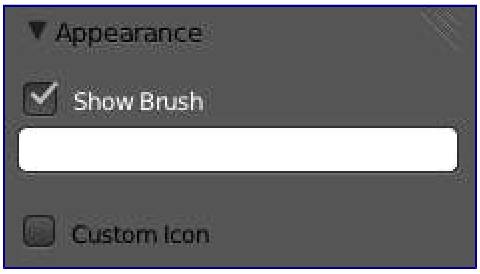
The brush Falloff curve



Curve Panel

The brush falloff editor allows you to specify the characteristics of your brushes to a large extent. The usage should be obvious and intuitive.

The brush appearance



Brush appearance

Show Brush
: makes the brush visible as a circle (on by default)

Color setter
: To define the color of the brush circle

Custom icon
: Allows definition of a custom brush icon

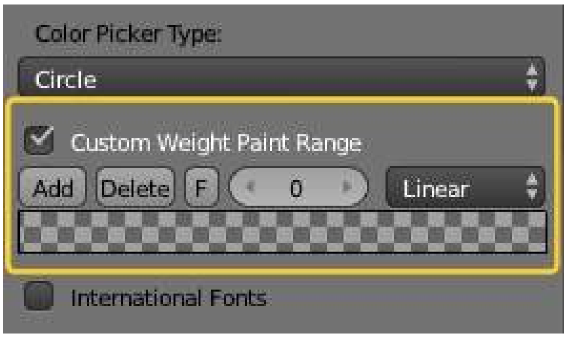
Brush presets

Bforartists provides several Brush presets:

- **Mix, Draw, Brush** : uses the Mix Blending mode to draw the brush weight with varying strength and brush falloff
- **Add** : uses the Add Blending mode
- **Subtract** : uses the Subtract Blending mode
- **Lighten** : uses the Lighten Blending mode
- **Darken** : uses the Darken Blending mode
- **Multiply** :uses the Multiply Blending mode

- **Blur** : uses the Blur Blending mode

Customizing brush color space



Customizing the Color Band

Bforartists allows customization of the color range used for the Weight Paint colors. You can define the color band as you like; for example, you can make it purely black/white if you prefer, you can even use alpha values here.

You find the customizer in the User Properties section, in the System Tab.

Selection Masking

If you have a complex mesh, it is sometimes not easy to paint on all vertices in Weight Paint mode. Suppose you only want to paint on a small area of the Mesh and keep the rest untouched. This is where *selection masking* comes into play. When this mode is enabled, a brush will only paint on the selected verts or faces. The option is available from the footer menu bar of the 3D viewport (see icons surrounded by the yellow frame):

You can choose between *Face Selection masking* (left icon) and *Vertex selection masking* (right icon).

Select mode has some advantages over the default *Weight Paint* mode:

- The original mesh edges are drawn, even when modifiers are active.
- You can select faces to restrict painting to the vertices of the selected faces.
- Selecting tools include:

Details about selecting

The following standard selection operations are supported:

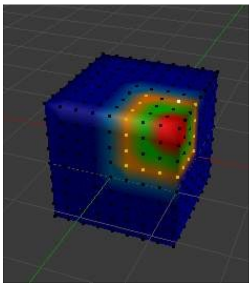
- `RMB` - Single faces. Use `Shift-RMB` to select multiple.
- `A` - All faces, also to de-select.
- `B` - Block/Box selection.
- `C` - Select with brush.
- `L` - Pick linked (under the mouse cursor).
- `Ctrl-L` - Select linked.
- `Ctrl-I` - Invert selection (*Inverse*).

Tip

Selecting Deform Groups

When you are doing weight painting for deform bones (with an Armature), you can select a deform group by selecting the corresponding bone. However, this Vertex Group selection mode is disabled when Selection Masking is active!

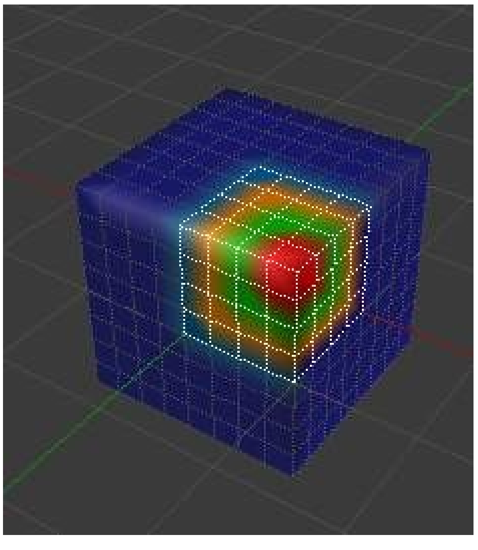
Vertex Selection Masking



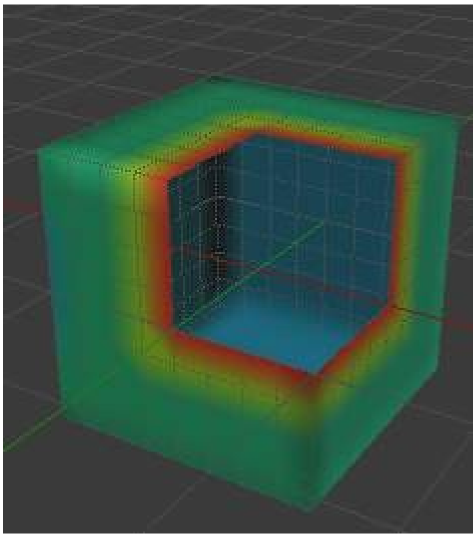
Vertex Selection masking

In this mode you can select one or more vertices and then paint only on the selection. All unselected vertices are protected from unintentional changes.

Face Selection Masking



Face Selection masking



hidden faces

The *Face Selection masking* allows you to select faces and limit the weight paint tool to those faces, very similar to Vertex selection masking.

Hide/Unhide Faces

You also can hide selected faces as in Edit Mode, then paint on the remaining visible faces and finally unhide the hidden faces again

Hide/Unhide Vertices

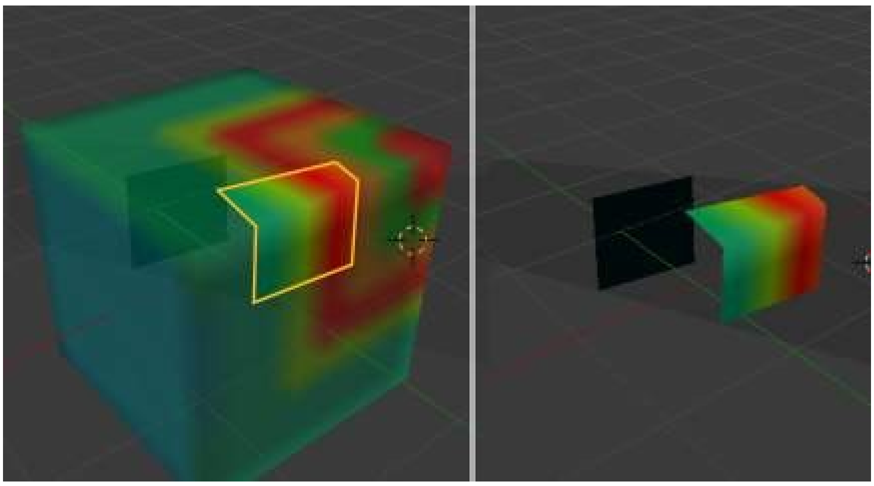
You cannot directly hide selected faces in vertex mask selection mode. However you can use a trick:

- First go to Face selection mask mode
- Select the areas you want to hide and then hide the faces (as explained above)
- Switch back to Vertex Selection mask mode

Now the verts belonging to the hidden Faces will remain hidden.

The Clipping Border

To constrain the paint area further you can use the *Clipping Border.* The selected area will be “cut out” as the area of interest. The rest of the 3D window gets hidden.

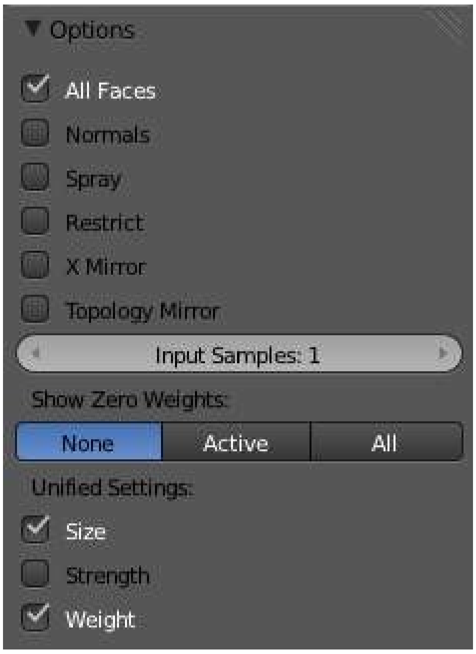


The Clipping Border is used to select interesting parts for local painting

You make the entire mesh visible again by calling the Clipping Border tool again. It's a toggle.

All weight paint tools that use the view respect this clipping, including border select, weight gradient and of course brush strokes.

Weight Paint Options



Weight Paint Options

The Weight Paint Options modify the overall brush behavior:

Normals
: The vertex normal (helps) determine the extent of painting. This causes an effect as if painting with light.

Spray
: This option accumulates weights on every mouse move.

Restrict
: This option limits the influence of painting to vertices belonging (even with weight 0) to the selected vertex group.

X-mirror
: Use the X-mirror option for mirrored painting on groups that have symmetrical names, like with extension `.R` / `.L`, or `_R` / `_L`. If a group has no mirrored counterpart, it will paint symmetrically on the active group itself. You can read more about the naming convention in *Editing Armatures: Naming conventions*. The convention for armatures/bones apply here as well.

Topology Mirror
: Use topology-based mirroring, for when both side of a mesh have matching mirrored topology.

Input Samples
: not so sure

Show Zero Weights
- None
- Active
- All

Unified Settings: The *Size*, *Strength* and *Weight* of the brush can be set to be shared across different brushes, as opposed to per-brush.

- Spray: to constantly draw (opposed to drawing one stroke per mouse click).
- Restrict: to only paint on vertices which already are weighted in the active weight group. (No new weights are created; only existing weights are modified.)
- x-mirror: to draw symmetrically. Note the this only works when the character symmetry plane is z-y (character looks into y direction).
- Show Zero weights: To display unreferenced and zero weighted areas in black (by default).

Weight Paint Tools

Weight Paint Tools

Bforartists provides a set of helper tools for Weight Painting. The tools are located in the weight tools panel.

The weight paint tools are full described in the *Weight Paint Tools* page

Weight Painting for Bones

This is one of the main uses of weight painting. When a bone moves, vertices around the joint should move as well, but just a little, to mimic the stretching of the skin around the joint. Use a “light” weight (10-40%) paint on the vertices around the joint so that they move a little when the bone rotates. While there are ways to automatically assign weights to an armature (see the *Armature section*), you can do this manually. To do this from scratch, refer to the process below. To modify automatically assigned weights, jump into the middle of the process where noted:

- Create an armature.
- Create a mesh that will be deformed when the armature’s bone(s) move.
- With the mesh selected, create an *Armature* modifier for your mesh (located in the *Editing* context, *Modifiers* panel). Enter the name of the armature.

Pick up here for modifying automatically assigned weights.

- Select the armature in 3D View, and bring the armature to *Pose* **mode**
- Select a desired bone in the armature.

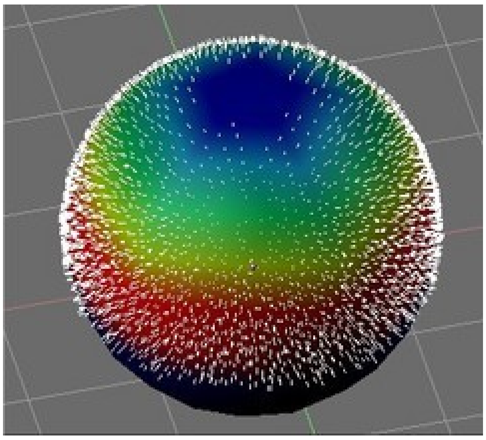
- Select your mesh (using RMB) and change immediately to *Weight Paint* mode. The mesh will be colored according to the weight (degree) that the selected bone movement affects the mesh. Initially, it will be all blue (no effect).
- Weight paint to your heart's content. The mesh around the bone itself should be red (generally) and fade out through the rainbow to blue for vertices farther away from the bone.

You may select a different bone with RMB while weight painting, provided the armature was left in *Pose* mode as described above. This will activate the vertex group sharing the name with the selected bone, and display related weights. If the mesh skins the bones, you will not be able to see the bones because the mesh is painted. If so, turn on *X-Ray* view (*Buttons* window, *Editing* context, *Armature* panel).

If you paint on the mesh, a vertex group is created for the bone. If you paint on vertices outside the group, the painted vertices are automatically added to the vertex group.

If you have a symmetrical mesh and a symmetrical armature you can use the option *X-Mirror*. Then the mirrored groups with the mirrored weights are automatically created.

Weight Painting for Particles



Weight painted particle emission.

Faces or vertices with zero weight generate no particles. A weight of 0. 1 will result in 10% of the amounts of particles. This option "conserves" the total indicated number of particles, adjusting the distributions so that the proper weights are achieved while using the actual number of particles called for. Use this to make portions of your mesh hairier than others by weight painting a vertex group, and then calling out the name of the vertex group in the *VGroup:* field (*Particles* panel, *Object* context).

Weight Tools

Weight Paint Tools

Bforartists provides a set of helper tools for Weight Painting. The tools are accessible from the Tool Shelf in Weight Paint mode. And they are located in the weight tools panel.

The Subset Option

Some of the tools also provide a Subset parameter (in the Operator panel, displayed after the tool is called) with following options:

- Active Group
- Selected Pose Bones
- Deform pose Bones
- All Groups

All tools also work with Vertex Selection Masking and Face Selection masking. In these modes the tools operate only on selected verts or faces.

Tip
About the Blend tool The Blend tool only works when “Vertex selection masking for painting” is enabled. Otherwise the tool button is grayed out.

Normalize All

For each vertex, this tool makes sure that the sum of the weights across all Vertex Groups is equal to 1. This tool normalizes all of the vertex groups, except for locked groups, which keep their weight values untouched.

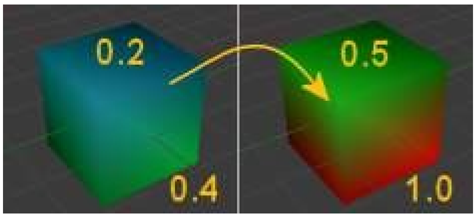
Operator Parameters

Normalize All Options

Lock Active
Keep the values of the active group while normalizing all the others.

Note
Currently this tool normalizes ALL vertex groups except the locked vertex groups.

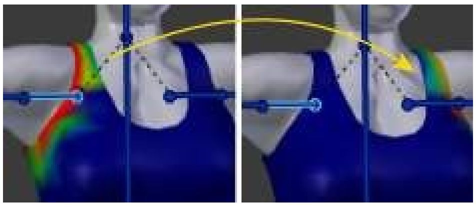
Normalize



Normalize All Options

This tool only works on the active Vertex Group. All vertices keep their relative weights, but the entire set of weights is scaled up such that the highest weight value is 1.0

Mirror



Normalize All Options

This tool mirrors the weights from one side of the mesh to the opposite side (only mirroring along x-axis is supported). But note, the weights are not transferred to the corresponding opposite bone weight group. The mirror only takes place within the selected Vertex Group.

Operator Parameters

Mirror Options

Mirror Weights
    Mirrors the weights of the active group to the other side. Note, this only affects the active weight group.
Flip Group Names
    Exchange the names of left and right side. This option only renames the groups.
All Groups
    Operate on all selected bones.
Topology Mirror
    Mirror for meshes which are not 100% symmetric (approximate mirror).

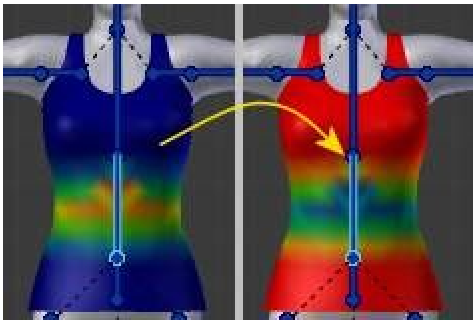
Tip

Mirror to opposite bone

If you want to create a mirrored weight group for the opposite bone (of a symmetric character), then you can do this:

- Delete the target Vertex Group (where the mirrored weights will be placed)
- Create a copy of the source bone Vertex Group (the group containing the weights which you want to copy)
- Rename the new Vertex Group to the name of the target Vertex Group (the group you deleted above)
- Select the Target Vertex Group and call the Mirror tool (use only the Mirror weights option and optionally Topology Mirror if your mesh is not symmetric)

Invert



Invert

Replaces each Weight of the selected weight group by 1.0 - weight.

Examples:

- original 1.0 converts to 0.0
- original 0.5 remains 0.5
- original 0.0 converts to 1.0

Operator Parameters

Mirror Options

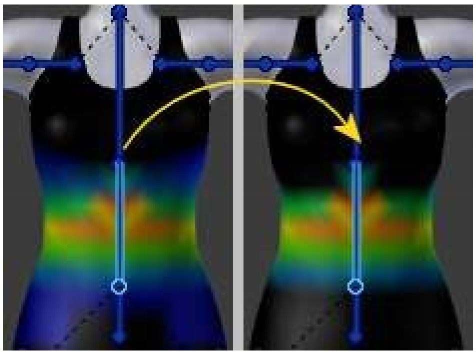
Subset
: Restrict the tool to a subset. See above (*The Subset Option*) about how subsets are defined.

Add Weights
: Add verts that have no weight before inverting (these weights will all be set to 1.0)

Remove Weights
: Remove verts from the Vertex Group if they are 0.0 after inverting.

Note
Locked vertex Groups are not affected.

Clean



Invert

Removes weights below a given threshold. This tool is useful for clearing your weight groups of very low (or zero-) weights.

In the example shown, I used a cutoff value of 0.139 (see operator options below) so all blue parts (left side) are cleaned out (right side).

Note, the images use the *Show Zero weights* =Active option so that unreferenced Weights are shown in Black.

Operator Parameters

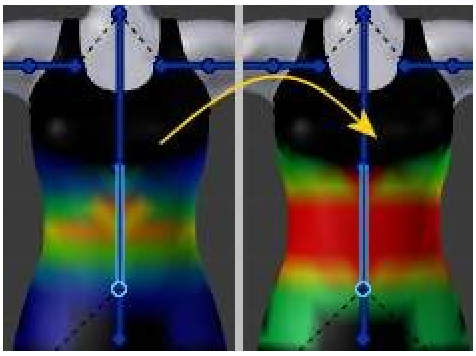
Mirror Options

Subset
: Restrict the tool to a subset. See above (*The Subset Option*) for how subsets are defined.

Limit
: This is the minimum weight value that will be kept in the Group. Weights below this value will be removed from the group.

Keep Single
: Ensure that the Clean tool will not create completely unreferenced verts (verts which are not assigned to any Vertex Group), so each vertex will keep at least one weight, even if it is below the limit value!

Levels



Invert

Adds an offset and a scale to all weights of the selected Weight Groups. with this tool you can raise or lower the overall “heat” of the weight group.

Note
No weight will ever be set to values above 1.0 or below 0.0 regardless of the settings.

Operator Parameters

Mirror Options

Subset
: Restrict the tool to a subset. See above (*The Subset Option*) for how subsets are defined.

Offset
: A value from the range [-1.0,1.0]) to be added to all weights in the Vertex Group.

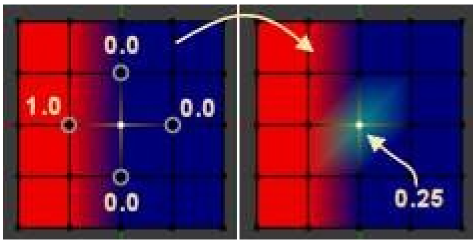
Gain
: All weights in the Subset are multiplied with the gain. The drag sliders of this value allow only a range of [-10.0, 10.0]. However, you can enter any factor you like here by typing from the keyboard.

Note

Whichever Gain and Offset you choose, in all cases the final value of each weight will be clamped to the range [0.0, 1.0]. So you will never get negative weights or overheated areas (weight > 1.0) with this tool.

Blend

Blends the weights of selected vertices with adjacent unselected vertices. This tool only works in vertex select mode.



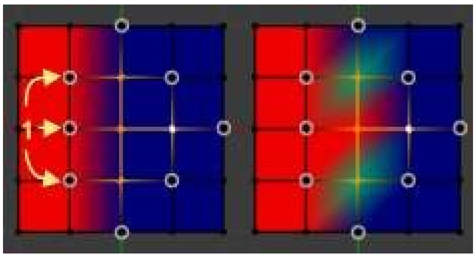
Blending

To understand what the tool really does, let's take a look at a simple example. The selected vertex is connected to 4 adjacent vertices (marked with a gray circle in the image). All adjacent vertices are unselected. Now the tool calculates the average weight of all connected **and** unselected verts. In the example this is:

```
(1 + 0 + 0 + 0) / 4 = 0.25
```

This value is multiplied by the factor given in the Operator parameters (see below).

- If the factor is 0.0 then actually nothing happens at all and the vertex just keeps its value.
- If the factor is 1.0 then the calculated average weight is taken (0.25 here).
- Dragging the factor from 0 to 1 gradually changes from the old value to the calculated average.



Blending

Now let’s see what happens when we select all but one of the neighbors of the selected vert as well. Again all connected and unselected verts are marked with a gray circle. When we call the Blend tool now and set the Factor to 1.0, then we see different results for each of the selected verts:

- The topmost and bottommost selected verts:

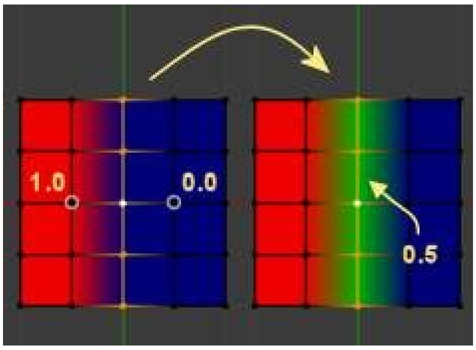
  are surrounded by 3 unselected verts, with an average weight of `(1 + 0 + 0) / 3 = 0.333` So their color has changed to light green.

- The middle vertex:

  is connected to one unselected vert with `weight = 1`. So the average weight is `1.0` in this case, thus the selected vert color has changed to red.

- The right vert:

  is surrounded by 3 unselected verts with average weight = `(0 + 0 + 0) / 3 = 0.0` So the average weight is 0, thus the selected vert color has not changed at all (it was already blue before blend was applied).



Blending

Finally let’s look at a practical example (and explain why this tool is named Blend). In this example I have selected the middle edge loop. And I want to use this edge loop for blending the left side to the right side of the area.

- All selected vertices have 2 unselected adjacent verts.
- The average weight of the unselected verts is (1 + 0) / 2 = 0.5
- Thus when the Blend Factor is set to 1.0 then the edge loop turns to green and finally does blend the cold side (right) to the hot side (left).

Operator Parameters

Blend Options

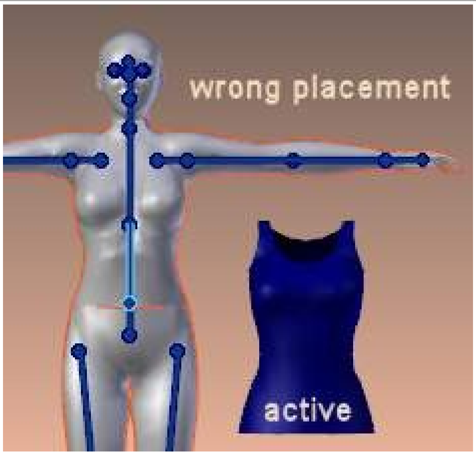
Factor

The effective amount of blending (range [0.0, 1.0]). When Factor is set to 0.0 then the Blend tool does not do anything. For Factor > 0 the weights of the affected vertices gradually shift from their original value towards the average weight of all connected **and** unselected verts (see examples above).

Transfer Weights

Copy weights from other objects to the vertex groups of the active Object. By default this tool copies all vertex groups contained in the selected objects to the target object. However you can change the tool's behavior in the operator redo panel (see below).

Prepare the Copy



Blending

Blending

You first select all source objects, and finally the target object (the target object must be the active object).

It is important that the source objects and the target object are at the same location. If they are placed side by side, then the weight transfer won't work. You can place the objects on different layers, but you have to ensure that all objects are visible when you call the tool.

Now ensure that the Target Object is in Weight Paint mode.

Call the Tool

Open the Tool Shelf and locate the Weight Tools panel. From there call the "Transfer weights" tool. The tool will initially copy all vertex groups from the source objects. However the tool also has an operator redo panel (which appears at the bottom of the tool shelf). From the redo panel you can change the parameters to meet your needs. (The available Operator parameters are documented below.)

Redo Panel Confusion

You may notice that the Operator Redo Panel (see below) stays available after the weight transfer is done. The panel only disappears when you call another Operator that has its own redo Panel. This can lead to confusion when you use Transfer weights repeatedly after you changed your vertex groups. If you then use the still-visible redo panel, then Bforartists will reset your work to its state right before you initially called the Transfer Weights tool.

Workaround

When you want to call the Transfer Weights tool again after you made some changes to your vertex groups, then always use the “Transfer Weights” Button, even if the operator panel is still available. Unless you really want to reset your changes to the initial call of the tool.

Operator Parameters

Note
This tool now uses the generic ‘data transfer’ one. Please refer to the *Data Transfer Modifier* for options details and explanations.

Limit Total

Reduce the number of weight groups per vertex to the specified Limit. The tool removes lowest weights first until the limit is reached.

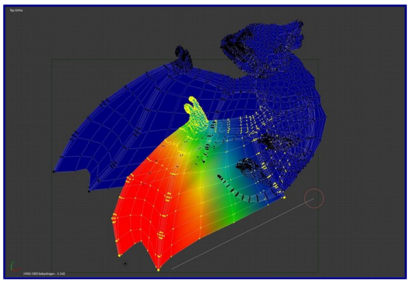
Hint: The tool can only work reasonably when more than one weight group is selected.

Operator Parameters

Subset
: Restrict the tool to a subset. See above (*The Subset Option*) for how subsets are defined.

Limit
: Maximum number of weights allowed on each vertex (default:4)

Weight Gradient



example of the gradient tool being used with selected vertices.

This is an interactive tool for applying a linear/radial weight gradient; this is useful at times when painting gradual changes in weight becomes difficult.

The gradient tool can be accessed from the Toolbar as a key shortcut:

- Linear: `Alt-LMB` and drag
- Radial: `Alt-Ctrl-LMB` and drag

The following weight paint options are used to control the gradient:

- Weight - The gradient starts at the current selected weight value, blending out to nothing.
- Strength - Lower values can be used so the gradient mixes in with the existing weights (just like with the brush).
- Curve - The brush falloff curve applies to the gradient too, so you can use this to adjust the blending.

Blends the weights of selected vertices with unselected vertices.

Hint

This tool only works in vertex select mode.

Operator Parameters

Type:

- Linear
- Radial

X Start: X End: Y Start: Y End:

Sculpting

Overview

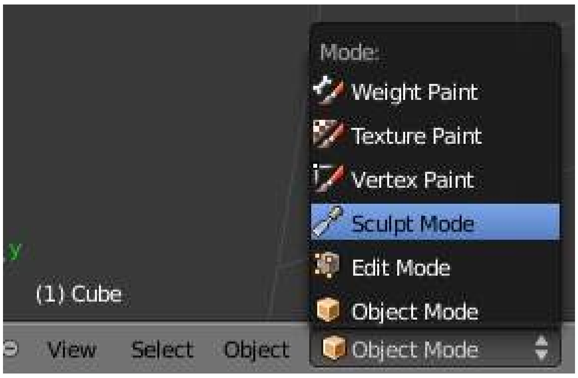
Sculpt Mode is similar to *Edit* Mode in that it is used to alter the shape of a model, but Sculpt Mode uses a very different workflow: instead of dealing with individual elements (vertices, edges, and faces), an area of the model is altered using a brush. In other words, instead of selecting a group of vertices, Sculpt Mode automatically selects vertices based on where the brush is, and modifies them accordingly.

Sculpt Mode

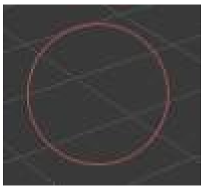
Sculpt mode is selected from the mode menu of the *3D View* header. Once sculpt mode is activated the *Toolbar* of the *3D View* will change to sculpt mode specific panels. The panels in the toolbar will be *Brush*, *Texture*, *Tool*, *Symmetry*, *Stroke*, *Curve*, *Appearance*, and *Options*. Also a red circle will appear that follows the location of the cursor in the 3d view.

Note

To have a predictable brush behavior, apply the scale of your mesh.



Sculpt Mode Dropdown.

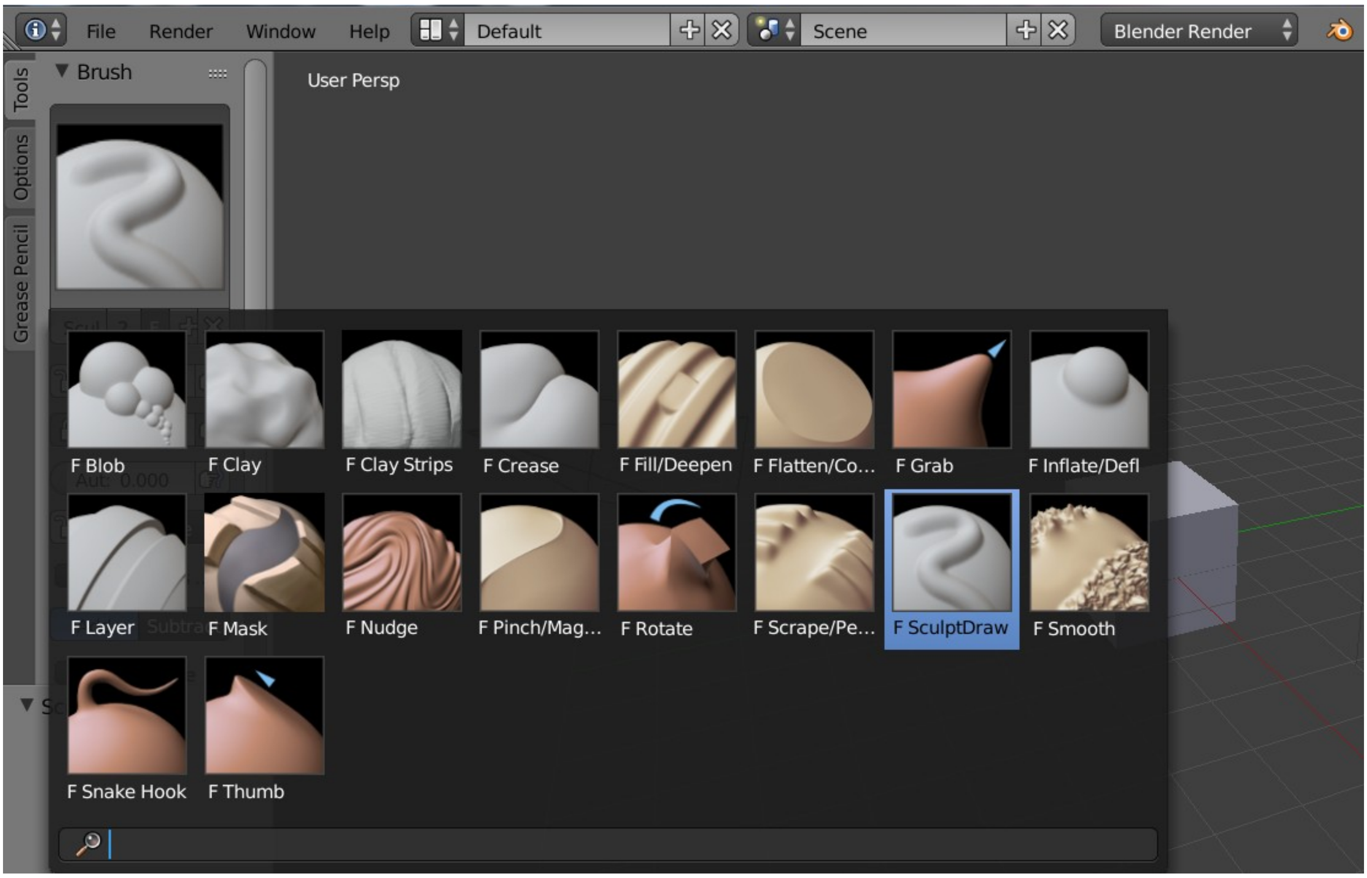


The cursor in Sculpt Mode.

Sculpt Brushes

Brushes are brush presets. They are a combination of a ‘tool’, along with stroke, texture, and options.

Sculpt Mode has sixteen brushes, each of which operates on the model in a unique way. Many can be toggled to have an additive or subtractive effect. They can be selected in the *Tool* menu.



Sculpt brushes

Blob
: Pushes mesh outward or inward into a spherical shape with settings to control the amount of pinching at the edge of the sphere.

Clay
: Similar to the *Draw* brush, but includes settings to adjust the plane on which the brush acts.

Clay Strips
: Similar to the *Clay* brush, but it uses a cube test to define the brush area of influence rather than a sphere.

Crease
: Creates sharp indents or ridges by pushing or pulling the mesh, while pinching the vertices together.

Draw
: Moves vertices inward or outward, based the average normal of the vertices contained within the drawn brush stroke.

Fill
: The *Fill* brush works like the Flatten brush, but only brings vertices below the brush plane upwards. The inverse of the Scrape brush is to *Deepen* by pushing vertices above the plane downward.

Flatten
: The *Flatten* brush finds an ‘area plane’ located by default at the average height above/below the vertices within the brush area. The vertices are then pulled towards this plane. The inverse of the Flatten brush is the *Contrast* brush which pushes vertices up or down away from the brush plane.

Grab
: *Grab* is used to drag a group of points around. Unlike the other brushes, *Grab* does not modify different points as the brush is dragged across the model. Instead, *Grab* selects a group of vertices on mousedown, and pulls them to follow the mouse. The effect is similar to moving a group of vertices in *Edit mode* with proportional-editing enabled, except that *Grab* can make use of other Sculpt Mode options (like textures and symmetry).

Inflate
: Similar to *Draw*, except that vertices in *Inflate* mode are displaced in the direction of their own normals.

Layer
: This brush is similar to *Draw*, except that the height of the displacement layer is capped. This creates the appearance of a solid layer being drawn. This brush does not draw on top of itself; a brush stroke intersects itself. Releasing the mouse button and starting a new stroke will reset the depth and paint on top of the previous stroke.

Nudge
: Moves vertices in the direction of the brush stroke.

Pinch
: *Pinch* pulls vertices towards the center of the brush. The inverse setting is *Magnify*, in which vertices are pushed away from the center of the brush.

Rotate
: Rotates vertices within the brush in the direction the cursor is moved.

Scrape
: The *Scrape* brush works like the Flatten brush, but only brings vertices above the plane downwards. The inverse of the Scrape brush is to *Peak* by pushing vertices above the plane up away from the plane.

Smooth
: As the name suggests, eliminates irregularities in the area of the mesh within the brush’s influence by smoothing the positions of the vertices.

Snake Hook
: Pulls vertices along with the movement of the brush to create long, snake-like forms.

Thumb
: Similar to the *Nudge* brush, this one flattens the mesh in the brush area, while moving it in the direction of the brush stroke.

Sculpt Properties Panel

This panel appears in the tool palette on the left side of the 3D viewport.

Brush Panel

Radius
: This option controls the radius of the brush, measured in pixels. `F` in the 3D view allows you to change the brush size interactively by dragging the mouse and then left clicking (the texture of the brush should be visible inside the circle). Typing a number then enter while in `F` sizing allows you to enter the size numerically. Brush size can be affected by enabling the pressure sensitivity icon, if a supported tablet is being used.

Strength
: *Strength* controls how much each application of the brush affects the model. For example, higher values cause the *Draw* brush to add depth to the model more quickly, and cause the *Smooth* brush to smooth the model more quickly. This setting is not available for *Grab*, *Snake Hook*, or *Rotate*.

If the range of strengths doesn’t seem to fit the model (for example, if even the lowest strength setting still makes too large of a change on the model) then you can scale the model (in *Edit* Mode, not *Object* Mode). Larger sizes will make the brush’s effect smaller, and vice versa. You can change the brush strength interactively by pressing `Shift-F` in the 3D view and then moving the brush and then left clicking. You can enter the size numerically also while in `Shift-F` sizing. Brush strength can be affected by enabling the pressure sensitivity icon, if a supported tablet is being used.

Autosmooth
: Sets the amount of smoothing to be applied to each stroke.

Normal Weight
: TODO.

Pinch Factor
: TODO.

Rake Factor
: TODO.

Sculpt Plane
: Use this menu to set the plane in which the sculpting takes place.

Plane Offset
: Adjusts the plane on which the brush acts toward or away from the viewer.

Height
: TODO.

Trim
: Enables trimming of the sculpt plane, determined by the *Distance* setting.

Front Faces Only
: When enabled, the brush only affects vertices that are facing the viewer.

Accumulate
: Causes stroke dabs to accumulate on top of each other.

Add/Subtract
: TODO.

Persistent
: TODO.

Stroke Panel

Stroke Method

Defines the way brush strokes are applied to the mesh:

Dots
Standard brush stroke.

Drag Dot
Creates a single displacement in the brush shape. Click then drag on mesh to desired location, then release.

Space
Creates brush stroke as a series of dots, whose spacing is determined by the *Spacing* setting. *Spacing* represents the percentage of the brush diameter.

Anchored
Creates a single displacement at the brush location. Clicking and dragging will resize the brush diameter. When *Edge to Edge* the brush location and orientation is determined by a two point circle, where the first click is one point, and dragging places the second point, opposite from the first.

Airbrush
Flow of the brush continues as long as the mouse click is held, determined by the *Rate* setting. If disabled, the brush only modifies the model when the brush changes its location. This option is not available for the *Grab* brush.

The following parameters are available for the *Dots*, *Space*, and *Airbrush* strokes:

Jitter
Jitters the position of the brush while painting.

Smooth stroke

Brush lags behind mouse and follows a smoother path. When enabled, the following become active:

Radius
Sets the minimum distance from the last point before stroke continues.

Factor
Sets the amount of smoothing

Curve Panel

The *Curve* section allows you to use a curve control to the right to modify the intensity of the brush from its centre (left part of the curve) towards its borders (right part of the curve).

See also

- Read more about using the Curve Widget.

Texture Panel

A texture can be used to determine the strength of brush effects as well. Select an existing texture from the texture box, or create a new one by selecting the *New* button

Brush Mapping

Sets the way the texture is mapped to the brush stroke:

Fixed
If *Fixed* is enabled, the texture follows the mouse, so it appears that the texture is being dragged

across the model.

Tiled

The *Tile* option tiles the texture across the screen, so moving the brush appears to move separately from the texture. The *Tile* option is most useful with tileable images, rather than procedural textures.

3D

The *3D* option allows the brush to take full advantage of procedural textures. This mode uses vertex coordinates rather than the brush location to determine what area of the texture to use.

Angle

This is the rotation angle of the texture brush. It can be changed interactively via `Ctrl-F` in the 3D view. While in the interactive rotation you can enter a value numerically as well. Can be set to:

User

Directly input the angle value.

Rake

Angle follows the direction of the brush stroke. Not available with *3D* textures.

Random

Angle is randomized.

Offset

Fine tunes the texture map placement in the x, y, and z axes.

Size

This setting allows you to modify the scaling factor of the texture. Not available for *Drag* textures.

Sample Bias

Value added to texture samples.

Symmetry Panel

Mirror

Mirror the brush strokes across the selected local axes. Note that if you want to alter the directions the axes point in, you must rotate the model in *Edit* Mode, not *Object* Mode

Radial

These settings allow for radial symmetry in the desired axes. The number determines how many times the stroke will be repeated within 360 degrees around the central axes.

Feather

Reduces the strength of the stroke where it overlaps the planes of symmetry.

Lock

These three buttons allow you to block any modification/deformation of your model along selected local axes, while you are sculpting it.

Tiling

Using this option allows you to seamlessly tile your strokes along the given axes.

Tile Offset

The default tile size is set to one BU (Bforartists Unit). The offset allows the option to alter the tile size along all three axes.

Overlay Panel

When enabled, the brush texture is shown in the viewport

View

The eye icon is used as a toggle to show or hide the given brush texture

Alpha

You can change the amount of transparency used when showing the texture using the Alpha slider

Stroke Overlay

The brush icon allows you to turn off the viewport overlay during strokes

Options Panel

Gravity

Factor

Setting the factor allows you to add gravity to your brush strokes, giving it a draping effect.

Orientation

Using another object, the gravity can be oriented to the set object's local Z axis, changing the direction of the gravity.

Threaded Sculpt

Takes advantage of multiple CPU processors to improve sculpting performance.

Fast Navigation

For *Multires* models, show low resolution while navigation the viewport.

Use Deform Only

Limits active modifiers on the active object to Deform modifiers, and Multiresolution

Show Diffuse Color

Allows the active object to show it's diffuse color when sculpting

Unified Settings:

Size

Forces the brush size to be shared across brushes.

Strength

Forces the brush strength to be shared across brushes.

Color

Not Used in Sculpt Mode

Show Brush

Shows the brush shape in the viewport.

Color (Add/Subtract)

Set the color of the brush ring when its particular effect is active

Appearance Panel

Show Brush

Shows the brush shape in the viewport.

Color (Add/Subtract)

Set the color of the brush ring when its particular effect is active

Custom Icon

Append an image file to the active brush as an icon.

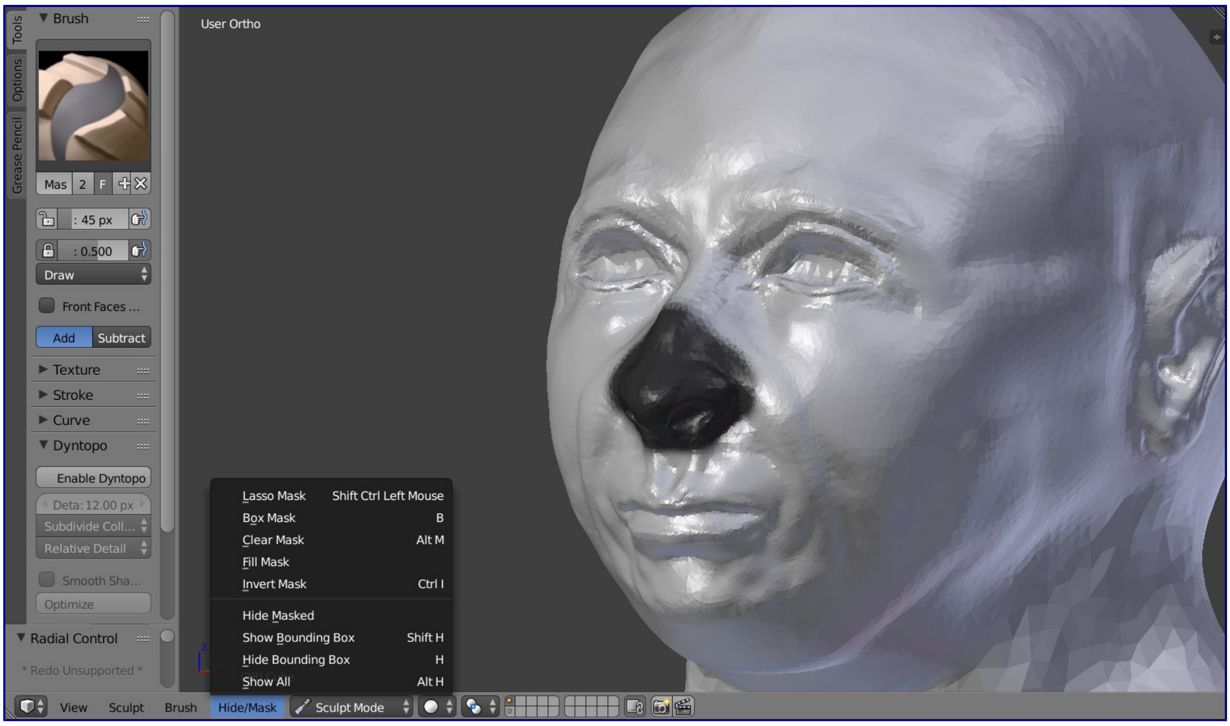
Sculpt Menus

Tool Menu

Here you can select the type of brush preset to use. *Reset Brush* will return the settings of a brush to its defaults. You can also set Bforartists to use the current brush for *Vertex Paint* mode, *Weight Paint* mode, and *Texture Paint* mode using the toggle buttons.

Hiding and Masking Mesh

It is sometimes useful to isolate parts of a mesh to sculpt on. To hide a part of a mesh, press `H` then click & drag around the part you want to hide. To reveal a hidden part of a mesh, press `Shift-H` then click & drag around the part you want to reveal. To reveal all hidden parts, just press `Alt-H`. With the mask brush we can paint a part of the mesh and hide it.



Black part is masked, down in the picture mask/hide menu

Adaptive Sculpting

Dynamic Topology

Dynamic topology (AKA dyntopo) is a dynamic tessellation sculpting method, adds and removes details on the fly. Dyntopo is quick, just get a brush and start to sculpt. Dyntopo will add details base upon your brush size, detail type and strength.

Detail Type

Dyntopo uses three different detail methods to create dynamic detail to an object. The methods available are Relative Detail (Default), Constant Detail, and Brush Detail.

Relative Detail
: This method uses a detail size based on the number of pixels, and in turn will create topology in that size. Zoom out big details, zoom in small fines details.

Constant Detail
: To keep detail uniform across the entire object, Constant Detail can be used. The Detail is based on the percentage of a single BU (Bforartists Unit).

Brush Detail
: Giving more control over the topology, with this method you can create topology based on the brush size. You can increase and lower topology by simply resizing the brush itself. The detail size is based the size of the brush itself, where 100% will create topology the size of the brush ring itself.

Detail Size

Each Detail Type's detail is set here. Depending on the Detail Type being used this property will rather show as a pixel count (px), or percentage.

Detail Refine Method

When using Dynamic Topology, a certain method will be used to tell how topology is handled. Setting the option will determine which of the methods will be used when altering the topology.

Subdivide

Just like the subdivide command, this method will only subdivide topology to match the detail given.

Collapse

When topology is too dense, and is smaller than the detail given, edges will be collapse to fit the detail size appropriately.

Subdivide Collapse

This method combines the two methods, subdividing edges smaller than the detail size, and collapsing topology.

Detail Flood Fill

When using Constant Detail mode, this option is made available, allowing you to fill the entire object with a uniform detail, based on the detail size.

Direction

Determines which direction the model will be symmetrized.

Dyntopo Symmetrize

Uses direction orientation to symmetrize. Since Dyntopo adds details dynamical may happen that the model goes asymmetric, so this a good tool for that.

Multi-Resolution Modifier

The multires modifier is needed to sculpt. The modifier will subdivide the mesh. The more subdivision the more computing will be needed. With the Bforartists stack no-destructive data, multires sculpting will help when you have a clean topology base mesh.

When sculpting with multires we have the ability sculpt in different level of subdivision, this mean we can sculpt some details in subdivision level 1 and add more details in subdivision 2 and go back to subdivision 1 correct some mistakes. While this workflow is often used, multires modifier has some limitations. You may end up with some mesh distortions. As an advice, add as more details as possible before adding more subdivisions. Clay brush, SculptDraw work better with multires sculpting to sculpt secondary forms.

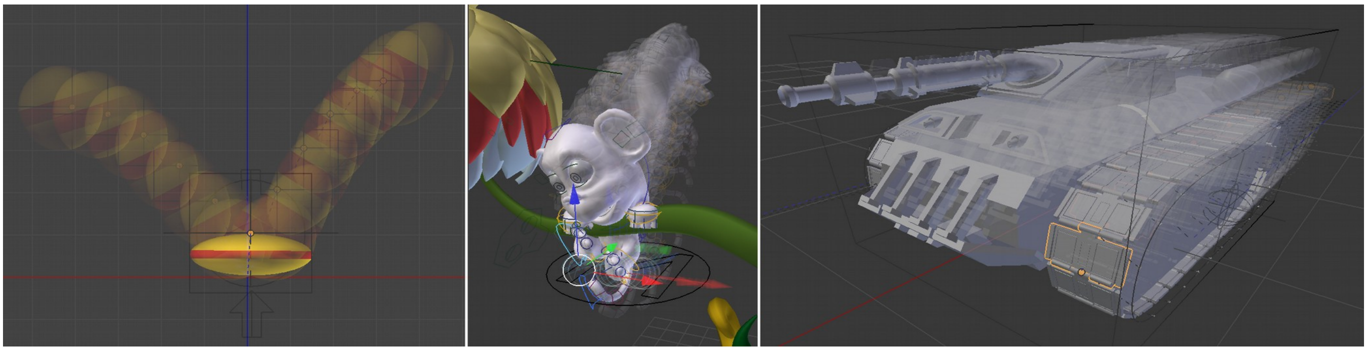
See also

Read more about the *Multi Resolution Modifier.*

7.1 Rigging - Constraints

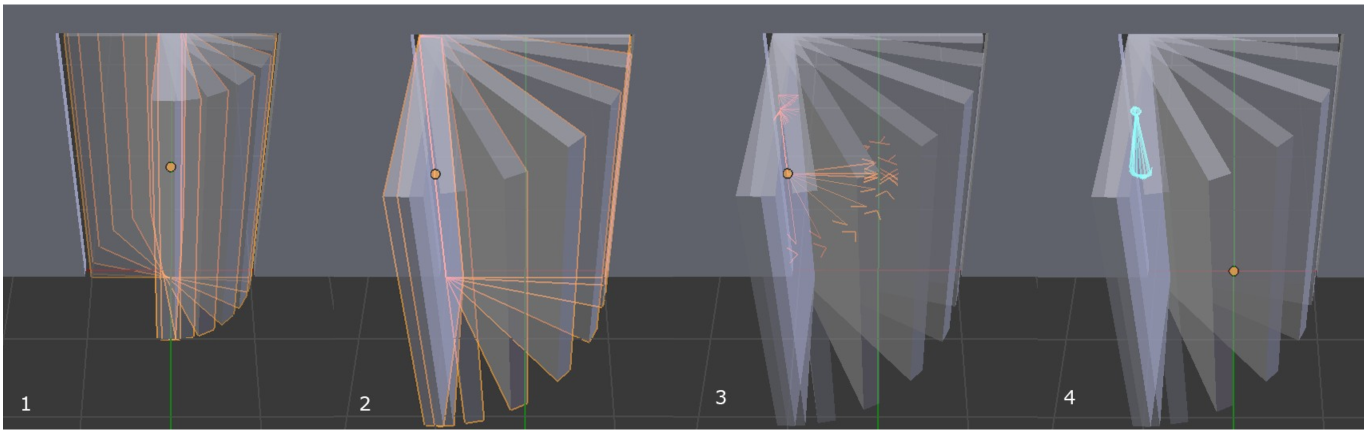
Rigging

Rigging makes animation possible. Without a good rig animation is incredibly frustrating. Imagine animating a bouncing ball without the ability to squash it against the ground? Try animating a monkey swinging through the trees with no control to make the monkey’s hands grab onto the branches. What if you had to animate an army tank speeding through the desert by positioning each tread on the tank one at a time?



At its most basic level, rigging solves motion problems. Imagine a door that opens into a hallway. Without a rig, the door won’t swing open properly (1). A rig is needed to help the door swing open on its hinges (2,3,4), and there are many ways to rig the door. Door 2 gets rigged by repositioning the Object Center of the door. Door 3 gets rigged by Parenting the door to an Empty. Door 4 gets rigged by Weight Painting all of its Vertices to a

Bone in an Armature.



Most production rigs are more complicated than a simple door, but be careful not to rush off building complicated rigs until you have developed some experience. Rigging is a discipline that takes practice. Start by building simple rigs (like a bouncing ball, a tumbling box, an odometer, a clock). Stay humble. Stay patient. Study the fundamental concepts that make a bouncing ball bounce. Add one rigging tool to your toolbox at a time. Test your simple rigs in actual animation projects. And only after much trial and error, consider putting everything together into the sophisticated character rig of your dreams.

See also

The content of this chapter is simply a reference to how rigging is accomplished in Bforartists. It should be paired with additional resources such as Nathan Vegdahl's excellent (and free!) introduction to the fundamental concepts of character rigging, Humane Rigging.

Constraints

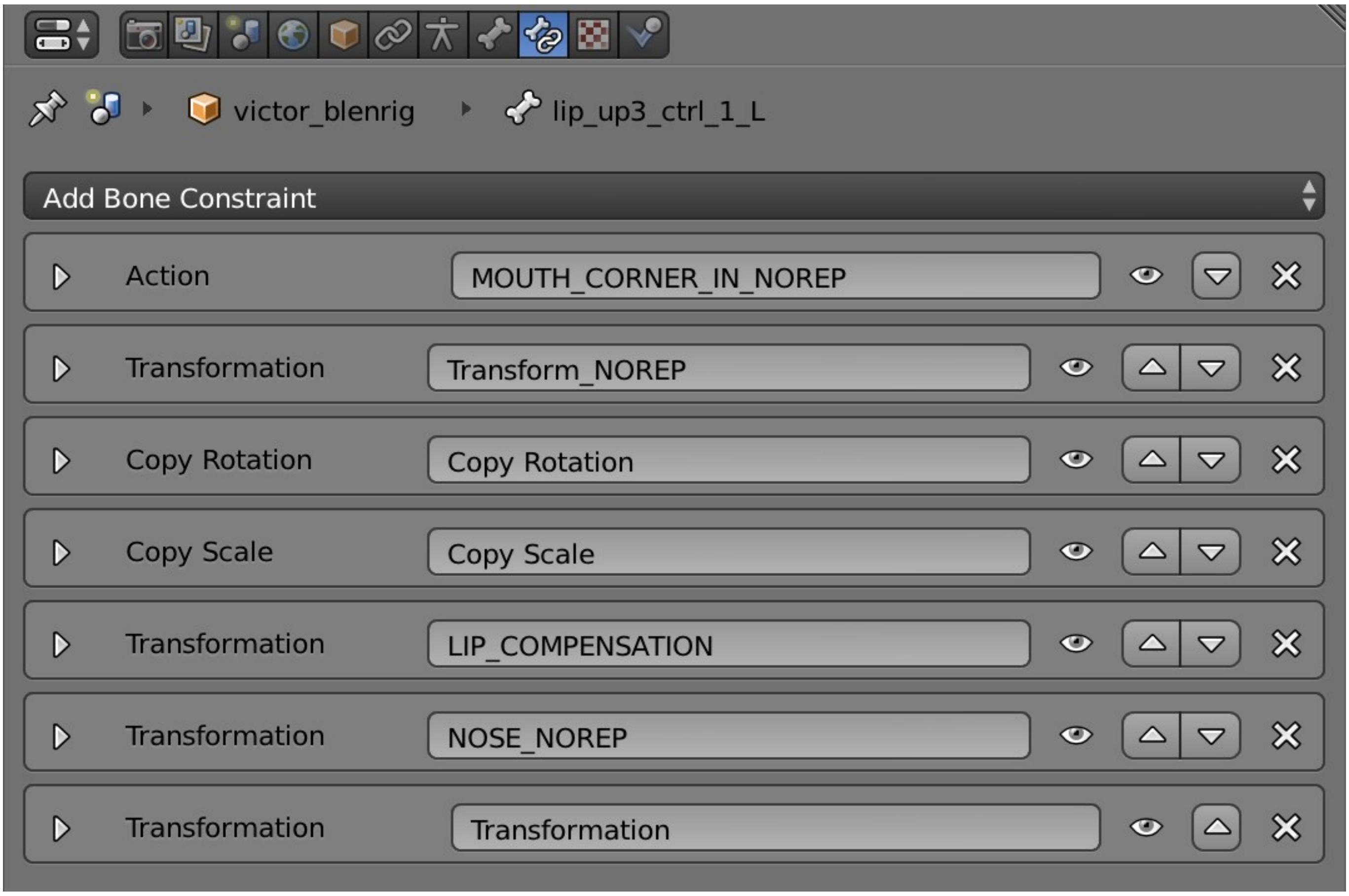
Constraints control the behavior of one object with data from another. Constraints can make the eyes of a tennis player track a tennis ball bouncing across the court. Constraints allow the wheels on a bus to all rotate together. Constraints help a dinosaur's legs bend at the knee automatically. Constraints make it easy for a hand to grip the hilt of a sword and the sword to swing with the hand.

Constraints, in Bforartists, work with Objects and Bones.

Object Constraints.

Bone Constraints.

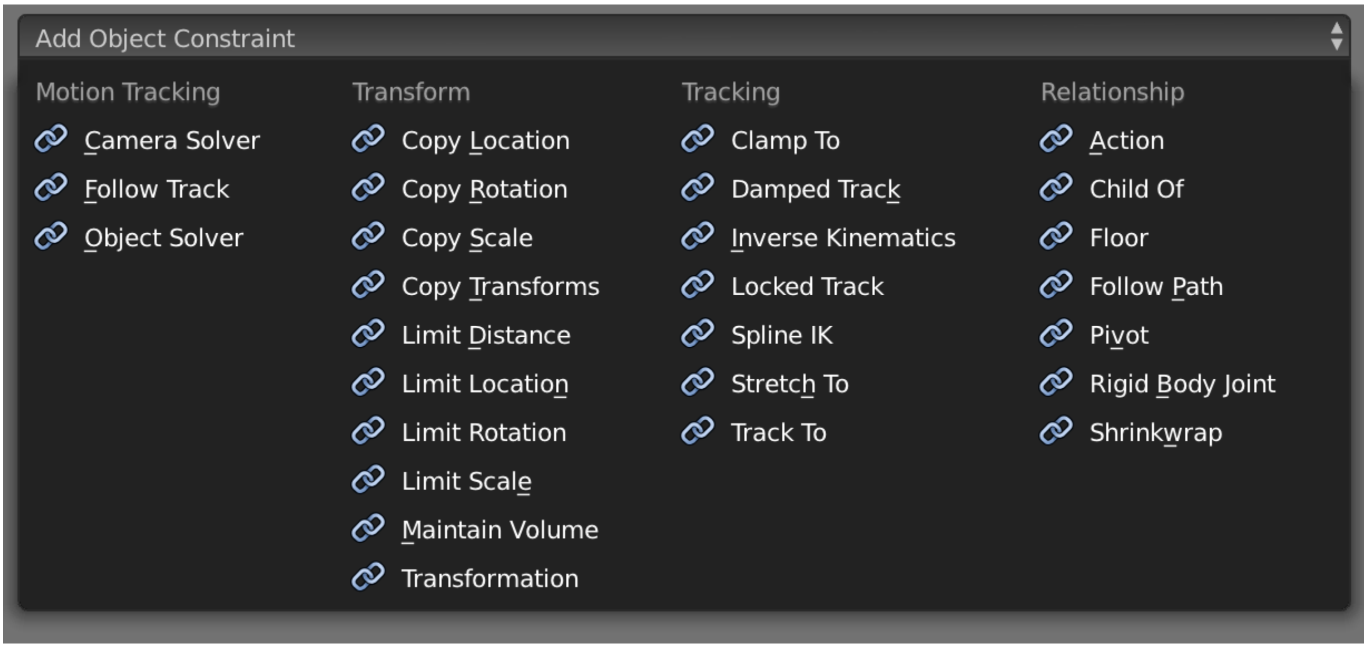
Constraints work in combination with each other to form a Constraint Stack.



The Constraint Stack is evaluated from top to bottom.

Constraints are a fantastic way to add sophistication and complexity to a rig. But be careful not to rush in too quickly, piling up constraint upon constraint until you lose all sense of how they interact with each other.

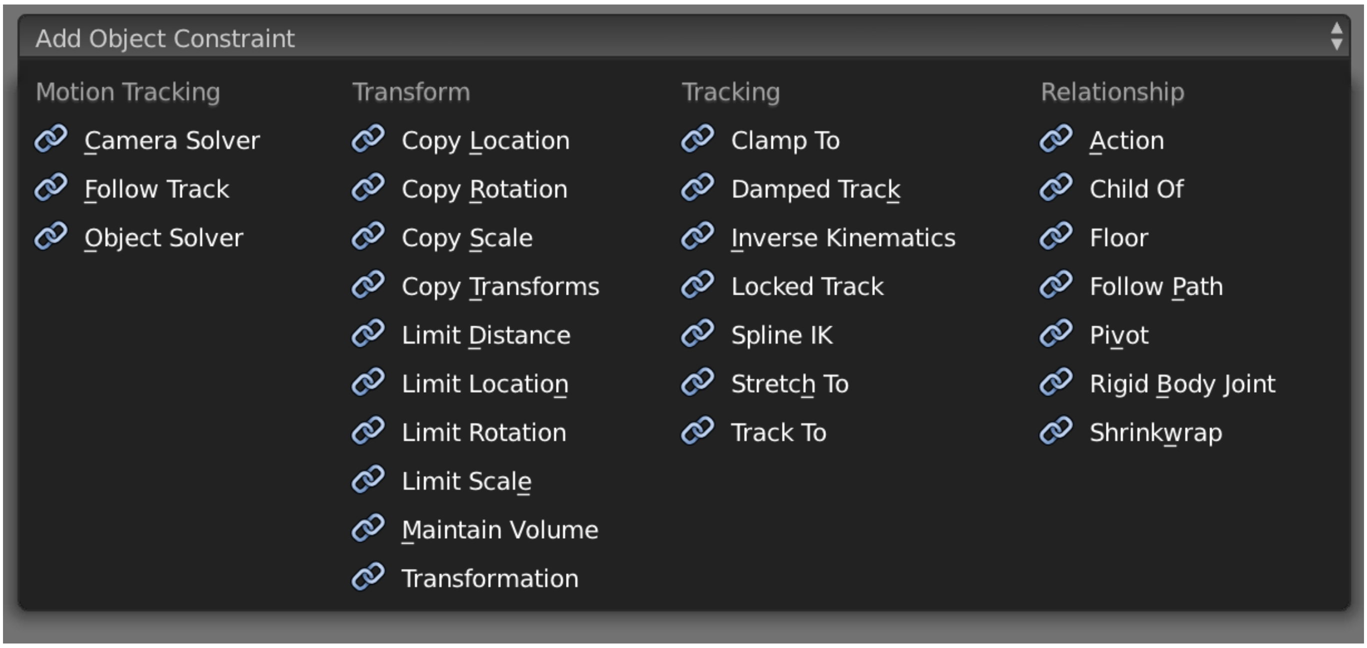
Start simply. Get to know a single constraint inside and out. Copy Location is a good first constraint to explore. Take the time to understand every fundamental concept behind it, and the other constraints will make far more sense.



Adding/Removing a Constraint

To add a constraint in the *Constraints Panel*:

Click on the “Add Constraint” drop-down box.



To add a constraint in the 3D view:

Select the object you would like to constrain. Go to and choose a constraint from the pop-up menu. If the chosen constraint needs a target, Bforartists will add an empty automatically as the target and position it at the center of the constrained object.

To add a constraint in the 3D view and simultaneously give it a target:

Select the target first and then shift-select the object you would like to constrain. Go to and choose a constraint from the menu.

To remove a constraint:

Click on the “X” button in the *header.*

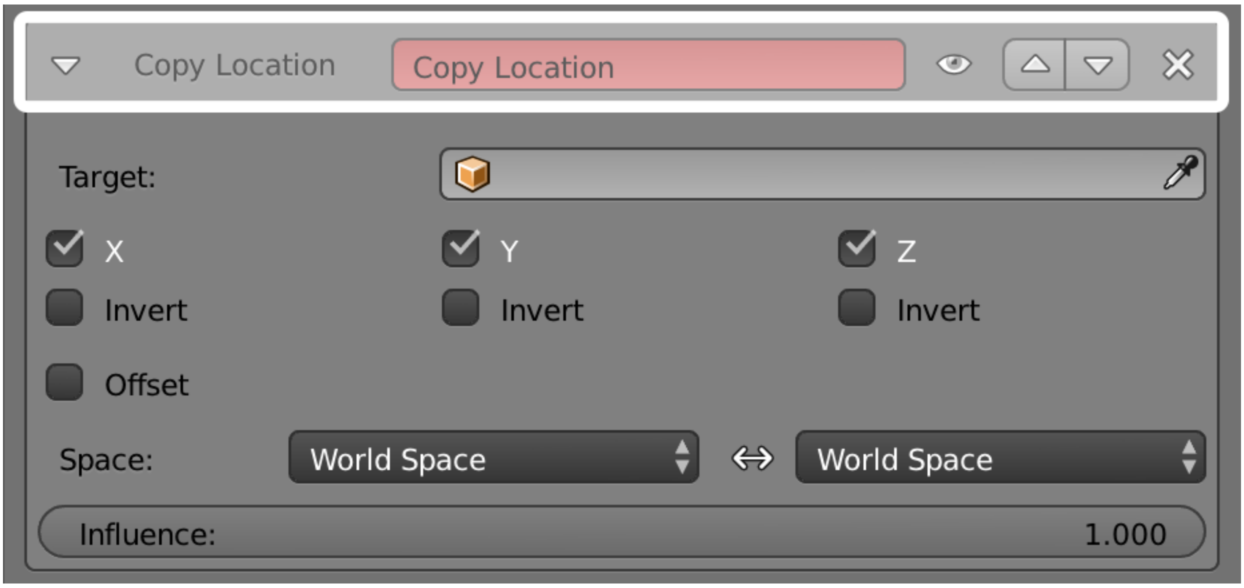
To remove all constraints from all selected object(s):

Click Object ‣ Constraints ‣ Clear Object Constraints in the 3D View Header.

or Pose ‣ Constraints ‣ Clear Pose Constraints (for bone constraints).

Header

Every constraint has a header. The interface elements of the header are explained below using a Copy Location constraint as an example.



A Header sits at the top of every constraint.

Expansion Arrow (pointing down or right)

Show or Hide the settings of the constraint. Tidy up the *constraint stack* by hiding constraints that don't currently need attention. Constraints will continue to affect the scene even when hidden.

"Copy Location" (first occurrence)

The type of constraint. This is determined at the time the constraint is created.

"Copy Location" (second occurrence)

Give the constraint a meaningful name in this field, something that describes its intent. Meaningful names help you and your team members understand what each constraint is supposed to do.

The **red** background is a warning that the constraint is not yet functional. The background will turn **gray** when the constraint is functioning. When this Copy Location constraint has a valid target in the "Target Field" it will turn gray and begin to function.

Eyeball (open or closed)

Enable or Disable (Mute/Unmute) the constraint. Disabling a constraint will stop its affect on the scene.

Disabling a constraint is useful for turning off a constraint without losing all of its settings. Disabling means you can enable the constraint at a later time with the settings intact. Disabling is similar to setting the *influence* slider to 0.0.

Up/Down Arrows

Move a constraint up or down in the *constraint stack*. Since the stack is evaluated from top to bottom, moving a constraint in the stack can significantly affect the final outcome of the stack.

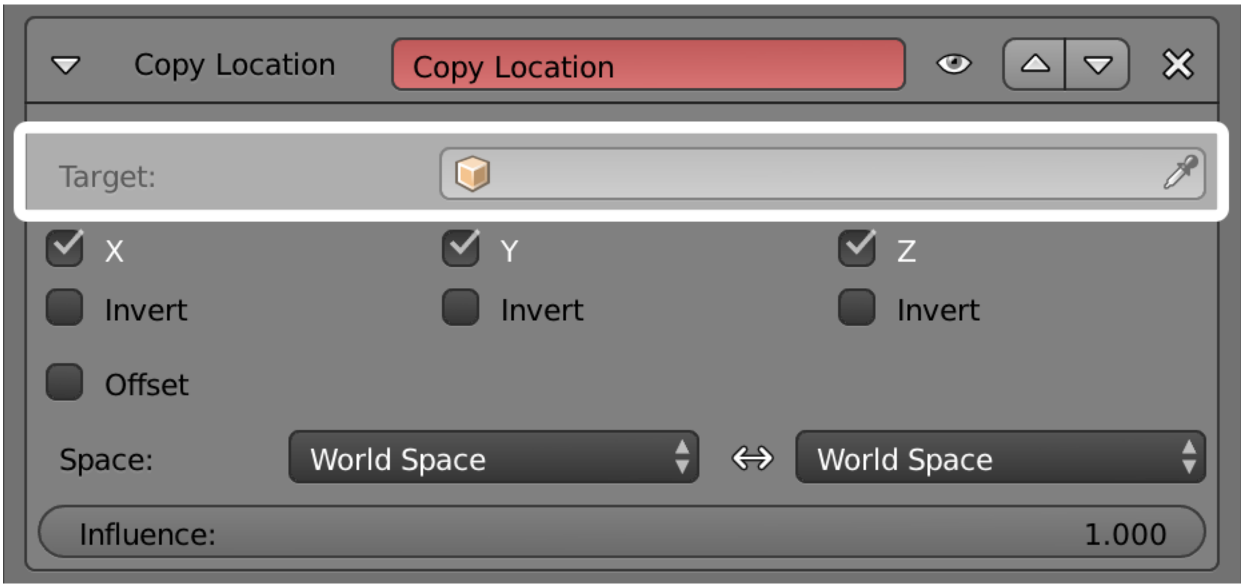
If there is only one constraint in the stack, the arrows will not be drawn. If the constraint is at the top of the stack, only the down arrow will be drawn. If the constraint is at the bottom of the stack, only the up arrow will be drawn.

Delete

Delete the constraint from the stack. The settings will be lost. The constraint will no longer affect the final outcome of the stack.

Target

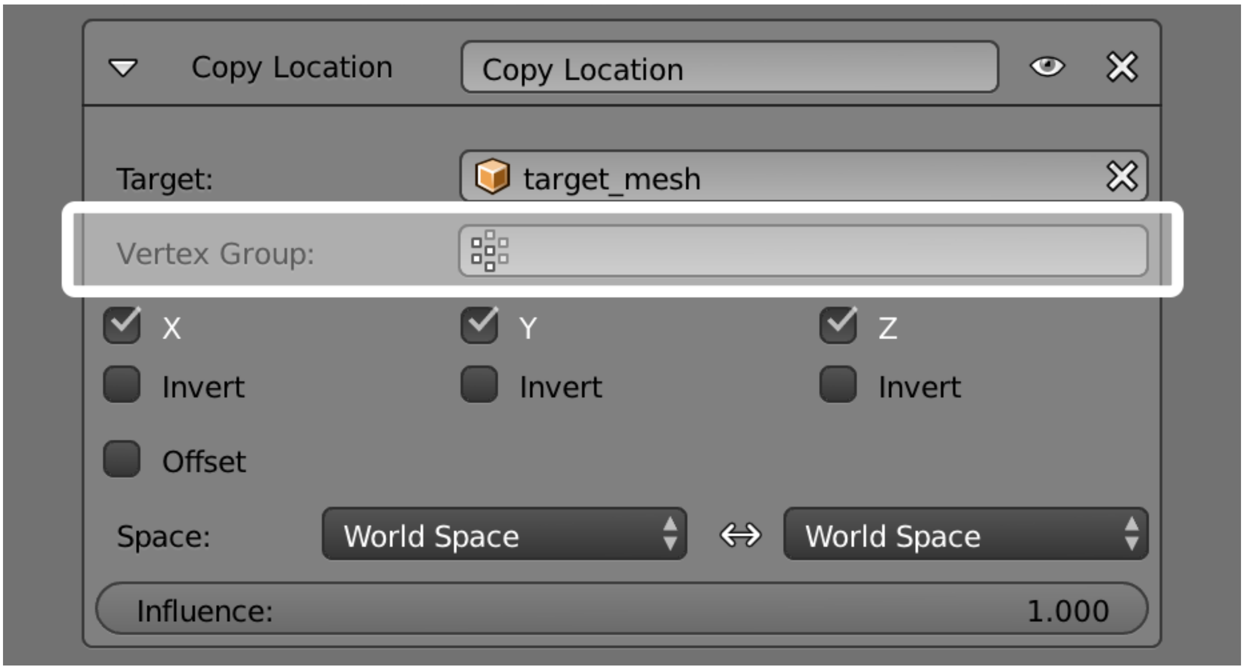
The Target field lets you link the constraint to a Target object of your choosing. This link provides data to the constraint so that it can begin to function. For example, the Copy Location Constraint needs location data to function. Fill in the Target field, and the Copy Location constraint will begin to use location data from the Target object.



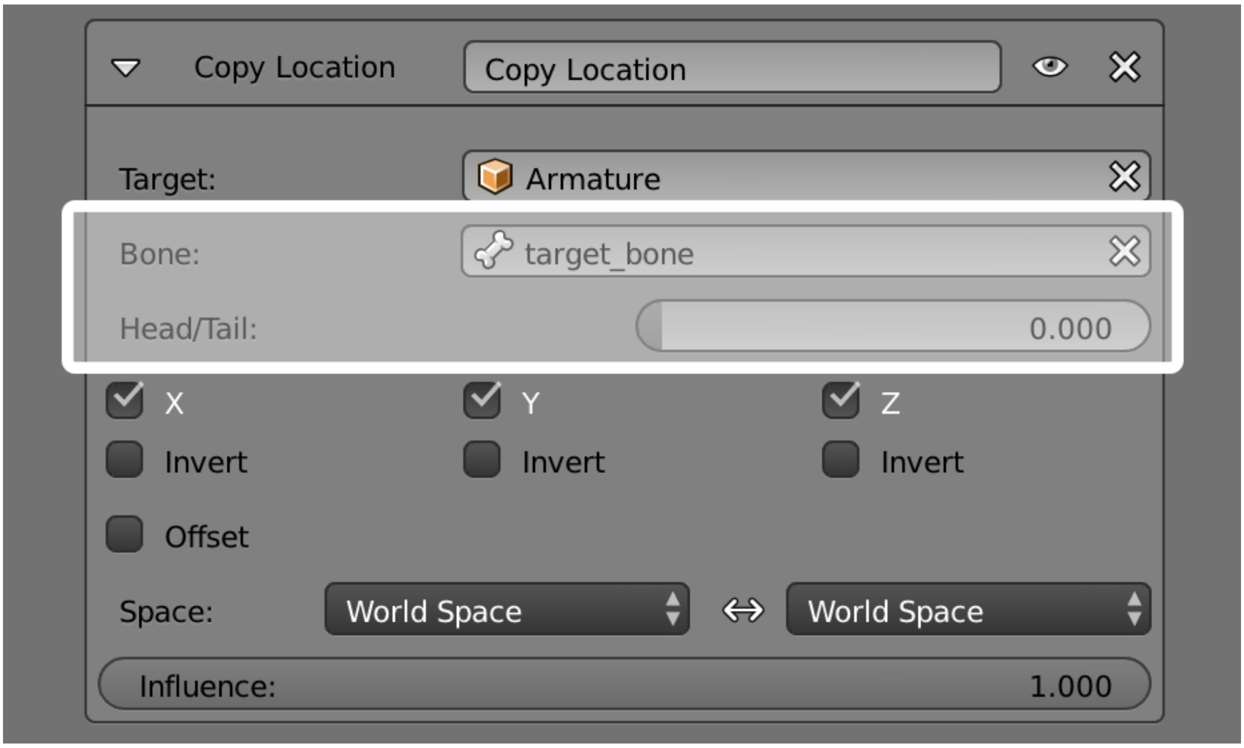
The Target field must be filled in for the constraint to function.

By default, the Target will use the Object Center as the target point.

If the Target field links to a Mesh or Lattice object, a Vertex Group field will appear. Enter the name of a vertex group and the constraint will target the median point of this vertex group instead of the object center.



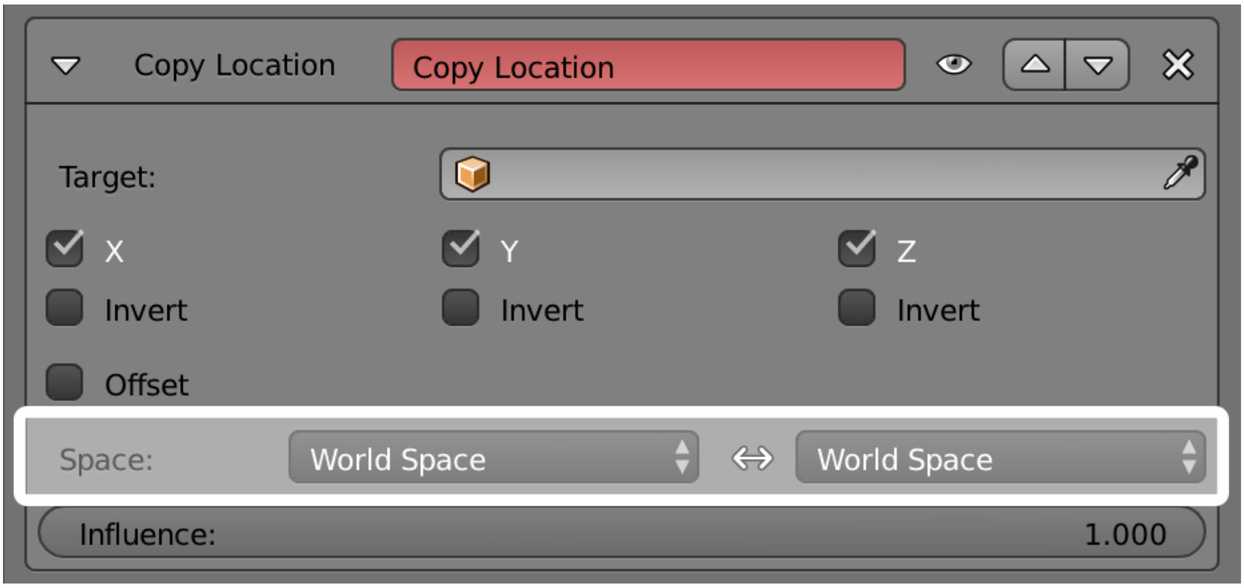
If the Target field links to an Armature, a Bone field will appear along with a Head/Tail slider. Enter the name of a bone and the constraint will target the bone instead of the entire armature object center. Slide the slider and the constraint will target the head, the tail or somewhere inbetween.



Space

Constraints need a frame of reference in order to function. This frame of reference is called the “space” of the constraint. Choosing one space vs. another will change this frame of reference and substantially alter the behavior of a constraint.

To understand how changing the space will change the behavior of the constraint, consider experimenting with two empties. Make sure they display as arrows so that you can see the local axes for each empty. Make sure to size one empty a little larger than the other so that they are both always visible even if directly on top of each other. Then add a constraint to one empty that targets the other and experiment thoroughly by moving, rotating and scaling the target in many different ways.



This constraint is set to use World Space as the frame of reference for both its Target Space and its Owner Space.

Target Space & Owner Space

The space used to evaluate the target of the constraint is called the Target Space. The space used to evaluate the constrained object (the object that owns the constraint) is called the owner space. Hover over the space drop-down box (or boxes) to learn whether it affects the space of the target or the space of the owner.

Some constraints don't use Target or Owner space, so there won't be a drop-down box. Some constraints use only Target or only Owner space, so there will only be one drop-down box. Some constraints (like the Copy Location constraint above) use both Target AND Owner space, so there will be two drop-down boxes.

When a constraint uses both Target and Owner space, the Target and Owner can be any combination of space types.

Space Types

World Space
: In this space type the world is the frame of reference for the object (or bone). Location is relative to the world origin. Rotation and Scale are oriented to the world axes. Transformations to the object, the object's parent and any other constraints higher up in the constraint stack are all taken into account.

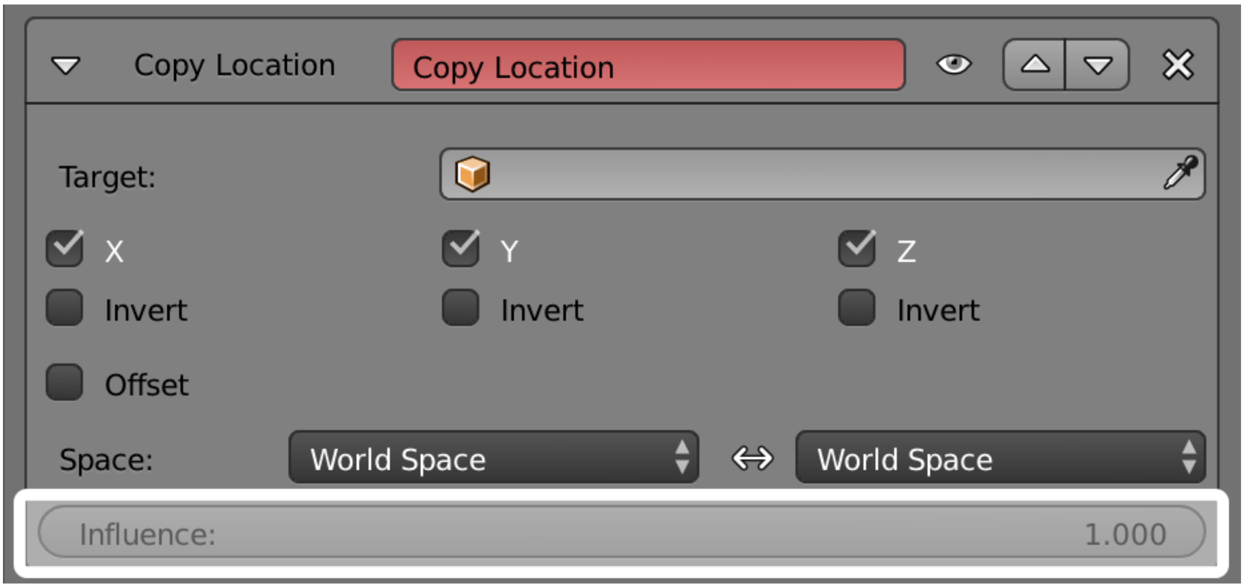
Local Space
: In this space type the parent of the object (or bone) is the frame of reference. Location is relative to the parent object origin. Rotation and Scale are oriented to the parent object axes. Only transformations to the object istelf are taken into account. Transformations to the object's parent and any other constraints higher up in the constraint stack are NOT taken into account.

Local With Parent (bones only)
: The bone properties are evaluated in its own local space, *including* the transformations due to a possible parent relationship (i.e. due to the chain's transformations above the bone).

Pose Space (bones only)
: The bone properties are evaluated in the armature object local space (i.e. independently from the armature transformations in *Object* mode). Hence, if the armature object has null transformations, *Pose Space* will have the same effect as *World Space*.

Influence

The influence slider determines how much the constraint will affect the constrained object.



An influence of **0.0** will have no effect. An influence of **1.0** will have the full effect.

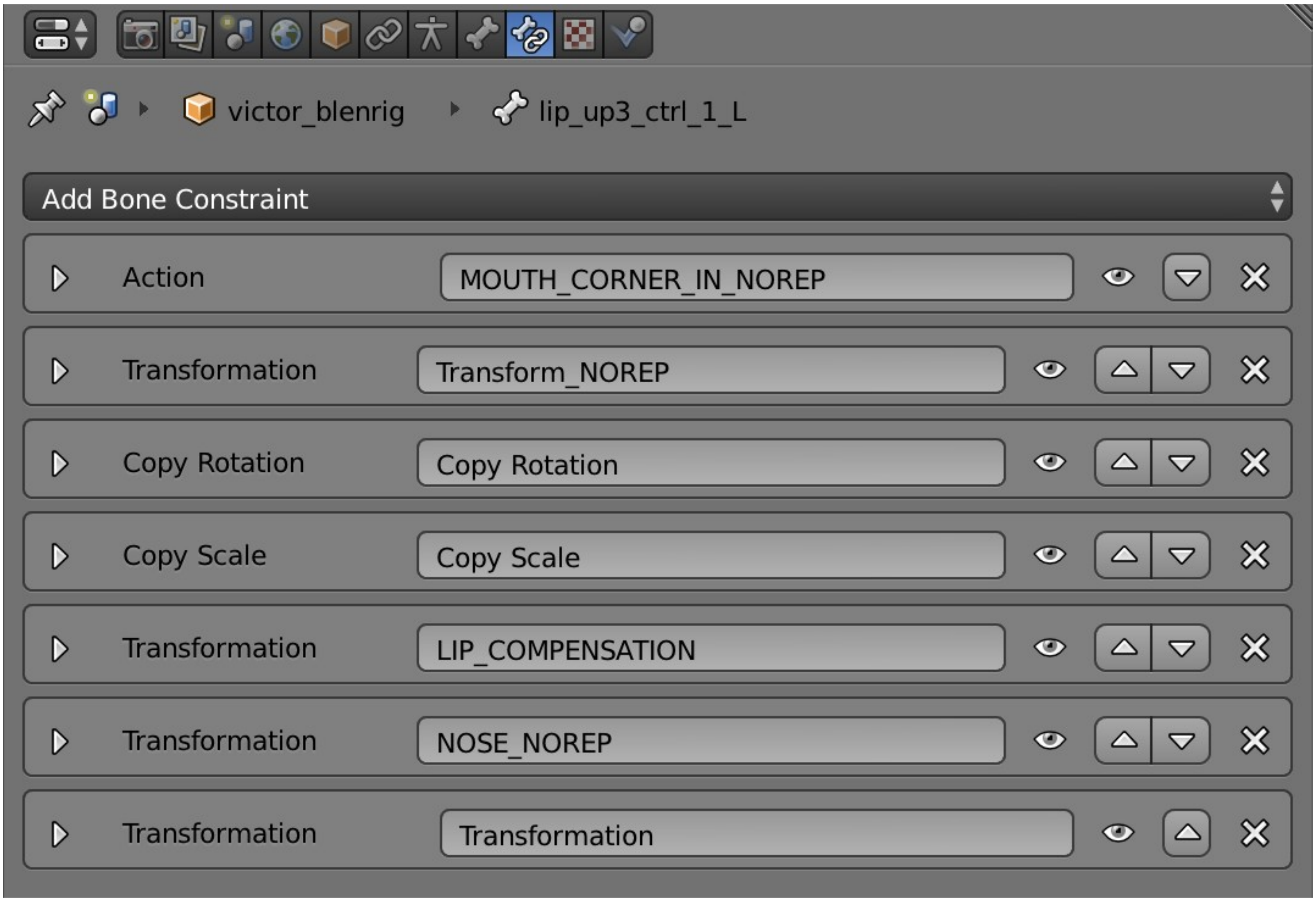
Values between 0.0 and 1.0, will have a partial effect, but be careful. These partial effects can be difficult to control, especially as the *constraint stack* grows in complexity.

The influence value is animatable, allowing constraints to be turned off, or or partially on as needed. (see

The Constraints Stack

The combination of all the constraints that affect an object are called the Constraints Stack. The Stack is in the Constraints panel, below the “Add Constraint” drop-down box.

Constraints in the stack are evaluated from top to bottom. The order of each constraint has a substantial impace on the final outcome of the stack. Changing the order of the constraints can change the behavior of the entire stack.



The 7 constraints in this example stack are evaluated from top to bottom starting with the “Action” constraint and ending with the final “Transformation” constraint.

To change the order of a constraint use the up/down arrows in the *header.*

Camera Solver

TODO - see: https://developer.Bforartists.org/T46926

Object Solver

TODO - see: https://developer.Bforartists.org/T46926

Follow Track

TODO - see: https://developer.Bforartists.org/T46926

Copy Location Constraint

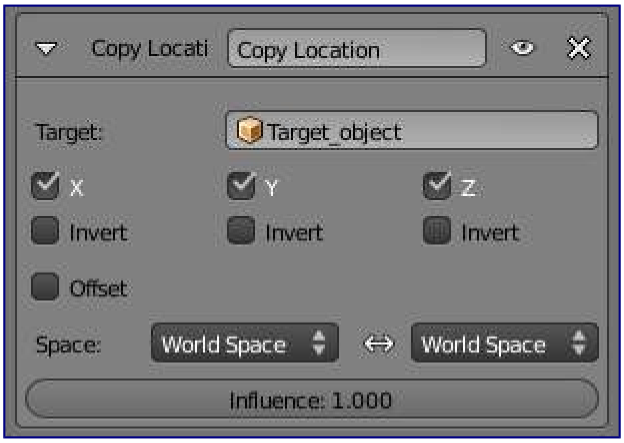
Description

The *Copy Location* constraint forces its owner to have the same location as its target.

Warning

Note that if you use such a constraint on a *connected* bone, it will have no effect, as it is the parent's tip which controls the position of your owner bone's root.

Options



Copy Location panel

Target

This constraint uses one target, and is not functional (red state) when it has none.

Bone

If *Target* is an *Armature*, a new field is displayed offering the optional choice to set an individual bone as *Target*.

Head/Tail

If a *Bone* is set as *Target*, a new field is displayed offering the optional choice of where along this bone the target point lies.

Vertex Group

If *Target* is a *Mesh*, a new field is displayed offering the optional choice to set a *Vertex Group* as target.

X, Y, Z

These buttons control which axes (i.e. coordinates) are constrained - by default, all three ones are.

Invert

The *Invert* buttons invert their respective preceding coordinates.

Offset

When enabled, this control allows the owner to be translated (using its current transform properties), relative to its target’s position.

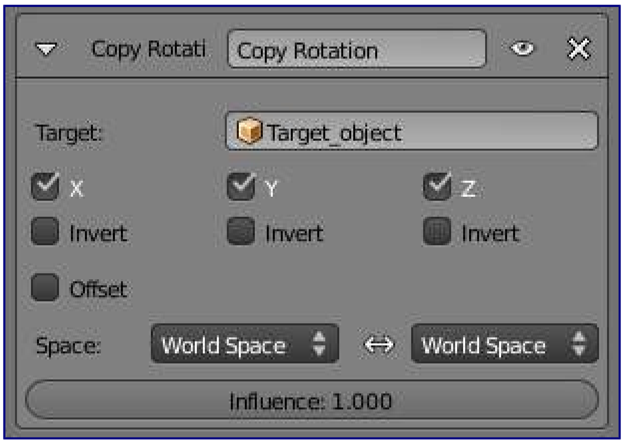
Space

This constraint allows you to choose in which space to evaluate its owner’s and target’s transform properties.

Copy Rotation Constraint

The *Copy Rotation* constraint forces its owner to match the rotation of its target.

Options



Copy Rotation panel

Target

This constraint uses one target, and is not functional (red state) when it has none.

Bone

If *Target* is an *Armature*, a new field is displayed offering the optional choice to set an individual bone as *Target*.

Head/Tail

If a *Bone* is set as *Target*, a new field is displayed offering the optional choice of where along this bone the target point lies.

Vertex Group

If *Target* is a *Mesh*, a new field is displayed offering the optional choice to set a *Vertex Group* as target.

X, Y, Z

These buttons control which axes are constrained - by default, all three are on.

Invert

The *Invert* buttons invert their respective rotation values.

Offset

When enabled, this control allows the owner to be rotated (using its current transform properties), relative to its target’s orientation.

Space

This constraint allows you to choose in which space to evaluate its owner’s and target’s transform properties.

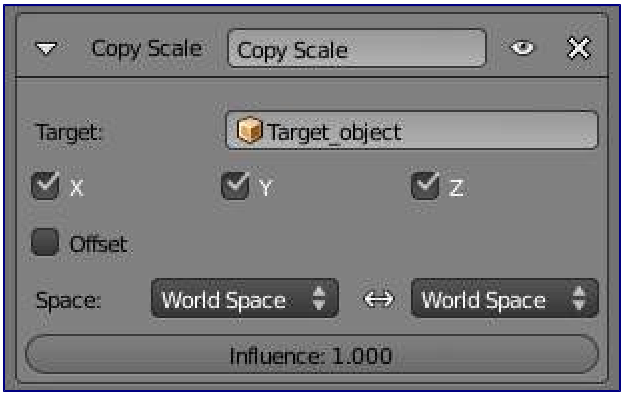
Copy Scale Constraint

Description

The *Copy Scale* constraint forces its owner to have the same scale as its target.

> **Warning**
>
> Here we talk of **scale**, not of **size**! Indeed, you can have two objects, one much bigger than the other, and yet both of them have the same scale. This is also true with bones: in *Pose* mode, they all have a unitary scale when they are in rest position, represented by their visible length.

Options



Copy Scale panel

Target

This constraint uses one target, and is not functional (red state) when it has none.

Bone

If *Target* is an *Armature*, a new field is displayed offering the optional choice to set an individual bone as *Target*.

Head/Tail

If a *Bone* is set as *Target*, a new field is displayed offering the optional choice of where along this bone the target point lies.

Vertex Group

If *Target* is a *Mesh*, a new field is displayed offering the optional choice to set a *Vertex Group* as target.

X, Y, Z

These buttons control along which axes the scale is constrained - by default, it is enabled along all three.

Offset

When enabled, this control allows the owner to be scaled (using its current transform properties), relatively to its target's scale.

Space

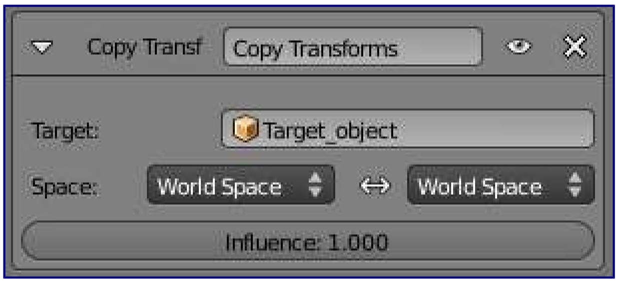
This constraint allows you to choose in which space to evaluate its owner's and target's transform properties.

Copy Transforms Constraint

Description

The *Copy Transforms* constraint forces its owner to have the same transforms as its target.

Options



Copy Transforms panel

Target

This constraint uses one target, and is not functional (red state) when it has none.

Bone

If *Target* is an *Armature*, a new field is displayed offering the optional choice to set an individual bone as *Target*.

Head/Tail

If a *Bone* is set as *Target*, a new field is displayed offering the optional choice of where along this bone the target point lies.

Vertex Group

If *Target* is a *Mesh*, a new field is displayed offering the optional choice to set a *Vertex Group* as target.

Space

This constraint allows you to choose in which space to evaluate its owner's and target's transform properties.

Limit Distance Constraint

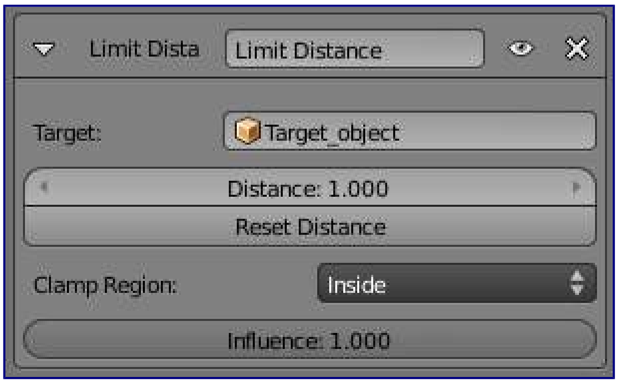
Description

The *Limit Distance* constraint forces its owner to stay either further from, nearer to, or exactly at a given distance from its target. In other words, the owner’s location is constrained either outside, inside, or at the surface of a sphere centered on its target.

When you specify a (new) target, the *Distance* value is automatically set to correspond to the distance between the owner and this target.

> **Warning**
>
> Note that if you use such a constraint on a *connected* bone, it will have no effect, as it is the parent’s tip which controls the position of your owner bone’s root.

Options



Limit Distance panel

Target

This constraint uses one target, and is not functional (red state) when it has none.

Bone

If *Target* is an *Armature*, a new field is displayed offering the optional choice to set an individual bone as *Target*.

Head/Tail
If a *Bone* is set as *Target*, a new field is displayed offering the optional choice of where along this bone the target point lies.

Vertex Group
If *Target* is a *Mesh*, a new field is displayed offering the optional choice to set a *Vertex Group* as target.

Distance
This numeric field sets the limit distance, i.e. the radius of the constraining sphere.

Reset Distance
When clicked, this small button will reset the *Distance* value, so that it corresponds to the actual distance between the owner and its target (i.e. the distance before this constraint is applied).

Clamp Region

The *Limit Mode* drop-down menu allows you to choose how to use the sphere defined by the *Distance* setting and target’s center:

Inside (default)
The owner is constrained *inside* the sphere.
Outside
The owner is constrained *outside* the sphere.
Surface
The owner is constrained *on the surface* of the sphere.

Limit Location Constraint

Description

An object or *unconnected* bone can be moved around the scene along the X, Y and Z axes. This constraint restricts the amount of allowed translations along each axis, through lower and upper bounds.

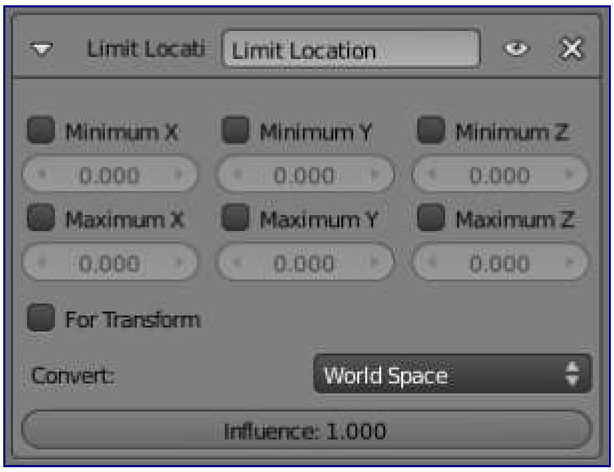
The limits for an object are calculated from its center, and the limits of a bone, from its root.

It is interesting to note that even though the constraint limits the visual and rendered location of its owner, its owner’s data block still allows (by default) the object or bone to have coordinates outside the minimum and maximum ranges. This can be seen in its *Transform Properties panel*. When an owner is grabbed and attempted to be moved outside the limit boundaries, it will be constrained to those boundaries visually and when rendered, but internally, its coordinates will still be changed beyond the limits. If the constraint is removed, its ex-owner will seem to jump to its internally specified location.

Similarly, if its owner has an internal location that is beyond the limits, dragging it back into the limit area will appear to do nothing until the internal coordinates are back within the limit threshold (unless you enabled the *For Transform* option, see below).

Setting equal the min and max values of an axis, locks the owner’s movement along that axis... Although this is possible, using the *Transformation Properties* axis locking feature is probably easier!

Options



Limit Location panel

Minimum X, Minimum Y, Minimum Z

These buttons enable the lower boundary for the location of the owner's center along, respectively, the X, Y and Z axes of the chosen *Space*. The numeric field below them controls the value of their limit. Note that if a min value is higher than its corresponding max value, the constraint behaves as if it had the same value as the max one.

Maximum X, Maximum Y, Maximum Z

These buttons enable the upper boundary for the location of the owner's center along, respectively, the X, Y and Z axes of the chosen *Space*. Same options as above.

For Transform

We saw that by default, even though visually constrained, the owner can still have coordinates out of bounds (as shown by the *Transform Properties* panel). Well, when you enable this button, this is no longer possible - the owner's transform properties are also limited by the constraint. Note however that the constraint does not directly modify the coordinates: you have to grab its owner one way or another for this to take effect...

Convert

This constraint allows you to choose in which space to evaluate its owner's transform properties.

Limit Rotation Constraint

Description

An object or bone can be rotated around the X, Y and Z axes. This constraint restricts the amount of allowed rotations around each axis, through lower and upper bounds.

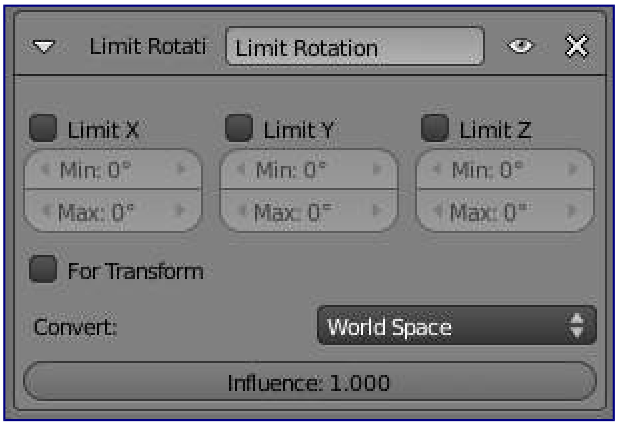
It is interesting to note that even though the constraint limits the visual and rendered rotations of its owner, its owner's data block still allows (by default) the object or bone to have rotation values outside the minimum and maximum ranges. This can be seen in the *Transform Properties panel*. When an owner is rotated and attempted to be rotated outside the limit boundaries, it will be constrained to those boundaries visually and when rendered, but internally, its rotation values will still be changed beyond the limits. If the constraint is removed, its ex-owner will seem to jump to its internally specified rotation.

Similarly, if its owner has an internal rotation that is beyond the limit, rotating it back into the limit area will appear to do nothing until the internal rotation values are back within the limit threshold (unless you enabled the *For Transform* option, see below).

Setting equal the min and max values of an axis, locks the owner's rotation around that axis... Although this is possible, using the *Transformation Properties* axis locking feature is probably easier.

This transform does not constrain the bone if it is manipulated by the IK solver. For constraining the rotation of a bone for IK purposes, see the "Inverse Kinematics" section of Bone properties.

Options



Limit Rotation panel

Limit X, LimitY, LimitZ

These buttons enable the rotation limit around respectively the X, Y and Z axes of the owner, in the chosen *Space*. The *Min* and *Max* numeric fields to their right control the value of their lower and upper boundaries, respectively.

Note that:

- If a min value is higher than its corresponding max value, the constraint behaves as if it had the same value as the max one.
- Unlike the *Limit Location constraint*, you cannot enable separately lower or upper limits...

For Transform

We saw that by default, even though visually constrained, the owner can still have rotations out of bounds (as shown by the *Transform Properties* panel). Well, when you enable this button, this is no more possible - the owner transform properties are also limited by the constraint. Note however that the constraint does not directly modifies the rotation values: you have to rotate one way or the other its owner, for this to take effect...

Convert

This constraint allows you to chose in which space evaluate its owner’s transform properties.

Limit Scale Constraint

Description

An object or bone can be scaled along the X, Y and Z axes. This constraint restricts the amount of allowed scalings along each axis, through lower and upper bounds.

Warning

This constraint does not tolerate negative scale values (those you might use to mirror an object...): when you add it to an object or bone, even if no axis limit is enabled, nor the *For Transform* button, as soon as you scale your object, all negative scale values are instantaneously inverted to positive ones... And the boundary settings can only take strictly positive values.

It is interesting to note that even though the constraint limits the visual and rendered scale of its owner, its owner's data block still allows (by default) the object or bone to have scale values outside the minimum and maximum ranges (as long as they remain positive!). This can be seen in its *Transform Properties panel*. When an owner is scaled and attempted to be moved outside the limit boundaries, it will be constrained to those boundaries visually and when rendered, but internally, its coordinates will still be changed beyond the limits. If the constraint is removed, its ex-owner will seem to jump to its internally-specified scale.

Similarly, if its owner has an internal scale that is beyond the limits, scaling it back into the limit area will appear to do nothing until the internal scale values are back within the limit threshold (unless you enabled the *For Transform* option, see below - or your owner has some negative scale values).

Setting equal the min and max values of an axis locks the owner's scaling along that axis. Although this is possible, using the *Transformation Properties* axis locking feature is probably easier.

Options

Limit Scale panel

Minimum / Maximum X, Y, Z
: These buttons enable the lower boundary for the scale of the owner along respectively the X, Y and Z axes of the chosen *Space*. The *Min* and *Max* numeric fields to their right control the value of their lower and upper boundaries, respectively. Note that if a min value is higher than its corresponding max value, the constraint behaves as if it had the same value as the max one.

For Transform
: We saw that by default, even though visually constrained, and except for the negative values, the owner can still have scales out of bounds (as shown by the *Transform Properties* panel). Well, when you enable this button, this is no longer possible - the owner transform properties are also limited by the constraint. Note however that the constraint does not directly modify the scale values: you have to scale its owner one way or another for this to take effect.

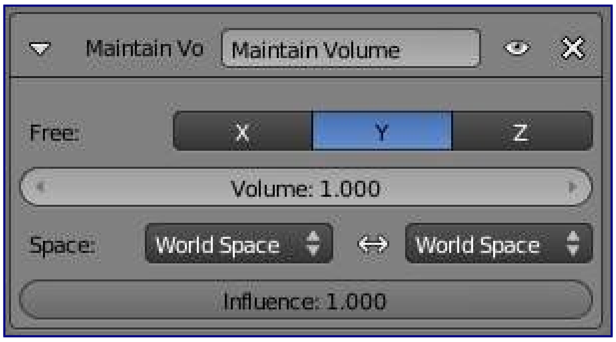
Convert
: This constraint allows you to choose in which space to evaluate its owner's transform properties.

Maintain Volume Constraint

Description

The *Maintain Volume* constraint limits the volume of a mesh or a bone to a given ratio of its original volume.

Option



Maintain Volume panel

Free X / Y / Z
The free-scaling axis of the object.

Volume
The bone's rest volume. Default is `1.0`.

Space
This constraint allows you to choose in which space to evaluate its owner's transform properties.

See also

- Harkyman on the development of the Maintain Volume constraint, March 2010

Transformation Constraint

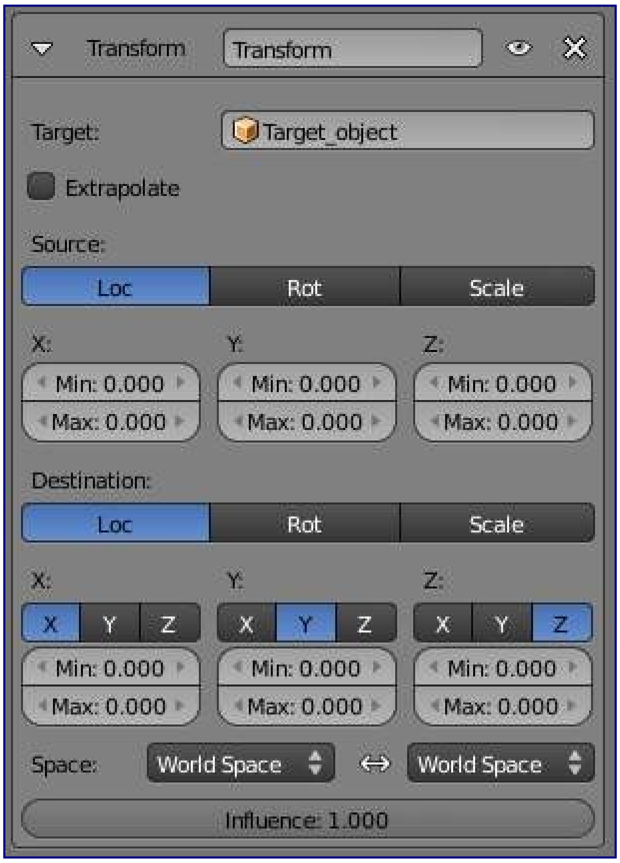
This constraint is more complex and versatile than the other "transform" constraints. It allows you to map one type of transform properties (i.e. location, rotation or scale) of the target, to the same or another type of transform properties of the owner, within a given range of values (which might be different for each target and owner property). You can also switch between axes, and use the range values not as limits, but rather as "markers" to define a mapping between input (target) and output (owner) values.

So, e.g. you can use the position of the target along the X axis to control the rotation of the owner around the Z axis, stating that **1 BU** along the target X axis corresponds to

`10` around the owner Z axis. Typical uses for this include gears (see note below),

and rotation based on location setups.

Options



Transformation panel

Target

This constraint uses one target, and is not functional (red state) when it has none.

Bone

If *Target* is an *Armature*, a new field is displayed offering the optional choice to set an individual bone as *Target*.

Head/Tail

If a *Bone* is set as *Target*, a new field is displayed offering the optional choice of where along this bone the target point lies.

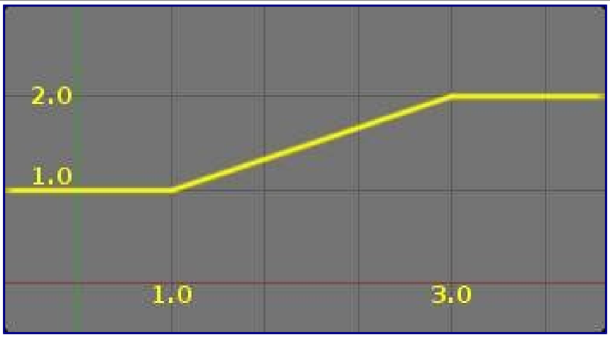
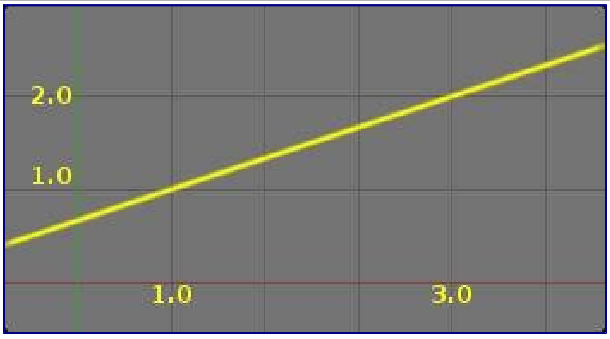
Vertex Group

If *Target* is a *Mesh*, a new field is displayed offering the optional choice to set a *Vertex Group* as target.

Extrapolate

By default, the *min* and *max* values bound the input and output values; all values outside these ranges are clipped to them. When you enable this button, the *min* and *max* values are no longer strict limits, but rather "markers" defining a proportional (linear) mapping between input and corresponding output values. Let's illustrate that with two graphs (*The Extrapolate principles*). In these pictures, the input range (in abscissa) is set to `[1.0, 4.0]`, and its corresponding output range (in ordinate), to `[1.0, 2.0]`. The yellow curve represents the mapping between input and output.

The *Extrapolate* principles.

	
Extrapolate disabled: the output values are bounded inside the [1.0, 2.0] range.	Extrapolate enabled: the output values are "free" to proportionally follow the input ones.

Warning

Note that:

- When mapping transform properties to location (i.e. *Loc*, *Destination* button is enabled), the owner's existing location is added to the result of evaluating this constraint (exactly like when the *Offset* button of the *Copy Location constraint* is enabled...).
- Conversely, when mapping transform properties to rotation or scale, the owner's existing rotation or scale is overridden by the result of evaluating this constraint.
- When using the rotation transform properties of the target as input, whatever the real values are, the constraint will always "take them back" into the `-180, 180` range (e.g. if the target has a rotation of `420` around its X axis, the values used as X input by the constraint will be `((420 + 180) modulo 360) - 180 = 60- ...`). This is why this constraint is not really suited for gears!
- Similarly, when using the scale transform properties of the target as input, whatever the real values are, the constraint will always take their absolute values (i.e. invert negative ones).
- When a *min* value is higher than its corresponding *max* one, both are considered equal to the *max* one. This implies you cannot create "reversed" mappings...

Source

It contains the input (from target) settings. The three *Loc*, *Rot* and *Scale* toggle buttons, mutually exclusive, allow you to select which type of property to use. The *X:*, *Y:* and *Z:* *min* and *max* numeric fields control the lower and upper bounds of the input value range, independently for each axis. Note that if a min value is higher than its corresponding max value, the constraint behaves as if it had the same value as the max one.

Destination

It contains the output (to owner) settings.

- The three *Loc*, *Rot* and *Scale* toggle buttons, mutually exclusive, allow you to select which type of property to control.
- The three *Axis Mapping* drop-down lists allow you to select which input axis to map to, respectively (from top to bottom), the X, Y and Z output (owner) axes.
- The *min* and *max* numeric fields control the lower and upper bounds of the output value range, independently for each mapped axis. Note that if a min value is higher than its corresponding max value, the constraint behaves as if it had the same value as the max one.

Space

This constraint allows you to choose in which space to evaluate its owner’s and target’s transform properties.

Clamp To Constraint

The *Clamp To* constraint clamps an object to a curve. The *Clamp To* constraint is very similar to the *Follow Path* constraint, but instead of using the evaluation time of the target curve, *Clamp To* will get the actual location properties of its owner (those shown in the *Transform Properties* panel, N), and judge where to put it by “mapping” this location along the target curve.

One benefit is that when you are working with *Clamp To*, it is easier to see what your owner will be doing; since you are working in the 3D view, it will just be a lot more precise than sliding keys around on a time Ipo and playing the animation over and over.

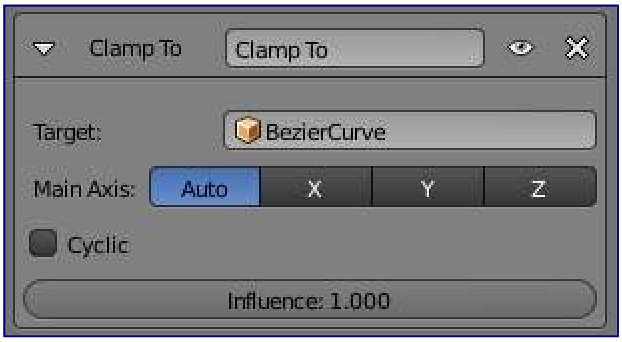
A downside is that unlike in the *Follow Path constraint*, *Clamp To* doesn’t have any option to track your owner’s rotation (pitch, roll, yaw) to the banking of the targeted curve, but you don’t always need rotation on, so in cases like this it’s usually a lot handier to fire up a *Clamp To*, and get the bits of rotation you do need some other way.

The mapping from the object’s original position to its position on the curve is not perfect, but uses the following simplified algorithm (note, I am not the original code author so this may not be 100% accurate):

- A “main axis” is chosen, either by the user, or as the longest axis of the curve’s bounding box (the default).
- The position of the object is compared to the bounding box of the curve in the direction of the main axis. So for example if X is the main axis, and the object is aligned with the curve bounding box’s left side, the result is 0; if it is aligned with the right side, the result is 1.
- If the cyclic option is unchecked, this value is clamped in the range 0-1.
- This number is used as the curve time, to find the final position along the curve that the object is clamped to.

This algorithm does not produce exactly the desired result because curve time does not map exactly to the main axis position. For example an object directly in the centre of a curve will be clamped to a curve time of 0.5 regardless of the shape of the curve, because it is halfway along the curve’s bounding box. However the 0.5 curve time position can actually be anywhere within the bounding box!

Options



Clamp To panel

Target

The Target: field indicates which curve object the Clamp To constraint will track along. The Target: field must be a curve object type. If this field is not filled in then it will be highlighted in red indicating that this constraint does not have all the information it needs to carry out its task and will therefore be ignored on the constraint stack.

Main Axis

This button group controls which global axis (X, Y or Z) is the main direction of the path. When clamping the object to the target curve, it will not be moved significantly on this axis. It may move a small amount on that axis because of the inexact way this constraint functions.

For example if you are animating a rocket launch, it will be the Z axis because the main direction of the launch path is up. The default *Auto* option chooses the axis which the curve is longest in (or X if they are equal). This is usually the best option.

Cyclic

By default, once the object has reached one end of its target curve, it will be constrained there. When the *Cyclic* option is enabled, as soon as it reaches one end of the curve, it is instantaneously moved to its other end. This is of course primarily designed for closed curves (circles & co), as this allows your owner to go around it over and over.

Damped Track Constraint

The *Damped Track* constraint constrains one local axis of the owner to always point towards *Target*. In another 3D software you can find it with the name “Look at” constraint.

Options

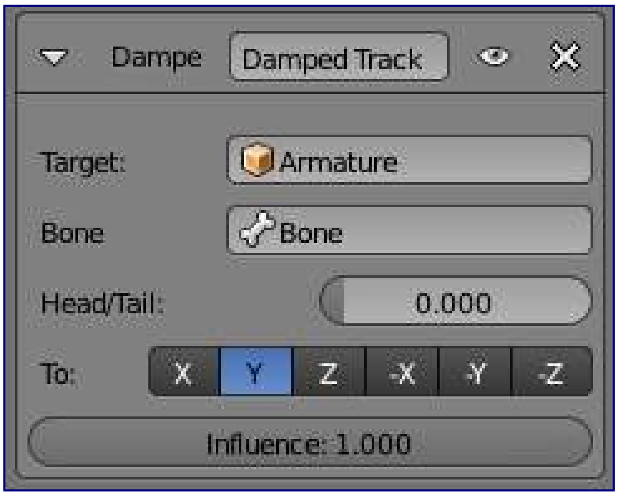
Damped Track panel

Target (Mesh Object Type)

This constraint uses one target, and is not functional (red state) when it has none.

Vertex Group

If *Target* is a *Mesh*, a new field is displayed offering the optional choice to set a *Vertex Group* as target.



Damped Track for Bones

Target (Armature Object Type):

Bone

If *Target* is an *Armature*, a new field is displayed offering the optional choice to set an individual bone as *Target*.

Head/Tail

If *Target* is an *Armature*, a new field is displayed offering the optional choice to set whether the Head or Tail of a Bone will be pointed at by the *Target*. It is a slider value field which can have a value between 0 and 1. A value of 0 will point the Target at the Head/Root of a Bone while a value of 1 will point the Target at the Tail/Tip of a Bone.

To

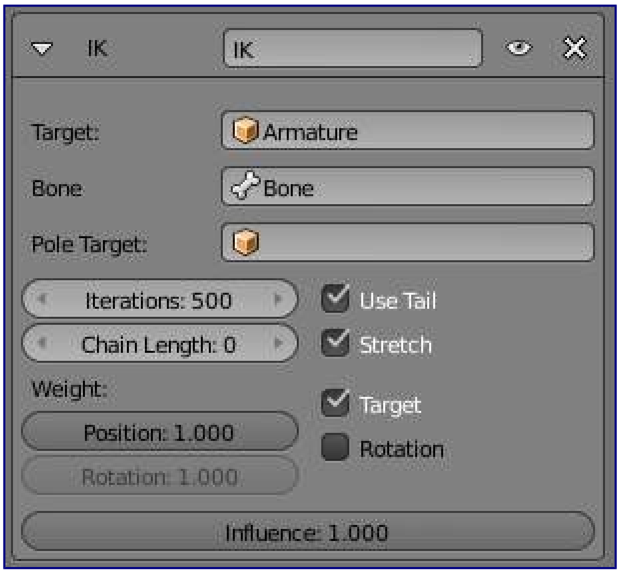
Once the owner object has had a Damped Track constraint applied to it, you must then choose which axis of the object you want to point at the Target object. You can choose between 6 axis directions (-X, -Y, -Z, X, Y, Z). The negative axis direction cause the object to point away from the Target object along the selected axis direction.

IK Solver Constraint

The *Inverse Kinematics* constraint implements the *inverse kinematics* armature posing technique. Hence, it is only available for bones. To quickly create an IK constraint with a target, select a bone in pose mode, and press `Shift I`.

This constraint is fully documented in the *inverse kinematics page* of the rigging chapter.

Options



Inverse Kinematics panel

Target
: Must be an armature

Bone
: A bone in the armature

Pole Target
: Object for pole rotation

Iterations
: Maximum number of solving iterations

Chain Length

How many bones are included in the IK effect. Set to 0 to include all bones

Use Tail
: Include bone’s tail as last element in chain

Stretch
: Enable IK stretching

Weight:

Position
: For Tree-IK: Weight of position control for this target

Rotation
: Chain follow rotation of target

Target
: Disable for targetless IK

Rotation
: Chain follows rotation of target

Locked Track Constraint

The *Locked Track* constraint is a bit tricky to explain, both graphically and textually. Basically, it is a *Track To* *constraint*, but with a locked axis, i.e. an axis that cannot rotate (change its orientation). Hence, the owner can only track its target by rotating around this axis, and unless the target is in the plane perpendicular to the locked axis, and crossing the owner, this owner cannot really point at its target.

Let’s take the best real world equivalent: a compass. It can rotate to point in the general direction of its target (the magnetic North, or a neighbor magnet), but it can’t point *directly at it*, because it spins like a wheel on an axle. If a compass is sitting on a table and there is a magnet directly above it, the compass can’t point to it. If we move the magnet more to one side of the compass, it still can’t point *at* the target, but it can point in the general direction of the target, and still obey its restrictions of the axle.

When using a *Locked Track* constraint, you can think of the target as a magnet, and the owner as a compass. The *Lock* axis will function as the axle around which the owner spins, and the *To* axis will function as the compass’ needle. Which axis does what is up to you!

If you have trouble understanding the buttons of this constraint, read the tool-tips, they are pretty good. If you don’t know where your object’s axes are, turn on the *Axis* button in the *Object* menu’s *Draw* panel. Or, if you’re working with bones, turn on the *Axes* button in the *Armature* menu’s *Display* panel.

This constraint was designed to work cooperatively with the *Track To* constraint. If you set the axes buttons right for these two constraints, *Track To* can be used to point the axle at a primary target, and *Locked Track* can spin the owner around that axle to a secondary target.

This constraints also works very well for 2D billboarding.

Options

Locked track panel

Target
: This constraint uses one target, and is not functional (red state) when it has none.

To
: The tracking local axis (*Y* by default), i.e. the owner’s axis to point at the target. The negative options force the relevant axis to point away from the target.

Lock
: The locked local axis (*Z* by default), i.e. the owner’s axis which cannot be re-oriented to track the target.

> **Warning**
>
> If you choose the same axis for *To* and *Lock*, the constraint will no longer be functional (red

state).

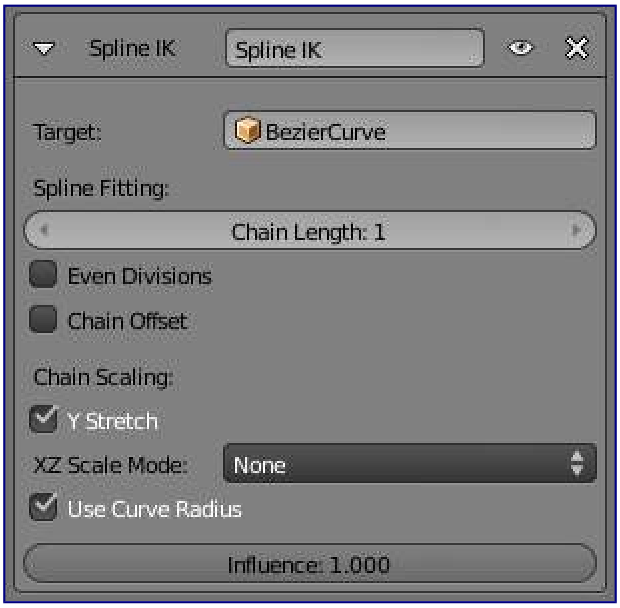
Spline IK Constraint

The *Spline IK* constraint aligns a chain of bones along a curve. By leveraging the ease and flexibility of achieving aesthetically pleasing shapes offered by curves and the predictability and well-integrated control offered by bones, *Spline IK* is an invaluable tool in the riggers' toolbox. It is particularly well suited for rigging flexible body parts such as tails, tentacles, and spines, as well as inorganic items such as ropes.

To set up *Spline IK*, it is necessary to have a chain of connected bones and a curve to constrain these bones to.

- With the last bone in the chain selected, add a *Spline IK* constraint from the *Bone Constraints* tab in the *Properties Editor.*
- Set the 'Chain Length' setting to the number of bones in the chain (starting from and including the selected bone) that should be influenced by the curve.
- Finally, set *Target* to the curve that should control the curve.

Options



Spline IK panel

Target
: The target curve

Spline Fitting:
: **Chain Length**
: How many bones are included in the chain
: **Even Division**
: Ignore the relative length of the bones when fitting to the curve
: **Chain Offset**
: Offset the entire chain relative to the root joint

Chain Scaling:

Y stretch

Stretch the Y axis of the bones to fit the curve

XZ Scale Mode:

None

Don’t scale the X and X axes (default)

Bone Original

Use the original scaling of the bones

Volume Preservation

Scale of the X and Z axes is the inverse of the Y scale

Use Curve Radius

Average radius of the endpoints is used to tweak the X and Z scaling of the bones, on top of the X and Z scale mode

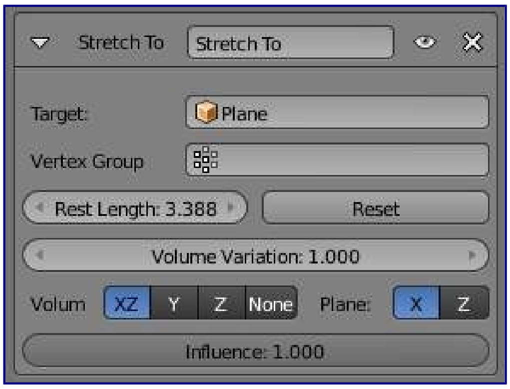
Stretch To Constraint

The *Stretch To* constraint causes its owner to rotate and scale its Y axis towards its target. So it has the same tracking behavior as the *Track To constraint*. However, it assumes that the Y axis will be the tracking and stretching axis, and doesn’t give you the option of using a different one.

It also optionally has some raw volumetric features, so the owner can squash down as the target moves closer, or thin out as the target moves farther away. Note however that it is not the real volume of the owner which is thus preserved, but rather the virtual one defined by its scale values. Hence, this feature works even with non-volumetric objects, like empties, 2D meshes or surfaces, and curves.

With bones, the “volumetric” variation scales them along their own local axes (remember that the local Y axis of a bone is aligned with it, from root to tip).

Options



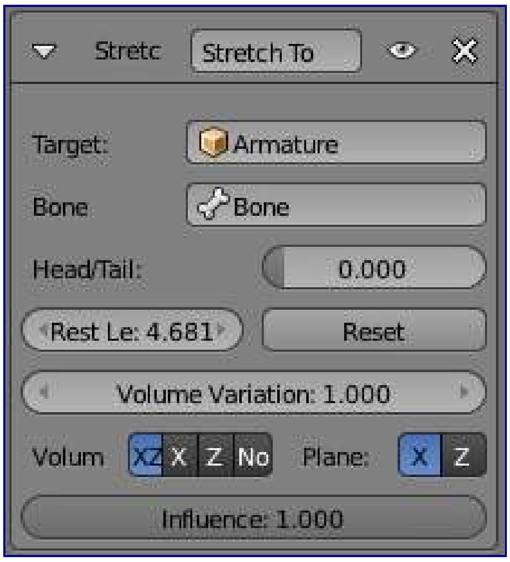
Stretch To panel for a Mesh Object

Target (Mesh Object Type)

This constraint uses one target, and is not functional (red state) when it has none.

Vertex Group

When *Target* is a mesh, a new field is display where a vertex group can be selected.



Stretch To panel for a Armature Object

Target (Armature Object Type)

This constraint uses one target, and is not functional (red state) when it has none.

Bone
When *Target* is an armature, a new field for a bone is displayed.

Head/Tail
When using a Bone *Target*, you can choose where along this bone the target point lies.

Rest Length

This numeric field sets the rest distance between the owner and its target, i.e. the distance at which there is no deformation (stretching) of the owner.

Reset
When clicked, this small button will recalculate the *Rest Length* value, so that it corresponds to the actual distance between the owner and its target (i.e. the distance before this constraint is applied).

Volume Variation
This numeric field controls the amount of “volume” variation proportionally to the stretching amount. Note that the **0.0** value is not allowed, if you want to disable the volume feature, use the *None* button (see below).

Volume
These buttons control which of the X and/or Z axes should be affected (scaled up/down) to preserve the virtual volume while stretching along the Y axis. If you enable the *NONE* button, the volumetric features are disabled.

Plane
These buttons are equivalent to the *Up* ones of the *Track To constraint*: they control which of the X or Z axes should be maintained (as much as possible) aligned with the global Z axis, while tracking the target with the Y axis.

Track To Constraint

Description

The *Track To* constraint applies rotations to its owner, so that it always points a given “To” axis towards its target, with another “Up” axis permanently maintained as much aligned with the global Z axis (by default) as possible. This tracking is similar to the “billboard tracking” in 3D (see note below).

This is the preferred tracking constraint, as it has a more easily controlled constraining mechanism.

This constraint shares a close relationship to the *Inverse Kinematics constraint* in some ways.

Tip

Billboard tracking

The term “billboard” has a specific meaning in real-time CG programming (i.e. video games!), where it is used for plane objects always facing the camera (they are indeed “trackers”, the camera being their “target”). Their main usage is as support for tree or mist textures: if they were not permanently facing the camera, you would often see your trees squeezing to nothing, or your mist turning into a millefeuille paste, which would be funny but not so credible.

Options

Track To panel

Targets

This constraint uses one target, and is not functional (red state) when it has none.

Bone
When *Target* is an armature, a new field for a bone is displayed.

Head/Tail
When using a bone target, you can choose where along this bone the target point lies.

Vertex Group
When *Target* is a mesh, a new field is display where a vertex group can be selected.

To

The tracking local axis (*Y* by default), i.e. the owner’s axis to point at the target. The negative options force the relevant axis to point away from the target.

Up

The “upward-most” local axis (*Z* by default), i.e. the owner’s axis to be aligned (as much as possible) with the global Z axis (or target Z axis, when the *Target* button is enabled).

Target Z

By default, the owner’s *Up* axis is (as much as possible) aligned with the global Z axis, during the tracking rotations. When this button is enabled, the *Up* axis will be (as much as possible) aligned with the target’s local Z axis?

Space

This constraint allows you to choose in which space to evaluate its owner’s and target’s transform properties.

Warning

If you choose the same axis for *To* and *Up*, the constraint will not be functional anymore (red state).

Action Constraint

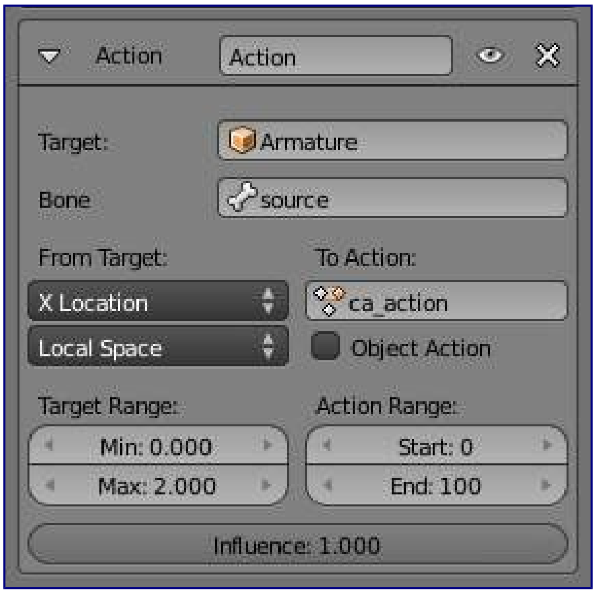
The *Action* constraint is powerful. It allows you control an *Action* using the transformations of another object.

The underlying idea of the *Action* constraint is very similar to the one behind the *Drivers*, except that the former uses a whole action (i.e. a bunch a Fcurves of the same type), while the latter controls a single Fcurve of their “owner”...

Note that even if the constraint accepts the *Mesh* action type, only the *Object*, *Pose* and *Constraint* types are really working, as constraints can only affect objects’ or bones’ transform properties, and not meshes’ shapes. Also note that only the object transformation (location, rotation, scale) is affected by the action, if the action contains keyframes for other properties they are ignored, as constraints do not influence those.

As an example, let’s assume you have defined an *Object* action (it can be assigned to any object, or even no object at all), and have mapped it on your owner through an *Action* constraint, so that moving the target in the `[0.0, 2.0]` range along its X axis maps the action content on the owner in the `[0, 100]` frame range. This will mean that when the target’s X property is `0.0` the owner will be as if in frame `0` of the linked action; with the target’s X property at `1.0` the owner will be as if in frame `50` of the linked action, etc.

Options



Action panel

Target

This constraint uses one target, and is not functional (red state) when it has none.

Bone:

When target is an armature object, use this field to select the target bone.

Transform Channel

This drop-down list controls which transform property (location, rotation or scale along/around one of its axes) from the target to use as “action driver”.

Target Space

This constraint allows you to choose in which space to evaluate its target’s transform properties.

To Action

Select the name of the action you want to use.

> **Warning**
>
> Even though it might not be in red state (UI refresh problems...), this constraint is obviously not functional when this field does not contain a valid action.

Object Action

Bones only, when enabled, this option will make the constrained bone use the “object” part of the linked action, instead of the “same-named pose” part. This allows you to apply the action of an object to a bone.

Target Range Min / Max

The lower and upper bounds of the driving transform property value. By default, both values are set to `0.0`

> **Warning**
>
> Unfortunately, here again we find the constraints limitations:
>
> - When using a rotation property as “driver”, these values are “mapped back” to the `[-180.0- ,`

180.0- [range.

- When using a scale property as “driver”, these values are limited to null or positive values.

Action Range Start / End

The starting and ending frames of the action to be mapped. Note that:

- These values must be strictly positive.
- By default, both values are set to `0` which disables the mapping (i.e. the owner just gets the properties defined at frame `0` of the linked action...).

Notes

- When the linked action affects some location properties, the owner’s existing location is added to the result of evaluating this constraint (exactly as when the *Offset* button of the *Copy Location constraint* is enabled...).
- When the linked action affects some scale properties, the owner’s existing scale is multiplied with the result of evaluating this constraint.
- When the linked action affects some rotation properties, the owner’s existing rotation is overridden by the result of evaluating this constraint.
- Unlike usual, you can have a *Start* value higher than the *End* one, or a *Min* one higher than a *Max* one: this will reverse the mapping of the action (i.e. it will be “played” reversed...), unless you have both sets reversed, obviously!
- When using a *Constraint* action, it is the constraint *channel’s names* that are used to determine to which constraints of the owner apply the action. E.g. if you have a constraint channel named “trackto_empt1”, its keyed *Influence* and/or *Head/Tail* values (the only ones you can key) will be mapped to the ones of the owner’s constraint named “trackto_empt1”.
- Similarly, when using a *Pose* action (which is obviously only meaningful and working when constraining a bone!), it is the bone’s name that is used to determine which bone *channel’s names* from the action to use (e.g. if the constrained bone is named “arm”, it will use and only use the action’s bone channel named “arm”...). Unfortunately, using a *Pose* action on a whole armature object (to affect all the keyed bones in the action at once) won’t work...
- Note also that you can use the *pose library feature* to create/edit a *Pose* action data-block... just remember that in this situation, there’s one pose per frame!

Child Of Constraint

Child Of is the constraint version of the standard parent/children relationship between objects

Parenting with a constraint has several advantages and enhancements, compared to the traditional method:

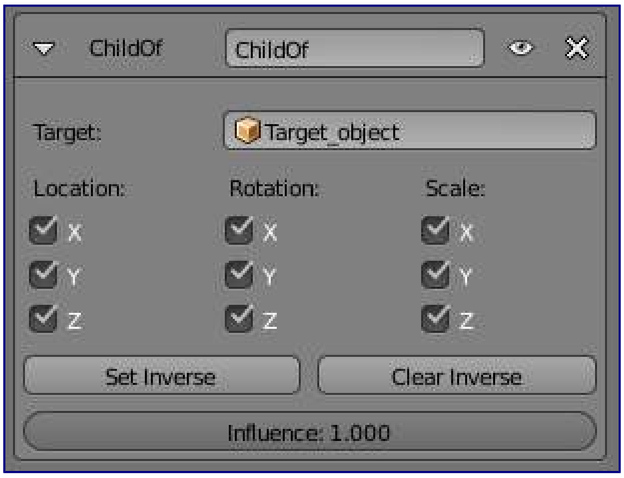
- You can have several different parents for the same object (weighting their respective influence with the *Influence* slider).

- As with any constraint, you can key (i.e. animate) its Influence setting. This allows the object which has a Child Of constraint upon it to change over time which target object will be considered the parent, and therefore have influence over the Child Of constrained object.

Warning

Don't confuse this "basic" object parenting with the one that defines the chains of bones inside of an armature. This constraint is used to parent an object to a bone (the so-called *object skinning*), or even bones to bones. But don't try to use it to define chains of bones.

Options



Child Of panel

Target
The target object that this object will act as a child of. This constraint uses one target, and is not functional (red state) when it has none. If *Target* is an armature or a mesh, a new name field appears where a name of a *Bone* or a *Vertex Group* can be selected.

Location X, Y, Z
Each of these buttons will make the parent affect or not affect the location along the corresponding axis.

Rotation X, Y, Z
Each of these buttons will make the parent affect or not affect the rotation around the corresponding axis.

Scale X, Y, Z
Each of these buttons will make the parent affect or not affect the scale along the corresponding axis.

Set Inverse
By default, when you parent your owner to your target, the target becomes the origin of the owner's space. This means that the location, rotation and scale of the owner are offset by the same properties of the target. In other words, the owner is transformed when you parent it to your target. This might not be desired! So, if you want to restore your owner to its before-parenting state, click on the *Set Inverse* button.

Clear Inverse
This button reverses (cancels) the effects of the above one, restoring the owner/child to its default state regarding its target/parent.

Tips

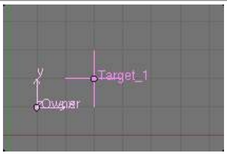
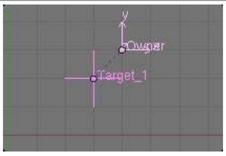
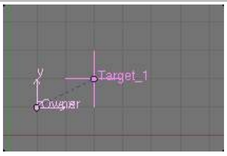
When creating a new parent relationship using this constraint, it is usually necessary to click on the *Set Inverse* button after assigning the parent. As noted above, this cancels out any unwanted transform from the parent, so that the owner returns to the location/rotation/scale it was in before the constraint was applied. Note that you should apply *Set Inverse* with all other constraints disabled (their *Influence* set to **0.0**) for a particular *Child Of* constraint, and before transforming the target/parent (see example below).

About the toggle buttons that control which target's (i.e. parent's) individual transform properties affect the owner, it is usually best to leave them all enabled, or to disable all three of the given Location, Rotation or Scale transforms.

Technical Note

If you use this constraint with all channels on, it will use a straight matrix multiplication for the parent relationship, not decomposing the parent matrix into loc/rot/size. This ensures any transformation correctly gets applied, also for combinations of rotated and non-uniform scaled parents.

Examples

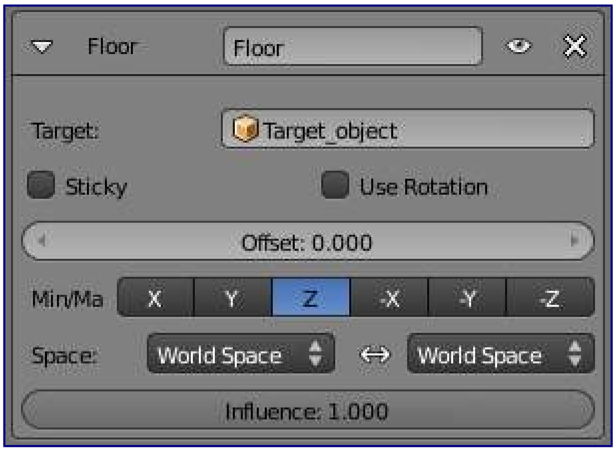
 **1. No constraint** Note the position of `Owner` empty - `1.0` BU along X and Y axes.	 **2.** ***Child Of*** **just added** Here you can see that `Owner` empty is now **1.0 BU** away from `Target_1` empty along X and Y axes.
 **3. Offset set** *Set Inverse* has been clicked, and `Owner` is back to its original position.	 **4. Target/parent transformed** `Target_1` has been translated in the XY plane, rotated around the Z axis, and scaled along its *local* X axis.
 **5. Offset cleared** *Clear Inverse* has been clicked - `Owner` is fully again controlled by `Target_1`.	 **6. Offset set again** *Set Offset* has been clicked again. As you can see, it does not gives the same result as in (*Target/parent transformed*). As noted above, use *Set Inverse* only once, before transforming your target/parent.

Floor Constraint

Description

The *Floor* constraint allows you to use its target position (and optionally rotation) to specify a plane with a "forbidden side", where the owner cannot go. This plane can have any orientation you like. In other words, it creates a floor (or a ceiling, or a wall)! Note that it is only capable of simulating entirely flat planes, even if you use the *Vertex Group* option. It cannot be used for uneven floors or walls.

Options



Floor panel

Targets

This constraint uses one target, and is not functional (red state) when it has none.

Bone
When *Target* is an armature, a new field for a bone is displayed.

Vertex Group
When *Target* is a mesh, a new field is display where a vertex group can be selected.

Sticky
This button makes the owner immovable when touching the "floor" plane (it cannot slide around on the surface of the plane any more). This is fantastic for making walk and run animations!

Use Rotation
This button forces the constraint to take the target's rotation into account. This allows you to have a "floor" plane of any orientation you like, not just the global XY, XZ and YZ ones...

Offset
This numeric field allows you to offset the "floor" plane from the target's center, by the given number of Bforartists Units. Use it e.g. to account for the distance from a foot bone to the surface of the foot's mesh.

Max / Min
This set of (mutually exclusive) buttons controls which plane will be the "floor". The buttons' names correspond indeed to the *normal* to this plane (e.g. enabling *Z* means "XY plane", etc.) By default, these normals are aligned with the *global* axes. However, if you enable *Use Rotation* (see above), they will be aligned with the *local target's axes*. As the constraint does not only define an uncrossable plane, but also a side of it which is forbidden to the owner, you can choose which side by enabling either the positive or negative normal axis... E.g, by default (*Z*), the owner is stuck in the positive Z coordinates.

Space
This constraint allows you to choose in which space to evaluate its owner's and target's transform properties.

Follow Path Constraint

The *Follow Path* constraint places its owner onto a *curve* target object, and makes it move along this curve (or path). It can also affect its owner's rotation to follow the curve's bends, when the *Follow Curve* option is enabled.

The owner is always evaluated in the global (world) space:

- Its location (as shown in the *Transform Properties* panel, `N`) is used as an offset from its normal position on the path. E.g. if you have an owner with the `(1.0, 1.0, 0.0)` location, it will be one BU away from its normal position on the curve, along the X and Y axis. Hence, if you want your owner *on* its target path, clear its location (`Alt-G`)!
- This location offset is also proportionally affected by the *scale of the target curve*. Taking the same `(1.0, 1.0, 0.0)` offset as above, if the curve has a scale of `(2.0, 1.0, 1.0)`, the owner will be offset *two* BU along the X axis (and one along the Y one)...
- When the *Curve Follow* option is enabled, its rotation is also offset to the one given by the curve (i.e. if you want the Y axis of your object to be aligned with the curve's direction, it must be in rest, non-constrained state, aligned with the global Y axis). Here again, clearing your owner's rotation (`Alt-R`) might be useful...

The movement of the owner along the target curve/path may be controlled in two different ways:

- The most simple is to define the number of frames of the movement, in the Path Animation panel of the Object Data context, via the numeric field Frames, and its start frame via the constraint's Offset option (by default, start frame: 1 [= offset of 0)], duration: 100).
- The second way, much more precise and powerful, is to define a *Evaluation Time* interpolation curve for the *Target* path (in the *Graph Editor.* See the *animation chapter* to learn more about Fcurves.
- If you don't want your owner to move along the path, you can give to the target curve a flat *Speed* FCurve (its value will control the position of the owner along the path).

Follow Path is another constraint that works well with the *Locked Track one*. One example is a flying camera on a path. To control the camera's roll angle, you can use a *Locked Track* and a target object to specify the up direction, as the camera flies along the path.

Note

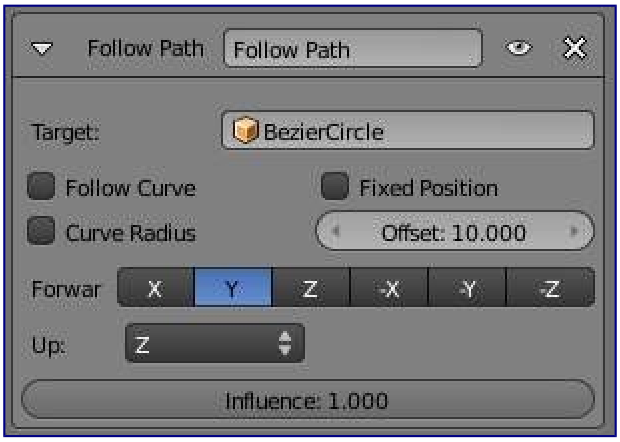
Follow Path and *Clamp To*

Do not confuse these two constraints. Both of them constraint the location of their owner along a curve, but *Follow Path* is an "animation-only" constraint, inasmuch that the position of the owner along the curve is determined by the time (i.e. current frame), whereas the *Clamp To constraint* determines the position of its owner along the curve using one of its location properties' values.

Note

Note that you also need to keyframe Evaluation Time for the Path. Select the path, go to the path properties, set the overall frame to the first frame of the path (e.g. frame 1), set the value of Evaluation time to the first frame of the path (e.g. 1), right click on Evaluation time, select create keyframe, set the overall frame to the last frame of the path (e.g. frame 100), set the value of Evaluation time to the last frame of the path (e.g. 100), right click on Evaluation time, select create keyframe. .. Comment: <!– from http://overshoot.tv/node/1123 paragraph needs cleanup but this definitely needs to be in the documentation –> .

Options



Follow Path panel

Target
: This constraint uses one target, which *must be a curve object*, and is not functional (red state) when it has none.

Curve Radius
: Objects scale by the curve radius. See *Curve Editing*

Fixed Position
: Object will stay locked to a single point somewhere along the length of the curve regardless of time

Offset
: The number of frames to offset from the "animation" defined by the path (by default, from frame **1**).

Follow Curve

: If this option is not activated, the owner's rotation isn't modified by the curve; otherwise, it's affected depending on the following options:

  Forward
  : The axis of the object that has to be aligned with the forward direction of the path (i.e. tangent to the curve at the owner's position).

  Up
  : The axis of the object that has to be aligned (as much as possible) with the world Z axis. In fact, with this option activated, the behavior of the owner shares some properties with the one caused by a *Locked Track constraint*, with the path as "axle", and the world Z axis as "magnet".

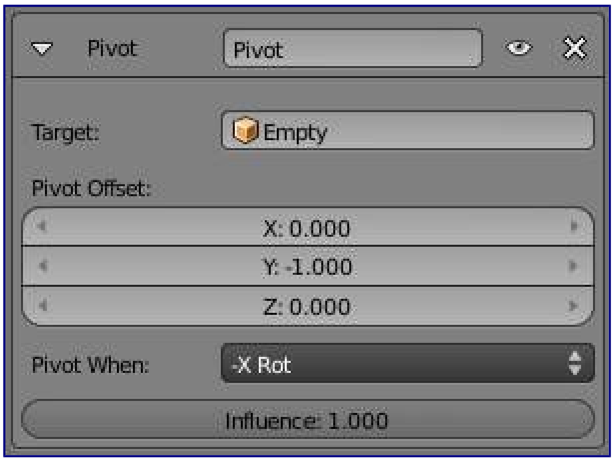
Pivot Constraint

Description

The *Pivot* constraint allows the owner to rotate around a target object.

It was originally intended for foot rigs.

Options



Pivot panel

Target

The object to be used as a pivot point

Bone
When *Target* is an armature, a new field for a bone is displayed.

Head/Tail
When using a bone target, you can choose where along this bone the target point lies.

Vertex Group
When *Target* is a mesh, a new field is display where a vertex group can be selected.

Pivot Offset
Offset of pivot from target

Pivot When
Always, Z Rot, Y Rot...

Rigid Body Joint Constraint

Description

The *Rigid Body Joint* constraint is very special. Basically, it is used by the physical part of the Bforartists Game Engine to simulate a joint between its owner and its target. It offers four joint types: hinge type, ball-and-socket type, cone-twist, and generic six-DoF (degrees of freedom) type.

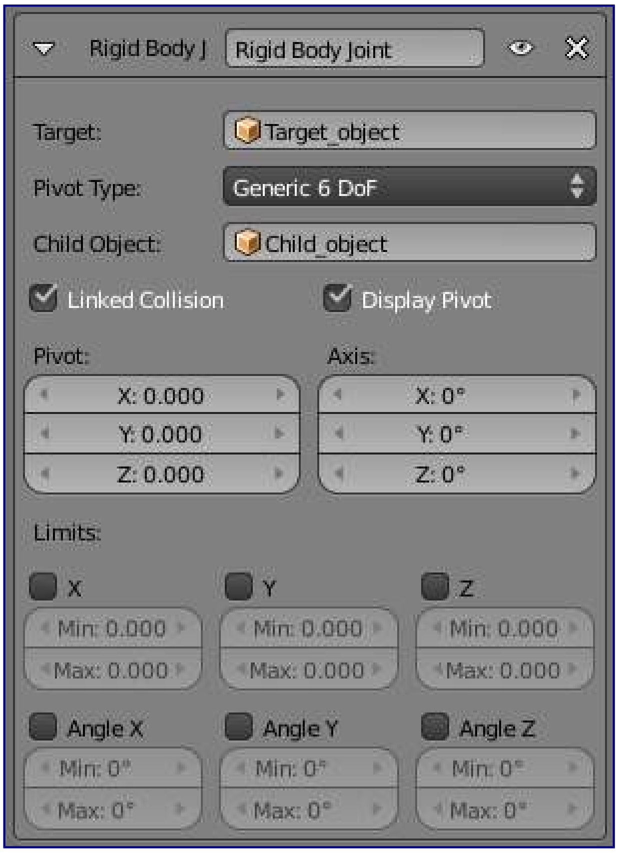
The joint point and axes are defined and fixed relative to the owner. The target moves as if it were stuck to the center point of a stick, the other end of the stick rotating around the joint/pivot point...

This constraint is of no use in most “standard” static or animated projects. However, you can use its results outside of the BGE, through the Game ‣ Record Animation menu entry (from the main menu of the *User Preferences* window, see *Rigid Bodies* for more info on this topic).

Note

In order for this constraint to work properly, both objects (so the owner and the target object) need to have "Collision Bounds" enabled.

Options



Rigid Body Joint panel

Target
: This constraint uses one target, and is not functional (red state) when it has none.

Joint Type:

Ball
: works like an ideal ball-and-socket joint, i.e. allows rotations around all axes like a shoulder joint.

Hinge
: works in one plane, like an elbow: the owner and target can only rotate around the X axis of the pivot (joint point).

Limits
: Angular limits for the X axis

Cone Twist
: similar to *Ball*, this is a point-to-point joint with limits added for the cone and twist axis

Limits
: Angular limits

Generic 6DOF

works like the *Ball* option, but the target is no longer constrained at a fixed distance from the pivot point, by default (hence the six degrees of freedom: rotation and translation around/along the three axes). In fact, there is no longer a joint by default, with this option, but it enables additional settings which allow you to restrict some of these DoF:

Limits

Linear and angular limits for a given axis (of the pivot) in Bforartists Units and degrees respectively.

Child Object

normally, leave this blank. You can reset it to blank by right clicking and selecting Reset to Default Value. Comment: <!– Is this right? 2.4 just had a ‘to object’. Now we have a ‘target’ and a ‘child object’. These are not documented. It seems that we recreate the behaviour of 2.4 by leaving the child object blank. The target seems to be the 2.4 ‘to object’. What is the child object? Please explain: m.e –> .

Linked Collision

When enabled, this will disable the collision detection between the owner and the target (in the physical engine of the BGE).

Display Pivot

When enabled, this will draw the pivot of the joint in the 3D views. Most useful, especially with the *Generic 6DOF* joint type!

Pivot

These three numeric fields allow you to relocate the pivot point, *in the owner’s space*.

Axis

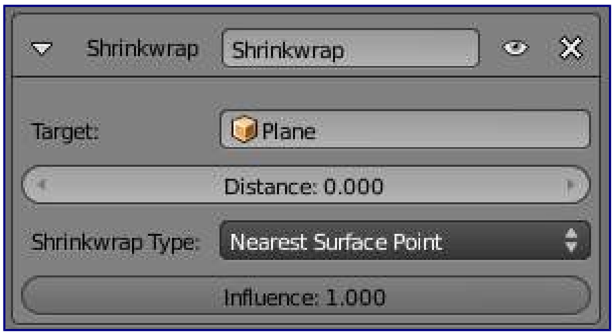
These three numeric fields allow you to rotate the pivot point, *in the owner’s space*.

Shrinkwrap Constraint

The *Shrinkwrap* constraint is the “object counterpart” of the *Shrinkwrap modifier.* It moves the owner origin and therefore the owner object’s location to the surface of its target.

This implies that the target *must* have a surface. In fact, the constraint is even more selective, as it can only use meshes as targets. Hence, the *Shrinkwrap* option is only shown in the *Add Constraint to Active Object* menu, (or its bone’s equivalent), when the selected inactive object is a mesh.

Options



Shrinkwrap panel

Target

This constraint uses one target, which *must be a mesh object*, and is not functional (red state) when it has none.

Distance

This numeric field controls the offset of the owner from the shrunk computed position on the target’s surface. Positive values place the owner “outside” of the target, and negative ones, “inside” the target. This offset is applied along the straight line defined by the original (i.e. before constraint) position of the owner, and the computed one on the target’s surface.

Shrinkwrap Type

This drop-down list allows you to select which method to use to compute the point on the target’s surface to which to translate the owner’s center. You have three options:

Nearest Surface Point

The chosen target’s surface’s point will be the nearest one to the original owner’s location. This is the default and most commonly useful option.

Projection

The target’s surface’s point is determined by projecting the owner’s center along a given axis. This axis is controlled by the three *X*, *Y* and *Z* toggle buttons that show up when you select this type. This mean the projection axis can only be aligned with one of the global axes, median to both of them (XY, XZ or YZ), or to the three ones (XYZ). When the projection of the owner’s center along the selected direction does not hit the target’s surface, the owner’s location is left unchanged.

Nearest Vertex

This method is very similar to the *Nearest Surface Point* one, except that the owner’s possible shrink locations are limited to the target’s vertices.

7.2 Rigging - Armatures

Armatures

An “armature” is a type of object used for *rigging*. Armature object borrows many ideas from real life skeletons.

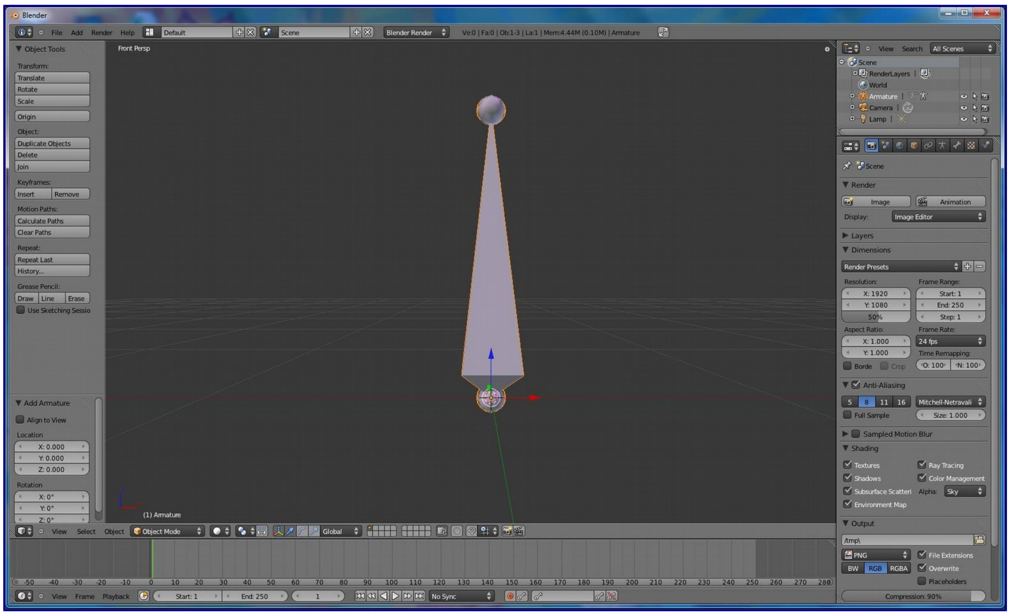
Your first armature

In order to see what we're talking about, let's try to add the default armature in Bforartists.

(Note that armature editing details are explained in the *armatures editing section*).

Open a default scene, then:

- delete all objects in the scene
- make sure the cursor is in the world origin with `Shift-C`
- press `Numpad1` to see the world in Front view
- then, either: - in the Main Menu, Go to Add > Armature > Single Bone - -or- in the 3D view, add an armature with `Shift-A` pop-up ‣ Armature ‣ Single Bone
- press `NumpadDelete` to see the armature at maximum zoom



The default armature Toolbox: –> Add Armature –> Single Bone

The armature object

As you can see, an armature is like any other object type in Bforartists:

- It has a center, a position, a rotation and a scale factor.
- It has an ObData data-block, that can be edited in *Edit mode*.
- It can be linked to other scenes, and the same armature data can be reused on multiple objects.
- All animation you do in *Object mode* is only working on the whole object, not the armature's bones (use the *Pose mode* to do this).

As armatures are designed to be posed, either for a static or animated scene, they have a specific state, called "rest position". This is the armature's default "shape", the default position/rotation/scale of its bones, as set in *Edit mode*.

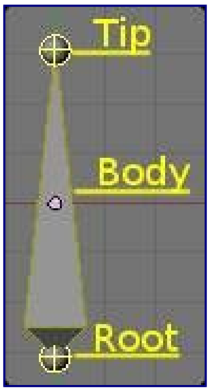
In *Edit mode*, you will always see your armature in rest position, whereas in *Object* and *Pose mode*, you usually get the current “pose” of the armature (unless you enable the *Rest Position* button of the *Armature* panel).

Armature chapter overview

In the “Armatures” section, we will only talk about armatures themselves, and specifically we will talk about:

- the armature object *panels*
- the basics of *bones*
- the different *armature visualizations*
- the armature *structure types*
- how to *select* its parts,
- how to *edit an armature*
- how to *Edit Bones*
- how to *edit bones properties*
- how to sketch armatures with the *Etch-a-Ton tool*
- how to use *templates*

Bones



The elements of a bone.

Bones are the base elements of armatures.

They have three elements:

- the “start point” named **root** or **head**,
- the “body” itself,
- and the “end point” named **tip** or **tail**.

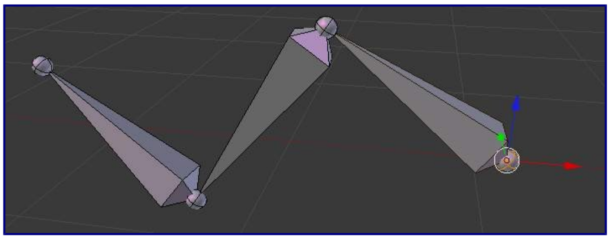
With the default armature in edit-mode, you can select the root and the tip, and move them as you do with mesh vertices.

Both root and tip (the “ends”) define the bone by their respective position.

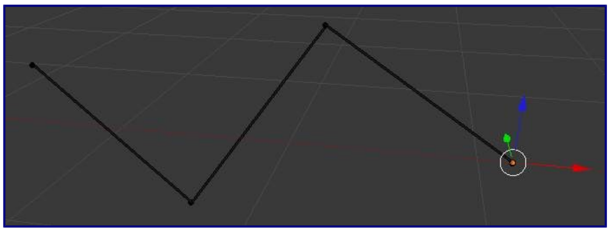
They also have a radius property, only useful for the envelope deformation method (see below).

Bones Visualization

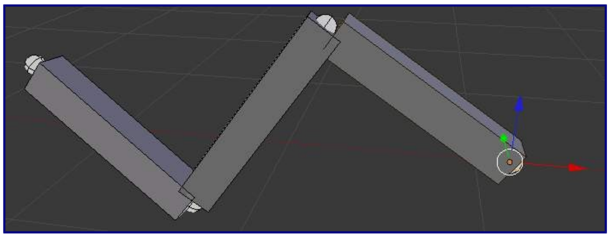
Bones can be visualized in various ways: *Octahedron*, *Stick*, *B-Bone*, *Envelope* and *Wire*. Custom shapes can be used, too!



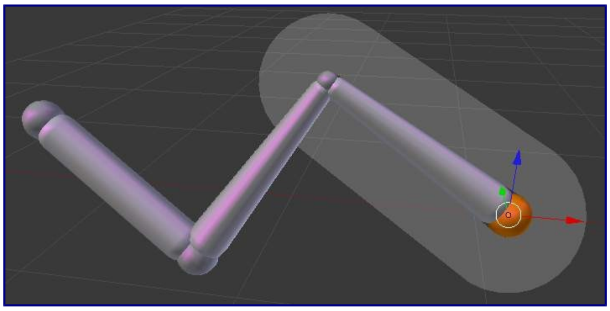
Octahedral bone display.



Stick bone display.



B-Bone bone display.



Envelope bone display.

Since armatures are made of bones, you’ll find more about this when we’ll talk about *Armatures Visualization*.

Activating *Axes* checkmark on the *Armature* / *Display* panel, will show local axes for each bone’s tip. The Y axis is always aligned along the bone, oriented from root to tip. So, this is the “roll” axis of the bones.

The Bone context.

Bones properties

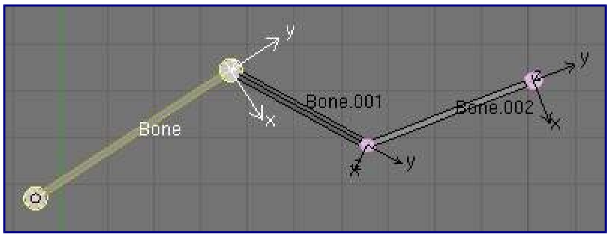
When bones are selected (hence in *Edit mode* and *Pose mode*), their properties are shown in the *Bone* button context of the *Properties* window.

This shows different panels used to control features of each selected bone; the panels change depending on which mode you're working in.

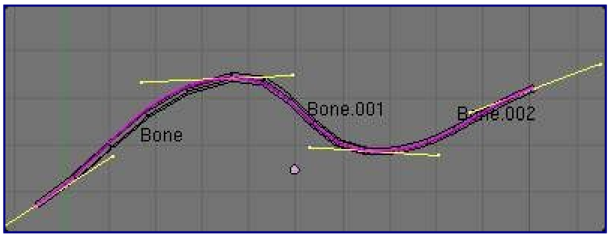
Bones Rigidity

Even though bones are rigid (i.e. behave as rigid sticks), they are made out of *segments*. *Segments* are small, rigid linked elements that can rotate between each other. By default, each new bone has only one segment and as such it cannot "bend" along its length. It is a rigid bone.

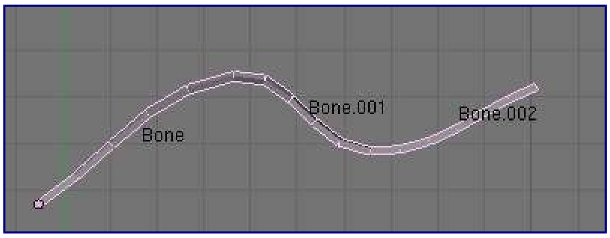
You can see these segments in *Object mode* and in *Pose mode*, and only if bones are visualized as *B-bones*; while in *Edit mode* bones are always drawn as rigid sticks. Note that in the special case of a single bone, you can't see these segments in *Object mode*, because they're aligned.



An armature of B-Bones, in Edit mode



The Bézier curve superposed to the chain, with its handles placed at bones' ends.



The same armature in Object mode

When you connect bones to form a chain, Bforartists calculates a Bezier curve passing through all the bones' ends, and bones' segments in the chain will bend and roll to follow this invisible curve.

You have no direct access to this curve; you can only control it to some extent using bone properties, as explained in the editing pages.

In *An armature of B-Bones in Edit mode* we connected 3 bones, each one made of 5 segments. These are *B-bones* but as you see, in *Edit mode* they are shown as rigid elements. Look at *The same armature in Object* *mode*: now, in *Object mode*, we can see how the bones' segments smoothly "blend" into each other, even for roll.

Of course, a geometry influenced by the chain is smoothly deformed according to the Bezier curve! In fact, smooth bones are an easy way to replace long chains of many small rigid bones posed using IK...

However, if the chain has an influence on objects rather than geometry, the segments' orientation is not taken in account (details are explained in the *skinning part*).

When not visualized as *B-Bone* s, bones are always shown as rigid sticks, *even though the bone segments are still present and effective* (see *skinning to ObData*).

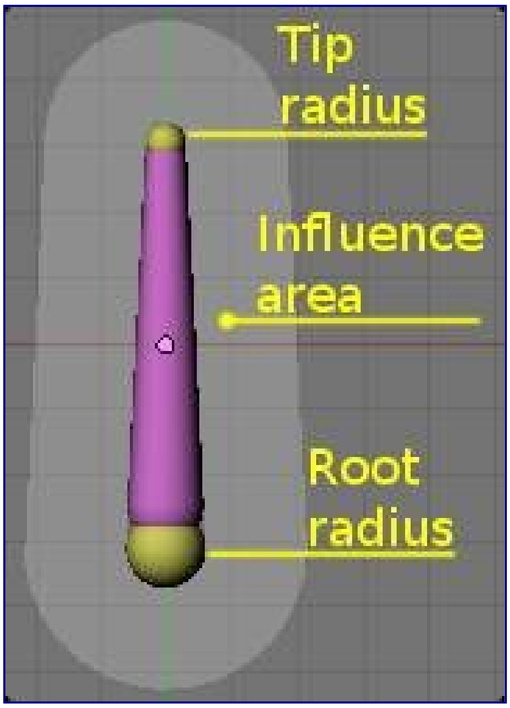
This means that even in e.g. *Octahedron* visualization, if some bones in a chain have several segments, they will nonetheless smoothly deform their geometry...

Bones Influence

Basically, a bone controls a geometry when vertices "follow" the bone. This is like how the muscles and skin of your finger follow your finger-bone when you move a finger.

To do this, you have to define **how much** a bone influences a certain vertex.

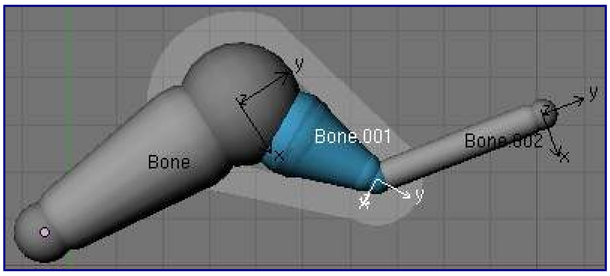
The simplest way is to have each bone affecting those parts of the geometry that are within a given range from it. This is called the *envelope technique*, because each bone can control only the geometry "enveloped" by its own influence area.



A bone in Envelope visualization, in Edit mode.

If a bone is visualized as *Envelope*, in *Edit mode* and in *Pose mode* you can see the area of influence, which depends on:

- the *distance* property
- the root's radius and the tip's radius.



Our armature in Envelope visualization, in Pose mode.

All these influence parameters are further detailed in the *skinning pages*.

Armature Editing

Reference
Mode: *Edit mode*

As with any other object, you edit your armature in *Edit mode*

Editing an armature means two main domains of action:

- *Editing the bones* - i.e. adding/inserting/deleting/extruding/sub-dividing/joining them...
- *Editing the bones' properties* - this includes key features, like transform properties (i.e. grab, scale, etc...) and relationships between bones (parenting and connecting), as well as bones' names, influence, behavior in *Pose* mode, etc.

These are standard editing methods, quite similar for example to *meshes* editing. Bforartists also features a more advanced "armature sketching" tool, called *Etch-a-Ton*. The same tool might also be used in *templating*, i.e. using another armature as template for the current one...

Warning
One important thing to understand about armature editing is that you **edit the rest position of your armature**, i.e. its "default state". An armature in its *rest position* has all bones with no rotation and scaled to **1.0** in their own local space.

The different *poses* you might create afterwards are based on this rest position - so if you modify it in *Edit mode*, all the poses already existing will also be modified. Thus you should in general be sure that your armature is definitive before starting to *skin* and *pose* it!

Warning
Please note that some tools work on bones' ends, while others work on bones themselves. Be careful not to get confused.

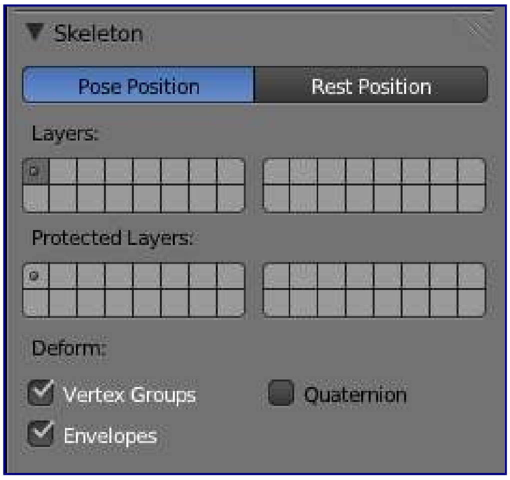
Armature Panels Overview

Reference
Reference Mode: *Object mode*, *Edit mode* and *Pose mode* Panel: All in *Properties* window, *Object data* property

Let’s first have a general overview of the various panels gathering the armature settings, in *Properties* window, *Object data* context:

The Object data property in the Properties window.

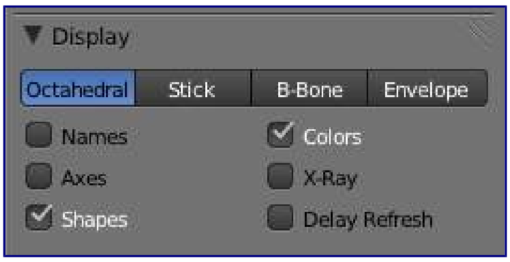
Skeleton panel (all modes)



The Skeleton panel.

In this panel you can arrange sets of bones into different layers for easier manipulation.

Display panel (all modes)



The Display panel.

This controls the way the bones appear in 3D view; you have 4 different options you can select.

There are several other options available which we will cover later on.

Bone groups panel (pose mode)

The Bone Groups panel.

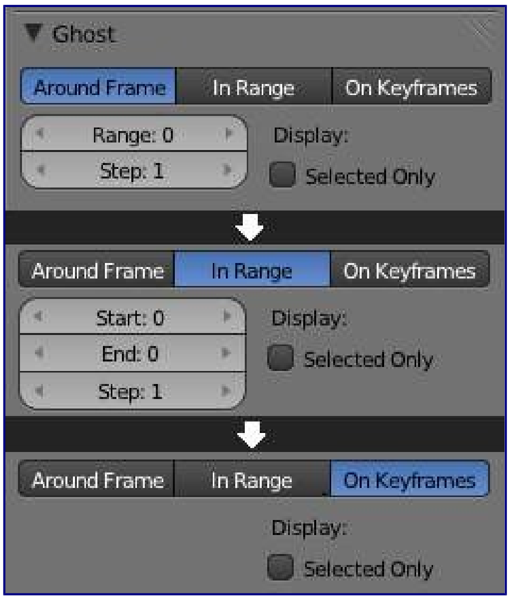
Lets you assign sets of bones into groups for easy manipulation and management.

Pose Library panel (Pose mode)

The Pose Library panel.

Allows you to save different settings (location, rotation, scale) for selected bones for later use.

Ghost panel (all modes)



The Ghost panel.

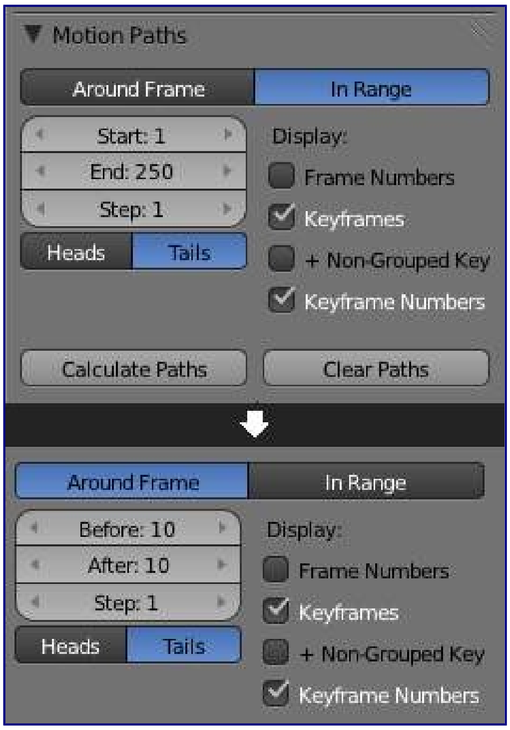
Allows you to see a set of different consecutive poses, very useful when animating.

iTaSC parameters panel (all modes)

The iTaSC parameters panel.

Defines the type of IK solver used in your animation.

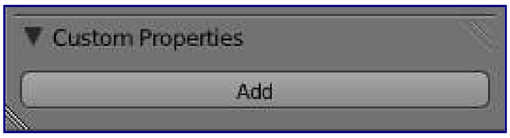
Motion Paths panel (Pose mode)



The Motion Paths panel.

In this panel you can enable visualization of the motion path your skeleton leaves when animated.

Custom Properties panel (all modes)



The Custom Properties panel.

Panel for defining custom properties; this is used when scripting.

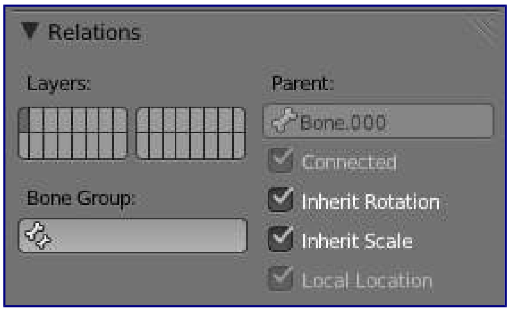
Bone Panels Overview

Reference
Mode: *Object mode*, *Edit mode* and *Pose mode* Panel: All in *Properties* window, *Bone* property

Let’s first have a general grasp of the various panels gathering the bone settings, in *Properties* window, *Bone* context:

The Bone context.

Relations panel (edit mode)



The Relations panel.

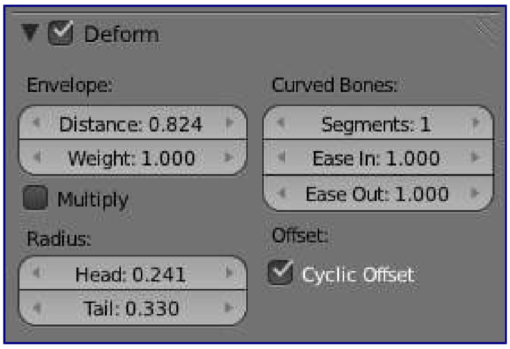
In this panel you can arrange sets of bones in different layers for easier manipulation.

Display panel (object mode)

The Display panel.

Display panel lets you customize the look of your bones taking the shape of a another existing object.

Deform panel (all modes)



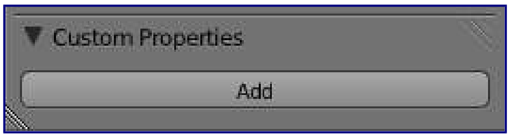
The Deform panel.

In this panel you can set basic properties of the bones.

Turning the Deform option on and off, includes the active bone in the Automatic Weight Calculation when the Mesh is Parented to the Armature using the Armature Deform with the “With Automatic Weights” option.

Also it’s worth noting that by turning off a bone’s deform option, makes it not influence the mesh at all, overriding any weights that it might have been assigned before; It mutes its influence.

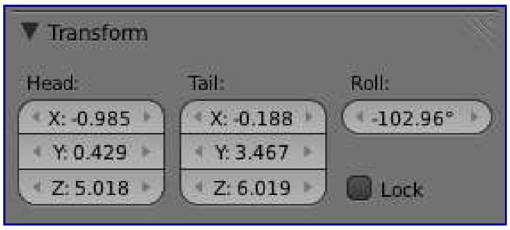
Custom Properties panel (all modes)



The Custom Properties panel.

Panel for defining custom properties, this is used when scripting.

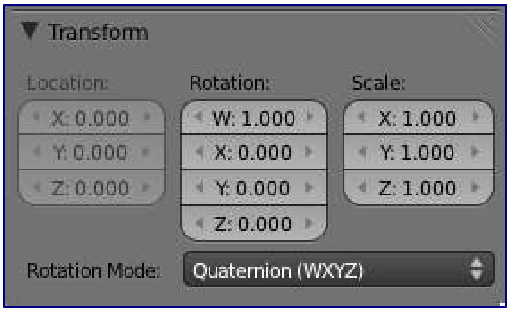
Transform panel (edit and pose mode)



The Transform panel(edit mode).

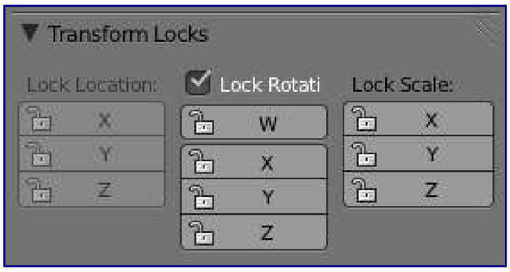
When in edit mode you can use this panel to control position and roll of individual bones.

When in pose mode you can only set location for the main bone, and you can now set rotation and scale.



The Transform panel(pose mode).

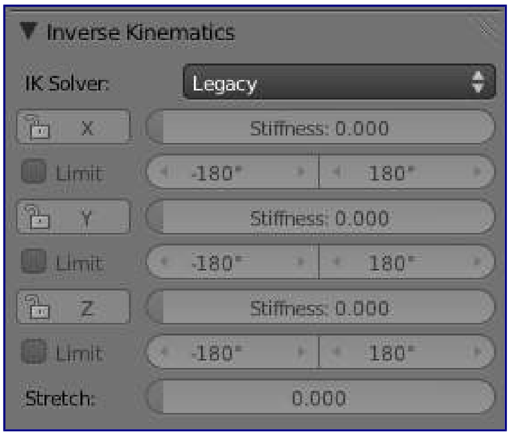
Transform Locks panel (pose mode)



The Transform Locks panel.

This panel appears only in pose mode and allows you to restrict position, rotation and scale by axis on each bone in the armature.

Inverse Kinematics panel (pose mode)



The Inverse Kinematics panel.

This panel controls the way a bone or set of bones behave when linked in an inverse kinematic chain.

Selecting armature's bones

Reference
Mode: *Edit mode* Panel: Bone panel

You can select and edit bones of armatures in *Edit mode* and in *Pose mode*. Here, we will see how to select bones in *Edit mode*. Selecting bones in *Pose mode* is similar to selecting in *Edit mode* with a few specific differences that will be detailed in the *posing part*.

Similar to *vertices/edges selection* in meshes, there are two ways to select whole bones in *Edit mode*:

- directly, by selecting the bone's body
- selecting both of its end points (root and tip)

This is an important point to understand, because selecting bones' ends only might lead to non-obvious behavior, with respect to which bone you actually select, see the.

Note that unlike the mesh draw type the armature draw type has no effect on selection behavior. In other words, you can select a bone's end or body the same way regardless of the bone visualization chosen.

Selecting bones' ends

To select bones' ends you have the standard selection methods.

action	shortcut	menu	mouse
Select a bone's end			`RMB` -click on it
Add or Remove from the current selection			`Shift-RMB`

action	shortcut	menu	mouse
Box selection	Click and drag `LMB` the box around the ends you want to add to the current selection Click and drag `LMB` to remove from the current selection release `LMB` to validate press `Esc` or click `RMB` to cancel		
Box selection tool OFF	`B` or `Esc`		`RMB`
Lasso selection	Click and drag `Ctrl-LMB` the lasso around the ends you want to add to the current selection Click and drag `Ctrl-Shift-LMB` to remove from the current selection Release `LMB` to validate Hit `Esc` or click `RMB` to cancel		

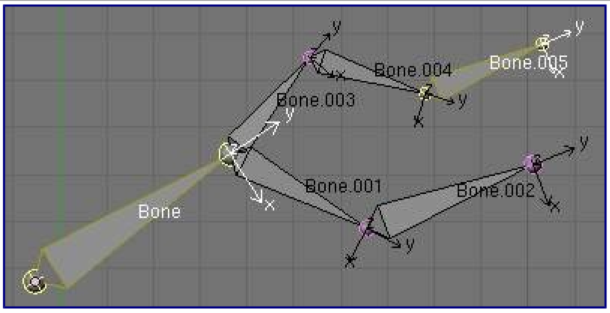
Inverse selection

As stated above, you have to remember that these selection tools are for bones' ends only, not the bones' bodies.

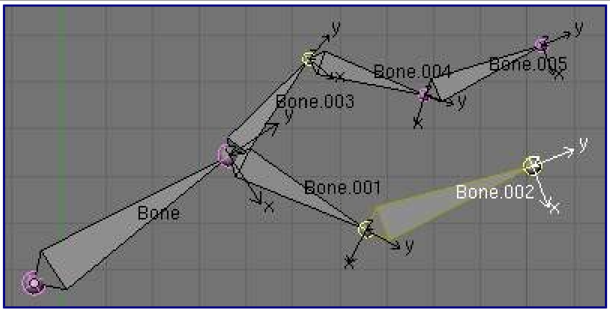
For example, the *Inverse* selection option inverts the selection of bones' ends, not of bones (see *Inverse selection*).

Remember that a bone is selected only if both its ends are selected. So, when the selection status of bones' ends is inverted, a new set of bones is selected.

Inverse selection



Two bones selected.



The result of the inverse selection Ctrl-I the bones ends selection has been inverted, and not the bones selection.

Selecting connected bones' ends

Another example is: when you select the root of a bone connected to its parent, you also implicitly select the tip of its parent (and vice versa).

Remember: when selecting bones' ends, the tip of the parent bone is the "same thing" as the root of its children bones.

Selecting Bones

By `RMB` -clicking on a bone's body, you will select it (and hence you will implicitly select its root and tip).

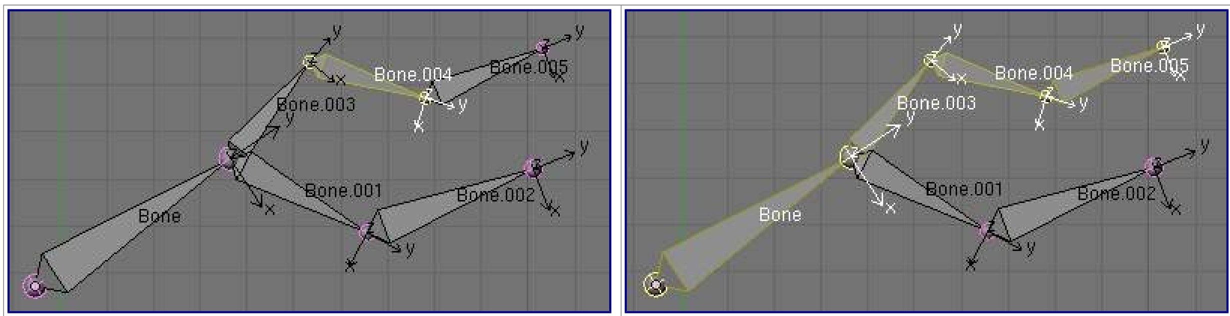
To each selected bone corresponds a sub-panel in the *Armature Bones* panel (*Editing* context). These sub-panels contain settings for some of the bones' properties (regarding e.g. relationships between bones, bones' influence on deformed geometry, etc.), as we will see later.

Using `Shift-click` , you can add to/remove from the selection.

You also have some **advanced selection** options, based on their relations.

You can select at once all the bones in the chain which the active (last selected) bone belongs to by using the *linked selection* tool, `L`.

Linked bones selection



A single selected bone. | Its whole chain selected with [L].

You can deselect the active bone and select its immediate parent or one of its children using respectively Select

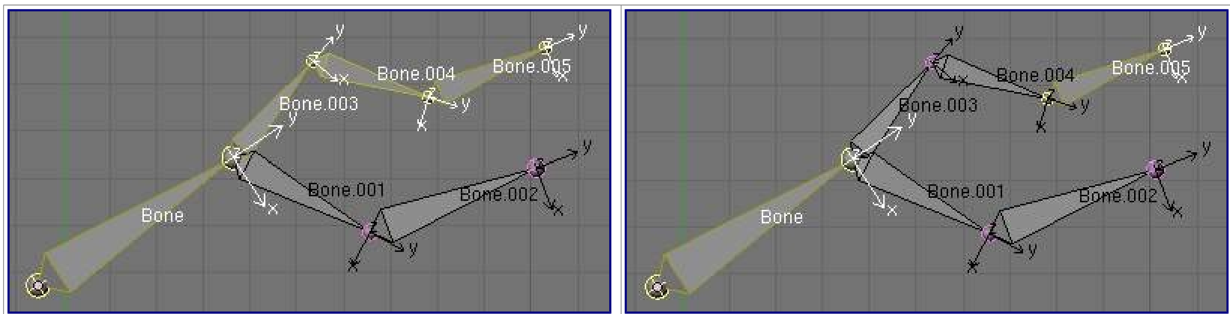
Deselecting connected bones

There is a subtlety regarding connected bones.

When you have several connected bones selected, if you deselect one bone, *you will in fact deselect its tip, but not its root if it is also the tip of another selected bone.*

To understand this, look at *Bone deselection in a selected chain*.

Bone deselection in a selected chain



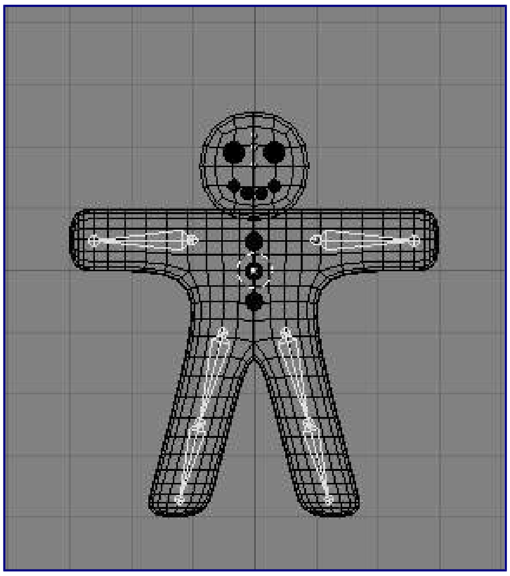
A selected chain.

After `Shift-RMB` -clicking `Bone.003`:

- `Bone.003` 's tip (which is same as `Bone.004` 's root) is deselected

- `Bone` is `Bone.003` ‘s parent. Therefore `Bone.003` ‘s root is same as the tip of `Bone`. Since `Bone` is still selected, its tip is selected. Thus the root of `Bone.003` remains selected.

Armature Structure



Example of a very basic armature.

Armatures mimic real skeletons. They are made out of bones, which are (by default) rigid elements. But you have more possibilities than with real skeletons: In addition to the “natural” rotation of bones, you can also translate and even scale them! And your bones do not have to be connected to each other; they can be completely free if you want. However, the most natural and useful setups imply that some bones are related to others, forming so-called “chains of bones”, which create some sort of “limbs” in your armature, as detailed in Chains of Bones.

Chains of Bones

An armature with two chains of bones.

The bones inside an armature can be completely independent from each other (i.e. the modification of one bone does not affect the others). But this is not often a useful set up: To create a leg, all bones “after” the thigh bone should move “with” it in a well-coordinated manner. This is exactly what happens in armatures - by parenting a bone to the next one in the limb, you create a “chains of bones”. These chains can be ramified. For example, five fingers attached to a single “hand” bone.

Bones are chained by linking the tip of the parent to the root of the child. Root and tip can be *connected*, i.e.

they are always exactly at the same point; or they can be *free*, like in a standard parent-child object relationship.

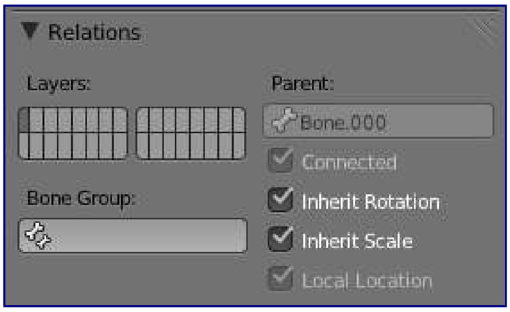
A given bone can be the parent of several children, and hence be part of several chains at the same time.

The bone at the beginning of a chain is called its *root bone*, and the last bone of a chain is the *tip bone* (don't confuse them with similar names of bones' ends!).

Chains of bones are a particularly important topic in *posing* (especially with the standard *forward kinematics* versus "automatic" *inverse kinematics* posing techniques). You create/edit them in *Edit* mode, but except in case of connected bones, their relationships have no effect on bone transformations in this mode (i.e. transforming a parent bone won't affect its children).

Editing Bones Relationships

This is detailed in the editing pages, but let us have a quick look at this important feature.



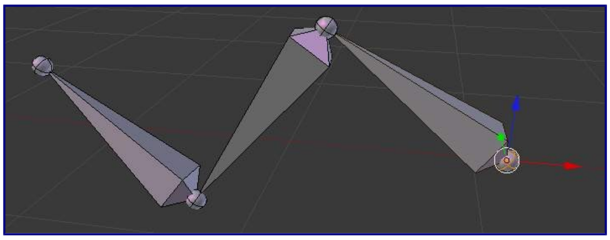
The Armature Bones panel with two bones selected, and their Child of settings highlighted.

The easiest way to manage bones relationships is to use the *Relations* panel *Bone* context:

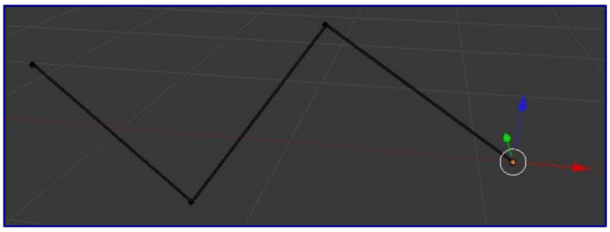
- First, *select* the bones you want to edit (selection order does not matter here).
- To *parent* a bone to another one, select the name of this parent in its drop-down *Parent* list.
- To *unparent* a bone, just select the void entry in the same *Parent* list.
- To *connect* a bone to its parent, enable its small *Con* button.
- To *unconnect* a bone, disable its *Con* button.

Armature visualization

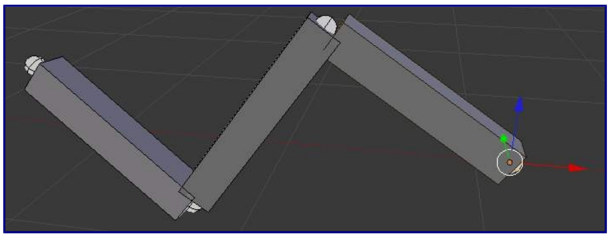
We have 4 basic bone visualization: Octahedral, Stick, B-Bone, Envelope and Wire:



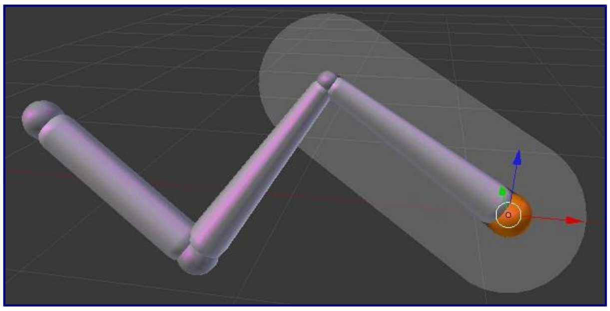
Octahedral bone display.



Stick bone display.



B-Bone bone display.

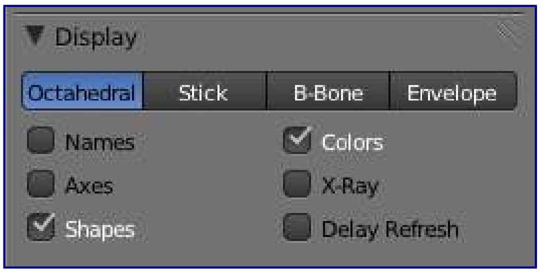


Envelope bone display.

Display Panel

Reference
Mode: *Object*, *Edit* and *Pose* modes Panel: *Display Object Data* context

But let’s first see some general visualization properties of armatures, found in the *Display* panel of the *Object data* context.



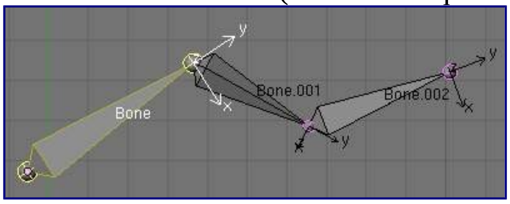
The Display panel.

Bone Types

Octahedral bone

This is the default visualization, well suited for most of editing tasks. It materializes:

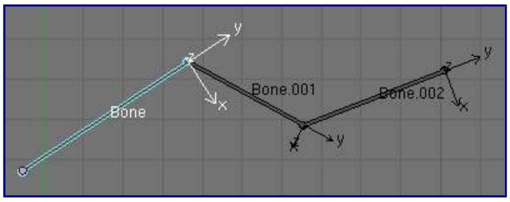
- The bone root (“big” end) and tip (“small” end).
- The bone “size” (its thickness is proportional to its length).
- The bone roll (as it has a square section).



Note the 40- rolled Bone.001 bone.

Stick bone

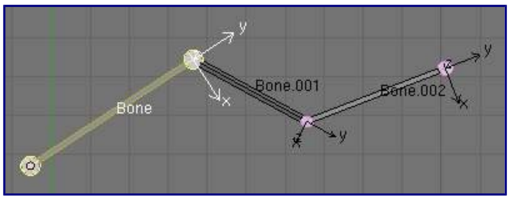
This is the simplest and most non-intrusive visualization. It just materializes bones by sticks of constant (and small) thickness, so it gives you no information about root and tip, nor bone size or roll angle.



Note that Bone.001 roll angle is not visible (except by its XZ axes).

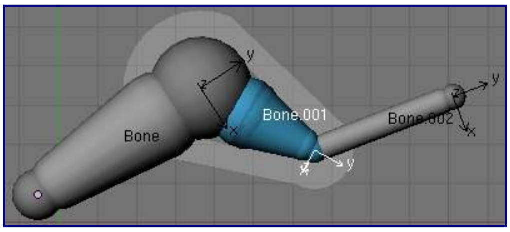
B-Bone bone

This visualization shows the curves of “smooth” multi-segmented bones; see the bone page for details.



Envelope bone

This visualization materializes the bone deformation influence. More on this in the bone page.



Draw Options

Names
When enabled, the name of each bone is drawn.

Colors
This is only relevant for *Pose* mode, and is described in detail *there*.

Axes

When enabled, the (local) axes of each bone are drawn (only relevant for *Edit* and *Pose* modes).

X-Ray

When enabled, the bones of the armature will always be drawn on top of the solid objects (meshes, surfaces, ...) - i.e. they will always be visible and selectable (this is the same option as the one found in the *Display* panel of the *Object data* context. Very useful when not in *Wireframe* mode.

Shapes

When enabled, the default standard bone shape is replaced, in *Object* and *Pose* modes, by the shape of a chosen object (see Shaped Bones for details).

Delay Refresh

When enabled, the bone doesn't deform its children when manipulating the bone in pose mode.

Shaped Bones

Reference
Mode: *Object* and *Pose* modes Panel: *Display* panel from *Bone* context.

Bforartists allows you to give to each bone of an armature a specific shape (in *Object* and *Pose* modes), using another object as "template". First of all, you have to enable the *Shapes* button (*Armature* panel).

The Display panel.

Attributes

Wireframe

When enabled, bone is displayed in wireframe mode regardless of the viewport drawing mode. Useful for non-obstructive custom bone chains.

Hide

Bone is not visible when not in *Edit mode*.

Custom Shape

Object that defines the custom shape of the selected bone.

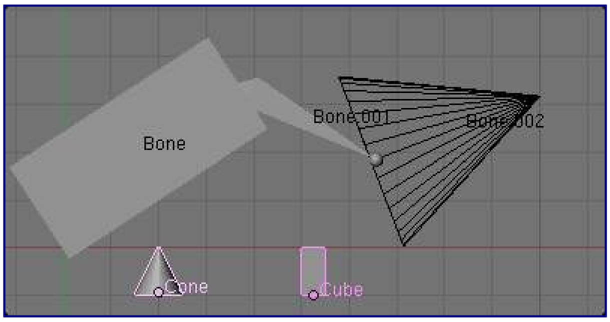
Custom At

Bone that defines the display transform of this shape bone

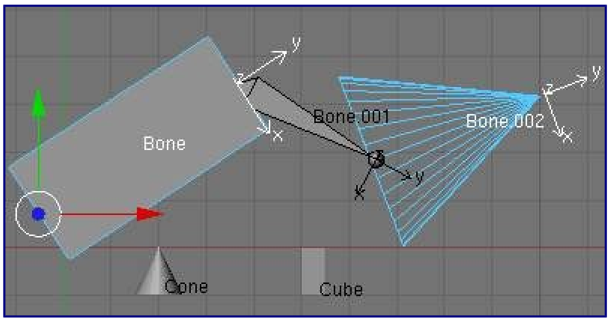
To assign a custom shape to a bone, you have to:

- Switch to *Pose* mode
- Select the relevant bone
- Go to the *Display* panel *Custom Shape* field and select the 3D object previously created in the scene; in this example we are using a cube and a cone. Tou can optionally set the *At* field to another bone.

The Display panel.



The armature with shapes assigned to two bones, in Object mode. Note the centers of the Cone and Cube objects.



The same armature in Pose mode...

Note that:

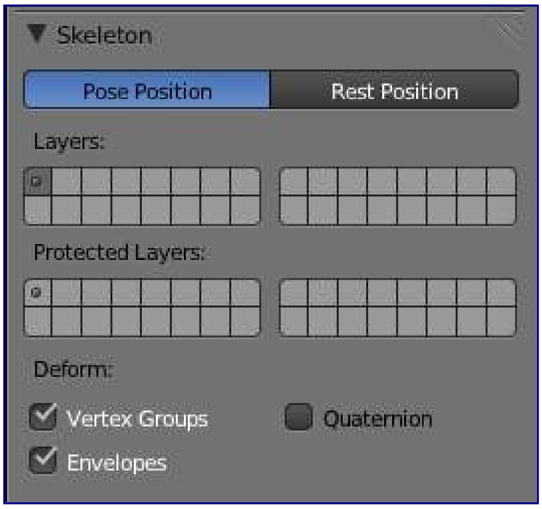
- These shapes will never be rendered - like any bone, they are only visible in 3D views.
- Even if any type of object seems to be accepted by the *OB* field (meshes, curves, even metas...), only meshes really work - all other types just make the bone invisible; nothing is drawn...
- The center of the shape object will be at the *root of the bone* (see the *bone page* for root/tip).
- The object properties of the shape are ignored (i.e. if you make a parallelepiped out of a cube by modifying its dimensions in *Object* mode, you’ll still have a cube shaped bone...).
- The “along bone” axis is the Y one, and the shape object is always scaled so that one Bforartists Unit stretches along the whole bone length.
- If you need to remove the custom shape of the bone, just right click in the *Custom Shape* field and select *Reset to default value* in the pop-up menu.

So to summarize all this, you should use meshes as shape objects, with their center at their lower-Y end, and an overall Y length of **1.0** BU.

Armature Layers

Reference
Mode: *Object*, *Edit* and *Pose* modes

Panel: *Skeleton* panel, *Object data* context



The Skeleton panel.

Each armature has 32 “Armature layers” which allow you to organize your armature by “regrouping” sets of bones into layers; this works similar to scene layers (those containing your objects). You can then “move” a bone to a given layer, hide or show one or several layers, etc.

Showing/hiding bone layers

Only bones in active layers will be visible/editable - but they will always be effective (i.e move objects or deform geometry), whether in an active layer or not. To (de)activate a layer, you have several options, depending in which mode you are in:

- In all modes, use the row of small buttons at the top of the *Display Options* group, *Armature* panel. If you want to enable/disable several layers at once, as usual, hold `Shift` while clicking...
- In *Edit* and *Pose* modes, you can also do this from the *3D View* s, by using the menu (Armature ‣ Switch Armature Layers or Pose ‣ Switch Armature Layers), to display a small pop-up dialog containing the same buttons as described above (here again, you can use `Shift-LMB` clicks to (de)select several layers at once).

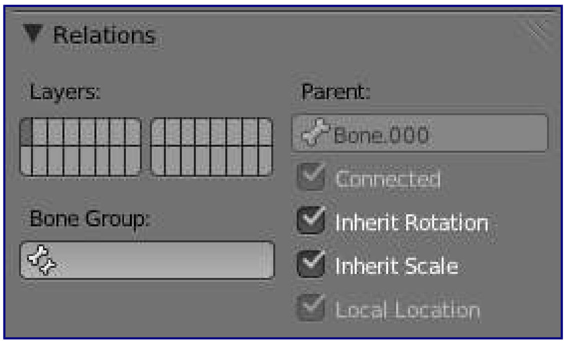
Protected Layers

You can lock a given bone layer for all proxies of your armature, i.e. all bones in this layer won’t be editable. To do so, in the *Skeleton* panel, `Ctrl-LMB` click on the relevant button, the layer lock will be enabled.

Protected layers in proxy are restored to proxy settings on file reload and undo.

Bone Layers

Reference
Mode: *Object*, *Edit* and *Pose* modes Panel: *Relations* panel *Bone* context



The Relations panel.

Moving bones between layers

Obviously, you have to be in *Edit* or *Pose* modes to move bones between layers - note that as with objects, bones can lay in several layers at once, just use the usual `Shift-LMB` clicks... First of all, you have to select the chosen bone(s)!

- In the *Button* window, use the “layer buttons” of each selected bone “sub-panel” (*Armature Bones* panel) to control in which layer(s) it lays.
- In the *3D View* window, use the menu (Armature ‣ Move Bone To Layer or Pose ‣ Move Bone To Layer) to show the usual pop-up layers dialog. Note that this way, *you assign the same layers to all selected bones*.

Hiding Bones

Reference
Mode: *Edit* and *Pose* modes Panel: *Display* panel, *Bone* context

The Display panel.

You do not have to use bone layers to show/hide some bones. As with objects, vertices or control points, you can use the Hide command.

You can also use the *Hide* check button of the *Display* panel, *Bone* context).

Note that hidden bones are specific to a mode - i.e. you can hide some bones in *Edit* mode, they will still be visible in *Pose* mode, and vice-versa. Hidden bone in *Pose* mode are also invisible in *Object* mode. And in *Edit* mode, the bone to hide must be fully selected, not just his root or tip...

Editing

Editing Bones

Reference
Mode: *Edit mode*

You'll learn here how to add (Adding Bones), delete (Deleting Bones) or subdivide (Subdividing Bones) bones. We will also see how to prevent any bone transformation (Locking Bones) in *Edit* mode, and the option that features an automatic mirroring (X-Axis Mirror Editing) of editing actions along the X axis.

Adding Bones

To add bones to your armature, you have more or less the same options as when editing meshes:

- *Add* menu,
- extrusion,
- `Ctrl-LMB` clicks,
- fill between joints,
- duplication.

Add Menu

Reference
Mode: *Edit mode* *Menu: Tool Shelf > Tools > Armature Tools*

This bone will be:

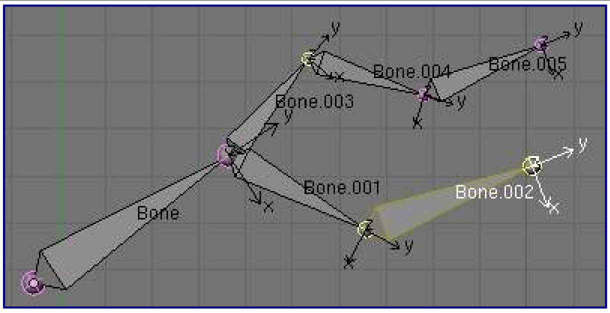
- of one Bforartists Unit of length,
- oriented towards the positive Y axis of the view,
- with its root placed at the 3D cursor position,
- with no relationship with any other bone of the armature.

Extrusion

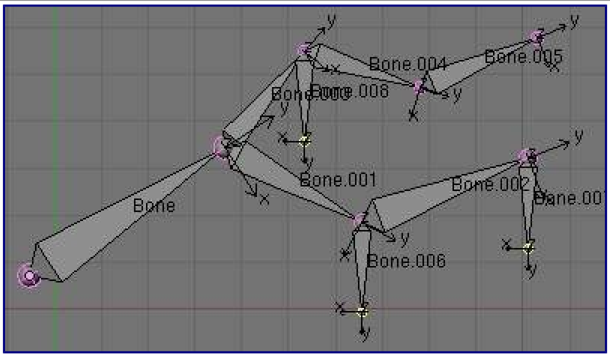
Reference
Mode: *Edit mode* Menu: Armature ‣ Extrude

You can create a new bone by extrude. This bone will be the child of “its” tip owner, and connected to it. As usual, once extrusion is done, only the new bones' tips are selected, and in grab mode, so you can place them to your liking. See (*Extrusion example*).

Extrusion example



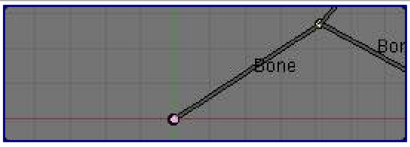
An armature with three selected tips.



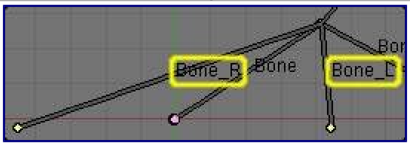
The three extruded bones.

You also can use the rotating/scaling extrusions, as with meshes, by pressing respectively `E-R` and `E-S` - as well as *locked* extrusion along a global or local axis.

Mirror extrusion example



A single selected bone’s tip.



The two mirror-extruded bones.

Bones have an extra “mirror extruding” tool, it behaves exactly like the standard extrusion. But once you have enabled the X-Axis mirror editing option (see X-Axis Mirror Editing), each extruded tip will produce *two new bones*, having the same name except for the `_L`/`_R` suffix (for left/right, see the next page). The `_L` bone behaves like the single one produced by the default extrusion - you can grab/rotate/scale it exactly the same way. The `_R` bone is its mirror counterpart (along the armature’s local X axis), see (*Mirror extrusion example*).

Warning
Cancelling the extrude action causes the newly created bones to snap back to the source position, *(creating zero length bones)*. These will be removed when exiting editmode, however they can cause confusion and it’s unlikely you want to keep them. If you realize the problem immediately undo the extrude action.

In case you’re wondering, you cannot just delete to solve this as you would in mesh editing, because extrusion selects the newly created tips, and as explained below the delete command ignores bones’ ends. To get rid of these extruded bones without undoing, you would have to move the tips, then select the bones and delete (Deleting Bones) them.

Mouse Clicks

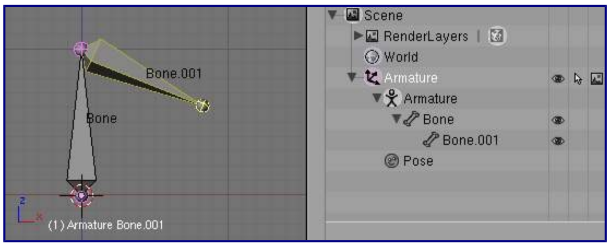
Reference
Mode: *Edit mode* Hotkey: `Ctrl-LMB`

If at least one bone is selected, `Ctrl-LMB` -clicking adds a new bone.

About the new bone’s tip:

- after you `Ctrl-LMB` -clicked it becomes the active element in the armature,
- it appears to be right where you clicked, but...
- ...(as in mesh editing) it will be on the plane parallel to the view and passing through the 3D cursor.

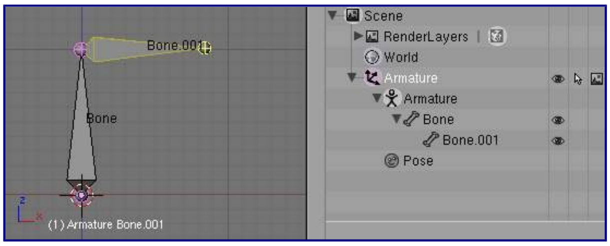
The position of the root and the parenting of the new bone depends on the active element:



Ctrl-clicking when the active element is a bone

If the active element is a **bone**

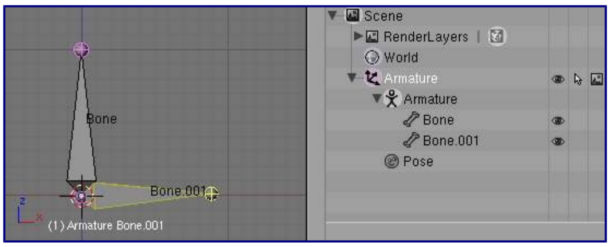
- the new bone's root is placed on the active bone's tip
- the new bone is parented and connected to the active bone (check the outliner in *Ctrl-clicking when the active element is a bone*).



Ctrl-clicking when the active element is a tip

If the active element is a **tip** :

- the new bone's root is placed on the active tip
- the new bone is parented and connected to the bone owning the active tip (check the outliner in *Ctrl-clicking when the active element is a tip*).

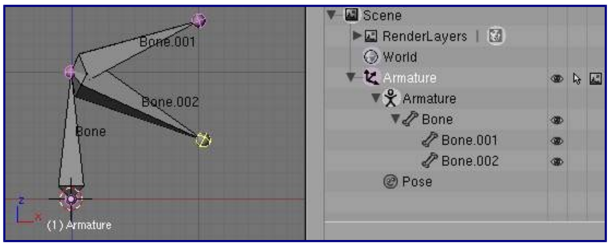


Ctrl-clicking when the active element is a disconnected root

If the active element is a **disconnected root** :

- the new bone's root is placed on the active root
- the new bone is **NOT** parented to the bone owning the active root (check the outliner in *Ctrl-clicking when the active element is a disconnected root*).

And hence the new bone will **not** be connected to any bone.



Ctrl-clicking when the active element is a connected root

If the active element is a **connected root** :

- the new bone’s root is placed on the active root
- the new bone **IS** parented and connected to the parent of the bone owning the active root (check the outliner in *Ctrl-clicking when the active element is a connected root*).

This should be obvious because if the active element is a connected root then the active element is also the tip of the parent bone, so it is the same as the second case.

As the tip of the new bone becomes the active element, you can repeat these ctrl-clicks several times, to consecutively add several bones to the end of the same chain.

Fill between joints

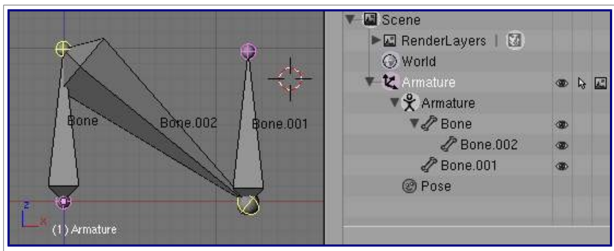
Reference
Mode: *Edit mode*
Menu: Armature ‣ Fill Between Joints

The main use of this tool is to create one bone between two selected ends, similar to how in mesh editing you can “create edges/faces”.

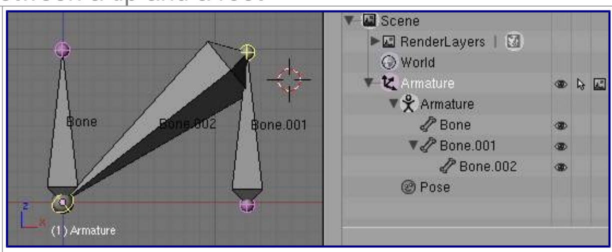
If you have one root and one tip selected, the new bone:

- will have the root placed on the selected tip
- will have the tip placed on the selected root
- will be parented and connected to the bone owning the selected tip

Fill between a tip and a root



Active tip on the left

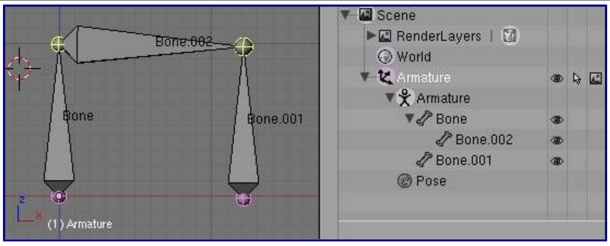


Active tip on the right

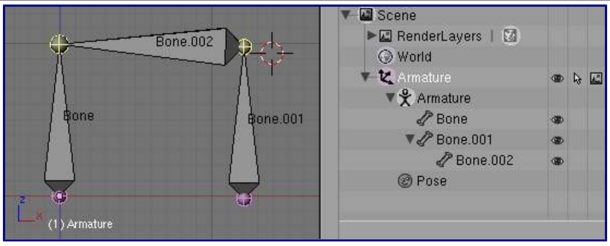
If you have two tips selected, the new bone:

- will have the root placed on the selected tip closest to the 3D cursor
- will have the tip placed on the other selected tip
- will be parented and connected to the bone owning the tip used as the new bone’s root

Fill between tips



3D cursor on the left



3D cursor on the right

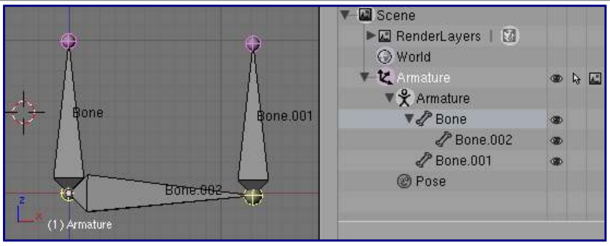
If you have two roots selected, you will face a small problem due to the event system in Bforartists not updating the interface in real time.

When clicking F, similar to the previous case, you will see a new bone:

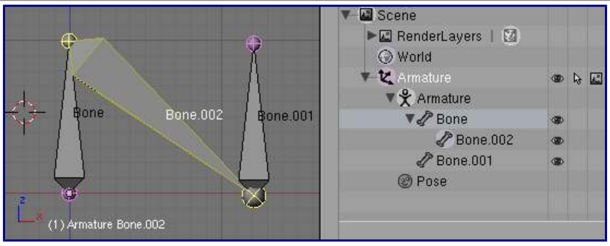
- with the root placed on the selected root closest to the 3D cursor
- with the tip placed on the other selected root
- parented and connected to the bone owning the root used as the new bone's root

If you try to move the new bone, Bforartists will update the interface and you will see that the new bone's root moves to the tip of the parent bone.

Fill between roots



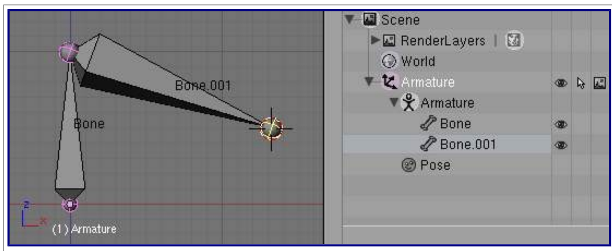
Before UI update (3D cursor on the left)



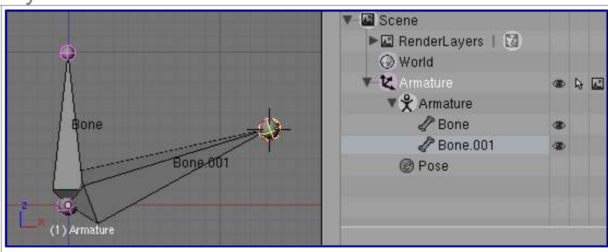
After UI update, correct visualization

Clicking F with only one bone end selected will create a bone from the selected end to the 3D cursor position, and it won't parent it to any bone in the armature.

Fill with only one bone end selected



Fill with only one tip selected



Fill with only one root selected

You will get an error when:

- trying to fill two ends of the same bone, or
- trying to fill more than two bone ends.

Duplication

Reference
Mode: *Edit mode*
Menu: Armature ‣ Duplicate

Note
This tool works on selected bones; selected ends are ignored.

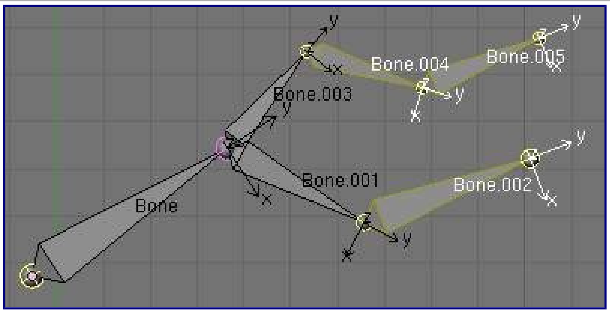
As in mesh editing,

- the selected bones will be duplicated,
- the duplicates become the selected elements and they are placed in grab mode, so you can move them wherever you like.

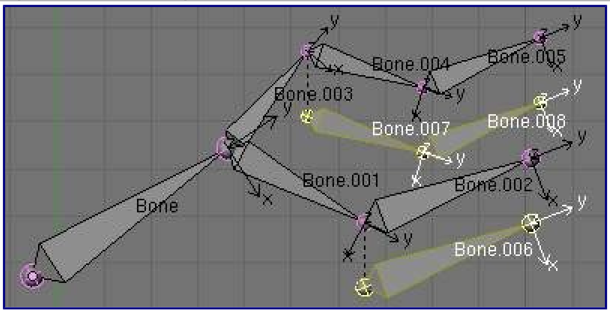
If you select part of a chain, by duplicating it you'll get a copy of the selected chain, so the copied bones are interconnected exactly like the original ones.

The duplicate of a bone which is parented to another bone will also be parented to the same bone, even if the root bone is not selected for the duplication. Be aware, though, that if a bone is parented **and connected** to an unselected bone, its copy will be parented **but not connected** to the unselected bone (see *Duplication example*).

Duplication example



An armature with three selected bones and a selected single root.



The three duplicated bones. Note that the selected chain is preserved in the copy, and that Bone.006 is parented but not connected to Bone.001, as indicated by the black dashed line. Similarly, Bone.007 is parented but not connected to Bone.003.

Deleting Bones

You have two ways to remove bones from an armature: the standard deletion, and merging several bones in one.

Standard deletion

Reference
Mode: *Edit mode* Menu: Armature ‣ Delete

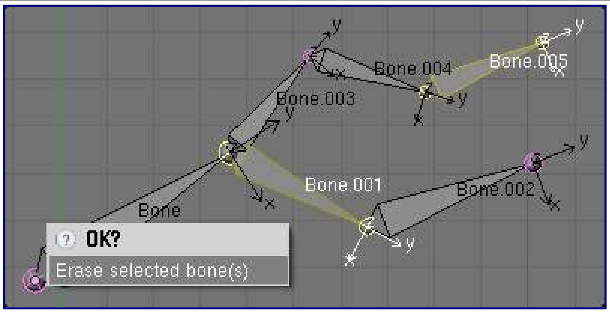
Note
This tool works on selected bones: selected ends are ignored.

To delete a bone, you can:

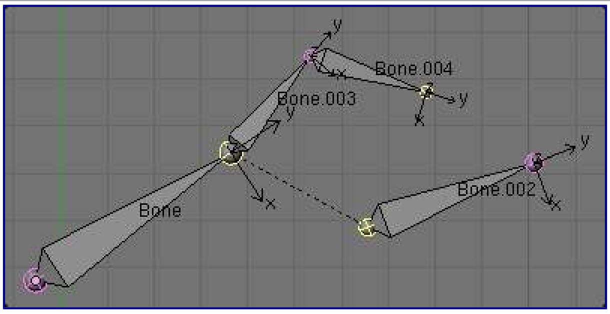
- press the standard `delete` key and confirm, or
- use the menu Armature ‣ Delete and confirm.

If you delete a bone in a chain, its child(ren) will be automatically re-parented to its own parent, **but not connected**, to avoid deforming the whole armature.

Deletion example



An armature with two selected bones, just before deletion.



The two bones have been deleted. Note that Bone.002, previously connected to the deleted Bone.001, is now parented but not connected to Bone.

Merge

Reference
Mode: *Edit mode*
Menu: Armature ‣ Merge

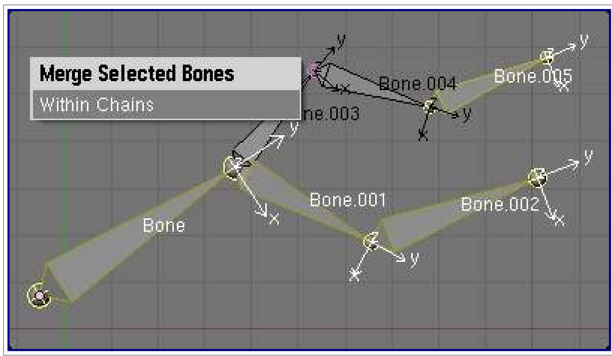
You can merge together several selected bones, *as long as they form a chain*. Each sub-chain formed by the selected bones will give one bone, whose root will be the root of the root bone, and whose tip will be the tip of the tip bone.

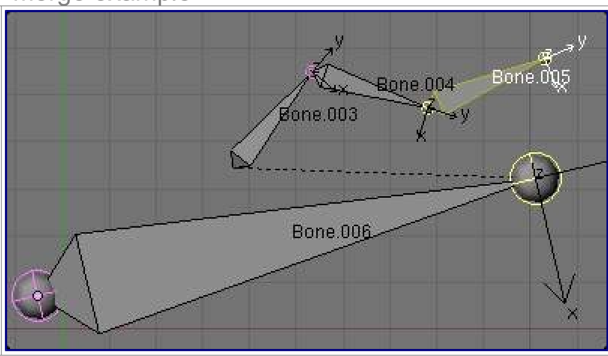
Confirm by clicking on *Within Chains* in the *Merge Selected Bones* pop-up.

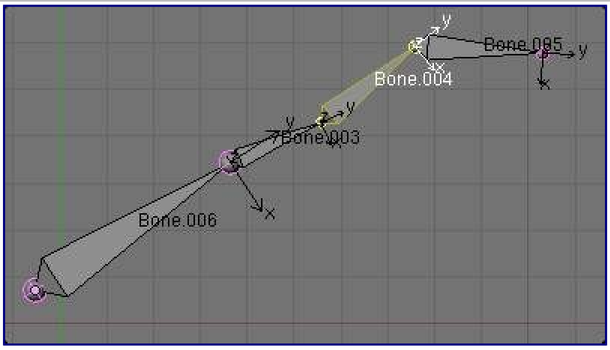
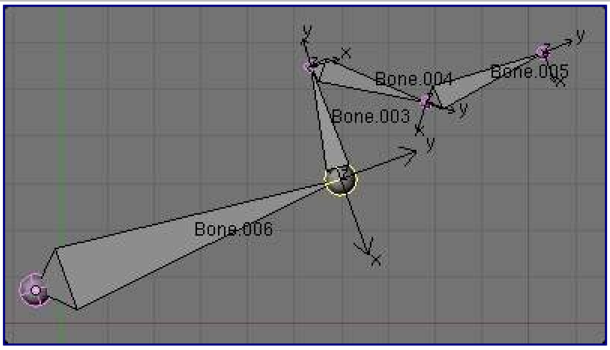
If another (non-selected) chain origins from inside of the merged chain of bones, it will be parented to the resultant merged bone. If they were connected, it will be connected to the new bone.

Here’s a strange subtlety (see *Merge example*): even though connected (the root bone of the unmerged chain has no root sphere), the bones are not visually connected - this will be done as soon as you edit one bone, differently depending in which chain is the edited bone (compare the bottom two images of the example to understand this better).

Merge example





An armature with a selected chain, and a single selected bone, just before merging.	Bones Bone, Bone.001 and Bone.002 have been merged in Bone.006, whereas Bone.005 wasn't modified. Note Bone.003, connected to Bone.006 but not yet "really" connected.
	
Bone.004 has been rotated, and hence the tip of Bone.006 was moved to the root of Bone.003.	The tip of Bone.006 has been translated, and hence the root of Bone.003 was moved to the tip of *Bone.006*

Subdividing Bones

Reference
Mode: *Edit mode* Menu: Armature ‣ Subdivide, Armature ‣ Subdivide Multi

You can subdivide bones, to get two or more bones where there was just one bone. The tool will subdivide all selected bones, preserving the existing relationships: the bones created from a subdivision always form a connected chain of bones.

To create two bones out of each selected bone:

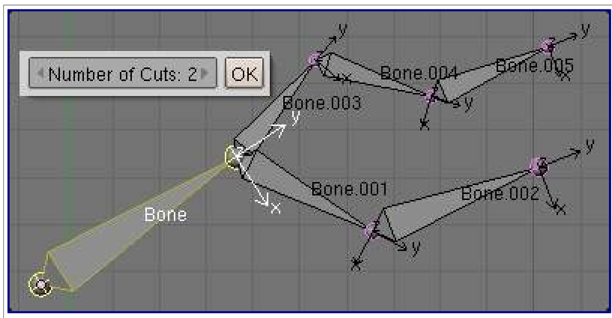
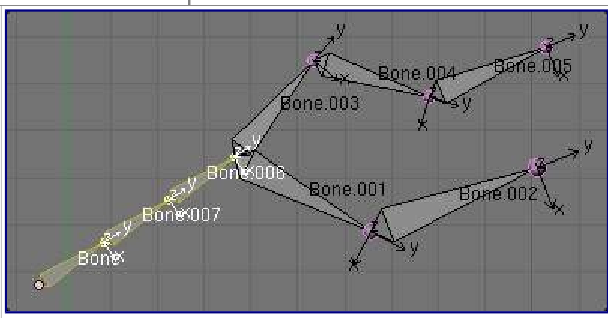
- select Armature ‣ Subdivide from the header menu

To create an arbitrary number of bones from each selected bone:

- select Armature ‣ Subdivide Multi from the header menu, an

Then specify the number of cuts you want in the pop-up. As in mesh editing, if you set `n` cuts, you'll get `n+1` bones for each selected bone.

Subdivision example

	
An armature with one selected bone, just before multi-subdivision.	The selected bone has been "cut" two times, giving three sub-bones.

Locking Bones

You can prevent a bone from being transformed in *Edit mode* in several ways:

- The active bone can be locked clicking on *Lock* in the *Transform Properties* panel (`N` in a 3D view);
- all bones can be locked clicking on the *Lock* button of their sub-panels in the *Armature Bones* panel;
- press `Shift-W`pop-up ‣ Toggle Settings ‣ Locked
- select Armature ‣ Bone Settings ‣ Toggle a Setting).

If the root of a locked bone is connected to the tip of an unlocked bone, it won't be locked, i.e. you will be able to move it to your liking. This means that in a chain of connected bones, when you lock one bone, you only really lock its tip. With unconnected bones, the locking is effective on both ends of the bone.

X-Axis Mirror Editing

Another very useful tool is the *X-Axis Mirror* editing option (*Tool panel* > *Armature Options*, while Armature is selected in *Edit Mode*), When you have pairs of bones of the same name with just a different "side suffix" (e.g. `.R` / `.L`, or `_right` / `_left` ...), once this option is enabled, each time you transform (move/rotate/scale...) a bone, its "other side" counterpart will be transformed accordingly, through a *symmetry along the armature local X axis*. As most rigs have at least one axis of symmetry (animals, humans, ...), it's an easy way to spare you half of the editing work!

See also

- naming bones.

Separating Bones in a new Armature

You can, as with meshes, separate the selected bones in a new armature object - and of course, in *Object* mode, you can join all selected armatures in one

Editing Bone Properties

In this page, you will learn how to edit and control most of the properties for Bforartists bones - For editing bones in an armature, you should read the *previous page* first! We will see how to manage the bones' relationships (Chain Editing), rename them (Naming Bones), etc.

Transforming Bones

We won't detail here the various transformations of bones, nor things like axis locking, pivot points, and so on, as they are common to most object editing, and already described *here* (note however that some options, like snapping, do not seem to work, even though they are available...). The same goes for mirroring, as it's nearly the same as with *mesh editing*. Just keep in mind that bones' roots and tips behave more or less like meshes' vertices, and bones themselves act like edges in a mesh.

As you know, bones can have two types of relationships: They can be parented, and in addition connected. Parented bones behave in *Edit* mode exactly as if they had no relations - you can grab, rotate, scale, etc. a parent bone without affecting its descendants. However, connected bones must always have parent's tips connected to child’s roots, so by transforming a bone, you will affect all its connected parent/children/siblings.

The Transform Properties panel for armatures in Edit mode.

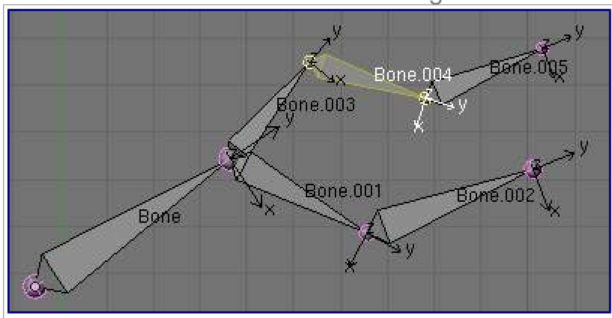
Finally, you can edit in the *Transform Properties* panel (N) the positions and radius of both ends of the active selected bone, as well as its roll rotation.

Radius and Scaling in Envelope Visualization

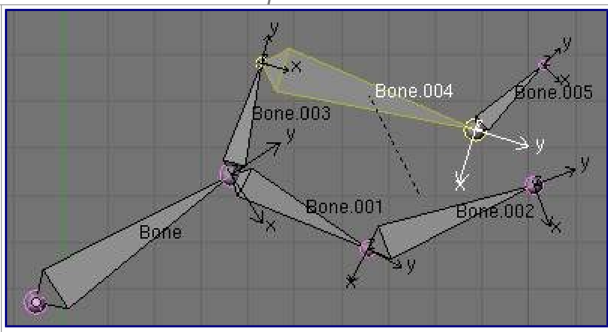
Reference
Mode: *Edit mode*, *Envelope* visualization Menu: Armature ‣ Transform ‣ Scale

When bones are displayed using *Octahedron*, *Stick* or *B-Bone* visualizations, scaling will behave as expected, similar to scaling mesh objects. When bones are displayed using *Envelope* visualization, scaling will have a different effect: it will scale the radius of the selected bones’s ends. (see: *skinning part*). As you control only one value (the radius), there is no axis locking here. And as usual, with connected bones, you scale at the same time the radius of the parent’s tip and of the children’s roots.

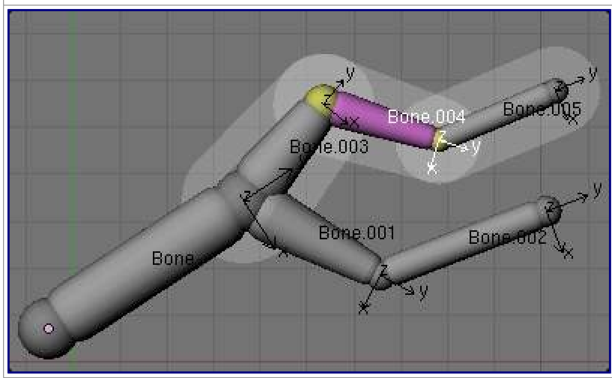
Scaling of a bone in** *Octahedron* and *Envelope* visualizations.

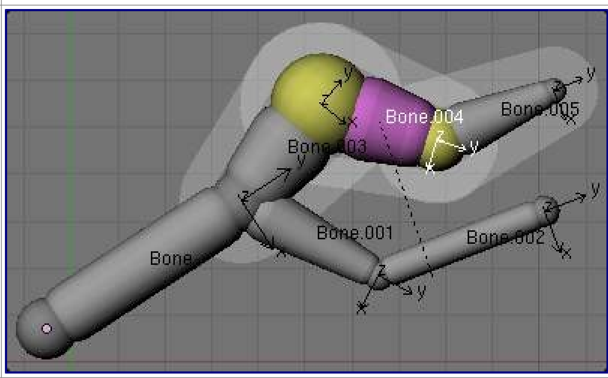


A single selected bone...



...Scaled in Octahedron visualization.





A single selected bone...	...Scaled in Envelope visualization - its length remains the same, but its ends' radius are bigger.

Note that when you resize a bone (either by directly scaling it, or by moving one of its ends), Bforartists automatically adjusts the end-radii of its envelope proportionally to the size of the modification. Therefore, it is advisable to place all the bones first, and only then edit these properties.

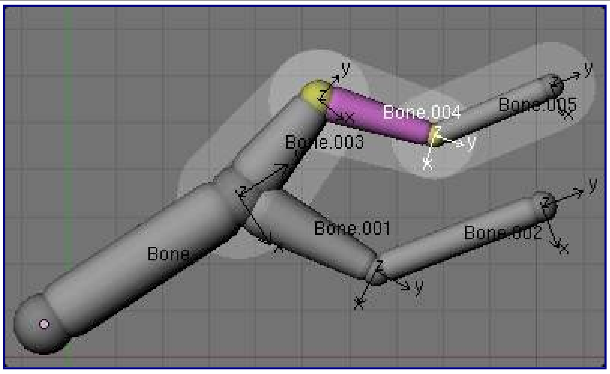
ScaleB and Envelope

Reference
Mode: *Edit mode*

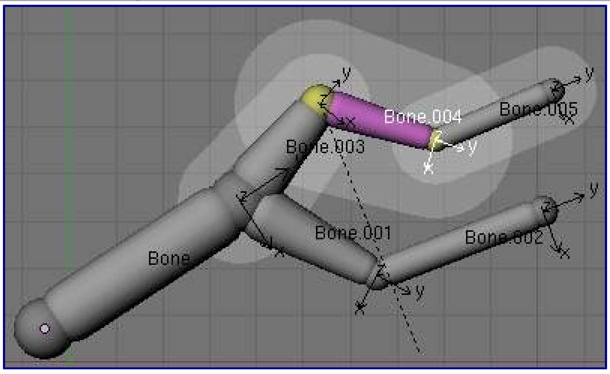
`Ctrl-Alt-Scale hotkey` activates a transform tool that is specific to armatures. It has different behavior depending on the active visualization, as explained below:

In *Envelope* visualization, it allows you to edit the influence of the selected bones (their *Dist* property, see the *skinning part*) - as with the "standard" scaling with this visualization (see the previous section), this is a one-value property, so there is no axis locking and such.

Envelope scaling example



A single bone selected in Envelope visualization.

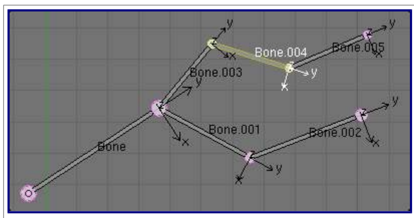


Its envelope scaled with [ctrl][alt][Scale hotkey].

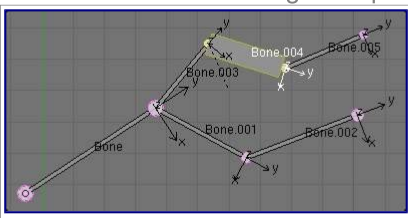
In the other visualizations, it allows you to edit the "bone size". This seems to only have a visible effect in *B-Bone* visualization, but is available also with *Octahedron* and *Stick* ... This tool in this situation has another specific behavior: While with other transform tools, the "local axes" means the object's axes, here they are the bone's own axes (when you lock to a local axis, by pressing the relevant key twice, the constraint is applied along the selected bone's local axis, not the armature object's axis).

WARNING! If you have more than one bone selected, using this tool crashes Bforartists!

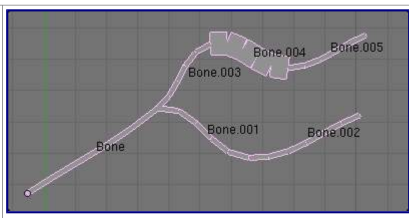
"Bone size" scaling example



A single "default size" bone selected in B-Bone visualization.



Its size scaled with [ctrl][alt][S].



The same armature in Object mode and B-Bone visualization, with Bone.004's

		size scaled up.

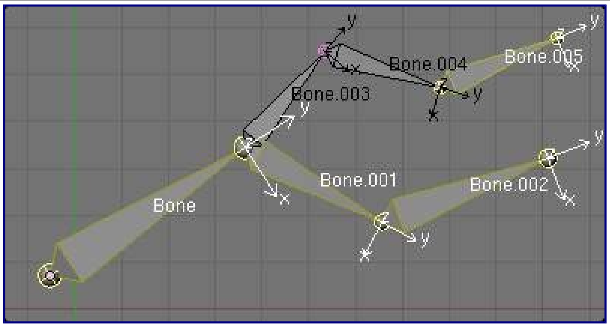
Bone Direction

Reference
Mode: *Edit* mode Menu: Specials ‣ Switch Direction

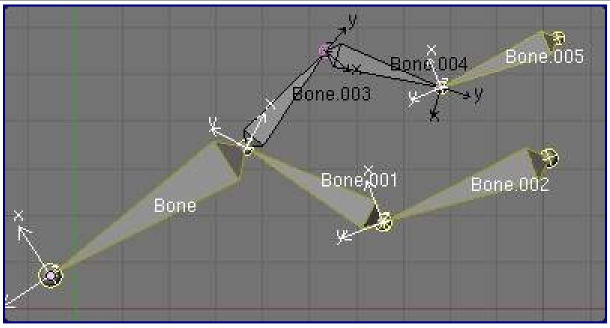
This tool is not available from the *Armature* menu, but only from the *Specials* pop-up menu(W). It allows you to switch the direction of the selected bones (i.e. their root will become their tip, and vice versa).

Switching the direction of a bone will generally break the chain(s) it belongs to. However, if you switch a whole (part of a) chain, the switched bones will still be parented/connected, but in “reversed order”. See the *Switching example*.

Switching example.



An armature with one selected bone, and one selected chain of three bones, just before switching.



The selected bones have been switched. Bone.005 is no more connected nor parented to anything. The chain of switched bones still exists, but reversed (Now Bone.002 is its root, and Bone is its tip). Bone.003 is now a free bone.

Bone Roll

In *Edit* mode, you can control of the bones roll (i.e. the rotation around the Y axis of the bone).

However, after editing the armature, or when using euler rotation, you may want to set the bone roll.

Set Bone Roll

Reference
Mode: *Edit* mode Menu: Armature ‣ Bone Roll ‣ Set

This is a transform mode where you can edit the roll of all selected bones.

Recalculate Bone Roll

Reference
Mode: *Edit* mode
Menu: Armature ‣ Bone Roll ‣ Recalculate

Axis Orientation

Local (X,Z) Tangent
Align roll relative to the axis defined by the bone and it’s parent.

Global (X,Y,Z) Axis
Align roll to global X,Y,Z axis.

Active Bone
Follow the rotation of the active bone.

View Axis
Set the roll to align with the view-port.

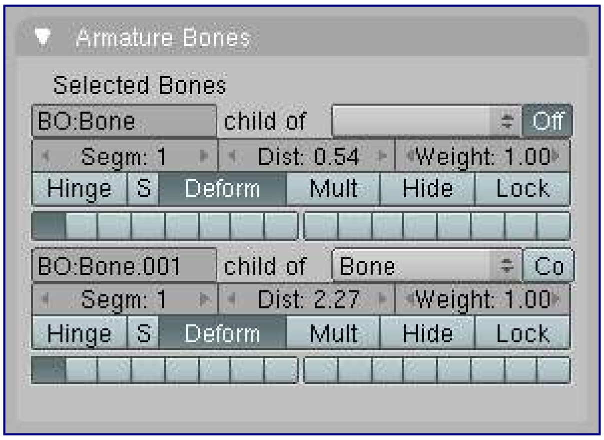
Cursor
Set the roll towards the 3D cursor.

Flip Axis
Reverse the axis direction.

Shortest Rotation
Avoids rolling the bone over 90 degrees from its current value.

Properties

Reference
Mode: *Edit* mode
Panel: *Armature Bones* (*Editing* context)
Menu: Armature ‣ Bone Settings ‣ ...



The Armature Bones panel in Edit mode.

Most bones’ properties (excepted the transform ones) are regrouped in each bone’s sub-panel, in the *Armature Bones* panel (*Editing* context`). Let’s detail them.

Note that some of them are also available in the 3D views, through the three pop-up menus *Toggle Setting* (`Shift-W` or Armature ‣ Bone Settings ‣ Toggle a Setting), *Enable Setting* (`Ctrl-Shift-W` or Armature

‣ Bone Settings ‣ Enable a Setting), and *Disable Setting* (`Alt-W` or Armature ‣ Bone Settings ‣ Disable a Setting) - all three have the same entries, their respective effect should be obvious...

BO
: The bone name field, see Naming Bones.

child of
: These two settings control the bone relationship, as detailed in Chain Editing.

Segm
: This setting controls the number of segments that a bone has; see Bone Rigidity.

Dist, Weight, Deform
: These settings control how the bone influences its geometry - along with the bones' ends radius. This will be detailed in the *skinning part*.

Hinge
: These settings affect the behavior of children bones while transforming their parent in *Pose* mode, so this will be detailed in the *posing part* !

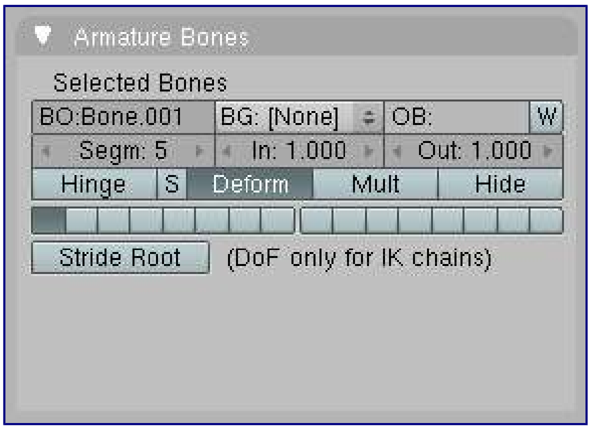
Hide
: This will hide the bone (same as pressing `H` in the 3D views; see this page).

Lock
: This will prevent all editing of the bone in *Edit* mode; see *previous page*.

Layers button
: These small buttons allow you to control to which bone layer this bone belongs; see this page.

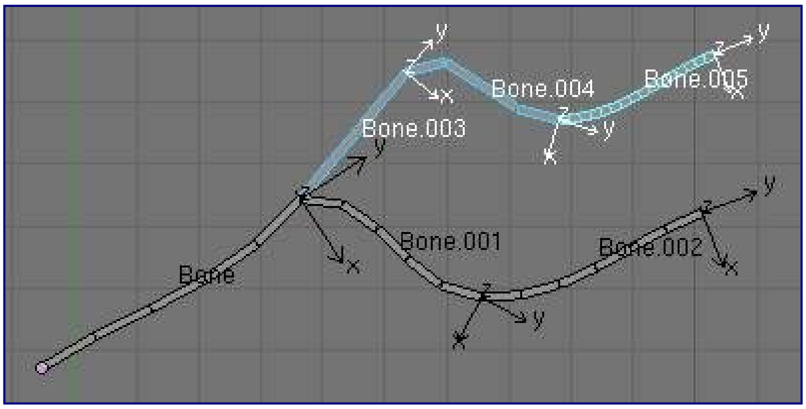
Bone Rigidity

Reference
Mode: *Edit* and *Pose* modes
Panel: *Armature Bones* (*Editing* context)



The Armature Bones panel in Pose mode.

Even though you have the *Segm* setting available in *Edit* mode (bones sub-panel, in the *Armature Bones* panel), you should switch to the *Pose* mode to edit these "smooth" bones' properties - one explanation to this strange need is that in *Edit* mode, even in *B-Bone* visualization, bones are drawn as sticks, so you can't visualize the effects of these settings.

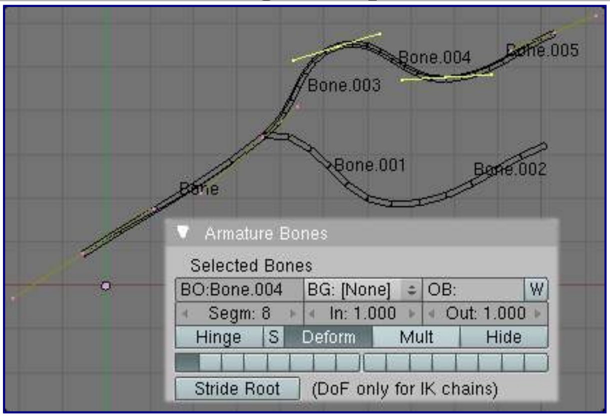


An armature in Pose mode, B-Bone visualization: Bone.003 has one segment, Bone.004 has four, and Bone.005 has sixteen.

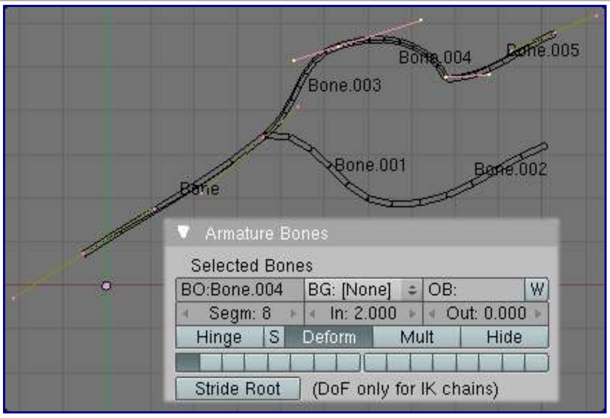
We saw in *this page* that bones are made of small rigid segments mapped to a “virtual” Bézier curve. The *Segm* numeric field allows you to set the number of segments inside a given bone - by default, it is **1**, which gives a standard rigid bone! The higher this setting (max **32**), the smoother the bone, but the heavier the pose calculations...

Each bone’s ends are mapped to its “virtual” Bezier curve’s “auto” handle. Therefore, you can’t control their direction, but you can change their “length” using the *In* and *Out* numeric fields, to control the “root handle” and “tip handle” of the bone, respectively. These values are proportional to the default length, which of course automatically varies depending on bone length, angle with previous/next bones in the chain, and so on.

Bone *In* / *Out* settings example, with a materialized Bézier curve.



Look at Bone.004: it has the default In and Out values (1.0).



Bone.004 with In at 2.0, and Out at 0.0.

Chain Editing

Reference
Mode: *Edit* mode
Panel: *Armature Bones* (*Editing* context)
Menu: Armature ‣ Parent ‣ ...

You can edit the relationships between bones (and hence create/modify the chains of bones) both from the 3D views and the *Buttons* window. Whatever method you prefer, it’s always a matter of deciding, for each bone, if it has to be parented to another one, and if so, if it should be connected to it.

To parent and/or connect bones, you can:

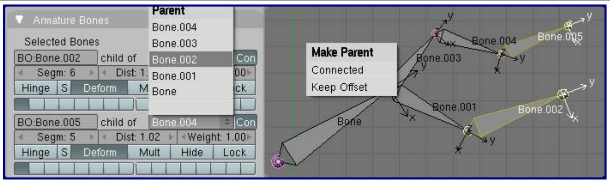
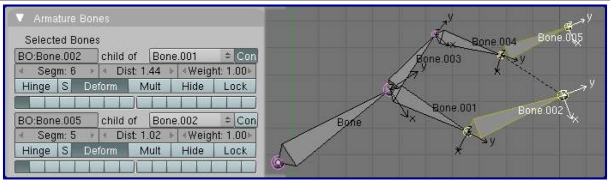
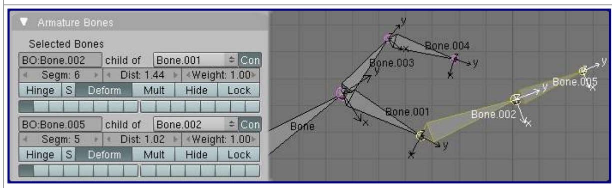
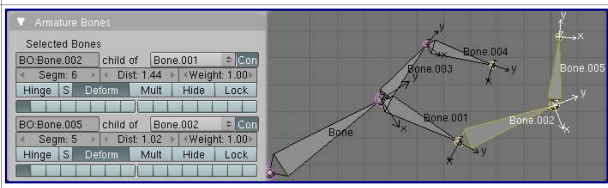
- In a 3D view, select the bone and *then* its future parent, and choose Armature ‣ Parent ‣ Make Parent. In the small *Make Parent* menu that pops up, choose *Connected* if you want the child to be connected to its parent, else click on *Keep Offset*. If you have selected more than two bones, they will all be parented to the last selected one. If you only select one already-parented bone, or all selected bones are already parented to the last selected one, your only choice is to connect them, if not already done. If you select only one non-parented bone, you’ll get the *Need selected bone(s)* error message...

  With this method, the newly-children bones won’t be scaled nor rotated - they will just be translated if you chose to connect them to their parent’s tip.

- In the *Buttons* window, *Armature Bones* panel, for each selected bone, you can select its parent in the *Parent* drop-down list to the upper right corner of its sub-panel. If you want them to be connected, just enable the little *Con* button to the right of the list.

  With this method, the tip of the child bone will never be translated - so if Con is enabled, the child bone will be completely transformed by the operation.

Parenting example.

 The starting armature, with Bone.005 parented and connected to Bone.004.	 Bone.005 re-parented to Bone.002, but not connected to it (same result, using either [ctrl][P][2] in 3D view, or the Armature Bones panel settings).
 Bone.005 parented and connected to Bone.002, using [ctrl][P][1] in 3D view.	 Bone.005 parented and connected to Bone.002, using the Parent drop-down list of Bone.005 sub-panel.

To disconnect and/or free bones, you can:

- In a 3D view, select the desired bones, and choose Armature ‣ Parent ‣ Clear Parent. In the small *Clear Parent* menu that pops up, choose *Clear Parent* to completely free all selected bones, or *Disconnect Bone* if you just want to break their connections.
- In the *Buttons* window, *Armature Bones* panel, for each selected bone, you can select no parent in the *Parent* drop-down list of its sub-panel, to free it completely. If you just want to disconnect it from its parent, disable the *Con* button.

Note that relationships with non-selected children are never modified.

Naming Bones

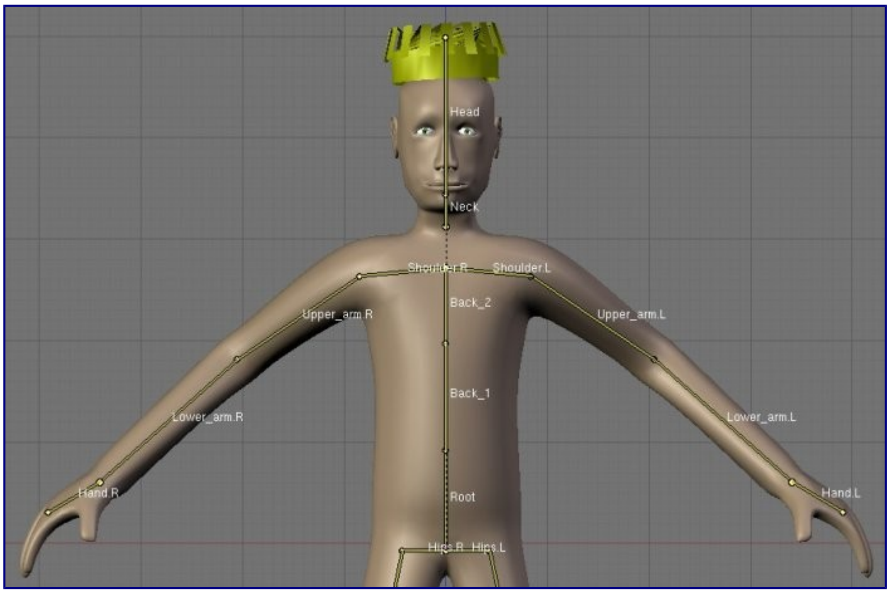
Reference
Mode: *Edit* mode

Panel: *Armature Bones* (*Editing* context), *Transform Properties*

You can rename your bones, either using the *Bone* field of the *Transform Properties* panel in the 3D views, for the active bone , or using the *BO* field in each bone sub-panel of the *Armature Bones* panel (*Editing* context).

Bforartists also provides you some tools that take advantage of bones named in a left/right symmetry fashion, and others that automatically name the bones of an armature. Let’s look at this in detail.

Naming Conventions



An example of left/right bone naming in a simple rig.

Naming conventions in Bforartists are not only useful for you in finding the right bone, but also to tell Bforartists when any two of them are counterparts.

In case your armature can be mirrored in half (i.e. it’s bilaterally symmetrical), it’s worthwhile to stick to a left/right naming convention. This will enable you to use some tools that will probably save you time and effort (like the *X-Axis Mirror* editing tool we saw above...).

- First you should give your bones meaningful base-names, like `leg`, `arm`, `finger`, `back`, `foot`, etc.
- If you have a bone that has a copy on the other side (a pair), like an arm, give it one of the following separators:
    - Left/right separators can be either the second position (`L_calfbone`) or last-but-one (`calfbone.R`)
    - If there is a lower or upper case `L`, `R`, `left` or `right`, Bforartists handles the counterpart correctly. See below for a list of valid separators. Pick one and stick to it as close as possible when rigging; it will pay off. Examples of **valid saparators**:
        - *(nothing)*: hand `Left` –> hand `Right`
        - `_` *(underscore)*: Hand `_L` –> Hand `_R`
        - `.` *(point)*: hand `.l` –> hand `.r`
        - `-` *(dash)*: Foot `-l` –> Foot `-r`

- `` `` *(space)*: pelvis `LEFT` –> pelvis `RIGHT`

  Note that all examples above are also valid with the left/right part placed before the name. You can only use the short `L` / `R` code if you use a separator (i.e. `handL` / `handR` won't work!).

- Before Bforartists handles an armature for mirroring or flipping, it first removes the number extension, if it's there (like `.001`)
- You can copy a bone named `bla.L` and flip it over using [W] ‣ Flip Left-Right Names. Bforartists will name the copy `bla.L.001` and flipping the name will give you `bla.R`.

Bone name flipping

Reference
Mode: *Edit* mode Menu: Armature ‣ Flip Left & Right Names

You can flip left/right markers (see above) in selected bone names, using either Armature ‣ Flip Left & Right Names. This can be useful if you have constructed half of a symmetrical rig (marked for a left or right side) and duplicated and mirrored it, and want to update the names for the new side. Bforartists will swap text in bone names according to the above naming conventions, and remove number extensions if possible.

Auto bone naming

Reference
Mode: *Edit* mode Menu: Armature ‣ AutoName Left-Right, Armature ‣ AutoName Front-Back, Armature ‣ AutoName Top-Bottom

The three *AutoName* entries of the *Armature* and *Specials* (`W`) menus allows you to automatically add a suffix to all selected bones, *based on the position of their root relative to the armature center and its local coordinates* :

AutoName Left-Right
: will add the `.L` suffix to all bones *with a positive X-coordinate root*, and the `.R` suffix to all bones *with a negative X-coordinate root*. If the root is exactly at `0.0` on the X-axis, the X-coordinate of the tip is used. If both ends are at `0.0` on the X-axis, the bone will just get a period suffix, with no L/R (as Bforartists cannot decide whether it is a left or right bone...).

AutoName Front-Back
: will add the `.Bk` suffix to all bones *with a positive Y-coordinate root*, and the `.Fr` suffix to all bones *with a negative Y-coordinate root*. The same as with *AutoName Left-Right* goes for **0.0** Y-coordinate bones...

AutoName Top-Bottom
: will add the `.Top` suffix to all bones *with a positive Z-coordinate root*, and the `.Bot` suffix to all bones *with a negative Z-coordinate root*. The same as with *AutoName Left-Right* goes for **0.0** Z-coordinate bones...

Skeleton Sketching

If you think that creating a whole rig by hand, bone after bone, is quite boring, be happy: some Bforartists developers had the same feeling, and created the Skeleton Sketching tool, formerly the Etch-a-ton tool, which basically allows you to “draw” (sketch) whole chains of bones at once.

Skeleton Sketching is obviously only available in *Edit* mode, in the 3D views. You control it through its *Skeleton Sketching* panel in the *Transform panel*, which you can open with `N`. Use mouse (`LMB` to draw strokes, and `RMB` for gestures. Showing its tool panel won’t enable sketching - *you must tick the checkbox next to Skeleton Sketching to start drawing bone chains* (otherwise, you remain in the standard *Edit* mode...).

Sketching is done in two steps:

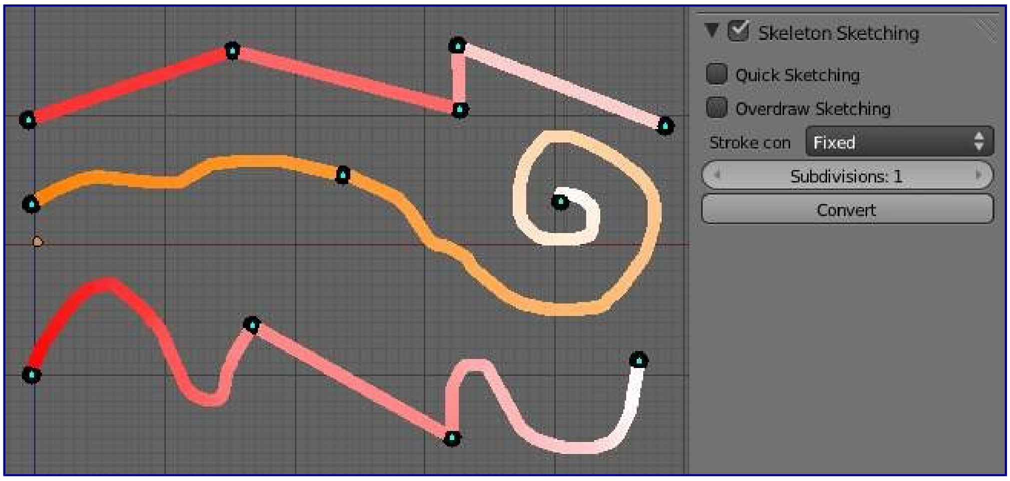
- Drawing Chains (called “strokes”). Each stroke corresponds to a chain of bones.
- Converting to Bones, using different methods.

The point of view is important, as it determines the future bones’ roll angle: the Z axis of a future bone will be aligned with the view Z axis of the 3D view in which you draw its “parent” stroke (unless you use the* *Template* converting method...). Strokes are drawn in the current view plane passing through the 3D cursor, but you can create somewhat “3D” strokes using the* *Adjust* drawing option in different views (see below).

If you enable the small* *Quick Sketch* option, the two steps are merged into one: once you have finalized the drawing of a stroke (see Drawing Chains), it is immediately converted to bones (using the current active method) and deleted. This option makes bone sketching quick and efficient, but you lose all the advanced stroke editing possibilities.

Sketches are not saved into Bforartists files, so you can’t interrupt a sketching session without losing all your work! Note also that the* sketching is common to the whole Bforartists session, i.e. there is only one set of strokes (one sketch) in Bforartists, and not one per armature, or even per file...

Drawing Chains

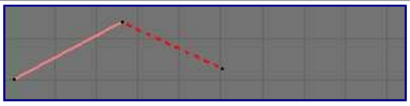


Strokes example. From top to bottom: A selected polygonal stroke of four straight segments, oriented from left to right. An unselected free stroke of two segments, oriented from left to right. A mixed stroke, with one straight segment between two free ones, right to left.

So, each stroke you draw will be a chain of bones, oriented from the starting point (the reddest or most orange part of the stroke) to its end (its whitest part). A stroke is made of several segments, delimited by small black dots - there will be at least one bone per segment (except with the* *Template* conversion method, see *next page*), so all black points represents future bones' ends. There are two types of segments, which can be mixed together:

Straight Segments

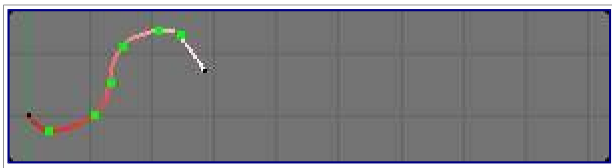
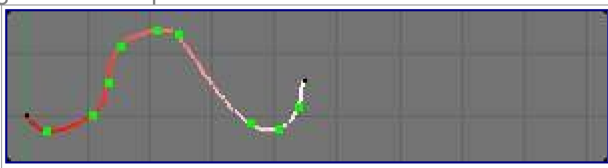
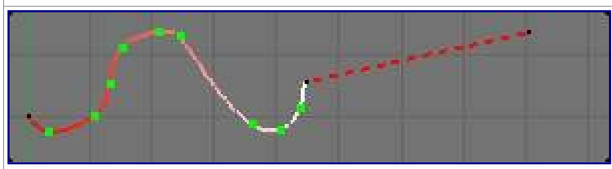
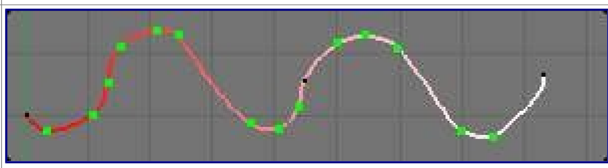
To create a straight segment, click* `LMB` *at its starting point. Then move the mouse cursor, without pressing any button - a dashed red line represents the future segment. Click* `LMB` again to finalize it. Each straight segment of a stroke will always create one and only one bone, whatever convert algorithm you use (except for the* *Template* conversion method).

 The first segment has been started (LMB click) and the mouse moved to its end point.	 The first segment has been finalized by a second LMB click, which also started a new segment...	 Repeating these steps, we now have a four-segment polygonal stroke.

Free Segments

To create a free (curved) segment, click* and hold `LMB` at its starting point. Then draw your segment by moving the mouse cursor - as in any paint program! Release `LMB` to finalize the segment - you will then be creating a new straight segment, so if you would rather start a new free segment, you must immediately re-press `LMB`. The free segments of a stroke will create different number of bones, in different manners, depending on the conversion method used. The future bones' ends for the current selected method are represented by small green dots for each one of those segments, for the selected strokes only. The free segment drawing uses the same* *Manhattan Dist* setting as the *grease pencil tool* (*User Preferences window, Edit Methods* "panel", *Grease Pencil* group) to control where and when to add a new point to the segment - so if you feel your free segments are too detailed, raise this value a bit, and if you find them too jagged, lower it.

Drawing free segments example.

 While drawing a first free segment (LMB click and drag).	 The first free segment finalized (releasing LMB).
 If you now move the mouse without pressing LMB again, you'll create a straight segment...	 But if you immediately click again and drag LMB you'll instead start a new free segment.

You finalize a whole stroke by clicking* `RMB`. You can cancel the stroke you are drawing by pressing `Esc`. You can also snap strokes to underlying meshes by holding* `Ctrl` while drawing. By the way, the *Peel Objects button at the bottom of the Bone Sketching* panel is the same thing as the "monkey" button of the snapping header bar controls shown when* *Volume* snap element is selected - see the snap to mesh page for details.

Selecting Strokes

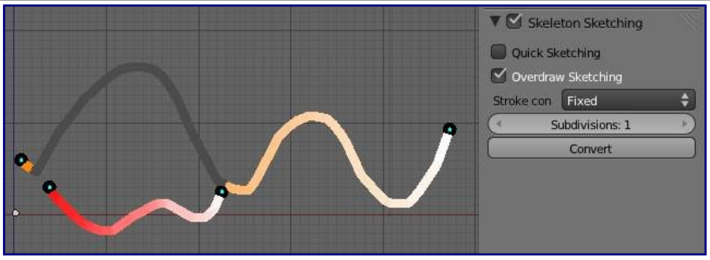
A stroke can be selected (materialized by a solid red-to-white line), or not (shown as a orange-to-white line) - see (Strokes example) above. As usual, you select a stroke by clicking* `RMB` on it, you add one to/remove one from the current selection with a* `Shift-RMB` *click, and* (de)selects all strokes...

Deleting

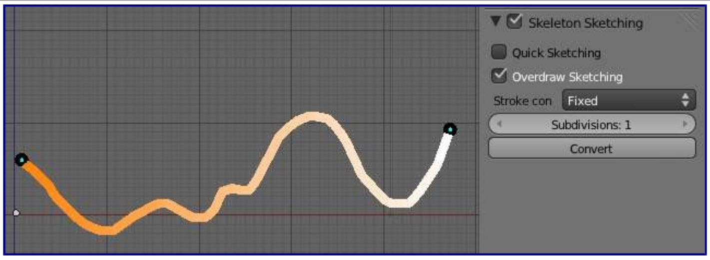
Clicking on the *Delete* button (*Bone Sketching* panel) deletes the selected strokes (be careful, no warning/confirmation pop-up menu here). See also Gestures.

Modifying Strokes

You can adjust, or "redraw" your strokes by enabling the *Overdraw Sketching option of the Bone Sketching* panel. This will modify the behavior of the strokes drawing (i.e. `LMB` clicks and/or hold): when you draw, you won't create a new stroke, but rather modify the nearest one. The part of the old stroke that will be replaced by the new one are drawn in gray. This option does not take into account stroke selection, i.e. all strokes can be modified this way, not just the selected ones... Note also that even if it is enabled, when you draw too far away from any other existing stroke, you won't modify any of them, but rather create a new one, as if* *Overdraw Sketching* was disabled.



Adjusting a stroke: the gray part of the "unselected" (orange) stroke will be replaced by the currently drawn "replacement".



Stroke adjusted.

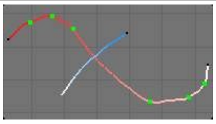
Adjusting stroke example.

Finally, note that there is no undo/redo for sketch drawing...

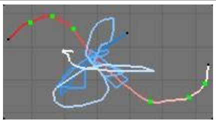
Gestures

There quite a few things about strokes editing that are only available through gestures. Gestures are started by clicking and holding `Shift-LMB` (when you are not already drawing a stroke), and materialized by blue-to-white lines. A gesture can affect several strokes at once.

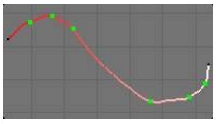
There is no direct way to cancel a gesture once you've started "drawing" it. So the best thing to do, if you change your mind (or made a "false move"), is to continue to draw until you get a disgusting scribble, crossing your stroke several times - in short, something that the gesture system would never recognize!



Damn! I didn't want to cut this stroke here!



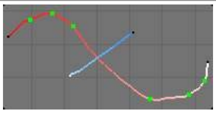
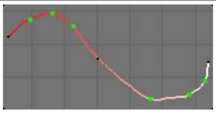
Let's doodle a bit...



Phew! That was close, but the stroke is still in one piece.

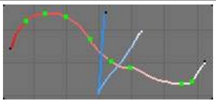
Cut

To* **cut** a segment (i.e. add a new black dot inside it, making two segments out of one), “draw” a straight line crossing the chosen segment where you want to split it.

 Gesture.	 Result.

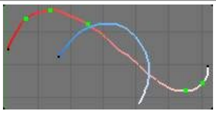
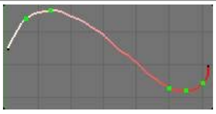
Delete

To* **delete** a stroke, draw a “V” crossing the stroke to delete twice.

 Gesture.	 Result.

Reverse

To **reverse** a stroke (i.e. the future chain of bones will be reversed), draw a “C” crossing twice the stroke to reverse.

 Gesture.	 Result.

Converting to Bones

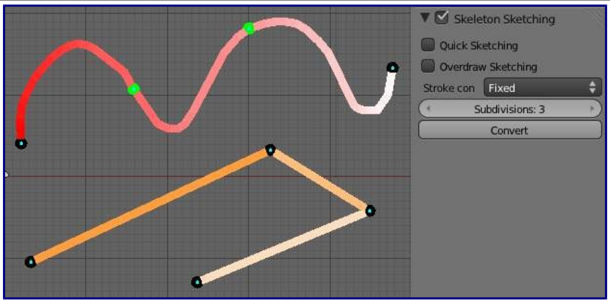
Once you have one or more selected strokes, you can convert them to bones, using either the* *Convert* button of the *Bone Sketching* panel, or the corresponding gesture (see Gestures). Each selected stroke will generate a chain of bones, oriented from its reddest end to its whitest one. Note that converting a stroke does not delete it.

There are four different conversion methods - three “simple” ones, and one more advanced and complex, *Template*, that reuses bones from the same armature or from another one as a template for the strokes to convert, and which is detailed in *the next page*. Anyway, remember that* straight segments are always converted to one and only one bone (except for the *Template* conversion method), and that the future bones’ ends are shown as green dots on selected free segments.

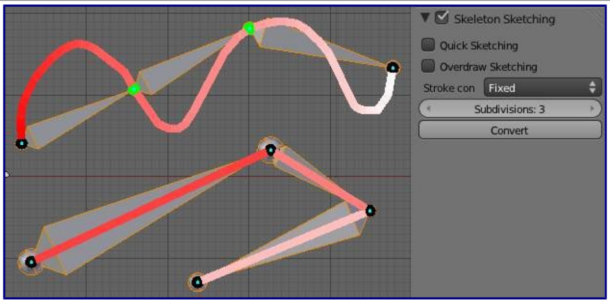
Remember also that the roll rotation of the created bones has been set during their “parent” stroke drawing (except for the *Template* conversion method) - their Z axis will be aligned with the view Z axis of the active 3D view at draw time.

Fixed

With this method, each free segment of the selected strokes will be uniformly divided in n parts (set in *Num* numeric field), i.e. will give n bones.



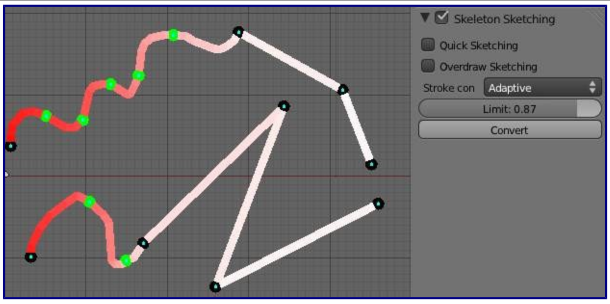
The Fixed conversion settings and its preview on selected strokes.



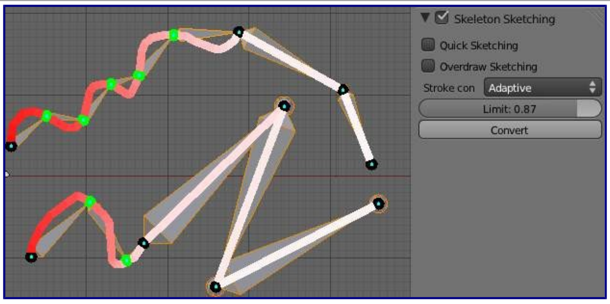
The Fixed conversion result.

Adaptative

With this method, each free segment of the selected strokes will create as many bones as necessary to follow its shape closely enough - this “closely enough” parameter being set by the *Thres* hold numeric field; higher values giving more bones, following more closely the segments’ shape. So the more twisted a free segment, the more bones it will generate.



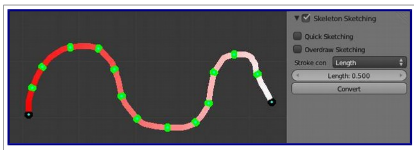
The Adaptative conversion settings and its preview on selected strokes.

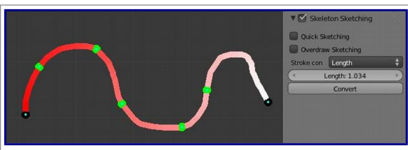


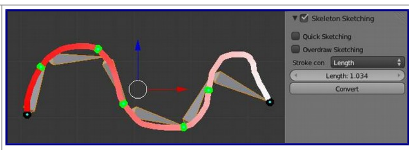
The Adaptative conversion result.

Length

With this method, each free segment of the selected strokes will create as many bones as necessary, so that none of them is longer than the *Length* numeric field value (in Bforartists Units).


The Length conversion settings and its preview on selected strokes.


Using a larger length value.


The Length conversion result.

Retarget

Retarget template bone chain to stroke.

Template

Template armature that will be retargeted to the stroke. This is a more complex topic, detailed in its *own page*.

Retarget roll mode

None

Don’t adjust roll.

View

Roll bones to face the view.

Joint
Roll bone to original joint plane offset.

Autoname
...

Number
...

Side
...

Armature Templating

The idea of templating is to use an already existing armature as base ("template") to create a new armature. It differs from a simple copy in that you can directly define the new armature different in some aspects than its reference rig.

In Bforartists, the only templating tool is the bone sketching one (Etch-a-ton, described in *the previous page*), with its *Template* conversion method - so you should have read its page before this one!

Using Bone Sketching

Reference
Mode: *Edit* mode Panel: *Bone Sketching* (*3D View* window) Menu: Armature ‣ Bone Sketching

The *Template* conversion method of *Bone Sketching* tool maps a copy of existing bones to each selected stroke. The new bones will inherit some of their properties (influence, number of segments, etc.) from the corresponding bones in the template, but they will acquire their lengths, rolls and rotation from the sketch; so these properties would be different as compared to the template.

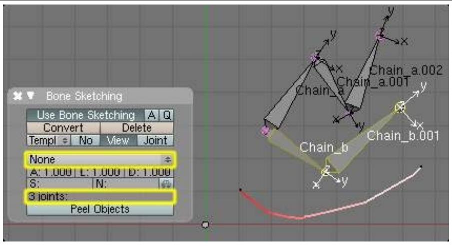
This is easier to understand with some examples.

In the following image, `armature.002` is set as the template, and the stroke maps with `chain_a` of this template. None of the bones are selected in the template. Note that there is no second stroke to map with chain `chain_b` of the template. The result is shown at right: Bforartists creates a copy of `chain_a` and matches the bones with the stroke.

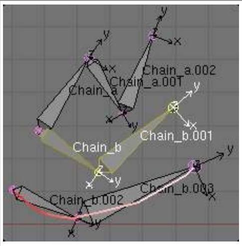
Bforartists also creates a copy of `chain_b`, but this chain is not altered in any way; because this command can map only one selected chain with a stroke.

In the following example, no template is selected. (In other words, all the action is within the armature itself.)

Two bones are selected in `chain_b`, and the property panel is set to map the joints with the stroke. So these two selected bones are copied and the newly created copy of the chain is matched with the stroke. (Note that the newly created bones are named in continuation of the original chain.)

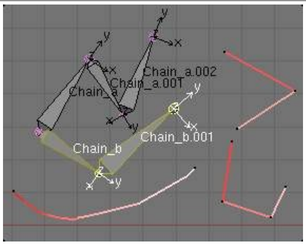


Before conversion.

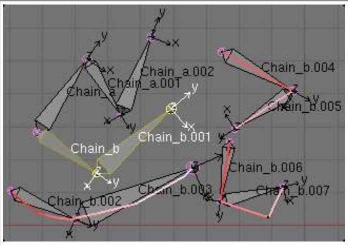


After conversion.

If you had selected both the chains (`Chain_a` and `Chain_b`), you would have still got the same result as in the example above, because the command maps to stroke only one selected chain.
In the following example also, only one chain is selected, but there are three strokes to map to. In this case, the same chain is copied three times (once for each stroke) and then mapped to individual strokes. Note how a two-bone chain is fitted to a three-segment stroke.
The newly created bones are numbered sequentially, after the original bones' names.



Before conversion.



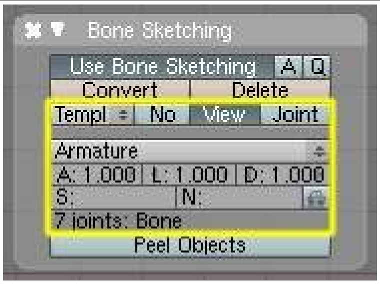
After conversion.

OK now let us see some important ground rules:

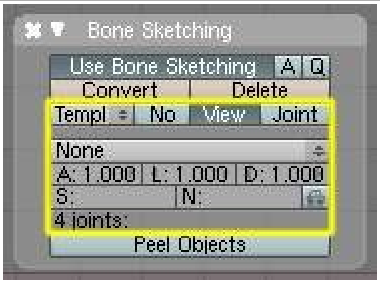
- This conversion method can use as reference bones either *the selected bones in the currently edited armature*, or *all bones from another armature*. In general, it is a better idea to create new "templated" bones inside the "reference" armature, so you can precisely select which bones to use as template - if you want the new bones in a different armature, you can then use the *Separate* and optionally *Join* commands...
- This tool only considers *one chain of bones*, so it's better to select only one chain of bones inside the current armature (or use a single-chain armature object as template). Else, the chain of the template containing the first created bones will be mapped to the selected strokes, and *the other chains will just be "copied" as is*, without any modification.
- This tool maps the same chain of bones on all selected strokes, so you can't use multiple strokes to map a multi-chains template - you will rather get a whole set of new bones for each selected stroke!
- If you have strokes only made of straight segments, *they must have at least as much segments as there are bones in the template chain* (else, the newly created chain is not mapped at all to the stroke, and remains an exact duplicate of its template). If there are more segments than necessary, the conversion algorithm will chose the best "joints" for the bones to fit to the reference chain, using the same influence settings as for free segments (*A*, *L* and *D* settings, see below).
- If you try to *Convert* without template bones (i.e. either an empty armature selected as template, or no bones selected in the current edited armature), you will get the error message `No Template and no`

`deforming bones selected`, and nothing will occur.

The *Bone Sketching* panel with *Template* conversion method enabled.



With current edited armature as template.



With another armature as template.

Now, let us see the settings of this conversion method:

No, View, Joint buttons

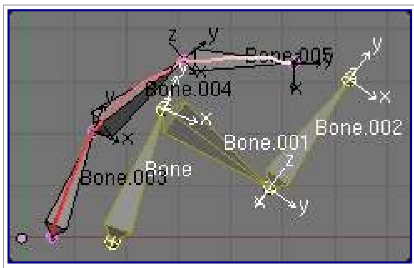
These three toggle buttons (mutually exclusive) control how the roll angle of newly created bones is affected:

No
: Do not alter the bones roll (i.e. the new bones' rolls fit their reference ones).

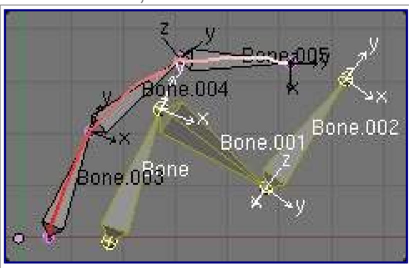
View
: Roll each bone so that one of its X, Y or Z local axis is aligned (as much as possible) with the current view's Z axis.

Joint
: New bones roll fit their original rotation (as *No* option), but with regards to the bend of the joint with its parent.

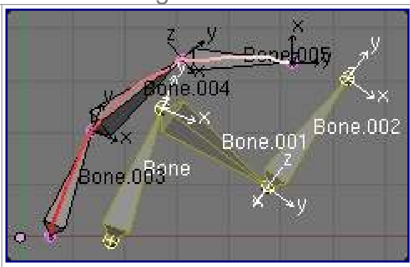
Templating: bone roll example. The Bone.003 -to- Bone.005 chain is the mapped-to-stroke version of Bone -to- Bone.002 selected one, and Bone.001 has a modified roll angle.



With No roll option.



With View roll option.



With Joint roll option.

Template drop-down list

Here you select the armature to use as template. If you choose *None*, the selected bones from the currently edited armature will be used as reference, else all bones of the other armature will be used.

A, *L*, *D* are numeric fields.

Think of them as A(ngle of bones), L(ength of bones) and D(efinition of stroke).

These settings control how the template is mapped to the selected strokes. Each one can have a value between **0.0** and **10.0**, the default being **1.0**.

A

controls the influence of the angle of the joints (i.e. angle between bones) - the higher this value, the more the conversion process will try to preserve these joints angle in the new chain.

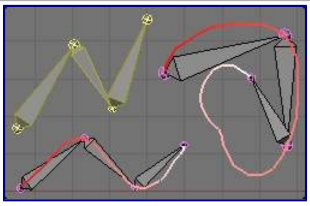
L

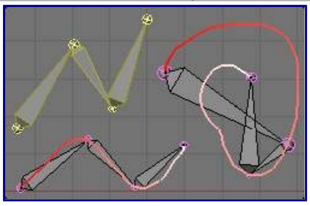
controls the influence of the bones’ length - the higher this value, the more the conversion process will try to preserve these lengths in the new bones.

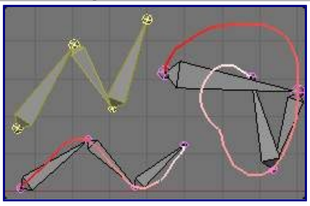
D

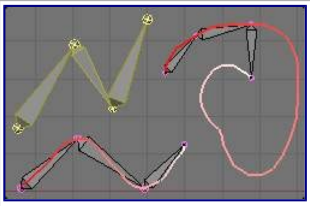
controls the influence of the stroke’s shape - the higher this value, the more the conversion process will try to follow the stroke with the new chain.

Examples of *Template* conversions for various influence weights values, with one stroke quite similar to the template chain’s shape, and one stroke very different.


A: 1.0; L: 1.0; D: 1.0.


A: 1.0; L: 0.0; D: 0.0.

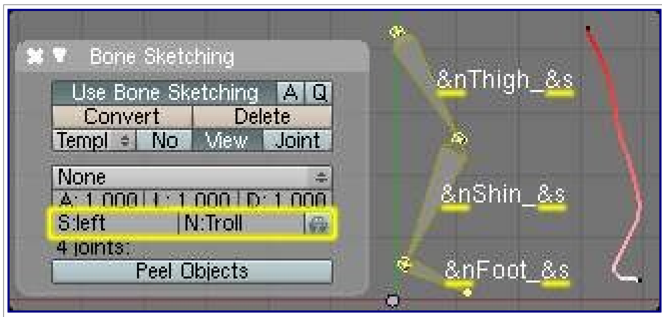

A: 0.0; L: 1.0; D: 0.0.


A: 0.0; L: 0.0; D: 1.0.

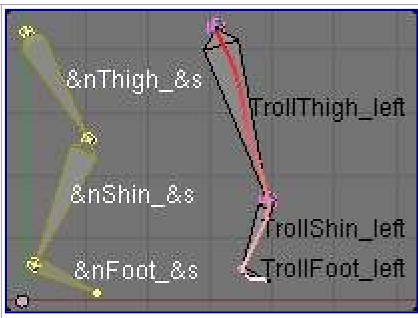
S and N text fields, “auto” button

These control how the new bones are named. By default, they just take the same names as the originals from the template - except for the final number, increased as needed. However, if the template bones have `&s` somewhere in their name, this “placeholder” will be replaced in the “templated” bones’ names by the content of the *S* text field (“S” for “side”). Similarly, a `&n` placeholder will be replaced by the *N* field content (“N” for “number”). If you enable the small “auto” button, the *N* field content is auto-generated, producing a number starting from nothing, and increased each time you press the *Convert* button, and the `&s` placeholder is replaced by the side of the bone (relative to the local X axis: `r` for negative X values, `l` for positive ones).

Naming and placeholders, using a simple leg template.

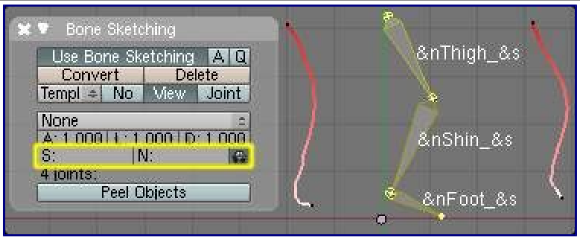
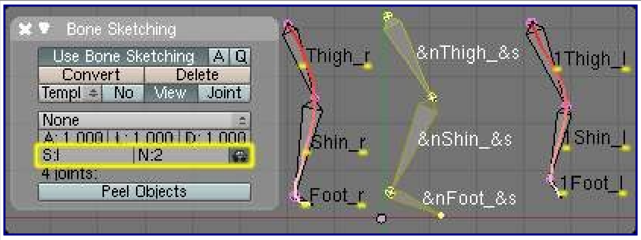


Before conversion (note the &n and &s placeholders in template bones’ names).



After conversion: the placeholders have been replaced by the content of the S and N text fields of the Bone Sketching panel.

Auto naming and placeholders, using a simple leg template.

 Before conversion (note that, in the Bone Sketching panel, the S and N fields are empty, and the small "auto" button is enabled).	

Static text line

The line just above the *Peel Objects* button gives you two informations:

- The *n* `joints` part gives you the number of joints (i.e. bones' ends, with connected ends considered as one joint), either from the selected bones of the edited armature, or in the whole other template armature.
- The second part is only present when another armature has been selected as template - it gives you *the root bone's name of the chain that will be mapped to the strokes*. Or, while you are drawing a stroke with straight segments, the name of the bone corresponding to the current segment (and `Done` when you have enough segments for all bones in the template chain).

Rigging - Armatures

Introduction

An Armature in Blender can be thought of as similar to the armature of a real skeleton, and just like a real skeleton an Armature can consist of many bones. These bones can be moved around and anything that they are attached to or associated with will move and deform in a similar way.

An “armature” is a type of object used for rigging. Armature object borrows many ideas from real life skeletons.

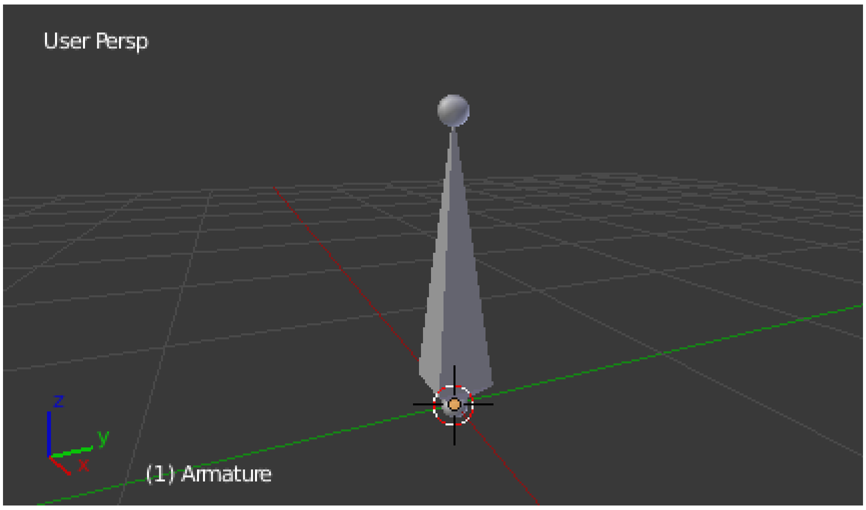
Your first armature

In order to see what we are talking about, let us try to add the default armature in Blender.

(Note that armature editing details are explained in the armatures editing section).

Open a default scene, then:

1. Delete all objects in the scene.
2. Make sure the cursor is in the world origin
3. Press `Numpad1` to see the world in Front view.
4. Add a *Single Bone* (Add ‣ Armature ‣ Single Bone).
5. Press `NumpadDelete` to see the armature at maximum zoom.



The default armature.

The Armature Object

As you can see, an armature is like any other object type in Blender:

- It has a center, a position, a rotation and a scale factor.
- It has an Object Data data-block, that can be edited in *Edit Mode*.
- It can be linked to other scenes, and the same armature data can be reused on multiple objects.

- All animation you do in *Object Mode* is only working on the whole object, not the armature's bones (use the *Pose Mode* to do this).

As armatures are designed to be posed, either for a static or animated scene, they have a specific state, called "rest position". This is the armature's default "shape", the default position/rotation/scale of its bones, as set in *Edit Mode*.

In *Edit Mode*, you will always see your armature in rest position, whereas in *Object Mode* and *Pose Mode*, you usually get the current "pose" of the armature (unless you enable the *Rest Position* button of the *Armature* panel).

Armature Chapter Overview

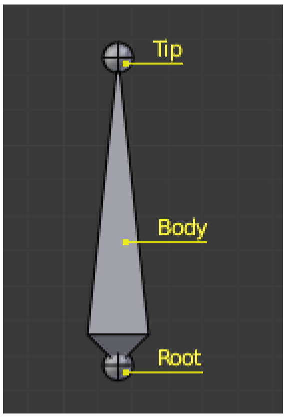
In the "Armatures" section, we will only talk about armatures themselves, and specifically we will talk about:

- The basics of bones.
- The different armature visualizations.
- The armature structure types.
- How to Select Bones,
- How to Edit Armatures,
- How to Edit Bones,
- How to edit bones properties,
- How to sketch armatures with the Etch-a-Ton tool,
- How to use templates.

Introduction

Bones are the base elements of armatures. The visualization of bones can be set in the Armatures Display Panel.

Structure



The elements of a bone.

They have three elements:

- The “start joint” named *root* or *head*,
- the “body” itself,
- and the “end joint” named *tip* or *tail*.

With the default armature in edit-mode, you can select the root and the tip, and move them as you do with mesh vertices.

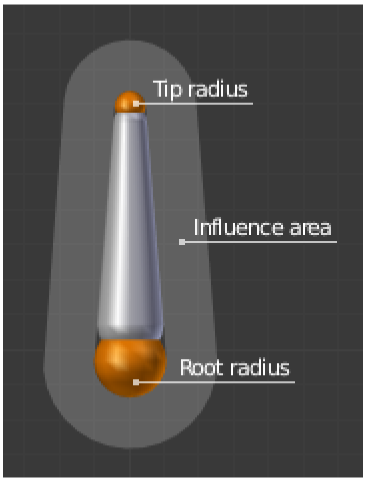
Both root and tip (the “joints”) define the bone by their respective position.

They also have a radius property, only useful for the envelope deformation method (see below).

Roll

Activating *Axes* checkbox on the Armature tab ‣ Display panel, will show local axes for each bone’s tip. The Y axis is always aligned along the bone, oriented from root to tip. So, this is the “roll” axis of the bones.

Bones Influence



A bone in Envelope visualization, in Edit Mode.

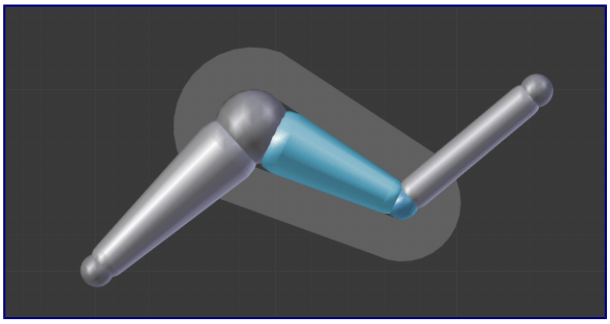
Basically, a bone controls a geometry when vertices “follow” the bone. This is like how the muscles and skin of your finger follow your finger-bone when you move a finger.

To do this, you have to define the strength of *influences* a bone has on a certain vertex.

The simplest way is to have each bone affecting those parts of the geometry that are within a given range from it. This is called the *envelope technique*, because each bone can control only the geometry “enveloped” by its own influence area.

If a bone is visualized as *Envelope*, in *Edit Mode* and in *Pose Mode* you can see the area of influence, which depends on:

- The *distance* property and
- the root’s radius and the tip’s radius.



Our armature in Envelope visualization, in Pose Mode.

All these influence parameters are further detailed in the skinning pages.

Selecting

You can select and edit bones of armatures in *Edit Mode* and in *Pose Mode*. Here, we will see how to select bones in *Edit Mode*. Selecting bones in *Pose Mode* is similar to selecting in *Edit Mode* with a few specific differences that will be detailed in the posing part.

Similar to vertices/edges selection in meshes, there are two ways to select whole bones in *Edit Mode*:

- Directly, by selecting the bone's body.
- Selecting both of its joints (root and tip).

This is an important point to understand, because selecting bones' joints only might lead to non-obvious behavior, with respect to which bone you actually select, see the.

Note that unlike the mesh draw type the armature draw type has no effect on selection behavior. In other words, you can select a bone's joint or body the same way regardless of the bone visualization chosen.

Selecting Bone Joints

To select bones' joints you have the standard selection methods.

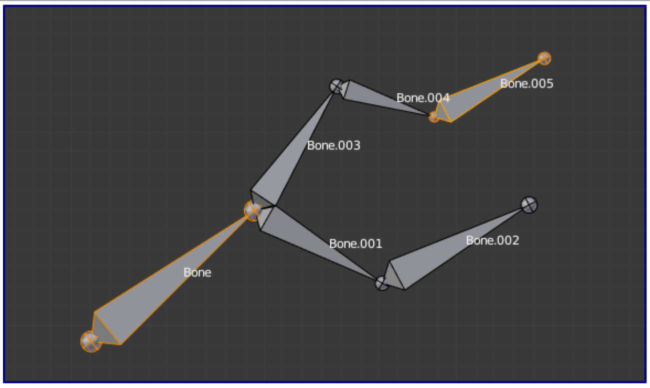
Inverse selection

As stated above, you have to remember that these selection tools are for bones' joints only, not the bones' bodies.

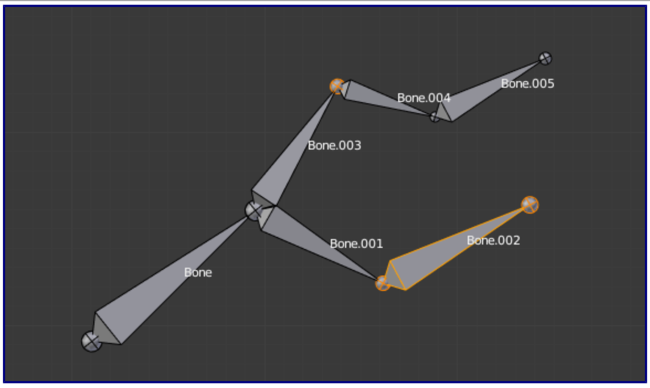
For example, the *Inverse* selection option `Ctrl-I` inverts the selection of bones' joints, not of bones (see *Inverse selection*).

Remember that a bone is selected only if both its joints are selected. So, when the selection status of bones' joints is inverted, a new set of bones is selected.

Inverse selection.



Two bones selected.



The result of the inverse selection `Ctrl-I` the bones joints selection has been inverted, and not the bones selection.

Selecting connected Bone Joints

Another example is: when you select the root of a bone connected to its parent, you also implicitly select the tip of its parent (and vice versa).

Note

Remember that when selecting bones' joints, the tip of the parent bone is the "same thing" as the root of its children bones.

Selecting Bones

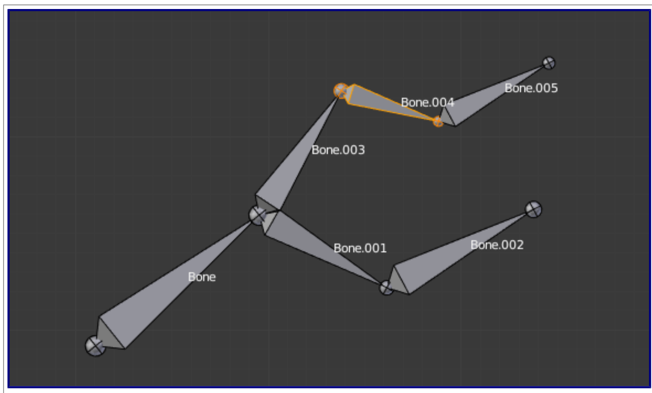
By `RMB` -clicking on a bone's body, you will select it (and hence you will implicitly select its root and tip).

Using `Shift-RMB`, you can add to/remove from the selection.

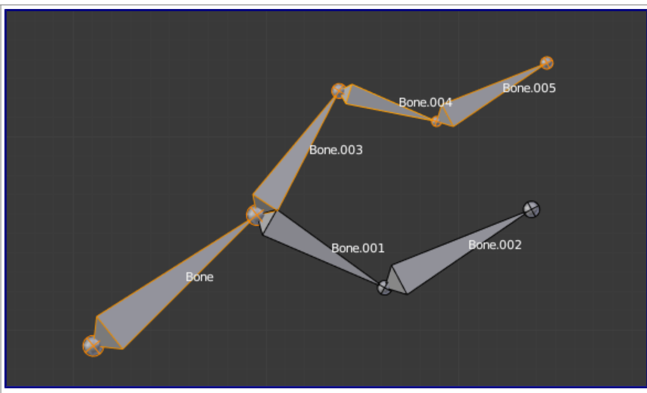
You also have some *advanced selection* options, based on their relations.

You can select at once all the bones in the chain which the active (last selected) bone belongs to by using the *linked selection* tool, `L`.

Linked bones selection



A single selected bone.



Its whole chain selected with `L`.

Mirror `Shift-Ctrl-M`

Flip the selection from one side to another.

Pick Shortest Path `Ctrl-RMB`

Selects the path from the active bone to the bone under the mouse.

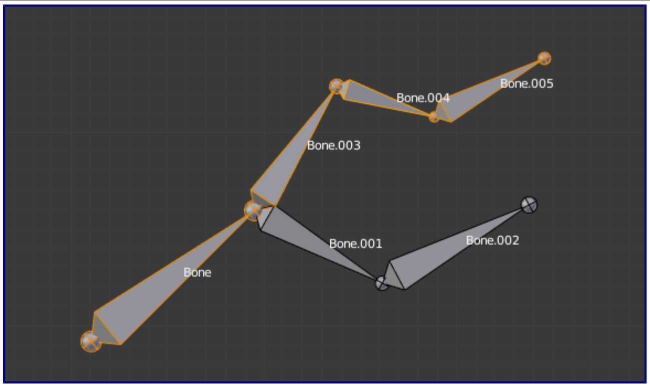
Deselecting connected Bones

There is a subtlety regarding connected bones.

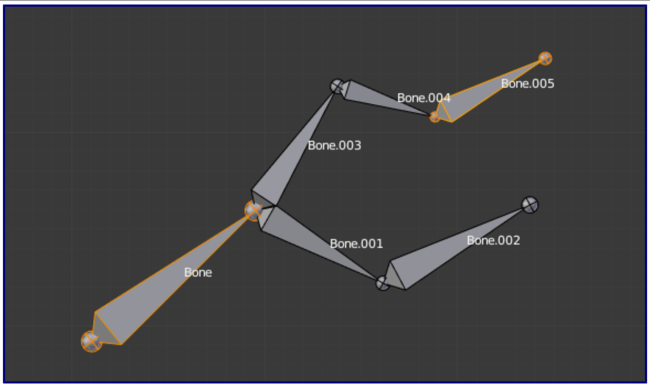
When you have several connected bones selected, if you deselect one bone, its tip will be deselected, but not its root, if it is also the tip of another selected bone.

To understand this, look at Fig. Bone deselection in a selected chain..

Bone deselection in a selected chain.



A selected chain.



Two selected bones.

After `Shift-RMB` -clicking “Bone.003”:

- “Bone.003” ‘s tip (which is same as “Bone.004” ‘s root) is deselected.
- “Bone” is “Bone.003” ‘s parent. Therefore “Bone.003” ‘s root is same as the tip of “Bone”. Since “Bone” is still selected, its tip is selected. Thus the root of “Bone.003” remains selected.

More/Less

Reference
Mode: Edit Mode Menu: Select

More :kbd;`Ctrl-Numpad+`
ToDo.

Less :kbd;`Ctrl-Numpad-`
ToDo.

Parent `[`, Child `]`
You can deselect the active bone and select its immediate parent or one of its children.

Extend Parent `Shift-[`, Extend Child `Shift-]`
Similar to *Parent*/*Child* but it keeps the active bone in the selection.

Similar

Reference
Mode: Edit Mode
Menu: Select ‣ Similar
Hotkey: `Shift-G`

Children
Extends the selection to all hierarchical descendant bones.
Immediate Children
Extends the selection to all direct child bones.
Siblings
Selects bones that have the same parent as the active bone.
Length
Selects bones with a similar bone length (between tip and tail) under the specified *Threshold*.
Direction (Y axis)
ToDo.
Prefix
ToDo.
Suffix
ToDo.
Layer
ToDo.

Introduction

Reference
Mode: Edit Mode

As with any other object, you edit your armature in *Edit Mode.*

Editing an armature means two main domains of action:

- Editing the bones – i.e. adding/inserting/deleting/extruding/sub-dividing/joining them...
- Editing the bones' properties – this includes key features, like transform properties (e.g. grab, scale, etc...) and relationships between bones (parenting and connecting), as well as bones' names, influence, behavior in *Pose Mode*, etc.

These are standard editing methods, quite similar for example to meshes editing. Blender also features a more advanced “armature sketching” tool, called Etch-a-Ton. The same tool might also be used in templating, i.e. using another armature as template for the current one...

Important
One important thing to understand about armature editing is that you edit the *rest position* of your armature, i.e. its “default state”. An armature in its *rest position* has all bones with *no* rotation and scaled to

1.0 in their own local space.

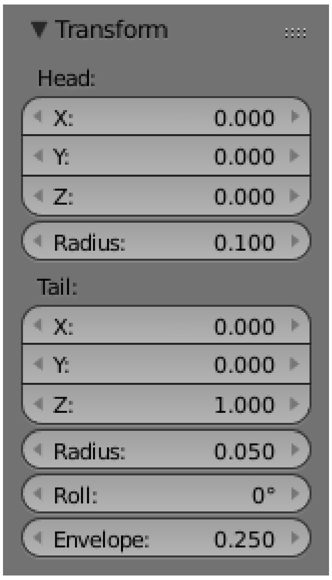
The different poses you might create afterwards are based on this rest position. So if you modify it in *Edit Mode*, all the poses already existing will also be modified. Thus you should in general be sure that your armature is definitive before starting to skin and pose it!

Note

Please note that some tools work on bones' joints, while others work on bones themselves. Be careful not to get confused.

Transform

Transform



The Transform panel for armatures in Edit Mode.

We will not detail here the various transformations of bones, nor things like axis locking, pivot points, and so on, as they are common to most object editing, and already described here (note however, that some options, like snapping, do not seem to work, even though they are available...). The same goes for mirroring, as it is nearly the same as with mesh editing. Just keep in mind that bones' roots and tips behave more or less like meshes' vertices, and bones themselves act like edges in a mesh.

As you know, bones can have two types of relationships: They can be parented, and in addition connected. Parented bones behave in *Edit Mode* exactly as if they had no relations. They can be grabbed, rotated, scaled, etc. a parent bone without affecting its descendants. However, connected bones must always have parent's tips connected to child's roots, so by transforming a bone, you will affect all its connected parent/children/siblings.

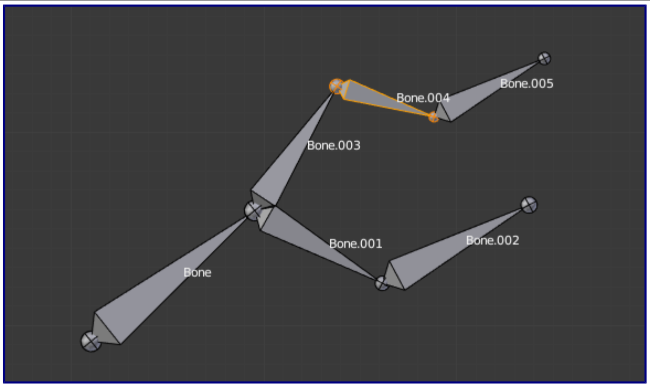
Finally, you can edit in the *Transform* panel in the Properties region the positions and radius of both joints of the active selected bone, as well as its roll rotation.

Radius and Scaling in Envelope Visualization

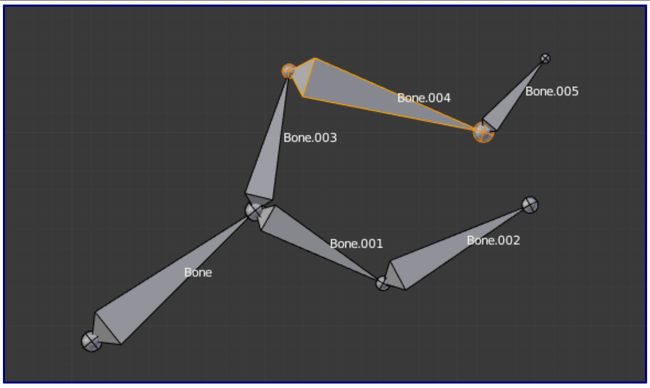
Reference
Mode: Edit Mode, Envelope visualization
Menu: Armature ‣ Transform ‣ Scale

When bones are displayed using *Octahedron*, *Stick* or *B-Bone* visualizations, scaling will behave as expected, similar to scaling mesh objects. When bones are displayed using *Envelope* visualization, scaling will have a different effect: it will scale the radius of the selected bones's joints. (see: skinning part). As you control only one value (the radius), there is no axis locking here. And as usual, with connected bones, you scale at the same time the radius of the parent's tip and of the children's roots.

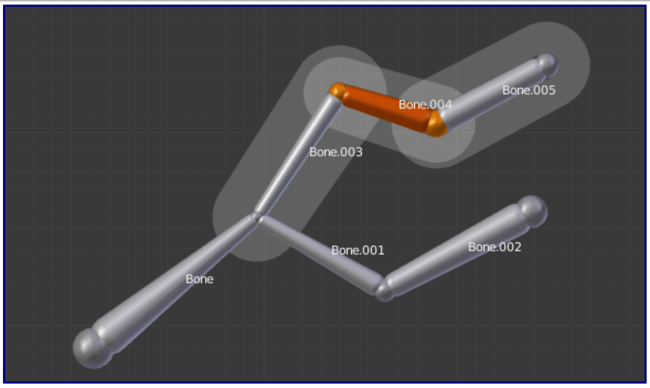
Scaling of a bone in *Octahedron* and *Envelope* visualizations.



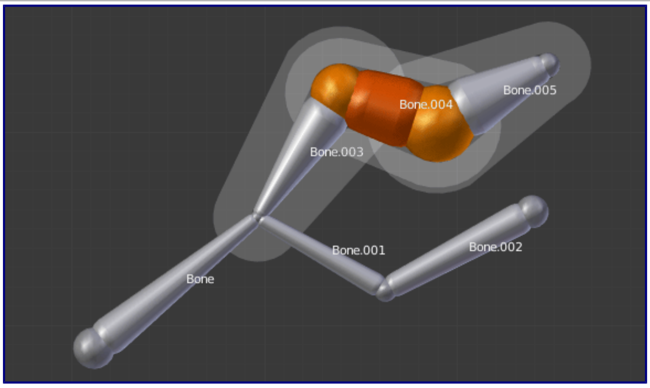
A single selected bone...



...Scaled in Octahedron visualization.



A single selected bone...



...Scaled in Envelope visualization. Its length remains the same, but its joints' radius are bigger.

Note that when you resize a bone (either by directly scaling it, or by moving one of its joints), Blender automatically adjusts the end-radii of its envelope proportionally to the size of the modification. Therefore, it is advisable to place all the bones first, and only then edit these properties.

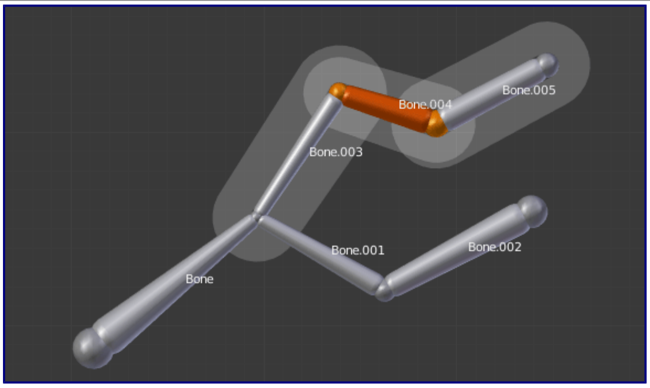
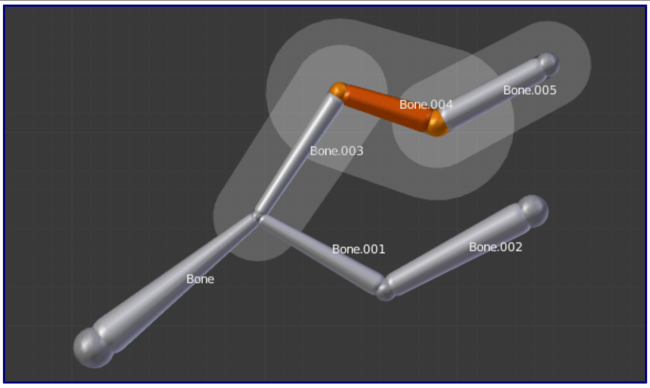
ScaleB and Envelope

Reference
Mode: Edit Mode

activates a transform tool that is specific to armatures. It has different behavior depending on the active visualization, as explained below:

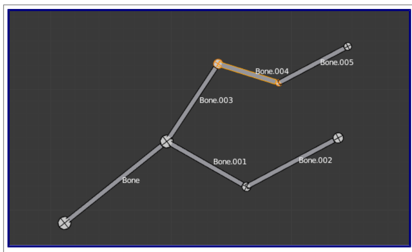
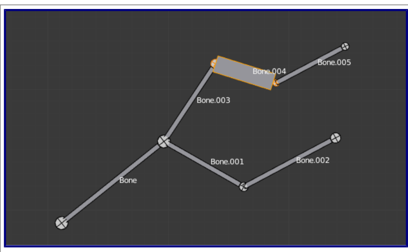
In *Envelope* visualization, it allows you to edit the influence of the selected bones (their *Distance* property, see the skinning part) – as with the “standard” scaling with this visualization (see the previous section), this is an one-value property, so there is no axis locking and such.

Envelope scaling example.

	
A single bone selected in Envelope visualization.	Its envelope scaled with `Ctrl-Alt-S`.

In the other visualizations, it allows you to edit the “bone size”. This seems to only have a visible effect in *B-Bone* visualization, but is available also with *Octahedron* and *Stick*... This tool in this situation has another specific behavior: While with other transform tools, the “local axes” means the object’s axes, here they are the bone’s own axes (when you lock to a local axis, by pressing the relevant key twice, the constraint is applied along the selected bone’s local axis, not the armature object’s axis).

“Bone size” scaling example.

		
A single “default size” bone selected in B-Bone visualization.	Its size scaled with `Ctrl-Alt-S`.	The same armature in Object Mode and B-Bone visualization, with Bone.004’s size scaled up.

Bone Roll

In *Edit Mode*, you can control of the bones roll (i.e. the rotation around the Y axis of the bone).

However, after editing the armature, or when using euler rotation, you may want to set the bone roll.

Set Bone Roll

Reference
Mode: Edit Mode
Menu: Armature ‣ Bone Roll ‣ Set

This is a transform mode where you can edit the roll of all selected bones.

Recalculate Bone Roll

Reference
Mode: Edit Mode
Menu: Armature ‣ Bone Roll ‣ Recalculate

Axis Orientation

Local Tangent

Align roll relative to the axis defined by the bone and its parent.

X, Z

Global Axis

Align roll to global X, Y, Z axis.

X, Y, Z

Active Bone

Follow the rotation of the active bone.

View Axis

Set the roll to align with the view-port.

Cursor

Set the roll towards the 3D cursor.

Flip Axis

Reverse the axis direction.

Shortest Rotation

Avoids rolling the bone over 90 degrees from its current value.

Switch Direction

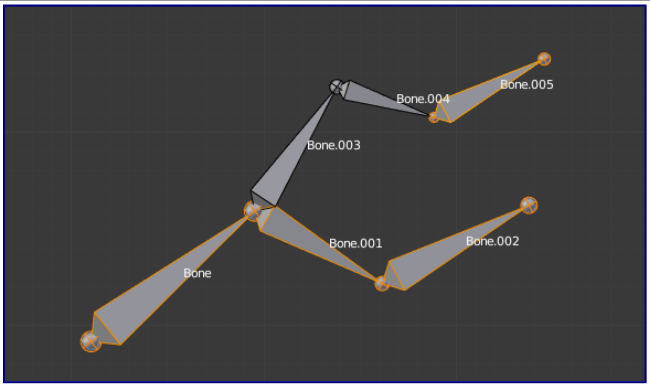
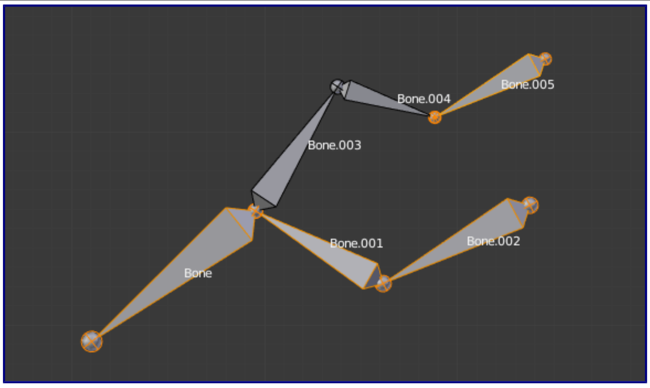
Reference
Mode: Edit Mode

Menu: Armature ‣ Switch Direction, Specials ‣ Switch Direction

This tool is not available from the *Armature* menu, but only from the *Specials* pop-up menu `W`. It allows you to switch the direction of the selected bones (i.e. their root will become their tip, and vice versa).

Switching the direction of a bone will generally break the chain(s) it belongs to. However, if you switch a whole (part of a) chain, the switched bones will still be parented/connected, but in “reversed order”. See the Fig. Switching example..

Switching example.

	
An armature with one selected bone, and one selected chain of three bones, just before switching.	The selected bones have been switched. Bone.005 is no more connected nor parented to anything. The chain of switched bones still exists, but reversed (Now Bone.002 is its root, and Bone is its tip). Bone.003 is now a free bone.

Editing Bones

Reference
Mode: Edit Mode

You will learn here how to add (Adding Bones), delete (Deleting Bones) or subdivide (Subdividing Bones) bones. We will also see how to prevent any bone transformation (Locking Bones) in *Edit Mode*, and the option that features an automatic mirroring (X-Axis Mirror Editing) of editing actions along the X axis.

Adding Bones

To add bones to your armature, you have more or less the same options as when editing meshes:

- *Add* menu,
- extrusion,

- `Ctrl-LMB` clicks,
- fill between joints,
- duplication.

Add Menu

Reference
Mode: Edit Mode
Tool Shelf

This bone will be:

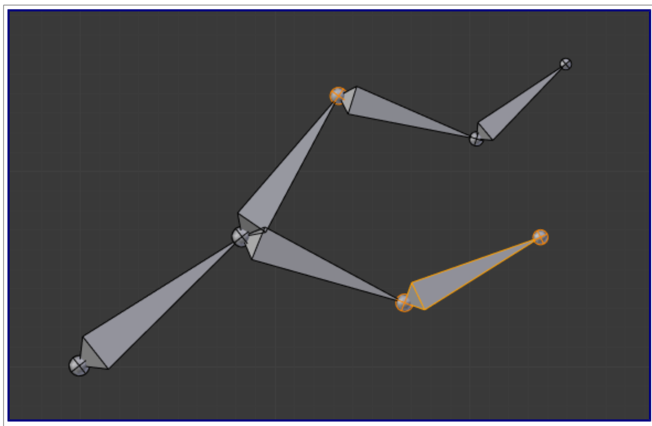
- of one Blender Unit of length,
- oriented towards the global Z axis,
- with its root placed at the 3D cursor position,
- with no relationship with any other bone of the armature.

Extrusion

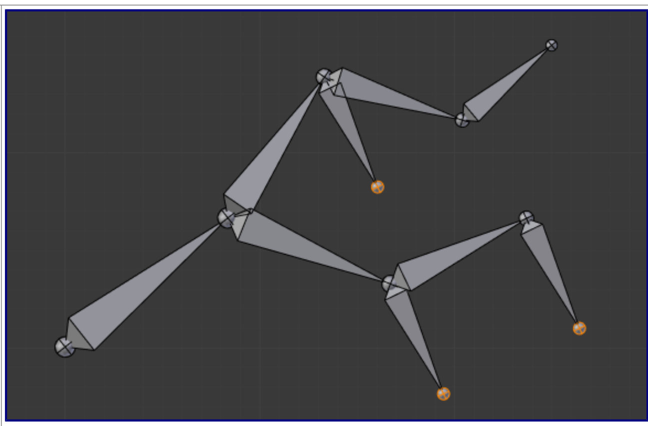
Reference
Mode: Edit Mode
Tool Shelf ‣ Extrude

When you press E, for each selected tip (either explicitly or implicitly), a new bone is created. This bone will be the child of “its” tip owner, and connected to it. As usual, once extrusion is done, only the new bones’ tips are selected, and in grab mode, so you can place them to your liking. See Fig. Extrusion example..

Extrusion example.



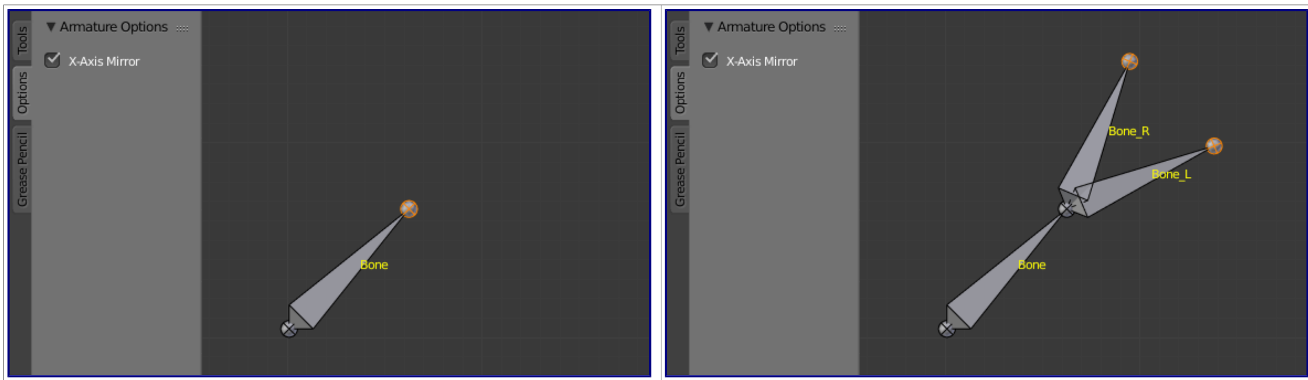
An armature with three selected tips.



The three extruded bones.

You also can use the rotating/scaling extrusions, as with meshes, by pressing respectively `E-R` and `E-S` – as well as locked extrusion along a global or local axis.

Mirror extrusion example.



A single selected bone’s tip. The two mirror-extruded bones.

Bones have an extra “mirror extruding” tool. By default, it behaves exactly like the standard extrusion. But once you have enabled the X-Axis mirror editing option (see X-Axis Mirror Editing), each extruded tip will produce *two new bones*, having the same name except for the “_L”/ “_R” suffix (for left/right, see the next page). The “_L” bone behaves like the single one produced by the default extrusion – you can grab/rotate/scale it exactly the same way. The “_R” bone is its mirror counterpart (along the armature’s local X axis), see Fig. Mirror extrusion example..

Warning

Canceling the extrude action causes the newly created bones to snap back to the source position, (creating zero length bones). These will be removed when exiting Edit Mode, however, they can cause confusion and it’s unlikely you want to keep them. If you realize the problem immediately undo the extrude action.

In case you are wondering, you cannot just press `DEL` to solve this as you would in mesh editing, because extrusion selects the newly created tips, and as explained below the delete command ignores bones’ joints. To get rid of these extruded bones without undoing, you would have to move the tips, then select the bones and delete (Deleting Bones) them.

Mouse Clicks

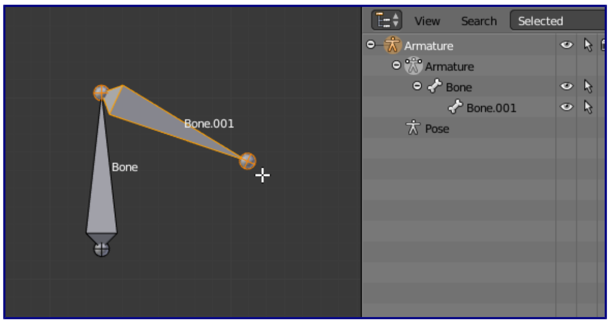
Reference	
Mode: Edit Mode	
Hotkey:	`Ctrl-LMB`

If at least one bone is selected, `Ctrl-LMB` -clicking adds a new bone.

About the new bone's tip:

- after you `Ctrl-LMB` -clicked it becomes the active element in the armature,
- it appears to be right where you clicked, but...
- ...(as in mesh editing) it will be on the plane parallel to the view and passing through the 3D cursor.

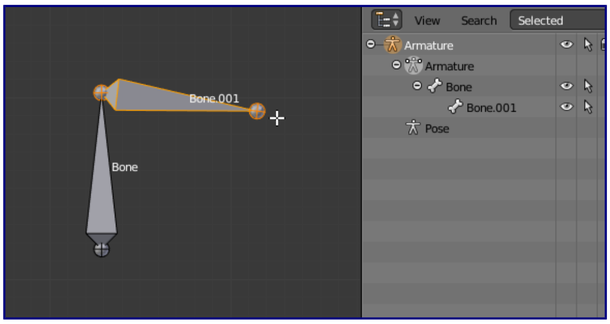
The position of the root and the parenting of the new bone depends on the active element:



Ctrl-clicking when the active element is a bone.

If the active element is a *bone*

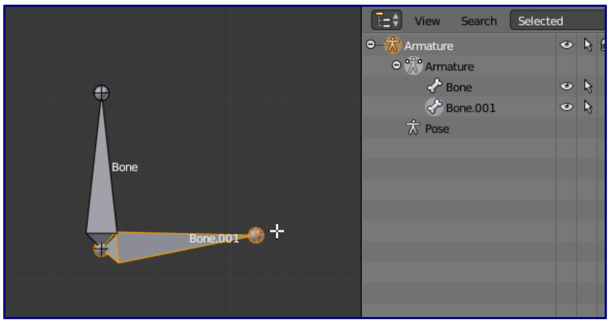
- the new bone's root is placed on the active bone's tip
- the new bone is parented and connected to the active bone (check the Outliner in Fig. Ctrl-clicking when the active element is a tip.).



Ctrl-clicking when the active element is a tip.

If the active element is a *tip* :

- the new bone's root is placed on the active tip
- the new bone is parented and connected to the bone owning the active tip (check the Outliner in Fig. Ctrl-clicking when the active element is a tip.).

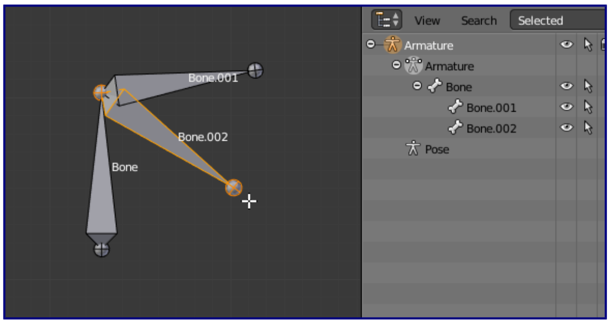


Ctrl-clicking when the active element is a disconnected root.

If the active element is a *disconnected root* :

- the new bone’s root is placed on the active root
- the new bone is **not** parented to the bone owning the active root (check the Outliner in Fig. Ctrl-clicking when the active element is a disconnected root.).

And hence the new bone will **not** be connected to any bone.



Ctrl-clicking when the active element is a connected root.

If the active element is a *connected root* :

- the new bone’s root is placed on the active root
- the new bone **is** parented and connected to the parent of the bone owning the active root (check the Outliner in Fig. Ctrl-clicking when the active element is a connected root.).

This should be obvious because if the active element is a connected root then the active element is also the tip of the parent bone, so it is the same as the second case.

As the tip of the new bone becomes the active element, you can repeat these `Ctrl-RMB` several times, to consecutively add several bones to the end of the same chain.

Fill between joints

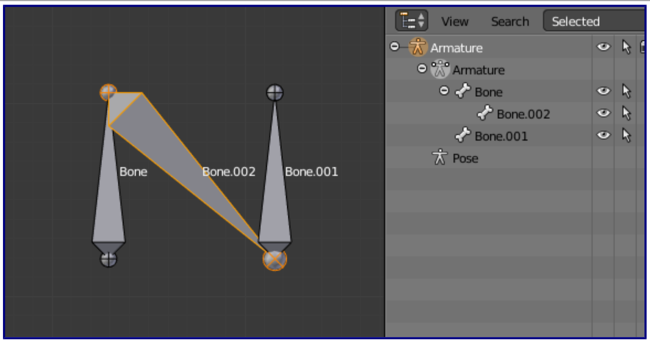
Reference
Mode: Edit Mode
Menu: Armature ‣ Fill Between Joints

The main use of this tool is to create one bone between two selected joints by pressing `F`, similar to how in mesh editing you can “create edges/faces”.

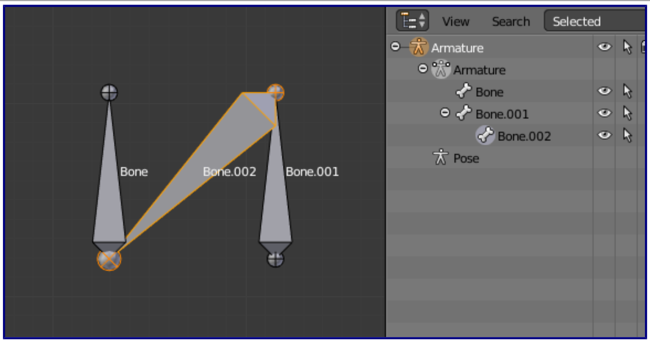
If you have one root and one tip selected, the new bone:

- Will have the root placed on the selected tip.
- Will have the tip placed on the selected root.
- Will be parented and connected to the bone owning the selected tip.

Fill between a tip and a root.



Active tip on the left.

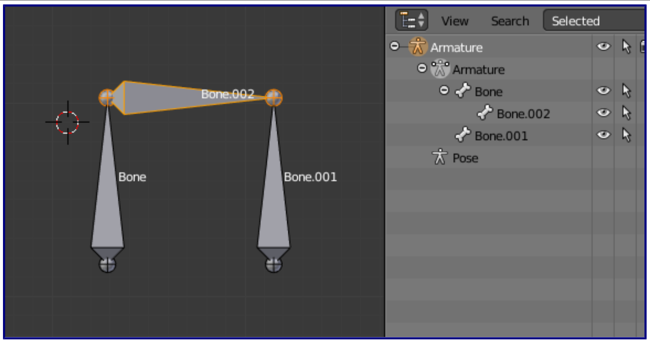


Active tip on the right.

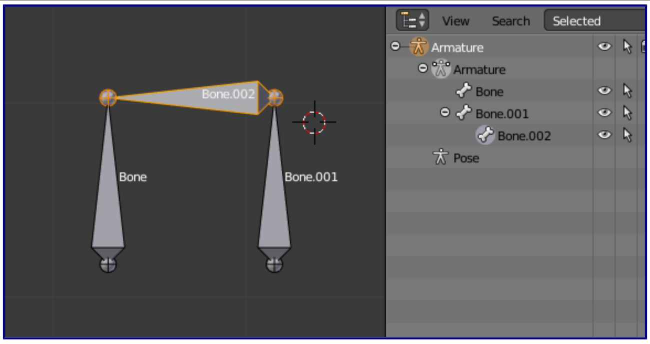
If you have two tips selected, the new bone:

- Will have the root placed on the selected tip closest to the 3D cursor.
- Will have the tip placed on the other selected tip.
- Will be parented and connected to the bone owning the tip used as the new bone's root.

Fill between tips.



3D cursor on the left.



3D cursor on the right.

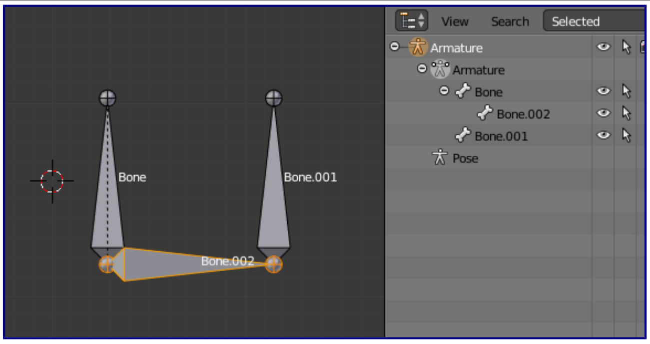
If you have two roots selected, you will face a small problem due to the event system in Blender not updating the interface in real time.

When clicking F, similar to the previous case, you will see a new bone:

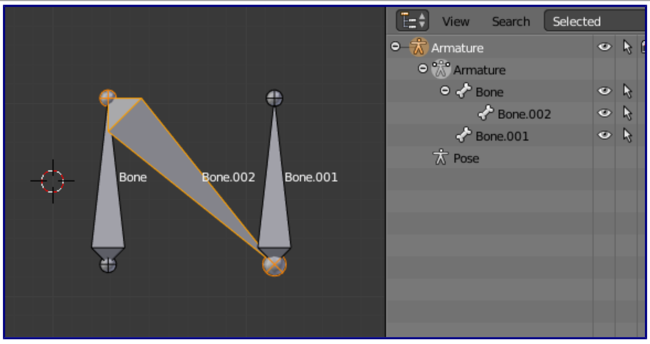
- With the root placed on the selected root closest to the 3D cursor.
- With the tip placed on the other selected root.
- Parented and connected to the bone owning the root used as the new bone's root.

If you try to move the new bone, Blender will update the interface and you will see that the new bone's root moves to the tip of the parent bone.

Fill between roots.



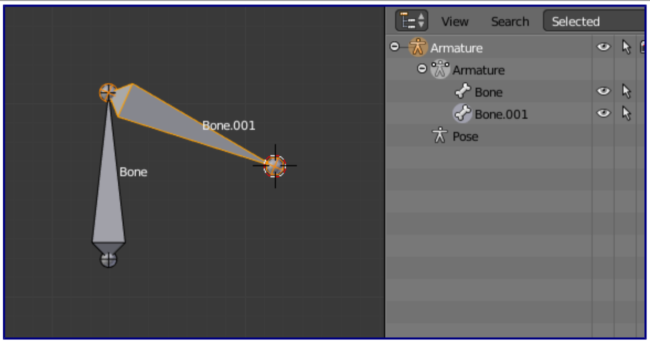
Before UI update (3D cursor on the left).



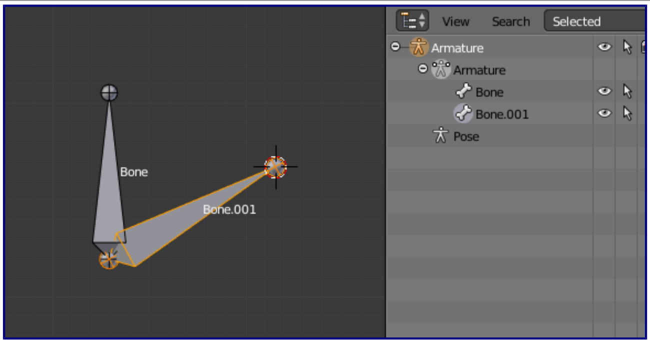
After UI update, correct visualization.

Clicking F with only one bone joint selected will create a bone from the selected joint to the 3D cursor position, and it will not parent it to any bone in the armature.

Fill with only one bone joint selected.



Fill with only one tip selected.



Fill with only one root selected.

You will get an error when:

- trying to fill two joints of the same bone, or
- trying to fill more than two bone joints.

Duplication

Reference
Mode: Edit Mode
Menu: Armature ‣ Duplicate

Note
This tool works on selected bones; selected joints are ignored.

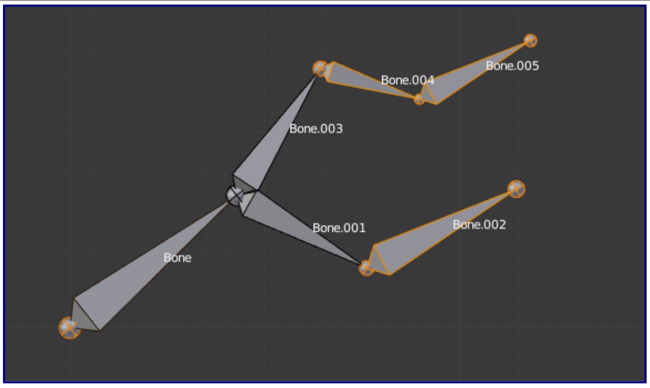
As in mesh editing,

- the selected bones will be duplicated,
- the duplicates become the selected elements and they are placed in grab mode, so you can move them wherever you like.

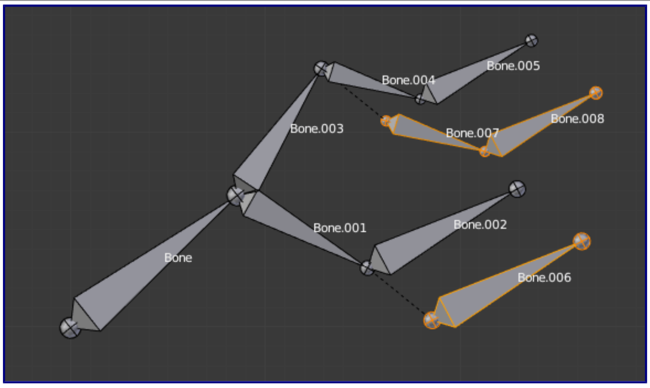
If you select part of a chain, by duplicating it you will get a copy of the selected chain, so the copied bones are interconnected exactly like the original ones.

The duplicate of a bone which is parented to another bone will also be parented to the same bone, even if the root bone is not selected for the duplication. Be aware, though, that if a bone is parented **and** connected to an unselected bone, its copy will be parented, but **not** connected to the unselected bone (see Fig. Duplication example.).

Duplication example.



An armature with three selected bones and a selected single root.



The three duplicated bones. Note that the selected chain is preserved in the copy, and that Bone.006 is parented but not connected to Bone.001, as indicated by the black dashed line. Similarly, Bone.007 is parented but not connected to Bone.003.

Split

Reference
Mode: Edit Mode
Menu: Armature ‣ Split

Disconnects the selection and clears the parent at the start and end. ToDo.

Deleting Bones

You have two ways to remove bones from an armature: the standard deletion, and merging several bones in one.

Standard deletion

Reference
Mode: Edit Mode

Menu: Armature ‣ Delete

Hotkey: DEL

Note

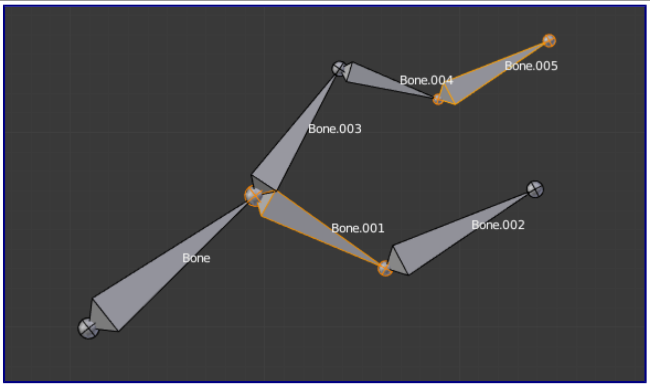
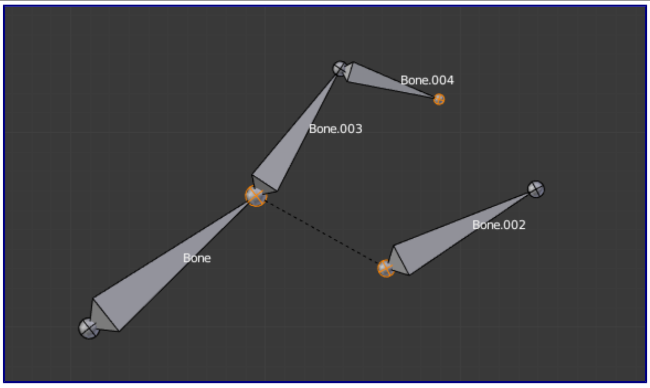
This tool works on selected bones: selected joints are ignored.

To delete a bone, you can:

- press DEL
- use the menu Armature ‣ Delete

If you delete a bone in a chain, its child(ren) will be automatically re-parented to its own parent, but **not** connected, to avoid deforming the whole armature.

Deletion example.

	
An armature with two selected bones, just before deletion.	The two bones have been deleted. Note that Bone.002, previously connected to the deleted Bone.001, is now parented but not connected to Bone.

Dissolve

Reference

Mode: Edit Mode

Menu: none

ToDo.

Merge

Reference
Mode: Edit Mode
Menu: Armature ‣ Merge

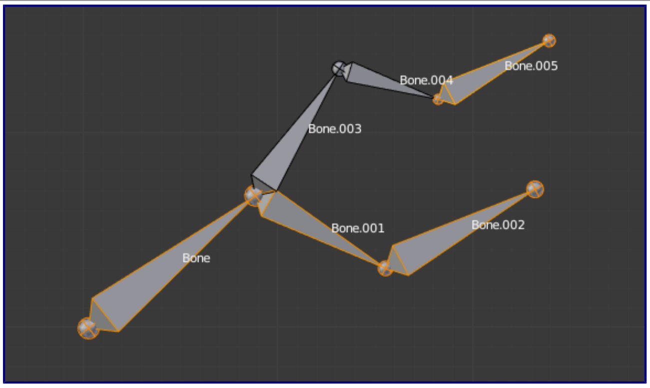
You can merge together several selected bones, as long as they form a chain. Each sub-chain formed by the selected bones will give one bone, whose root will be the root of the root bone, and whose tip will be the tip of the tip bone.

Confirm by clicking on Merge Selected Bones ‣ Within Chains .

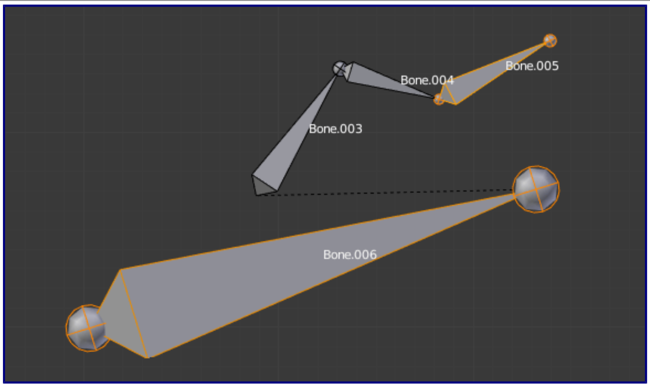
If another (non-selected) chain origins from inside of the merged chain of bones, it will be parented to the resultant merged bone. If they were connected, it will be connected to the new bone.

Here is a strange subtlety (see Fig. Merge example.): even though connected (the root bone of the unmerged chain has no root sphere), the bones are not visually connected. This will be done as soon as you edit one bone, differently depending in which chain is the edited bone (compare the bottom two images of the example to understand this better).

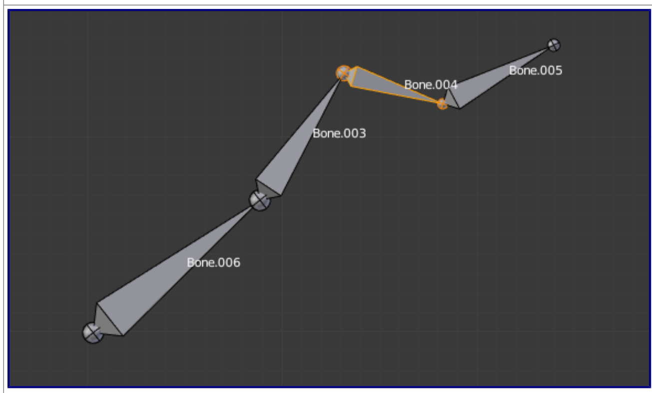
Merge example.



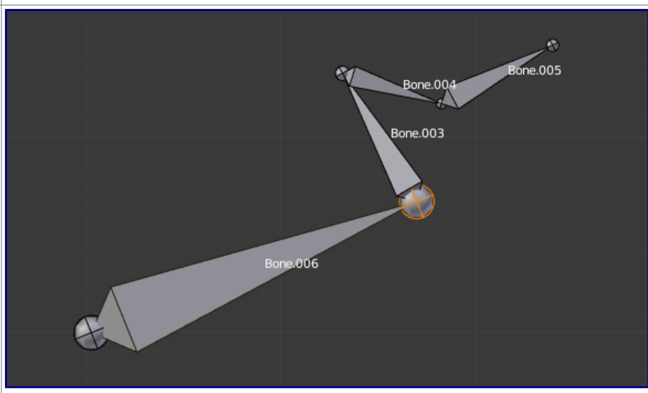
An armature with a selected chain, and a single selected bone, just before merging.



Bones Bone, Bone.001 and Bone.002 have been merged in Bone.006, whereas Bone.005 was not modified. Note Bone.003, connected to Bone.006 but not yet “really” connected.



Bone.004 has been rotated, and hence the tip of Bone.006 was moved to the root of Bone.003.



The tip of Bone.006 has been translated, and hence the root of Bone.003 was moved to the tip of

	“Bone.006”

Subdividing Bones

Reference
Mode: Edit Mode Menu: Armature ‣ Subdivide

You can subdivide bones, to get two or more bones where there was just one bone. The tool will subdivide all selected bones, preserving the existing relationships: the bones created from a subdivision always form a connected chain of bones.

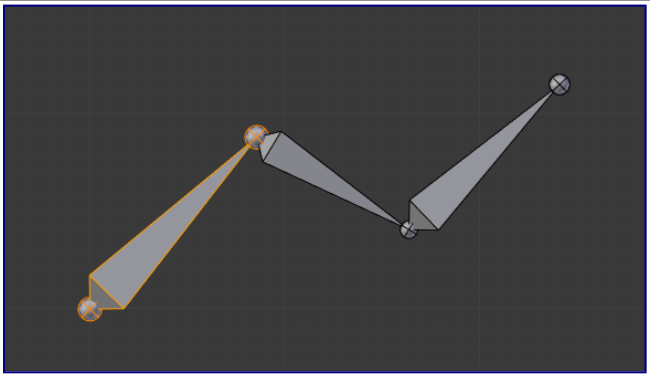
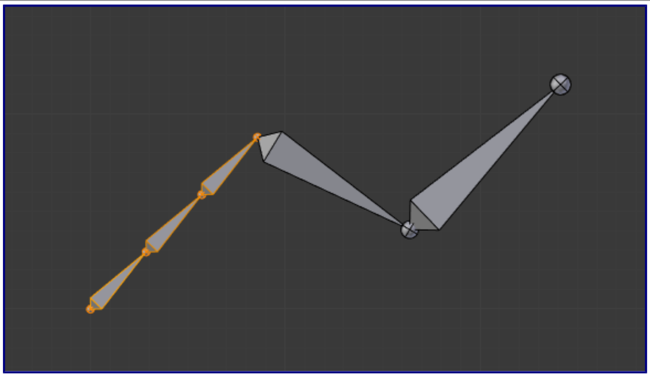
To create two bones out of each selected bone:

- select Armature ‣ Subdivide from the header menu.

To create an arbitrary number of bones from each selected bone in the Subdivide Multi Operator panel.

Number of Cuts
Specifies the number of cuts. As in mesh editing, if you set *n* cuts, you will get *n* + 1 bones for each selected bone.

Subdivision example.

	
An armature with one selected bone, just before multi-subdivision.	The selected bone has been “cut” two times, giving three sub-bones.

Locking Bones

You can prevent a bone from being transformed in *Edit Mode* in several ways:

- All bones can be locked clicking on the *Lock* checkbox of their Transform panel in the *Bones* tab;
- Press `Shift-W` Toggle Bone Options ‣ Locked
- Select Armature ‣ Bone Settings ‣ Toggle a Setting).

If the root of a locked bone is connected to the tip of an unlocked bone, it will not be locked, i.e. you will be able to move it to your liking. This means that in a chain of connected bones, when you lock one bone, you only really lock its tip. With unconnected bones, the locking is effective on both joints of the bone.

X-Axis Mirror Editing

Another very useful tool is the *X-Axis Mirror* editing option by Tool panel ‣ Armature Options , while Armature is selected in *Edit Mode*. When you have pairs of bones of the same name with just a different "side suffix" (e.g. ".R"/".L", or "_right"/"_left" ...), once this option is enabled, each time you transform (move/rotate/scale...) a bone, its "other side" counterpart will be transformed accordingly, through a symmetry along the armature local X axis. As most rigs have at least one axis of symmetry (animals, humans, ...), it is an easy way to spare you half of the editing work!

See also

naming bones.

Separating Bones in a new Armature

You can, as with meshes, separate the selected bones in a new armature object Armature ‣ Separate , and of course, in *Object Mode*, you can join all selected armatures in one Object ‣ Join Objects ,

Naming

Reference
Mode: Edit Mode
Panel: Properties region ‣ Item, Bones tab ‣ Bones panel

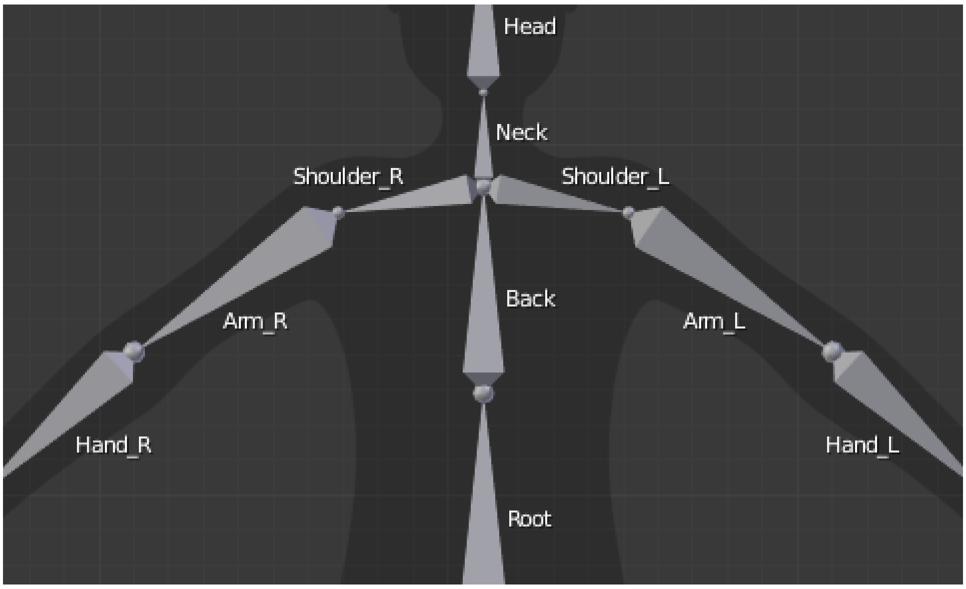
You can rename your bones, either using the *name* field of the *Item* panel in the 3D Views, for the active bone, or using the *name* field in each bone of the *Bones* tab in *Edit Mode*.

Blender also provides you some tools that take advantage of bones named in a left/right symmetry fashion, and others that automatically name the bones of an armature. Let us look at this in detail.

Naming Conventions

Naming conventions in Blender are not only useful for you in finding the right bone, but also to tell Blender when any two of them are counterparts.

In case your armature can be mirrored in half (i.e. it is bilaterally symmetrical), it is worthwhile to stick to a left/right naming convention. This will enable you to use some tools that will probably save you time and effort (like the *X-Axis Mirror* editing tool we saw above...).



An example of left/right bone naming in a simple rig.

1. First you should give your bones meaningful base-names, like “leg”, “arm”, “finger”, “back”, “foot”, etc.
2. If you have a bone that has a copy on the other side (a pair), like an arm, give it one of the following separators:

   - Left/right separators can be either the second position “L_calfbone” or last-but-one “calfbone.R”
   - If there is a lower or upper case “L”, “R”, “left” or “right”, Blender handles the counterpart correctly. See below for a list of valid separators. Pick one and stick to it as close as possible when rigging; it will pay off.

   Examples of valid saparators:

   - (nothing): handLeft –> handRight
   - _ (underscore): hand_L –> hand_R
   - . (dot): hand.l –> hand.r
   - - (dash): hand-l –> hand-r
   - `` `` (space): hand LEFT –> hand RIGHT

3.
   Note

   Note that all examples above are also valid with the left/right part placed before the name. You can only use the short “L”/ “R” code if you use a separator (e.g “handL”/ “handR” will not work!).

4. Before Blender handles an armature for mirroring or flipping, it first removes the number extension, e.g. ”.001”.

5. You can copy a bone named “bla.L” and flip it over using Specials ‣ Flip Left-Right Names. Blender will name the copy “bla.L.001” and flipping the name will give you “bla.R”.

Flip Name

Reference
Mode: Edit Mode
Menu: Armature ‣ Flip Name

You can flip left/right markers (see above) in selected bone names, using Armature ‣ Flip Name. This can be useful if you have constructed half of a symmetrical rig (marked for a left or right side) and duplicated and mirrored it, and want to update the names for the new side. Blender will swap text in bone names according to the above naming conventions, and remove number extensions if possible.

AutoName

Reference
Mode: Edit Mode
Menu: Armature ‣ AutoName Left/Right, Armature ‣ AutoName Front/Back, Armature ‣ AutoName Top/Bottom

The three *AutoName* entries of the *Armature* and *Specials* menu `W` allows you to automatically add a suffix to all selected bones, based on the position of their root relative to the armature center and its local coordinates:

AutoName Left/Right
: will add the ”.L” suffix to all bones with a *positive* X-coordinate root, and the ”.R” suffix to all bones with a *negative* X-coordinate root. If the root is exactly at 0.0 on the X-axis, the X-coordinate of the tip is used. If both joints are at 0.0 on the X-axis, the bone will just get a period suffix, with no “L”/ “R” (as Blender cannot decide whether it is a left or right bone...).

AutoName Front/Back
: will add the ”.Bk” suffix to all bones with a *positive* Y-coordinate root, and the ”.Fr” suffix to all bones with a *negative* Y-coordinate root. The same as with *AutoName Left-Right* goes for 0.0 Y-coordinate bones...

AutoName Top/Bottom
: will add the ”.Top” suffix to all bones with a *positive* Z-coordinate root, and the ”.Bot” suffix to all bones with a *negative* Z-coordinate root. The same as with *AutoName Left-Right* goes for 0.0 Z-coordinate bones...

Parenting

Reference
Mode: Edit Mode
Panel: Armature
Menu: Armature ‣ Parent ‣ ...

You can edit the relationships between bones (and hence create/modify the chains of bones) both from the 3D Views and the Properties editor. Whatever method you prefer, it's always a matter of deciding, for each bone, if it has to be parented to another one, and if so, if it should be connected to it.

To parent and/or connect bones, you can:

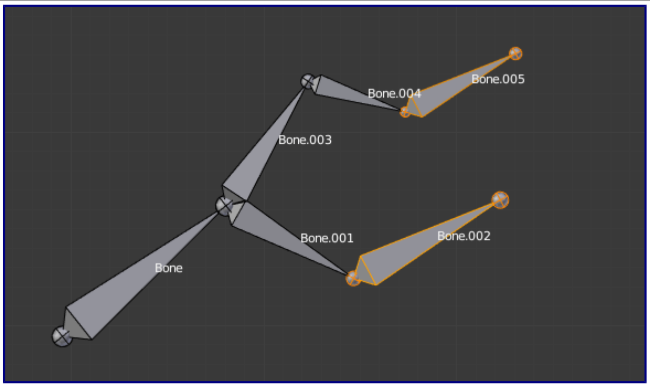
- In a 3D View, select the bone and *then* its future parent, and press `Ctrl-P` (or Armature ‣ Parent ‣ Make Parent...). In the small *Make Parent* menu that pops up, choose *Connected* if you want the child to be connected to its parent, else click on *Keep Offset*. If you have selected more than two bones, they will all be parented to the last selected one. If you only select one already-parented bone, or all selected bones are already parented to the last selected one, your only choice is to connect them, if not already done. If you select only one non-parented bone, you will get the *Need selected bone(s)* error message...

Note
With this method, the newly-children bones will not be scaled nor rotated – they will just be translated if you chose to connect them to their parent's tip.

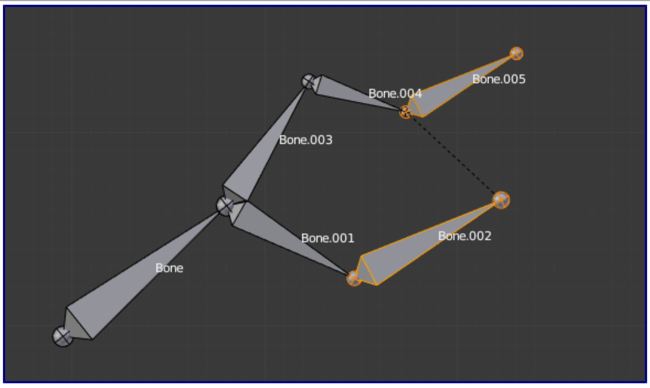
- In the Properties editor, *Bones* tab, for each selected bone, you can select its parent in the *Parent* data-ID to the upper right corner of its Relations panel. If you want them to be connected, just enable the checkbox to the right of the list.

Note
With this method, the tip of the child bone will never be translated – so if *Connected* is enabled, the child bone will be completely transformed by the operation.

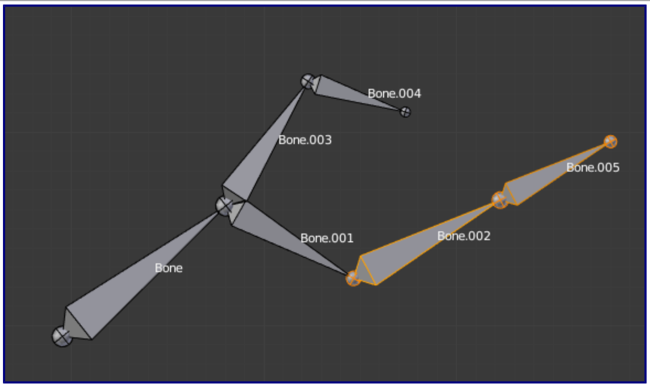
Parenting example.



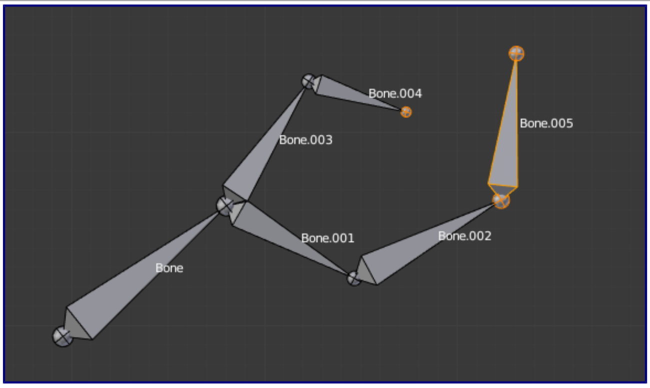
The starting armature, with Bone.005 parented and connected to Bone.004.



Bone.005 re-parented to Bone.002, but not connected to it (same result, using either `Ctrl-P-2` in 3D View, or the Bones tab settings).



Bone.005 parented and connected to Bone.002, using `Ctrl-P-1` in 3D View.



Bone.005 parented and connected to Bone.002.

Using the Parent data-ID of Bone.005 Relations panel.

To disconnect and/or free bones, you can:

- In a 3D View, select the desired bones, and press `Alt-P` (or Armature ‣ Parent ‣ Clear Parent...). In the small *Clear Parent* menu that pops up, choose *Clear Parent* to completely free all selected bones, or *Disconnect Bone* if you just want to break their connections.
- In the Properties editor, *Bones* tab, for each selected bone, you can select no parent in the *Parent* data-ID of its Relations panel, to free it completely. If you just want to disconnect it from its parent, disable the *Connected* checkbox.

Note that relationships with non-selected children are never modified.

Properties

Reference
Mode: Edit Mode
Menu: Armature ‣ Bone Settings ‣ ...

Most bones' properties (excepted the transform ones) are regrouped in each bone's panels, in the *Bones* tab in *Edit Mode*. Let us detail them.

Draw Wire
ToDo.

Deform

Multiply Vertex Group by Envelope

These settings control how the bone influences its geometry, along with the bones' joints radius. This will be detailed in the skinning part.

Inherit Rotation
These settings affect the behavior of children bones while transforming their parent in *Pose Mode*, so this will be detailed in the posing part !

Inherit Scale
ToDo.

Lock
This will prevent all editing of the bone in *Edit Mode*;

Skeleton Sketching

The Bone Sketching panel.

If you think that creating a whole rig by hand, bone after bone, is quite boring, be happy: some Blender developers had the same feeling, and created the Skeleton Sketching tool, formerly the Etch-a-ton tool, which basically allows you to "draw" (sketch) whole chains of bones at once.

Skeleton Sketching is obviously only available in *Edit Mode*, in the 3D Views. You control it through its *Skeleton Sketching* panel in the *Transform panel*, which you can open with `N`. Use the mouse `LMB` to draw strokes, and `RMB` for gestures. Showing its tool panel will not enable sketching. You must tick the checkbox next to *Skeleton Sketching* to start drawing bone chains (otherwise, you remain in the standard *Edit Mode*...).

Sketching is done in two steps:

- Drawing Chains (called "strokes"). Each stroke corresponds to a chain of bones.

- Converting to Bones, using different methods.

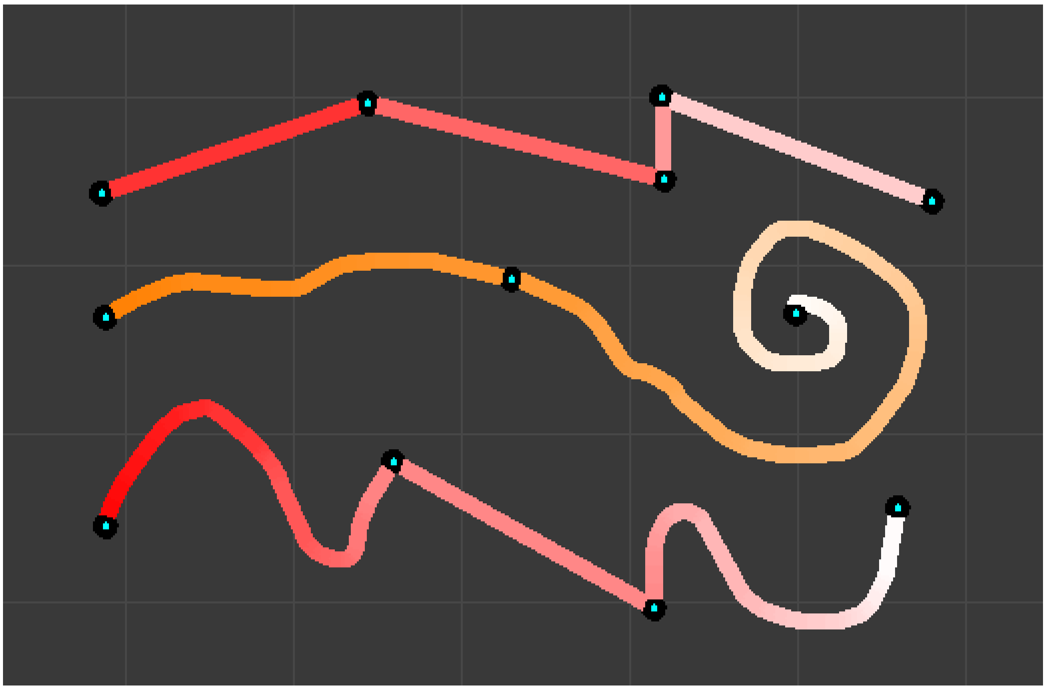
The *point of view* is important, as it determines the future bones' roll angle: the Z axis of a future bone will be aligned with the view Z axis of the 3D View in which you draw its "parent" stroke (unless you use the *Template* converting method...). Strokes are drawn in the current view plane passing through the 3D cursor, but you can create somewhat "3D" strokes using the *Adjust* drawing option in different views (see below).

If you enable the small *Quick Sketch* option, the two steps are merged into one: once you have finalized the drawing of a stroke (see Drawing Chains), it is immediately converted to bones (using the current active method) and deleted. This option makes bone sketching quick and efficient, but you lose all the advanced stroke editing possibilities.

Sketches are **not** saved into blend-files, so you cannot interrupt a sketching session without losing all your work! Note also that the sketching is common to the whole Blender session, i.e. there is only one set of strokes (one sketch) in Blender, and not one per armature, or even per file...

Drawing Chains

So, each stroke you draw will be a chain of bones, oriented from the starting point (the reddest or most orange part of the stroke) to its end (its whitest part). A stroke is made of several segments, delimited by small black dots. There will be at least one bone per segment (except with the *Template* conversion method, see next page), so all black points represents future bones' joints. There are two types of segments, which can be mixed together:

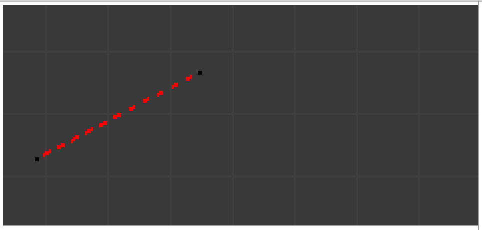
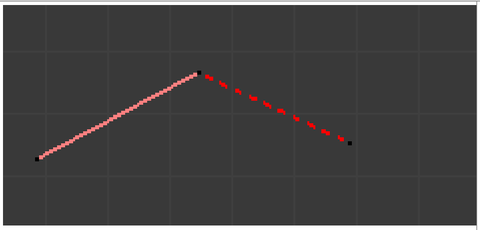
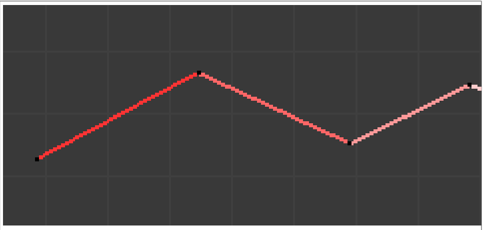


Strokes example. From top to bottom: A selected polygonal stroke of four straight segments, oriented from left to right. An unselected free stroke of two segments, oriented from left to right. A mixed stroke, with one straight segment between two free ones, right to left.

Straight Segments

To create a straight segment, click `LMB` at its starting point. Then move the mouse cursor, without pressing any button, a dashed red line represents the future segment. Click `LMB` again to finalize it. Each straight segment of a stroke will always create one and only one bone, whatever convert algorithm you use (except for the *Template* conversion method).

Drawing straight segments example.

		
The first segment has been started with a `LMB` click and the mouse moved to its end point.	The first segment has been finalized by a second `LMB` click, which also started a new segment...	Repeating these steps, we now have a four-segment polygonal stroke.

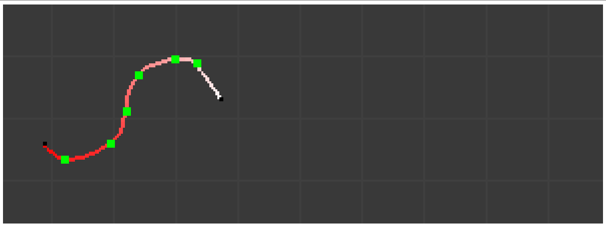
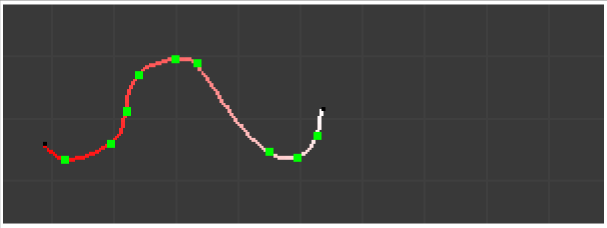
Free Segments

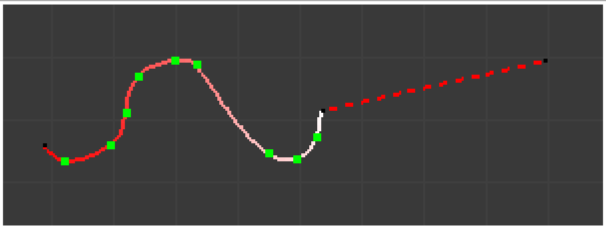
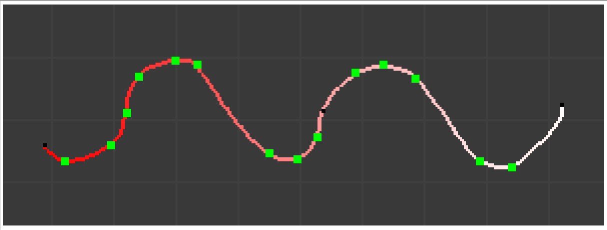
To create a free (curved) segment, click and hold `LMB` at its starting point. Then draw your segment by moving the mouse cursor – as in any paint program! Release `LMB` to finalize the segment. You will then be creating a new straight segment, so if you would rather start a new free segment, you must immediately re-press `LMB`.

The free segments of a stroke will create different number of bones, in different manners, depending on the conversion method used. The future bones' joints for the current selected method are represented by small green dots for each one of those segments, for the selected strokes only.

The free segment drawing uses the same *Manhattan Distance* setting as the grease pencil tool (*User Preferences*, *Edit Methods* “panel”, *Grease Pencil* group) to control where and when to add a new point to the segment. So if you feel your free segments are too detailed, raise this value a bit, and if you find them too jagged, lower it.

Drawing free segments example.

	
While drawing a first free segment with click and drag `LMB`.	The first free segment finalized by releasing `LMB`.

	
If you now move the mouse without pressing LMB again, you will create a straight segment...	But if you immediately click again and drag LMB you will instead start a new free segment.

You finalize a whole stroke by clicking RMB. You can cancel the stroke you are drawing by pressing Esc. You can also snap strokes to underlying meshes by holding Ctrl while drawing. By the way, the *Peel Objects* button at the bottom of the *Bone Sketching* panel is the same thing as the “monkey” button of the snapping header controls shown when *Volume* snap element is selected. See the snap to mesh page for details.

Selecting Strokes

A stroke can be selected (materialized by a solid red-to-white line), or not (shown as an orange-to-white line) - see (Strokes example) above. As usual, you select a stroke by clicking RMB on it, you add one to/remove one from the current selection with a Shift-RMB click, and A (de)selects all strokes...

Deleting

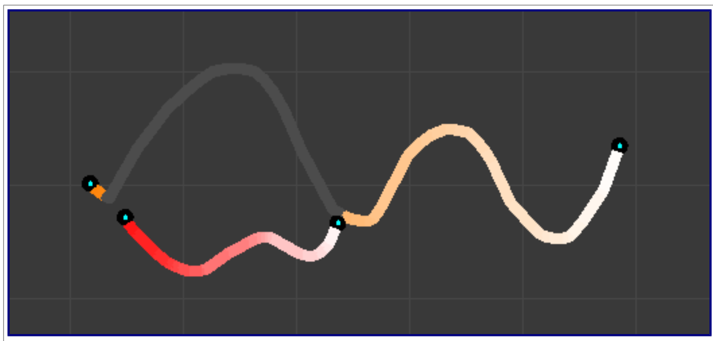
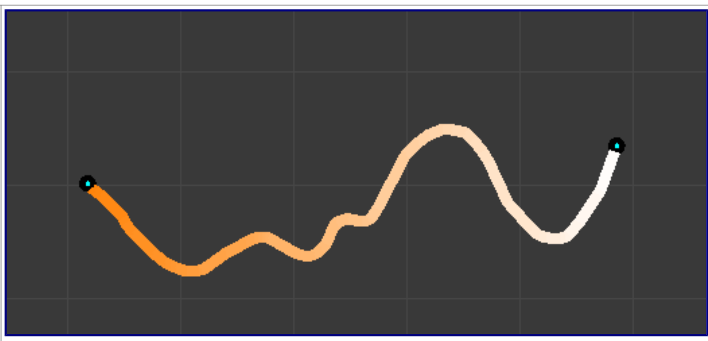
Clicking on the *Delete* button (*Bone Sketching* panel) deletes the selected strokes (be careful, no warning/confirmation pop-up menu here). See also Gestures.

Modifying Strokes

You can adjust, or “redraw” your strokes by enabling the *Overdraw Sketching* option of the *Bone Sketching* panel. This will modify the behavior of the strokes drawing (i.e. LMB clicks and/or hold): when you draw, you will not create a new stroke, but rather modify the nearest one.

The part of the old stroke that will be replaced by the new one are drawn in gray. This option does not take into account stroke selection, i.e. all strokes can be modified this way, not just the selected ones... Note also that even if it is enabled, when you draw too far away from any other existing stroke, you will not modify any of them, but rather create a new one, as if *Overdraw Sketching* was disabled.

Adjusting stroke example.

	
Adjusting a stroke: the gray part of the “unselected” (orange) stroke will be replaced by the currently drawn	Stroke adjusted.

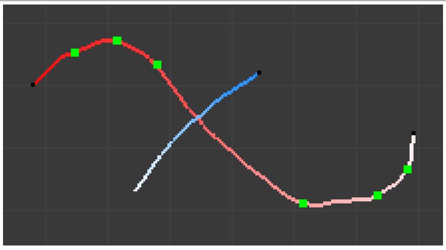
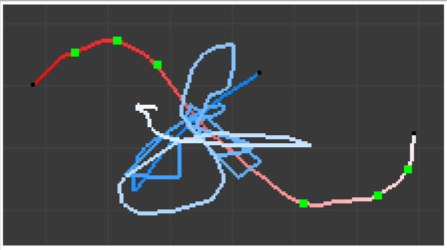
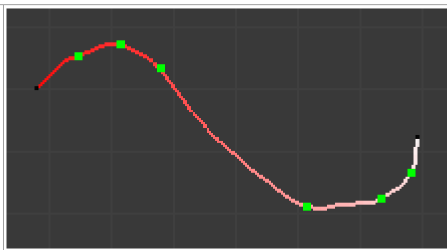
“replacement”.	

Warning
There is no undo/redo for sketch drawing...

Gestures

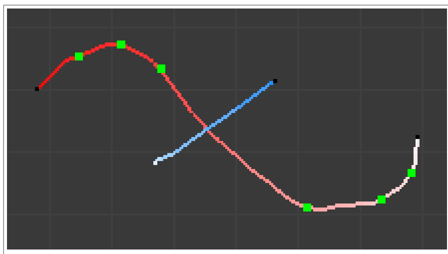
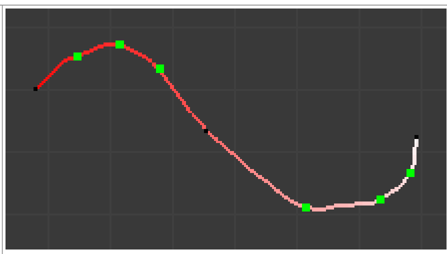
There quite a few things about strokes editing that are only available through gestures. Gestures are started by clicking and holding `Shift-LMB` (when you are not already drawing a stroke), and materialized by blue-to-white lines. A gesture can affect several strokes at once.

There is no direct way to cancel a gesture once you have started “drawing” it. So the best thing to do, if you change your mind (or made a “false move”), is to continue to draw until you get a disgusting scribble, crossing your stroke several times. In short, something that the gesture system would never recognize!

		
An unwanted cut stroke.	Some random drawing.	The stroke is still in one piece.

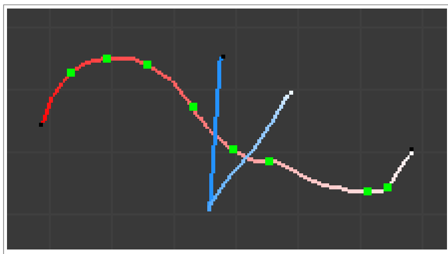
Cut

To *cut* a segment (i.e. add a new black dot inside it, making two segments out of one), “draw” a straight line crossing the chosen segment where you want to split it.

	
Gesture.	Result.

Delete

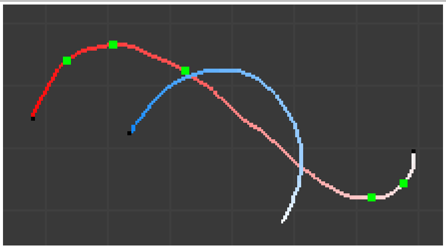
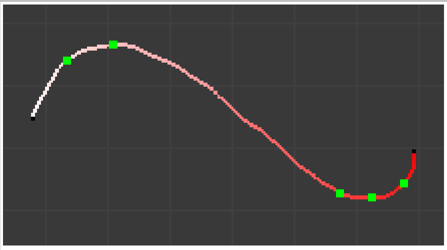
To *delete* a stroke, draw a “V” crossing the stroke to delete twice.

Gesture.	Result.

Reverse

To *reverse* a stroke (i.e. the future chain of bones will be reversed), draw a “C” crossing twice the stroke to reverse.

	
Gesture.	Result.

Converting to Bones

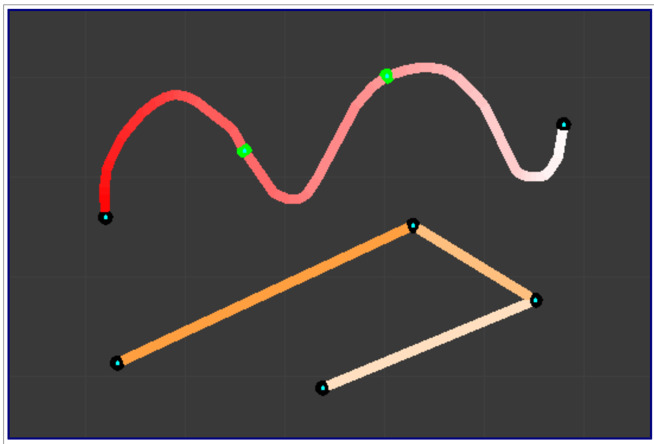
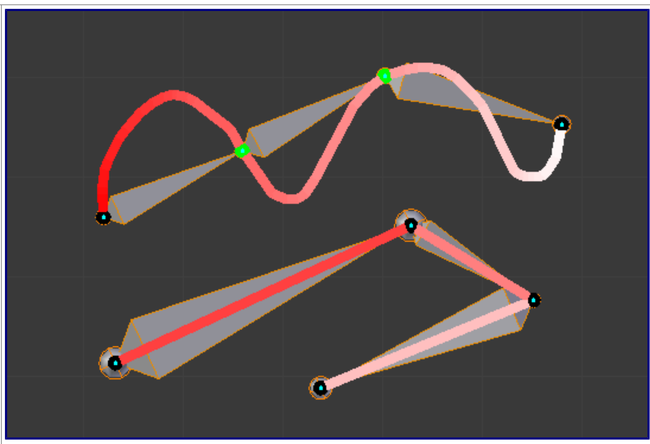
Once you have one or more selected strokes, you can convert them to bones, using either the *Convert* button of the *Bone Sketching* panel, or the corresponding gesture (see Gestures). Each selected stroke will generate a chain of bones, oriented from its reddest end to its whitest one. Note that converting a stroke does not delete it.

There are four different conversion methods with three “simple” ones, and one more advanced and complex, *Template*, that reuses bones from the same armature or from another one as a template for the strokes to convert, and which is detailed in the next page. Anyway, remember that straight segments are always converted to one and only one bone (except for the *Template* conversion method), and that the future bones’ joints are shown as green dots on selected free segments.

Remember also that the roll rotation of the created bones has been set during their “parent” stroke drawing (except for the *Template* conversion method) - their Z axis will be aligned with the view Z axis of the active 3D View at draw time.

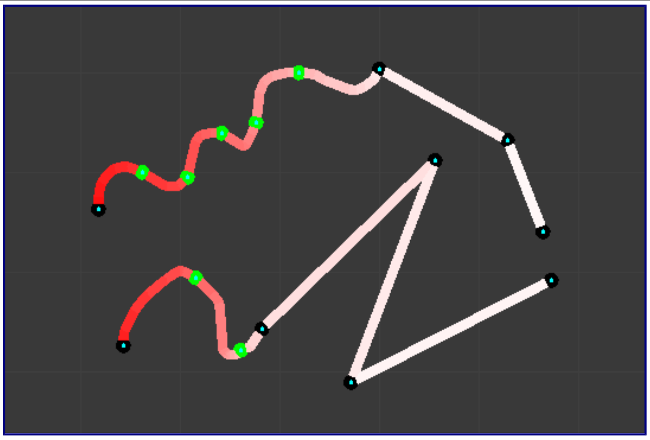
Fixed

With this method, each free segment of the selected strokes will be uniformly divided in *n* parts (set in *Number* number button), i.e. will give *n* bones.

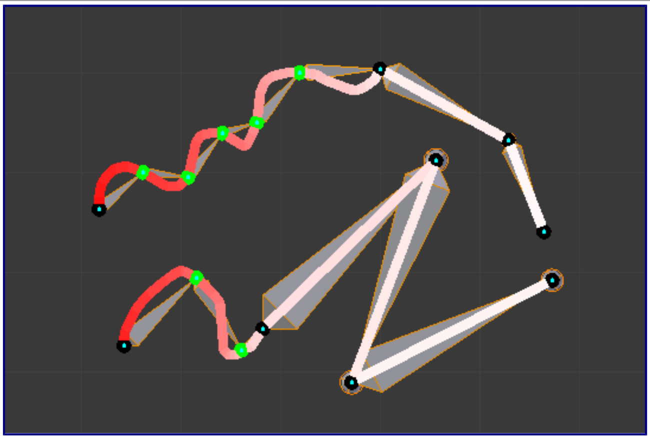
	
The Fixed conversion preview on selected strokes.	The Fixed conversion result.

Adaptive

With this method, each free segment of the selected strokes will create as many bones as necessary to follow its shape closely enough. This “closely enough” parameter being set by the *Threshold* number button; higher values giving more bones, following more closely the segments’ shape. So the more twisted a free segment, the more bones it will generate.



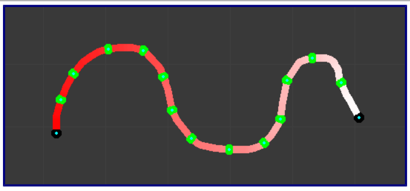
The Adaptive conversion preview on selected strokes.



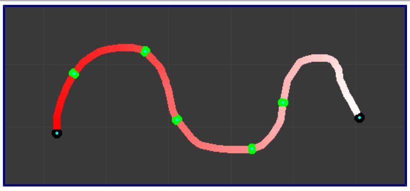
The Adaptive conversion result.

Length

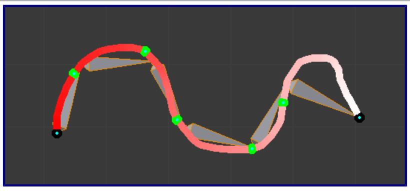
With this method, each free segment of the selected strokes will create as many bones as necessary, so that none of them is longer than the *Length* number button value (in Blender Units).



The Length conversion preview on selected strokes.



Using a larger length value.



The Length conversion result.

Retarget

Retarget template bone chain to stroke.

Template
: Template armature that will be retargeted to the stroke. This is a more complex topic, detailed in its own page.

Retarget roll mode

- **None**
  Do not adjust roll.
- **View**
  Roll bones to face the view.
- **Joint**
  Roll bone to original joint plane offset.

Autoname
: Todo.

Number

Todo.

Side

Todo.

Armature Templating

The idea of templating is to use an already existing armature as base ("template") to create a new armature. It differs from a simple copy in that you can directly define the new armature different in some aspects than its reference rig.

In Blender, the only templating tool is the bone sketching one (Etch-a-ton, described in the previous page), with its *Template* conversion method, so you should have read its page before this one!

Using Bone Sketching

Reference
Mode: Edit Mode Panel: Bone Sketching (3D View editor) Menu: Armature ‣ Bone Sketching

The *Template* conversion method of *Bone Sketching* tool maps a copy of existing bones to each selected stroke. The new bones will inherit some of their properties (influence, number of segments, etc.) from the corresponding bones in the template, but they will acquire their lengths, rolls and rotation from the sketch; so these properties would be different as compared to the template.

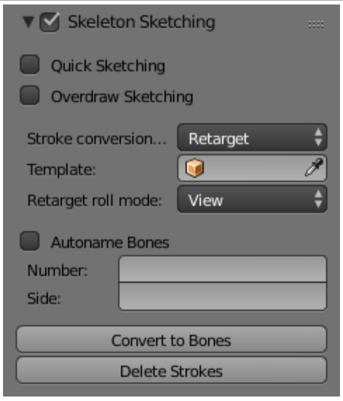
This is easier to understand with some examples.

In the following image, "armature.002" is set as the template, and the stroke maps with "chain_a" of this template. None of the bones are selected in the template. Note that there is no second stroke to map with chain "chain_b" of the template. The result is shown at right: Blender creates a copy of "chain_a" and matches the bones with the stroke.

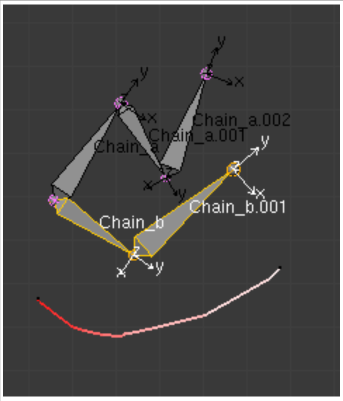
Blender also creates a copy of "chain_b", but this chain is not altered in any way; because this command can map only one selected chain with a stroke.

In the following example, no template is selected. (In other words, all the action is within the armature itself.)

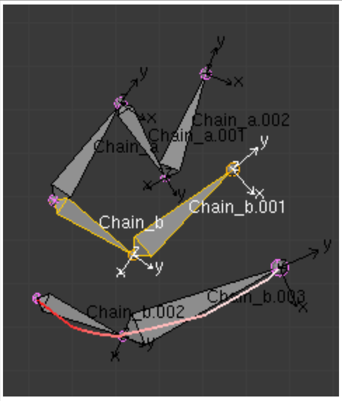
Two bones are selected in "chain_b", and the property panel is set to map the joints with the stroke. So these two selected bones are copied and the newly created copy of the chain is matched with the stroke. (Note that the newly created bones are named in continuation of the original chain.)



Conversion settings.



Before conversion.

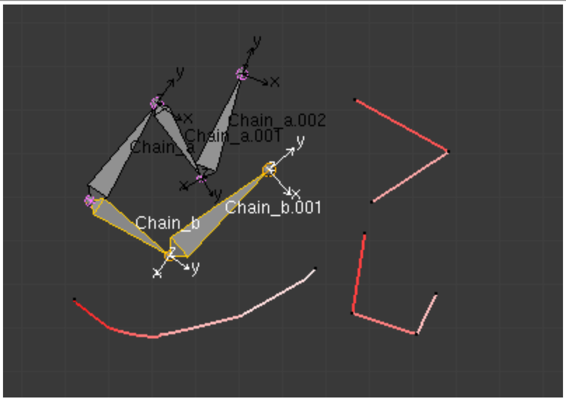


After conversion.

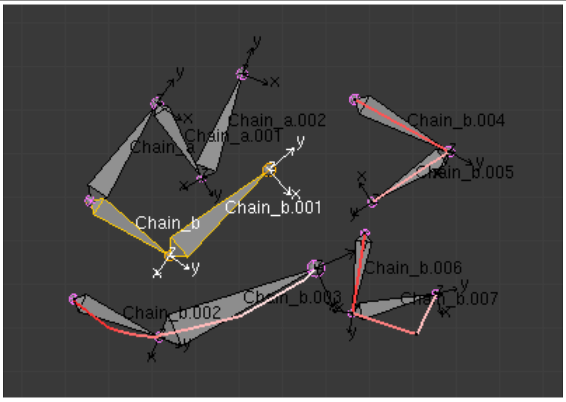
If you had selected both the chains (“Chain_a” and “Chain_b”), you would have still got the same result as in the example above, because the command maps to stroke only one selected chain.

In the following example also, only one chain is selected, but there are three strokes to map to. In this case, the same chain is copied three times (once for each stroke) and then mapped to individual strokes. Note how a two-bone chain is fitted to a three-segment stroke.

The newly created bones are numbered sequentially, after the original bones’ names.



Before conversion.



After conversion.

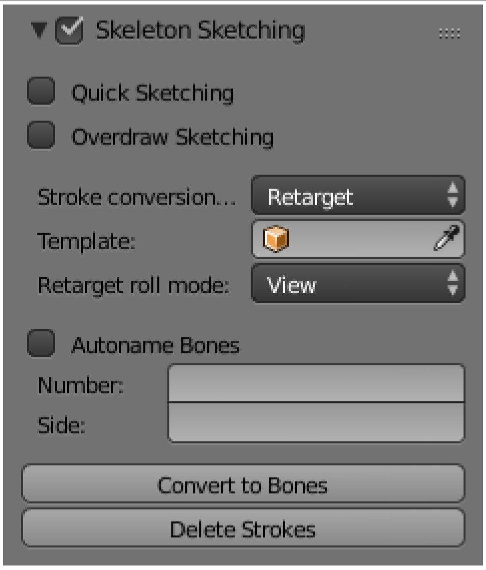
OK now, here are some important ground rules:

- This conversion method can use as reference bones either the selected bones in the *currently* edited armature, or *all* bones from another armature. In general, it is a better idea to create new “templated” bones inside the “reference” armature, so you can precisely select which bones to use as template – if you want the new bones in a different armature, you can then use the *Separate* and optionally *Join* commands...
- This tool only considers *one* chain of bones, so it is better to select only one chain of bones inside the current armature (or use a single-chain armature object as template). Else, the chain of the template containing the first created bones will be mapped to the selected strokes, and the other chains will just be “copied” *as is*, without any modification.
- This tool maps the same chain of bones on all selected strokes, so you cannot use multiple strokes to map a multi-chains template – you will rather get a whole set of new bones for each selected stroke!
- If you have strokes only made of straight segments, they must have *at least* as much segments as there are bones in the template chain (else, the newly created chain is not mapped at all to the stroke, and

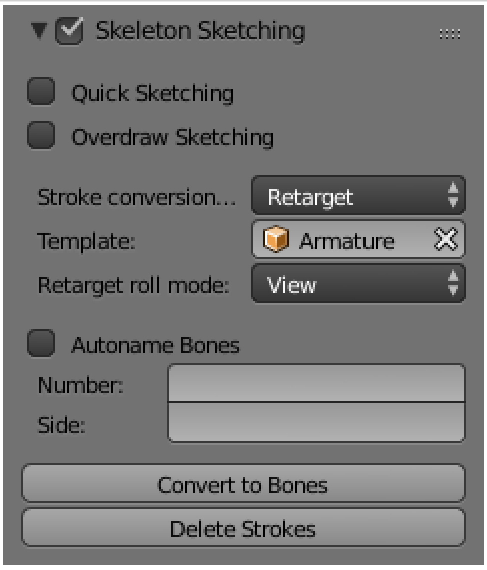
remains an exact duplicate of its template). If there are more segments than necessary, the conversion algorithm will chose the best "joints" for the bones to fit to the reference chain, using the same influence settings as for free segments (*Angle*, *Length* and *Definition* settings, see below).

- If you try to *Convert* without template bones (i.e. either an empty armature selected as template, or no bones selected in the current edited armature), you will get the error message `No Template and no deforming bones selected`, and nothing will occur.

The *Skeleton Sketching* panel with *Retarget* conversion method enabled.



With current edited armature as template.



With another armature as template.

Now, here are the settings of this conversion method:

No, View, Joint buttons

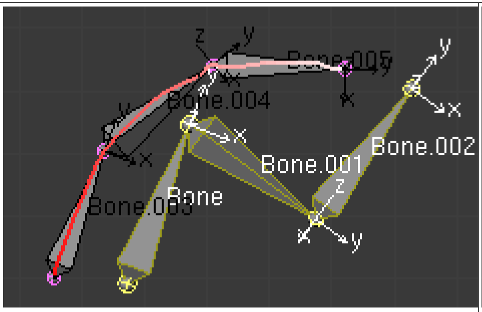
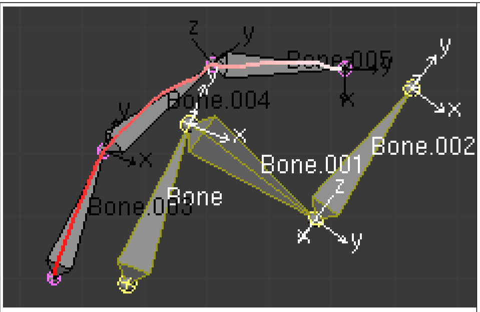
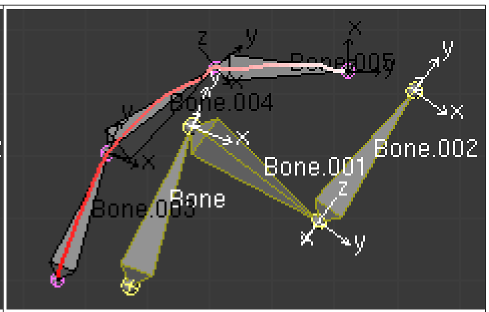
These three toggle buttons (mutually exclusive) control how the roll angle of newly created bones is affected:

No
: Do not alter the bones roll (i.e. the new bones' rolls fit their reference ones).

View
: Roll each bone so that one of its X, Y or Z local axis is aligned (as much as possible) with the current view's Z axis.

Joint
: New bones roll fit their original rotation (as *No* option), but with regards to the bend of the joint with its parent.

Templating: bone roll example.

		
With No roll option.	With View roll option.	With Joint roll option.

The “Bone.003” to “Bone.005” chain is the mapped-to-stroke version of “Bone” to “Bone.002” selected one, and “Bone.001” has a modified roll angle.

Template

In this data-ID you can select the armature to use as template. If you choose *None*, the selected bones from the currently edited armature will be used as reference, else all bones of the other armature will be used.

***Angle*, *Length*, *Definition* are numeric fields.**

These settings control how the template is mapped to the selected strokes. Each one can have a value between (0.0 and 10.0), the default being 1.0.

Angle

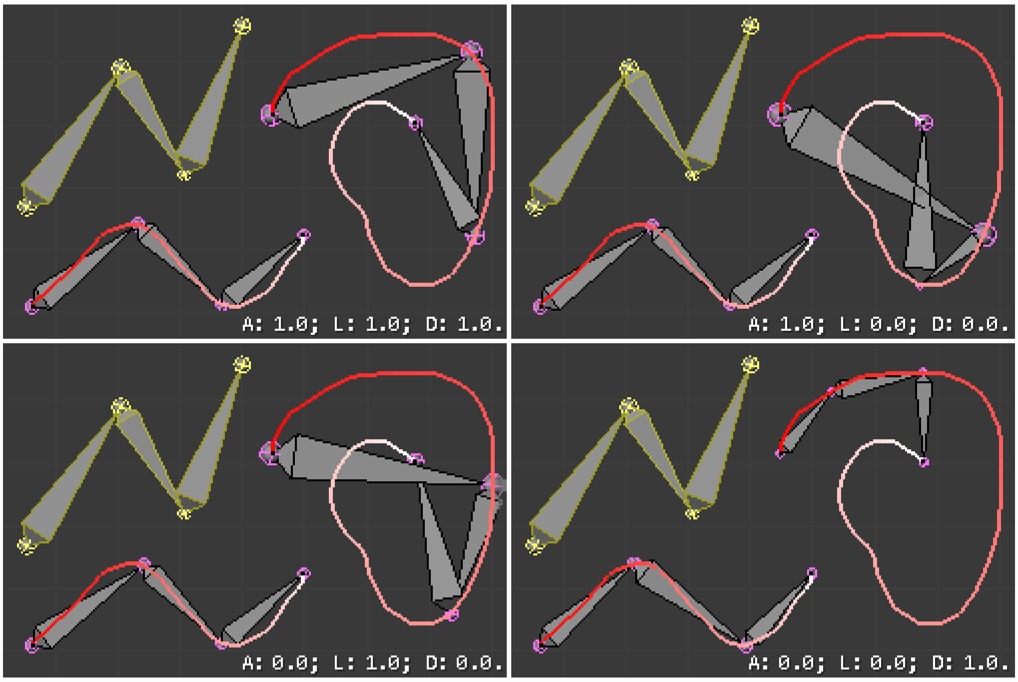
Controls the influence of the angle of the joints (i.e. angle between bones). The higher this value, the more the conversion process will try to preserve these joints angle in the new chain.

Length

Controls the influence of the bones’ length. The higher this value, the more the conversion process will try to preserve these lengths in the new bones.

Definition

Controls the influence of the stroke’s shape. The higher this value, the more the conversion process will try to follow the stroke with the new chain.

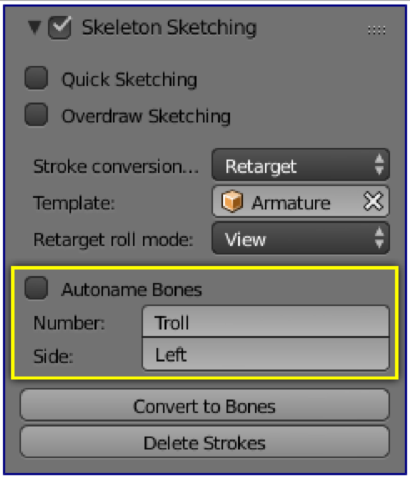


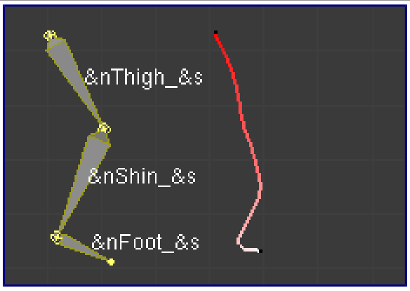
Examples of Template conversions for various influence weights values, with one stroke quite similar to the template chain’s shape, and one stroke very different.

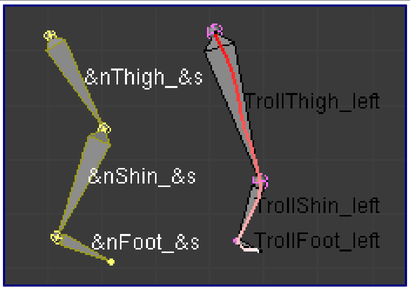
Side and Number text fields, *auto* button

These control how the new bones are named. By default, they just take the same names as the originals from the template, except for the final number, increased as needed. However, if the template bones have “&s” somewhere in their name, this “placeholder” will be replaced in the “templated” bones’ names by the content of the *Side* text field. Similarly, a “&n” placeholder will be replaced by the *Number* field content. If you enable the small *auto* button, the *Number* field content is auto-generated, producing a number starting from nothing, and increased each time you press the *Convert* button, and the “&s” placeholder is replaced by the side of the bone (relative to the local X axis: “r” for negative X values, “l” for positive ones).

Naming and placeholders, using a simple leg template.

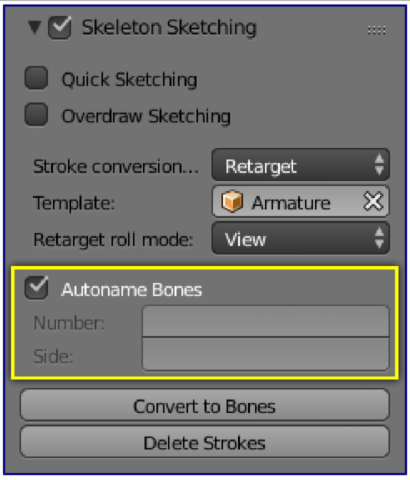
<table>
<tr>
<td>

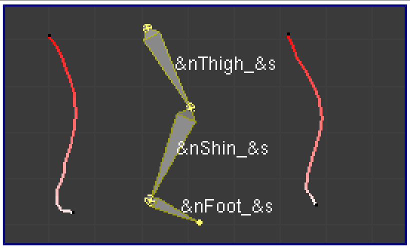
Conversion settings.</td>
<td>

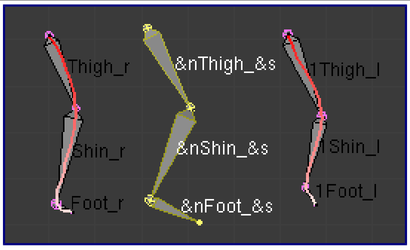
Before conversion (note the &n and &s placeholders in template bones’ names).</td>
<td>

After conversion: the placeholders have been replaced by the content of the S and N text fields of the Bone Sketching panel.</td>
</tr>
</table>

Auto naming and placeholders, using a simple leg template.

<table>
<tr>
<td>

Conversion settings.</td>
<td>

Before conversion (note that, in the Bone Sketching panel, the S and N fields are empty, and the small “auto” button is enabled).</td>
<td>

After conversion.</td>
</tr>
</table>

Static text line

The line just above the *Peel Objects* button gives you two informations:

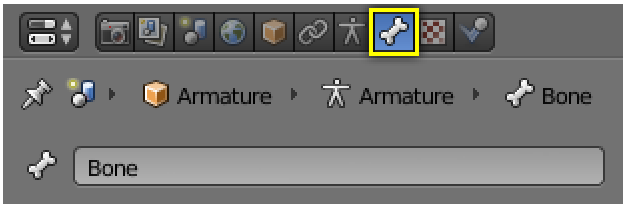
- The *n* joints part gives you the number of joints (i.e. bones’ joints, with connected joints considered as one joint), either from the selected bones of the edited armature, or in the whole other template armature.

- The second part is only present when another armature has been selected as template – it gives you the *root bone's name* of the chain that will be mapped to the strokes. Or, while you are drawing a stroke with straight segments, the name of the bone corresponding to the current segment (and "Done" when you have enough segments for all bones in the template chain).

Introduction

Reference
Mode: Object Mode, Edit Mode and Pose Mode
Panel: All in Properties editor, *Bone* property

When bones are selected (hence in *Edit Mode* and *Pose Mode*), their properties are shown in the *Bone* tab of the Properties editor. This shows different panels used to control features of each selected bone; the panels change depending on which mode you are working in.



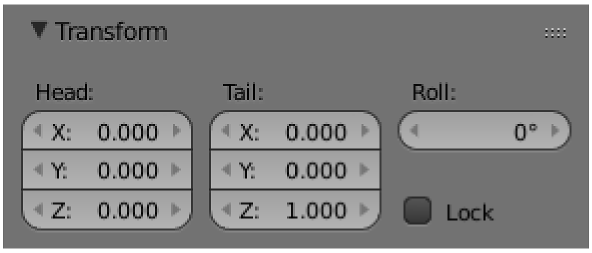
The Bone tab.

Relations
: In this panel you can arrange sets of bones in different layers for easier manipulation.

Display
: Display panel lets you customize the look of your bones taking the shape of another existing object.

Deform
: In this panel you can set basic deformation properties of the bones.

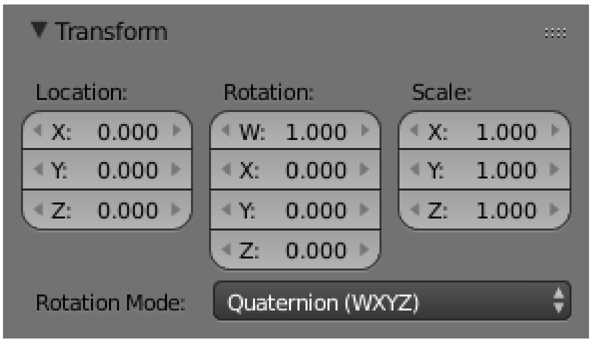
Transform



The Transform panel (edit mode).

When in edit mode you can use this panel to control position and roll of individual bones.

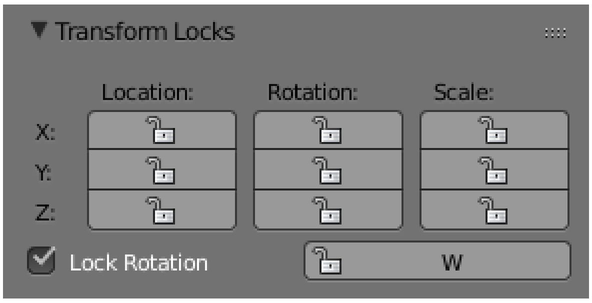
When in pose mode you can only set location for the main bone, and you can now set rotation and scale.



The Transform panel (pose mode).

Note
This mode is only available in Edit Pose Modes.

Transform Locks

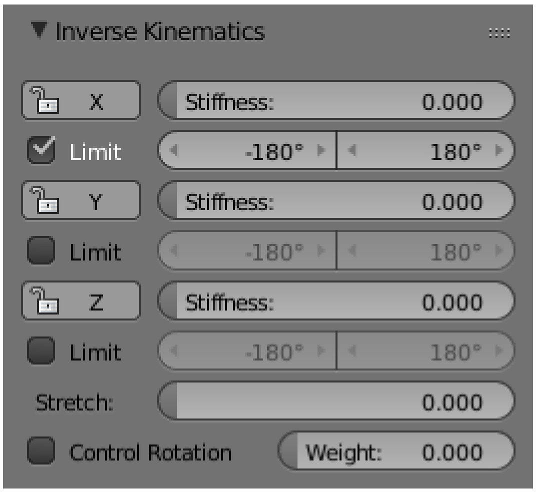


The Transform Locks panel.

This panel appears only in pose mode and allows you to restrict position, rotation and scale by axis on each bone in the armature.

Note
This mode is only available in Pose Mode.

Inverse Kinematics



The Inverse Kinematics panel.

This panel controls the way a bone or set of bones behave when linked in an inverse kinematic chain.

Note

This mode is only available in Pose Mode.

Custom Properties

See the Custom Properties page for more information.

Bendy Bones

Bendy Bones (B-Bones) are an easy way to replace long chains of many small rigid bones. A common use case for curve bones is to model spine columns or facial bones.

Technical Details

Blender treats the bone as a section of a Bézier curve passing through the bones' joints. Each *Segments* will bend and roll the to follow this invisible curve representing a tessellated point of the Bézier curve. The control points at each end of the curve are the endpoints of the bone. The shape of the B-Bones can be controlled using a series of properties or indirectly through the neighboring bones (i.e. first child and parent). The properties construct handles on either end of the bone to control the curvature.

When using the B-bone as a constraint target Data ID offers an option to follow the curvature.

Note

However, if the bone is used as an target rather than to deform geometry, the roll is not taken in account.

Display

You can see these segments only if bones are visualized as *B-bones*.

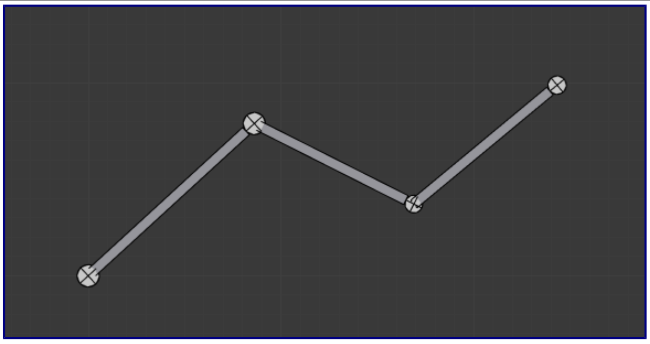
When not visualized as *B-Bone* s, bones are always shown as rigid sticks, even though the bone segments are still present and effective. This means that even in e.g. *Octahedron* visualization, if some bones in a chain have several segments, they will nonetheless smoothly deform their geometry...

Rest Pose

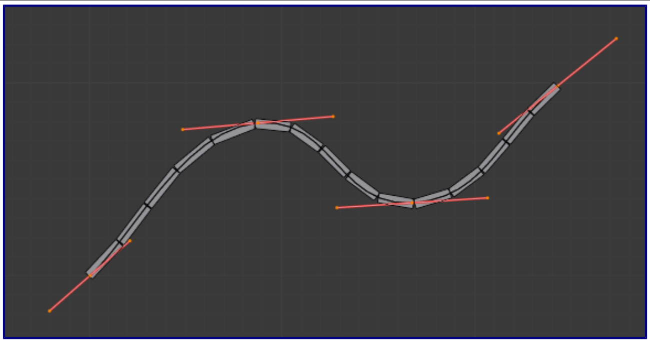
The initial shape of a B-Bone can be defined in Edit Mode as a rest pose of that bone. This is useful for curved facial features like curved eyebrows or mouths.

B-Bones have two sets of the Bendy Bone properties – one for Edit mode (i.e. the Rest Pose/Base Rig) and another for Pose Mode – adding together their values to get the final transforms.

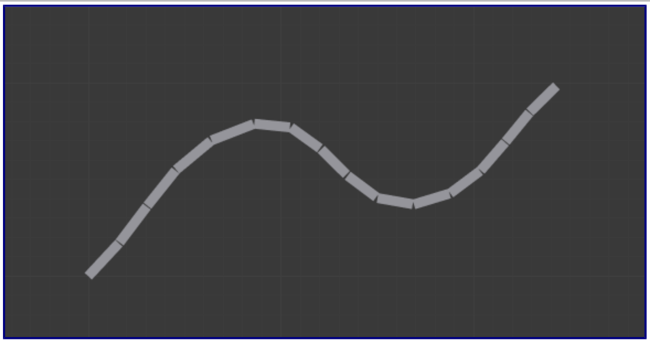
Example



The OLD B-Bones, in Edit Mode. ToDo.



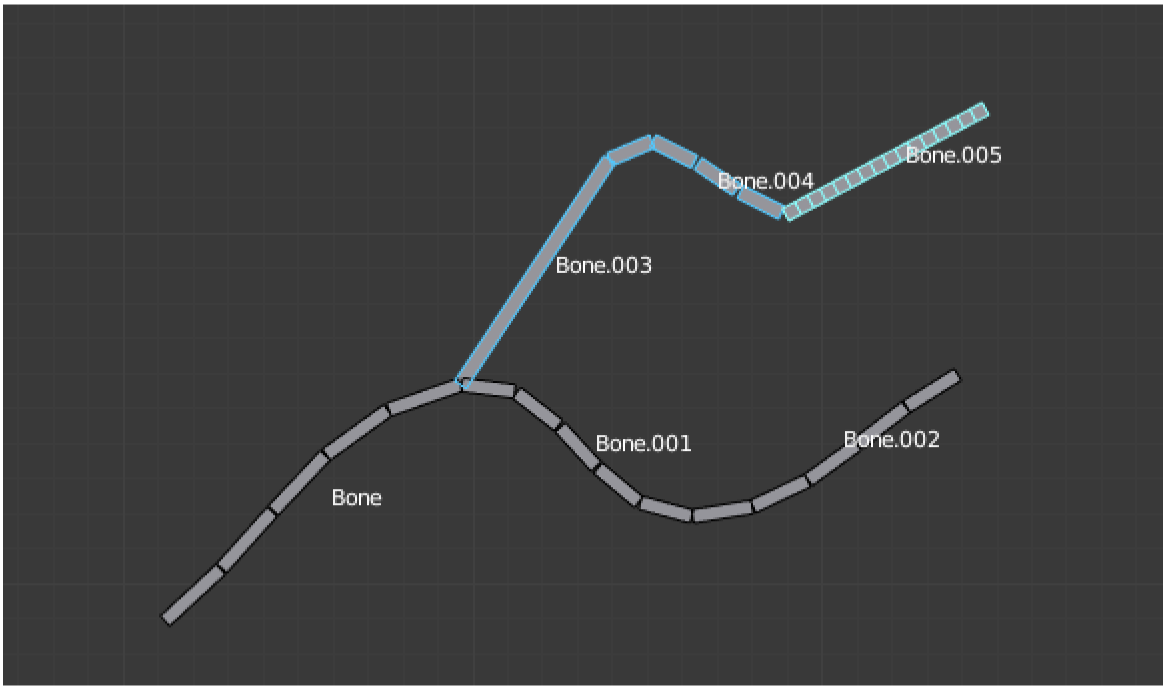
The Bézier curve superposed to the chain, with its handles placed at bones' joints.



The same armature in Object Mode.

In Fig. The OLD B-Bones, in Edit Mode. ToDo. we connected three bones, each one made of five segments.

Look at Fig. The same armature in Object Mode., we can see how the bones' segments smoothly "blend" into each other, even for roll.



An armature in Pose Mode, B-Bone visualization: Bone.003 has one segment, Bone.004 has four, and Bone.005 has sixteen.

Options

Segments

The *Segments* number button allows you to set the number of segments, which the given bone is subdivided into. Segments are small, rigid linked child bones that interpolate between the root and the tip. The higher this setting, the smoother "bends" the bone, but the heavier the pose calculations...

Curve XY Offsets

Applies an offsets the curve handle positions on the plane perpendicular to the bone's primary (Y) axis. As a result, the handle moves per-axis (XY) further from its original location, causing the curve to bend.

Roll

Roll In, Out
: The roll value (or twisting around the main Y axis of the bone) is interpolated per-segment, between the start and end roll values. It is applied as a rotational offsets on top of the previous rotation.

Inherit End Roll
: ToDo.

Scale

Scale In, Out
: Scaling factor that adjusts the thickness of each segment for X and Z axes only, i.e. length is not affected. Similar to *Roll* it is interpolated per-segment.

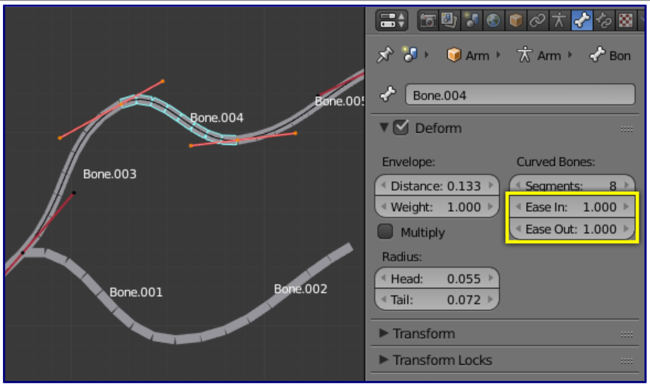
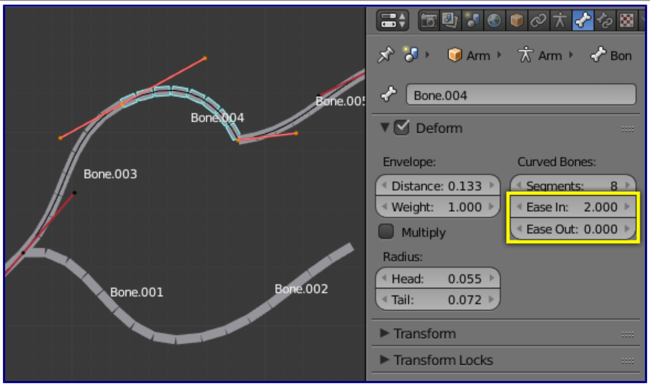
Easing

Ease In, Out

The *Ease In/Out* number buttons, change the “length” of the “auto” Bézier handle to control the “root handle” and “tip handle” of the bone, respectively.

These values are proportional to the default length, which of course automatically varies depending on bone length, angle with the handle reference, and so on.

Ease In/Out settings example, with a materialized Bézier curve.

	
Look at Bone.004: it has the default In and Out values (1.0).	Bone.004 with In at 2.0, and Out at 0.0.

Custom Handle Reference

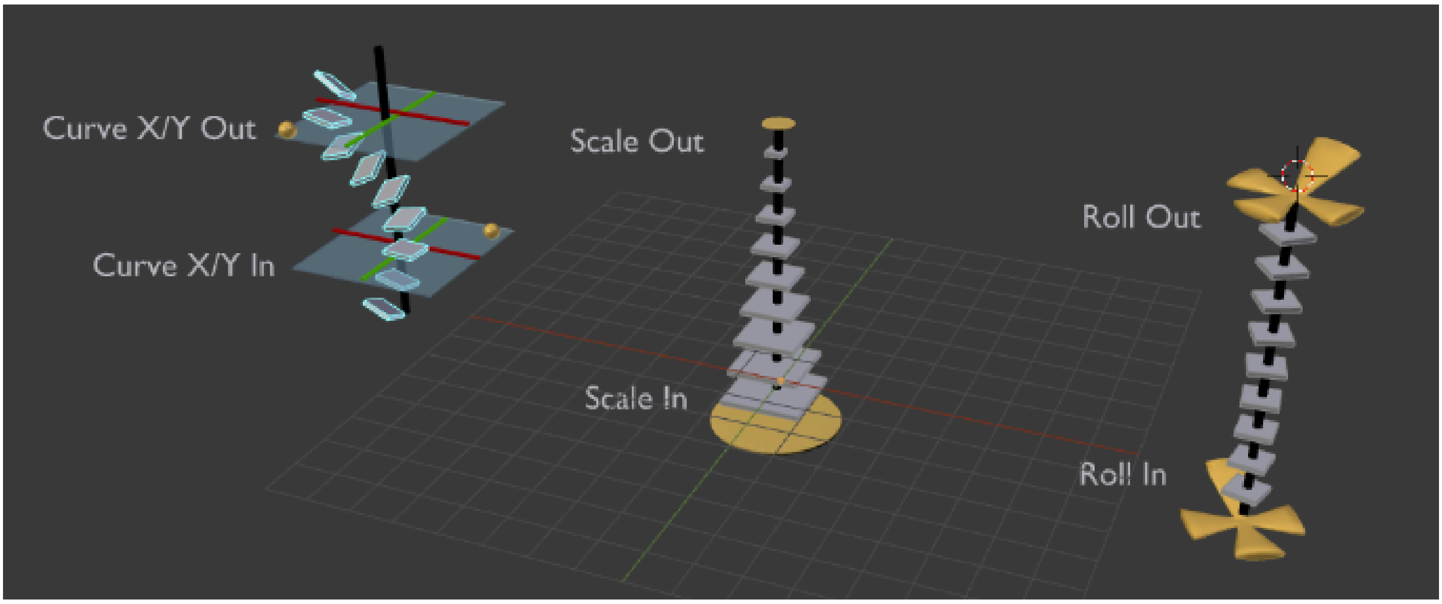
B-Bones can use custom bones as their reference bone handles, instead of only using the parent/child bones. To do so, enable the *Use Custom Reference Handles* toggle in Pose Mode. If none are specified, then the BBone will only use the Bendy Bone properties. When the option is on, just use the specified bones instead of using trying looking at the bone’s neighbors.

Relative

Instead of using the endpoints of the bones as absolute points in 3D space it computes how far the reference bone has moved away from its rest pose. The delta transformation is then applied as to the bone’s own endpoints to get the handle locations. This is useful if the custom control bone is far away from its target.

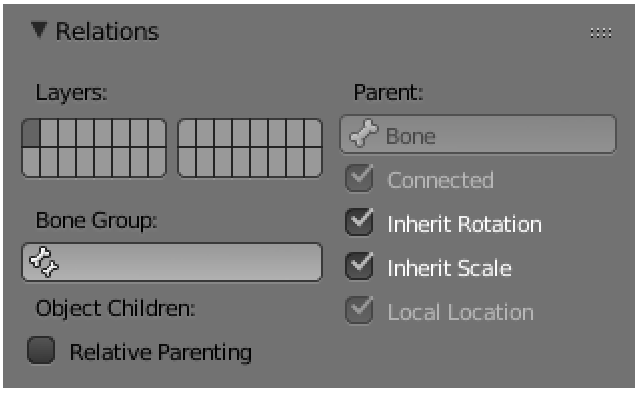
Tip
Keying Set The “BBone Shape” Keying Set includes all Bendy Bones properties.

Example



Visualization of the Bendy Bones properties.

Relations



The Relations panel.

In this panel you can arrange sets of bones in different layers for easier manipulation.

Bone Layers

Reference
Mode: Object, Edit and Pose Mode
Panel: Bone ‣ Relations

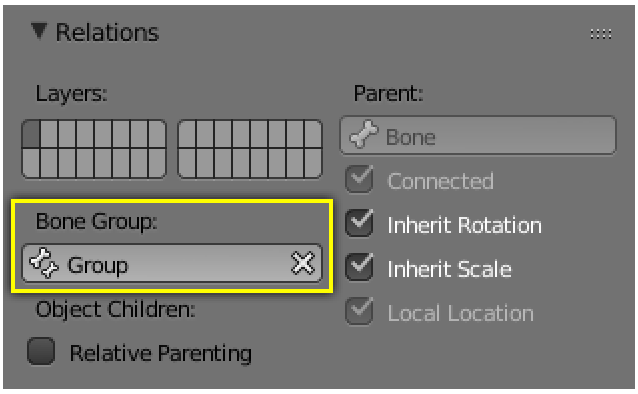
Moving bones between layers

Obviously, you have to be in *Edit Mode* or *Pose Mode* to move bones between layers. Note that as with objects, bones can lay in several layers at once, just use the usual `Shift-LMB` clicks... First of all, you have to select the chosen bone(s)!

- In the Properties editor, use the “layer buttons” of each selected bone Relations panel (*Bones* tab) to control in which layer(s) it lays.
- In the *3D View* editor, use the menu Armature ‣ Move Bone To Layer or Pose ‣ Move Bone To Layer or press `M` to show the usual pop-up layers menu. Note that this way, you assign the same layers to all selected bones.

Bone Group

Reference
Mode: Pose Mode



The Bone Group data-ID.

To assign a selected bone to a given bone group use the *Bone Group* data-ID.

Object Children

Reference
Mode: Pose Mode

Relative Parenting
ToDo.

Parenting

Parent
A data-ID to select the bone to set as a parent.

Connected

The *Connected* checkbox set the head of the bone to be connected with its parent root.

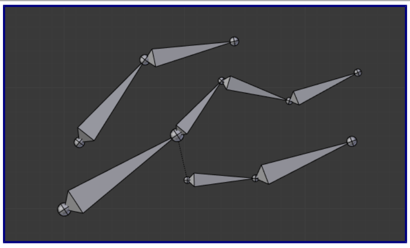
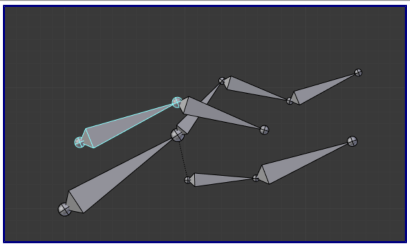
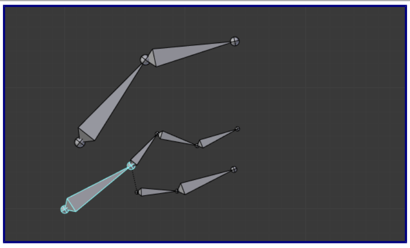
Transformations

Bones relationships have effects on transformations behavior.

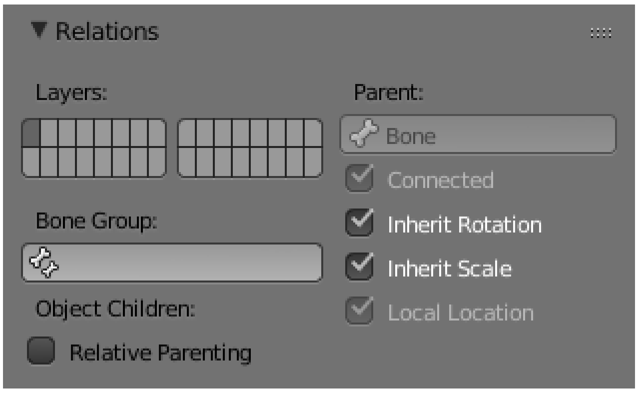
By default, children bones inherit:

- Their parent position, with their own offset of course.
- Their parent rotation (i.e. they keep a constant rotation relatively to their parent).
- Their parent scale, here again with their own offset.

Examples of transforming parented/connected bones.

		
The armature in its rest position.	Rotation of a root bone.	Scaling of a root bone.

Exactly like standard children objects. You can modify this behavior on a per-bone basis, using the Relations panel in the *Bones* tab:



Relations panel in Pose Mode.

Inherit Rotation

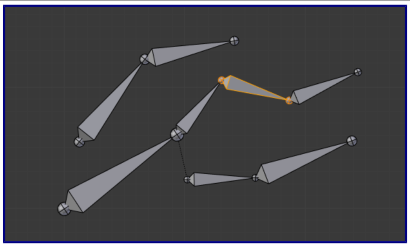
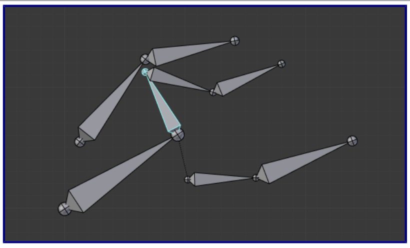
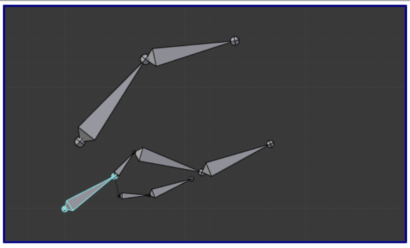
When disabled, this will “break” the rotation relationship to the bone’s parent. This means that the child will keep its rotation in the armature object space when its parent is rotated.

Inherit Scale

When disabled, this will “break” the scale relationship to the bone’s parent.

These inheriting behaviors propagate along the bones’ hierarchy. So when you scale down a bone, all its descendants are by default scaled down accordingly. However, if you set one bone’s *Inherit Scale* or *Inherit Rotation* property on in this “family”, this will break the scaling propagation, i.e. this bone *and all its descendants* will no longer be affected when you scale one of its ancestors.

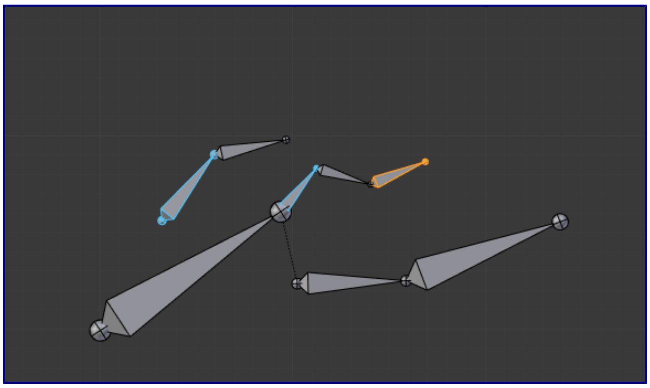
Examples of transforming parented/connected bones with Inherit Rotation disabled.

		
The yellow outlined Inherit Rotation disabled bone in the armature.	Rotation of a bone with an Inherit Rotation disabled bone among its descendants.	Scaling of a bone with an Inherit Rotation disabled bone among its descendants.

Connected bones have another specificity: they cannot be translated. Indeed, as their root must be at their parent's tip, if you do not move the parent, you cannot move the child's root, but only its tip, which leads to a child rotation. This is exactly what happens, when you press `G` with a connected bone selected, Blender automatically switches to rotation operation.

Bones relationships also have important consequences on how selections of multiple bones behave when transformed. There are many different situations which may not be included on this list, however, this should give a good idea of the problem:

- Non-related selected bones are transformed independently, as usual.



Scaling bones, some of them related.

- When several bones of the same "family" are selected, *only* the "most parent" ones are really transformed – the descendants are just handled through the parent relationship process, as if they were not selected (see Fig. Scaling bones, some of them related. the third tip bone, outlined in yellow, was only scaled down through the parent relationship, exactly as the unselected ones, even though it is selected and active. Otherwise, it should have been twice smaller!).
- When connected and unconnected bones are selected, and you start a grab operation, only the unconnected bones are affected.
- When a child connected hinge bone is in the selection, and the "most parent" selected one is connected, when you press `G`, nothing happens, because Blender remains in grab operation, which of course has no effect on a connected bone.

So, when posing a chain of bones, you should always edit its elements from the root bone to the tip bone. This process is known as *forward kinematics* (FK). We will see in a later page that Blender features another pose method, called *inverse kinematics* (IK), which allows you to pose a whole chain just by moving its tip.

Note

This feature is somewhat extended/completed by the pose library tool.

Display Panel

Reference

Mode: Object and Pose Mode

Panel: Bone ‣ Display

The Display panel.

Display panel lets you customize the look of your bones taking the shape of another existing object.

Hide
: Hides the selected bone.

Wireframe
: When enabled, bone is displayed in wireframe mode regardless of the viewport drawing mode. Useful for non-obstructive custom bone chains.

Custom Shape

Blender allows you to give to each bone of an armature a specific shape (in *Object Mode* and *Pose Mode*), using another object as "template". In order to be visible the *Shapes* checkbox has to be enabled (Armature ‣ Display panel).

Options

Custom Shape
: Object that defines the custom shape of the selected bone.

Bone Size
: Option not to use bones length, so that changes in Edit Mode don't resize the custom-shape.

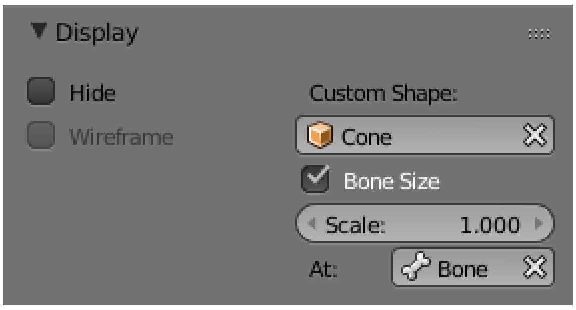
Scale
: Avoids having multiple custom-shapes at different sizes.

At
: Bone that defines the display transform of this shape bone.

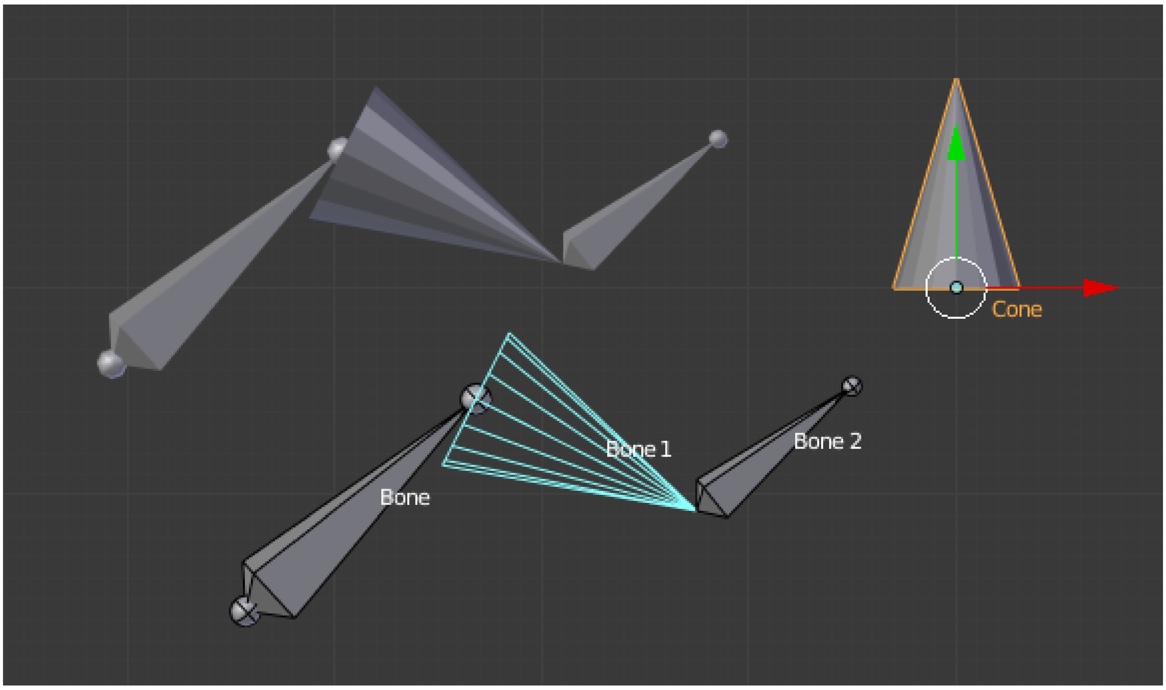
Workflow

To assign a custom shape to a bone, you have to:

- Switch to *Pose Mode*
- Select the relevant bone by clicking on it with RMB.
- Go to the *Display* panel *Custom Shape* field and select the 3D object previously created in the scene; in this example we are using a cube and a cone. You can optionally set the *At* field to another bone.



The Display panel.



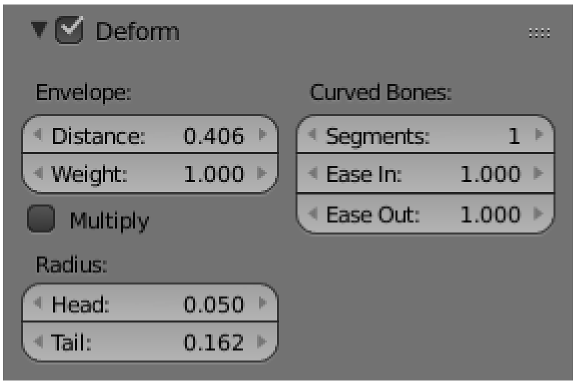
The armature with shape assigned to bone. Note the center of the Cone object.

Note

- These shapes will never be rendered, like any bone, they are only visible in 3D Views.
- Even if any type of object seems to be accepted by the *OB* field (meshes, curves, even metas...), only meshes really work. All other types just make the bone invisible; nothing is drawn...
- The center of the shape object will be at the *root of the bone* (see the bone page for root/tip).
- The object properties of the shape are ignored (i.e. if you make a parallelepiped out of a cube by modifying its dimensions in *Object Mode*, you will still have a cube shaped bone...).
- The "along bone" axis is the Y one, and the shape object is always scaled so that one Blender Unit stretches along the whole bone length.
- If you need to remove the custom shape of the bone, just right click in the *Custom Shape* field and select *Reset to default value* in the pop-up menu.

So to summarize all this, you should use meshes as shape objects, with their center at their lower -Y end, and an overall Y length of 1.0 BU.

Deform



The Deform panel.

In this panel you can set basic properties of the bones.

Turning the Deform option on and off, includes the active bone in the Automatic Weight Calculation when the Mesh is Parented to the Armature using the Armature Deform with the “With Automatic Weights” option.

Also it is worth noting that by turning off a bone’s deform option, makes it not influence the mesh at all, overriding any weights that it might have been assigned before; It mutes its influence.

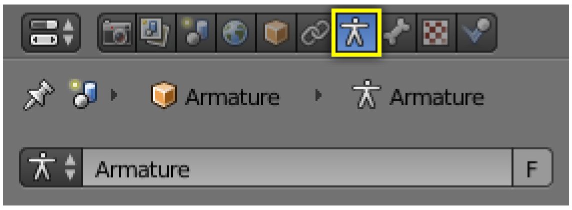
Envelope

ToDo.

Introduction

Reference
Mode: Object Mode, Edit Mode and Pose Mode Panel: All in Properties editor, *Object* property

Let us first have a general overview of the various panels gathering the armature settings, in Properties editor, *Object* tab:



The Object property in the Properties editor.

Skeleton
: In this panel you can arrange sets of bones into different layers for easier manipulation.

Display
: This controls the way the bones appear in 3D View.

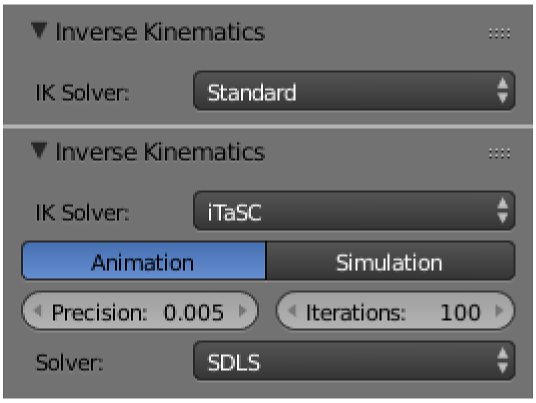
Bone Groups
: Bone Groups are meant to be used during the rig creation to define and assign a color to a meaningful set of bones.

Pose Library
: Allows you to save different properties (location, rotation, scale) for selected bones for later use.

Ghost
: Allows you to see a set of different poses, very useful when animating.

Motion Paths
: In the Motion Paths panel you can enable visualization of the motion path your skeleton leaves when animated.

Inverse Kinematics



The Inverse Kinematics panel.

Defines the type of IK solver used in your animation.

Custom Properties

See the Custom Properties page for more information.

Skeleton

The Skeleton panel.

In this panel you can arrange sets of bones into different layers for easier manipulation.

Position

A radio button to switch between Pose Position and Rest Position.

Whereas in *Edit Mode*, you always see your armature in its rest position, in *Object Mode* and *Pose Mode* you see it by default in its *Pose Position* (i.e. as it was transformed in the *Pose Mode*). If you want to see it in the rest position in all modes, enable the *Rest Position* button in the *Armature* tab (*Edit Mode*).

Armature Layers

Reference
Mode: Object, Edit and Pose Mode
Panel: Object data ‣ Skeleton

Each armature has 32 “Armature layers” which allow you to organize your armature by “regrouping” sets of bones into layers; this works similar to scene layers (those containing your objects). You can then “move” a bone to a given layer, hide or show one or several layers, etc.

Showing/hiding bone layers

Only bones in active layers will be visible/editable, but they will always be effective (i.e move objects or deform geometry), whether in an active layer or not. To (de)activate a layer, you have several options, depending in which mode you are in:

- In all modes, use the row of small buttons at the top of the *Display Options* group, *Armature* panel. If you want to enable/disable several layers at once, as usual, hold `Shift` while clicking...
- In *Edit Mode* and *Pose Mode*, you can also do this from the *3D View*, either by using the menu Armature ‣ Switch Armature Layers or Pose ‣ Switch Armature Layers , to display a small pop-up menu containing the same buttons as described above (here again, you can use `Shift-LMB` clicks to (de)select several layers at once).

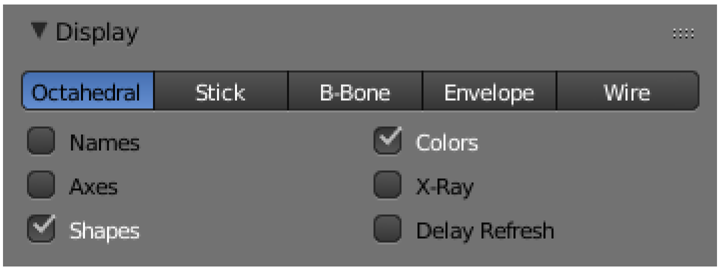
Protected Layers

You can lock a given bone layer for all proxies of your armature, i.e. all bones in this layer will not be editable. To do so, in the *Skeleton* panel, `Ctrl-LMB` click on the relevant button, the layer lock will be enabled.

Protected layers in proxy are restored to proxy settings on file reload and undo.

Display Panel

Reference
Mode: Object, Edit and Pose Mode
Panel: Object Data ‣ Display

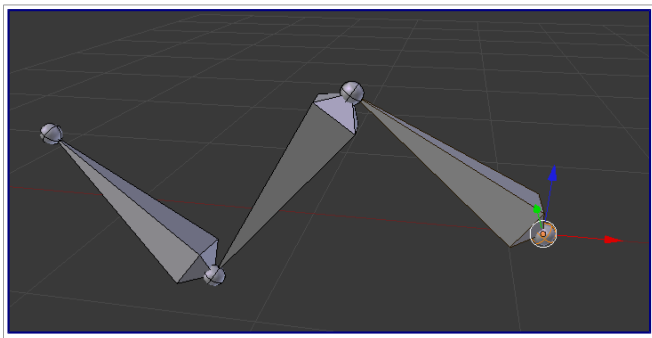
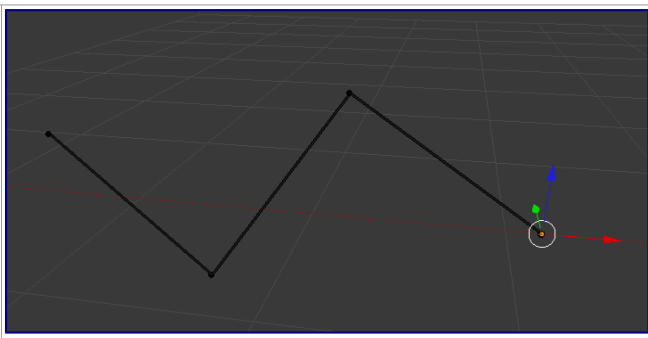


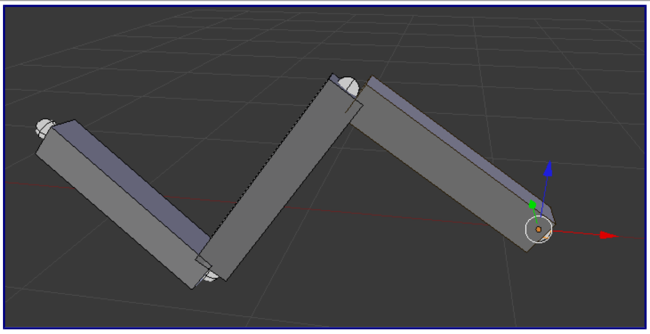
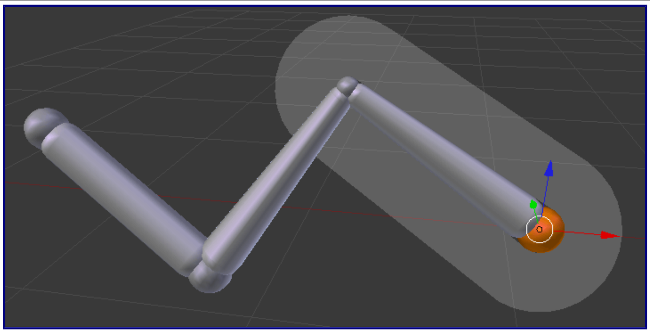
The Display panel.

This controls the way the bones appear in 3D View; you have four different visualizations you can select.

Bone Types

We have four basic bone visualization: Octahedral, Stick, B-Bone, Envelope and Wire:

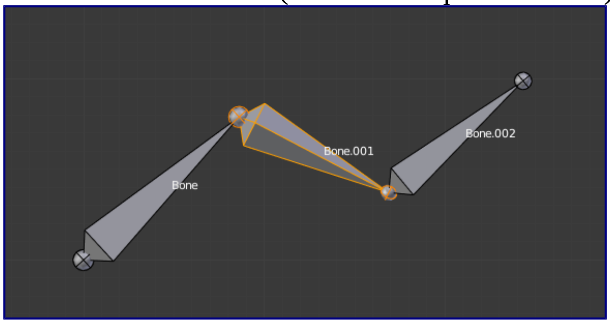
	
Octahedral bone display.	Stick bone display.

	
B-Bone bone display.	Envelope bone display.

Octahedral bone

This is the default visualization, well suited for most of editing tasks. It materializes:

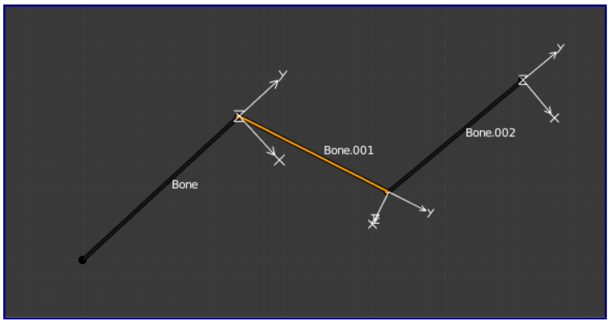
- The bone root (“big” joint) and tip (“small” joint).
- The bone “size” (its thickness is proportional to its length).
- The bone roll (as it has a square section).



Note the 40° rolled Bone.001 bone.

Stick bone

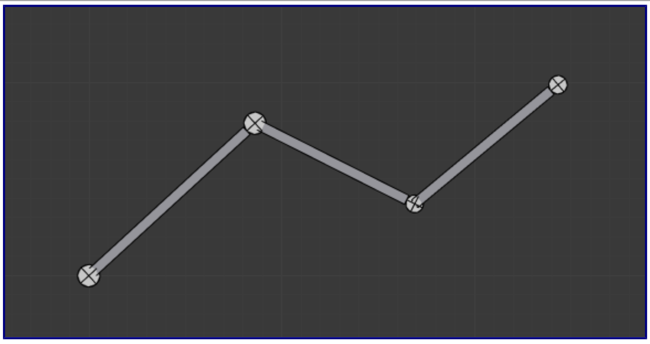
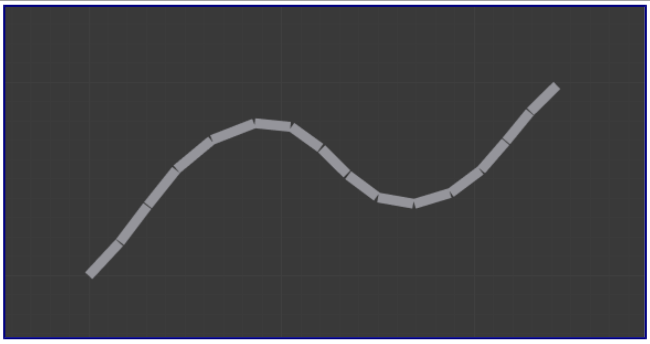
This is the simplest and most non-intrusive visualization. It just materializes bones by sticks of constant (and small) thickness, so it gives you no information about root and tip, nor bone size or roll angle.



Note that Bone.001 roll angle is not visible (except by its XZ axes).

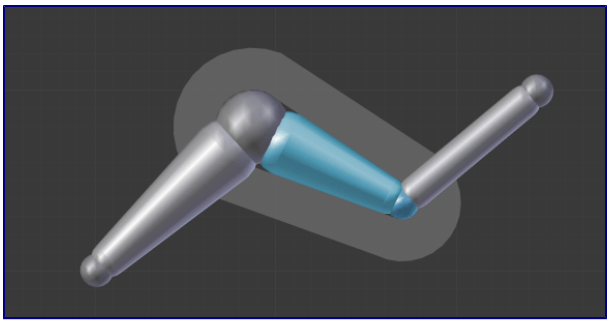
B-Bone bone

This visualization shows the curves of “smooth” multi-segmented bones; see the Bendy Bones for details.

	
An armature of B-Bones, in Edit Mode.	The same armature in Object Mode.

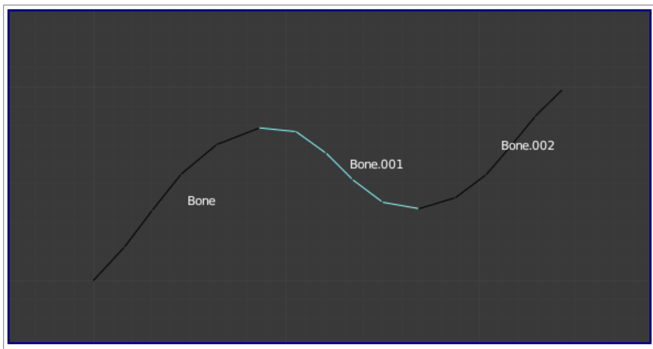
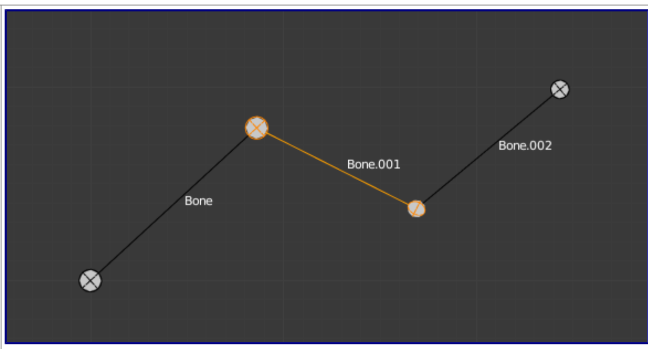
Envelope bone

This visualization materializes the bone deformation influence. More on this in the bone page.



Wire bone

This simplest visualization shows the curves of “smooth” multi-segmented bones.

	
An armature of Wire, in Pose Mode.	The same armature in Edit Mode.

Draw Options

Names
: When enabled, the name of each bone is drawn.

Colors
: This is only relevant for *Pose Mode*, and is described in detail there.

Axes
: When enabled, the (local) axes of each bone are drawn (only relevant for *Edit Mode* and *Pose Mode*).

X-Ray
: When enabled, the bones of the armature will always be drawn on top of the solid objects (meshes, surfaces, ...) – i.e. they will always be visible and selectable (this is the same option as the one found in the *Display* panel of the *Object data* tab. Very useful when not in *Wireframe* mode.

Shapes

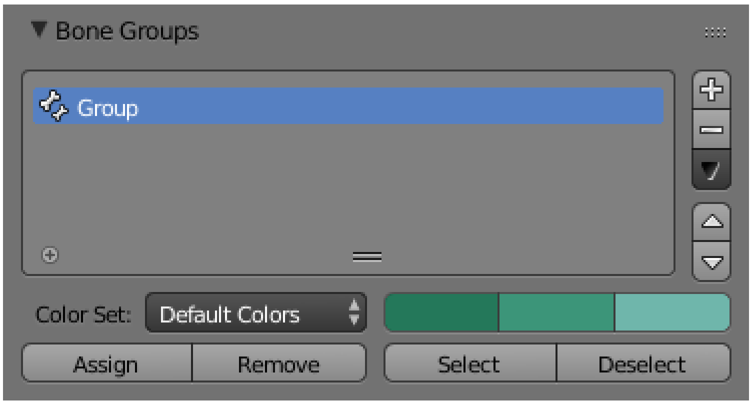
When enabled, the default standard bone shape is replaced, in *Object Mode* and *Pose Mode*, by the shape of a chosen object (see Shaped Bones for details).

Delay Refresh

When enabled, the bone does not deform its children when manipulating the bone in pose mode.

Bone Groups

Reference
Mode: Pose Mode
Panel: Armature tab ‣ Motion Paths panel
Menu: Pose ‣ Bone Groups ‣ ...



The Bone Groups panel.

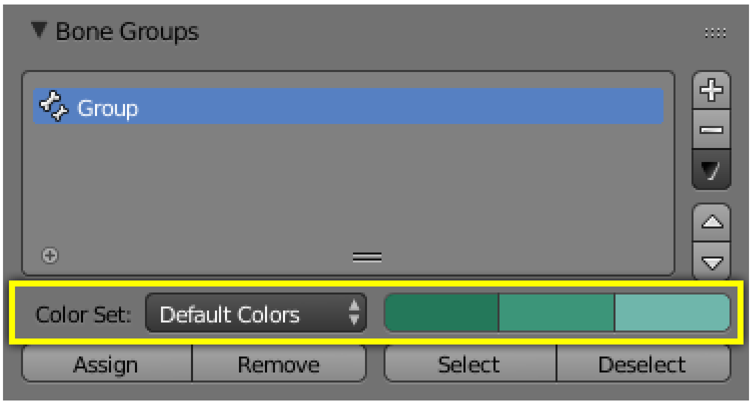
This panel allows the creation, deletion and editing of Bone Groups. The panel *Bone Groups* is available in the tab *Armature* of the Properties editor.

Bone Groups can be used for selection or to assign a color theme to a set of bones. In example to color the left parts of the rig as blue and right parts as red.

Active Bone Group

The Bone Group List view.

Color Set



The Bone Color Set selector and the color buttons.

You can assign a “color theme” to a group (each bone will have these colors). Remember you have to enable the *Colors* checkbox (*Display* panel) to see these colors.

Bone Color Set

A select menu.

- *Default Colors*: The default (gray) colors.
- *nn - Theme Color Set*: One of the twenty Blender presets by the theme.
- *Custom Set*: A custom set of colors, which is specific to each group.

Normal
: The first color button is the color of unselected bones.

Selected
: The second color button is the outline color of selected bones.

Active
: The third color button is the outline color of the active bone.

As soon as you alter one of the colors, it is switched to the *Custom Set* option.

Assign and Select

In the 3D Views, using the Pose ‣ Bone Groups menu entries you can:

Assign
: Assigns the selected bones to the active bone group. It is important to note that a bone can only belong to one group.

Remove
: Removes the selected bones from the active bone group.

Select
: Selects the bones in the active bone group.

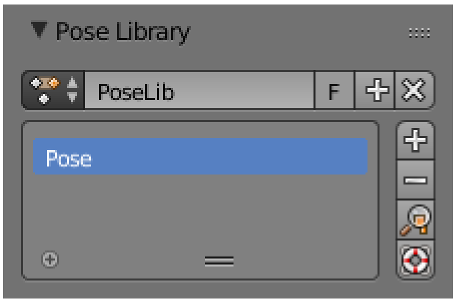
Deselect
: Deselects the bones in the active bone group.

See also
A single bone can be assign to a group in the Relations panel.

See also

Bones belonging to multiple groups is possible with this add-on Selection Sets.

Pose Library Panel



The Pose Library panel.

The *Pose Library* panel is used to save, apply, and manage different armature poses. *Pose Libraries* are saved to *Actions*. They are not generally used as actions, but can be converted to and from.

Action
: A Data-Block Menu for Actions or Pose Libraries.

Pose Libraries

A List Views & Presets of poses for the active Pose Library.

Add +

If a pose is added a pose marker is created.

Add New
: Adds a new pose to the active Pose Library with the current pose of the armature.

Add New (Current Frame).
: Will add a pose to the Pose Library based on the current frame selected in the Time line. In contrast to *Add New* and *Replace Existing* which automatically allocate a pose to an action frame.

Replace Existing
: Replace an existing pose in the active Pose Library with the current pose of the armature.

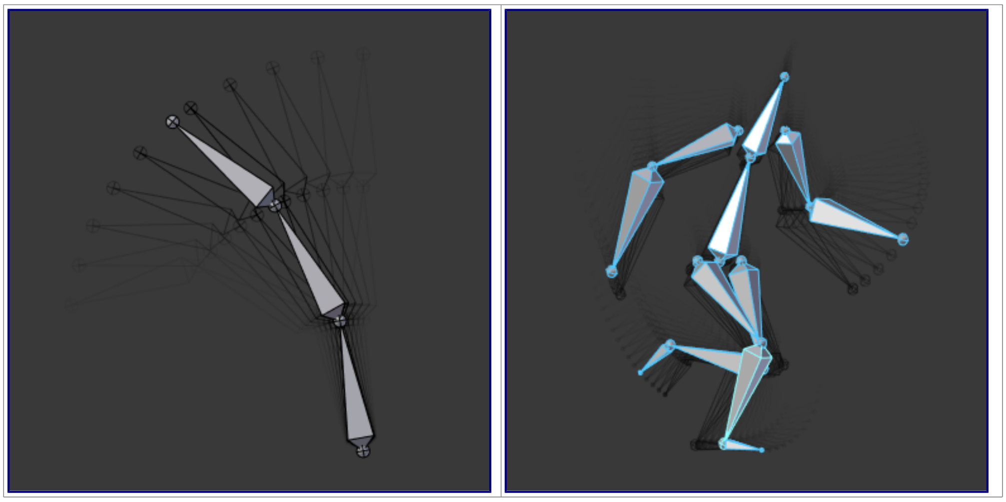
Apply Pose (magnifying glass icon)
: Apply the active pose to the selected pose bones.

Sanitize Action (livesaver icon)
: Makes a action suitable for use as a Pose Library. This is used to convert an Action to a Pose Library. A pose is added to the Pose Library for each frame with keyframes.

Ghost

Reference
Mode: Pose Mode
Panel: Armature tab ‣ Ghost panel

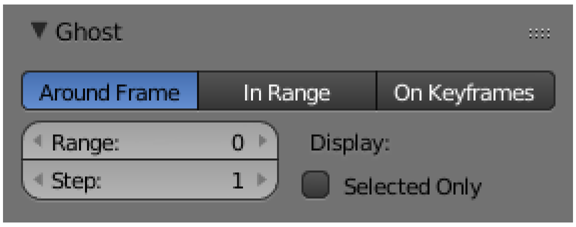
Ghosts examples.



In traditional cartoon creation animators use tracing paper, to see several frames preceding the one they are working on. This allows them to visualize the overall movement of their character, without having to play it back.

Blender features something very similar for armatures in *Pose Mode*: the “ghosts”. The ghosts are black outlines (more or less opaque) of the bones as they are at certain frames.

Options



The Ghost panel.

The ghosts settings are found in the *Armature* tab, only active in *Pose Mode*.

Type

Around Current Frame

This will display a given number of ghosts before and after the current frame. The ghosts are shaded from opaque at the current frame, to transparent at the most distant frames.

In Range

This will display the ghosts of the armature’s bones inside a given range of frames. The ghosts are shaded from transparent for the first frame, to opaque at the last frame. It has four options:

On Keyframes

This is very similar to the *In Range* option, but there are ghosts only for keyframes in the armature animation (i.e. frames at which you keyed one or more of the bones). So it has the same options as above, except for the *Step* one (as only keyframes generate ghosts). Oddly, the shading of ghosts is reversed compared to *In Range* - from opaque for the first keyframe, to transparent for the last keyframe.

Range

This number button specifies how many ghosts you will have on both "sides" (i.e. a value of 5 will give you ten ghosts, five before the current frame, and five after).

Start, End

This number button specifies the start/end frame of the range (exclusive). Note that unfortunately, it cannot take a null or negative value, which means you can only see ghosts starting from frame 2 included...

Step

This number button specifies whether you have a ghost for every frame (the default value of 1), or one each two frames, each three frames, etc.

Display

Selected Only

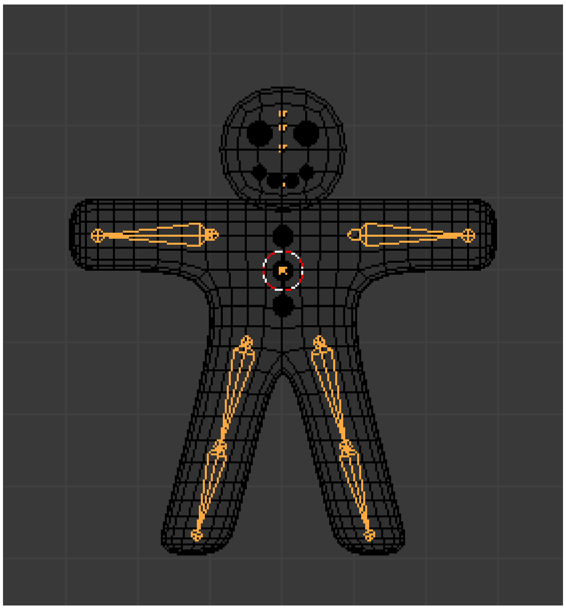
When enabled, you will only see the ghosts of selected bones (otherwise, every bone in the armatures has ghosts...)

Finally, these ghosts are also active when playing the animation `Alt-A` – this is only useful with the *Around Current Frame* option, of course...

Note

There is no "global switch" to disable this display feature. To do so, you have to either set *Ghost* to 0 (for *Around Current Frame* option), or the same frame number in both *Start* and *End* (for the two other ghosts types).

Structure

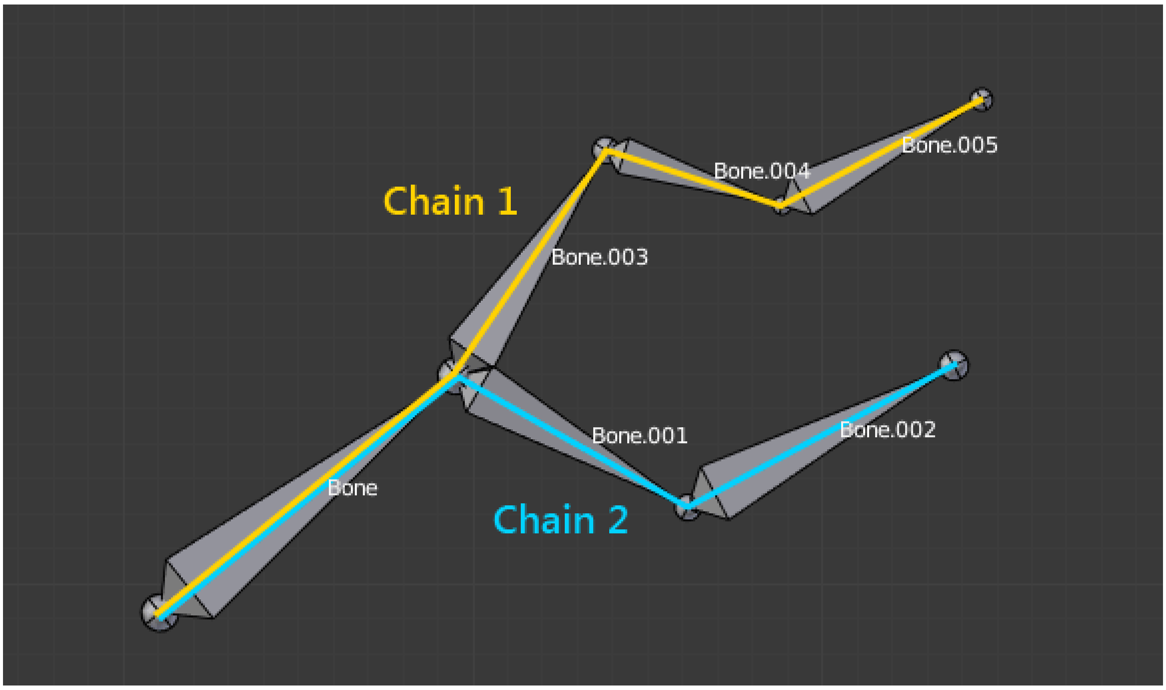


Example of a very basic armature.

Armatures mimic real skeletons. They are made out of bones, which are (by default) rigid elements. But you have more possibilities than with real skeletons: In addition to the “natural” rotation of bones, you can also translate and even scale them! And your bones do not have to be connected to each other; they can be completely free if you want. However, the most natural and useful setups imply that some bones are related to others, forming so-called “chains of bones”, which create some sort of “limbs” in your armature, as detailed in Chains of Bones.

Chains of Bones

The bones inside an armature can be completely independent from each other (i.e. the modification of one bone does not affect the others). But this is not often a useful set up: To create a leg, all bones “after” the thigh bone should move “with” it in a well-coordinated manner. This is exactly what happens in armatures by parenting a bone to the next one in the limb, you create a “chains of bones”. These chains can be ramified. For example, five fingers attached to a single “hand” bone.



An armature with two chains of bones.

Bones are chained by linking the tip of the parent to the root of the child. Root and tip can be *connected*, i.e. they are always exactly at the same point; or they can be *free*, like in a standard parent-child object relationship.

A given bone can be the parent of several children, and hence be part of several chains at the same time.

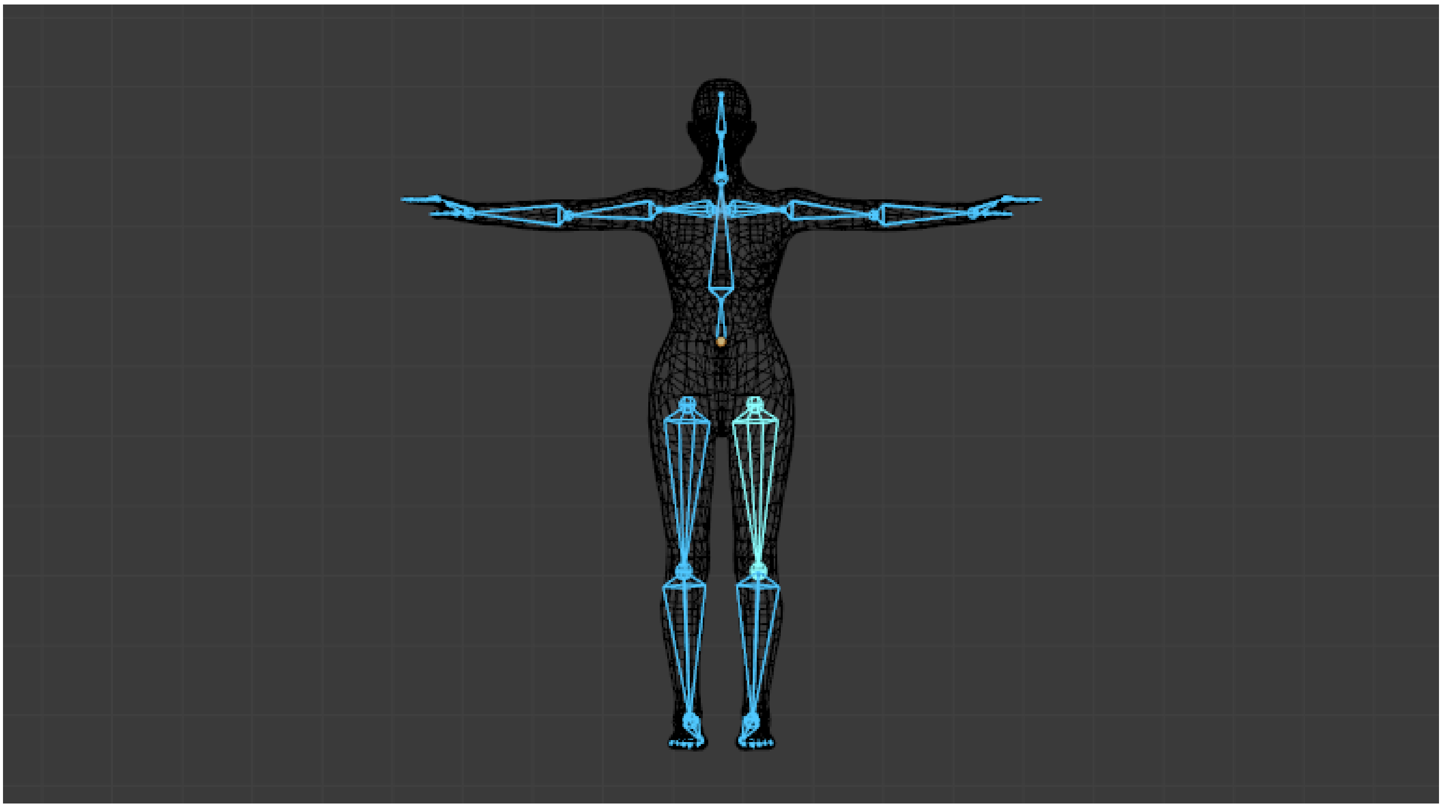
The bone at the beginning of a chain is called its *root bone*, and the last bone of a chain is the *tip bone* (do not confuse them with similar names of bones’ joints!).

Chains of bones are a particularly important topic in posing (especially with the standard *forward kinematics* versus “automatic” *inverse kinematics* posing techniques). You create/edit them in *Edit Mode*, but except in case of connected bones, their relationships have no effect on bone transformations in this mode (i.e. transforming a parent bone will not affect its children).

The easiest way to manage bones relationships is to use the Relations panel in the *Bone* tab.

Skinning Introduction

We have seen in previous pages how to design an armature, create chains of bones, etc. Now, having a good rig is not the final goal, unless you want to produce a “Dance Macabre” animation, you will likely want to put some flesh on your skeletons! Surprisingly, “linking” an armature to the object(s) it should transform and/or deform is called the “skinning” process...



The human mesh skinned on its armature.

In Blender, you have two main skinning types:

- You can Parent/Constrain Objects to Bones - then, when you transform the bones in *Pose Mode*, their “children” objects are also transformed, exactly as with a standard parent/children relationship... The “children” are **never** deformed when using this method.
- You can Using the Armature Modifier on entire Mesh, and then, some parts of this object to some bones inside this armature. This is the more complex and powerful method, and the only way to really deform the geometry of the object, i.e. to modify its vertices/control points relative positions.

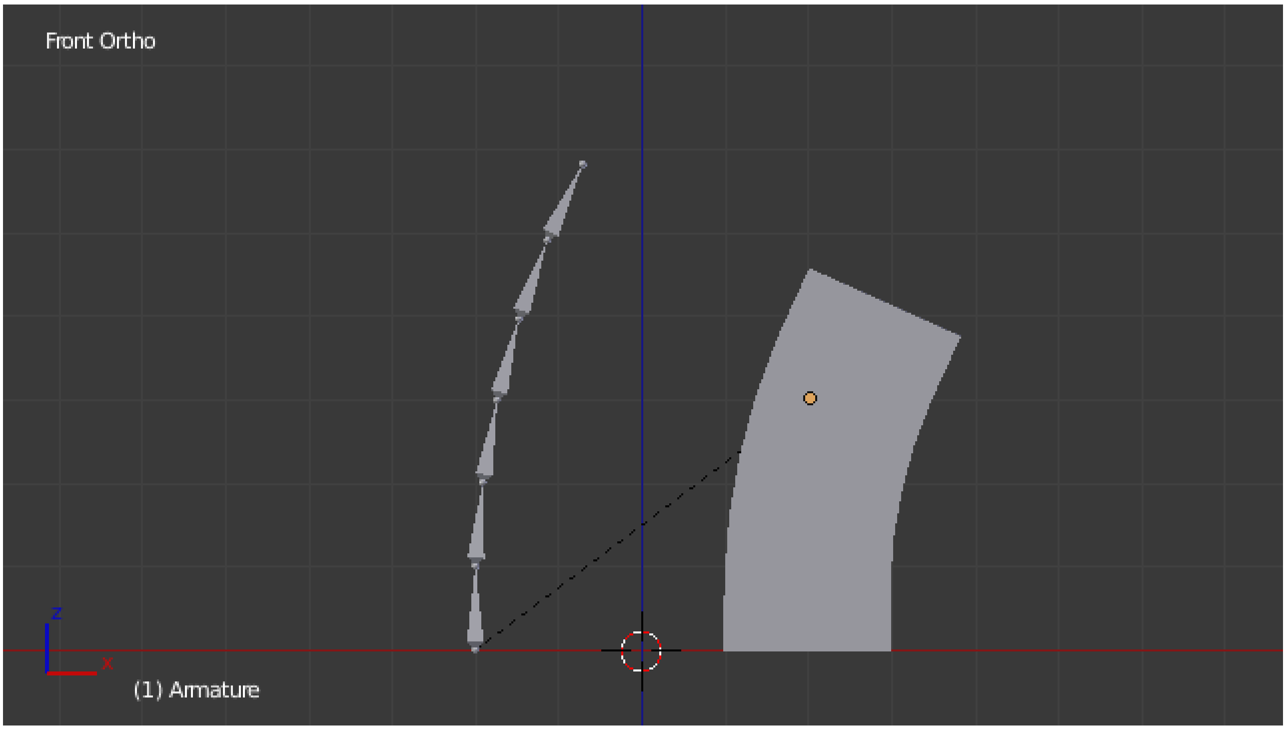
Hint

Retargeting

Retargeting which is a way to apply motion-capture data (acquired from real world) to a rig is available through add-ons and importers.

Armature Deform Parent

In Blender Armature Object Types are usually used to associate certain bones of an Armature to certain parts of a Mesh Object Types Mesh Geometry. You are then able to move the Armature Bones and the Mesh Object will deform.



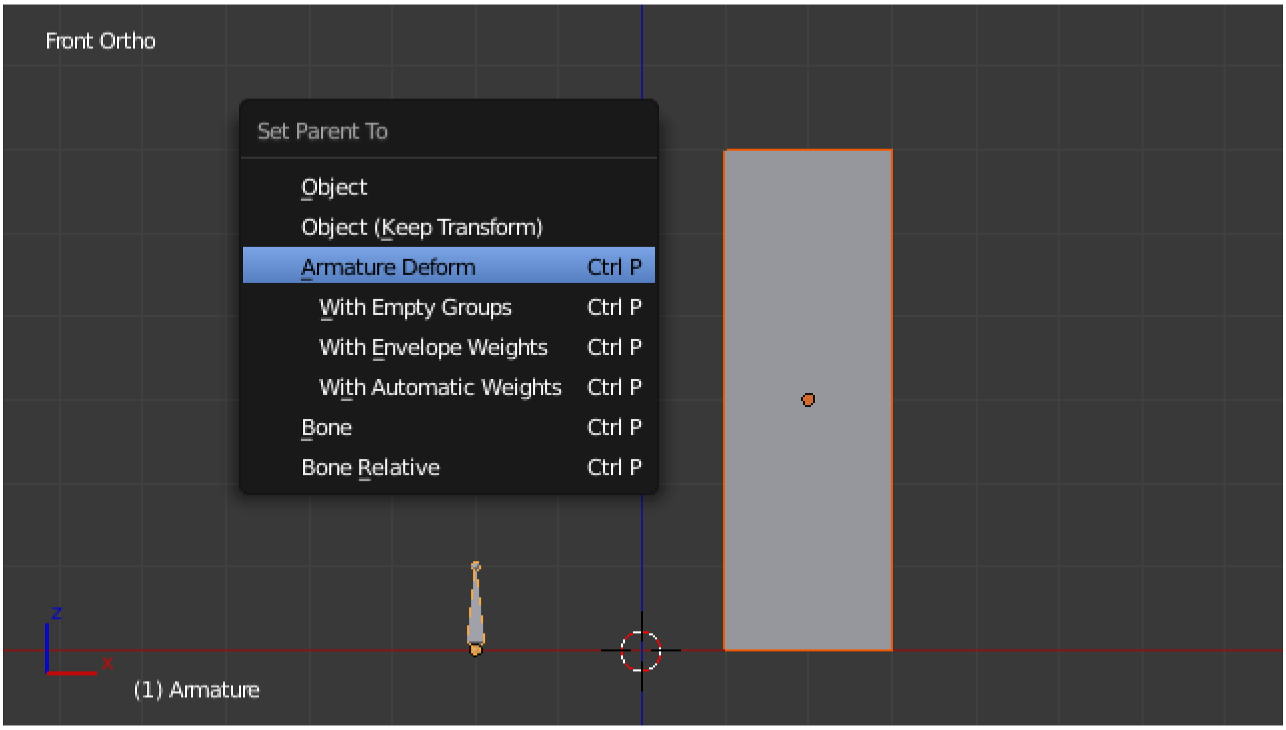
Bone associated with Mesh Object.

Armature Deform Parenting is one of the most flexible ways of associating Bones in an Armature to another Object, it gives a lot of freedom but that comes at the price of a little complexity, as there are multiple steps involved in setting up *Armature Deform Parenting* such that deformations are actually carried out.

Blender has several different ways of Parenting an Armature to an object, most of them can automate several of the steps involved, but all of them ultimately do all the steps we describe for Armature Deform Parenting.

Using the Armature Deform Parenting operator is the first step in setting up the relationship between an Armature Object and its Child Objects.

To use Armature Deform Parenting you must first select all the Child Objects that will be influenced by the Armature and then lastly, select the Armature Object itself. Once all the Child Objects and the Armature Object are selected and select Armature Deform in the Set Parent To pop-up menu.



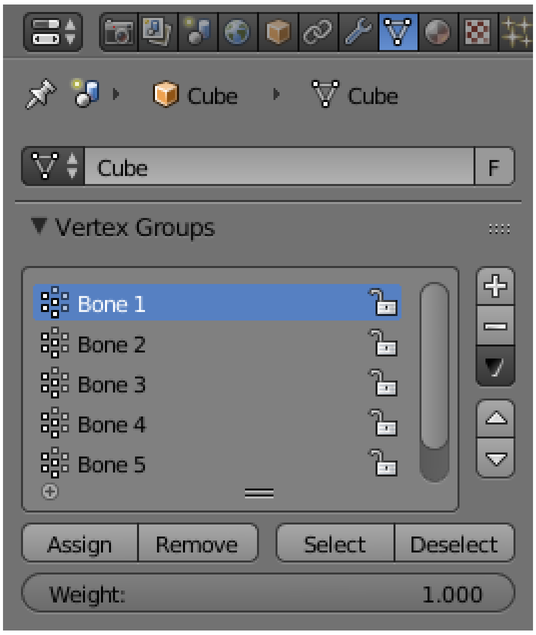
Set Parent To menu with Armature Deform Parenting option highlighted.

Once this is done the Armature Object will be the Parent Object of all the other Child Objects, also we have informed Blender that the Bones of the Armature Object can be associated with specific parts of the Child Objects so that they can be directly manipulated by the Bones.

At this point however, all Blender knows is that the Bones of the Armature could be used to alter the Child Objects, we have not yet told Blender which Bones can alter which Child Objects or by how much.

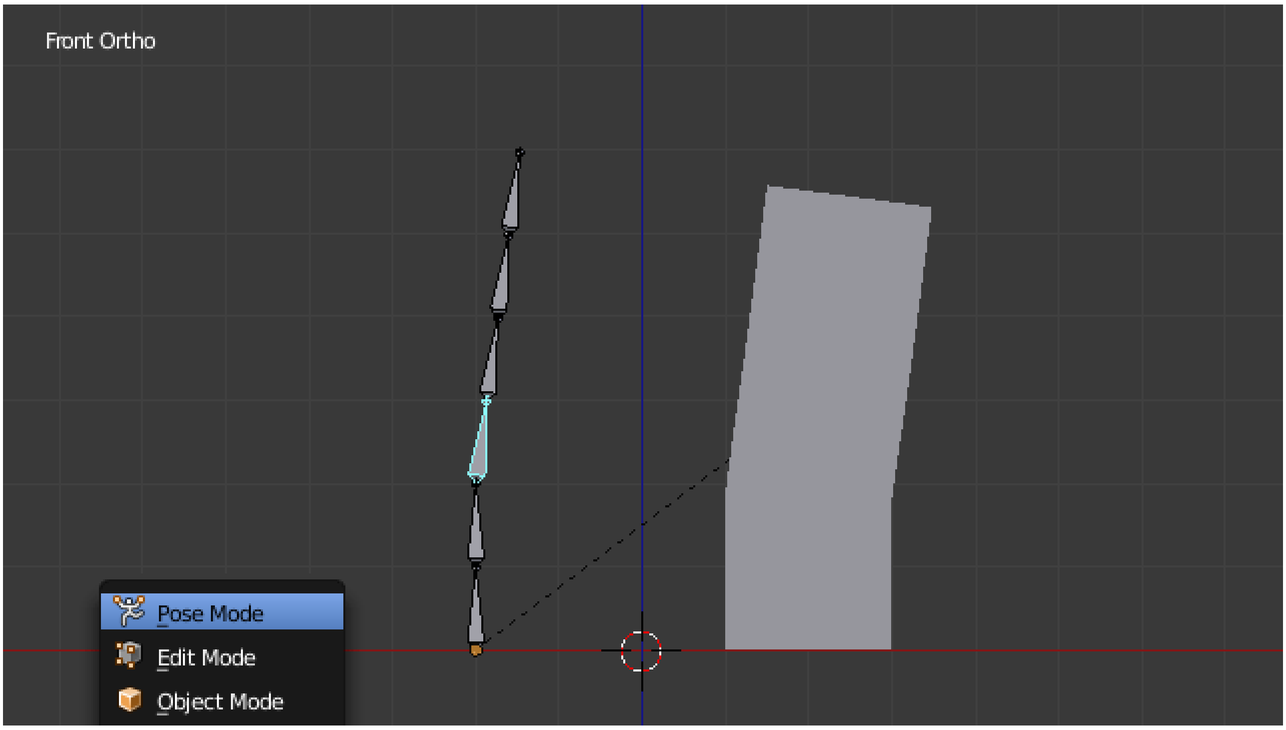
To do that we must individually select each Child Object individually and toggle into Edit Mode on that Child Object. Once in Edit Mode we can then select the vertices we want to be influenced by the Bones in the Armature. Then with the vertices still selected navigate to Properties Editor ‣ Object Data ‣ Vertex Groups and create a new Vertex Group with the same name as the Bone that you want the selected vertices to be influenced by.

Once the Vertex Group has been created we then assign the selected vertices to the Vertex Group by clicking the Assign Button. By default when selected vertices are assigned to a Vertex Group they will have an Influence Weight of 1.0 This means that they are fully influenced when a Bone they are associated with is moved, if the Influence Weight had been 0.5 then when the bone moves the vertices would only move half as much.



Vertex groups panel with Assign Button and influence Weight Slider highlighted.

Once all these steps have been carried out, the Bones of the Armature Object should be associated with the Vertex Groups with the same names as the Bones. You can then select the Armature Object and switch to Pose Mode in the 3D View Editor Header ‣ Mode Select menu.



Armature Bone in Pose Mode affecting the Mesh Object.

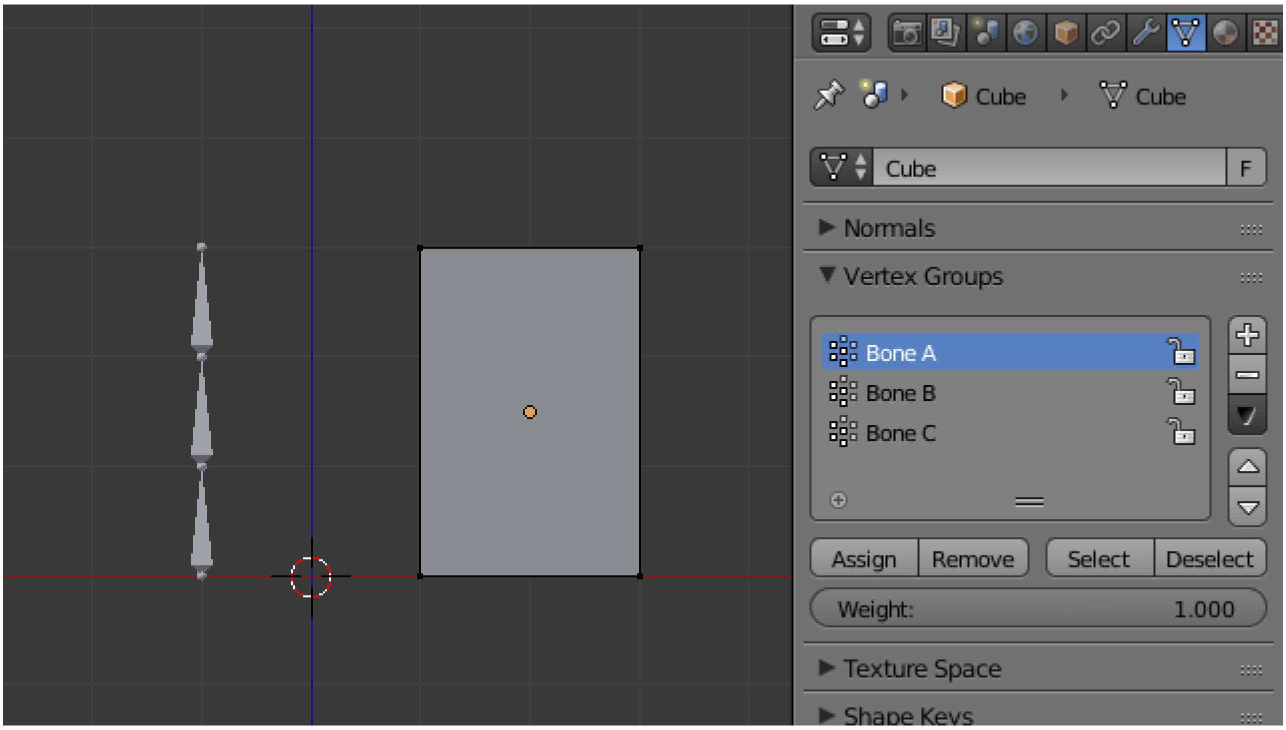
The bone is highlighted in Cyan.

Once in Pose Mode transforming one of the Bones of the Armature that has been associated with vertices of an object will result in those vertices also being transformed.

Armature Deform Parent With Empty Groups

The Armature Deform With Empty Groups parenting method works in almost the same way as Armature Deform parenting with one difference. That difference is that when you parent a Child Object to an Armature Object the names of the bones in the armature are copied to the Child Objects in the form of newly created Vertex Groups, one for each different deforming armature bone name. The newly created Vertex Groups will be empty this means they will not have any vertices assigned to those Vertex Groups. You still must manually select the vertices and assign them to a particular Vertex Group of your choosing to have bones in the armature influence them.

For example, if you have an Armature Object which consists of three bones named “BoneA”, “BoneB” and “BoneC” and Cube Mesh Object type called “Cube”. If you parent the Cube Child Object to the Armature Parent Object the Cube will get three new Vertex Groups created on it called “BoneA”, “BoneB” and “BoneC”. Notice that each Vertex Group is empty.



Cube in Edit Mode using Armature Deform with empty groups.

Bones in an Armature can be generally classified into two different types:

- Deforming Bones
- Control Bones

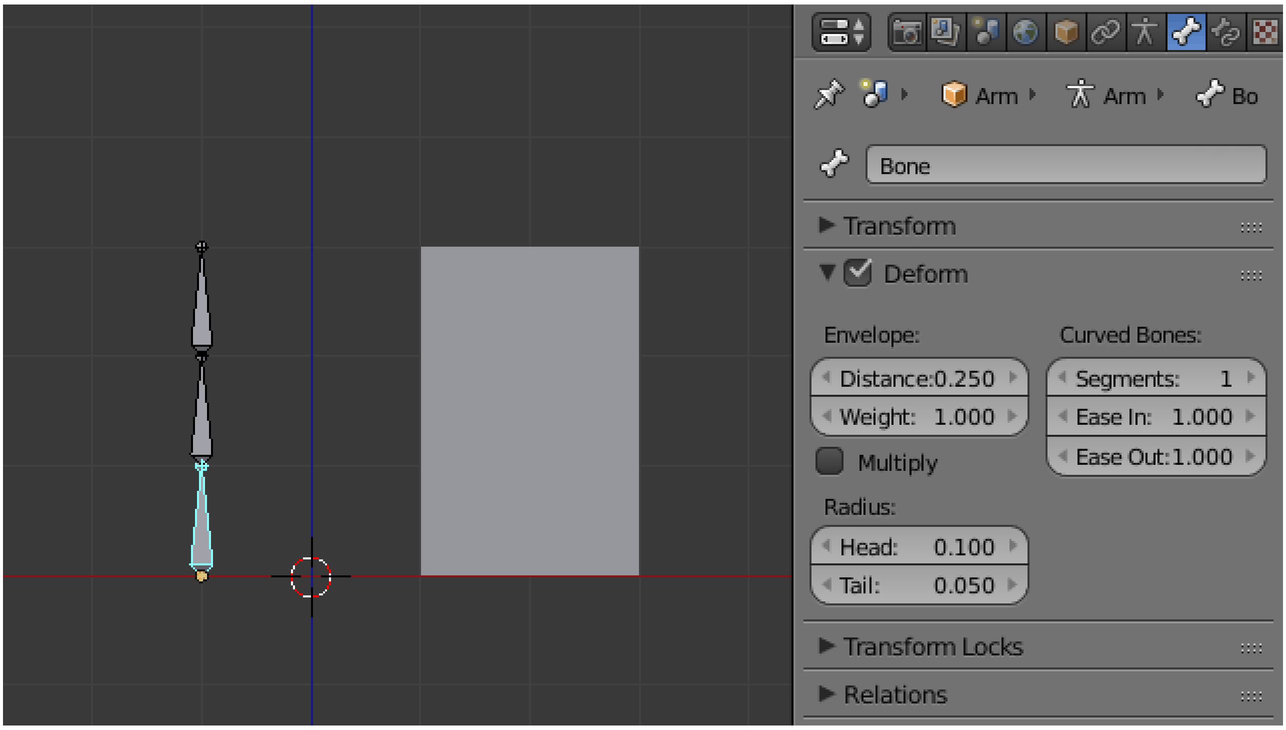
Deforming Bones
Are bones which when transformed will result in vertices associated with them also transforming in a similar way. Deforming Bones are directly involved in altering the positions of vertices associated with their bones.

Control Bones
Are Bones which act in a similar way to switches, in that, they control how other bones or objects react when they are transformed. A Control Bone could for example act as a sliding switch control when the bone is in one position to the left it could indicate to other bones that they react in a particular way when transformed, when the Control Bone is positioned to the right, transforming other bones or objects could

do something completely different. Control Bones are not directly used to alter the positions of vertices, in fact, Control Bones often have no vertices directly associated with themselves.

When using the Armature Deform With Empty Groups parenting method Vertex Groups on the Child Object will only be created for Armature Bones which are setup as Deforming Bone types. If a Bone is a Control Bone no Vertex Group will be created on the Child Object for that bone.

To check whether a particular bone in an armature is a Deforming Bone simply switch to Pose or Edit Mode on the armature and select the bone you are interested in by RMB it. Once the bone of interest is selected navigate to Properties Editor ‣ Bone ‣ Deform Panel and check if the Deform tickable option is ticked or not. If it is the selected bone is a Deforming Bone, otherwise, it is a Control Bone.



Three Bone Armature in *Pose* Mode with 1st bone selected.

Armature Deform With Automatic Weights

Armature Deform With Automatic Weights parenting feature does everything Armature Deform With Empty Groups does with one extra thing. That extra thing is that unlike Armature Deform With Empty Groups which leaves the automatically created Vertex Groups empty with no vertices assigned to them; Armature Deform With Automatic Weight will try to calculate how much Influence Weight a particular Armature Bone would have on a certain collection of vertices based on the distance from those vertices to a particular Armature Bone.

Once Blender has calculated the Influence Weight vertices should have it will assign that Influence Weight to the Vertex Groups that were previously created automatically by Blender on the Child Object when Armature Deform With Automatic Weights parenting command was carried out.

If all went well it should be possible to select the Armature Object switch it into Pose Mode and transform the bones of the Armature and the Child Object should deform in response. Unlike Armature Deform parenting you will not have to create Vertex Groups on the Child Object, neither will you have to assign Influences Weights to those Vertex Groups, Blender will try to do it for you.

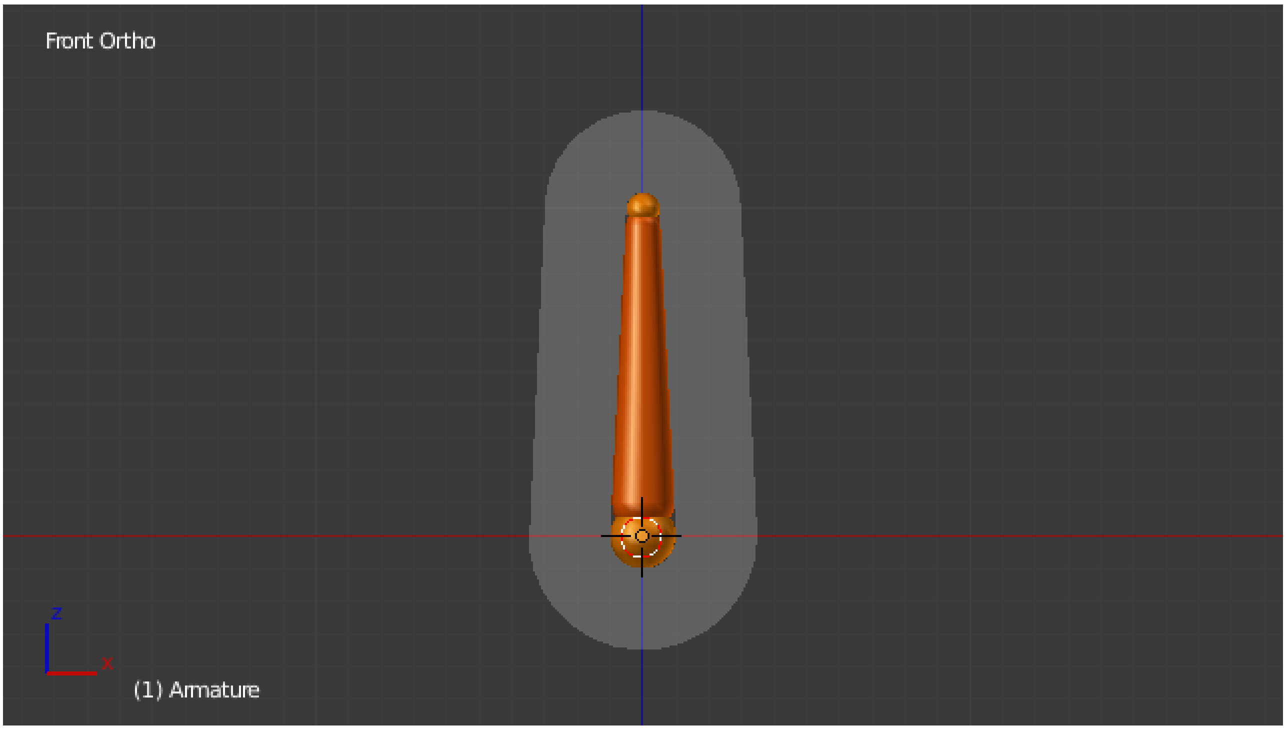
To activate Armature Deform With Automatic Weights you must be in Object Mode or Pose Mode, then select all the Child Objects (usually Mesh Object Types) and lastly select the Armature Object; Once done press and select the Armature Deform With Automatic Weights from the Set Parent To pop-up menu.

This method of parenting is certainly easier setup but it can often lead to Armatures which do not deform Child Objects in ways you would want as Blender can get a little confused when it comes to determining which Bones should influence certain vertices when calculating Influence Weights for more complex armatures and Child Objects. Symptoms of this confusion are that when transforming the Armature Object in Pose Mode parts of the Child Objects do not deform as you expect; If Blender does not give you the results you require you will have to manually alter the Influence Weights of vertices in relation to the Vertex Groups they belong to and have influence in.

Armature Deform With Envelope Weights

Works in a similar way to Armature Deform With Automatic Weights in that it will create Vertex Groups on the Child Objects that have names matching those of the Parent Object Armature Bones. The created Vertex Groups will then be assigned Influence Weights. The major difference is in the way those Influence Weights are calculated.

Influence Weights that are calculated when using Armature Deform With Envelope Weights parenting are calculated entirely visually using Bone Envelopes.

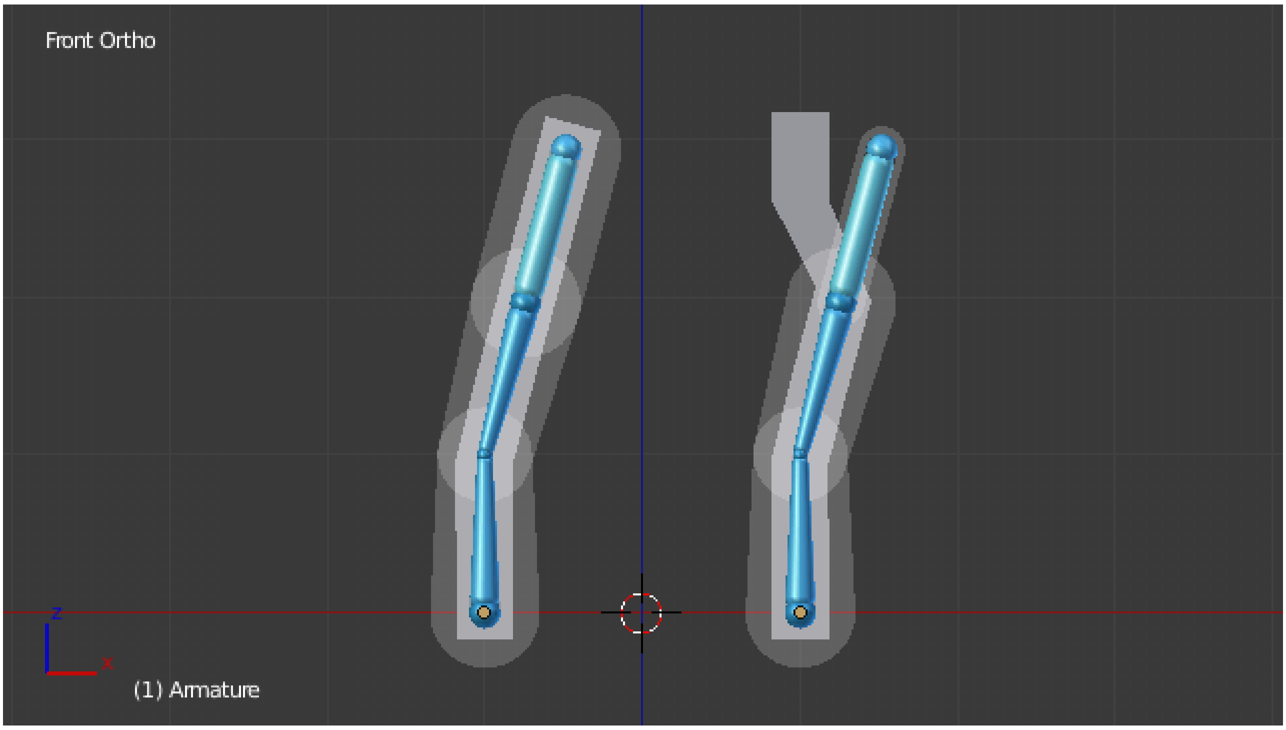


Single Armature Bone in Edit Mode with Envelope Weight display enabled.

The gray volume around the bone is the Bone Envelope.

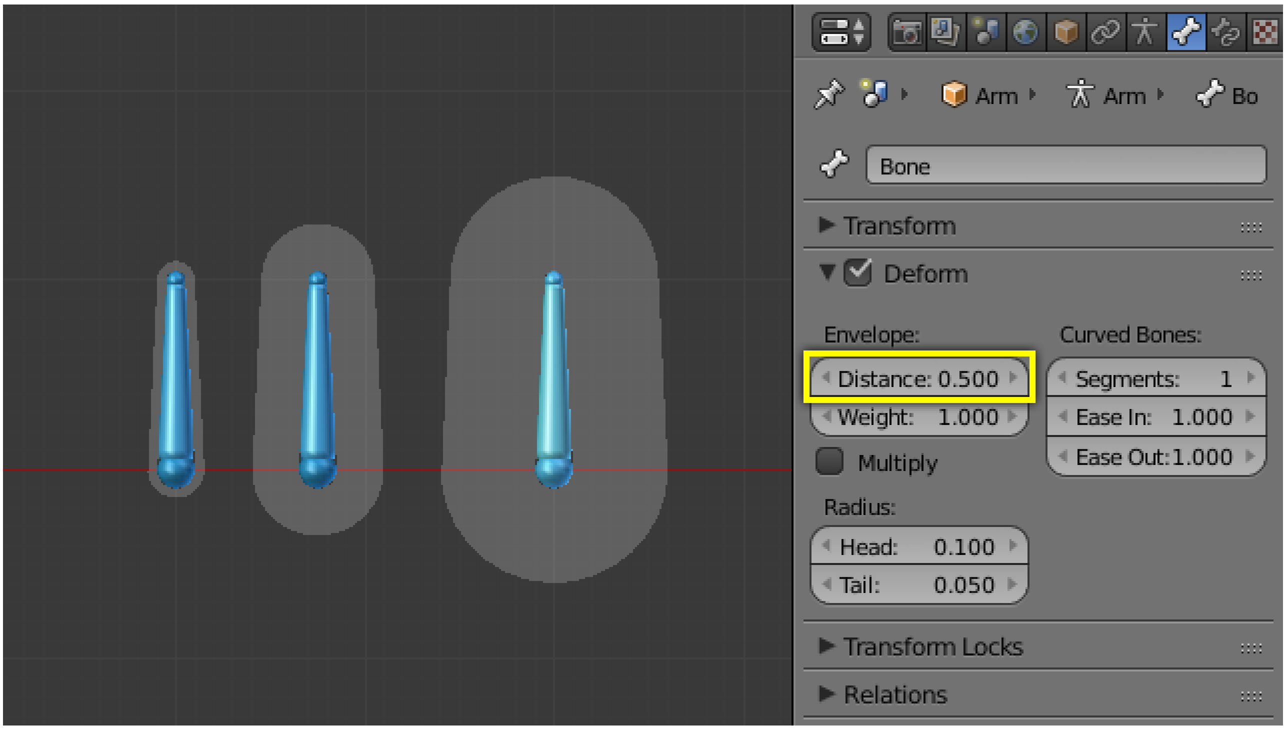
Fig. Single Armature Bone in Edit Mode with Envelope Weight display enabled. shows a single Armature Bone in Edit Mode with Envelope Weight activated. The gray semi-transparent volume around the bone is the Bone Envelope.

Any Child Object that has vertices inside the volume of the Bone Envelope will be influenced by the Parent Object Armature when the Armature Deform With Envelope Weights operator is used. Any vertices outside the Bone Envelope volume will not be influenced. When the bones are transformed in Pose Mode the results are very different.



Two sets of Armatures each with three bones.

The default size of the Bone Envelope volume does not extend very far from the surface of a bone; You can alter the size of the Bone Envelope volume by clicking on the body of the bone you want to alter, switch to Edit Mode or Pose Mode and then pressing `Ctrl-Alt-S` then drag your mouse left or right and the Bone Envelope volume will alter accordingly.



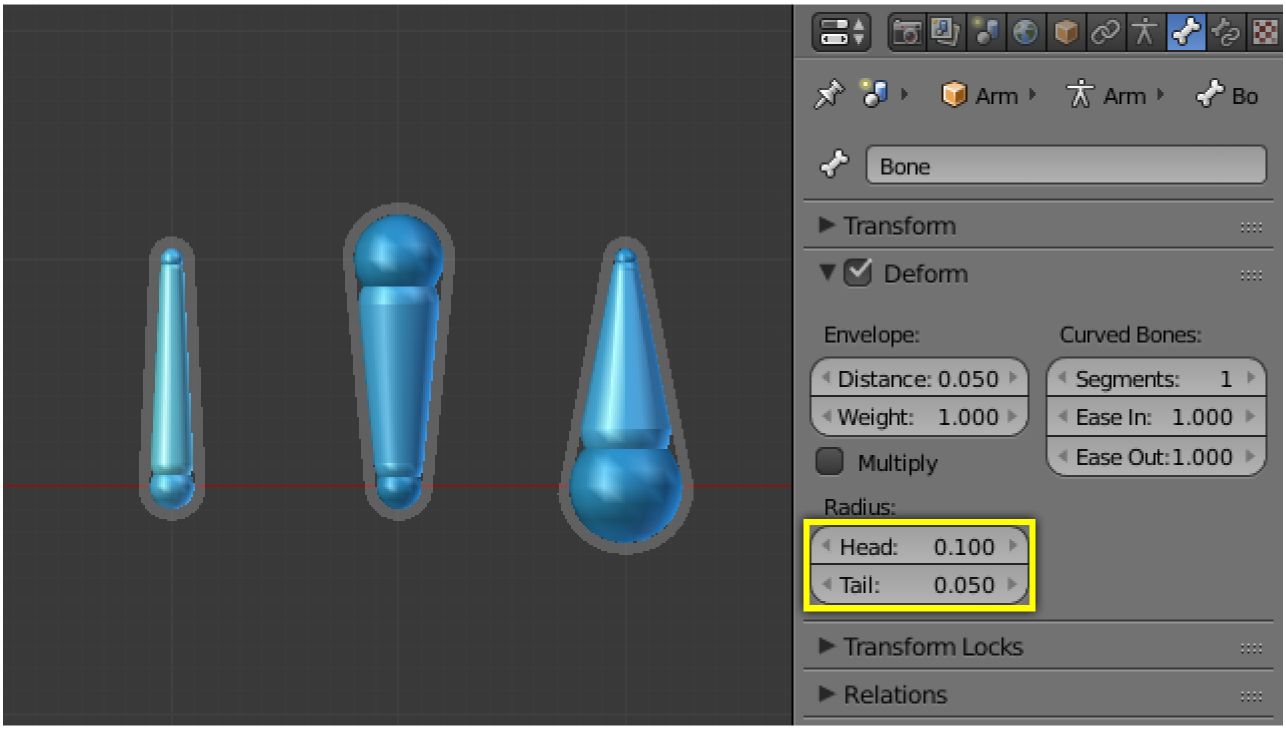
Single Armature Bone with various different Bone Envelope sizes.

Envelope distance fields highlighted.

You can also alter the Bone Envelope volume by selecting the Bone you wish to alter and switching to Edit Mode or Pose Mode, then navigate to Properties Editor ‣ Bone ‣ Deform ‣ Envelope ‣ Distance then enter a new value into it.

Altering the Bone Envelope volume does not alter the size of the Armature Bone just the range within which it can influence vertices of Child Objects.

You can alter the radius that a bone has by selecting the head, body or tail parts of a bone while in Edit Mode, and then press `Alt-S` and move the mouse left or right. This will make the selected bone fatter or thinner without altering the thickness of the Bone Envelope volume.



Three Armature Bones all using Envelope Weight.

The 1st with a default radius value, the two others with differing Tail and Head radius values.

You can also alter the bone radius by selecting the tail or head of the bone you wish to alter and switching to Edit Mode, then navigate to Properties Editor ‣ Bone ‣ Deform ‣ Radius Section and entering new values for the *Tail* and *Head* fields.

Note

If you alter the Bone Envelope volume of a bone so that you can have it include/exclude certain vertices after you have already used Armature Deform With Envelope Weights, by default, the newly included/excluded vertices will not be affected by the change. When using Armature Deform With Envelope Weights it only calculates which vertices will be affected by the Bone Envelope volume at the time of parenting, at which point it creates the required named Vertex Groups and assigns vertices to them as required. If you want any vertices to take account of the new Bone Envelope volume size you will have to carry out the Armature

Deform With Envelope Weights parenting again; In fact, all parenting used in the Set Parent To pop-up menu which tries to automatically assign vertices to Vertex Groups works like this.

Posing Introduction

Once your armature is skinned by the needed object(s), you can start to pose it. Basically, by transforming its bones, you deform or transform the skin object(s). But you do not do that in *Edit Mode* – remember that in this mode, you edit the default, base, “rest” position of your armature. You cannot use the *Object Mode* either, as here you can only transform whole objects...

So, armatures in Blender have a third mode, *Pose*, dedicated to this process. It is a sort of “object mode for bones”. In rest position (as edited in *Edit Mode*), each bone has its own position/rotation/scale to neutral values (i.e. 0.0 for position and rotation, and 1.0 for scale). Hence, when you edit a bone in *Pose Mode*, you create an offset in its transform properties, from its rest position – this is quite similar to meshes relative shape keys, in fact.

Posing Section Overview

In this section, we will see:

- How to select and edit bones in this mode.
- How to use pose library.
- How to use constraints to control your bones’ DoF (degrees of freedom).
- How to use inverse kinematics features.
- How to use the Spline inverse kinematics features.

Even though it might be used for completely static purposes, posing is heavily connected with animation features and techniques.

In this part, we will try to focus on animation-independent posing, but this is not always possible. So if you know nothing about animation in Blender, it might be a good idea to read the animation features and techniques chapter first, and then come back here.

Visualization

Bone State Colors

The color of the bones are based on their state. There are six different color codes, ordered here by precedence (i.e. the bone will be of the color of the bottommost valid state):

- Gray: Default.
- Blue wireframe: in Pose Mode.
- Green: with Constraint.
- Yellow: with IK Solver constraint.

- Orange: with Targetless Solver constraint.

Note

When Bone Groups colors are enabled, the state colors will be overridden.

Selecting

Selection in *Pose Mode* is very similar to the one in Edit Mode, with a few specificities:

You can only select *whole bones* in *Pose Mode*, not roots/tips...

Grouped

You can select bones based on their group and/or layer, through the *Select Grouped* menu .

Editing

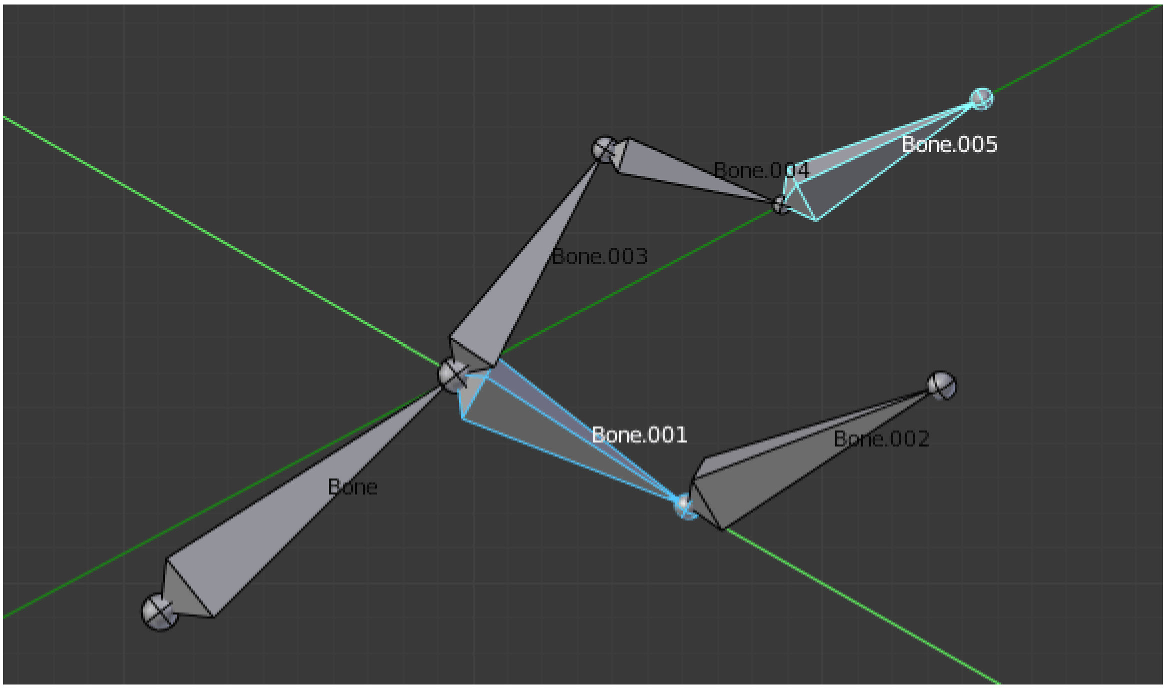
Pose Tools.

In *Pose Mode*, bones behave like objects. So the transform actions (grab/rotate/scale, etc.) are very similar to the same ones in *Object* mode (all available ones are regrouped in the Pose ‣ Transform sub-menu). However, there are some important specificities:

- Bones' relationships are crucial (see Parenting).
- The "transform center" of a given bone (i.e. its default pivot point, when it is the only selected one) is *its root*. Note by the way that some pivot point options seem to not work properly, In fact, except for the *3D Cursor* one, all others appear to always use the median point of the selection (and not e.g. the active bone's root when *Active Object* is selected, etc.).

Basic Posing

As previously noted, bones' transformations are performed based on the *Rest Position* of the armature, which is its state as defined in *Edit Mode*. This means that in rest position, in *Pose Mode*, each bone has a scale of 1.0, and null rotation and position (as you can see it in the *Transform* panel, in the 3D Views, `N`).



An example of locally-Y-axis locked rotation, with two bones selected. Note that the two green lines materializing the axes are centered on the armature's center, and not each bone's root...

Moreover, the local space for these actions is the bone's own one (visible when you enable the *Axes* option of the *Armature* panel). This is especially important when using axis locking, for example, there is no specific "bone roll" tool in *Pose Mode*, as you can rotate around the bone's main axis just by locking on the local Y axis `R-Y-Y`... This also works with several bones selected; each one is locked to its own local axis!

When you pose your armature, you are supposed to have one or more objects skinned on it! And obviously, when you transform a bone in *Pose Mode*, its related objects or object's shape is moved/deformed accordingly, in real time. Unfortunately, if you have a complex rig set-up and/or a heavy skin object, this might produce lag, and make interactive editing very painful. If you experience such troubles, try enabling the *Delay Deform* button of the *Armature* panel the skin objects will only be updated once you validate the transform operation.

Auto IK

Reference
Mode: Pose Mode

Panel: Tool Shelf ‣ Options ‣ Pose Options

The auto IK option in the tool shelf enables a temporary IK constraint when posing bones. The chain acts from the tip of the selected bone to root of the uppermost parent bone. Note that this mode lacks options, and only works by applying the resulting transform to the bones in the chain.

Clear Transform

Reference
Mode: Pose Mode
Menu: Pose ‣ Clear Transform

Once you have transformed some bones, if you want to return to their rest position, just clear their transformations.

Note that in *Envelope* visualization, `Alt-S` does not clear the scale, but rather scales the *Distance* influence area of the selected bones (also available through the Pose ‣ Scale Envelope Distance menu entry, which is only effective in *Envelope* visualization, even though it is always available...).

Apply

Reference
Mode: Pose Mode
Menu: Pose ‣ Apply

Conversely, you may define the current pose as the new rest position (i.e. “apply” current transformations to the *Edit Mode*), using the Pose ‣ Apply Pose as Restpose menu entry. When you do so, the skinned objects/geometry is **also** reset to its default, undeformed state, which generally means you will have to skin it again.

In-Betweens

There are several tools for editing poses in an animation.

Push Pose

Reference
Mode: Pose Mode

Panel: Tool Shelf ‣ Tool ‣ Tool ‣ Pose Tools ‣ In-Betweens: Push
Menu: Pose ‣ In-Betweens ‣ Push Pose

Push pose exaggerates the current pose.

Relax Pose

Reference
Mode: Pose Mode
Panel: Tool Shelf ‣ Tool ‣ Pose Tools ‣ In-Betweens: Relax
Menu: Pose ‣ In-Betweens ‣ Relax Pose

Relax pose is somewhat related to the above topic, but it is only useful with keyframed bones. When you edit such a bone (and hence take it "away" from its "keyed position"), using this command will progressively "bring it back" to its "keyed position", with smaller and smaller steps as it comes near it.

Breakdowner

Reference
Mode: Pose Mode
Panel: Tool Shelf ‣ Tool ‣ Pose Tools ‣ In-Betweens: Breakdowner
Menu: Pose ‣ In-Betweens ‣ Pose Breakdowner

Creates a suitable breakdown pose on the current frame.

There are also in *Pose Mode* a bunch of armature-specific editing options/tools, like auto-bones naming, properties switching/enabling/disabling, etc., that we already described in the armature editing pages. See the links above...

Copy/Paste Pose

Reference
Mode: Pose Mode

Panel: Tool Shelf ‣ Tool ‣ Pose Tools ‣ Pose: Copy, Paste

Menu: Pose ‣ Copy Current Pose , Pose ‣ Paste Pose , Pose ‣ Paste X-Flipped Pose

Blender allows you to copy and paste a pose, either through the *Pose* menu, or directly using the three "copy/paste" buttons found at the right part of the 3D Views header:

Copy Current Pose

To copy the current pose of selected bones into the pose buffer.

Paste Pose

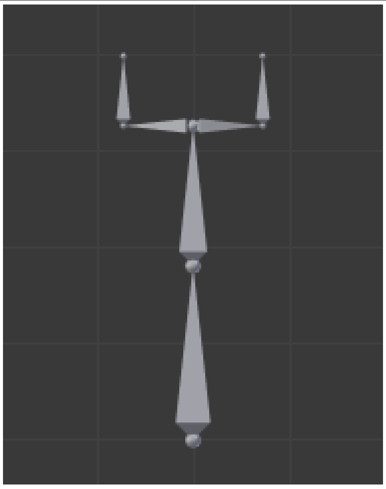
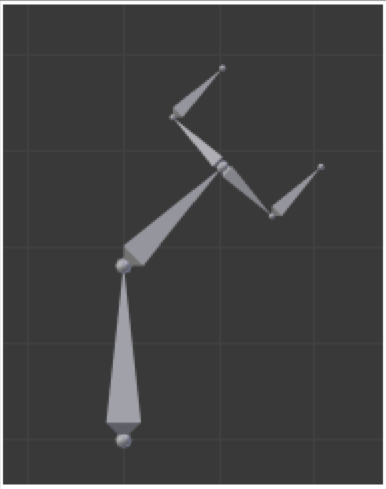
Paste the buffered pose to the currently posed armature.

Paste X-Flipped Pose

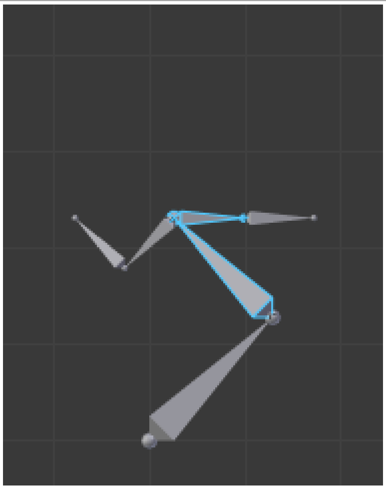
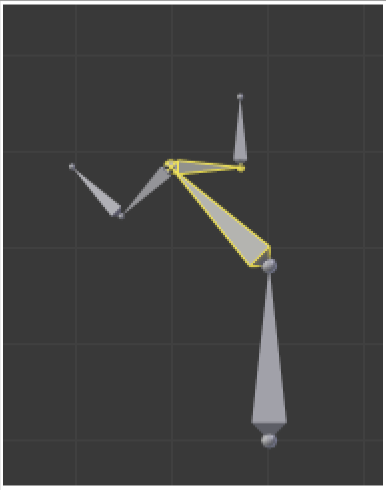
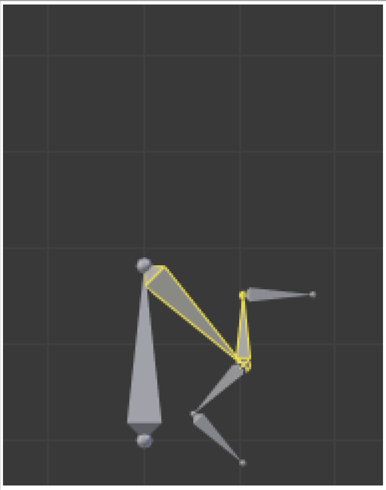
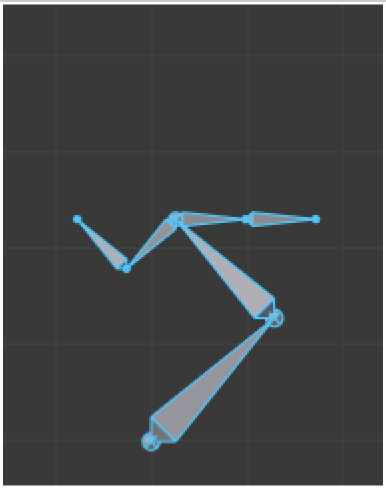
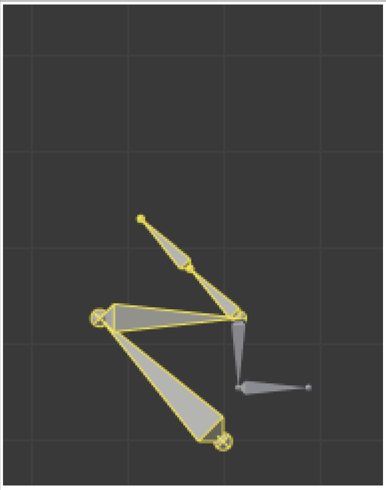
Paste the *X axis mirrored* buffered pose to the currently posed armature.

Here are important points:

- This tool works at the Blender session level, which means you can use it across armatures, scenes, and even files. However, the pose buffer is not saved, so you lose it when you close Blender.
- There is only one pose buffer.
- Only the selected bones are taken into account during copying (i.e. you copy only selected bones' pose).
- During pasting, on the other hand, bone selection has no importance. The copied pose is applied on a per-name basis (i.e. if you had a `forearm` bone selected when you copied the pose, the `forearm` bone of the current posed armature will get its pose when you paste it – and if there is no such named bone, nothing will happen...).
- What is copied and pasted is in fact the position/rotation/scale of each bone, in its own space. This means that the resulting pasted pose might be very different from the originally copied one, depending on: - The rest position of the bones, and - The current pose of their parents.

	
The rest position of our original armature.	The rest position of our destination armature.

Examples of pose copy/paste.

		
The first copied pose (note that only two bones are selected and hence copied).	...pasted on the destination armature...	...and mirror-pasted on the destination armature.
		
The same pose as above is copied, but this time with all bones selected, ...	...pasted on the destination armature...	...and mirror-pasted on the destination armature.

Propagate

Reference
Mode: Pose Mode
Panel: Tool Shelf ‣ Tool ‣ Pose Tools ‣ Pose: Propagate
Menu: Pose ‣ Propagate

The Propagate tool copies the pose of the selected bones on the current frame over to the keyframes delimited by the *Termination Mode*. It automates the process of copying and pasting.

ToDo.

Options

Termination Mode

Modes which determine how it decides when to stop overwriting keyframes.

While Held
: The most complicated of the modes available, as it tries to guess when to stop propagating by examining the pauses in the animation curves per control (i.e. all F-Curves for a bone, instead of per F-Curve).

To Next Keyframe
: Simply copies the pose to the first keyframe after (but not including any keyframe on) the current frame.

To Last Keyframe
: Will simply replace the last keyframe. (i.e. making action cyclic).

Before Frame
: To all keyframes between current frame and the *End frame* option. This option is best suited for use from scripts due to the difficulties in setting this frame value, though it is possible to set this manually via the Operator panel if necessary.

Before Last Keyframe
: To all keyframes from current frame until no more are found.

On Selected Keyframes
: Will apply the pose of the selected bones to all selected keyframes.

On Selected Markers
: To all keyframes occurring on frames with Scene Markers after the current frame.

End Frame
: Defines the upper-bound for the frame range within which keyframes will be affected (with the lower bound being the current frame).

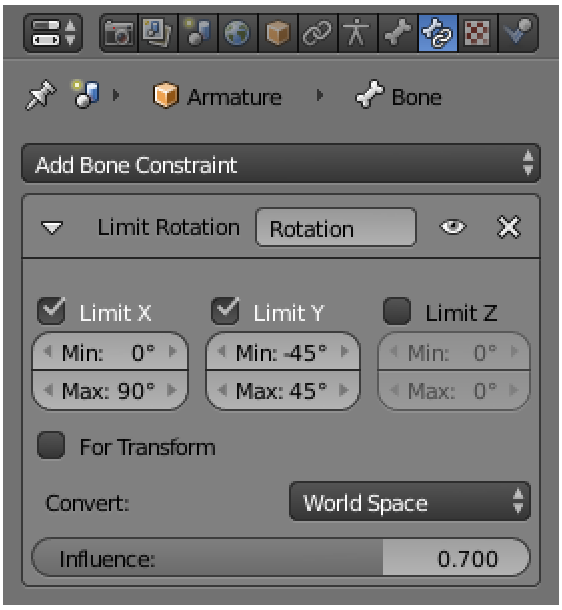
Show/Hide

Reference
Mode: All Modes
Panel: Properties editor ‣ Bone ‣ Display
Menu: ... ‣ Show/Hide

You can also use the *Hide* checkbox of the Bone tab ‣ Display panel.

Note that hidden bones are specific to a mode, i.e. you can hide some bones in *Edit Mode*, they will still be visible in *Pose Mode*, and vice-versa. Hidden bone in *Pose Mode* are also invisible in *Object Mode*. And in *Edit Mode*, the bone to hide must be fully selected, not just his root or tip.

Bone Constraints Introduction



The Constraints panel in Pose Mode, with one Limit Rotation constraint applied to the active bone.

As bones behave like objects in *Pose Mode*, they can also be constrained. This is why the *Constraints* tab is shown in both *Object Mode* and *Edit Mode*. This panel contains the constraints *of the active bone* (its name is displayed at the top of the panel, in the *To Bone:...* static text field).

Constraining bones can be used to control their degree of freedom in their pose transformations, using e.g. the *Limit* constraints. You can also use constraints to make a bone track another object/bone (inside the same object, or in another armature), etc. And the inverse kinematics feature is also mainly available through the *IK Solver* constraint, which is specific to bones.

For example, a human elbow cannot rotate backward (unless the character has broken his hand), nor to the sides, and its forward and roll rotations are limited in a given range (for example, depending on the rest position of your elbow, it may be from (0 to 160) or from (-45 to 135).

So you should apply a *Limit Rotation* constraint to the forearm bone (as the elbow movement is the result of rotating the forearm bone around its root).

Using bones in constraints, either as owners or as targets, is discussed in detail in the constraints pages.

IK Introduction

IK simplifies the animation process, and makes it possible to make more advanced animations with lesser effort.

IK allows you to position the last bone in a bone chain and the other bones are positioned automatically. This is like how moving someone’s finger would cause his arm to follow it. By normal posing techniques, you would have to start from the root bone, and set bones sequentially till you reach the tip bone: When each parent bone is moved, its child bone would inherit its location and rotation. Thus making tiny precise changes in poses becomes harder farther down the chain, as you may have to adjust all the parent bones first.

This effort is effectively avoided by use of IK.

Automatic IK

Automatic IK is a tool for quick posing, it can be enabled in the tool shelf in the 3D View, when in pose mode. When the Auto IK option is enabled, translating a bone will activate inverse kinematics and rotate the parent bone, and the parent's parent, and so on, to follow the selected bone. The IK chain can only extend from a child to a parent bone if the child is *connected* to it.

The length of the chain is increased (if there is a connected parent available to add to it) with `Ctrl-PageUp` or `Ctrl-WheelDown`, and decreased with `Ctrl-PageDown` or `Ctrl-WheelUp`. However, the initial chain length is 0, which effectively means follow the connections to parent bones as far as possible, with no length limit. So pressing `Ctrl-PageUp` the first time sets the chain length to 1 (move only the selected bone), and pressing `Ctrl-PageDown` at this point sets it back to 0 (unlimited) again. Thus, you have to press `Ctrl-PageUp` *more than once* from the initial state to set a finite chain length greater than 1.

This is a more limited feature than using an IK constraint, which can be configured, but it can be useful for quick posing.

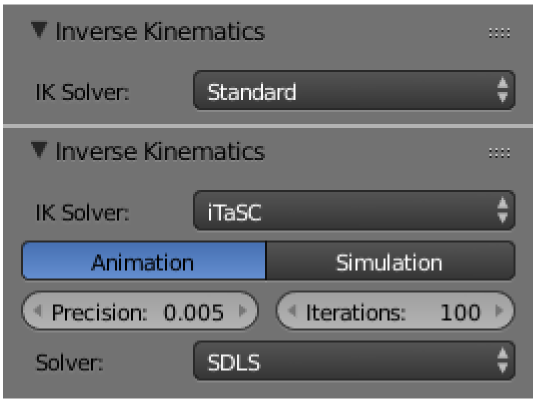
IK Constraints

IK is mostly done with bone constraints. They work by the same method but offer more choices and settings. Please refer to these pages for detail about the settings for the constraints:

- IK Solver
- Spline IK

Armature IK Panel

This panel is used to select the IK Solver type for the armature. *Standard* or *iTaSC*.



Properties ‣ Armature ‣ Inverse Kinematics Panel

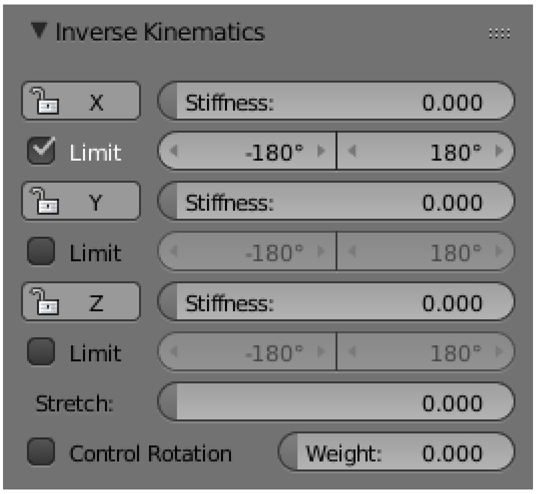
Most the time people will use the *Standard* IK solver. There is some documentation for the *iTaSC* "instantaneous Task Specification using Constraints" IK solver here.

See also

Robot IK Solver.

Bone IK Panel

This panel is used to control how the *Pose Bones* work in the IK chain.



Properties ‣ Bone ‣ Inverse Kinematics Panel

Lock
: Disallow movement around the axis.

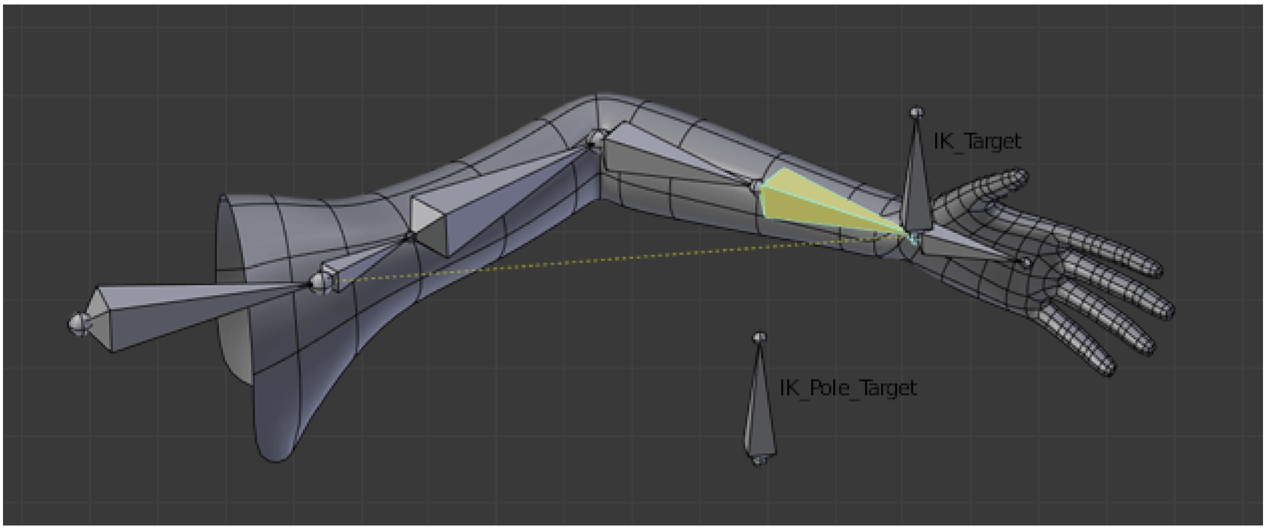
Stiffness
: Stiffness around the axis. Influence disabled if using *Lock*.

Limit
: Limit movement around the axis.

Stretch
: Stretch influence to IK target.

Arm Rig Example

This arm uses two bones to overcome the twist problem for the forearm. IK locking is used to stop the forearm from bending, but the forearm can still be twisted manually by pressing `R-Y-Y` in *Pose Mode*, or by using other constraints.



IK Arm Example..

Note that, if a *Pole Target* is used, IK locking will not work on the root boot.

Spline IK

Spline IK is a constraint which aligns a chain of bones along a curve. By leveraging the ease and flexibility of achieving aesthetically pleasing shapes offered by curves and the predictability and well integrated control offered by bones, Spline IK is an invaluable tool in the riggers' toolbox. It is particularly well suited for rigging flexible body parts such as tails, tentacles, and spines, as well as inorganic items such as ropes.

Full description of the settings for the spline IK are detailed on the Spline IK page.

Basic Setup

The Spline IK Constraint is not strictly an 'Inverse Kinematics' method (i.e. IK Constraint), but rather a 'Forward Kinematics' method (i.e. normal bone posing). However, it still shares some characteristics of the IK Constraint, such as operating on multiple bones not being usable for Objects, and being evaluated after all other constraints have been evaluated. It should be noted that if a Standard IK chain and a Spline IK chain both affect a bone at the same time the Standard IK chain takes priority. Such setups are best avoided though, since the results may be difficult to control.

To setup Spline IK, it is necessary to have a chain of connected bones and a curve to constrain these bones to:

- With the last bone in the chain selected, add a Spline IK Constraint from the Bone Constraints tab in the Properties Editor.
- Set the 'Chain Length' setting to the number of bones in the chain (starting from and including the selected bone) that should be influenced by the curve.
- Finally, set the 'Target' field to the curve that should control the curve.

Congratulations, the bone chain is now controlled by the curve.

Settings and Controls

Roll Control

To control the 'twist' or 'roll' of the Spline IK chain, the standard methods of rotating the bones in the chain along their y-axes still apply. For example, simply rotate the bones in the chain around their y-axes to adjust the roll of the chain from that point onwards. Applying copy rotation constraints on the bones should also work.

Offset Controls

The entire bone chain can be made to follow the shape of the curve while still being able to be placed at an arbitrary point in 3D-space when the 'Chain Offset' option is enabled. By default, this option is not enabled, and the bones will be made to follow the curve in its untransformed position.

Thickness Controls

The thickness of the bones in the chain is controlled using the constraint's 'XZ Scale Mode' setting. This setting determines the method used for determining the scaling on the X and Z axes of each bone in the chain.

The available modes are:

None
: this option keeps the X and Z scaling factors as 1.0.

Volume Preserve
: the X and Z scaling factors are taken as the inverse of the Y scaling factor (length of the bone), maintaining the 'volume' of the bone

Bone Original
: this options just uses the X and Z scaling factors the bone would have after being evaluated in the standard way.

In addition to these modes, there is an option, *Use Curve Radius*. When this option is enabled, the average radius of the radii of the points on the curve where the joints of each bone are placed, are used to derive X and Z scaling factors. This allows the scaling effects, determined using the modes above, to be tweaked as necessary for artistic control.

Tips for Nice Setups

- For optimal deformations, it is recommended that the bones are roughly the same length, and that they are not too long, to facilitate a better fit to the curve. Also, bones should ideally be created in a way that follows the shape of the curve in its 'rest pose' shape, to minimize the problems in areas where the curve has sharp bends which may be especially noticeable when stretching is disabled.
- For control of the curve, it is recommended that hooks (in particular, Bone Hooks) are used to control the control-vertices of the curve, with one hook per control-vertex. In general, only a few control-vertices should be needed for the curve (e.g one for every 3-5 bones offers decent control).
- The type of curve used does not really matter, as long as a path can be extracted from it that could also be used by the Follow Path Constraint. This really depends on the level of control required from the hooks.
- When setting up the rigs, it is currently necessary to have the control bones (for controlling the curve) in a separate armature to those used for deforming the meshes (i.e. the deform rig containing the Spline IK chains). This is to avoid creating pseudo "Dependency Cycles", since Blender's Dependency Graph can only resolve the dependencies the control bones, curves, and Spline IK'ed bones on an object by object basis.

7.4.1 Rigging - Posing - Introduction

Posing

Once your armature is *skinned* by the needed object(s), you can start to pose it. Basically, by transforming its bones, you deform or transform the skin object(s). But you don’t do that in *Edit* mode - remember that in this mode, you edit *the default, base, “rest” position of your armature*. You can’t use the *Object* mode either, as here you can only transform whole objects...

So, armatures in Bforartists have a third mode, *Pose*, dedicated to this process. It’s a sort of “object mode for bones”. In rest position (as edited in *Edit* mode), each bone has its own position/rotation/scale to neutral values (i.e. `0.0` for position and rotation, and `1.0` for scale). Hence, when you edit a bone in *Pose* mode, you create an offset in its transform properties, from its rest position - this is quite similar to *meshes relative shape keys*, in fact.

Posing Section Overview

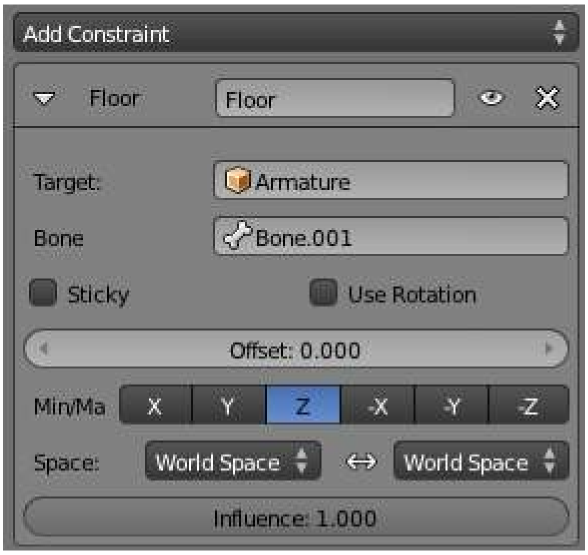
In this section, we will see:

- The *visualization features* specific to *Pose* mode.
- How to *select and edit bones* in this mode.
- How to *use pose library.*
- How to *use constraints* to control your bones' DoF (degrees of freedom).
- How to *use inverse kinematics features*.
- How to *use the Spline inverse kinematics features*.

Even though it might be used for completely static purposes, posing is heavily connected with *animation features and techniques*.

In this part, we will try to focus on animation-independent posing, but this isn't always possible. So if you know nothing about animation in Bforartists, it might be a good idea to read the *animation features and techniques* chapter first, and then come back here.

Applying Constraints to Bones



The Constraints panel in Pose mode, with one Floor constraint applied to the active bone (Bone.001).

As bones behave like objects in *Pose* mode, they can also be constrained. This is why the *Constraints* panel is shown in both *Object* and *Editing* contexts in this mode... This panel contains the constraints *of the active bone* (its name is displayed at the top of the panel, in the *To Bone:*... static text field).

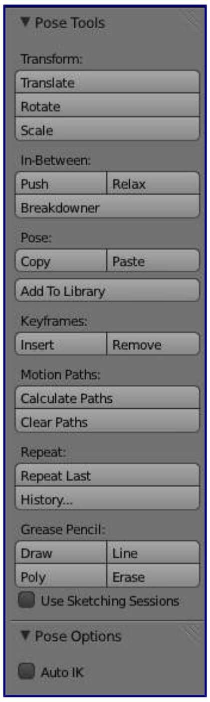
Constraining bones can be used to control their degree of freedom in their pose transformations, using e.g. the *Limit* constraints. You can also use constraints to make a bone track another object/bone (inside the same object, or in another armature), etc. And the *inverse kinematics feature* is also mainly available through the *IK Solver* constraint - which is specific to bones.

For example, a human elbow can't rotate backward (unless the character has broken his hand), nor to the sides, and its forward and roll rotations are limited in a given range (for example, depending on the rest position of your elbow, it may be from `0` to `160`, OR from `-45` to `135`).

So you should apply a *Limit Rotation* constraint to the forearm bone (as the elbow movement is the result of rotating the forearm bone around its root).

Using bones in constraints, either as owners or as targets, is discussed in detail in the *constraints pages*.

Editing Poses



Pose Tools

In *Pose* mode, bones behave like objects. So the transform actions (grab/rotate/scale, etc.) are very similar to the same ones in *Object* mode (all available ones are regrouped in the Pose ‣ Transform sub-menu). However, there are some important specificities:

- Bones' relationships are crucial (see Effects of Bones Relationships).
- The "transform center" of a given bone (i.e. its default pivot point, when it is the only selected one) is *its root*. Note by the way that some pivot point options seem to not work properly - in fact, except for the *3D Cursor* one, all others appear to always use the median point of the selection (and not e.g. the active bone's root when *Active Object* is selected, etc.).

Selecting Bones

Selection in *Pose* mode is very similar to the one in *Edit mode*, with a few specificities:

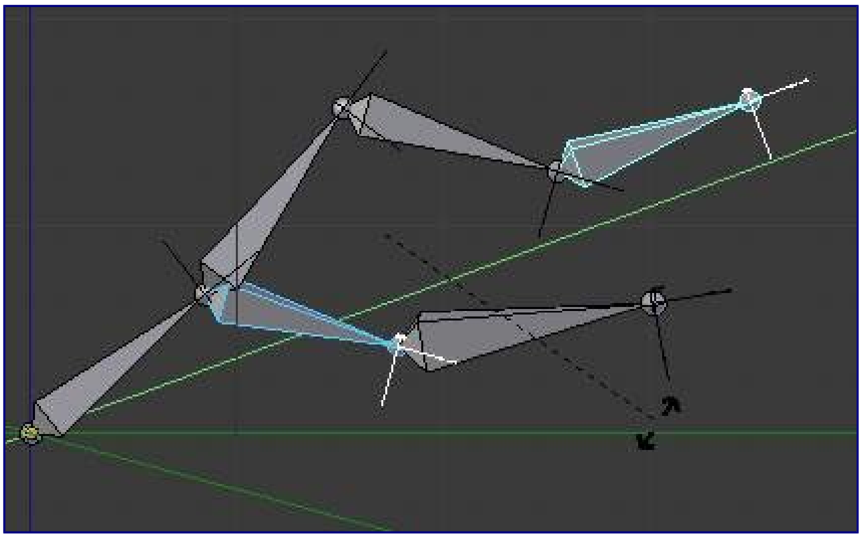
- You can only select *whole bones* in *Pose* mode, not roots/tips...

The Select Grouped pop-up menu.

- You can select bones based on their group and/or layer, through the *Select Grouped* pop-up menu
  - To select all bones belonging to the same group(s) as the selected ones, use the *In Same Group* entry
  - To select all bones belonging to the same layer(s) as the selected ones, use the *In Same Layer* entry

Basic Posing

As previously noted, bones' transformations are performed based on the *rest position* of the armature, which is its state as defined in *Edit* mode. This means that in rest position, in *Pose* mode, each bone has a scale of **1.0**, and null rotation and position (as you can see it in the *Transform Properties* panel, in the 3D views).



An example of locally-Y-axis locked rotation, with two bones selected. Note that the two green lines materializing the axes are centered on the armature's center, and not each bone's root...

Moreover, the local space for these actions is the bone's own one (visible when you enable the *Axes* option of the *Armature* panel). This is especially important when using axis locking - for example, there is no specific "bone roll" tool in *Pose* mode, as you can rotate around the bone's main axis just by locking on the local Y axis ... This also works with several bones selected; each one is locked to its own local axis!

When you pose your armature, you are supposed to have one or more objects skinned on it! And obviously, when you transform a bone in *Pose* mode, its related objects or object's shape is moved/deformed accordingly, in real time. Unfortunately, if you have a complex rig set-up and/or a heavy skin object, this might produce lag, and make interactive editing very painful. If you experience such troubles, try enabling the *Delay Deform* button of the *Armature* panel - the skin objects will only be updated once you validate the transform operation.

Auto IK

The auto IK option in the tool shelf enables a temporary ik constraint when posing bones. The chain acts from the tip of the selected bone to root of the uppermost parent bone. Note that this mode lacks options, and only works by applying the resulting transform to the bones in the chain.

Rest Pose

Once you have transformed some bones, if you want to return to their rest position, just clear their transformations

Note that in *Envelope* visualization, `Alt-S` does not clear the scale, but rather scales the *Distance* influence area of the selected bones (also available through the Pose ‣ Scale Envelope Distance menu entry - only effective in *Envelope* visualization, even though it is always available...).

Conversely, you may define the current pose as the new rest position (i.e. “apply” current transformations to the *Edit* mode), using the Pose ‣ Apply Pose as Restpose menu entry **When you do so, the skinned objects/geometry is also reset to its default, undeformed state**, which generally means you’ll have to skin it again.

Whereas in *Edit* mode, you always see your armature in its rest position, in *Object* and *Pose* ones, you see it by default in its *pose position* (i.e. as it was transformed in the *Pose* mode). If you want to see it in the rest position in all modes, enable the *Rest Position* button in the *Armature* panel (*Editing* context).

In-Betweens

There are several tools for editing poses in an animation.

Relax Pose
: Relax pose is somewhat related to the above topic - but it is only useful with keyframed bones (see the *animation chapter*). When you edit such a bone (and hence take it “away” from its “keyed position”), using this command will progressively “bring it back” to its “keyed position”, with smaller and smaller steps as it comes near it.

Push Pose
: Push pose exaggerates the current pose.

Breakdowner
: Creates a suitable breakdown pose on the current frame

There are also in *Pose* mode a bunch of armature-specific editing options/tools, like auto-bones naming, properties switching/enabling/disabling, etc., that we already described in the armature editing pages - follow the links above...

Copy/Paste Pose

Reference
Mode: *Pose* mode
Panel: *3D View* header
Menu: Pose ‣ Copy Current Pose, Pose ‣ Paste Pose, Pose ‣ Paste Flipped Pose

Copy and paste pose buttons in the 3D View header in Pose mode.

Bforartists allows you to copy and paste a pose, either through the *Pose* menu, or directly using the three “copy/paste” buttons found at the right part of the 3D views header:

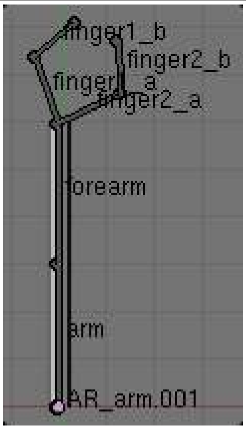
Pose ‣ Copy Current Pose
: to copy the current pose of selected bones into the pose buffer.

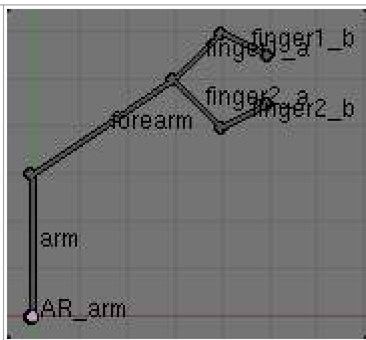
Pose ‣ Paste Pose
: paste the buffered pose to the currently posed armature.

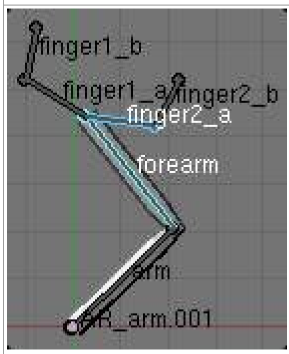
Pose ‣ Paste Flipped Pose
: paste the **X axis mirrored** buffered pose to the currently posed armature.

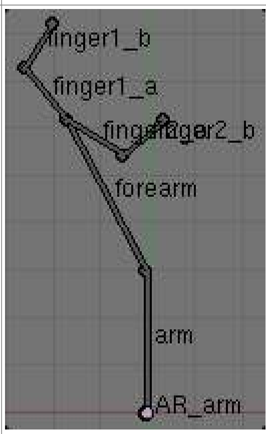
Here are important points:

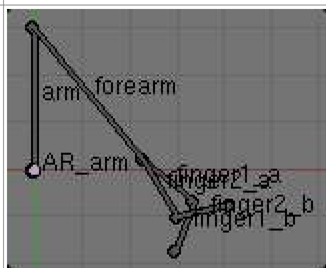
- This tool works at the Bforartists session level, which means you can use it across armatures, scenes, and even files. However, the pose buffer is not saved, so you lose it when you close Bforartists.
- There is only one pose buffer.
- Only the selected bones are taken into account during copying (i.e. you copy only selected bones' pose).
- During pasting, on the other hand, bone selection has no importance. The copied pose is applied on a per-name basis (i.e. if you had a `forearm` bone selected when you copied the pose, the `forearm` bone of the current posed armature will get its pose when you paste it - and if there is no such named bone, nothing will happen...).
- What is copied and pasted is in fact the position/rotation/scale of each bone, in its own space. This means that the resulting pasted pose might be very different from the originally copied one, depending on: - The rest position of the bones, and - The current pose of their parents.

<table>
<tr>
<td>Examples of pose copy/paste.</td>
<td>

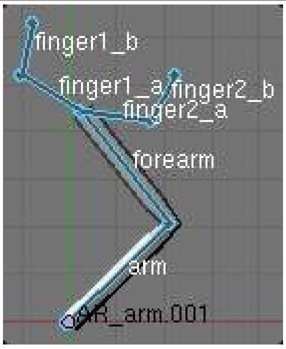
The rest position of our original armature.</td>
<td>

The rest position of our destination armature.</td>
</tr>
<tr>
<td>

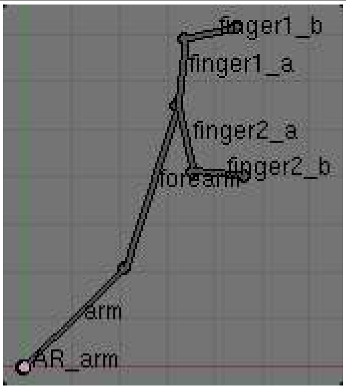
The first copied pose (note that only forearm and finger2_a are selected and hence copied).</td>
<td>

...pasted on the destination armature...</td>
<td>

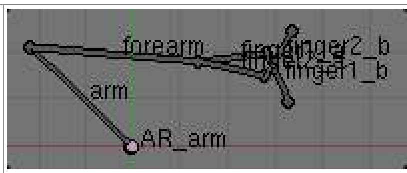
...and mirror-pasted on the destination armature.</td>
</tr>
</table>



The same pose as above is copied, but this time with all bones selected, ...



...pasted on the destination armature...



...and mirror-pasted on the destination armature.

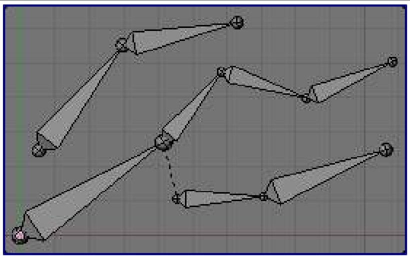
Effects of Bones Relationships

Bones relationships are crucial in *Pose* mode - they have important effects on transformations behavior.

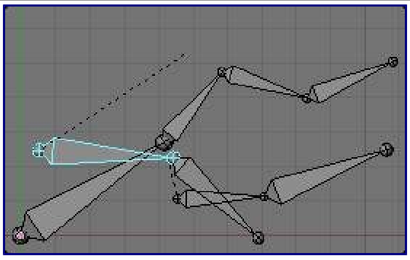
By default, children bones inherit:

- Their parent position, with their own offset of course.
- Their parent rotation (i.e. they keep a constant rotation relatively to their parent).
- Their parent scale, here again with their own offset.

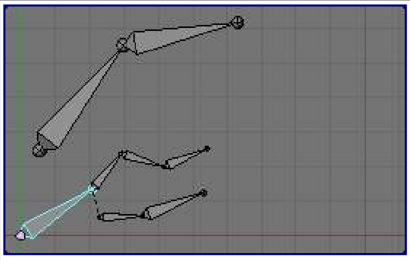
Examples of transforming parented/connected bones.



The armature in its rest position.

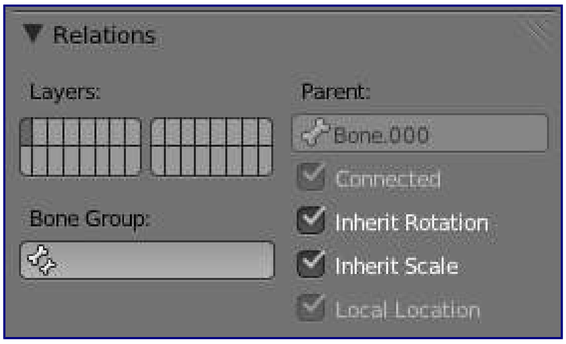


Rotation of a root bone.



Scaling of a root bone.

Exactly like standard children objects. You can modify this behavior on a per-bone basis, using their sub-panels in the *Armature Bones* panel:



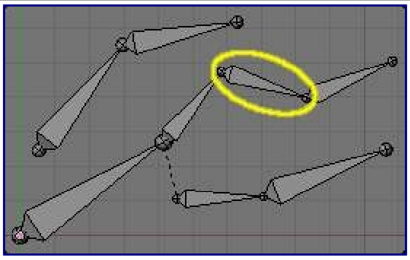
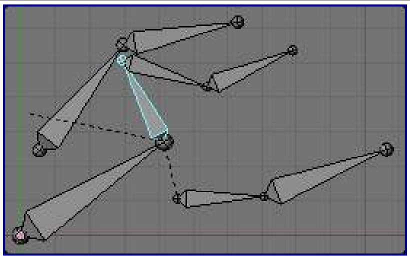
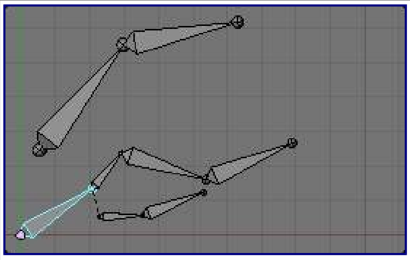
The Armature Bones panel in Pose mode.

Inherit Rotation
: When disabled, this will "break" the rotation relationship to the bone's parent. This means that the child will keep its rotation in the armature object space when its parent is rotated.

Inherit Scale
: When disabled, this will "break" the scale relationship to the bone's parent.

These inheriting behaviors propagate along the bones' hierarchy. So when you scale down a bone, all its descendants are by default scaled down accordingly. However, if you set one bone's *Inherit Scale* or *Inherit Rotation* property on in this "family", this will break the scaling propagation, i.e. this bone *and all its descendants* will no longer be affected when you scale one of its ancestors.

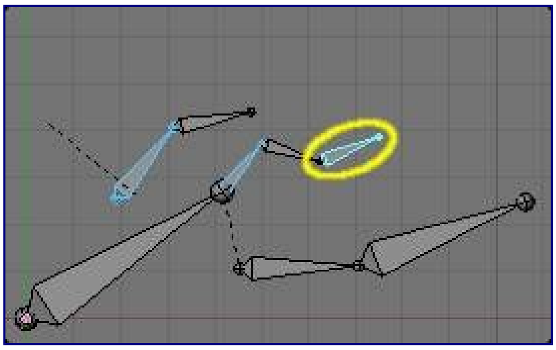
Examples of transforming parented/connected bones with** *Inherit Rotation* disabled.

		
The yellow outlined Inherit Rotation disabled bone in the armature.	Rotation of a bone with a Inherit Rotation disabled bone among its descendants.	Scaling of a bone with a Inherit Rotation disabled bone among its descendants.

Connected bones have another specificity: they cannot be translated. Indeed, as their root must be at their parent's tip, if you don't move the parent, you cannot move the child's root, but only its tip - which leads us to a child rotation. This is exactly what happens - when you press `G` with a connected bone selected, Bforartists automatically switches to rotation operation.

Bones relationships also have important consequences on how selections of multiple bones behave when transformed. There are many different situations, so I'm not sure I list all possible ones below - but this should anyway give you a good idea of the problem:

- Non-related selected bones are transformed independently, as usual.



Scaling bones, some of them related.

- When several bones of the same "family" are selected, *only the "most parent" ones are really transformed* - the descendants are just handled through the parent relationship process, as if they were not selected (see *Scaling bones, some of them related* - the third tip bone, outlined in yellow, was only scaled down through the parent relationship, exactly as the unselected ones, even though it is selected and active. Otherwise, it should have been twice smaller!).
- When connected and unconnected bones are selected, and you start a grab operation, only the unconnected bones are affected.
- When a child connected hinge bone is in the selection, and the "most parent" selected one is connected, when you press `G`, nothing happens - Bforartists remains in grab operation, which of course has no effect on a connected bone. This might be a bug, in fact, as I see no reason for this behavior...

So, when posing a chain of bones, you should always edit its elements from the root bone to the tip bone. This process is known as **forward kinematics**, or FK. We will see in a *later page* that Bforartists features another pose method, called **inverse kinematics**, or IK, which allows you to pose a whole chain just by moving its tip.

Note that this feature is somewhat extended/completed by the *pose library* tool.

Inverse Kinematics

Inverse Kinematics is used to animate a chain of bones of a bones system in reverse order. Forward kinematics means that you adjust the skeleton joint by joint. And by doing so all the bones AFTER the current joint gets affected by manipulation. Means, you rotate the shoulder, and the elbow down to hand and fingers follows this movement.

Inverse kinematics does the opposite. It affects the bones BEFORE the current joint. Up to the lock point. Means you pull at the tip of a finger for example. And the arm follows.

IK simplifies the animation process, and makes it possible to make more advanced animations with lesser effort.

IK allows you to position the last bone in a bone chain and the other bones are positioned automatically. This is like how moving someone’s finger would cause his arm to follow it. By normal posing techniques, you would have to start from the root bone, and set bones sequentially till you reach the tip bone: When each parent bone is moved, its child bone would inherit its location and rotation. Thus making tiny precise changes in poses becomes harder farther down the chain, as you may have to adjust all the parent bones first.

This effort is effectively avoided by use of IK.

Automatic IK

Automatic IK is a tool for quick posing, it can be enabled in the tool shelf in the 3D view, when in pose mode. When the Auto IK option is enabled, translating a bone will activate inverse kinematics and rotate the parent bone, and the parent’s parent, and so on, to follow the selected bone. The IK chain can only extend from a child to a parent bone if the child is *connected* to it.

The length of the chain is increased (if there is a connected parent available to add to it) with `Ctrl-PageUp` or `Ctrl-WheelDown`, and decreased with `Ctrl-PageDown` or `Ctrl-WheelUp`. However, the initial chain length is 0, which effectively means follow the connections to parent bones as far as possible, with no length limit. So pressing `Ctrl-PageUp` the first time sets the chain length to 1 (move only the selected bone), and pressing `Ctrl-PageDown` at this point sets it back to 0 (unlimited) again. Thus, you have to press `Ctrl-PageUp` *more than once from the initial state* to set a finite chain length greater than 1.

This is a more limited feature than using an IK constraint, which can be configured, but it can be useful for quick posing.

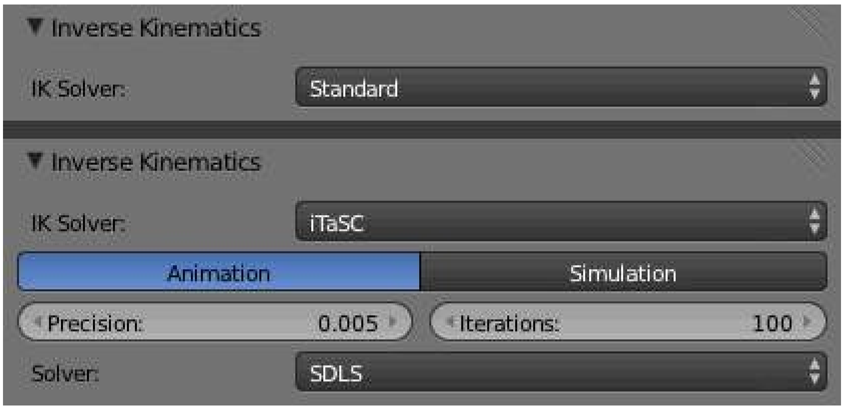
IK Contraints

IK is mostly done with bone constraints. They work by the same method but offer more choices and settings. Please refer to these pages for detail about the settings for the contraints:

- *IK Solver*
- *Spline IK*

Armature IK Panel

This panel is used to select the IK Solver type for the armature. *Standard* or *iTaSC*.



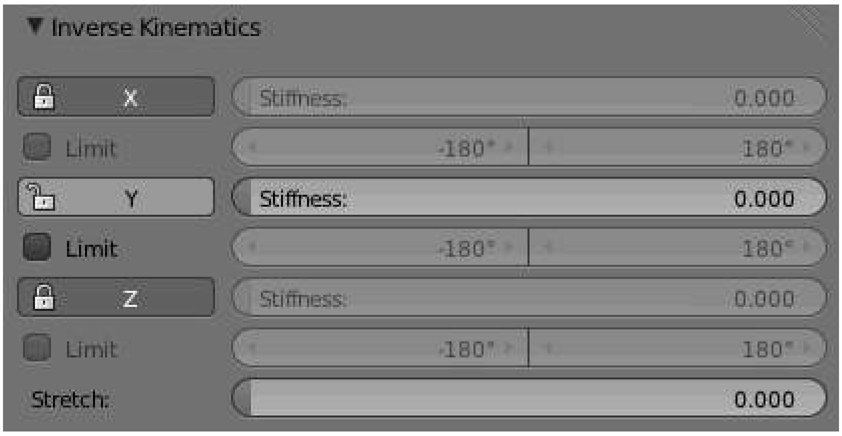
Properties > Armature > Inverse Kinematics Panel.

Most the time people will use the *Standard* IK solver. There is some documentation for the *iTaSC* “instantaneous Task Specification using Constraints” IK solver here.

Robot IK Solver

Bone IK Panel

This panel is used to control how the *Pose Bones* work in the IK chain.



Properties > Bone > Inverse Kinematics Panel.

Lock
: Disallow movement around the axis.

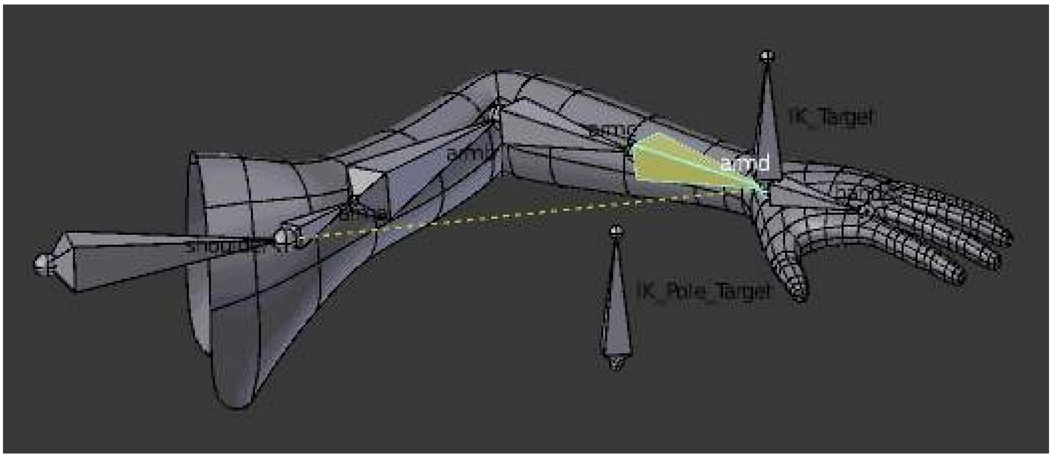
Stiffness
: Stiffness around the axis. Influence disabled if using *Lock*.

Limit
: Limit movement around the axis.

Stretch
: Stretch influence to IK target. 0.000 is the same as disabled.

Arm Rig Example

This arm uses two bones to overcome the twist problem for the forearm. IK locking is used to stop the forearm from bending, but the forearm can still be twisted manually by using other constraints.



IK Arm Example.

IK Arm Example.

Note that, if a *Pole Target* is used, IK locking will not work on the root boot.

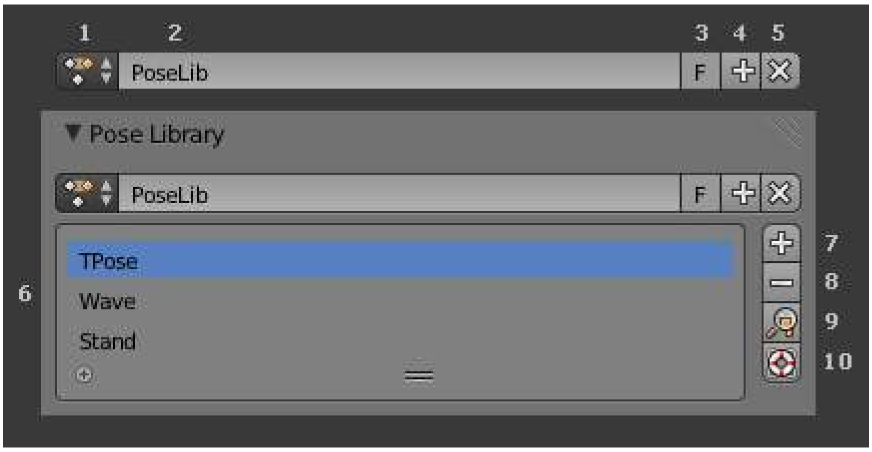
Pose Library

Introduction

The Pose Library panel is used to save, apply, and manage different armature poses.

Pose Libraries are saved to Actions. They are not generally used as actions, but can be converted to and from.

Pose Library Panel



Properties > Armature > Pose Library.

1. Browse Action / Pose Library to be linked.
2. Name of the Pose Library.

3. Set Fake User. This will make Bforartists save the Pose Library for if it has no users.
4. Add new Pose Library to the active object.
5. Remove the Pose Library from the active object.
6. A list of Poses for the active Pose Library.
7. Add Pose.

   Add New.

      Add a new Pose to the active Pose Library with the currect pose of the armature.

   Add New (Current Frame).

      Add New and Replace Existing automatically allocate a Pose to an Action frame. Add New (Currect Frame) will add a Pose to the Pose Library based on the current frame of the Time Cursor. Its not a well supported feature.

   Replace Existing.

      Replace an existing Pose in the active Pose Library with the currect pose of the armature.

8. Remove the active Pose from the Pose Library.
9. Apply the active Pose to the selected Pose Bones.
10. Sanitize Action. Make Action suitable for use as a Pose Library. This is used to convert an Action to a Pose Library. A Pose is added to the Pose Library for each frame with keyframes.

Visualization

We talk in *this page* about the armature visualization options available in all modes (the visualization types, the bones’ shapes, etc.).

In *Pose* mode, you have extra features, Colors to help you visually categorize your bones, Ghosts and Motion Paths to help you visualize armatures’ animations.

Colors

In *Pose* mode, the bones can have different colors, following two different processes, controlled by the *Color* button (*Armature* panel, *Editing* context):

- When it is disabled, bones are colored based on their “state” (i.e. if they use constraints, if they are posed, etc.).
- When it is enabled, bones are colored depending on which bone group they belong to (or as above if they belong to no group).

You can also mix both coloring methods, see Coloring from Bone Group below).

Coloring from Bone State

This is the default and oldest way - there are six different color codes, ordered here by precedence (i.e. the bone will be of the color of the topmost valid state):

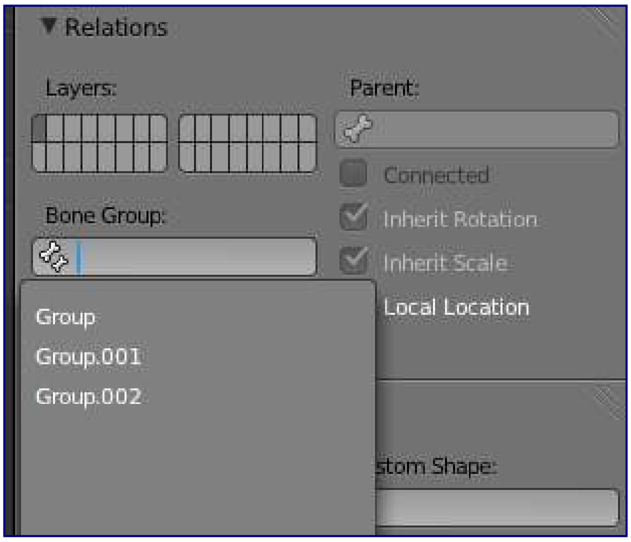
- **Orange**: A bone with a targetless Solver constraint.
- **Yellow**: A bone with an *IK Solver constraint*.
- **Green**: A bone with any other kind of constraint.
- **Blue**: A bone that is posed (i.e. has keyframes).
- **Gray**: Default state.

Coloring from Bone Group

The Bone Groups panel with a bone group (default colors).

The bone groups panel is available in the Object data editor for an armature. Bone groups facilitate the coloring (theming) of multiple bones. Bone groups are managed mostly in the *Buttons* window, *Editing* context.

To create a new bone group, click on the *Add Group* button in the *Bone Groups:* buttons set (*Link and Materials* panel). Once created, you can use the top row of controls to select another group in the drop-down list ("arrows" button), rename the current group (text field), or delete it



The Bone Group drop-down list of a bone sub-panel.

To assign a selected bone to a given bone group you can do one of the following:

- In the Bone Groups, select an existing group, and click *Assign*
- In the Relations section of the *Bones* panel), use the *Bone Group* drop-down list to select the chosen one.

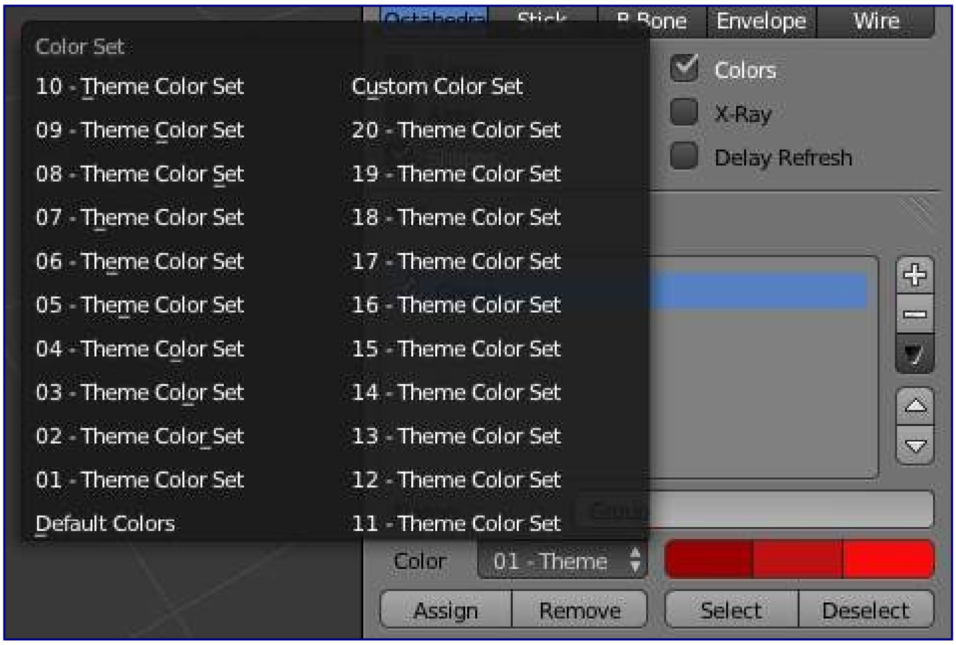
In the 3D views, using the Pose ‣ Bone Groups menu entries, and/or the *Bone Groups* pop-up menu you can:

Assign to New Group
: Assigns selected bones to a new bone group

Assign to Group
: Assigns selected bones to the selected Bone Groups

Remove Selected from Bone Groups
: Removes selected bones from all bone groups

Remove Bone Group
: Removes the active bone group



The Bone Color Set list of the bone group, and the color swatch of the chosen color theme.

You can also assign a “color theme” to a group (each bone will have these colors). Remember you have to enable the *Colors* button (*Armature* panel) to see these colors. Use the *Bone Color Set* drop-down list to select:

- The default (gray) colors (*Default Colors*).
- One of the twenty Bforartists presets (*nn - Theme Color Set*), common to all groups.
- A custom set of colors (*Custom Set*), which is specific to each group.

Below this list, you have three color swatches and a button.

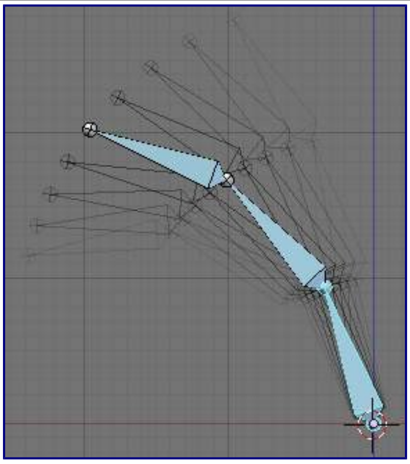
- The first swatch is the color of unselected bones.
- The second swatch is the outline color of selected bones.
- The third swatch is the outline color of the active bone.

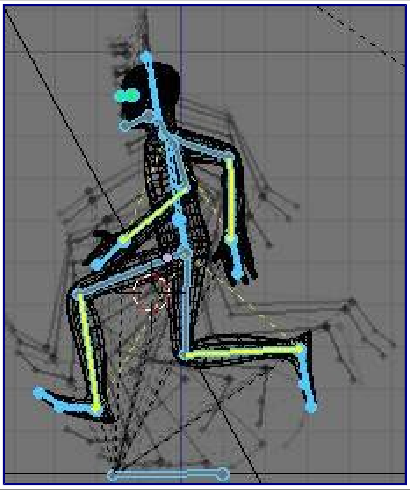
As soon as you click on a swatch (to change the color, through the standard color editing dialog), you are automatically switched to the *Custom Set* option.

Ghosts

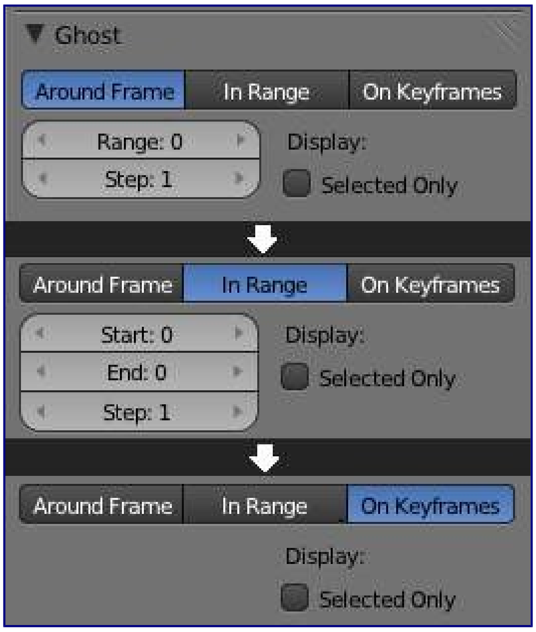
Reference
Mode: *Pose* mode Panel: *Visualisations*

Ghosts examples.





If you are a bit familiar with traditional cartoon creation, you might know that drawing artists use tracing paper heavily, to see several frames preceding the one they are working on. This allows them to visualize the overall movement of their character, without having to play it back... Well, Bforartists features something very similar for armatures in *Pose* mode: the “ghosts”.



The Ghost panel showing the different options associated with different modes.

The ghosts are simply black drawings (more or less opaque) of the bones’ outlines as they are at certain frames.

The ghosts settings are found in the *Visualisations* panel (*Editing* context), only available in *Pose* mode. You have three different types of ghosts, sharing more or less the same options:

Around Current Frame

This will display a given number of ghosts before and after the current frame. The ghosts are shaded from opaque at the current frame, to transparent at the most distant frames. It has three options:

Range
: This numeric field specifies how many ghosts you'll have on both "sides" (i.e. a value of **5** will give you ten ghosts, five before the current frame, and five after).

Step
: This numeric field specifies whether you have a ghost for every frame (the default **1** value), or one each two frames, each three frames, etc.

Selected Only
: When enabled, you will only see the ghosts of selected bones (otherwise, every bone in the armatures has ghosts...)

In Range

This will display the ghosts of the armature's bones inside a given range of frames. The ghosts are shaded from transparent for the first frame, to opaque at the last frame. It has four options:

Start
: This numeric field specifies the starting frame of the range (exclusive). Note that unfortunately, it cannot take a null or negative value - which means you can only see ghosts starting from frame **2** included...

End
: This numeric field specifies the ending frame of the range, and cannot take a value below *GSta* one.

Step
: Same as above.

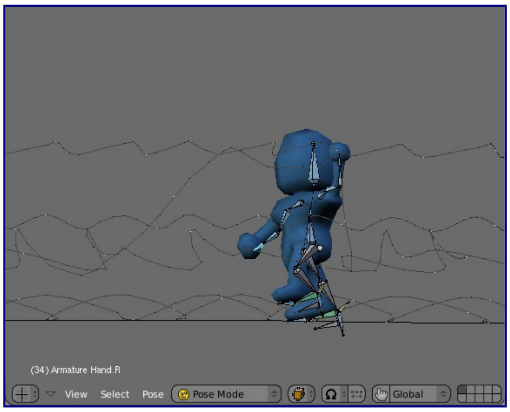
On Keyframes
: This is very similar to the *In Range* option, but there are ghosts only for keyframes in the armature animation (i.e. frames at which you keyed one or more of the bones). So it has the same options as above, except for the *GStep* one (as only keyframes generate ghosts). Oddly, the shading of ghosts is reversed compared to *In Range* - from opaque for the first keyframe, to transparent for the last keyframe.

Finally, these ghosts are also active when playing the animation (`Alt-A`) - this is only useful with the *Around Current Frame* option, of course...

Note also that there is no "global switch" to disable this display feature - to do so, you have to either set *Ghost* to **0** (for *Around Current Frame* option), or the same frame number in both *GSta* and *GEnd* (for the two other ghosts types).

Motion Paths

Reference
Mode: *Pose* mode
Panel: *Visualisations*
Menu: Pose ‣ Motion Paths ‣ ...



A motion paths example.

This feature allows you to visualize as curves the paths of bones’ ends (either their tips, by default, or their roots).

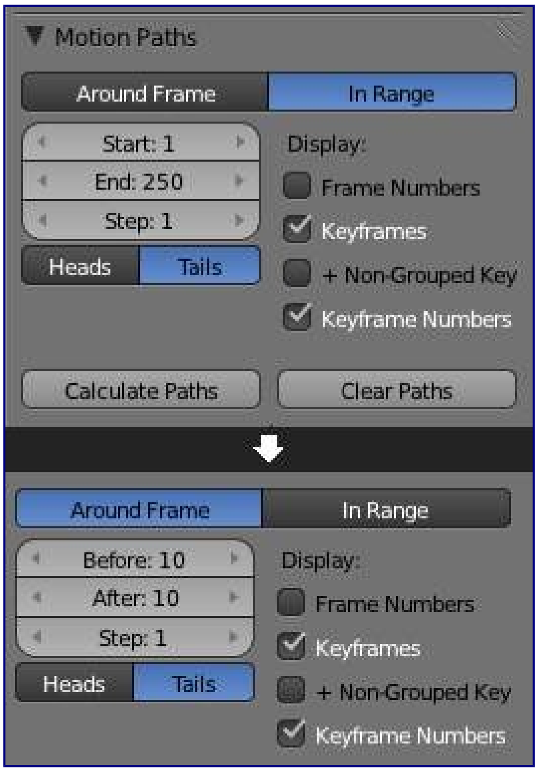
Before we look at its options (all regrouped in the same *Visualisations* panel, in the *Editing* context), let’s first see how to display/hide these paths. Unlike Ghosts, you have to do it manually - and you have to first select the bones you want to show/hide the motion paths. Then,

- To show the paths (or update them, if needed), click on the *Calculate Path* button of the *Visualisations* panel, or, in the 3D views, select the Pose ‣ Motion Paths ‣ Calculate Paths menu entry
- To hide the paths, click on the *Clear Paths* button, or, in the 3D views, do Pose ‣ Motion Paths ‣ Clear All Paths

Remember: only selected bones and their paths are affected by these actions!

The paths are drawn in a light shade of gray for unselected bones, and a slightly blueish gray for selected ones. Each frame is materialized by a small white dot on the paths.

As with ghosts, the paths are automatically updated when you edit your poses/keyframes, and they are also active during animation playback



The Motion Paths Panel showing options for the different modes

And now, the paths options:

Around Frame
: Around Frame, Display Paths of poses within a fixed number of frames around the current frame. When you enable this button, you get paths for a given number of frames before and after the current one (again, as with ghosts).

In Range
: In Range, Display Paths of poses within specified range.

Display Range

Before/After
: Number of frames to show before and after the current frame (only for ‘Around Current Frame’ Onion-skinning method)

Start/End
: Starting and Ending frame of range of paths to display/calculate (not for ‘Around Current Frame’ Onion-skinning method)

Step
: This is the same as the *GStep* for ghosts - it allows you to only display on the path one frame for each *n* ones. Mostly useful when you enable the frame number display (see below), to avoid cluttering the 3D views.

Frame Numbers
: When enabled, a small number appears next to each frame dot on the path, which is of course the number of the corresponding frame.

Keyframes
: When enabled, big yellow square dots are drawn on motion paths, materializing the keyframes of their bones (i.e. only the paths of keyed bones at a given frame get a yellow dot at this frame).

Keyframe Nums
: When enabled, you’ll see the numbers of the displayed keyframes - so this option is obviously only valid when *Show Keys* is enabled.

- **Non-Grouped Keyframes**

For bone motion paths, search whole Action for keyframes instead of in group with matching name only (is slower)

Calculate

Start / End

These are the start/end frames of the range in which motion paths are drawn. *You have to Calculate Paths again when you modify this setting*, to update the paths in the 3D views. Note that unlike with ghosts, the start frame is *inclusive* (i.e. if you set *PSta* to **1**, you'll really see the frame **1** as starting point of the paths...).

Bake Location

By default, you get the tips' paths. By changing this setting to Tails, you'll get the paths of the bone's roots (remember that in Bforartists UI, bones' roots are called "heads"...). *You have to Calculate Paths again when you modify this setting*, to update the paths in the 3D views.

Spline IK

Spline IK is a constraint which aligns a chain of bones along a curve. By leveraging the ease and flexibility of achieving aesthetically pleasing shapes offered by curves and the predictability and well integrated control offered by bones, Spline IK is an invaluable tool in the riggers' toolbox. It is particularly well suited for rigging flexible body parts such as tails, tentacles, and spines, as well as inorganic items such as ropes.

Full description of the settings for the spline IK are detailed on the *Spline IK* page.

Basic Setup

The Spline IK Constraint is not strictly an 'Inverse Kinematics' method (i.e. IK Constraint), but rather a 'Forward Kinematics' method (i.e. normal bone posing). However, it still shares some characteristics of the IK Constraint, such as operating on multiple bones not being usable for Objects, and being evaluated after all other constraints have been evaluated. It should be noted that if a Standard IK chain and a Spline IK chain both affect a bone at the same time the Standard IK chain takes priority. Such setups are best avoided though, since the results may be difficult to control.

To setup Spline IK, it is necessary to have a chain of connected bones and a curve to constrain these bones to.

- With the last bone in the chain selected, add a *Spline IK* Constraint from the Bone Constraints tab in the Properties Editor.
- Set the 'Chain Length' setting to the number of bones in the chain (starting from and including the selected bone) that should be influenced by the curve.
- Finally, set the 'Target' field to the curve that should control the curve.

Congratulations, the bone chain is now controlled by the curve.

Settings and Controls

Roll Control

To control the 'twist' or 'roll' of the Spline IK chain, the standard methods of rotating the bones in the chain along their y-axes still apply. For example, simply rotate the bones in the chain around their y-axes to adjust the roll of the chain from that point onwards. Applying copy rotation constraints on the bones should also work.

Offset Controls

The entire bone chain can be made to follow the shape of the curve while still being able to be placed at an arbitrary point in 3D-space when the ‘Chain Offset’ option is enabled. By default, this option is not enabled, and the bones will be made to follow the curve in its untransformed position.

Thickness Controls

The thickness of the bones in the chain is controlled using the constraint’s ‘XZ Scale Mode’ setting. This setting determines the method used for determining the scaling on the X and Z axes of each bone in the chain.

The available modes are:

None
: this option keeps the X and Z scaling factors as `1.0`

Volume Preserve
: the X and Z scaling factors are taken as the inverse of the Y scaling factor (length of the bone), maintaining the ‘volume’ of the bone

Bone Original
: this options just uses the X and Z scaling factors the bone would have after being evaluated in the standard way.

In addition to these modes, there is an option, ‘Use Curve Radius’. When this option is enabled, the average radius of the radii of the points on the curve where the endpoints of each bone are placed, are used to derive X and Z scaling factors. This allows the scaling effects, determined using the modes above, to be tweaked as necessary for artistic control.

Tips for Nice Setups

- For optimal deformations, it is recommended that the bones are roughly the same length, and that they are not too long, to facilitate a better fit to the curve. Also, bones should ideally be created in a way that follows the shape of the curve in its ‘rest pose’ shape, to minimise the problems in areas where the curve has sharp bends which may be especially noticeable when stretching is disabled.
- For control of the curve, it is recommended that hooks (in particular, Bone Hooks) are used to control the control-verts of the curve, with one hook per control-vert. In general, only a few control-verts should be needed for the curve (i.e. 1 for every 3-5 bones offers decent control).
- The type of curve used does not really matter, as long as a path can be extracted from it that could also be used by the Follow Path Constraint. This really depends on the level of control required from the hooks.
- When setting up the rigs, it is currently necessary to have the control bones (for controlling the curve) in a separate armature to those used for deforming the meshes (i.e. the deform rig containing the Spline IK chains). This is to avoid creating pseudo “Dependency Cycles”, since Bforartists’s Dependency Graph can only resolve the dependencies the control bones, curves, and Spline IK’ed bones on an object by object basis.

Lattice

Lattice – or commonly called deformation cage outside of Blender. A lattice consists of a three-dimensional non-renderable grid of vertices. Its main use is to apply a deformation to the object it controls with a Lattice Modifier. If the object is parented with *Lattice Deform* a Lattice Modifier is automatically applied.

Editing

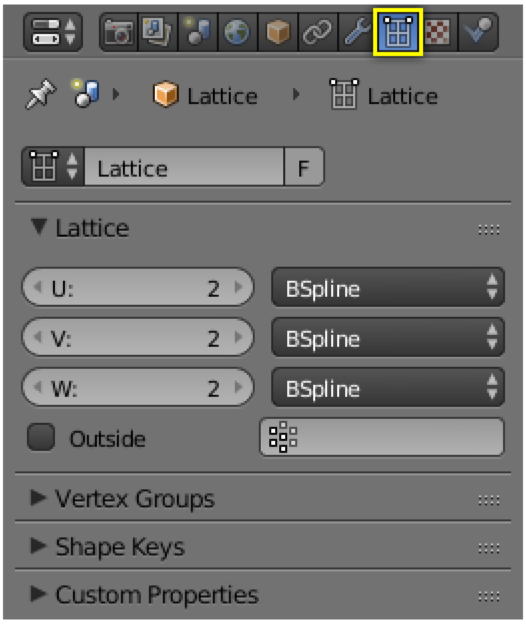
Flip (Distortion Free)

Mirrors the vertexes displacement from their base position.

U, V, W

Make Regular
Resets the whole lattice to a regular grid, where the cells are scaled to one cubic Blender Unit.

Properties



Lattice properties.

Lattice
A Data-Block Menu.

Lattice

Points

Rate of subdivision in the axes:

U, V, W

Interpolation Type

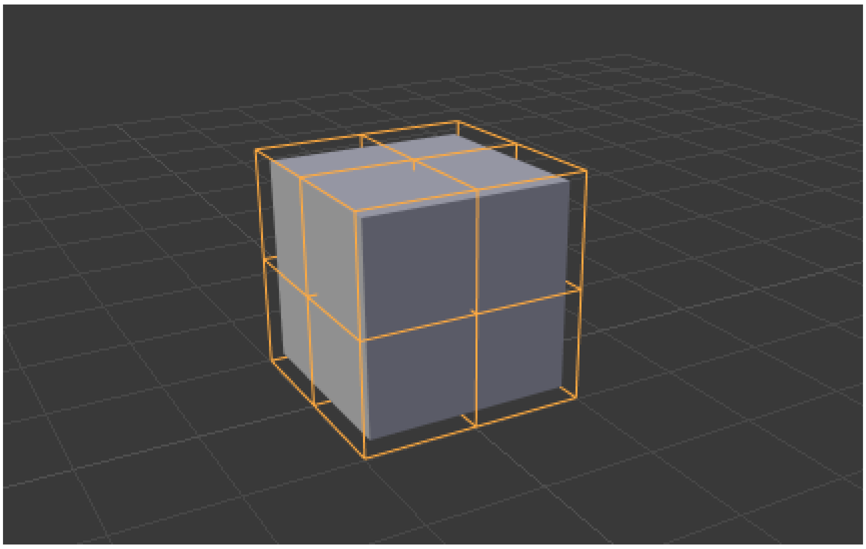
Selector for each axis. See Different types of interpolation..

Linear, Cardinal, Catmull-Rom, B-Spline

Outside
Takes only the vertices on the surface of the lattice into account.

Vertex Group
The strength of the influence assigned as a weight to the individual vertices in the selected vertex group.

Usage



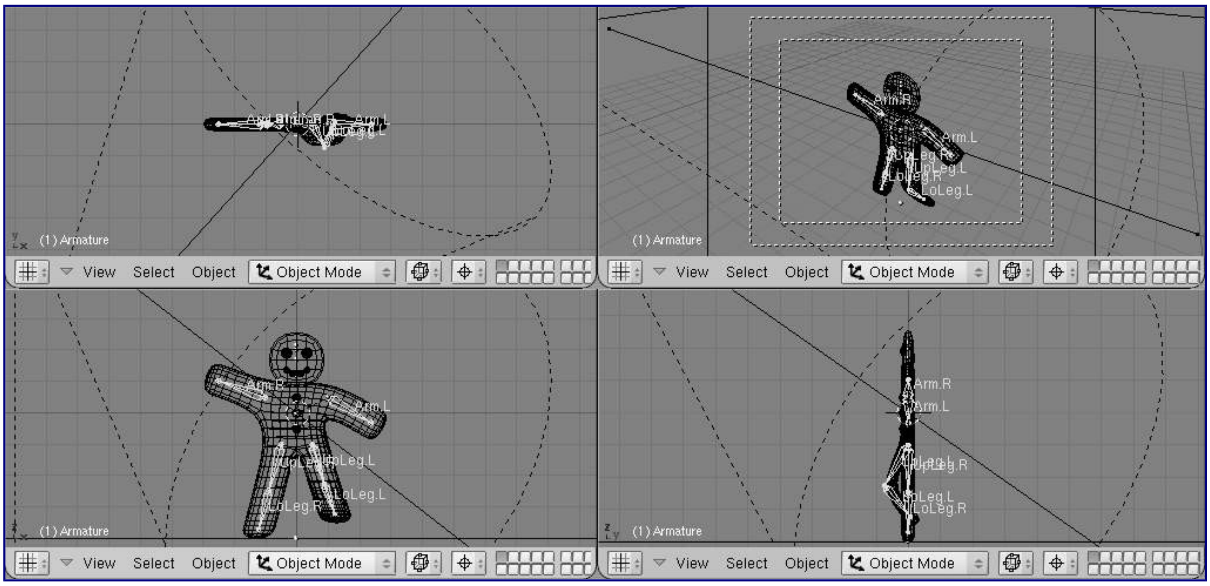
Lattice around the cube object in Object Mode.

The lattice should be scaled and moved to fit around your object in Object Mode. Any scaling applied to the object in Edit Mode will result in the object deforming. This includes applying scale with `Ctrl-A` as this will achieve the same result as scaling the lattice in Edit Mode, and therefore the object.

7.4 Rigging - Skinning

Skinning

We have seen in *previous pages* how to design an armature, create chains of bones, etc. Now, having a good rig is not the final goal - unless you want to produce a “Dance Macabre” animation, you’ll likely want to put some flesh on your skeletons! Surprisingly, “linking” an armature to the object(s) it should transform and/or deform is called the “skinning” process...



The ginebread mesh skinned on its armature.

In Bforartists, you have two main skinning types:

- You can *Parent/Constrain Objects to Bones* - then, when you transform the bones in *Pose* mode, their “children” objects are also transformed, exactly as with a standard parent/children relationship... *The “children” are* **never** *deformed when using this method*.
- You can *Using the Armature modifier on entire Mesh*, and then, some parts of this object to some bones inside this armature. This is the more complex and powerful method, and *the only way to really deform the geometry of the object*, i.e. to modify its vertices/control points relative positions.

Skinning to Shapes

We saw in the *previous page* how to link (parent) whole objects to armature bones - a way to control the transform properties of this object via a rig. However, armatures are much more powerful: they can deform the *shape* of an object (i.e. affect its ObData data-block - its vertices or control points...).

In this case, the child object is parented (skinned) to the whole armature, so that each of its bones controls a part of the “skin” object’s geometry. This type of skinning is available for meshes, lattices, curves, surfaces, and texts (with more options for the first two types).

Bones can affect the object’s shape in two ways:

- The Envelope process is available for all type of skinnable objects - it uses the “proximity” and “influence” of the bones to determine which part of the object they can deform.
- The Vertex Groups method is (obviously) reserved to meshes and lattices - one bone only affect the vertices in the *group* having the same name, using vertices’ weights as influence value. A much more precise method, but also generally longer to set up.

Both methods have some Common Options, and can be mixed together.

Parenting to Whole Armatures

But before diving into this, let’s talk about the different ways to skin (parent) an object to a whole armature - as with *object skinning*, there is an “old parenting” method and a new, more flexible and powerful one, based on modifiers - which allows creation of very complex setups, with objects deformed by several armatures.

For *meshes and lattices only*, you can use the `Ctrl-P` parent shortcut in the 3D views (after having selected first the “skin” object, then the armature). The *Make Parent To* menu pops up, select the *Armature* entry. If the skinning object is a lattice, you’re done; no more options are available. But with a child mesh, another *Create Vertex Groups?* menu appears, with the following options - all regarding the “vertex groups” skinning method:

Set Parent menu

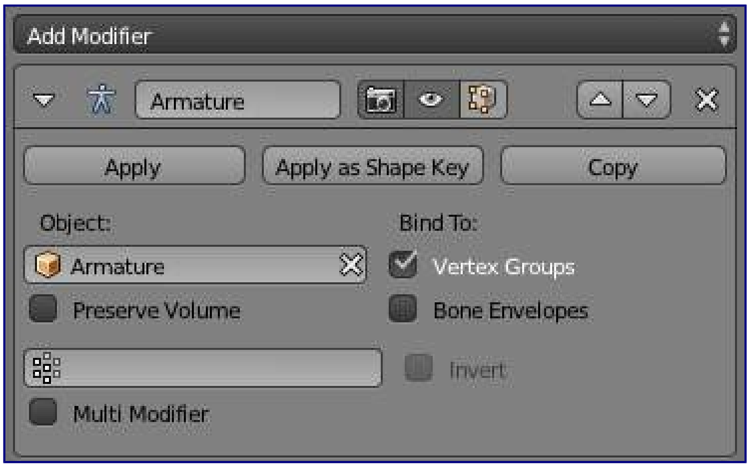
With Empty Groups
: will create, if they don’t already exist, empty groups, one for each bone in the skinned armature, with these bones’ names. Choose this option if you have already created (and weighted) all the vertex groups the mesh requires.

With Envelope Weights
: will create, as with *Name Groups* option, the needed vertex groups. However, it will also weight them

according to the bones' envelope settings (i.e. it will assign to each groups the vertices that are inside its bone's influence area, weighted depending on their distance to this bone). This means that if you had defined vertex groups using same names as skinned bones, their content will be completely overridden! *You'll get the same behavior as if you used the envelopes skinning method, but with vertex groups?*

Automatic Weights

Creates, as with *Envelope Weights* option, the needed vertex groups, with vertices assigned and weighted using the newer "bone heat" algorithm.



The Armature modifier.

This "parenting" method will create an* *Armature modifier* in the skinning object's modifiers stack. And so, of course, adding an* *Armature modifier* to an object is the second, new skinning method (which also works for curves/surfaces/texts...). Follow the above link to read more about this modifier's specific options. Note that there is a way with new *Armature* modifiers to automatically create vertex groups and weight them; see the Vertex Groups description below.

Warning

A single object can have several *Armature* modifiers (with e.g. different armatures, or different settings...), working on top of each other, **or** mixing their respective effects (depending whether their* *MultiModifier* option is set, see their description for more details), and only one "virtual old parenting" one, which will always be at the top of the stack.

Note finally that for settings that are present in both the armature's *Armature panel and in the objects' Armature* modifier panel (namely, *Vertex Groups / VertGroups* , *Envelopes*, *Quaternion and B-Bone Rest*), the modifier ones always override the armature ones. This means that if, for example, you only enable the *Envelopes* deformation method of the armature, and then skin it with an object using an* *Armature* modifier, where only *VertGroups* is enabled, the object will only be deformed based on its "bones" vertex groups, ignoring completely the bones' envelopes.

Common Options

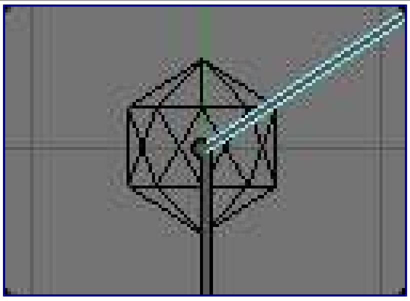
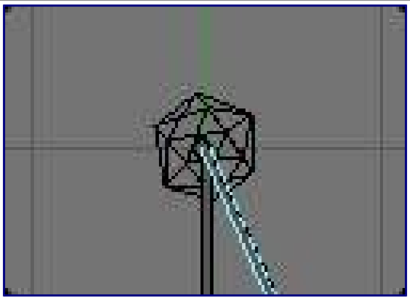
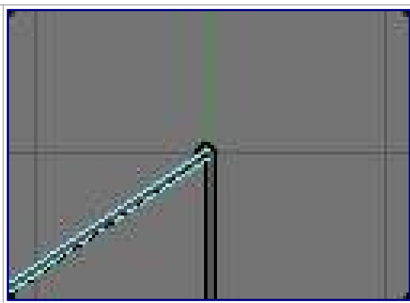
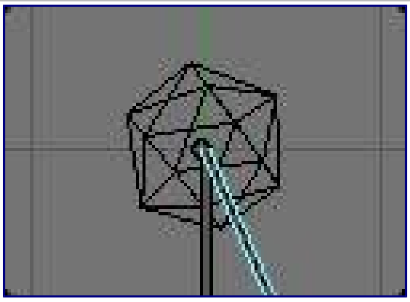
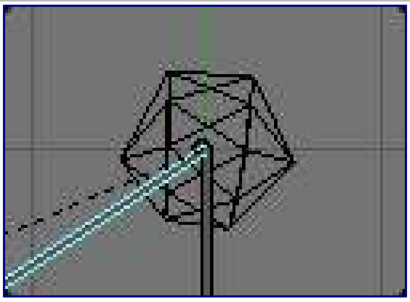
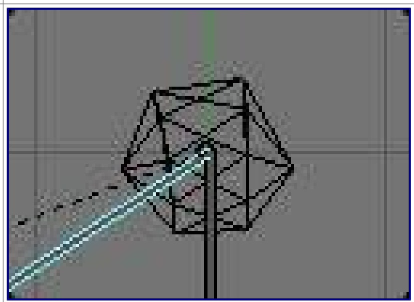
There are two armature-global skinning options that are common to both envelopes and vertex groups methods:*

Preserve Volume (Armature modifier)

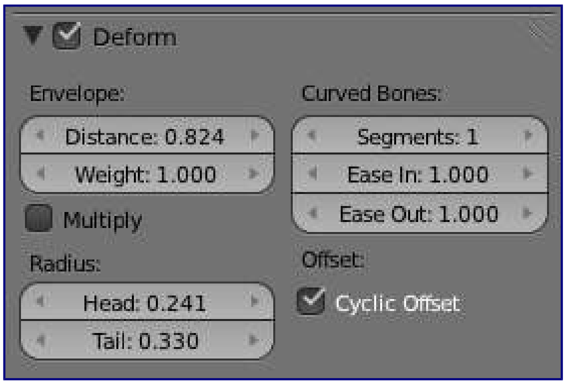
This affects the way geometry is deformed, especially at bones' joints, when rotating them.

Without *Preserve Volume*, rotations at joints tend to scale down the neighboring geometry, up to nearly zero at `180d` from rest position. With* *Preserve Volume*, the geometry is no longer scaled down, but there is a "gap", a discontinuity when reaching* `180d` from rest position.

Example of *Quaternion* option effects.

 Initial state.	 100- rotation, Preserve Volume disabled.	 180- rotation, Preserve Volume disabled.
 100- rotation, Preserve Volume enabled.	 179.9- rotation, Preserve Volume enabled.	 180.1- rotation, Preserve Volume enabled.
Note that the IcoSphere is deformed using the envelopes method.		

Bone Deform Options



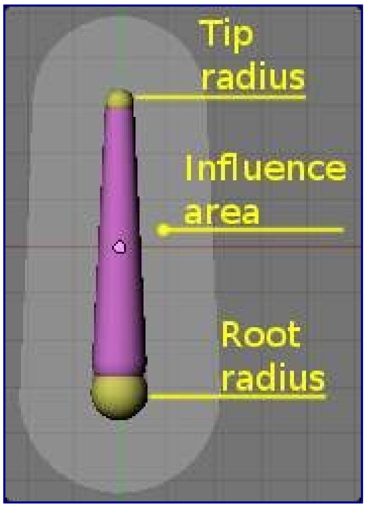
Bone Deform Options

The bones also have some deforming options in their sub-panels (* *Armature Bones panel), that you can therefore define independently for each of them*

Deform

By disabling this setting (enabled by default), you can completely prevent a bone from deforming the geometry of the skin object.

Envelope



Bone influence areas for envelopes method.

Envelopes is the most general skinning method - it works with all available object types for skinning (meshes, lattices, curves, surfaces and texts). It is based on proximity between bones and their geometry, each bone having two different areas of influence, shown in the *Envelope* visualization:

- The inside area, materialized by the "solid" part of the bone, and controlled by both root and tip radius. Inside this zone, the geometry if fully affected by the bone.
- The outside area, materialized by the lighter part around the bone, and controlled by the *Dist* setting. Inside this zone, the geometry is less and less affected by the bone as it goes away - following a quadratic decay.

See the* *editing pages* for how to edit these properties.

There is also a bone property, *Weight* (in each bone sub-panel, in* *Edit mode only, defaults to* **1.0**), that controls the global influence of the bone over the deformed object, when using the envelopes method. It is only useful for the parts of geometry that are "shared", influenced by more than one bone (generally, at the joints...) - a bone with a high weight will have more influence on the result than one with a low weight... Note that when set to* **0.0**, it has the same effect as disabling the* *Deform* option.

Mult
: Short for 'Multiply'. This option controls how the two deforming methods interact when they are both enabled. By default, when they are both active, all vertices belonging to at least one vertex group are only deformed through the vertex groups method - the other "orphan" vertices being handled by the envelopes one. When you enable this option, the "deformation influence" that this bone would have on a vertex (based from its envelope settings) is multiplied with this vertex's weight in the corresponding vertex group. In other words, the vertex groups method is further "weighted" by the envelopes method.

Radius
: Set the radius for the head and the tail of envelope bones.

Curved Bone

Curved Bones (previously known as B-bones) allow you make bones act like bezier curve segments, which results in smoother deformations for longer bones.

See the *editing pages* for how to edit these properties.

Vertex Groups

Vertex groups skinning method is only available for meshes and lattices - the only objects having *vertex groups* Its principle is very simple: each bone only affects vertices belonging to a vertex group having the same name as the bone. So if you have e.g. a `forearm` bone, it will only affect the `forearm` vertex group of its skin object(s).

The influence of one bone on a given vertex is controlled by the weight of this vertex in the relevant group. Thus, the Weight Paint mode (`Ctrl-Tab` with a mesh selected) is most useful here, to easily set/adjust the vertices' weights.

However, you have a few goodies when weight-painting a mesh already parented to (skinning) an armature. For these to work, you must:

- Select the armature.
- Switch to** *Pose* mode
- Select the mesh to weight.
- Switch to *Weight Paint* mode.

Now, when you select a bone of the armature (which remained in *Pose* mode), you automatically activate the corresponding vertex group of the mesh - Very handy! Obviously, you can only select one bone at a time in this mode (so `Shift-LMB` clicking does not work).

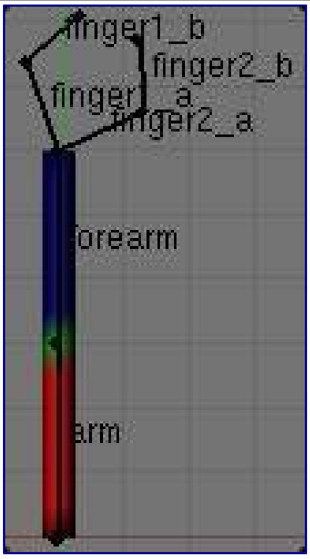
This way, you can also apply to the active bone/vertex group one of the same "auto-weighting" methods as available when doing an "old-parenting" to armature

- Select the bone (and hence the vertex group) you want.
- Hit `W`, and in the *Specials* menu that pops up, choose either *Apply Bone Envelopes to Vertex Groups* or *Apply Bone Heat Weights to Vertex Groups* (names are self explanatory, I think). Once again, even though these names are plural, you can only affect *one* vertex group's weights at a time with these options.

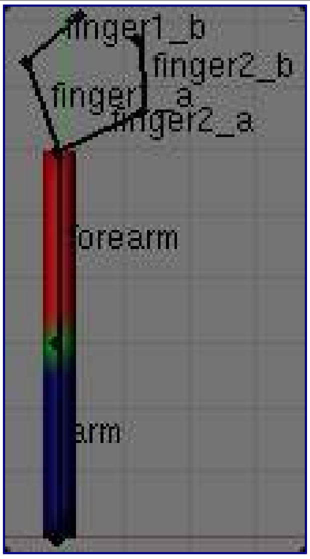
To automatically weight multiple bones, you can simply

- `Ctrl-Tab` out of Weight Paint Mode
- Select the Armature. It should be in Pose mode.
- Select multiple bones `Shift-LMB` or by selecting all
- Select Mesh again
- If not in weight paint already, toggle back into
- Use the Weight menu to automatic weight. This will weight all the bones you selected in Pose Mode.

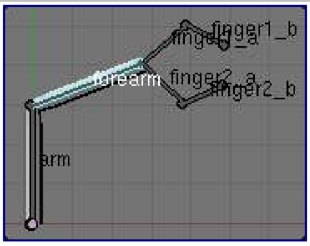
Example of vertex groups skinning method.



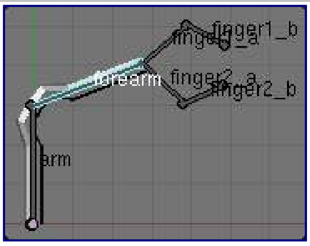
The weights of the arm vertex group.



The weights of the forearm vertex group.



The result when posing the armature.



The same pose, but using envelopes method rather that vertex groups.

Obviously, the same vertex can belong to several groups, and hence be affected by several bones, with a fine tuning of each bone’s influence using these vertex weights. Quite useful when you want to have a smooth joint. For example, when you skin an elbow, the upperarm vertex group contains the vertices of this part at full weight (** *1.0* **), and when reaching the elbow area, these weights decrease progressively to** *0.0’* when reaching the forearm zone - and vice versa for the forearm group weights... Of course, this is a very raw example - skinning a realistic joint is a big job, as you have to carefully find good weights for each vertex, to have the most realistic behavior when bending - and this is not an easy thing!

Objects

To Do

Retargeting

To Do

8 Animation

Animation

Animation is making an object move or change shape over time. Objects can be animated in many ways:

Moving as a whole object
Changing their position, orientation or size in time;

Deforming them
Animating their vertices or control points;

Inherited animation
Causing the object to move based on the movement of another object (e.g. its parent, hook, armature,

etc...).

In this chapter we will cover the first two, but the basics given here are actually vital for understanding the following chapters as well.

Animation is typically achieved with the use of *Key Frames*.

Chapters

General Principles and Tools

- *Key frames*
- *Using The Timeline*
- *Markers*

The Graph Editor

- *F-Curves*
- *F-Curve Editing*
- *F-Curve Modifiers*

The Action Editor

- *Actions*
- Working with Actions

Animation Techniques

- *Constraints*
- *Moving objects on a Path*
- *Game Engine Physics Recording*

Animating Deformation

- *Shape Keys*
- *Deforming by a Lattice*
- *Deforming with Hooks*

See also *Hook Modifier*

Drivers

- *Drivers*
- *Driven Shape Keys*

The Introduction to Character Animation tutorial is a good starting point for learning character animation. Even if you never used Bforartists before.

Animation Fundamentals

Actions

Actions are used to record the animation of objects and properties.

Drivers
Drivers are used to control and animate properties.
Keying Sets
Keying Sets are used to record a set of properties at the same time.
Markers
Markers are used to mark key points/events within an animation.
Motion Paths
Motion Paths are used to visualize an animation.
Shape Keys
Shape Keys are used to deform objects into new shapes.

Animation Editors

Timeline
The Timeline Editor is a quick editor to set and control the time frame. This also has some tools for animation.
Graph Editor
The Graph Editor is mostly used to edit the F-Curves and Keyframes for Channels and Drivers.
Dope Sheet
The Dopes Sheet contains a collection of animation editors.
NLA Editor
The NLA Editor is used to edit and blend Actions together.

Categories

Modifiers
Modifiers are automatic operations that affect an object in a non-destructive way. With modifiers, you can perform many effects automatically that would otherwise be tedious to do manually.
Rigging
Rigging.
Constraints
Constraints are a way of connecting transform properties (position, rotation and scale) between objects.
Physical Simulation
This category covers various advanced Bforartists effects, often used to simulate real physical phenomena. There is the Particle System for things like hair, grass, smoke, flocks. Soft Bodies are useful for everything that tends to bend, deform, in reaction to forces like gravity or wind. Cloth simulation, to simulate clothes or materials. Rigid Bodies can simulate dynamic objects that are fairly rigid. Fluids, which include liquids and gasses, can be simulated, including Smoke. Force Fields can modify the behavior of simulations.
Motion Tracking
Motion tracking is a new technique available in Bforartists. It is still under development, and currently supports basic operations for 2D motion tracking, 3D motion tracking, and camera solution.
Animation Scripts
Add-on scripts for animation.
Rigging Scipts
Add-on scripts for rigging.

Key Frames

A *Key Frame* is simply a marker in time which stores the value of a property.

For example, a key frame might indicate that the horizontal position of a cube is at `3m` on frame 1.

The purpose of a key frame is to allow for interpolated animation, meaning, for example, that the user could then add another key on frame 10, specifying the cube's horizontal position at `20m`, and Bforartists will automatically determine the correct position of the cube for all the frames between frame 1 and 10 depending on the chosen interpolation method (e.g. linear, bezier, quadratic, etc...).

Adding Key Frames

There are several methods of adding new keys. Namely:

- In the 3D View, pressing `I` will bring up a menu to choose what to add a key frame to.
- Hovering over a property and pressing `I`.
- `RMB` a value and choose *Insert Keyframe* from the menu.

Removing Key Frames

There are several methods of removing key frames

- In the 3D View press `Alt-I` to remove keys on the current frame for selected objects.
- When the mouse is over a value press `Alt-I`.
- `RMB` a value and choose *Delete Keyframe* from the menu.

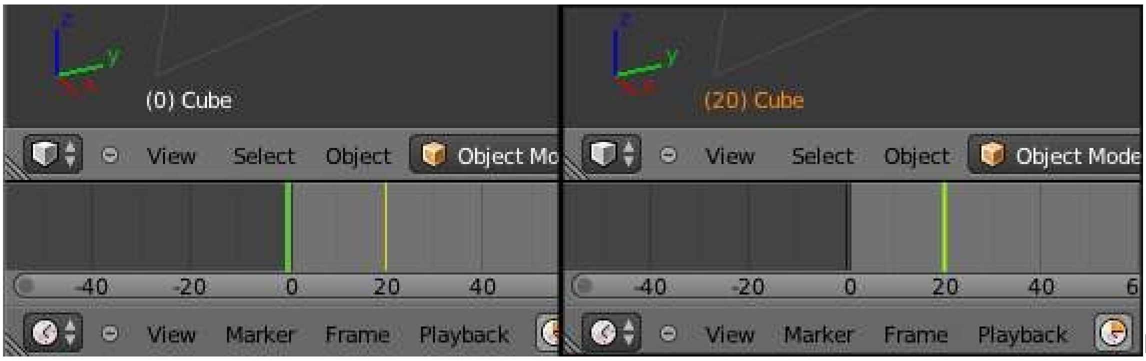
Editing Key Frames

For editing key frames go to the *Graph Editor* or to the *Dopesheet*

Keyframe Visualization

There are some important visualization features in the 3D views that can help animation.

When the current frame is a keyframe for the current active object, the name of this object (shown in the bottom left corner of the 3D views) turns yellow.



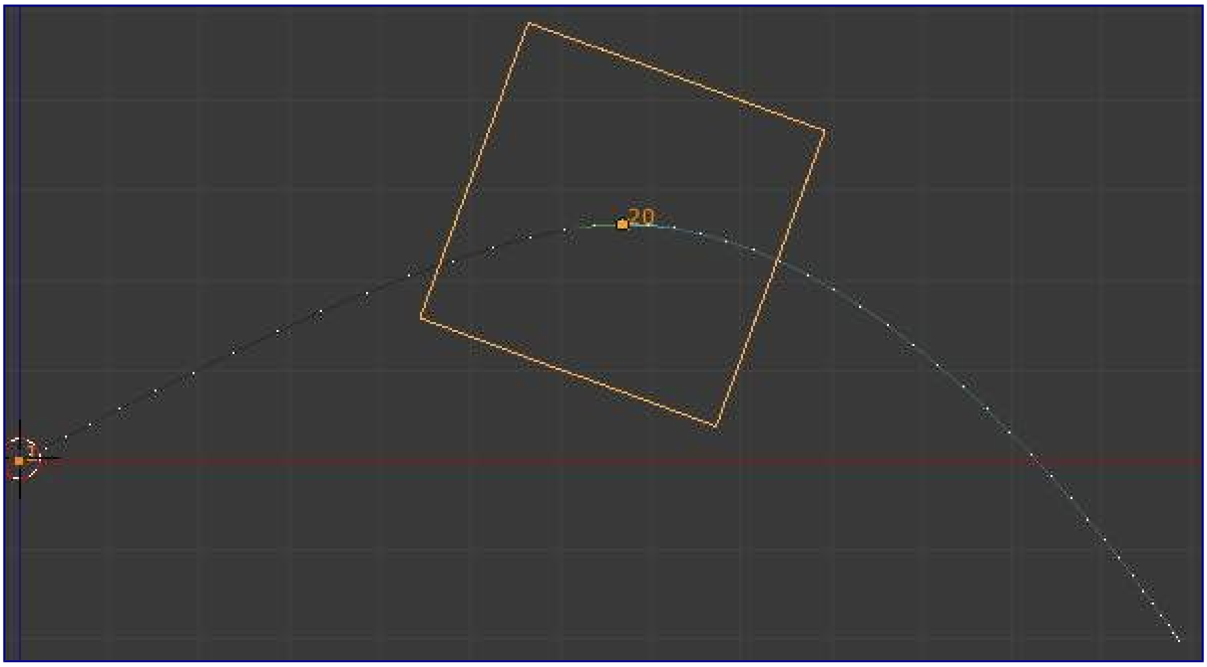
Left: Current frame at 0. Right: Current frame is a keyframe for Cube

Motion Paths

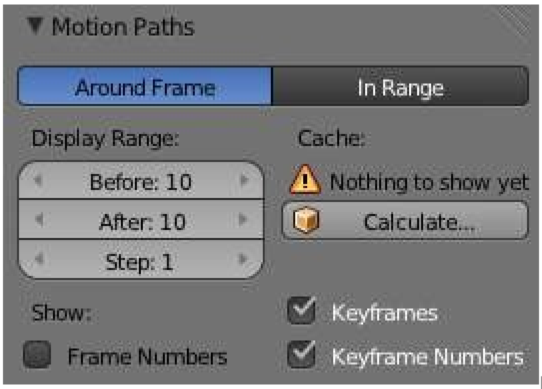
Reference

Mode: *Object* mode
Panel: *Object*

This feature allows you to visualize the animation of objects by displaying their position over a series of frames.



An animated cube with its motion path displayed



Motion paths panel

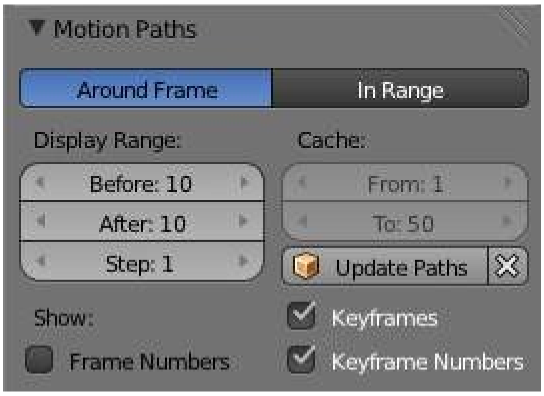
Before we look at its options (all regrouped in the same *Visualisations* panel, in the *Editing* context, let's first see how to display/hide these paths. You have to do it manually - and you have to first select the objects you want to show/hide the motion paths. Then,

- To show the paths (or update them, if needed), click on the *Calculate Path* button.
- To hide the paths, click on the *Clear Paths* button

Remember: only selected object and their paths are affected by these actions!

The paths are drawn in black with white dots indicating frames, and a blue glow around the current frame.

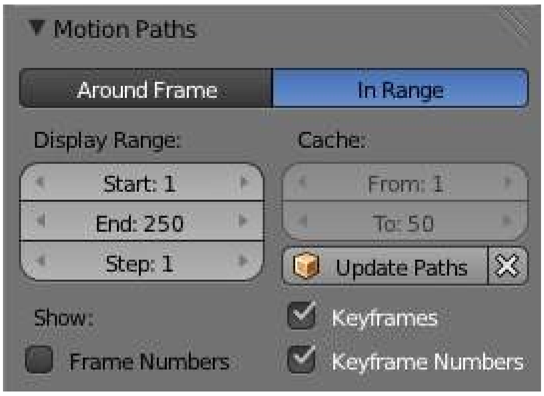
Options



The Motion Paths Panel set to “Around Frame”

Around Frame

Around Frame, Display Paths of poses within a fixed number of frames around the current frame. When you enable this button, you rather get paths for a given number of frames before and after the current one (again, as with ghosts).



The Motion Paths Panel set to “In Range”

In Range

In Range, Display Paths of poses within specified range.

Display Range

Before/After

Number of frames to show before and after the current frame (only for ‘Around Current Frame’ Onion-skinning method)

Start/End

Starting and Ending frame of range of paths to display/calculate (not for ‘Around Current Frame’ Onion-skinning method)

Step

This is the same thing as the *GStep* for ghosts - it allows you the only materialize on the path one frame each *n* ones. Mostly useful when you enable the frame number display (see below), to avoid cluttering the 3D views.

Frame Numbers

When enabled, a small number appears next to each frame dot on the path, which is of course the number of the corresponding frame...

Keyframes

When enabled, big yellow square dots are drawn on motion paths, materializing the keyframes of their bones (i.e. only the paths of keyed bones at a given frame get a yellow dot at this frame).

Keyframe Numbers

When enabled, you’ll see the numbers of the displayed keyframes - so this option is obviously only valid when *Show Keys* is enabled.

Cache

From / To

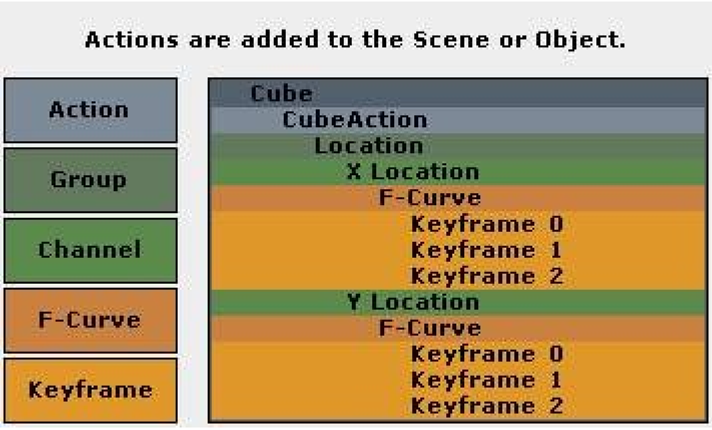
These are the start/end frames of the range in which motion paths are drawn. You cannot modify this range without deleting the motion path first.

Calculate Paths/ Update Paths

If no paths have been calculated, Calculate Paths will create a new motion path in cache. In the pop up box, select the frame range to calculate. If a path has already been calculated, Update Paths will update the path shape to the current animation. To change the frame range of the calculated path, you need to delete the path and calculate it again.

Actions

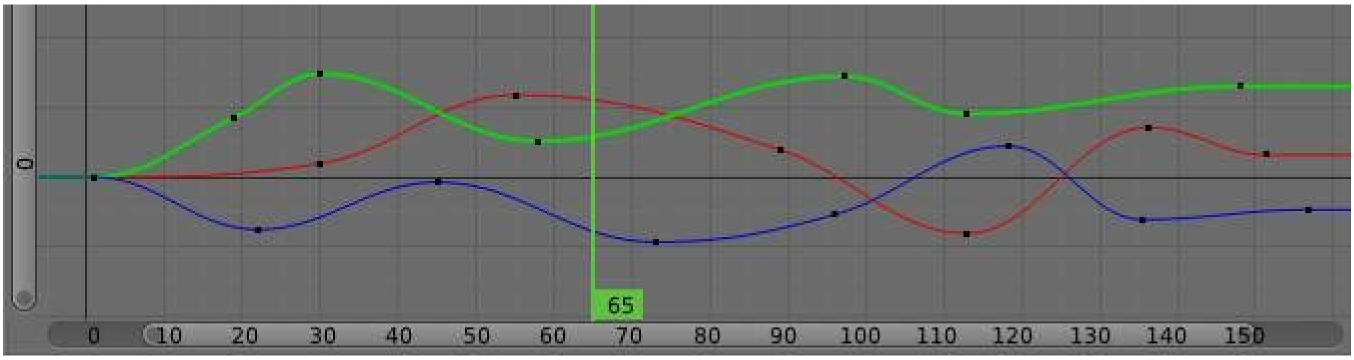
When animating objects and properties in Bforartists, Actions record and contain the data.



Actions.

So when you animate an object by changing its location with keyframes, the animation is saved to the Action.

Each property has a channel which it is recorded to, for example, Cube.location.x is recorded to Channel X Location.



Graph Editor. Each Channel has an F-Curve represented by the lines between the keyframes.

Actions

Record and contain animation data.

Groups

Are groups of channels.

Channels

Record properties.

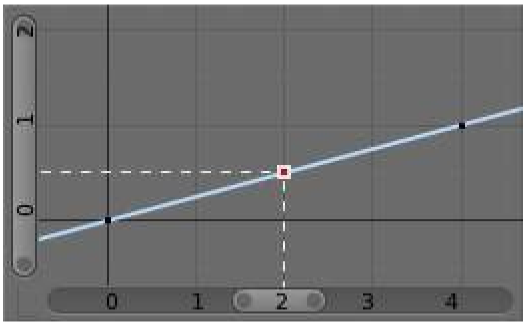
F-Curves

Are used to interpolate the difference between the keyframes.

Keyframes

Are used to set the values of properties.

F-Curve Interpolation



Graph Editor: Channel F-Curve.

The keyframes are set values by the user.

The *F-Curve* is used to interpolate the difference between the keyframes.

The *F-Curve* has different types of interpolation and also *F-Curve Modifiers*.

Most the settings for the *F-Curve* are found in the *Graph Editor.*

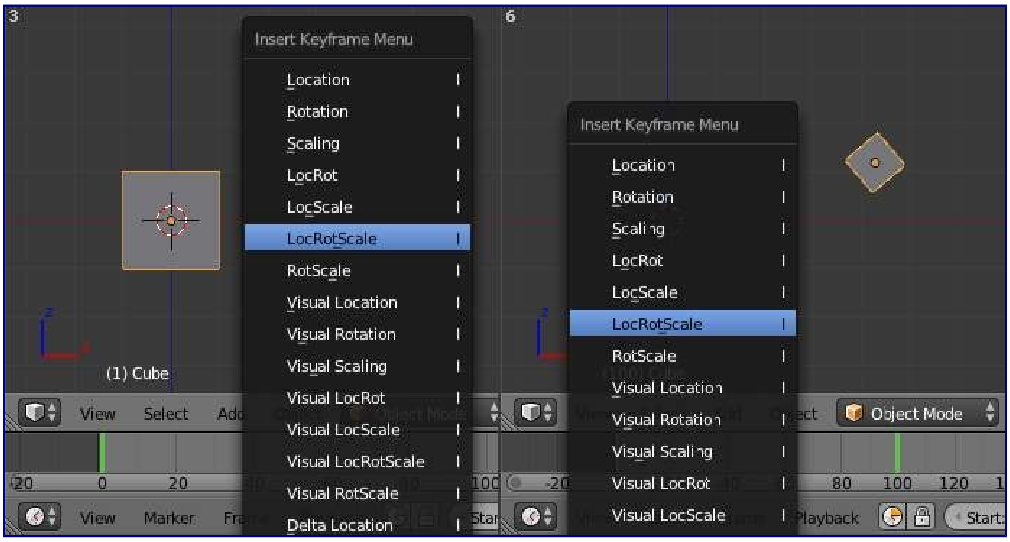
Basic Animation

These are some common ways to animate objects. These methods can be used on different objects, like armature bones in pose mode.

Insert Keyframes

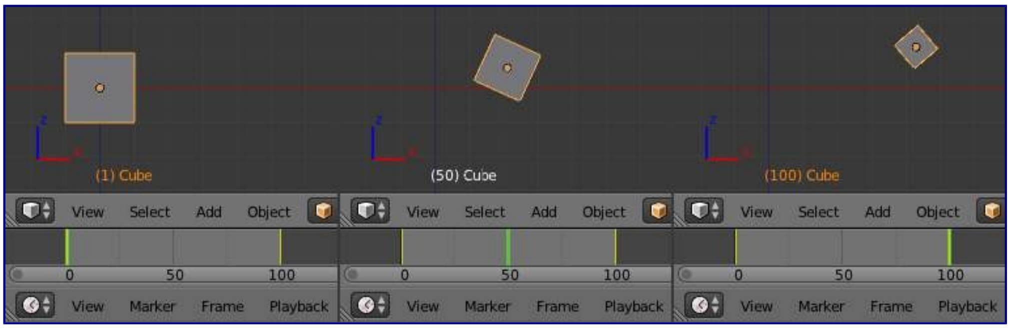
This example shows you how to animate a cubes location, rotation, and scale.

- First, in the *Timeline*, or other animation editors, set the frame to 1.
- With the *Cube* selected in *Object Mode*, press `I` in the 3D View.
- From the *Insert Keyframe Menu* select *LocRotScale*.
- This will record the location, rotation, and scale, for the *Cube* on frame 1.
- Set the frame to 100.
- Use Grab/Move `G`, Rotate `R`, Scale `S`, to transform the cube.
- Press `I` in the 3D View. From the *Insert Keyframe Menu* select *LocRotScale*.



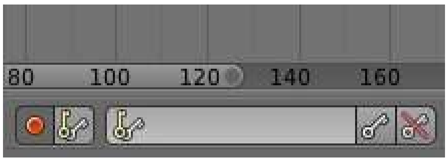
Insert Keyframes.

To test the animation, press `Alt-A` to play.



The animation on frames 1, 50, 100.

Auto Keyframe

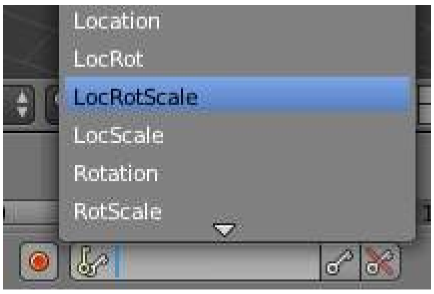


Timeline Auto Keyframe.

Auto Keyframe is the red record button in the *Timeline* header. Auto Keyframe adds keyframes automatically to the set frame if the value for transform type properties changes.

See Timeline V Keyframe Control for more info.

Keying Sets



Timeline Keying Sets.

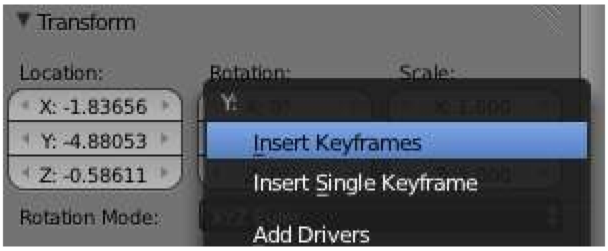
Keying Sets are a set of keyframe channels. They are used to record multiple properties at the same time. There are some built in keying sets, ‘LocRotScale’, and also custom keying sets can be made.

To use the keying set, first select a keying set from the *Timeline* header, or the *Keying Sets Panel*.

Now when you press `I` in the 3D view, Bforartists will add keyframes for all the properties in the active keying set.

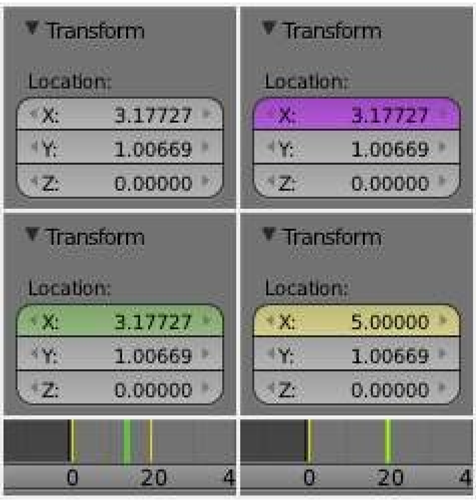
See *Keying Sets* for more info.

Properties



Keyframe properties.

Keyframes can be used to animate lots of different properties in Bforartists. To add keyframes to a property in the UI, `RMB` the property, then select Insert Single Keyframe, or Insert Keyframes. Insert Keyframes `I` will add a keyframes for the set of properties.



Properties, Drivers, Keyframes.

Properties have different colors and menu items for different states.

Gray - Property is not animated with Keyframes or Drivers.
Insert Keyframes `I`. Insert Single Keyframe. Add Drivers. Add Single Driver. Paste Driver.

Purple - Property value is controlled with a Driver.
Delete Drivers. Delete Single Driver. Copy Driver. Paste Driver.

Green - Property has Channel with Keyframes.
Insert Keyframes `I`. Insert Single Keyframe. Clear Keyframes `Alt-Shift-I` Clear Single Keyframes.

Yellow - Property has Keyframes on the current Frame.
Replace Keyframes `I`. Replace Single Keyframe. Delete Keyframes `Alt-I`. Delete Single Keyframe.

Clear Keyframes `Alt-Shift-I` Clear Single Keyframes.

Each property also has some Keying Set options.

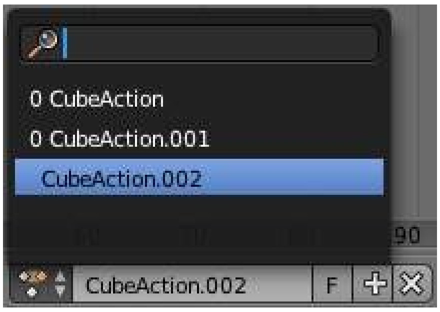
Add All to Keying Set K. Add Single to Keying Set. Remove from Keying Set.

Editing

3D View.

Insert Keyframes on current frame `I` Delete Keyframes on current frame `Alt-I`

Working with Actions



Action Browser.

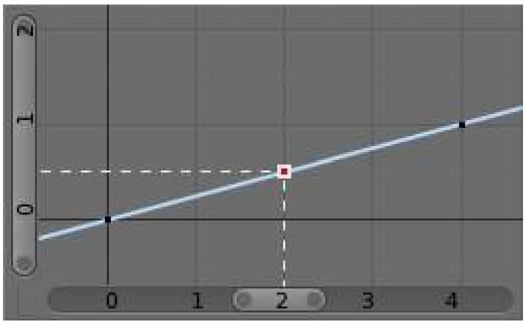
When you first animate an object by adding keyframes, Bforartists creates an *Action* to record the data.

Actions can be managed with the *Action Browser* in the *DopeSheet Action Editor* header, or the properties region of the *NLA Editor.*

If you are making multiple actions for the same object, press the **F** button for each action, this will give the actions a *Fake User* and will make Bforartists save the unlinked actions.

Objects can only use one *Action* at a time for editing, the *NLA Editor* is used to blend mutiple actions together.

Drivers



Graph Editor: Driver example.

Drivers can use properties, numbers, transformations, and scripts, to control the values of properties.

Using a F-Curve, the driver reads the value of the Driver Value and sets the value of the selected property it was added to.

So from this example, if the Driver Value is 2.0 the property will be 0.5.

The Driver Value is determined by Driver Variables or a Scripted Expression.

Most the settings for the drivers *F-Curves* are found in the *Graph Editor.*

Drivers Panel

Graph Editor: Drivers: Drivers Panel.

This panel is located in the *Graph Editor* with the mode set to Drivers.

The drivers panel is for setting up *Driver Variables* or a *Scripted Expression* which will determine the value of the *Driver Value*.

Driver Settings

Update Dependencies
: This will force an update for the Driver Value dependencies.

Remove Driver
: Removes the driver from the object.

Type

: The type of calculation to use on the set of Driver Variables. (If you only have one driver variable there is no real difference between average, sum, minimum and maximum)

  Average Value
  : Uses the average value of the referenced Driver Variables.

  Sum Values
  : Uses the sum of the referenced Driver Variables.

  Scripted Expression
  : Uses a Scripted Expression. See Expr. You must write a python expression which performs your own calculations on the Driver Variables.

  Minimum Value
  : Uses the lowest value from the referenced Driver Variables.

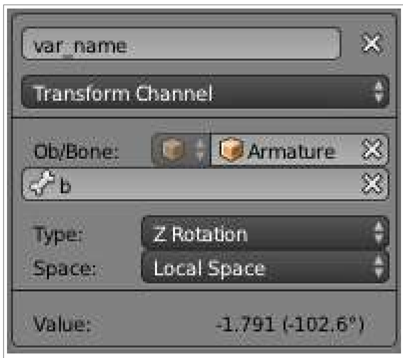
  Maximum Value
  : Uses the highest value from the referenced Driver Variables.

Expr
Scripted Expression. Here you can add real numbers, math operators, math functions, python properties, driver functions. See Driver Expression below for some examples.

Show Debug Info
Shows the Driver Value. The current value of the variables or scripted expression.

Add Variable
Adds a new Driver Variable.

Setup of a Single Property.

 Transform Channel Setup	 Distance Setup

Driver Variables

Name
Name to use for scripted expressions/functions. No spaces or dots are allowed and must start with a letter.

Variable Type

The type of variable to use.

Single Property

Use the value from some RNA property. For example, the Ambient shading color from a material. First select the type of ID-block, then the ID of the ID-block, then copy and paste an RNA property (Ctrl+V).

ID-Type
The ID-Block type, example, Key, Image, Object, Material.

ID
The ID of the ID-Block type, example, `Material.001`.

RNA Path
The RNA id name of the property, example, 'ambient' from material shading.

Transform Channel

Use one of the Transform channels from an object or bone.

ID
ID of the object, example, Cube, Armature, Camera.

Bone
ID of the Armature bone, example, `Bone`, `Bone.002`, `Arm.r`. This option is for armatures.

Type
Example, X Location, X Rotation, X Scale.

Space
World Space, Transform Space, Local Space.

Rotational Difference
Use the rotational difference between two objects or bones.

Distance
Use the distance between two objects or bones.

Value
Shows the value of the variable.

Workflow

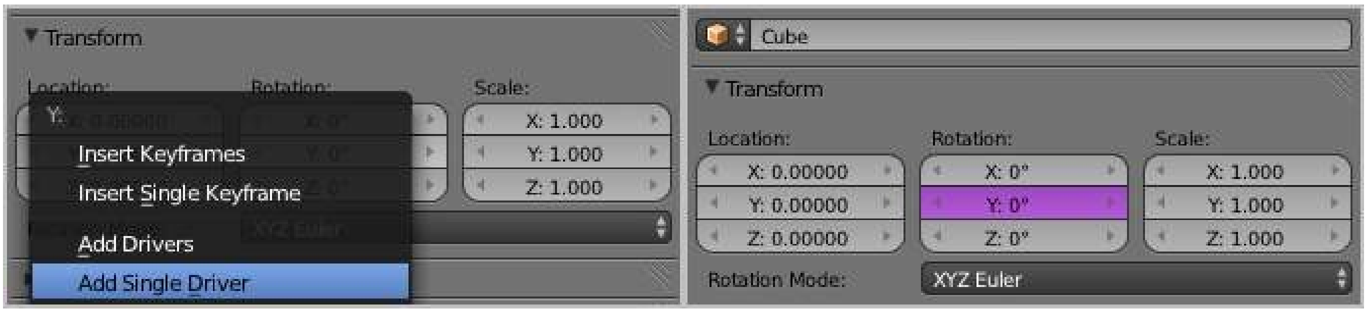
There are some different ways to add drivers in Bforartists. These are some driver examples and workflow. After adding drivers they are usually modified in the *Graph Editor* with the mode set the *Drivers*.

UI

The common way to add a driver to a property is to right click a property, then add a driver via the context menu.

Add Drivers
This will add drivers to the set of properties related to the selected one. For example, it will add drivers to X, Y, and Z for Rotation.

Add Single Driver
This will add a single driver to the selected property.



Drivers can also be added by pressing `D` with the mouse over the property set.

Expression

This is quick way to add drivers with a scripted expression. First click the property you want add a driver to, then add a hash # and a scripted expression.

Some examples.

- `#frame`
- `#frame / 20.0`
- `#sin(frame)`
- `#cos(frame)`

Copy Paste

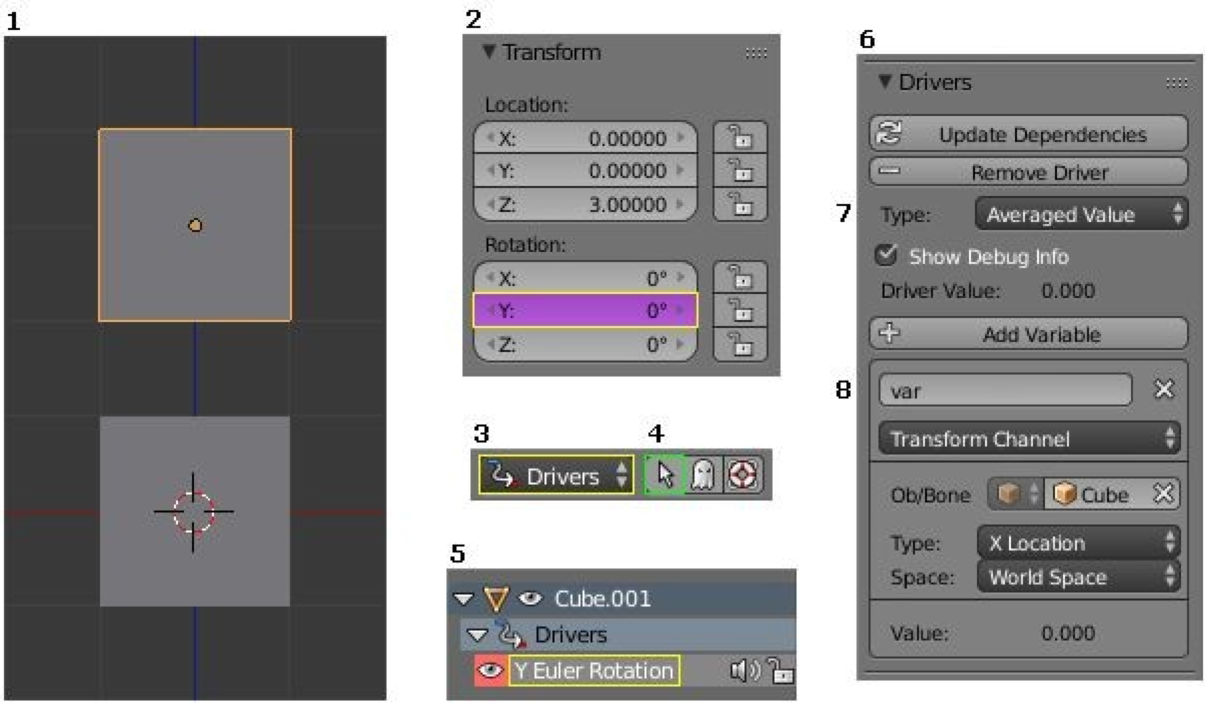
Drivers can be copied and pasted in the UI, via the context menu. When adding drivers with the same settings, this can save time modifying settings.

Transform Driver

This examples shows you how setup a transform driver. First make sure you are in the Front Ortho view. `Numpad5`, `Numpad1`.

1. In object mode, select then duplicate the default `Cube`. `Shift-D`. Move `Cube.001` to a new location.
2. With `Cube.001` selected, add a single driver to the **Rotation Y** property.
3. Open the *Graph Editor*, set the *Mode* to *Drivers*.
4. *Show Only Selected* is useful disabled for drivers, marked green in the picture.
5. In the channels region, select the **Y Euler Rotation** property.
6. Press `N` to open the properties region, scroll down to *Drivers* panel.
7. Change the *Type* to *Averaged Value*, this will return the averaged value of the driver variables.
8. Modify the driver variable settings.

- *Type - Transform Channel*
- *Ob/Bone - Cube*
- *Transform Type - X Location*
- *Transform Space - World Space*



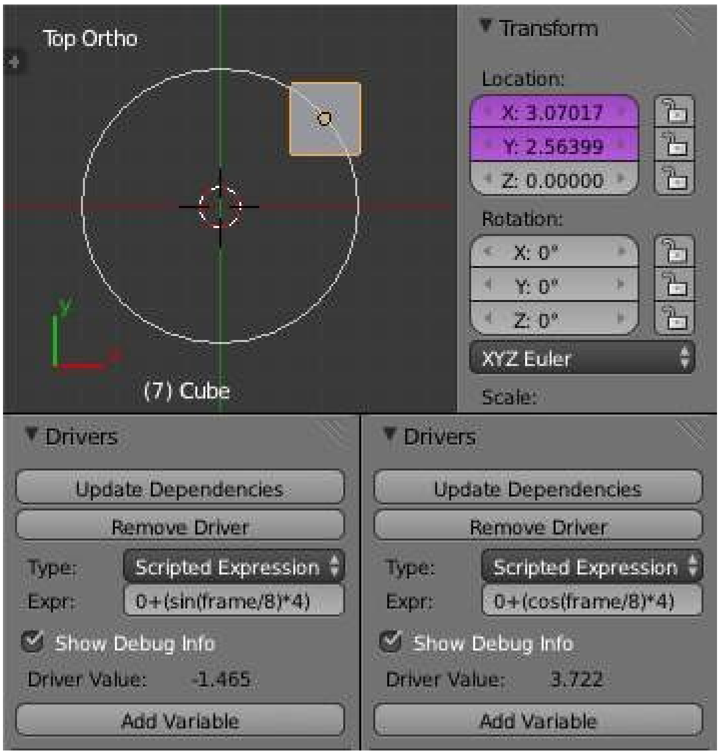
When finished, `Cube.001` should rotate on the Y axis when moving `Cube` left of right.

Examples

Some Driver Examples.

Driver Expression

Here are some examples using the scripted expression Expr to set the Driver Value.



Object Rotation.

Orbit a point

Here two drivers have been added to the Cube, X Location and Y Location.

The scripted expressions are being used to set the object location.

X Location Expr

`0 + (sin(frame / 8) * 4)`

`(frame/8)` : is the current frame of the animation, divided by 8 to slow the orbit down.
`(sin( )*4)` : This returns the sine of (frame/8), then multiplies by 4 for a bigger circle. `0 +` : is used to control the X Location offset of the orbit.

Y Location Expr

`0 + (cos(frame / 8) * 4)`

`(frame / 8)` : is the current frame of the animation, divided by 8 to slow the orbit down.
`(cos( ) * 4)` : This returns the cosine of (frame/8), then multiplies by 4 for a bigger circle. `0 +` : is used to control the Y Location offset of the orbit.

`frame` is the same as bpy.context.scene.frame_current.

Driver Namespace

There is a list of built in driver functions and properties. These can be displayed via the python console.

```
>>> bpy.app.driver_namespace['
                              __builtins__']
                              __doc__']
                              __loader__']
                              __name__']
                              __package__']
                              acos']
                              acosh']
                              asin']
                              asinh']
                              atan']
                              atan2']
                              atanh']
                              bpy']
                              ceil']
                              copysign']
                              cos']
                              cosh']
                              ..
```

This script will add a function to the driver namespace, which can then be used in the expression `driver_func(frame)`

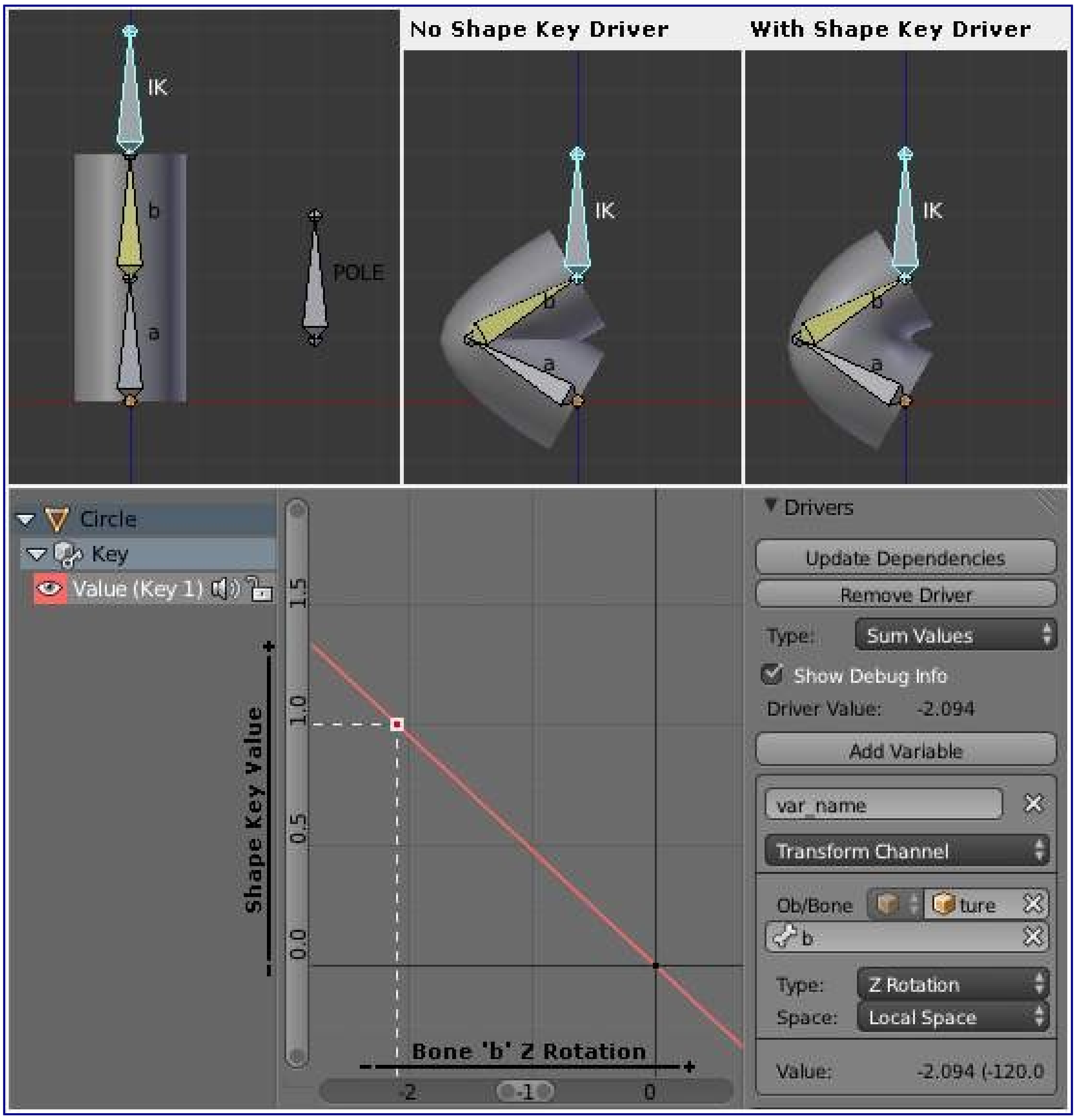
```
import bpy

def driver_func(val):
    return val * val    # return val squared

# add function to driver_namespace
bpy.app.driver_namespace['driver_func'] = driver_func
```

Shape Key Driver

This example is a Shape Key Driver. The driver was added to the shape key Value.



Shape Key Driver. Click to enlarge.

This example uses the Armature Bone ‘b’ Z Rotation to control the Value of a Shape Key. The bone rotation mode is set to XYZ Euler.

The Driver F-Curve is mapped like so

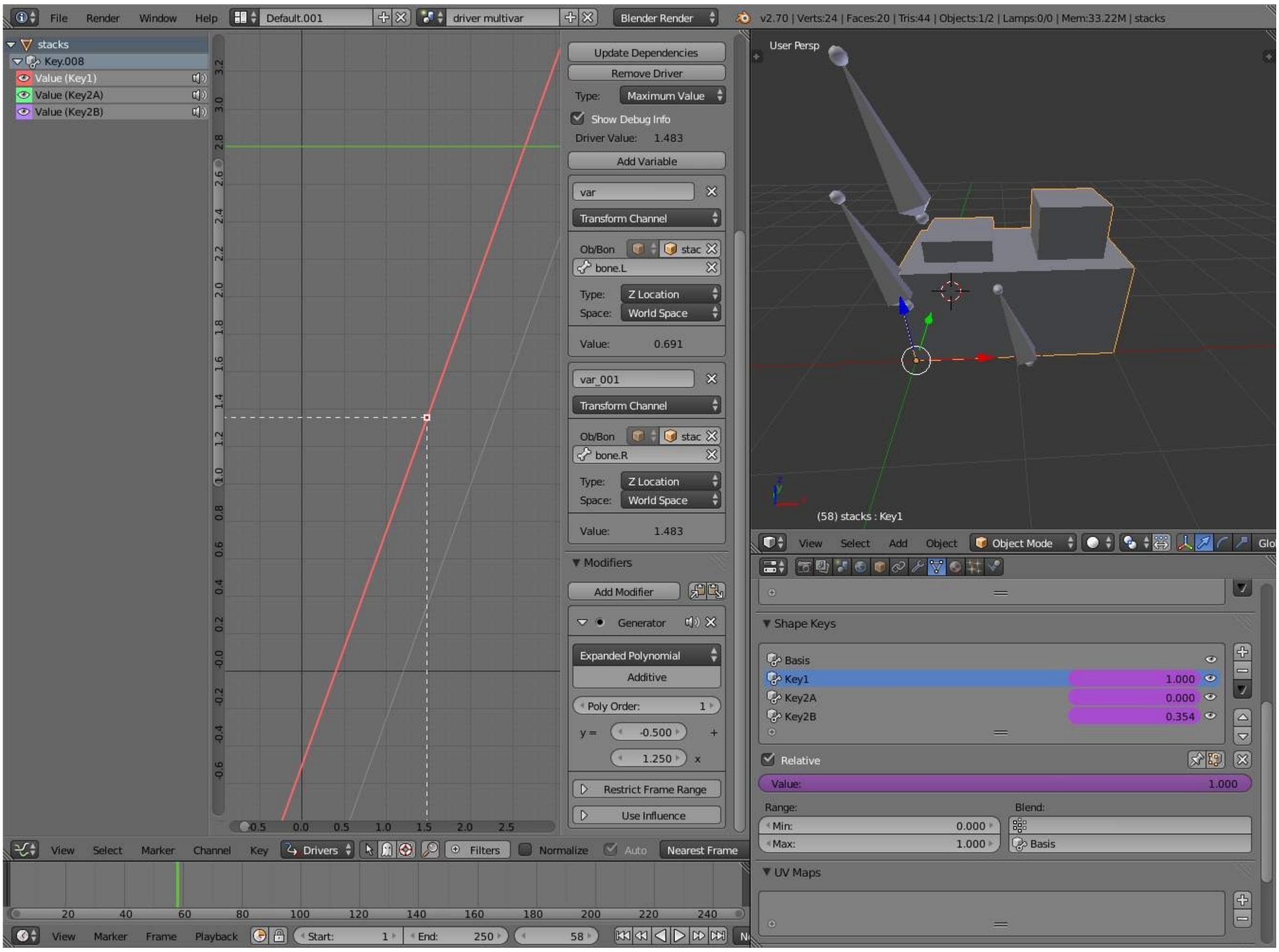
Bone Z Rotation 0.0(0.0): Shape Key value 0.0 Bone Z Rotation -2.09(-120.0): Shape Key value 1.0

This kind of driver can also be setup with the Variable Type Rotational Difference.

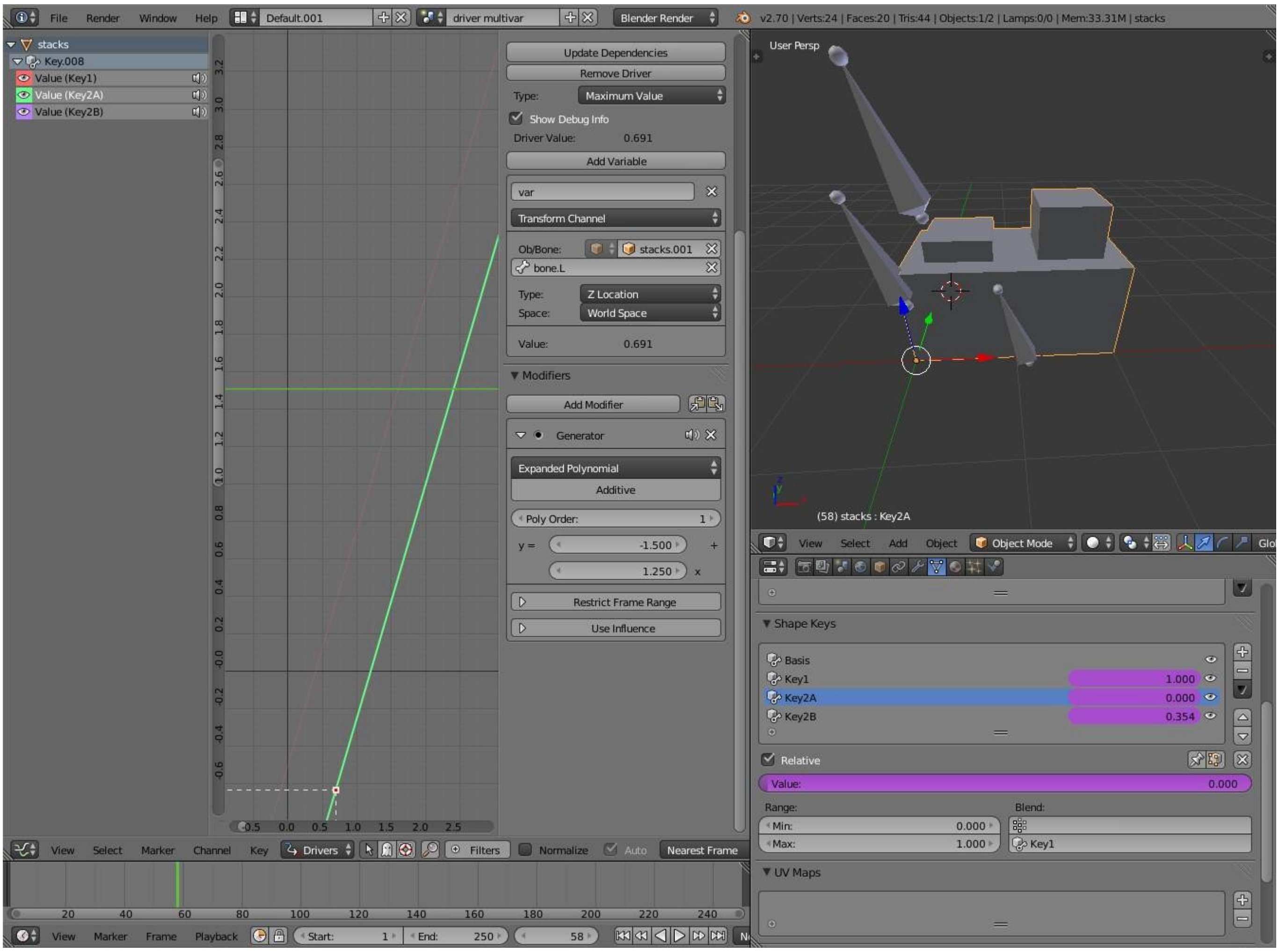
See *Shape Keys* for more info.

Drivers And Multiple Relative Shape Keys

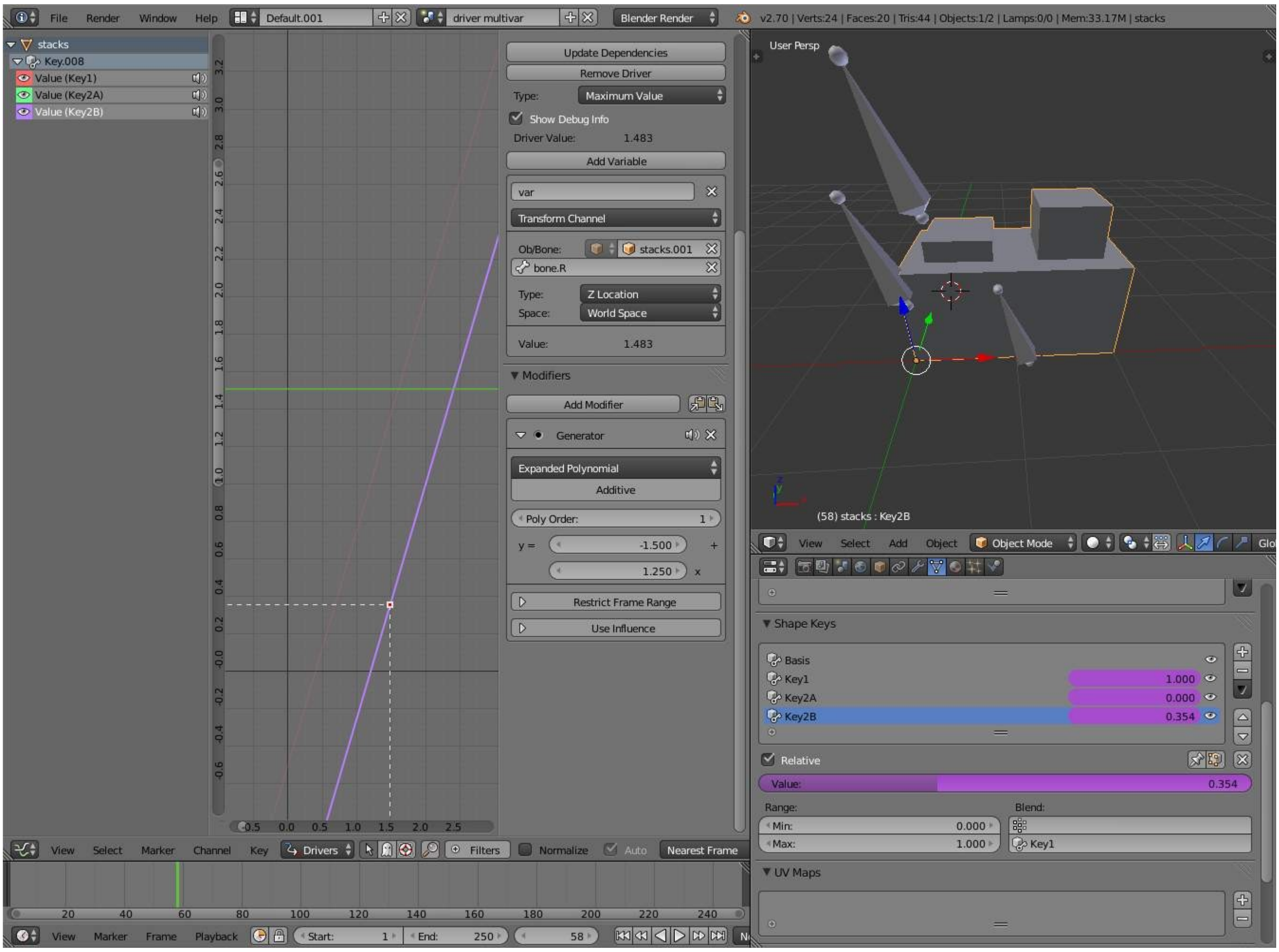
The following screenshots illustrate combining shape keys, bones, and drivers to make multiple chained relative shape keys sharing a single root. While it lacks the convenience of the single Evaluation Time of an absolute shape key, it allows you to have more complex relationships between your shape keys.



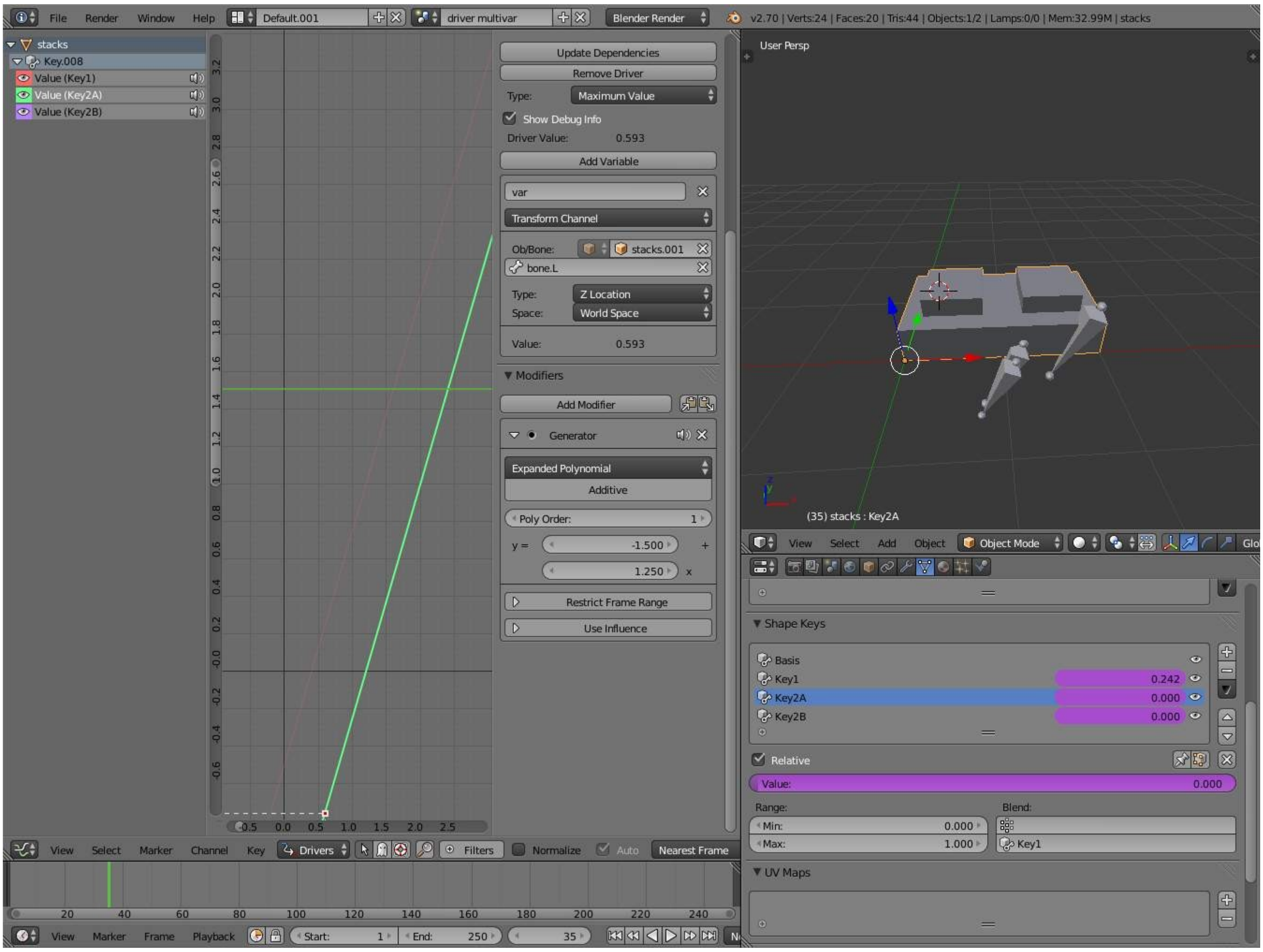
Key1 must handle conflicting values from the two bones



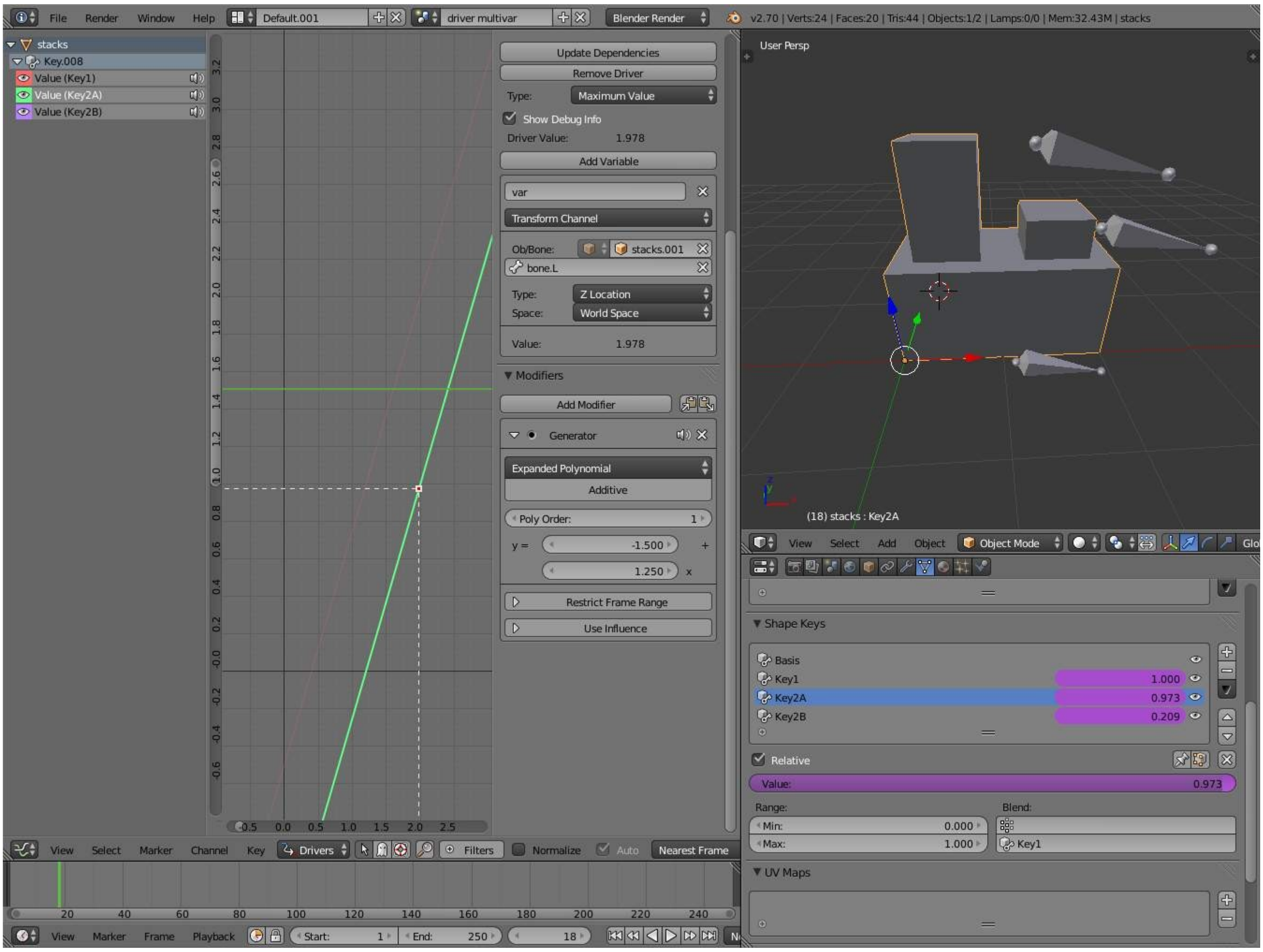
Key2A has different generator coefficients so it is activated in a different range of the bone’s position.



Key2B is the same as Key2A, but is controlled by the second bone.



when both bones are low, Key2B and Key2A are deactivated and Key1 is at low influence.



The Basis shape key has the stacks fully retracted. Key1 has the base fully extended. Key2A has the left stack fully extended. Key2B has the right stack fully extended. Key2A and Key2B are both relative to Key1 (as you can see in the field in the bottom right of the Shape Keys panel.

The value of Key1 is bound to the position of bones by a driver with two variables. Each variable uses the world Z coordinate of a bone and uses the maximum value to determine how much the base should be extended. The generator polynomial is crafted such that the top of the dominant stack should line up with the bone for that stack.

The value of Key2A is bound to the position of `Bone.L`. Its generator parameters are crafted such that when Key1's value reaches 1, the value of Key2A starts increasing beyond zero. In this way the top of the left stack will move with bone.L (mostly).

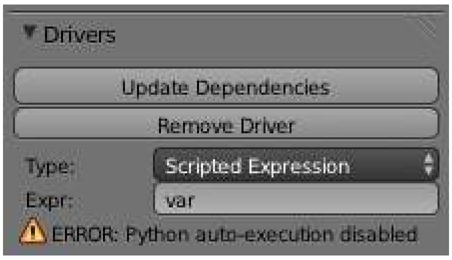
The value of Key2B is bound to the position of `Bone.R`. Its generator parameters are similar to Key2A so that the top of the right stack will move with bone.R (mostly).

Since it's quite easy for bone.L and bone.R to be in positions that indicate conflicting values for Key1 there will be times when the bones do not line up with the tops of their respective stacks. If the driver for Key1 were to use Average or Minimum instead of Maximum to determine the value of the shape key then "conflicts" between bone.L and bone.R would be resolved differently. You will chose according to the needs of your animation.

Troubleshooting

Some common problems people may run in to when using drivers.

Scripted Expression



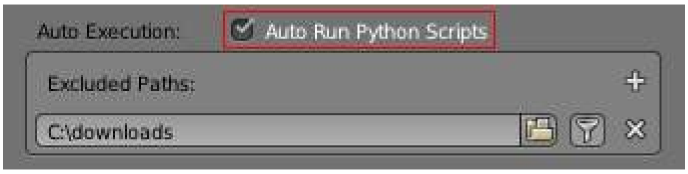
Graph Editor > Properties > Drivers.

Info Header.

By default Bforartists will not auto run python scripts.

If using a *Scripted Expression* Driver Type, you will have to open the file as *Trusted Source*, or set *Auto Run Python Scripts* in *User Preferences > File > Auto Execution*.

File Browser.



User Preference > File > Auto Execution.

Rotational Properties are Radians

Parts of the User Interface may use different units of measurements for angles, rotation. In the Graph Editor while working with Drivers, all angles are Radians.

Intra-armature Bone Drivers Can Misbehave

There is a well known limitation with drivers on bones that refer to another bone in the same armature. Their values can be incorrectly calculated based on the position of the other bone as it was *before* you adjust the current_frame. This can lead to obvious shape glitches when the rendering of frames has a jump in the frame number (either because the `.blend` file is currently on a different frame number or because you're skipping already-rendered frames).

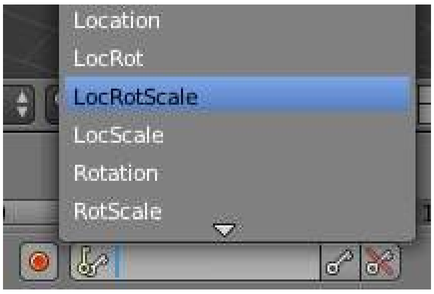
See Also

- *Animation*
- *Graph Editor*
- *F-Curves*
- Extending Bforartists with Python.

Links

- Python and its documentation.
- functions.wolfram.com

Keying Sets



Timeline Keying Sets.

Keying Sets are a collection of properties. They are used to keyframe multiple properties at the same time, usually by pressing `I` in the 3D View.

There are some built in Keying Sets, and also custom Keying Sets called *Absolute Keying Sets*.

To select and use a Keying Set, set the *Active Keying Set* in the Timeline Header, or the *Keying Set Panel*, or press `Ctrl-Alt-Shift-I` in the 3D View.

Keying Set Panel

This panel is used to add, select, manage *Absolute Keying Sets*.

Properties > Scene > Keying Set Panel.

Keying Set Name

The active Keying Set is highlighted in blue, press `Ctrl-LMB` to rename.

+

Add new (Empty) keying set to the active Scene.

-

Remove the active Keying Set.

Active Keying Set properties

Description

A short description of the keying set.

Export to File

Export Keying Set to a python script *File.py*. To re add the keying set from the *File.py*, open then run the *File.py* from the Text Editor.

Keyframing Settings

These options control all properties in the Keying Set. Note, the same settings in *User Preferences* override these settings if enabled.

Only Needed

Only insert keyframes where they're needed in the relevant F-Curves.

Visual Keying

Insert keyframes based on the visual transformation.

XYZ=RGB Colors

For new F-Curves, set the colors to RGB for the property set, Location XYZ for example.

Active Keying Set Panel

This panel is used to add properties to the active Keying Set.

Properties > Scene > Active Keying Set Panel.

Properties > Graph Editor > Channels, Named Group.

Paths

A collection of *Paths* each with a *Data Path* to a property to add to the active Keying Set. The active *Path* is highlighted in blue.

- Add new empty path to active Keying Set.
- Remove active path from the active Keying Set.

Active Path properties

ID-Block

Set the *ID-Type* + *Object ID Data Path* for the property.

Data Path

Set the rest of the *Data Path* for the property.

Array Target

Use *All Items* from the *Data Path* or select the array index for a specific property.

F-Curve Grouping

This controls what *Group* to add the *Channels* to. *Keying Set Name*, *None*, *Named Group*.

Keyframing Settings

These options control individual properties in the Keying Set.

Only Needed

Only insert keyframes where they’re needed in the relevant F-Curves.

Visual Keying

Insert keyframes based on the visual transformation.

XYZ=RGB Colors

For new F-Curves, set the colors to RGB for the property set, Location XYZ for example.

Adding Properties

Some ways to add properties to keying sets.

`RMB` the property in the *User Interface*, then select *Add Single to Keying Set* or *Add All to Keying Set*. This will add the properties to the active keying set, or to a new keying set if none exist.

Hover the mouse over the properties, then press `K`, to add *Add All to Keying Set.*

Markers

Markers are used to denote frames at which something significant happens - it could be that a character’s animation starts, the camera changes position, or a door opens, for example. Markers can be given names to make them more meaningful at a quick glance. They are available in many of Bforartists’s windows, under different forms. Unlike the keyframes, markers are always placed at a whole frame number, you cannot e.g. set a marker at “frame `2.5` ”.

Markers can be created and edited in all of the following editors (including their different modes):

- The *Graph Editor Window.*

- The *Action Editor window.*
- The *The Dope Sheet*.
- The *NLA Editor window.*
- The *Video Sequence Editor window.*
- The *Timeline window.*When you create

A marker created in one of these windows will also appear in all others that support them, including:

- The *3D View window.*

Pose markers

There is another type of markers, called “pose markers”, which are specific to the armatures and the Action Editor window. They are related to the pose libraries, and are discussed in detail *here*.

Visualization

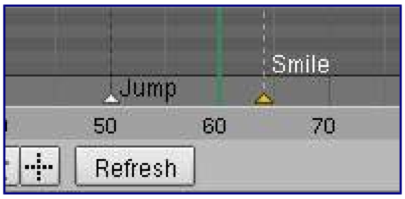
Standard

Markers: small but useful.

Most of the window types visualize markers the same way: as small triangles at their bottom, white if unselected or yellow if selected.

If they have a name, this is shown to their right, in white when the marker is selected. See (Markers: small but useful).

Sequencer



Markers in the Sequencer

The **Video Sequence Editor** just adds a vertical dashed line to each marker (gray if the marker is unselected, or white if it’s selected).

3D View

Marker in a 3D View.

The View do not allow you to create/edit/remove markers, they just show their name between <> at there bottom left corner, near the active object's name, when you are at their frame (see Marker in a 3D view).

Creating and Editing Markers

Unfortunately, there is no common shortcuts and menu for marker's editing, across the different window types that supports them... So in the refboxes of each action described below, I put the most-common shortcut and menu entry, with the known exceptions between brackets.

Creating Markers

Reference
Mode: all modes Menu: Marker ‣ Add Marker (Frame ‣ Add Marker in a timeline) Hotkey: `M` (`Ctrl-Alt-M` in a VSE)

The simplest way to add a marker is to move to the frame where you would like it to appear, and press `M` (or `Ctrl-Alt-M` in a video sequence editor).

Alternatively, you can press `Alt-A` (or the "playback" button of the *Timeline* window) to make the animation play, and then press `M` (or `Ctrl-Alt-M` in VSE) at the appropriate points. This can be especially useful to mark the beats in some music.

Selecting Markers

Reference
Mode: all modes Hotkey: `RMB`, `Shift-RMB`, `A` / `Ctrl-A`, `B` / `Ctrl-B`

Click `RMB` on the marker's triangle to select it. Use `Shift-RMB` to (de)select multiple markers.

In the Ipo Curve Editor, Action Editor, NLA Editor and Video Sequence Editor windows, you can also (de)select all markers with `Ctrl-A`, and border-select them with `Ctrl-B` (as usual, `LMB` to select, `RMB` to deselect). The corresponding options are found in the Select menu of these windows.

In the Timeline and Audio windows, you can (de)select all markers with `A` , and border (de)select them with `B` ...

Naming Markers

Reference
Mode: all modes Menu: Marker ‣ (Re)Name Marker (Frame ‣ Name Marker in a timeline) Hotkey: `Ctrl-M`

Having dozens of markers scattered throughout your scene's time won't help you much unless you know what they stand for. You can name a marker by selecting it, pressing `Ctrl-M`, typing the name, and pressing the OK button.

Moving Markers

Reference
Mode: all modes Menu: Marker ‣ Grab/Move Marker (Frame ‣ Grab/Move Marker in a timeline) Hotkey: `Ctrl-G` (`G` in a timeline or audio)

Once you have one or more markers selected, press `Ctrl-G` (or `G` in Timeline or Audio windows) to move them, and confirm the move with `LMB` or `Return` (as usual, cancel the move with `RMB`, or `Esc`).

By default, you grab the markers in one-frame steps, but if you hold `Ctrl`, the markers will move in steps corresponding to one second (according to the scenes *FPS*).

Duplicating Markers

Reference
Mode: all modes Menu: Marker ‣ Duplicate Marker (Frame ‣ Duplicate Marker in a timeline) Hotkey: `Ctrl-Shift-D` (`Shift-D` in a timeline or audio)

You can duplicate the selected markers by pressing `Ctrl-Shift-D` (or `Shift-D` in a Timeline or Audio window). Once duplicated, the new ones are automatically placed in grab mode, so you can move them where (or rather when) you want.

Note that unlike most other duplications in Bforartists, the names of the duplicated markers are not altered at all (no `.001` numeric counter append...).

Deleting Markers

Reference
Mode: all modes Menu: Marker ‣ Delete Marker (Frame ‣ Delete Marker in a timeline) Hotkey: `Shift-X` (`X` in a timeline or audio)

To delete the selected marker(s) simply press `Shift-X` (or `X` in a Timeline or Audio'' window), and confirm the pop-up message with `LMB`.

Using Constraints in Animation

Constraints are a way to control an object's properties (its location/rotation/scale), using either plain static values (like the *"limit" ones*), or (an)other object(s), called "targets" (like e.g. the *"copy" ones*).

Even though these constraints might be useful in static projects, their main usage is obviously in animation. There are two different aspects in constraints' animation:

- You can control an object's animation through the targets used by its constraints (this is a form of indirect animation).
- You can animate constraints' settings

Controlling Animation with Constraints

This applies only to constraints using target(s). Indeed, these targets can then control the constraint's owner's properties, and hence, animating the targets will indirectly animate the owner.

This indirect "constraint" animation can be very simple, like for example with the *Copy Location constraint*, where the owner object will simply copy the location of its target (with an optional constant offset). But you can also have very complex behaviors, like when using the *Action constraint*, which is a sort of *Animation Driver* for actions!

We should also mention the classical *Child Of constraint*, which creates parent/child relationship. These relationships indeed imply indirect animation (as transforming the parent affects by default all its children). But the *Child Of* constraint is also very important, as it allows you to parent your objects to bones, and hence use *Armatures* to animate them!

Back to our simple *Copy Location* example, you can have two different behaviors of this constraint:

- When its *Offset* button is disabled (the default), the location of the owner is "absolutely" controlled by the constraint's target, which means nothing (except other constraints below in the stack...) will be able to control the owner's position. Not even the object's animation curves.
- However, when the *Offset* button is enabled, the location of the owner is "relatively" controlled by the constraint's target. This means that location's properties of the owner are offset from the location of the target. And these owner's location properties can be controlled e.g. by its *Loc...* curves (or actions, or NLA...)!

Example

Let's use the *Copy Location* constraint and its *Offset* button. For example, you can make your owner (let's call it `moon`) describe perfect circles centered on the `(0.0, 0.0, 0.0)` point (using e.g. pydriven *LocX* / *LocY* animation curves, see *this page*), and then make it copy the location of a target (called, I don't know... `earth`, for example) - with the *Offset* button enabled. Congratulation, you just modeled a satellite in a (simplified) orbit around its planet... Just do the same thing with its planet around its star (which you might call `sun`, what do you think?), and why not, for the star around its galaxy...

Here is a small animation of a "solar" system created using (among a few others) the technique described above:

https://vimeo.com/15187945

Note that the this "solar" system is not realistic at all (wrong scale, the "earth" is rotating in the wrong direction around the “sun”, ...).

You can download the `.blend` file (download here) used to create this animation.

Animating Constraints Influence

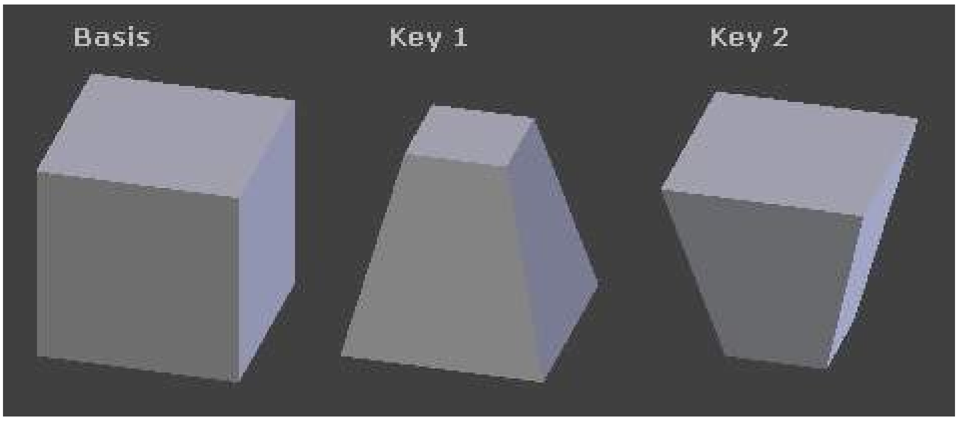
More “classically”, you can also animate a few properties of each constraint using animation curves.

You only have two animation curves (see also: *Graph Editor*):

- You can animate the *Influence* of a constraint. For example, in the Example above, I used it to first stick the camera to the “moon”, then to the “earth”, and finally to nothing, using two *Copy Location* constraints with *Offset* set, and their *Influence* cross-fading together...
- More anecdotal, you can also, for some constraints using an armature’s bone as target, animate where along this bone (between root and tip) lays the real target point (`0.0` means “full-root”, and `1.0`, “full-tip”).

Shape Keys

Shape Keys are used on Objects like *Mesh*, *Curve*, *Surface*, *Lattice*. They are used to deform the object vertices into a new shape.



A mesh with different shape keys applied.

There are two types of Shape Keys.

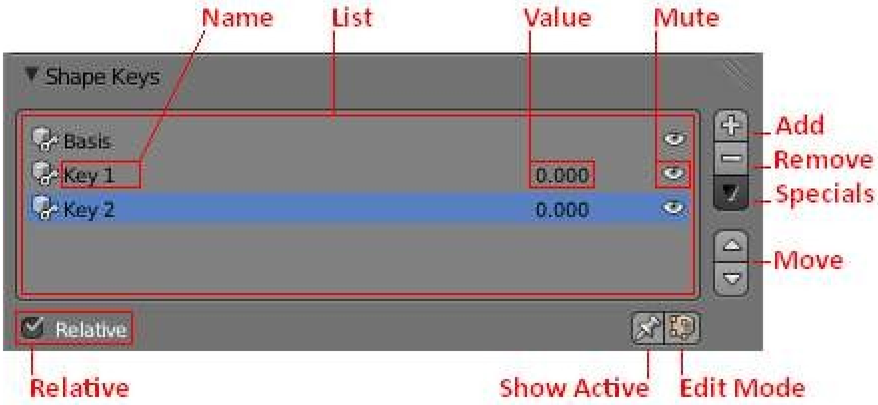
Relative
: Which are relative to the Basis or selected shape key. They are mainly used as, for limb joints, muscles, or Facial Animation.

Absolute
: Which are relative to the previous and next shape key. They are mainly used to deform the objects into different shapes over time.

The shape key data, the deformation of the objects vertices, is usually modified in the 3D View by selecting a shape key, then moving the object vertices to a new position.

Shape Keys Panel

Reference
Mode: All modes Panel: *Properties*, *Object Data*, *Shape Keys*



Shape Keys. Options.

Relative
: Set the shape keys to Relative or Absolute.

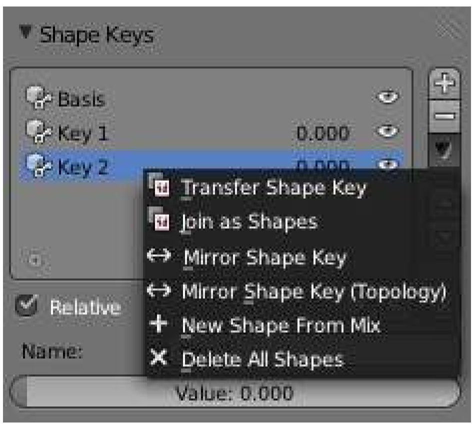
Name
: Name of the Shape Key.

Value
: Current Value of the Shape Key (0.0 to 1.0).

Mute
: This visually disables the shape key in the 3D view.

Add
: Add a new shape key to the list.

Remove
: Remove a shape key from the list.



Shape Keys Specials.

Specials

A menu with some operators.

Transfer Shape Key

Transfer the active 'Shape Key' from a different object. Select two objects, the active Shape Key is copied to the active object.

Join as Shapes

Transfer the 'Current Shape' from a different object. Select two objects, the Shape is copied to the active object.

Mirror Shape Key

If your mesh is nice and symmetrical, in *Object* Mode, you can mirror the shape keys on the X axis. This won't work unless the mesh vertices are perfectly symmetrical. Use the Mesh ‣ Symmetrize function in *Edit* Mode.

Mirror Shape Key (Topology)

This is the same as *Mirror Shape Key* though it detects the mirrored vertices based on the topology of the mesh. The mesh vertices dont have to be perfectly symmetrical for this one to work.

New Shape From Mix

Add a new shape key with the current deformed shape of the object.

Delete All Shapes

Delete all shape keys.

Move

Move shape key up or down in the list.

Show Active

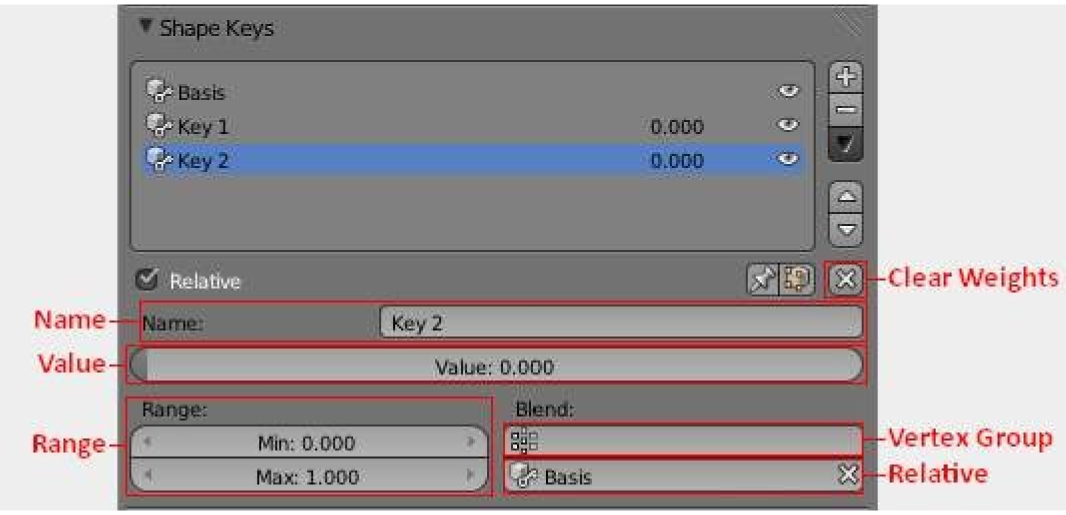
Show the shape of the active shape key in the 3D View. *Show Active* is enabled while the object is in *Edit Mode*, unless the setting below is enabled.

Edit Mode

Modify the shape key settings while the object is in *Edit mode*.

Relative Shape Keys

Relative shape keys deform from a selected shape key. By default all relative shape keys deform from the first shape key called the Basis shape key.



Relative Shape Keys. Options.

Clear Weights

Set all values to 0.

Name

Name of the active shape key.

Value

Value of the active shape key.

Range

Min and Max range of the active shape key value.

Vertex Group

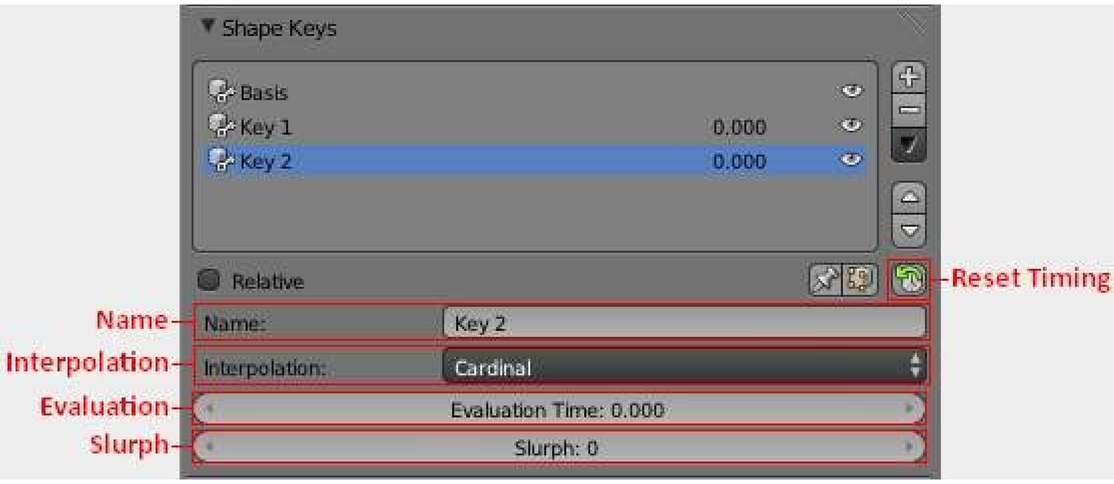
Limit the active shape key deformation to a vertex group.

Relative

Select the shape key to deform from.

Absolute Shape Keys

Absolute shape keys deform from the previous and to the next shape key. They are mainly used to deform the object into different shapes over time.



Absolute Shape Keys. Options.

Reset Timing

Reset the timing for absolute shape keys. For example, if you have the shape keys, Basis, Key_1, Key_2, in that order.

Reset Timing will loop the shapekeys, and set the shape key frames to +0.1.

Basis 0.1 Key_1 0.2 Key_2 0.3

Evaluation Time will show this as frame*100.

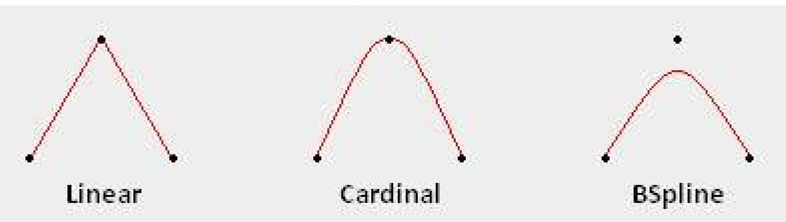
Basis 10.0 Key_1 20.0 Key_2 30.0

Name

Name of the active shape key.

Interpolation

This controls the interpolation between shape keys.



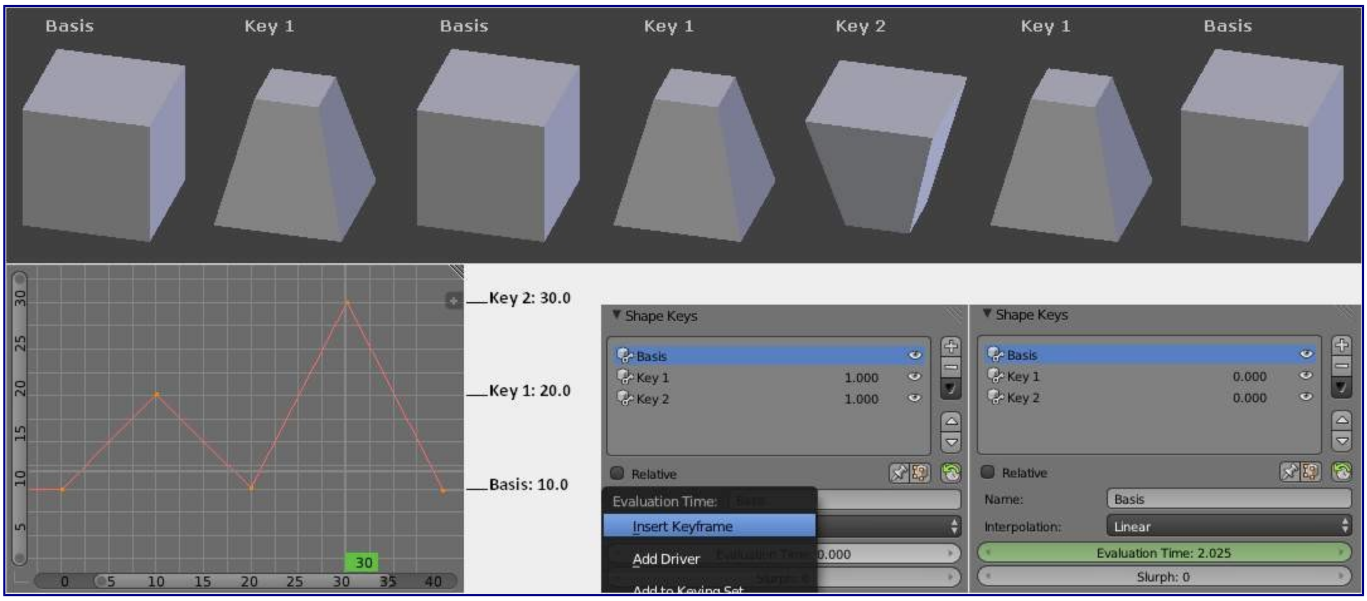
Different types of interpolation.

Evaluation Time

This is used to control the shape key influence.

For example, if you have the shape keys, Basis, Key_1, Key_2, in that order,and you reset timing.
Basis 10.0 Key_1 20.0 Key_2 30.0

You can control the shape key influence with Evaluation Time. Here keyframes have been used to control Evaluation Time for animation.

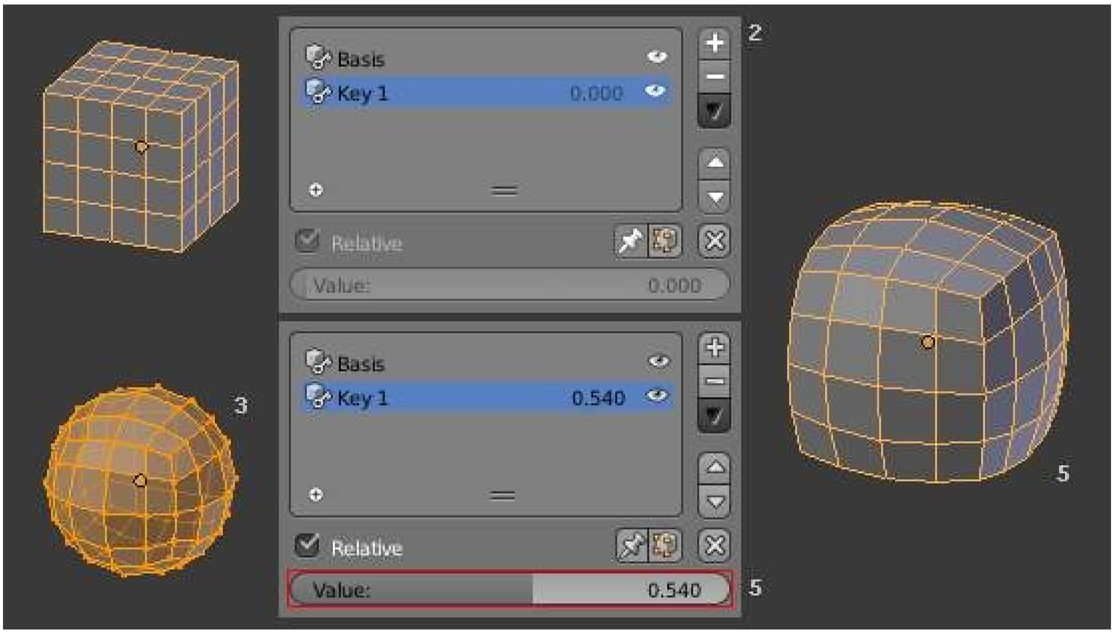


Animation with Evaluation Time.

Workflow For Relative Shape Keys

This example shows you how to make a cube mesh transform in to a sphere.

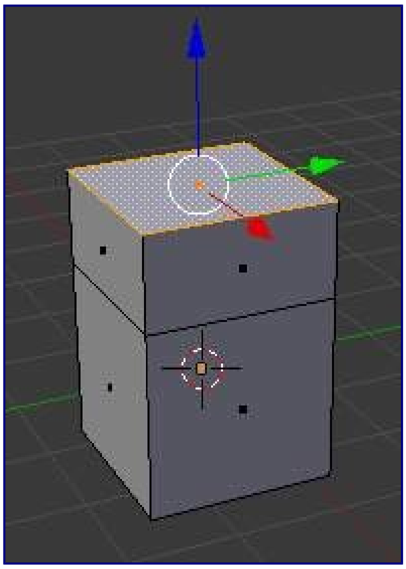
- In *Object Mode* add two shape keys via the *Shape Key Panel*.
- *Basis* is the rest shape. *Key 1* will be the new shape.
- With *Key 1* selected, switch to *Edit Mode*.
- Press `Shift-Alt-S` *To Sphere*, move the mouse right, then `LMB`.
- Switch to *Object Mode*.
- Set the *Value* for *Key 1* to see the transformation between the shape keys.



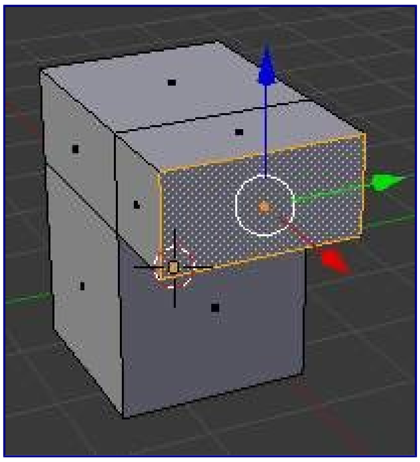
Shape Key workflow.

Workflow For Absolute Shape Keys

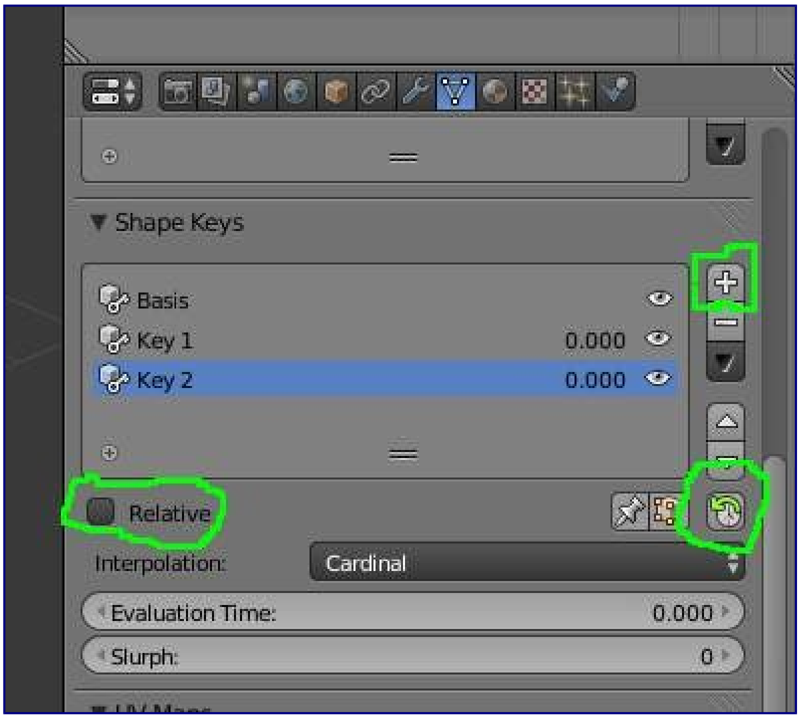
- Select the default Cube.
- Switch to Edit Mode.
- Switch to Face Select mode (if you are not already in it)



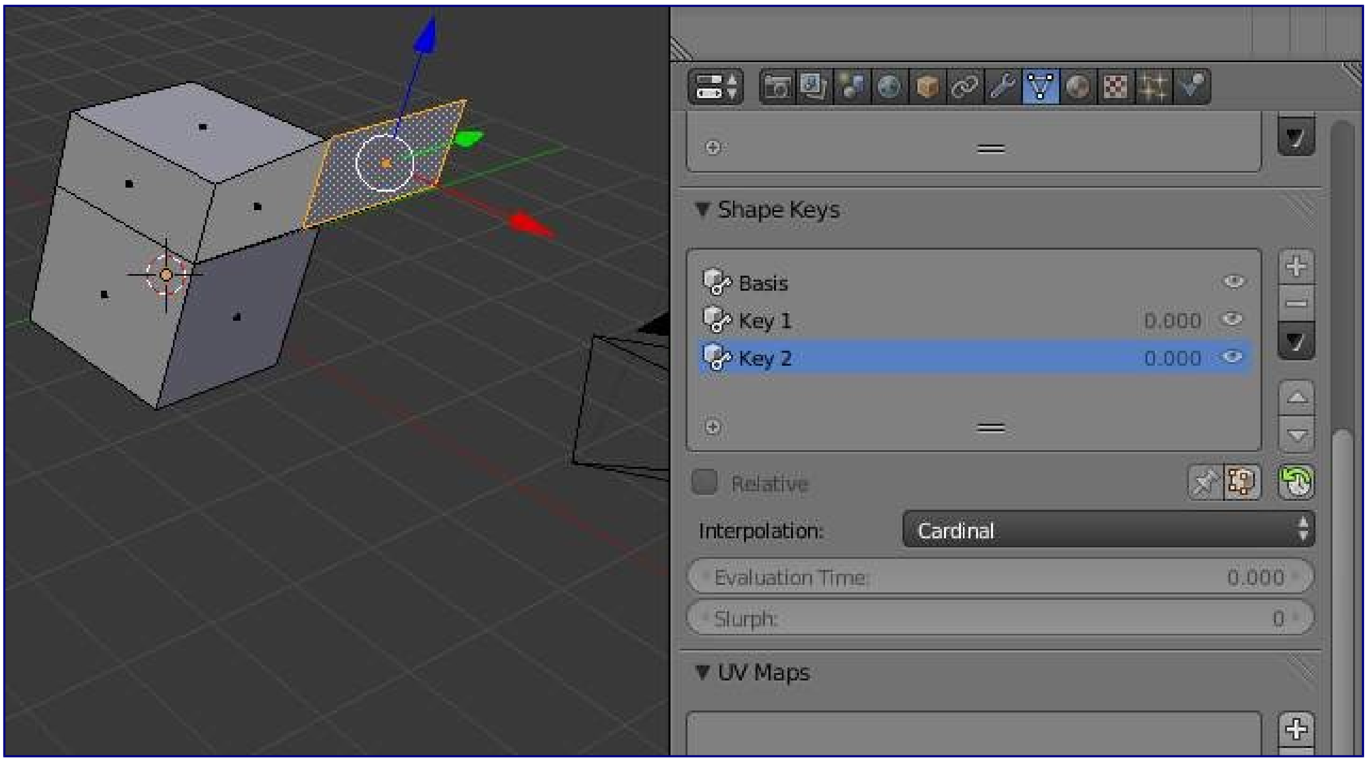
- Select the top face.
- Extrude up `E` `1` `LMB`.



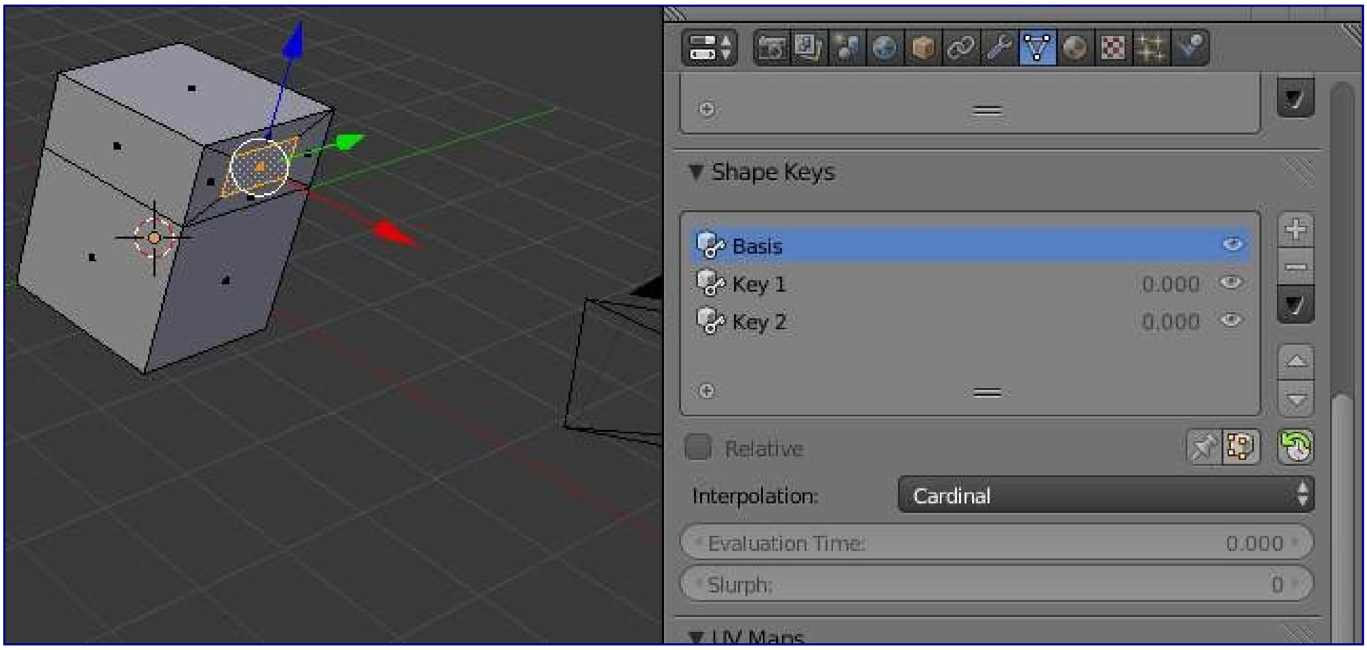
- Select a side face on the top half. (the one at x=1 if possible)
- Extrude out `E 1 LMB`.
- Switch back to Object Mode.



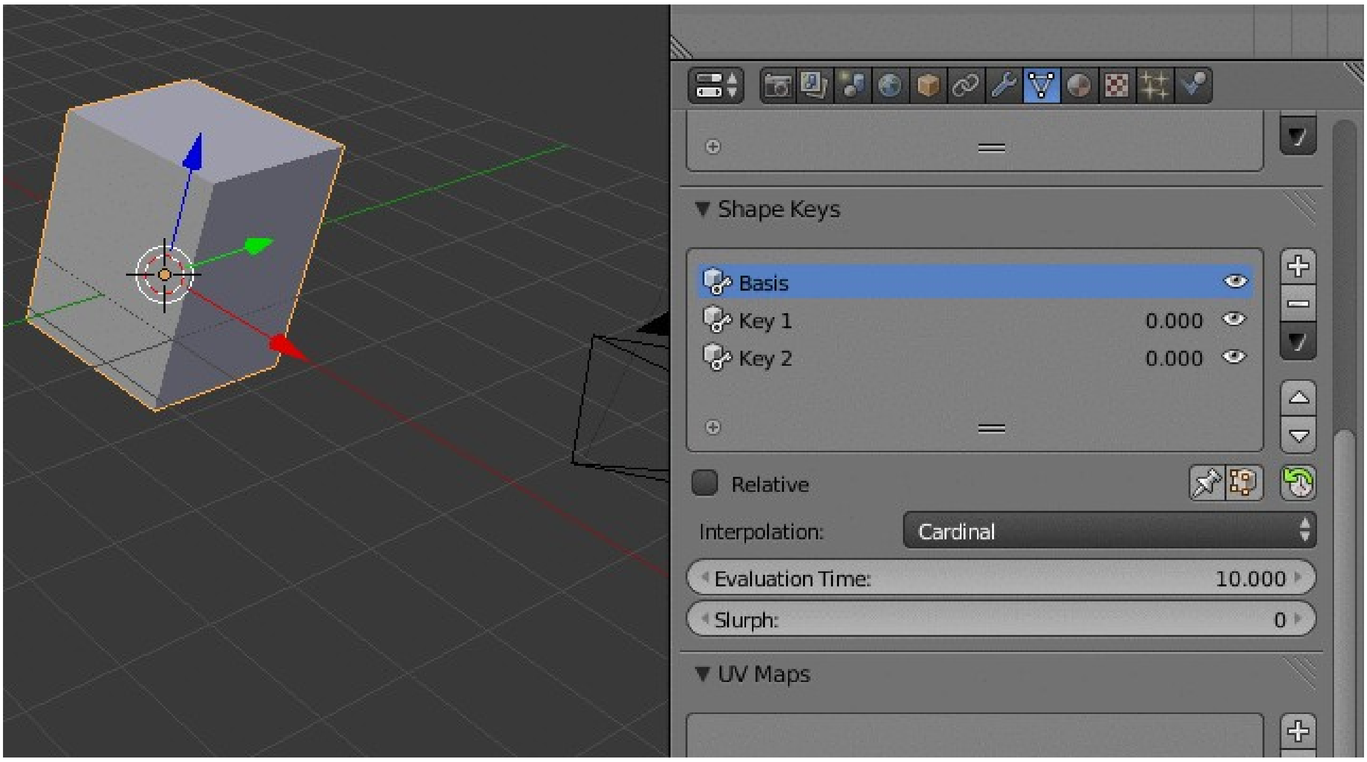
- Add a basis shape keys and two more via the + button on the Shape Key Panel.
- Uncheck the Relative checkbox.
- Click the Reset Timing button.
- Switch to Edit Mode.



- Select shape key Key 2 to edit the third shape key.
- Select the extruded side face and `G Z 1 LMB`



- Select shape key Basis to edit the first shape key.
- Select the extruded size face and `S 0.5 LMB`, then `G X Minus1 LMB`.
- Switch to Object Mode.
- Drag the Evaluation Time slider to make its value vary from 10 to 30.



More Details On Absolute Shape Keys

The thing to remember about absolute shape keys is that they are incomplete until you click the Reset Timing button. When you create a shape key its “frame” property is zero (https://developer.Bforartists.org/T39897), which is a completely useless value. This frame value is not displayed on the UI so you can’t easily tell if something is wrong or screwy until your animation starts misbehaving.

The number displayed to the right of the key name is the value and is used in relative shape keys. It has no effect on absolute shape keys, so ignore it.

When you reset the timings Bforartists iterates through the shape keys assigning them frame values incrementing by 0.1 from key to key.

name	frame	evaluation time
Basis	0.1	10
Key 1	0.2	20
Key 2	0.3	30
Key 3	0.4	40

If you delete a shape key this does not automatically alter the frame values assigned to remaining shape keys.

name	frame	evaluation time
Basis	0.1	10
Key 1	0.2	20
Key 3	0.4	40

The Evaluation Time is how you choose which shape key is active, and how active it is. The interesting values range from 10 .. (n*10) where n is the number of shape keys. (assuming you have not deleted or added any keys since the last Reset Timing). If you are using shape keys for animation, 99% of the time you will be putting keyframes on this Evaluation Time field.

Remember: if you are having problems with your absolute shape keys, there is a good chance that you need to Reset Timing.

Shape Key Operators

3D View > **Edit Mode** > **Header** > **Mesh** > **Vertices** > **Shape Propagate**
Apply selected vertex locations to all other shape keys.
3D View > **Edit Mode** > **Header** > **Mesh** > **Vertices** > **Blend From Shape**
Blend in shape from a shape key.

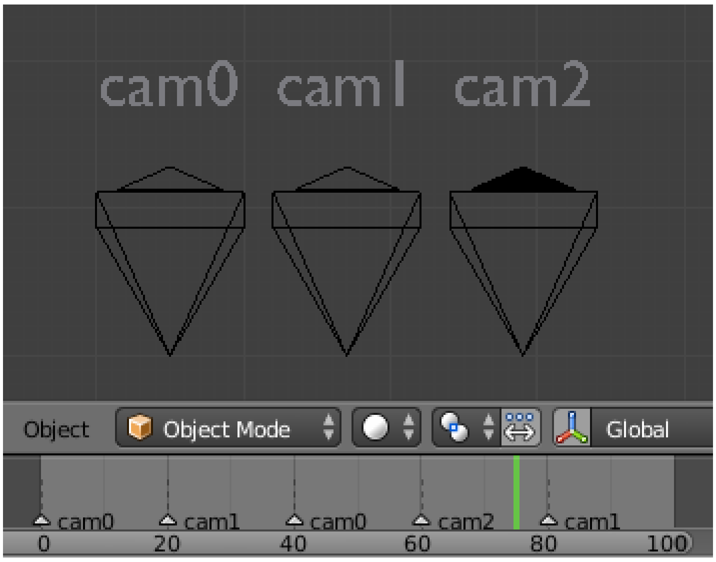
Animating Cameras

These are some basic tools and properties animators may use for the camera.

Switching Cameras

Switching cameras is done with the Timeline operator 'Bind Camera to Markers'.

The triangle above the camera will become shaded when active.



First in the Timeline, add a set of markers used to switch cameras. Press `M` to add marker, then `Ctrl M` to rename, duplicated markers should retain the same name.

1. In the 3D View, select the Camera the Markers will switch to.
2. In the Timeline, select the Marker(s) to switch to the Camera.
3. In the Timeline, press `Ctrl-B` to Bind Cameras to Markers.

Moving Cameras

Move Along a Path

Sometimes its easier to move objects on path, see *Moving Objects on a Path* for more info.

Fly/Walk Modes

Fly/Walk Mode can be used in conjunction with the timeline record option.

To record your flight path as animation curves.

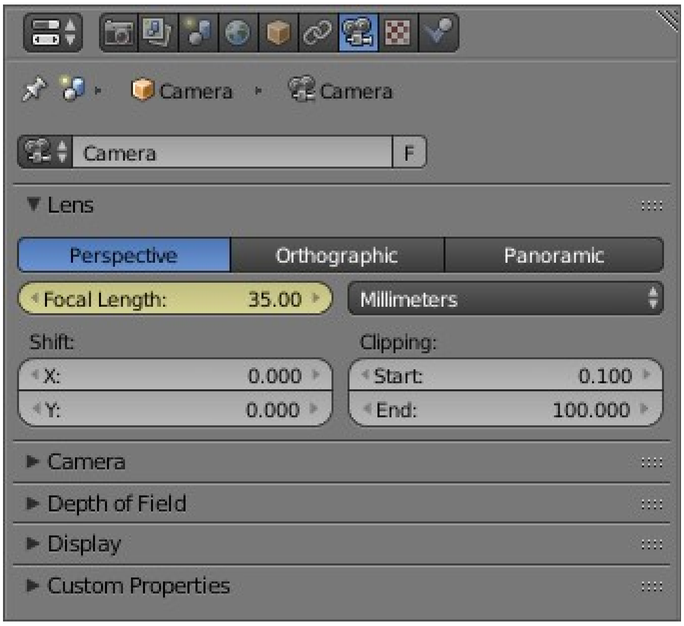
Lock Camera to View

Lock Camera to View can be used in conjunction with the timeline record option.

To record your view-port navigation as animation curves.

Dolly Zoom

The camera has a set of properties and tools via the *Properties Editor.*



While the camera is moving towards an object the *Focal Length* property can be decreased to produce a *Dolly Zoom* camera effect, or vice versa.

Moving Objects on a Path

To make objects move along a path is a very common animation need. Think of a complex camera traveling, a train on his rails - and most other vehicles can also use “invisible” tracks! -, the links of a bicycle chain, etc. All these movements could obviously be done with standard Ipo curves, but this would be a nightmare! It’s much more easy and intuitive to define a path materializing the desired movement, and make your object(s) follow it.

Bforartists features you two different constraints to make an object follow a path, which have different ways to determine/animate the position of their owner along their path.

In Bforartists, any *curve object* can become a path. A curve becomes a path when its *Path Animation* button is enabled in the *Curve* data panel, but you don't even have to bother about this: once a curve is selected as target for a "path" constraint, it automatically is enabled.

You can also directly add a "path" from the Add ‣ Curve ‣ Path menu entry (in a 3D view). This will insert in your scene a *three-dimensional* NURBS curve. This is an important point: by default, Bforartists's curve are *2D* and won't move on the Z axis. To turn a standard curve three-dimensional, enable its *3D* button, in the same *Curve and Surface* editing panel.

One last curve property that is important for a path is its *direction*, which is, for three-dimensional ones, materialized by its small arrows. You can switch it with the Curve ‣ Segments ‣ Switch Direction menu entry (or `W`, `2`).

For more on editing path/curves, see the *modeling chapter.*

> **Note**
>
> Shapes on Curves
>
> If you would rather like to have your object's *shape* follow a path (like e.g. a sheet of paper inside a printer), you should use the *Curve Modifier*

Parenting Method

Older versions of Bforartists did not have constraints to make an object follow a path. They used a different method (deprecated, but still available), based on parenting.

To use this method, select the object that will follow the path, then `Shift` select the curve, and use `Ctrl-P` to bring up the parenting menu. Choose *Follow Path*. The object will now be animated along the path.

The settings for the path animation are in the *Path Animation* panel of the Curve properties panel.

Frames
: Defines the number of frames it takes for the object to travel the path.

Evaluation Time
: Defines current frame of the animation. By default it is linked to the global frame number, but could be keyframed to give more control over the path animation.

Follow
: Causes the curve path children to rotate along the curvature of the path.

Radius
: Causes the curve path child to be scaled by the set curve radius. See *Curve Extruding*

Offset Children
: Causes the animation to be offset by the curve path child's time offset value, which can be found in its *Animation Hacks* section of the *Object Panel*.

The Follow Path Constraint

The *Follow Path* constraint implements the most "classical" technique. By default, the owner object will walk the whole path only once, starting at frame one, and over `100` frames. You can set a different starting frame in the *Offset* field of the constraint panel, and change the length (in frames) of the path using its *Frames* property (*Curve and Surface* panel).

But you can have a much more precise control over your object's movement along its path by keyframing or defining a *Speed* animation curve for the path's *Evaluation Time* attribute. This curve maps the current frame to a position along the path, from `0.0` (start point) to `1.0` (end point).

For more details and examples, see the *Follow Path constraint page*.

The Clamp To Constraint

Another method of keeping objects on a path is to use the *Clamp To* constraint, which implements a more advanced technique. To determine where along the path should lay its owner, its uses the *location of this owner* along a given axis. So to animate the movement of your owner along its target path, you have to animate some way (Ipo curves or other indirect animation) its location.

This implies that here, the length of the path have no more any effect - and that by default, the object is static somewhere on the path!

For more details and examples, see the *Clamp To constraint page*.

9.1 Physics - Collisions

Physics

The Physics chapter covers various advanced Bforartists effects, often used to simulate real physical phenomena, such as:

- Smoke
- Rain
- Dust
- Cloth
- Water
- Jello

Particle Systems can be used to simulate many things: hair, grass, smoke, flocks.

Hair is a subset of the particle system, and can be used for strand-like objects, such as hair, fur, grass, quills, etc.

Soft Bodies are useful for everything that tends to bend, deform, in reaction to forces like gravity or wind, or when colliding with other objects... It can be used for skin, rubber, and even clothes, even though there is separate *Cloth Simulation* specific for cloth-like objects.

Rigid Bodies can simulate dynamic objects that are fairly rigid.

Fluids, which include liquids and gases, can be simulated, including *Smoke*.

Force Fields can modify the behavior of simulations.

Gravity

Gravity is a global setting that is applied the same to all physics systems in a scene, which can be found in the scene tab. This value is generally fine left at its default value, at `-9.810` in the Z axis, which is the force of gravity in the real world. Lowering this value would simulate a lower or higher force of gravity. Gravity denoted g, measurement [$m \times s^{-2}$]).

Gravity is practically same around whole **Earth**. For rendering scenes from **Moon** use value 6 times smaller, e.g. `1.622` $m \times s^{-2}$. The most popular and probably not colonized **Mars** has `g = 3.69`.

Note that you can scale down the gravity value per physics system in the *Field Weights tab.*

Collisions

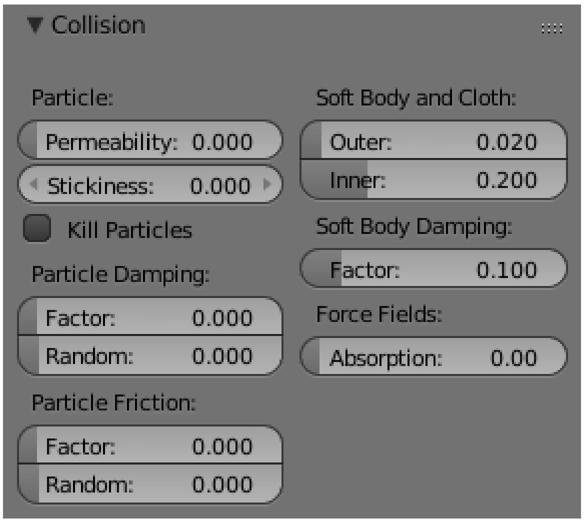
Particles, *Soft Bodies* and *Cloth objects* may collide with mesh objects. *Boids* try to avoid *Collision* objects.

- The objects need to share at least one common layer to have effect.
- You may limit the effect on particles to a group of objects (in the *Field Weights panel*).
- *Deflection* for softbody objects is difficult, they often penetrate the colliding objects.
- Hair particles ignore deflecting objects (but you can animate them as softbodies which take deflection into account).

If you change the deflection settings for an object you have to recalculate the particle, softbody or cloth system (*Free Cache*), this is not done automatically. You can clear the cache for all selected objects with `Ctrl-B` –> *Free cache selected*.

Reference
Mode: *Object* Mode Panel: *Object* context –> *Physics* sub-context –> *Collision*

Options



Collision Panel

Permeability
: Fraction of particles passing through the mesh.

Stickiness
: How much particles stick to the object.

Kill Particles
: Deletes Particles upon impact.

Damping Factor
: Damping during a collision (independent of the velocity of the particles).

Random damping
: Random variation of damping.

Friction Factor

Friction during movements along the surface.

Random friction

Random variation of friction.

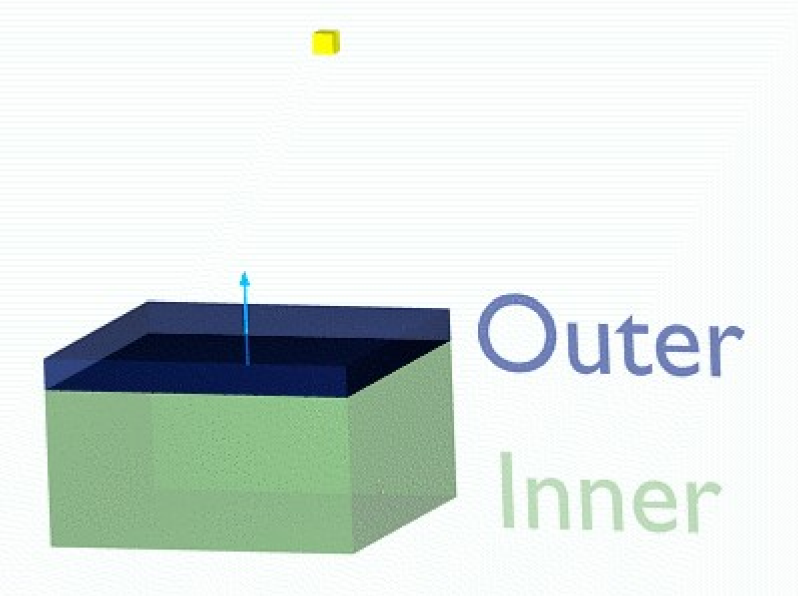


Image 1b: A softbody vertex colliding with a plane.

Soft Body and Cloth Interaction

Outer

Size of the outer collision zone.

Inner

Size of the inner collision zone (padding distance).

Outside and inside is defined by the face normal, depicted as blue arrow in (*Image 1b*).

Damping Factor

Damping during a collision.

Softbody collisions are difficult to get perfect. If one of the objects move too fast, the soft body will penetrate the mesh. See also the section about *Soft Bodies*.

Force Field Interaction

Absorption

A deflector can also deflect effectors. You can specify some collision/deflector objects which deflect a specific portion of the effector force using the *Absorption* value. 100% absorption results in no force getting through the collision/deflector object at all. If you have 3 collision object behind each other with e.g. 10%, 43% and 3%, the absorption ends up at around 50% (`100×(1-0.1)×(1-0.43)×(1-0.03)`).

Examples

Deflected Particles

Here is a *Meta* object, dupliverted to a particle system emitting downwards, and deflected by a mesh cube:

Hints

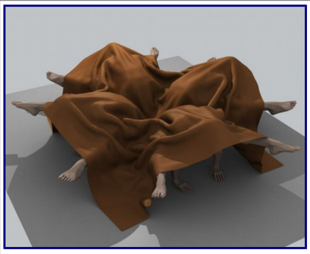
- Make sure that the normals of the mesh surface are facing towards the particles/points for correct deflection.
- Hair particles react directly to force fields, so if you use a force field with a short range you don’t need necessarily collision.
- Hair particles avoid their emitting mesh if you edit them in *Particle* mode. So you can at least model the hair with collision.

9.2 Physics - Cloth Simulations

Cloth Simulations

Cloth simulation is one of the hardest aspects of CG, because it is a deceptively simple real-world item that is taken for granted, yet actually has very complex internal and environmental interactions. After years of development, Bforartists has a very robust cloth simulator that is used to make clothing, flags, banners, and so on. Cloth interacts with and is affected by other moving objects, the wind and other forces, as well as a general aerodynamic model, all of which is under your control.


Cloth Example


Cloth on carved wooden


Cloth Example

	men (made by motorsep).	

Description

A piece of cloth is any mesh, open or enclosed, that has been designated as cloth. The *Cloth* panels are located in the *Physics* sub-context and consist of three panels of options. Cloth is either an open or closed mesh and is mass-less, in that all cloth is assumed to have the same density, or mass per square unit.

Cloth is commonly modeled as a mesh grid primitive, or a cube, but can also be, for example, a teddy bear. However, Bforartists's *Softbody system* provides better simulation of closed meshes; Cloth is a specialized simulation of fabrics.

Once the object is designated as Cloth, a Cloth *modifier* will be added to the object's modifier stack automatically. As a *modifier* then, it can interact with other modifiers, such as *Armature* and *Smooth*. In these cases, the ultimate shape of the mesh is computed in accordance with the order of the modifier stack. For example, you should smooth the cloth *after* the modifier computes the shape of the cloth.

So you edit the Cloth settings in two places: use the Physics buttons to edit the properties of the cloth and use the Modifier stack to edit the Modifier properties related to display and interaction with other modifiers.

You can *Apply* the cloth modifier to freeze, or lock in, the shape of the mesh at that frame, which removes the modifier. For example, you can drape a flat cloth over a table, let the simulation run, and then apply the modifier. In this sense, you are using the simulator to save yourself a lot of modeling time.

Results of the simulation are saved in a cache, so that the shape of the mesh, once calculated for a frame in an animation, does not have to be recomputed again. If changes to the simulation are made, you have full control over clearing the cache and re-running the simulation. Running the simulation for the first time is fully automatic and no baking or separate step interrupts the workflow.

Computation of the shape of the cloth at every frame is automatic and done in the background; thus you can continue working while the simulation is computed. However it is CPU-intensive and depending on the power of your PC and the complexity of the simulation, the amount of CPU needed to compute the mesh varies, as does the lag you might notice.

Note

Don't jump ahead

If you set up a cloth simulation but Bforartists has not computed the shapes for the duration of the simulation, and if you jump ahead a lot of frames forward in your animation, the cloth simulator may not be able to compute or show you an accurate mesh shape for that frame, if it has not previously computed the shape for the previous frame(s).

Workflow

A general process for working with cloth is to:

- Model the cloth object as a general starting shape.
- Designate the object as a "cloth" in the *Physics* tab of the *Properties* window.

- Model other deflection objects that will interact with the cloth. Ensure the Deflection modifier is last on the modifier stack, after any other mesh deforming modifiers.
- Light the cloth and assign materials and textures, UV-unwrapping if desired.
- If desired, give the object particles, such as steam coming off the surface.
- Run the simulation and adjust Options to obtain satisfactory results. The timeline window's VCR controls are great for this step.
- Optionally age the mesh to some point in the simulation to obtain a new default starting shape.
- Make minor edits to the mesh on a frame-by-frame basis to correct minor tears.

Tip

To avoid unstable simulation, ensure that the cloth object doesn't penetrate any of the deflection objects or an unstable simulation will result.

Cloth Panel

Presets
: Contains a number of preset cloth examples, and allows you to add your own.

Quality
: Set the number of simulation steps per frame. Higher values result in better quality, but is slower.

Material

Mass
: The mass of the cloth material.

Structural
: Overall stiffness of the cloth.

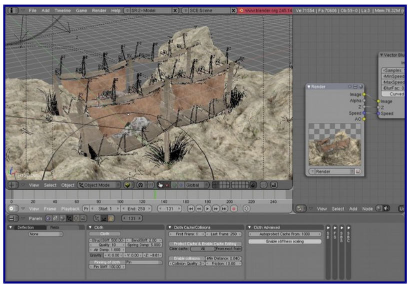
Bending
: Wrinkle coefficient. Higher creates more large folds.

Damping

Spring
: Damping of cloth velocity. Higher = more smooth, less jiggling.

Air
: Air normally has some thickness which slows falling things down.

Pinning



Cloth in action.

The first thing you need when pinning cloth is a *Vertex Group*. There are several ways of doing this including using the Weight Paint tool to paint the areas you want to pin (see the Weight Paint section of the manual). The weight of each vertex in the group controls how strongly it is pinned.

Once you have a vertex group set, things are pretty straightforward; all you have to do is press the *Pinning of cloth* button in the *Cloth* panel and select which vertex group you want to use, and the stiffness you want it at.

Stiffness
Target position stiffness. You can leave the stiffness as it is; the default value of 1 is fine.

Pinning Clothing To An Armature

Clothing can be simulated and pinned to an armature. For example, a character could have a baggy tunic pinned to the character's waist with a belt.

The typical workflow for pinning:

- Set the armature to its bind pose.
- Model clothing that encloses but does not penetrate the character's mesh.
- Parent the clothing objects to the armature. The armature will now have several child meshes bound to it.
- Create a new vertex group on each cloth object for its pinned vertices
- Add vertexes to be pinned to this vertex group and give these vertices non-zero weights (you probably want weight = 1). For example the belt area of the tunic would be in the vertex group and have weight one.
- Designate the clothing objects as "cloth" in the Physics tab of the Properties window. Make sure the *Cloth* modifier is below the *Armature* modifier in the modifier stack.
- press the *Pinning of Cloth* button in the *Cloth* panel and select the vertex group.
- Designate the character's mesh as "collision" object in the Physics tab of the Properties window.
- The clothing is now ready. Non-pinned vertices will be under control of the Cloth modifier. Pinned vertices will be under control of the Armature modifier.

Note
When animating or posing the character you must begin from the bind pose. Move the character to its initial pose over several frames so the physics engine can simulate the clothing moving. Very fast movements and teleport jumps can break the physics simulation.

Cloth Sewing Springs

Another method of restraining cloth similar to pinning is sewing springs. Sewing springs are virtual springs that pull vertices in one part of a cloth mesh toward vertices in another part of the cloth mesh. This is different from pinning which binds vertices of the cloth mesh in place or to another object. A clasp on a cloak could be created with a sewing spring. The spring could pull two corners of a cloak about a character’s neck. This could result in a more realistic simulation than pinning the cloak to the character’s neck since the cloak would be free to slide about the character’s neck and shoulders.

Sewing springs are created by adding extra edges to a cloth mesh. These extra edges do not need to be included in faces. They should connect vertices in the mesh that should be pulled together. For example the corners of a cloak. The vertexes of these extra edges are added to a vertex group.

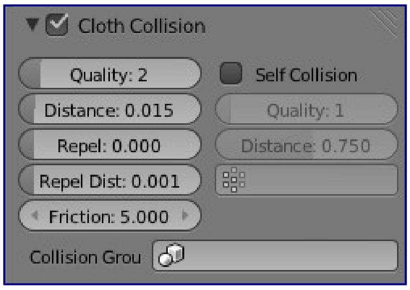
Enable the *Cloth Sewing Springs* panel and select the vertex group. Give the springs a non-zero force value and your cloth is ready to simulate.

Collisions

In most cases, a piece of cloth does not just hang there in 3D space, it collides with other objects in the environment. To ensure proper simulation, there are several items that have to be set up and working together:

- The *Cloth* object must be told to participate in *Collision* s.
- Optionally (but recommended) tell the cloth to collide with itself.
- Other objects must be visible to the *Cloth* object *via* shared layers.
- The other objects must be mesh objects.
- The other objects may move or be themselves deformed by other objects (like an armature or shape key).
- The other mesh objects must be told to deflect the cloth object.
- The blend file must be saved in a directory so that simulation results can be saved.
- You then *Bake* the simulation. The simulator computes the shape of the cloth for a frame range.
- You can then edit the simulation results, or make adjustments to the cloth mesh, at specific frames.
- You can make adjustments to the environment or deforming objects, and then re-run the cloth simulation from the current frame forward.

Collision Settings



Cloth Collisions panel.

Now you must tell the *Cloth* object that you want it to participate in collisions. For the cloth object, locate the

Cloth Collision panel, shown to the right:

Enable Collisions
: `LMB` click this to tell the cloth object that it needs to move out of the way.

Quality
: A general setting for how fine and good a simulation you wish. Higher numbers take more time but ensure less tears and penetrations through the cloth.

Distance
: As another object gets this close to it (in Bforartists Units), the simulation will start to push the cloth out of the way.

Repel
: Repulsion force to apply when cloth is close to colliding.

Repel Distance
: Maximum distance to apply repulsion force. Must be greater than minimum distance.

Friction
: A coefficient for how slippery the cloth is when it collides with the mesh object. For example, silk has a lower coefficient of friction than cotton.

Self-collisions

Real cloth cannot permeate itself, so you normally want the cloth to self-collide.

Enable Self Collisions
: Click this to tell the cloth object that it should not penetrate itself. This adds to simulation compute time, but provides more realistic results. A flag, viewed from a distance does not need this enabled, but a close-up of a cape or blouse on a character should have this enabled.

Quality
: For higher self-collision quality just increase the *Quality* and more self collision layers can be solved. Just keep in mind that you need to have at least the same *Collision Quality* value as the *Quality* value.

Distance
: If you encounter problems, you could also change the *Min Distance* value for the self-collisions. The best value is 0.75; for fast things you better take 1.0. The value 0.5 is quite risky (most likely many penetrations) but also gives some speedup.

Regression blend file: Cloth selfcollisions.

Shared Layers

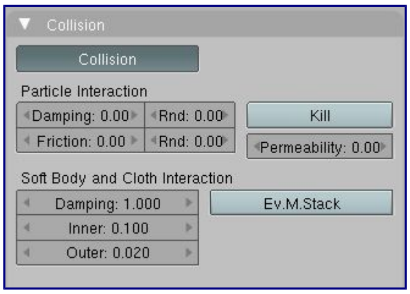
Suppose you have two objects: a pair of Pants on layers 2 and 3, and your Character mesh on layers 1 and 2. You have enabled the Pants as cloth as described above. You must now make the Character “visible” to the Cloth object, so that as your character bends its leg, it will push the cloth. This principle is the same for all simulations; simulations only interact with objects on a shared layer. In this example, both objects share layer 2.

To view/change an object’s layers, `RMB` click to select the object in *Object* mode in the 3D view. `M` to bring up the “Move Layers” pop-up, which shows you all the layers that the object is on. To put the object on a single layer, `LMB` click the layer button. To put the object on multiple layers, `Shift-LMB` the layer buttons. To remove an object from a selected layer, simply `Shift-LMB` the layer button again to toggle it.

Mesh Objects Collide

If your colliding object is not a mesh object, such as a NURBS surface, or text object, you must convert it to a mesh object. To do so, select the object in object mode, and in the 3D View header, select *Object –> Convert Object Type* (`Alt-C`), and select *Mesh* from the pop-up menu.

Cloth - Object collisions



Collision settings.

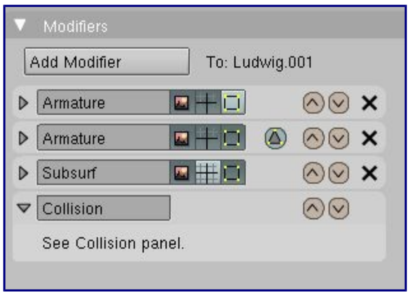
The cloth object needs to be deflected by some other object. To deflect a cloth, the object must be enabled as an object that collides with the cloth object. To enable Cloth - Object collisions, you have to enable deflections on the collision object (not on the cloth object).

In the *Buttons* window, *Object* context, *Physics* sub-context, locate the *Collision* panel shown to the right. It is also important to note that this collision panel is used to tell all simulations that this object is to participate in colliding/deflecting other objects on a shared layer (particles, soft bodies, and cloth).

Warning

There are three different *Collision* panels, all found in the *Physics* sub-context. The first (by default), a tab beside the *Fields* panel, is the one needed here. The second panel, a tab in the *Soft Body* group, concern softbodies (and so has nothing to do with cloth). And we have already seen the last one, by default a tab beside the *Cloth* panel.

Mesh Object Modifier Stack



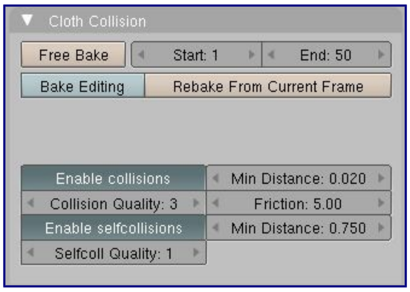
Collision stack.

The object's shape deforms the cloth, so the cloth simulation must know the "true" shape of that mesh object at that frame. This true shape is the basis shape as modified by shape keys or armatures. Therefore, the *Collision* modifier must be **after** any of those. The image to the right shows the *Modifiers* panel for the Character mesh object (not the cloth object).

Cloth Cache

Cache settings for cloth are the same as with other dynamic systems. See *Particle Cache* for details.

Bake Collision



After Baking.

After you have set up the deflection mesh for the frame range you intend to run the simulation (including animating that mesh *via* armatures), you can now tell the cloth simulation to compute (and avoid) collisions. Select the cloth object and in the *Object* context, *Physics* sub-context, set the *Start* and *End* settings for the simulation frames you wish to compute, and click the *Bake* button.

You cannot change *Start* or *End* without clearing the bake simulation. When the simulation has finished, you will notice you have the option to free the bake, edit the bake and re-bake:

There's a few things you'll probably notice right away. First, it will bake significantly slower than before, and it will probably clip through the box pretty badly as in the picture on the right.

Editing the cached simulation

The cache contains the shape of the mesh at each frame. You can edit the cached simulation, after you've baked the simulation and pressed the *Bake Editing* button. Just go to the frame you want to fix and `Tab` into *Edit mode*. There you can move your vertices using all of Bforartists's mesh shaping tools. When you exit, the shape of the mesh will be recorded for that frame of the animation. If you want Bforartists to resume the simulation using the new shape going forward, `LMB` click *Rebake from next Frame* and play the animation. Bforartists will then pick up with that shape and resume the simulation.

Edit the mesh to correct minor tears and places where the colliding object has punctured the cloth.

If you add, delete, extrude, or remove vertices in the mesh, Bforartists will take the new mesh as the starting shape of the mesh back to the *first frame* of the animation, replacing the original shape you started with, up to the frame you were on when you edited the mesh. Therefore, if you change the content of a mesh, when you `Tab` out of *Edit mode*, you should unprotect and clear the cache so that Bforartists will make a consistent simulation.

Troubleshooting

If you encounter some problems with collision detection, there are two ways to fix them:

- The fastest solution is to increase the *Min Distance* setting under the *Cloth Collision* panel. This will be the fastest way to fix the clipping; however, it will be less accurate and won't look as good. Using this method tends to make it look like the cloth is resting on air, and gives it a very rounded look.
- A second method is to increase the *Quality* (in the first *Cloth* panel). This results in smaller steps for the simulator and therefore to a higher probability that fast-moving collisions get caught. You can also increase the *Collision Quality* to perform more iterations to get collisions solved.

- If none of the methods help, you can easily edit the cached/baked result in *Edit mode* afterwards.
- My Cloth is torn by the deforming mesh - he “Hulks Out”: Increase its structural stiffness (*StructStiff* setting, *Cloth* panel), very high, like 1000.

Note

Subsurf Modifier

A bake/cache is done for every subsurf level so please use **the equal** subsurf level for render and preview.

Examples

To start with cloth, the first thing you need, of course, is some fabric. So, let’s delete the default cube and add a plane. I scaled mine up along the Y axis, but you don’t have to do this. In order to get some good floppy and flexible fabric, you’ll need to subdivide it several times. I did it 8 times for this example. So `Tab` into *Edit mode*, and press `W` –> *Subdivide multi*, and set it to 8.

Now, we’ll make this cloth by going to the *Object* context –> *Physics* sub-context. Scroll down until you see the *Cloth* panel, and press the *Cloth* button. Now, a lot of settings will appear, most of which we’ll ignore for now.

That’s all you need to do to set your cloth up for animating, but if you press `Alt-A`, your lovely fabric will just drop very un-spectacularly. That’s what we’ll cover in the next two sections about pinning and colliding.

Using Simulation to Shape/Sculpt a Mesh

You can *Apply* the *Cloth* modifier at any point to freeze the mesh in position at that frame. You can then re-enable the cloth, setting the start and end frames from which to run the simulation forward.

Another example of aging is a flag. Define the flag as a simple grid shape and pin the edge against the flagpole. Simulate for 50 frames or so, and the flag will drop to its “rest” position. Apply the *Cloth* modifier. If you want the flag to flap or otherwise move in the scene, re-enable it for the frame range when it is in camera view.

Smoothing of Cloth

Now, if you followed this from the previous section, your cloth is probably looking a little blocky. In order to make it look nice and smooth like the picture you need to apply a *Smooth* and/or *Subsurf* modifier in the *Modifiers* panel under the *Editing* context. Then, in the same context, find the *Links and Materials* panel (the same one you used for vertex groups) and press *Set Smooth*.

Now, if you press `Alt-A`, things are starting to look pretty nice, don’t you think?

Cloth on armature

Cloth deformed by armature and also respecting an additional collision object: Regression blend file.

Cloth with animated vertex groups

Cloth with animated pinned vertices: Regression blend file. UNSUPPORTED: Starting with a goal of 0 and increasing it, but still having the vertex not pinned will not work (e.g. from goal = 0 to goal = 0.5).

Cloth with Dynamic Paint

Cloth with Dynamic Paint using animated vertex groups: Regression blend file. UNSUPPORTED: Starting with a goal of 0 and increasing it, but still having the vertex not pinned will not work (e.g. from goal = 0 to goal = 0.5) because the necessary "goal springs" cannot be generated on the fly.

Using Cloth for Softbodies

Using cloth for softbodies.

Cloth can also be used to simulate softbodies. It's for sure not its main purpose but it works nonetheless. The example image uses standard *Rubber* material, no fancy settings, just `Alt-A`.

Blend file for the example image: Using Cloth for softbodies.

Cloth with Wind

Flag with wind applied.

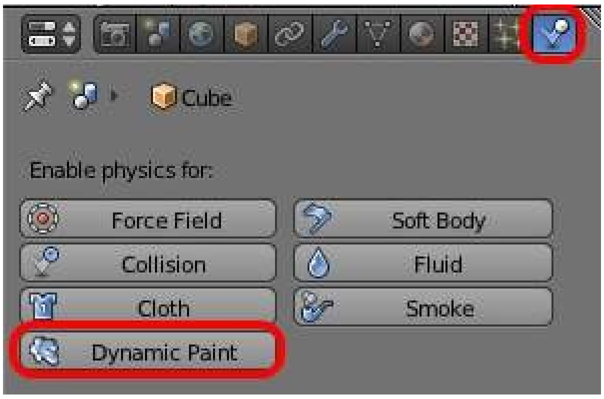
Regression blend file for Cloth with wind and self collisions (also the blend for the image above): Cloth flag with wind and selfcollisions.

9.3 Physics - Dynamic Paint

Dynamic Paint

Dynamic paint is a new modifier and physics system that can turn objects into paint canvases and brushes, creating vertex colors, image sequences or displacement. This makes many effects possible that were previously difficult to achieve, for example footsteps in the snow, raindrops that make the ground wet, paint that sticks to walls, or objects that gradually freeze.

This guide explains the very basics of Dynamic Paint user interface and general features.



How to activate the Dynamic Paint

Activating the modifier

Dynamic Paint can be activated from the “Physics” tab of the “Properties” editor.

Types

Modifier itself has two different types:

Canvas
Makes object receive paint from Dynamic Paint brushes.
Brush
Makes object apply paint on the canvas.

Note

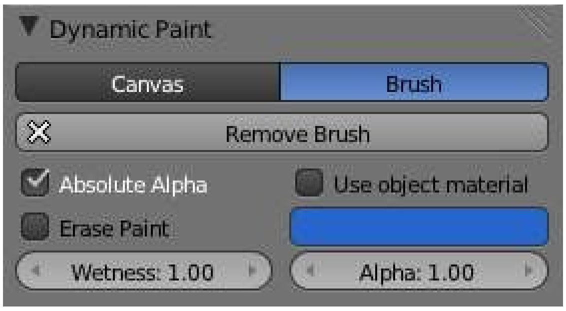
You can also enable brush and canvas simultaneously. In that case same object's "brush" doesn't influence it's "canvas", but can still interact with other objects in the scene.

See also

- A step-by step introduction
- A detailed guide that covers every setting with images and examples (Currently not up-to-date)

Dynamic Paint Brush

Main Panel



Brush main panel

From the first brush panel you can define how brush affects canvas color surfaces.

Absolute Alpha
This setting limits brush alpha influence. Without it, brush is "added" on surface over and over again each frame, increasing alpha and therefore influence of brush on canvas. In many cases however, it's preferred to not increase brush alpha if it already is on brushes level.
Erase Paint
Makes brush dissolve exiting paint instead of adding it.
Wetness
Defines how "wet" new paint is. Wetness is visible on "Paint" surface "wetmap". Speed of "Drip" and "Spread" effects also depends on how wet the paint is.
Use object material

When enabled, you can define a material to be used as brush color. This includes material's base color and all textures linked to it, eventually matching the rendered diffuse color. This setting is only available when using "Bforartists Internal" renderer at the moment.

Otherwise you can define a color for the brush from the color box below.

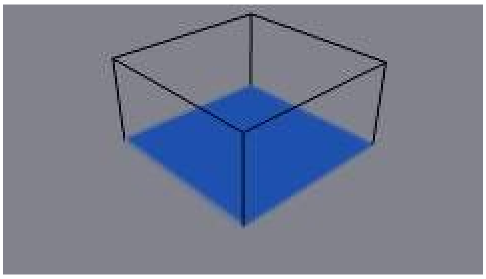
Alpha
Defines brush alpha or visibility. Final wetness is also affected by alpha.

Source Panel

Brush source panel

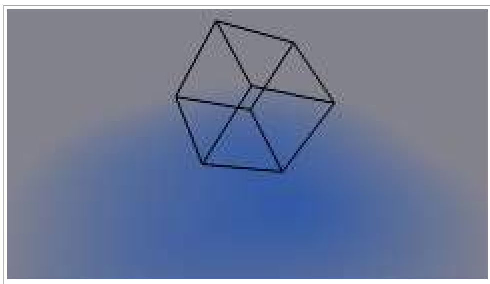
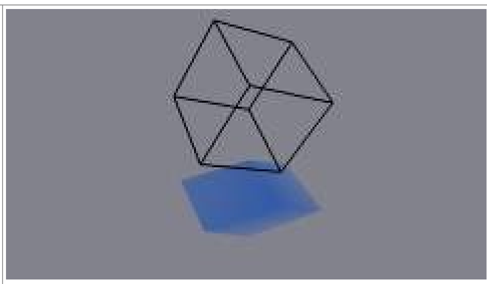
Brush "Source" setting lets you define how brush influence/intersection is defined.

There are currently five brush behavior types to choose from, each having individual settings for further tweaking:



Brush Source - Volume

Mesh Volume
This the default option. Brush affects all surface point inside the mesh volume.

	
Brush Source - Proximity. Brush affects all canvas pixels around it	"Project" setting enabled. See how brush only affects canvas in normal direction

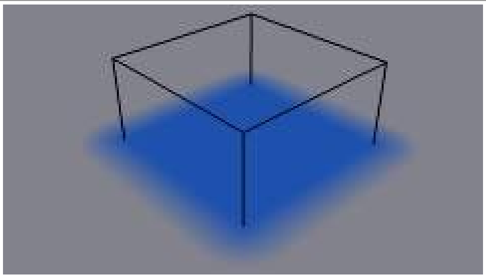
Proximity

Only uses defined distance to the closest point on brush mesh surface. Note that inside of the volume is not necessarily affected because it’s not close to the surface.

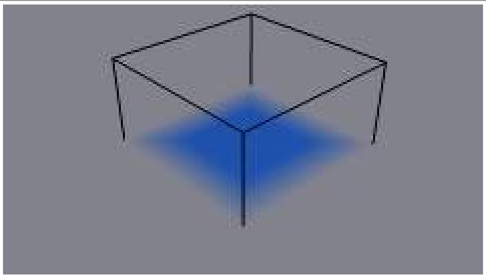
Proximity falloff type can be “Smooth”, “Sharp” or tweaked with a color ramp.

Project

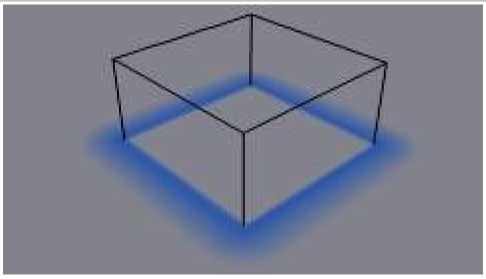
Projects brush to the canvas from a defined direction. Basically this can be considered as “direction aligned” proximity.



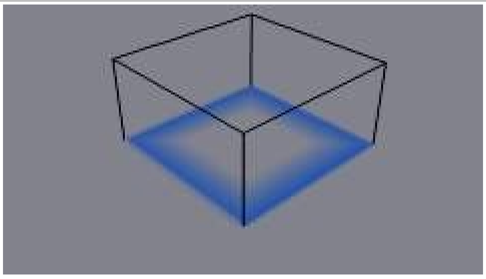
“Volume + Proximity” brush with no additional settings



Inner Proximity. Proximity falloff is now visible inside the volume



Negate Volume. Inner side of the volume has become completely transparent



Inner Proximity and Negate Volume enabled together

Mesh Volume + Proximity

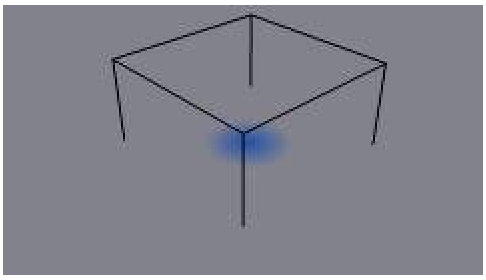
Same as volume type, but also has influence over defined distance. Same falloff types as for “Proximity” type are available.

Inner Proximity

Applies proximity inside the mesh volume.

Negate Volume

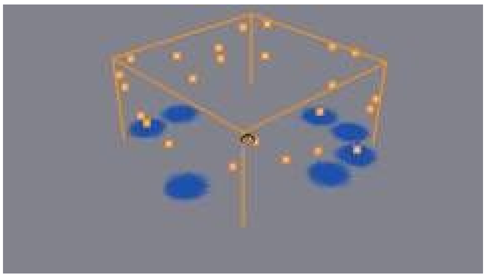
Negates brush alpha within mesh volume.



Brush Source - Object Center

Object Center

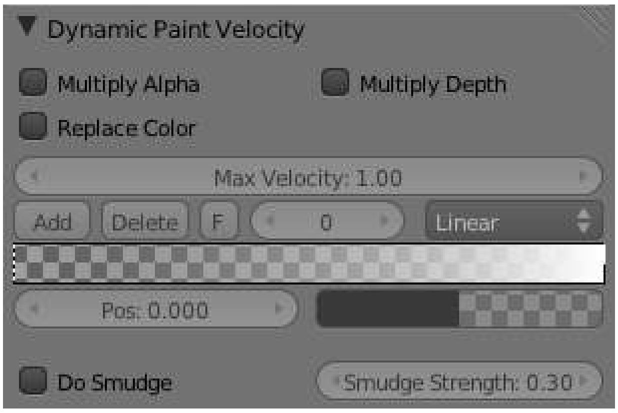
Instead of calculating proximity to the brush object mesh, which can be quite slow in some cases, only distance to only center is calculated. This is much faster and often good enough.



Brush Source - Particle System

Particle System
Brush influence is defined by particles from a selected particle system.

Velocity Panel



Velocity panel

This panel shows brush options that are based on object velocity.

On top you have a color ramp and several related settings. Basically the color ramp represents brush velocity values: left side being zero velocity and right side being the "Max velocity". Speed is measured in "Bforartists units per frame".

Tick boxes above can be used to define color ramp influence.

Multiply Alpha
Uses color ramp's alpha value depending on current velocity and multiplies brush alpha with it.

Replace Color
Replaces the brush color with the ramp color.

Multiply Depth
Multiplies brushes "depth intersection" effect. Basically you can adjust displace and wave strength depending on brush speed.

Smudge settings

Enabling Smudge makes the brush "smudge" (or "smear") existing colors on the surface as it moves. The strength of this effect can be defined from the "Smudge Strength" property.

Even when smudge is enabled brush still does it's normal paint effect. If you want a purely smudging brush use zero alpha. It's also possible to have "Erase" option enabled together with smudge.

Waves Panel

Brush Waves panel

This panel is used to adjust brush influence to “Wave” surfaces.

You can use “Wave Type” menu to select what effect this brush has on the wave simulation. Below are two settings for further adjustments.

Factor
: Adjusts how strongly brush “depth” affects the simulation. You can also use negative values to make brush pull water up instead of down.

Clamp Waves
: In some cases the brush goes very deep inside the surface messing whole simulation up. You can use this setting to “limit” influence to only certain depth.

There are four “Wave Type” options available:

Depth Change

This option makes brush create waves when the intersection depth with the surface is *changed* on that point. If the brush remains still it won’t have influence.

Using a negative “Factor” with this type can create a nice looking “wake” for moving objects like ships.

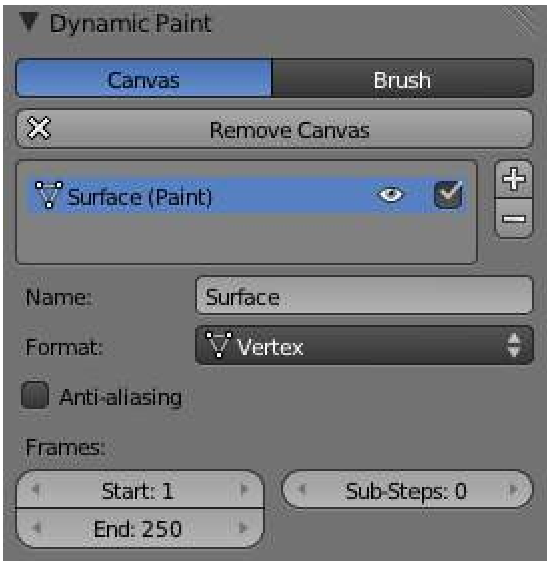
Obstacle
: Constantly affects surface whenever intersecting. Waves are also reflected off this brush type. However, due the nature of wave simulation algorithm this type creates an unnatural “dent” in the surface if brush remains still.

Force
: Directly affects the velocity of wave motion. Therefore the effect isn’t one to one with brush intersection depth, yet the force strength depends on it.

Reflect Only
: This type has no visible effect on the surface alone but reflects waves that are already on the surface.

Dynamic Paint Canvas

Main Panel



Canvas main panel

The first panel of canvas contains the list of Dynamic Paint surfaces. These surfaces are basically layers of paint, that work independently from each other. You can define individual settings for them and bake them separately.

If surface type/format allows previewing results in 3D-viewport, an eye icon is visible to toggle preview.

The checkbox toggles whether surface is active at all. If not selected, no calculations or previews are done.

You can also give each surface an unique name to easily identify them.

Below you can set surface type and adjust quality and timing settings.

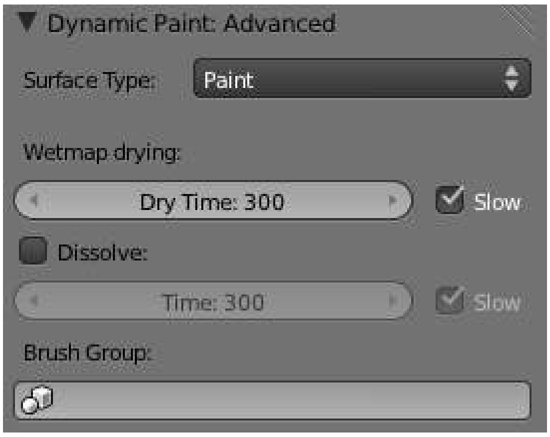
Each surface has a certain format and type. Format determines how data is stored and outputted. Currently there are two formats available:

- Image Sequences. Dynamic Paint generates UV wrapped image files of defined resolution as output.
- Vertex. Dynamic Paint operates directly on mesh vertex data. Results are stored by point cache and can be displayed in viewports. However, using vertex level also requires a highly subdivided mesh to work.

From quality settings you can adjust image resolution (for image sequences) and anti-aliasing.

Then you can define surface processing start and end frame, and number of used sub-steps. Sub-steps are extra samples between frames, usually required when there is a very fast brush.

Advanced Panel



Canvas advanced panel

From “Advanced” panel you can adjust surface type and related settings.

Each surface has a “type” that defines what surface is used for. Available types are:

- Paint
- Displace
- Waves
- Weight

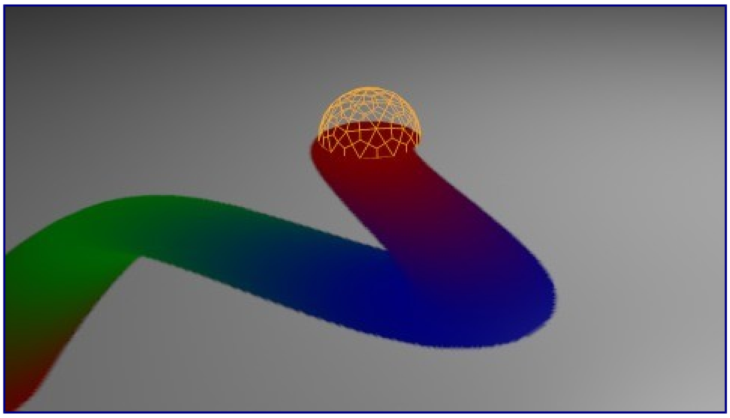
Common options

For each surface type there are special settings to adjust. Most types have the settings *Dissolve* and *Brush* :

Dissolve
: used to make the surface smoothly return to its original state during a defined time period

Brush Group
: used to define a specific object group to pick brush objects from

Paint

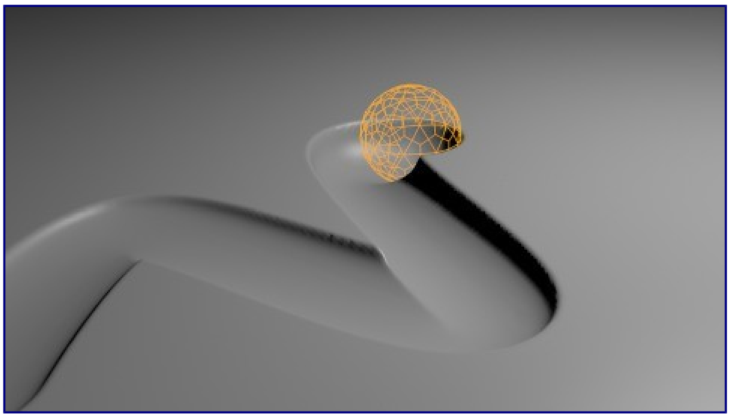


Paint Surface

“Paint” is the basic surface type that outputs color and wetness values. In case of vertex surfaces results are outputted as vertex colors.

Wetmap is a black-and-white output that visualizes paint wetness. White being maximum wetness, black being completely dry. It is usually used as mask for rendering. Some “paint effects” affect wet paint only.

Displace

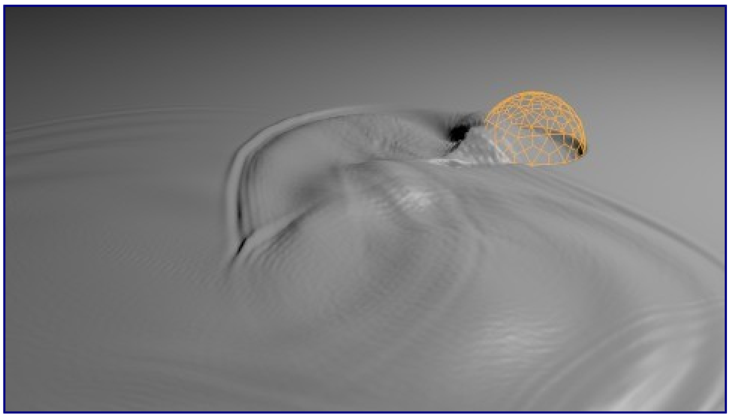


Displace Surface

This type of surface outputs intersection depth from brush objects.

Tip
If the displace output seems too rough it usually helps to add a “Smooth” modifier after Dynamic Paint in the modifier stack.

Waves



Waves Surface

This surface type produces simulated wave motion. Like displace, wave surface also uses brush intersection depth to define brush strength.

You can use following settings to adjust the motion:

Open Borders
: Allows waves to pass through mesh “edges” instead of reflecting from them.

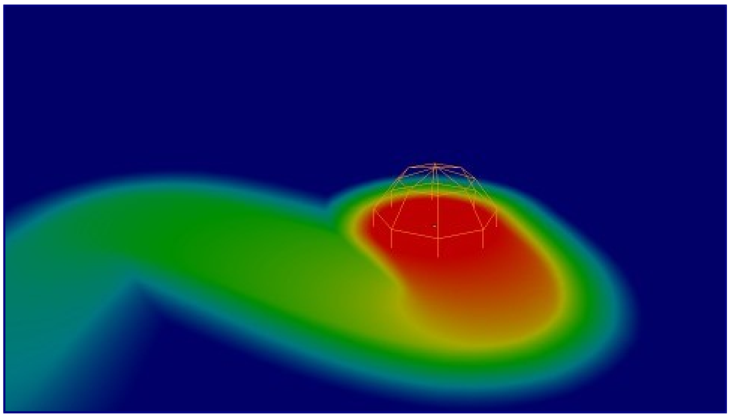
Timescale
: Directly adjusts simulation speed without affecting simulation outcome. Lower values make simulation go slower and otherwise.

Speed
: Affects how fast waves travel on the surface. This setting is also corresponds to the size of the simulation. Half the speed equals surface double as large.

Damping
Reduces the wave strength over time. Basically adjusts how fast wave disappears.
Spring
Adjusts the force that pulls water back to “zero level”.

Tip
In some cases the wave motion gets very unstable around brush. It usually helps to reduce wave speed, brush “wave factor” or even the resolution of mesh/surface.

Weight



Weight Surface

This is a special surface type only available for vertex format. It outputs vertex weight groups that can be used by other Bforartists modifiers and tools.

Tip
It’s usually preferred to use “proximity” based brushes for weight surfaces to allow smooth falloff between weight values.

Output Panel

Canvas output panel

From “Output” panel you can adjust how surface outputs its results.

For “Vertex” format surfaces, you can select a mesh data layer (color / weight depending on surface type) to generate results to. You can use the “+”/”-” icons to add/remove a data layers of given name. If layer with given name isn’t found, it’s shown as red.

For “Image Sequence” surfaces, you can define used “UV Layer” and output file saving directory, filenames and image format.

Effects Panel

Canvas effects panel

This is a special feature for “Paint” type surface. It generates animated movement on canvas surface.

Effects:

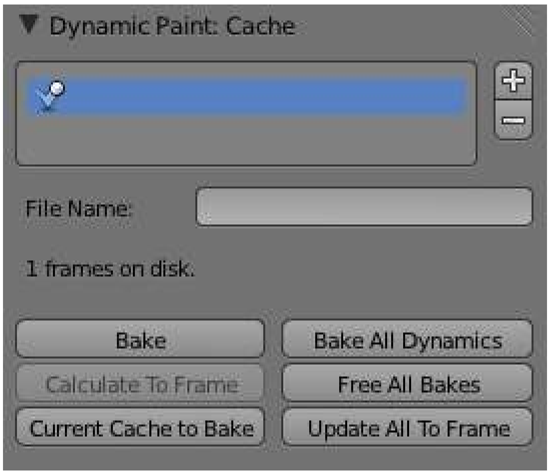
Spread
: Paint slowly spreads to surrounding points eventually filling all connected areas.

Drip
: Paint moves in specific direction specified by Bforartists force fields, gravity and velocity with user defined influences.

Shrink
: Painted area slowly shrinks until disappears completely.

For spread and drip effects, only “wet paint” is affected, so as the paint dries, movement becomes slower until it stops.

Cache Panel



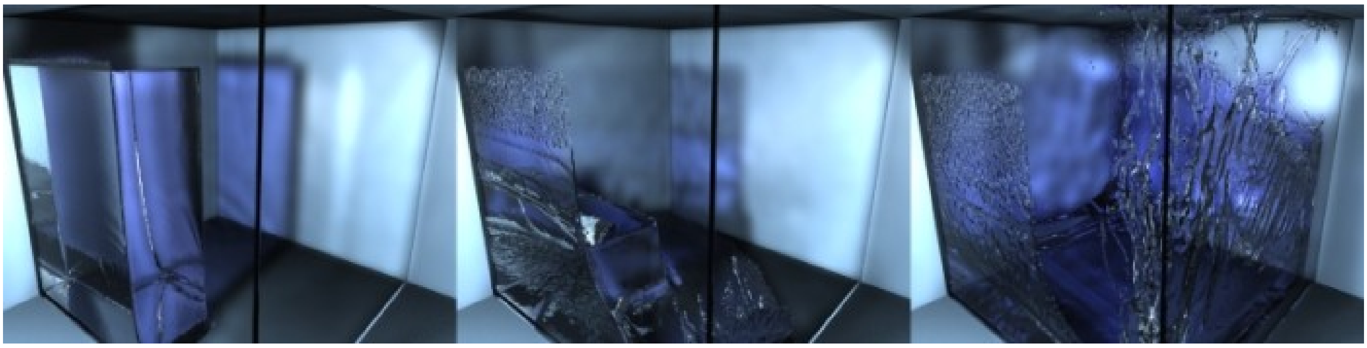
Canvas cache panel

This panel is currently only visible for “vertex” format surfaces. You can use it to adjust and bake point cache.

9.4 Physics - Fluid Simulation

Fluid Simulation

Fluid physics are used to simulate physical properties of liquids especially water. While creating a scene in Bforartists, certain objects can be marked to participate in the fluid simulation. These can include but not limited to, being a fluid or as an obstacle. For a fluid simulation you have to have a domain to define the space that the simulation takes up. In the domain settings you will be be able to define the global simulation parameters (such as viscosity and gravity).



Example of Fluid Simulation

Workflow

In general, you follow these steps:

- First you want to set the *simulation domain*,
- Next set the *fluid source(s)*, and specify there physical properties,
- In some cases you may want to set other objects to *Control the Flow* of the fluid,
- You can also depending on your scene add other objects related to the fluid, like:
  - *Obstacles*,
  - *Particles* floating on the fluid,
- And lastly you must *Bake the Simulation*.

Tip

Baking is done on the Domain object!

When you calculate the fluid simulation, you bake the simulation on the domain object.

For this reason:

- All the baking options are visible only when selecting the Domain Object,
- Baking options are explained in the the baking section of the Domain manual page.

See also

To know more about simulating fluids in Bforartists you can read the *fluids appendix*. Their you can find the limitations and workarounds, and some additional links.

Fluid Types

Common Options

Animated Mesh/Export

Click this button if the network is animated (eg . Deformed by an armature , shape keys (shape keys) or lattice). It can become very slow and is not necessary if the network is animated IPO position and rotation (ie only object transformations).

Volume Initialization Type

A common option amoung the different fluid types is *Volume Initialization*.

Volume

The inside of the object is initialized as fluid all . This works only if the closed mesh .

Shell

It is initialized as a thin fluid layer of the surface of the mesh . This can also be used in the mesh open.

Both

It is a state , such as the sum of the Volume and Shell. This also must be a closed mesh.

Example of different types of initiation of volume

Fluid Domain

The Domain Object

The bounding box of the object serves as the boundary of the simulation. **All fluid objects must be in the domain.** Fluid objects outside the domain will not bake. No tiny droplets can move outside this domain; it’s as if the fluid is contained within the 3D space by invisible force fields. There can be only a single fluid simulation domain object in the scene.

The shape of the object does not matter because it will *always* **be treated like a box** (The lengths of the bounding box sides can be different). So, usually there won’t be any reason to use another shape than a box. If you need obstacles or other boundaries than a box to interfere with the fluid flow, you need to insert additional obstacle objects *inside* the domain boundary.

This object will be *replaced* by the fluid during the simulation.

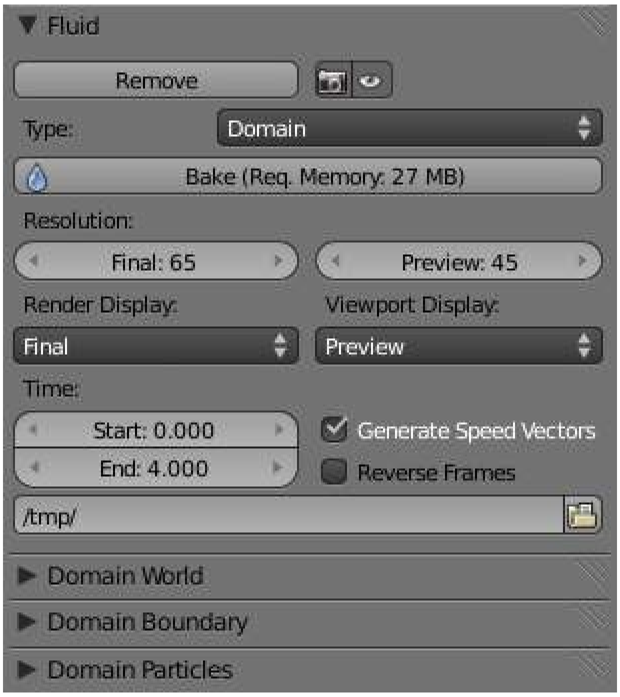
Tip

Baking is done on the Domain object

When you calculate the fluid simulation, **you bake the simulation on the domain object**. For this reason all the baking options are visible only when selecting the Domain Object.

For baking options, see *Baking*.

Options



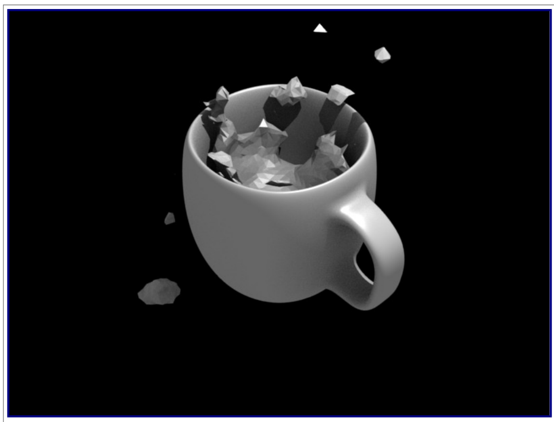
The fluid simulation options with Domain selected

Bake button
For baking options, see *Baking*.

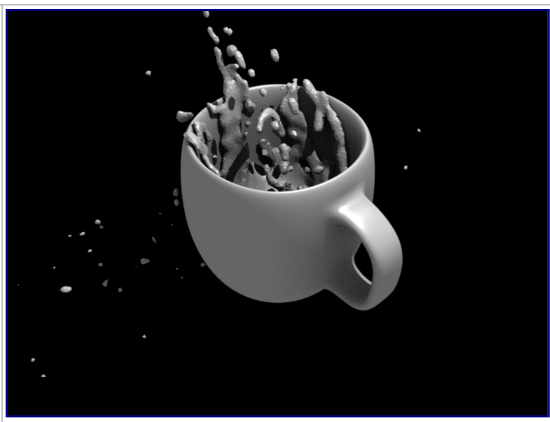
Resolution

Render resolution

The granularity at which the actual fluid simulation is performed. This is probably the most important setting for the simulation as it determines the amount of details in the fluid, the memory and disk usage as well as computational time.



10cm mug at Resolution 70.



10cm mug at Resolution 200.

Note that the amount of required memory quickly increases: a resolution of 32 requires ca. 4MB, 64 requires ca. 30MB, while 128 already needs more than 230MB. Make sure to set the resolution low enough, depending on how much memory you have, to prevent Bforartists from crashing or freezing. Remember also that many operating systems limit the amount of memory that can be allocated by a single *process*, such as Bforartists, even if the *machine* contains much more than this. Find out what limitations apply to your machine.

Note
Resolution and Real-size of the Domain Be sure to set the resolution appropriate to the real-world size of the domain (see the *Realworld-size* in the Domain World). If the domain is not cubic, the resolution will be taken for the longest side. The resolutions along the other sides will be reduced according to their lengths (therefore, a non-cubic domain will need less memory than a cubic one, resolutions being the same).

Preview resolution

This is the resolution at which the preview surface meshes will be generated. So it does not influence the actual simulation. Even if “there is nothing to see” in the preview, there might be a thin fluid surface that cannot be resolved in the preview.

Display quality

How to display a baked simulation in the 3d view (menu *Viewport Display*) and for rendering (menu *Render Display*):

Geometry
use the original geometry (before simulation).

Preview
use the preview mesh.

Final
use the final high definition mesh.

When no baked data is found, the original mesh will be displayed by default.

After you have baked a domain, it is displayed (usually) in the Bforartists window as the preview mesh. To see the size and scope of the original domain box, select *Geometry* in the left dropdown.

Time

Start

It is the simulation start time (in seconds).

This option makes the simulation computation in Bforartists start later in the simulation. The domain deformations and fluid flow prior to the start time are not saved.

For example, if you wanted the fluid to appear to already have been flowing for 4 seconds before the actual first frame of data, you would enter 4.0 here.

End

It is the simulation ending time (in seconds).

Tip

Start and end times have nothing to do with how many frames are baked

If you set *Start* time to 3.0, and *End* time to 4.0, you will simulate 1 second of fluid motion. That one second of fluid motion will be spread across however-many frames are set in the *Anim* panel (*Scene* context –> *Render* sub-context –> *Anim* and *Output* panel).

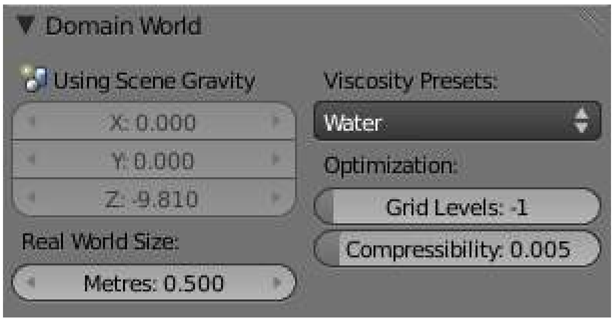
This means, for example, that if you have Bforartists set to make 250 frames at 25 fps, the fluid will look like it had already been flowing for 3 seconds at the start of the simulation, *but* will play in slow motion (one-tenth normal speed), since the 1 second fluid sim plays out over the course of 10 video seconds. To correct this, change the end time to 13.0 (3.0 + 10.0) to match the 250 frames at 25 fps. Now, the simulation will be real-time, since you set 10 seconds of fluid motion to simulate over 10 seconds of animation. Having these controls in effect gives you a “speed control” over the simulation.

Generate Speed Vector
: If this button is clicked, no speed vectors will be exported. So by default, speed vectors are generated and stored on disk. They can be used to compute image based motion blur with the compositing nodes.

Reverse fluid frames
: The simulation is calculated backward

***Bake* directory**
: For baking options see *Baking*.

Domain World



The Domain World options.

Viscosity

The “thickness” of the fluid and actually the force needed to move an object of a certain surface area through it at a certain speed. You can either enter a value directly or use one of the presets in the drop down (such as honey, oil, or water).

For manual entry, please note that the normal real-world viscosity (the so-called dynamic viscosity) is measured in Pascal-seconds (Pa.s), or in Poise units (P, equal to 0.1 Pa.s, pronounced *pwaz*, from the Frenchman Jean-Louis Poiseuille, who discovered the laws on “the laminar flow of viscous fluids”), and commonly centiPoise units (cP, equal to 0.001 Pa.s, *sentipwaz*). Bforartists, on the other hand, uses the kinematic viscosity (which is dynamic viscosity in Pa.s, divided by the density in kg.m $^{-3}$, unit $m^2 . s^{-1}$). The table below gives some examples of fluids together with their dynamic and kinematic viscosities.

Manual entries are specified by a floating point number and an exponent. These floating point and exponent entry fields (scientific notation) simplify entering very small or large numbers. The viscosity of water at room temperature is 1.002 cP, ou 0.001002 Pa.s; the density of water is about 1000 $kg.m^{-3}$, which gives us a kinematic viscosity of 0.000001002 $m^{2}.s^{-1}$ - so the entry would be 1.002 times 10 to the minus six (`1.002?10`$^{-6}$ in scientific notation). Hot Glass and melting iron is a fluid, but very thick; you should enter something like `1.0?10`^{0} (= 1.0) as its kinematic viscosity (indicating a value of `1.0?10`^{6} cP).

Note that the simulator is not suitable for non-fluids, such as materials that do not "flow". Simply setting the viscosity to very large values will not result in rigid body behavior, but might cause instabilities.

Note

Viscosity varies

The default values in Bforartists are considered typical for those types of fluids and "look right" when animated. However, actual viscosity of some fluids, especially sugar-laden fluids like chocolate syrup and honey, depend highly on temperature and concentration. Oil viscosity varies by SAE rating. Glass at room temperature is basically a solid, but glass at 1500 degrees Celsius flows (nearly) like water.

Bforartists Viscosity Unit Conversion.

Fluid	dynamic viscosity (in cP)	kinematic viscosity (Bforartists, in $m^{2}.s^{-1}$)
Water (20- C)	1.002×10^{0} (1.002)	1.002×10^{-6} (0.000001002)
Oil SAE 50	5.0×10^{2} (500)	5.0×10^{-5} (0.00005)
Honey (20- C)	1.0×10^{4} (10,000)	2.0×10^{-3} (0.002)
Chocolate Syrup	3.0×10^{4} (30,000)	3.0×10^{-3} (0.003)
Ketchup	1.0×10^{5} (100,000)	1.0×10^{-1} (0.1)
Melting Glass	1.0×10^{15}	1.0×10^{0} (1.0)

Realworld-size

Size of the domain object in the real world in meters. If you want to create a mug of coffee, this might be 10 cm (0.1 meters), while a swimming pool might be 10m. The size set here is for the longest side of the domain bounding box.

Optimization

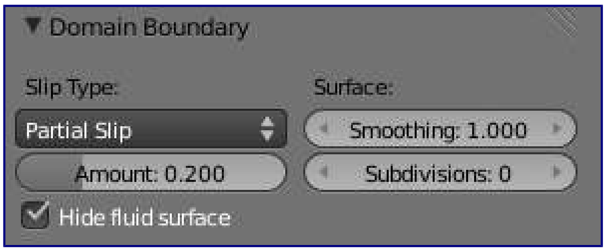
Gridlevel

How many adaptive grid levels to be used during simulation - setting this to -1 will perform automatic selection.

Compressibility

If you have problems with large standing fluid regions at high resolution, it might help to reduce this number (note that this will increase computation times).

Domain Boundary



The Domain Boundary panel

This box has all the slip and surface options.

Boundary type
The stickiness of the surface of the obstacle, to determine the “tacky surface (Surface Adhesion).” In the real world, and the tackiness and fluid, the granularity of the object surface, tack, determined by the elasticity.

No Slip
Fluid will stick To snugly (speed 0).

Free Slip
Fluid will move on the object (0 normal direction of speed).

Part Slip
It is a two intermediate. It is almost Noslip, 1 in the Free exactly the same in 0.

Surface

Surface Smoothing

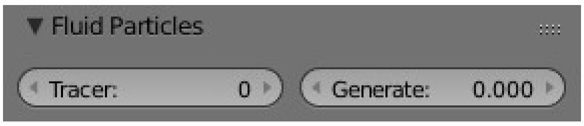
Amount of smoothing to be applied to the fluid surface. 1.0 is standard, 0 is off, while larger values increase the amount of smoothing.

Subdivisions

Allows the creation of high-res surface meshes directly during the simulation (as opposed to doing it afterwards like a subdivision modifier). A value of 1 means no subdivision, and each increase results in one further subdivision of each fluid voxel. The resulting meshes thus quickly become large, and can require large amounts of disk space. Be careful in combination with large smoothing values - this can lead to long computation times due to the surface mesh generation.

Hide fluid surface

Domain Particles

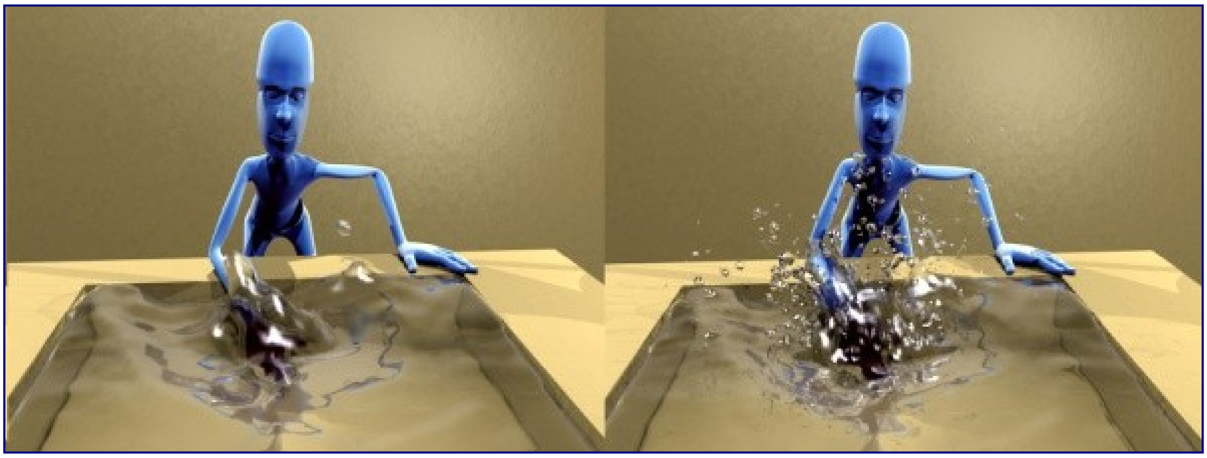


The Domain Particles Panel

Here you can add particles to the fluid simulated, to enhance the visual effect.

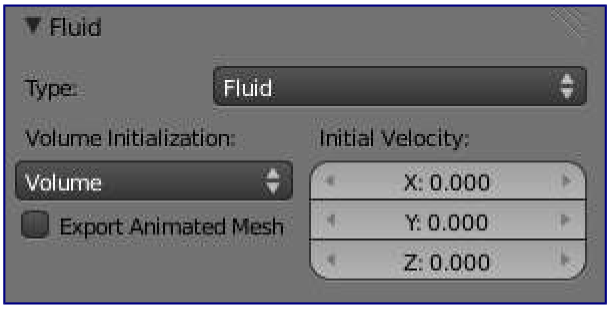
Tracer Particles
: Number of tracer particles to be put into the fluid at the beginning of the simulation. To display them create another object with the *Particle* fluid type, explained below, that uses the same bake directory as the domain.

Generate Particles
: Controls the amount of fluid particles to create (0=off, 1=normal, >1=more). To use it, you have to have a surface subdivision value of at least 2.



An example of the effect of particles can be seen here - the image to the left was simulated without, and the right one with particles and subdivision enabled.

Fluid Object



Fluid object settings

All regions of this object that are inside the domain bounding box will be used as actual fluid in the simulation. If you place more than one fluid object inside the domain, they should currently not intersect. Also make sure the surface normals are pointing outwards. In contrast to domain objects, the actual mesh geometry is used for fluid objects.

Volume Initialization Type
: See Volume Initialization Type

Animated Mesh/Export
: See Animated Mesh/Export

Initial velocity
: Speed of the fluid at the beginning of the simulation, in meters per second.

Tip

The direction of Surface Normals makes a big difference!

Bforartists uses the orientation of the Surface Normals to determine what is “inside of” the Fluid object and what is “outside”. You want all of the normals to face *outside*. If the normals face the wrong way, you’ll be rewarded with a “gigantic flood of water” because Bforartists will think that the volume of the object is outside of its mesh! This applies regardless of the *Volume init* type setting.

Fluid Obstacle

This object will be used as an obstacle in the simulation. As with a fluid object, obstacle objects currently should not intersect. As for fluid objects, the actual mesh geometry is used for obstacles. For objects with a volume, make sure that the normals of the obstacle are calculated correctly, and radiating properly (use the *Flip Normal* button, in *Edit mode*, *Mesh Tools* panel, *Editing* context), particularly when using a spinned container. Applying a *SubSurf Modifier* before baking the simulation could also be a good idea if the mesh is not animated.

Volume Initialization Type
: See Volume Initialization Type

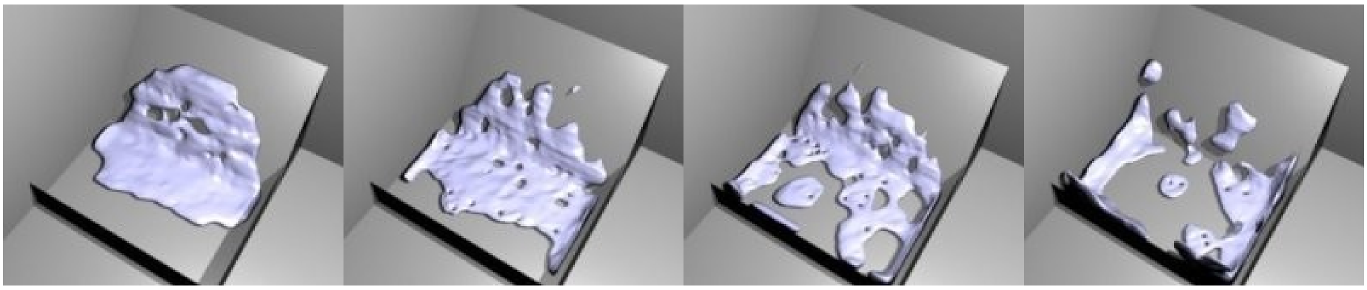
Boundary type
: Determines the stickiness of the obstacle surface, called “Surface Adhesion”. Surface Adhesion depends in real-world on the fluid and the graininess or friction/adhesion/absorption qualities of the surface.

  No Slip
  : Causes the fluid to stick to the obstacle (zero velocity).

  Free Slip
  : Allows movement along the obstacle (only zero normal velocity).

  Part Slip
  : Mixes both types, with 0 being mostly no slip, and 1 being identical to free slip.

  Note that if the mesh is moving, it will be treated as no slip automatically.



Example of the different boundary types for a drop falling onto the slanted wall. From left to right: no-slip, part-slip 0.3, part-slip 0.7 and free-slip.

Animated Mesh/Export
: See Animated Mesh/Export

PartSlip Amount

Amount of mixing between no- and free-slip, described above.

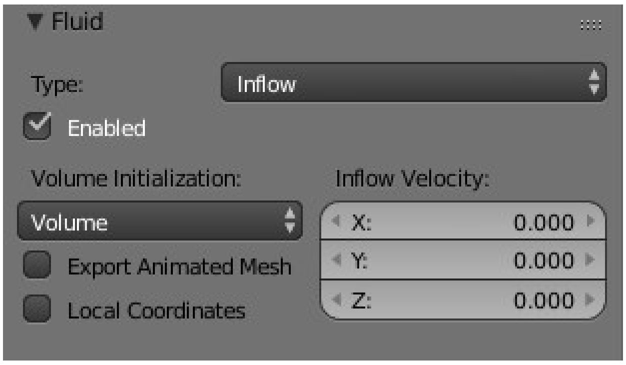
Impact Factor

Amount of fluid volume correction for gain/loss from impacting with moving objects. If this object is not moving, this setting has no effect. However, it if is and the fluid collides with it, a negative value takes volume away from the Domain, and a positive number adds to it. Ranges from -2.0 to 10.0.

Fluid Inflow / Outflow

To control the volume of the fluid simulation, you can set objects in the scene to add or absorb fluid within the *Fluid Domain*.

Inflow



Fluid Inflow Settings

Volume Initialization Type

See Volume Initialization Type

This object will put fluid into the simulation, like a water tap.

Inflow Velocity

Speed of the fluid that is created inside of the object.

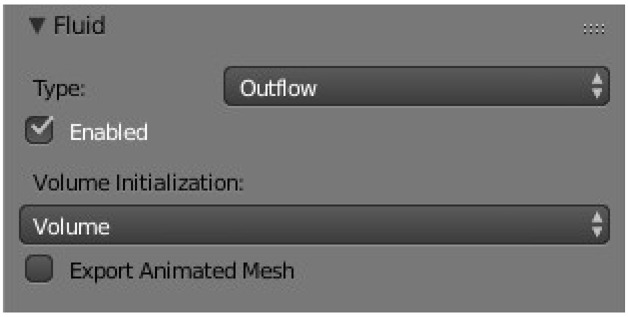
Local Coords/Enable

Use local coordinates for the inflow. This is useful if the inflow object is moving or rotating, as the inflow stream will follow/copy that motion. If disabled, the inflow location and direction do not change.

Animated Mesh/Export

See Animated Mesh/Export

Outflow



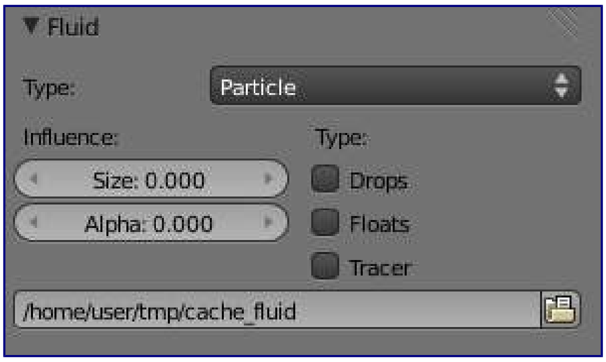
Fluid Outflow Settings

Any fluid that enters the region of this object will be deleted (think of a drain or a black hole). This can be useful in combination with an inflow to prevent the whole domain from filling up. When enabled, this is like a tornado (waterspout) or “wet vac” vacuum cleaner, and the part where the fluid disappears will follow the object as it moves around.

Volume Initialization Type
: See Volume Initialization Type

Animated Mesh/Export
: See Animated Mesh/Export

Fluid Particle



Fluid particle settings

This type can be used to display particles created during the simulation. For now only tracers swimming along with the fluid are supported. Note that the object can have any shape, position or type - once the particle button is pressed, a particle system with the fluid simulation particles will be created for it at the correct position. When moving the original object, it might be necessary to delete the particle system, disable the fluidsim particles, and enable them again. The fluidsim particles are currently also unaffected by any other particle forces or settings.

Influence

Size Influence
: The particles can have different sizes, if this value is 0 all are forced to be the same size.

Alpha Influence
: If this value is >0, the alpha values of the particles are changed according to their size.

Particle type

Drops
: Surface splashes of the fluid result in droplets being strewn about, like fresh water, with low Surface Tension.

Floats
: The surface tension of the fluid is higher and the fluid heavier, like cold seawater and soup. Breakaways are clumpier and fall back to the surface faster than *Drops*, as with high Surface Tension.

Tracer
: Droplets follow the surface of the water where it existed, like a fog suspended above previous fluid levels. Use this to see where the fluid level has been.

Path (bake directory)

The simulation run from which to load the particles. This should usually have the same value as the fluid domain object

Fluid Control

Description

Using the Lattice-boltzman method, the fluid is controlled using particles which define local force fields and are generated automatically from either a physical simulation or a sequence of target shapes. At the same time, as much as possible of the natural fluid motion is preserved.

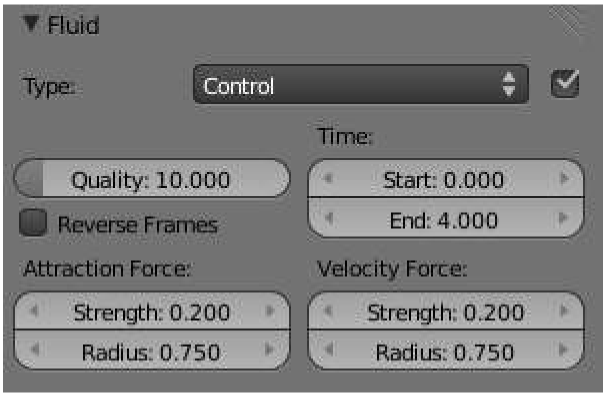
Examples

In this examples, we use the Fluid Control option to control part of the fluid so that it has a certain shape (the sphere drop or the teapot drop) before it falls in the rest of the fluid:

Falling drop

“Magic Fluid Control”

Options



Fluid control options.

Quality
: Higher quality result in more control particles for the fluid control object.

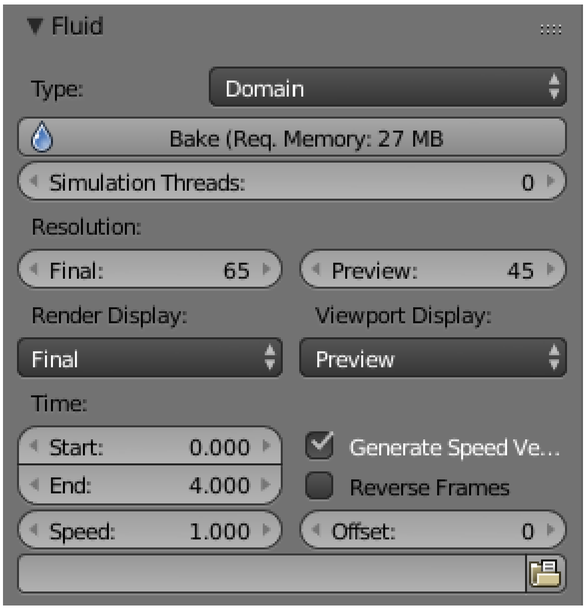
Reverse Frames
: The control particle movement gets reversed.

Time
: You specify the start and end time during which time the fluid control object is active.

Attraction force
: The attraction force specifies the force which gets emitted by the fluid control object. Positive force results in attraction of the fluid, negative force in avoidance.

Velocity force
: If the fluid control object moves, the resulting velocity can also introduce a force to the fluid.

Baking



The fluid simulation options with Domain selected

Bake Button

Perform the actual fluid simulation. Bforartists will continue to work normally, except there will be a status bar in the top of the window, next to the render pulldown. Pressing `Esc` or the “x” next to the status bar will abort the simulation. Afterwards two `.bobj.gz` (one for the *Final* quality, one for the *Preview* quality), plus one `.bvel.gz` (for the *Final* quality) will be in the selected output directory for each frame.

Bake directory

Directory and file prefix to store baked surface meshes.

This is similar to the animation output settings, only selecting a file is a bit special: when you select any of the previously generated surface meshes (e.g. `test1_fluidsurface_final_0132.bobj.gz`), the prefix will be automatically set (`test1_` in this example). This way the simulation can be done several times with different settings, and allows quick changes between the different sets of surface data.

Notes

Unique domain

Because of the possibility of spanning and linking between scenes, there can only be one domain in an entire .blend file.

Selecting a Baked Domain

After a domain has been baked, it changes to the fluid mesh. To re-select the domain so that you can bake it again after you have made changes, go to any frame and select (`RMB`) the fluid mesh. Then you can click the *BAKE* button again to recompute the fluid flows inside that domain.

Baking always starts at Frame #1

The fluid simulator disregards the *Start* setting in the *Animation* panel, it will always bake from frame 1. If you wish the simulation to start later than frame 1, you must key the fluid objects in your domain to be inactive until the frame you desire to start the simulation.

Baking always ends at the *End* Frame set in the *Animation* panel

If your frame-rate is 25 frames per second, and ending time is 4.0 seconds, then you should (if your start time is 0) set your animation to end at frame `4.0 × 25 = 100`

Freeing the previous baked solutions

Deleting the content of the “Bake” directory is a destructive way to achieve this. Be careful if more than one simulation uses the same bake directory (be sure they use different filenames, or they will overwrite one another)!

Reusing Bakes

Manually entering (or searching for) a previously saved (baked) computational directory and filename mask will switch the fluid flow and mesh deformation to use that which existed during the old bake. Thus, you can re-use baked flows by simply pointing to them in this field.

Baking processing time

Baking takes a **lot** of compute power (hence time). Depending on the scene, it might be preferable to bake overnight.

If the mesh has modifiers, the rendering settings are used for exporting the mesh to the fluid solver. Depending on the setting, calculation times and memory use might exponentially increase. For example, when using a moving mesh with *Subsurf* as an obstacle, it might help to decrease simulation time by switching it off, or to a low subdivision level. When the setup/rig is correct, you can always increase settings to yield a more realistic result.

Fluid Appendix

Hints

Some useful hints about fluid simulation in Bforartists:

- Don't be surprised, but you'll get whole bunch of mesh (.bobj.gz) files after a simulation. One set for preview, and another for final. Each set has a .gz file for each frame of the animation. Each file contains the simulation result - so you'll need them.
- Currently these files will not be automatically deleted, so it is a good idea to e.g. create a dedicated directory to keep simulation results. Doing a fluid simulation is similar to clicking the *ANIM* button - you currently have to take care of organizing the fluid surface meshes in some directory yourself. If you want to stop using the fluid simulation, you can simply delete all the `*fluid*.bobj.gz` files.
- Before running a high resolution simulation that might take hours, check the overall timing first by doing lower resolution runs.
- Fluid objects must be completely inside the bounding box of the domain object. If not, baking may not work correctly or at all. Fluid and obstacle objects can be meshes with complex geometries. Very thin objects might not appear in the simulation, if the chosen resolution is too coarse to resolve them (increasing it might solve this problem).
- Don't try to do a complicated scene all at once. Bforartists has a powerful compositor that you can use to combine multiple animations.

  For example, to produce an animation showing two separate fluid flows while keeping your domain small, render one .avi using the one flow. Then move the domain and render another .avi with the other flow using an alpha channel (in a separate B&W .avi?). Then, composite both .avi's using the compositor's add function. A third `.avi` is usually the smoke and mist and it is laid on top of everything as well. Add a rain sheet on top of the mist and spray and you'll have quite a storm brewing! And then lightning flashes, trash blowing around, all as separate animations, compositing the total for a truly spectacular result.

Limitations & Workarounds

- If the setup seems to go wrong, make sure all the normals are correct (hence, enter *Edit mode*, select all, and recalculate normals once in a while).
- Currently there's a problem with zero gravity simulation - simply select a very small gravity until this is fixed.
- If an object is initialized as *Volume*, it has to be closed and have an inner side (a plane won't work). To use planes, switch to *Shell*, or extrude the plane.
- Bforartists freezes after clicking *BAKE*. Pressing `Esc` makes it work again after a while - this can happen if the resolution is too high and memory is swapped to hard disk, making everything horribly slow. Reducing the resolution should help in this case.
- Bforartists crashes after clicking *BAKE* - this can happen if the resolution is really high and more than 2GB are allocated, causing Bforartists to crash. Reduce the resolution. Many operating systems limit the

total amount of memory that can be allocated by a *process*, such as Bforartists, even if the *machine* has more memory installed.

- The meshes should be closed, so if some parts of e.g. a fluid object are not initialized as fluid in the simulation, check that all parts of connected vertices are closed meshes. Unfortunately, the Suzanne (monkey) mesh in Bforartists is not a closed mesh (the eyes are separate).
- If the fluid simulation exits with an error message (stating e.g. that the “init has failed”), make sure you have valid settings for the domain object, e.g. by resetting them to the defaults.
- Note that first frame may well take only a few hundred MBs of RAM memory, but latter ones go over one GB, which may be why your bake fails after awhile. If so, try to bake one frame at the middle or end at full res so you’ll see if it works.
- Memory used doubles when you set surface subdivision from 1 to 2.
- Using “generate particles” will also add memory requirements, as they increase surface area and complexity. Ordinary fluid-sim generated particles probably eat less memory.

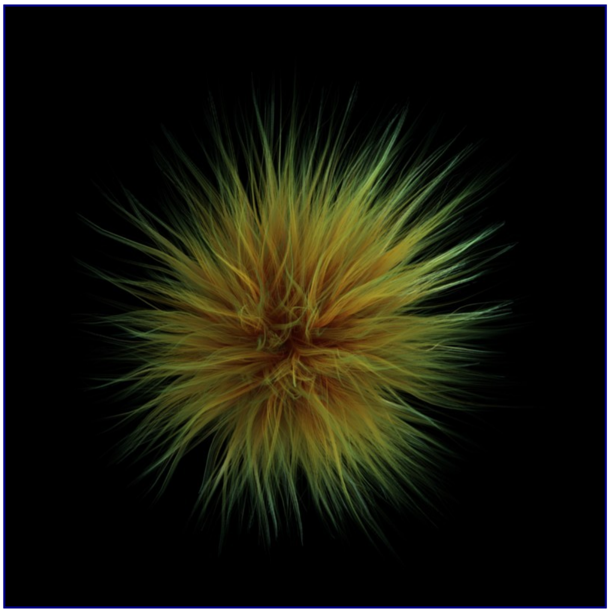
9.5 Physics - Particles

Particles

Particles are lots of items emitted from mesh objects, typically in the thousands. Each particle can be a point of light or a mesh, and be joined or dynamic. They may react to many different influences and forces, and have the notion of a lifespan. Dynamic particles can represent fire, smoke, mist, and other things such as dust or magic spells.

Hair type particles are a subset of regular particles. Hair systems form strands that can represent hair, fur, grass and bristles.

You see particles as a *Particle* modifier, but all settings are done in the *Particle tab*.



Some fur made from particles

Particles generally flow out from their mesh into space. Their movement can be affected by many things, including:

- Initial velocity out from the mesh.
- Movement of the emitter (vertex, face or object) itself.
- Movement according to “gravity” or “air resistance”.
- Influence of force fields like wind, vortexes or guided along a curve.
- Interaction with other objects like collisions.
- Partially intelligent members of a flock (herd, school, ...), that react to other members of their flock, while trying to reach a target or avoid predators.
- Smooth motion with softbody physics (only *Hair* particle systems).
- Or even manual transformation with *Lattices*.

Particles may be rendered as:

- *Halos* (for Flames, Smoke, Clouds).
- Meshes which in turn may be animated (e.g. fish, bees, ...). In these cases, each particle “carries” another object.
- *Strands* (for *Hair, Fur, Grass*); the complete way of a particle will be shown as a strand. These strands can be manipulated in the 3D window (combing, adding, cutting, moving, etc).

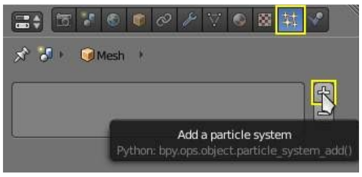
Every object may carry many particle systems. Each particle system may contain up to 100. 000 particles. Certain particle types (*Hair* and *Keyed*) may have up to 10.000 children for each particle (children move and emit more or less like their respective parents). The size of your memory and your patience are your practical boundaries.

Workflow

The process for working with standard particles is:

- Create the mesh which will emit the particles.
- Create one or more Particle Systems to emit from the mesh. Many times, multiple particle systems interact or merge with each other to achieve the overall desired effect.
- Tailor each Particle System’s settings to achieve the desired effect.
- Animate the base mesh and other particle meshes involved in the scene.
- Define and shape the path and flow of the particles.
- For *Hair* particle systems: Sculpt the emitter’s flow (cut the hair to length and comb it for example).
- Make final render and do physics simulation(s), and tweak as needed.

Creating a Particle System

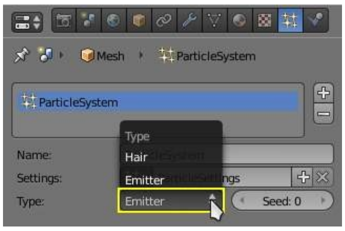


Adding a particle system.

To add a new particle system to an object, go to the *Particles* tab of the object *Settings* editor and click the small + button. An object can have many Particle Systems.

Each particle system has separate settings attached to it. These settings can be shared among different particle systems, so one doesn’t have to copy every setting manually and can use the same effect on multiple objects. Using the *Random* property they can be randomized to look slightly different, even when using the same settings.

Types of Particle systems



Particle System Types.

After you have created a particle system, the *Property* window fills with many panels and buttons. But don’t panic! There are two different types of particle systems, and you can change between these two with the *Type* drop-down list:

Emitter
: This parallels the old system to the greatest extent. In such a system, particles are emitted from the selected object from the *Start* frame to the *End* frame and have a certain lifespan.

Hair
: This system type is rendered as strands and has some very special properties: it may be edited in the 3D window in realtime and you can also animate the strands with *Cloth Simulation*.

The settings in the *Particle System* panel are partially different for each system type. For example, in *Image 3* they are shown for only system type *Emitter.*

Common Options

Each system has the same basic sets of controls, but options within those sets vary based on the system employed. These sets of controls are:

Emission
Settings for the initial distribution of particles on the emitter and the way they are born into the scene.

Cache
In order to increase realtime response and avoid unnecessary recalculation of particles, the particle data can be cached in memory or stored on disk.

Velocity
Initial speed of particles.

Rotation
Rotational behavior of particles.

Physics
How the movement of the particles behaves.

Render
Rendering options.

Display
Realtime display in the 3D View.

Children
Control the creation of additional child particles.

Field Weights
Factors for external forces.

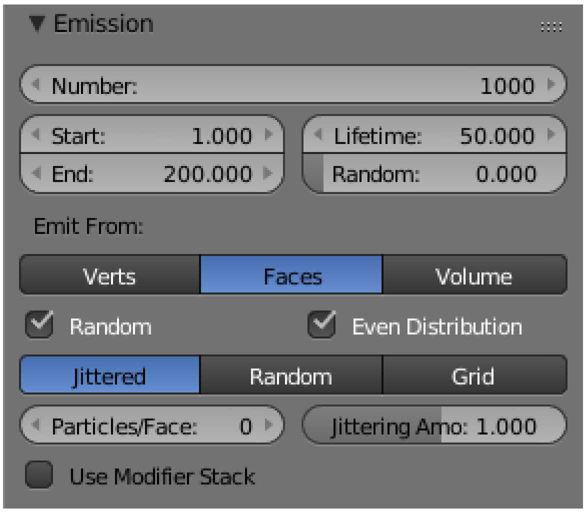
Force Field Settings
Makes particles force fields.

Vertex Groups
Influencing various settings with vertex groups.

Particle Emission

The *Emitter* system works just like its name says: it emits/produces particles for a certain amount of time. In such a system, particles are emitted from the selected object from the *Start* frame to the *End* frame and have a certain lifespan. These particles are rendered default as *Halos*, but you may also render these kind of particles as objects (depending on the particle system’s render settings, see *Visualization*).

Options



Particle Emission Settings

The buttons in the *Emission* panel control the way particles are emitted over time:

Amount
: The maximum amount of parent particles used in the simulation.

Start
: The start frame of particle emission. You may set negative values, which enables you to start the simulation before the actual rendering.

End
: The end frame of particle emission.

Lifetime
: The lifetime (in frames) of the particles.

Random
: A random variation of the lifetime of a given particle. The shortest possible lifetime is *Lifetime* `×(1-` *Rand* `)`. Values above 1.0 are not allowed. For example with the default *Lifetime* value of 50 a *Random* setting of 0.5 will give you particles with lives ranging from 50 frames to `50×(1.0-0.5)` =25 frames, and with a *Random* setting of 0.75 you'll get particles with lives ranging from 50 frames to `50×(1.0-0.75)` =12.5 frames.

Emission Location

Emit From parameters define how and where the particles are emitted, giving precise control over their distribution. You may use vertex groups to confine the emission, that is done in the *Vertexgroups* panel.

Verts
: Emit particles from the vertices of a mesh.

Faces
: Emit particles from the surface of a mesh's faces.

Volume
: Emit particles from the volume of an enclosed mesh.

Distribution Settings

These settings control how the emissions of particles are distributed throughout the emission locations

Random

The emitter element indices are gone through in a random order instead of linearly (one after the other).

For Faces and Volume, additional options appear:

Even Distribution
: Particle distribution is made even based on surface area of the elements, i.e. small elements emit less particles than large elements, so that the particle density is even.

Jittered
: Particles are placed at jittered intervals on the emitter elements.

  Particles/Face
  : Number of emissions per face (0 = automatic).

  JitteringAmount
  : Amount of jitter applied to the sampling.

Random
: Particles are emitted from random locations in the emitter's elements.

Grid
: Particles are set in a 3d grid and particles near/in the elements are kept.

  Invert Grid
  : Invert what is considered the object and what is not.

  Hexagonal
  : Uses a hexagonal shaped grid instead of a rectangular one.

  Resolution
  : Resolution of the grid.

  Random
  : Add a random offset to grid locations.

Tip

Your mesh must be manifold to emit particles from the volume.

Some modifiers like *Edge Split* break up the surface, in which case volume emission will not work correctly!

Use Modifier Stack

Take any *Modifiers* above the particle modifier in the *Modifier Stack* into account when emitting particles.

Note that particles may differ in the final render if these modifiers generate different geometry between the viewport and render.

Particle Physics

The movement of particles may be controlled in a multitude of ways. With particles physics: there are five different systems:

None (No Physics)
: It doesn't give the particles any motion, which makes them belong to no physics system.

Newtonian
: Movement according to physical laws.

Keyed
: Dynamic or static particles where the (animated) targets are other particle systems.

Boids
: Particles with limited artificial intelligence, including behavior and rules programming, ideal for flocks of birds or schools of fishes, or predators vs preys simulations.

Fluid
: Movement according to fluid laws (based on Smoothed Particle Hydrodynamics technique).

Additional ways of moving particles:

- By softbody animation (only for Hair particle systems).
- By forcefields and along curves.
- By lattices.

Here we will discuss only the particle physics in the narrower sense, i.e. the settings in the Physics panel.

Velocity

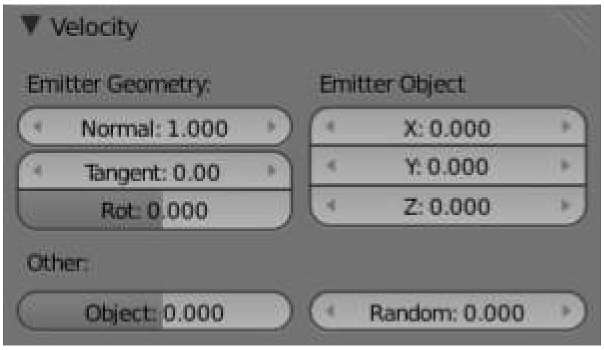


Image 3: Initial velocity.

The initial velocity of particles can be set through different parameters, based on the type of the particle system (see Particle System tab). If the particle system type is Emitter or Hair, then the following parameters give the particle an initial velocity in the direction of...

Emitter Geometry

Normal
: The emitter's surface normals (i.e. let the surface normal give the particle a starting speed).

Tangent
: Let the tangent speed give the particle a starting speed.

Rot
: Rotates the surface tangent.

Emitter Object

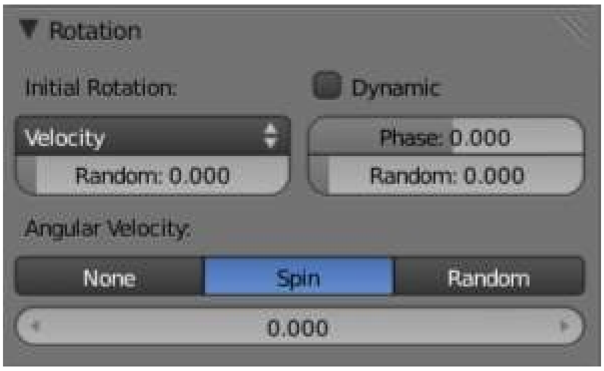
Align X,Y,Z
: Give an initial velocity in the X, Y, and Z axes.

Object

The emitter objects movement (i.e. let the object give the particle a starting speed).

Random
Gives the starting speed a random variation. You can use a texture to only change the value, see Controlling Emission, Interaction and Time).

Rotation



Particles rotation settings.

These parameters specify how the individual particles are rotated during their travel. To visualize the rotation of a particle you should choose visualization type Axis in the Visualization panel and increase the Draw Size.

Initial Rotation Mode

Sets the initial rotation of the particle by aligning the x-axis in the direction of:

None
the global x-axis.

Normal
Orient to the emitter's surface normal, the objects Y axis points outwards.

Normal-Tangent
As with normal, orient the Y axis to the surface normal. Also orient the X axis to the tangent for control over the objects rotation about the normal. requires UV coordinates, the UV rotation effects the objects orientation, currently uses the active UV layer. This allow deformation without the objects rotating in relation to their surface.

Velocity
the particle's initial velocity.

Global X/Global Y/Global Z
one of the global axes

Object X/Object Y/Object Z
one of the emitter object axes.

Random
Randomizes rotation.

Dynamic
If enabled, only initializes particles to the wanted rotation and angular velocity and let's physics handle the rest. Particles then change their angular velocity if they collide with other objects (like in the real world due to friction between the colliding surfaces). Otherwise the angular velocity is predetermined at all times (i.e. set rotation to dynamic/constant).

Phase
Initial rotation phase

Random
Rand allows a random variation of the Phase.

Angular Velocity

The magnitude of angular velocity, the dropdown specifies the axis of angular velocity to be

None
: a zero vector (no rotation).

Spin
: the particles velocity vector.

Random
: a random vector.

If you use a Curve Guide and want the particles to follow the curve, you have to set Angular Velocity to Spin and leave the rotation on Constant (i.e. don’t turn on Dynamic). Curve Follow does not work for particles.

Common Physics Settings

Size
: Sets the size of the particles.

Random Size
: Give the particles a random size variation.

Mass
: Specify the mass of the particles.

Multiply mass with particle size
: Causes larger particles to have larger masses.

No Physics

At first a Physics type that makes the particles do nothing could seem a bit strange, but it can be very useful at times. None physics make the particles stick to their emitter their whole life time. The initial velocities here are for example used to give a velocity to particles that are affected by a harmonic effector with this physics type when the effect of the effector ends.

Moreover, it can be very convenient to have particles at disposal (whose both Unborn and Died are visible on render) to groom vegetation and/or ecosystems using Object, Group or Billboard types of visualization.

Field Weights

The Field Weight Panel allows you to control how much influence each type of external force field, or effector, has on the particle system. Force fields are external forces that give dynamic systems motion. The force fields types are detailed on the *Force Field Page*.

Effector Group
: Limit effectors to a specified group. Only effectors in this group will have an effect on the current system.

Gravity
: Control how much the Global Gravity has an effect on the system.

All
: Scale all of the effector weights.

Force Fields

The Force Field Settings Panel allows you to make each individual act as a force field, allowing them to affect other dynamic systems, or even, each other.

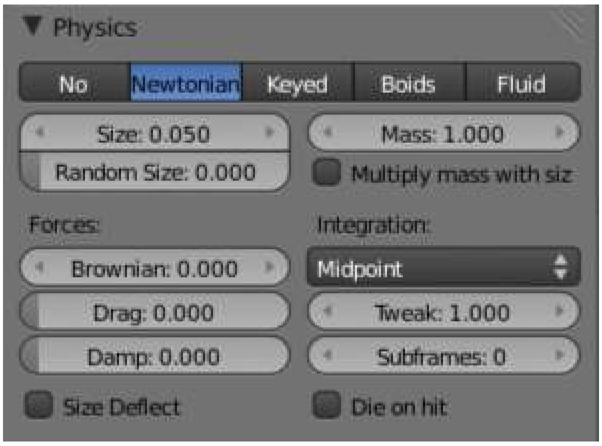
Self Effect
Causes the particle force fields to have an effect on other particles within the same system.
Amount
Set how many of the particles act as force fields. 0 means all of them are effectors.

You can give particle systems up to 2 force fields. By default they do not have any. Choose an effector type from the dropdowns to enable them. Settings are described on the *Force Field Page*.

Newtonian Physics

These are the “normal” particle physics. Particles start their life with the specified initial velocities and angular velocities, and move according to Newtonian forces. The response to environment and to forces is computed differently, according to any given integrator chosen by the animator.

Forces



Newtonian Physics Settings.

Brownian
Specify the amount of Brownian motion. Brownian motion adds random motion to the particles based on a Brownian noise field. This is nice to simulate small, random wind forces.
Drag
A force that reduces particle velocity in relation to it’s speed and size (useful in order to simulate Air-Drag or Water-Drag).
Damp
Reduces particle velocity (deceleration, friction, dampening).

Collision

Size Deflect
Use the particle size in deflections.
Die on Hit
Kill particle when it hits a deflector object.

Integration

Integrators are a set of mathematical methods available to calculate the movement of particles. The following guidelines will help to choose a proper integrator, according to the behavior aimed at by the animator.

Euler
: Also known as “Forward Euler”. Simplest integrator. Very fast but also with less exact results. If no dampening is used, particles get more and more energy over time. For example, bouncing particles will bounce higher and higher each time. Should not be confused with “Backward Euler” (not implemented) which has the opposite feature, energies decrease over time, even with no dampening. Use this integrator for short simulations or simulations with a lot of dampening where speedy calculations is more important than accuracy.

Varlet
: Very fast and stable integrator, energy is conserved over time with very little numerical dissipation.

Midpoint
: Also known as “2nd order Runge-Kutta”. Slower than Euler but much more stable. If the acceleration is constant (no drag for example), it is energy conservative. It should be noted that in example of the bouncing particles, the particles might bounce higher than they started once in a while, but this is not a trend. This integrator is a generally good integrator for use in most cases.

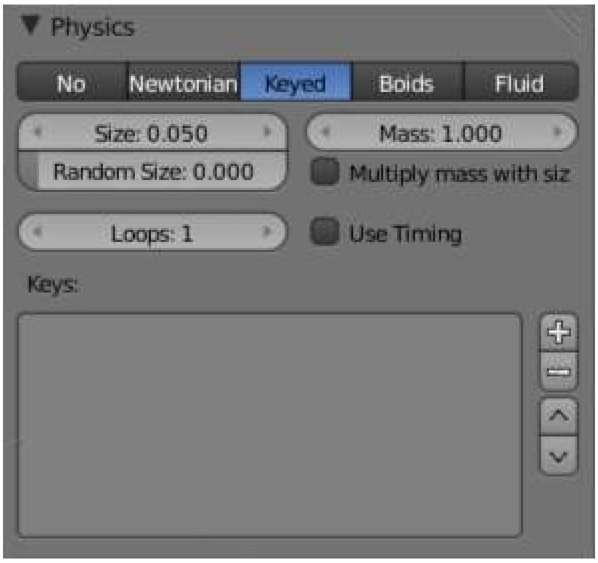
RK4
: Short for “4th order Runge-Kutta”. Similar to Midpoint but slower and in most cases more accurate. It is energy conservative even if the acceleration is not constant. Only needed in complex simulations where Midpoint is found not to be accurate enough.

Frame Settings

Timestep
: The simulation time step per frame.

Subframes
: Subframes to simulate for improved stability and finer granularity in simulations. Use higher values for faster moving particles.

Keyed Particles



Keyed Physics Settings.

The particle paths of keyed particles are determined from the emitter to another particle system's particles. This allows creation of chains of systems with keyed physics to create long strands or groovy moving particles. Basically the particles have no dynamics but are interpolated from one system to the next at drawtime.

Setup

To setup Keyed particles you need at least two particle systems.

The first system has keyed physics, and it needs the option First activated. This will be the system thats is visible.

- The second system may be another keyed system but without the option First,

or a normal particle system. This second system is the target of the keyed system.

Loops
Sets the number of times the keys are looped. Disabled if *Use Timing* is enabled.

Keys

Key Targets

You have to enter the name of the object which bears the target system and if there are multiple particle systems the number of the system.

Click the `Plus` to add a key, then select the object.

If you use only one keyed system the particles will travel in their lifetime from the emitter to the target. A shorter lifetime means faster movement. If you have more than one keyed system in a chain, the lifetime will be split equally. This may lead to varying particle speeds between the targets.

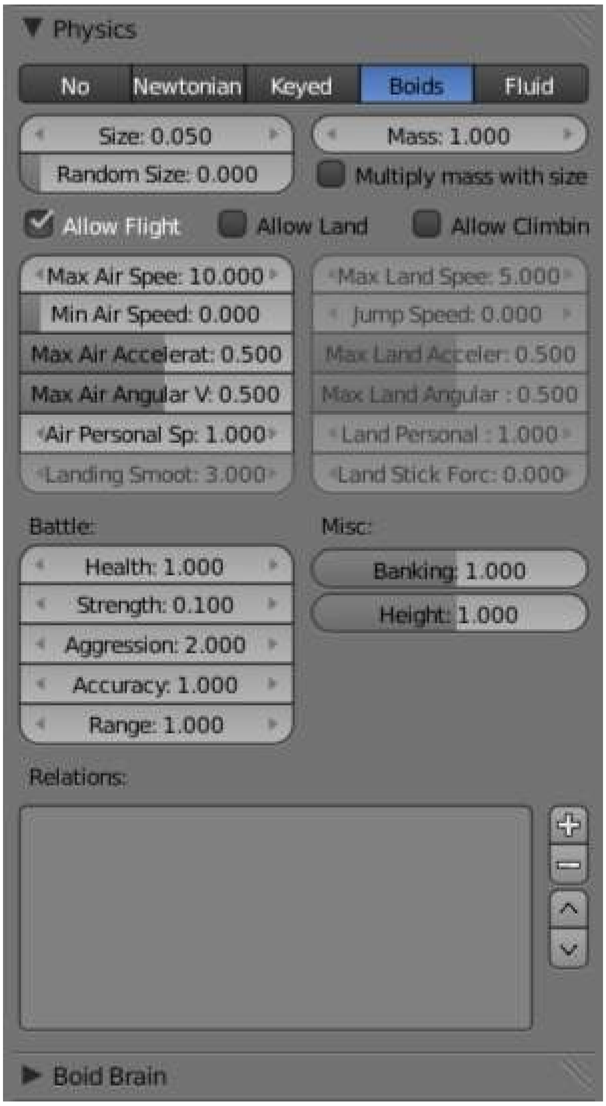
Timing

Use Timing
Timing works together with the Time slider for the other keyed systems in a chain. The Time slider allows to define a fraction of particle lifetime for particle movement.

An example: let's assume that you have two keyed systems in a chain and a third system as target. The particle lifetime of the first system shall be 50 keys. The particles will travel in 25 frames from the first keyed system to the second, and in further 25 frames from the second system to the target. If you use the Timed button for the first system, the Time slider appears in the second systems panel. It's default value is 0.5, so the time is equally split between the systems. If you set Time to 1, the movement from the first system to the second will get all the lifetime (the particles will die at the second system).

If you set Time to 0 the particles will start at the second system and travel to the target.

Boids



Boid Physics Settings.

Boids particle systems can be set to follow basic rules and behaviors. They are useful for simulating flocks, swarms, herds and schools of various kind of animals, insects and fishes. They can react on the presence of other objects and on the members of their own system. Boids can handle only a certain amount of information, therefore the sequence of the Behaviour settings is very important. In certain situations only the first three parameter are evaluated.

To view the subpanel to the right, add a *Particle System* of type *Emitter* and look in the middle area of the *Particle System* tab.

Physics

Boids try to avoid objects with activated Deflection. They try to reach objects with positive Spherical fields, and fly from objects with negative Spherical fields. The objects have to share one common layer to have effect. It is not necessary to render this common layer, so you may use invisible influences.

Boids can different physics depending on whether they are in the air, or on land (on collision object)

Allow Flight

Allow boids to move in the air.

Allow Land
Allow boids to move on land.

Allow Climbing
Allow boids to climb goal objects.

Max Air Speed
Set the Maximum velocity in the air.

Min Air Speed
Set the Minimum velocity in the air.

Max Air Acceleration
Lateral acceleration in air, percent of max velocity (turn). Defines how fast a boid is able to change direction.

Max Air Angular Velocity
Tangential acceleration in air, percent 180 degrees. Defines how much the boid can suddenly accelerate in order to fulfill a rule.

Air Personal Space
Radius of boids personal space in air. Percentage of particle size.

Landing Smoothness
How smoothly the boids land.

Max Land Speed
Set the Maximum velocity on land.

Jump Speed
Maximum speed for jumping

Max Land Acceleration
Lateral acceleration on land, percent of max velocity (turn). Defines how fast a boid is able to change direction.

Max Land Angular Velocity
Tangential acceleration on land, percent 180 degrees. Defines how much the boid can suddenly accelerate in order to fulfill a rule.

Land Personal Space
Radius of boids personal space on land. Percentage of particle size.

Land Stick Force
How strong a force must be to start effecting a boid on land.

Banking
Amount of rotation around velocity vector on turns. Banking of (1.0 == natural banking).

Pitch
Amount of rotation around side vector.

Height
Boid height relative to particle size.

Battle

Health
Initial boid health when born.

Strength
Maximum caused damage per second on attack.

Aggression
Boid will fight this times stronger than enemy.

Accuracy
Accuracy of attack.

Range
Maximum distance of which a boid can attack.

Alliance

The relations box allows you to set up other particle systems to react with the boids. Setting the type to *Enemy* will cause the systems to fight with each other. *Friend* will make the systems work together. *Neutral* will not cause them to align or fight with each other.

Deflectors and Effectors

As mentioned before, very much like Newtonian particles, Boids will react to the surrounding deflectors and fields, according to the needs of the animator:

Deflection: Boids will try to avoid deflector objects according to the Collision rule's weight. It works best for convex surfaces (some work needed for concave surfaces). For boid physics, Spherical fields define the way the objects having the field are seen by others. So a negative Spherical field (on an object or a particle system) will be a predator to all other boids particle systems, and a positive field will be a goal to all other boids particle systems.

When you select an object with a particle system set on, you have in the Fields tab a little menu stating if the field should apply to the emitter object or to the particle system. You have to select the particle system name if you want prey particles to flew away from predator particles.

Spherical fields: These effectors could be predators (negative Strength) that boids try to avoid or targets (positive Strength) that boids try to reach according to the (respectively) Avoid and Goal rules' weights. Spherical's effective Strength is multiplied by the actual relevant weight (e.g. if either Strength or Goal is null, then a flock of boids won't track a positive Spherical field). You can also activate Die on hit (Extras panel) so that a prey particle simply disappears when "attacked" by a predator particle which reaches it. To make this work, the predator particles have to have a spherical field with negative force, it is not sufficient just to set a positive goal for the prey particles (but you may set the predators force strength to -0.01). The size of the predators and the prey can be set with the Size button in the Extras panel.

Boid Brain

The Boid Brain panel controls how the boids particles will react with each other. The boids' behavior is controlled by a list of rules. Only a certain amount of information in the list can be evaluated. If the memory capacity is exceeded, the remaining rules are ignored.

The rules are by default parsed from top-list to bottom-list (thus giving explicit priorities), and the order can be modified using the little arrows buttons on the right side.

The list of rules available are:

Goal

Seek goal (objects with Spherical fields and positive Strength)

Predict

Predict target's movements

Avoid

Avoid "predators" (objects with Spherical fields and negative Strength)

Predict

Predict target’s movements

Fear Factor

Avoid object if danger from it is above this threshold

Avoid Collision

Avoid objects with activated Deflection

Boids

Avoid collision with other boids

Deflectors

Avoid collision with deflector objects

Look Ahead

Time to look ahead in seconds

Separate

Boids move away from each other

Flock

Copy movements of neighboring boids, but avoid each other

Follow Leader

Follows a leader object instead of a boid

Distance

Distance behind leader to follow

Line

Follow the leader in a line

Average Speed

Maintain average velocity.

Speed

Percentage of maximum speed

Wander

How fast velocity’s direction is randomized

Level

How much velocity’s Z component is kept constant

Fight

Move toward nearby boids

Fight Distance

Attack boids at a maximum of this distance

Flee Distance

Flee to this distance

Rule Evaluation

There are three ways control how rules are evaluated.

Average

All rules are averaged.

Random

A random rule is selected for each boid.

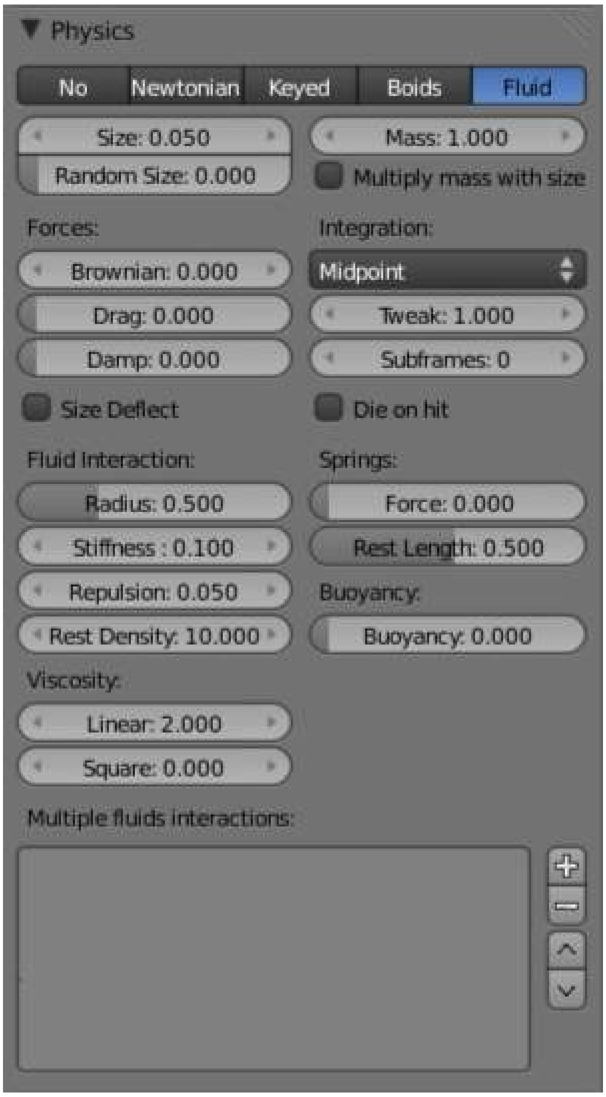
Fuzzy

Uses fuzzy logic to evaluate rules. Rules are gone through top to bottom. Only the first rule that effect above fuzziness threshold is evaluated. The value should be considered how hard the boid will try to respect a given rule (a value of 1.000 means the Boid will always stick to it, a value of 0.000 means it will never). If the boid meets more than one conflicting condition at the same time, it will try to fulfill all the rules according to the respective weight of each.

Please note that a given boid will try as much as it can to comply to each of the rules he is given, but it is more than likely that some rule will take precedence on other in some cases. For example, in order to avoid a predator, a boid could probably “forget” about Collision, Crowd and Center rules, meaning that “while panicked” it could well run into obstacles, for example, even if instructed not to, most of the time.

As a final note, the Collision algorithm is still not perfect and in research progress, so you can expect wrong behaviors at some occasion. It is worked on.

Fluid Physics



Fluid Physics Settings.

Fluid simulations are widely used in CG, and a very desired feature of any particle system, fluid particles are similar to newtonian ones but this time particles are influenced by internal forces like pressure, surface tension, viscosity, springs, etc. Bforartists particle fluids use the SPH techniques to solve the particles fluid equations.

Smoothed-particle hydrodynamics (SPH) is a computational method used for simulating fluid flows. It has been used in many fields of research, including astrophysics, ballistics, vulcanology, and oceanography. It is a mesh-free Lagrangian method (where the co-ordinates move with the fluid), and the resolution of the method can easily be adjusted with respect to variables such as the density.

From liquids to slime, goo to sand and wispy smoke the possibilities are endless.

Settings

Fluid physics share options with *Newtonian Physics*. These are covered on that page.

Fluid Properties

Stiffness
: How incompressible the fluid is.

Viscosity
: Linear viscosity. Use lower viscosity for thicker fluids.

Buoyancy
: Artificial buoyancy force in negative gravity direction based on pressure differences inside the fluid.

Advanced

Repulsion Factor
: How strongly the fluid tries to keep from clustering (factor of stiffness). Check box sets repulsion as a factor of stiffness.

Stiff Viscosity
: Creates viscosity for expanding fluid. Check box sets this to be a factor of normal viscosity.

Interaction Radius
: Fluid’s interaction radius. Check box sets this to be a factor of 4*particle size.

Rest Density
: Density of fluid when at rest. Check box sets this to be a factor of default density.

Springs

Force
: Spring force

Rest Length
: Rest length of springs. Factor of particle radius. Check box sets this to be a factor of 2*particle size.

Viscoelastic Springs
: Use viscoelastic springs instead of Hooke’s springs.

Elastic Limit
: How much the spring has to be stretched/compressed in order to change its rest length

Plasticity
: How much the spring rest length can change after the elastic limit is crossed.

Initial Rest Length
: Use initial length as spring rest length instead of 2*particle size.

Frames
: Create springs for this number of frames since particle’s birth (0 is always).

Particle Visualization

With the items in the *Display* and *Render* panel you can set the way the particles will be rendered or depicted in the view ports in various ways. Some option are valid only for the 3D window, the particles then are rendered always as *Halos*. Some of the options will be rendered as shown in the 3D window.

Viewport Display

The Display Panel controls how particles are displayed in the 3d viewport. This does not necessarily determine how they will appear when rendered.

None
The particles are not shown in the 3D window and are not rendered. The emitter may be rendered though.

Point
Particles are displayed as square points. Their size is independent of the distance from the camera.

Circle
Particles are displayed as circles that face the view. Their size is independent of the distance from the camera.

Cross
Particles are displayed as 6-point crosses that align to the rotation of the particles. Their size is independent of the distance from the camera.

Axis
Particles are displayed as 3-point axes. This useful if you want to see the orientation and rotation of particles in the view port. Increase the *Draw Size* until you can clearly distinguish the axis.

Particles visualized like Point, Circle, Cross and Axis don’t have any special options, but can be very useful when you have multiple particle systems at play, if you don’t want to confuse particles of one system from another (e.g. in simulations using *Boids* physics).

Display
Specifies the percentage of all particles to show in the viewport (all particles are still rendered).

Draw Size
Specifies how large (in pixels) the particles are drawn in the viewport (0 = default).

Size
Draw the size of the particles with a circle.

Velocity
Draw the velocity of the particles with a line that points in the direction of motion, and length relative to speed.

Number
Draw the id-numbers of the particles in the order of emission.

Color

The Color Menu allows you to draw particles according to certain particle properties.

None
Particles are black.

Material
Particles are colored according to the material they are given.

Velocity
Color particles according to their speed. The color is a ramp from blue to green to red, Blue being the

slowest, and Red being velocities approaching the value of *Max* or above. Increasing *Max* allows for a wider range of particle velocities.

Acceleration
Color particles according to their acceleration.

Render Settings

The Render Panel controls how particles appear when they are rendered.

Material Index
Set which of the object's material is used to shade the particles.

Parent
Use a different object's coordinates to determine the birth of particles.

Emitter
When disabled, the emitter is no longer rendered. Activate the button *Emitter* to also render the mesh.

Parents
Render also parent particles if child particles are used. Children have a lot of different deformation options, so the straight parents would stand between their curly children. So by default *Parents* are not rendered if you activate *Children*.. See *Children*

Unborn
Render particles before they are born.

Died
Render particles after they have died. This is very useful if particles die in a collision (*Die on hit*), so you can cover objects with particles.

None

When set to *None* particles are not rendered. This is useful if you are using the particles to duplicate objects.

Halo

Halo particles are rendered as *Halo Type Materials*.

Trail Count
Set the number of trail particles. When greater than 1, additional options appear.

Length in Frames
Path timing is in absolute frames.

Length
End time of drawn path.

Random
Give path lengths a random variation.

Line

The Line visualization mode creates (more or less thin) polygon lines with the strand renderer in the direction of particles velocities. The thickness of the line is set with the parameter *Start* of the *Strands* shader (*Material* sub-context, *Links and Pipeline* panel).

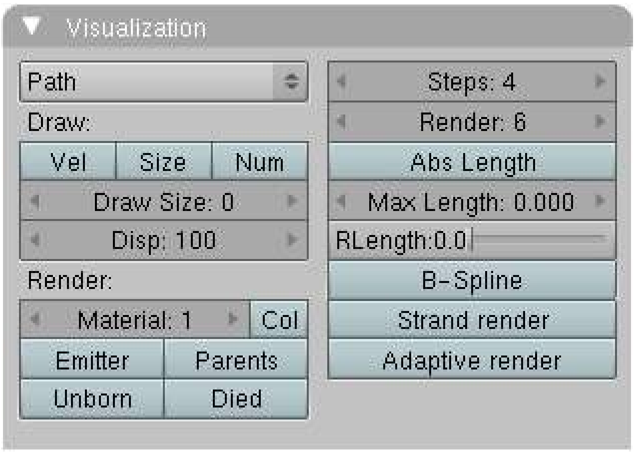
Back
Set the length of the particle's tail.

Front
Set the length of the particle's head.

Speed
Multiply the line length by particles' speed. The faster, the longer the line.

Trail Count
See description in Halo.

Path



The *Path* visualization needs a *Hair* particle system or *Keyed* particles.

Strand render
[Keypointstrands] Use the strand primitive for rendering. Very fast and effective renderer.

Adaptive render
Tries to remove unnecessary geometry from the paths before rendering particle strands in order to make the render faster and easier on memory.

Angle
How many degrees path has to curve to produce another render segment (straight parts of paths need fewer segments).

Pixel
How many pixels path has to cover to produce another render segment (very short hair or long hair viewed from far away need fewer parts). (only for Adaptive render).

B-Spline
Interpolate hair using B-Splines. This may be an option for you if you want to use low *Render* values. You loose a bit of control but gain smoother paths.

Steps
Set the number of subdivisions of the rendered paths (the value is a power of 2). You should set this value carefully, because if you increase the render value by two you need four times more memory to render. Also the rendering is faster if you use low render values (sometimes drastically). But how low you can go with this value depends on the waviness of the hair.(the value is a power of 2). This means 0 steps give 1 subdivision, 1 give 2 subdivisions, 2–>4, 3–>8, 4–>16, ... *n* `-->2` *n*.

Timing Options

Absolute Path Time
Path timing is in absolute frames.

Start
Start time of the drawn path.

End
End time of the drawn path.

Random
Give the path length a random variation.

Please see also the manual page about *Strands* for an in depth description.

Object

In the Object visualization mode the specified object (*Dupli Object:* field) is duplicated in place of each particle. The duplicated object has to be at the center of the coordinate system, or it will get an offset to the particle.

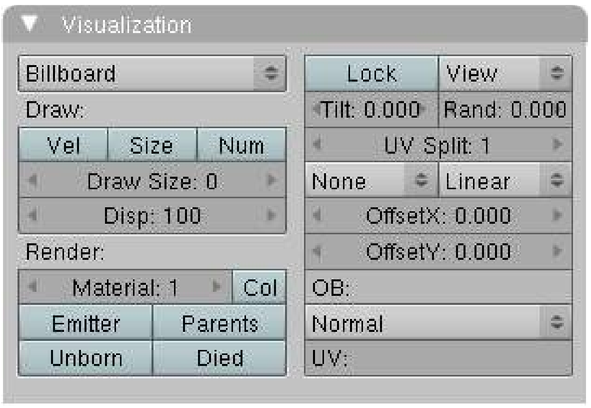
Global
Use object's global coordinates for duplication.
Size
Size of the objects
Random Size
Give the objects a random size variation.

Group

In the Group visualization mode, the objects that belong to the group (*GR:* field) are duplicated sequentially in the place of the particles.

WholeGroup
Use the whole group at once, instead of one of its elements, the group being displayed in place of each particle.
Use Count
Use objects multiple times in the same groups. Specify the order and number of times to repeat each object with the list box that appears. You can duplicate an object in the list with the `Plus` button, or remove a duplicate with the `Minus` button.
Use Global
Use object's global coordinates for duplication.
Pick Random
The objects in the group are selected in a random order, and only one object is displayed in place of a particle. Please note that this mechanism fully replaces old Bforartists particles system using parentage and DupliVerts to replace particles with actual geometry. This method is fully deprecated and doesn't work anymore.
Size
Size of the objects
Random Size
Give the objects a random size variation.

Billboard



Billboards are aligned square planes. They are aligned to the camera by default, but you can choose another object that they should be aligned to.

If you move a billboard around it's target, it always faces the center of it's target. The size of a billboard is set with the parameter *Size* of the particle (in Bforartists Units). You can use them e.g. for Sprites, or to replace *Halo* visualization. Everything that can be done with a halo can also be done with a billboard. But billboards are real objects, they are seen by raytracing, they appear behind transparent objects, they may have an arbitrary form and receive light and shadows. They are a bit more difficult to set up and take more render time and resources.

Texturing billboards (including animated textures with alpha) is done by using uv coordinates that are generated automatically for them so they can take an arbitrary shape. This works well for animations, because the alignment of the billboards can be dynamic. The textures can be animated in several ways:

- Depending on the particle lifetime (relative time).
- Depending on the particle starting time.
- Depending on the frame (absolute time).

You can use different sections of an image texture:

- Depending on the lifetime of the billboard.
- Depending on the emission time.
- Depending on align or tilt.

Since you use normal materials for the billboard you have all freedoms in mixing textures to your liking. The material itself is animated in absolute time.

The main thing to understand is that if the object doesn’t have any *UV Layers*, you need to create at least one in the objects *Editing* context, for any of these to work. Moreover, the texture has to be set to UV coordinates in the *Map Input* panel. If you want to see examples for some of the animation possibilities, see the Billboard Animation Tutorial.

An interesting alternative to billboards are in certain cases strands, because you can animate the shape of the strands. Because this visualization type has so much options it is explained in greater detail below.

You can limit the movement with these options. How the axis is prealigned at emission time.

View
: No prealignement, normal orientation to the target.

X / Y / Z
: Along the global X/Y/Z-axis respectively.

Velocity
: Along the speed vector of the particle.

Lock
: Locks the align axis, keeps this orientation, the billboard aligns only along one axis to it’s target

Billboard Object
: The target object that the billboards are facing. By default, the active camera is used.

Tilt Angle
: Rotation angle of the billboards planes. A tilt of 1 rotates by 180 degrees (turns the billboard upside down).

Random
: Random variation of tilt.

Offset X
: Offset the billboard horizontally in relation to the particle center, this does not move the texture.

Offset Y
: Offset the billboard vertically in relation to the particle center.

UV Channels
: Billboards are just square polygons. To texture them in different ways we have to have a way to set what textures we want for the billboards and how we want them to be mapped to the squares. These can then be set in the texture mapping buttons to set wanted textures for different coordinates. You may use three different UV layers and get three different sets of UV coordinates, which can then be applied to different (or the same) textures.

Billboard Normal UV
: Coordinates are the same for every billboard, and just place the image straight on the square.

Billboard Time-Index (X-Y)
: Coordinates actually define single points in the texture plane with the x-axis as time and y-axis as the particle index. For example using a horizontal blend texture mapped to color from white to black will

give us particles that start off as white and gradually change to black during their lifetime. On the other hand a vertical blend texture mapped to color from white to black will make the first particle to be white and the last particle to be black with the particles in between a shade of gray.

The animation of the UV textures is a bit tricky. The UV texture is split into rows and columns (N times N). The texture should be square. You have to use *UV Split* in the UV channel and fill in the name of the UV layer. This generated UV coordinates for this layer.

Split UV's

The amount of rows/columns in the texture to be used. Coordinates are a single part of the *UV Split* grid, which is a n?n grid over the whole texture. What the part is used for each particle and at what time is determined by the *Offset* and *Animate* controls. These can be used to make each billboard unique or to use an "animated" texture for them by having each frame of the animation in a grid in a big image.

Billboard Split UV

Set the name of the *UV layer* to use with billboards (you can use a different one for each *UV Channel*). By default, it is the active UV layer (check the *Mesh* panel in the *Editing* context.

Animate

Dropdown menu, indicating how the split UVs could be animated (changing from particle to particle with time):

None

No animation occurs on the particle itself, the billboard uses one section of the texture in it's lifetime.

Age

The sections of the texture are gone through sequentially in particles' lifetimes.

Angle

Change the section based on the angle of rotation around the *Align to* axis, if *View* is used the change is based on the amount of tilt.

Frame

The section is changes according to the frame.

Offset

Specifies how to choose the first part (of all the parts in the n×n grid in the texture defined by the *UV Split* number) for all particles.

None

All particles start from the first part.

Linear

First particle will start from the first part and the last particle will start from the last part, the particles in between will get a part assigned linearly from the first to the last part.

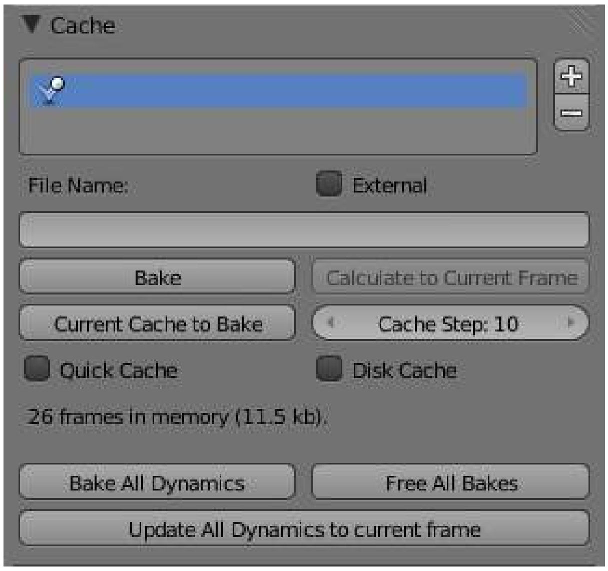
Random

Give a random starting part for every particle.

Trail Count

See the description in Halo.

Cache



Particles Cache Settings.

Emitter systems use a unified system for caching and baking (together with softbody and cloth). The results of the simulation are automatically cached to disk when the animation is played, so that the next time it runs, it can play again quickly by reading in the results from the disk. If you *Bake* the simulation the cache is protected and you will be asked when you're trying to change a setting that will make a recalculating necessary.

Tip

Beware of the *Start* and *End* Settings

The simulation is only calculated for the positive frames in-between the *Start* and *End* frames of the *Bake* panel, whether you bake or not. So if you want a simulation longer than 250 frames you have to change the *End* frame!

Caching

- As animation is played, each physics system writes each frame to disk, between the simulation start and end frames. These files are stored in folders with prefix `blendcache`, next to the `.blend` file. Note that for the cache to fill up, one has to start playback before or on the frame that the simulation starts.
- The cache is cleared automatically on changes - but not on all changes, so it may be necessary to free it manually e.g. if you change a force field.
- If it is impossible to write in the subdirectory there will be no caching.
- The cache can be freed per physics system with a button in the panels, or with the `Ctrl-B` shortcut key to free it for all selected objects.
- If the file path to the cache is longer than what is possible with your operating system (more than 250 characters for example), strange things might happen.

Baking

- The system is protected against changes after baking.
- The *Bake* result is cleared also for all selected objects by click on *Free Bake* for a singular particle system.
- If the mesh changes the simulation is not calculated anew.
- Sorry: no bake editing for particles like for softbodies and clothes.

Two notes at the end:

- For renderfarms, it is best to bake all the physics systems, and then copy the blendcache to the

renderfarm as well.
- Be careful with the sequence of modifiers in the modifier stack (as always). You may have a different number of faces in the 3D window and for rendering (e.g. when using subdivision surface), if so, the rendered result may be very different from what you see in the 3D window.

Hair

When set to hair mode, particle system creates only static particles, which may be used for hair, fur, grass and the like.

Particle hair systems example. Used for the grass and fur.

Growing

The first step is to create the hair, specifying the amount of hair strands and their lengths.

The complete path of the particles is calculated in advance. So everything a particle does a hair may do also. A hair is as long as the particle path would be for a particle with a lifetime of 100 frames. Instead of rendering every frame of the particle animation point by point there are calculated control points with an interpolation, the segments.

Styling

The next step is to style the hair. You can change the look of base hairs by changing the *Physics Settings*.

A more advanced way of changing the hair appearance is to use *Children*. This adds child hairs to the original ones, and has settings for giving them different types of shapes.

You can also interactively style hairs in *Particle Mode*. In this mode, the particle settings become disabled, and you can comb, trim, lengthen, etc. the hair curves.

Animating

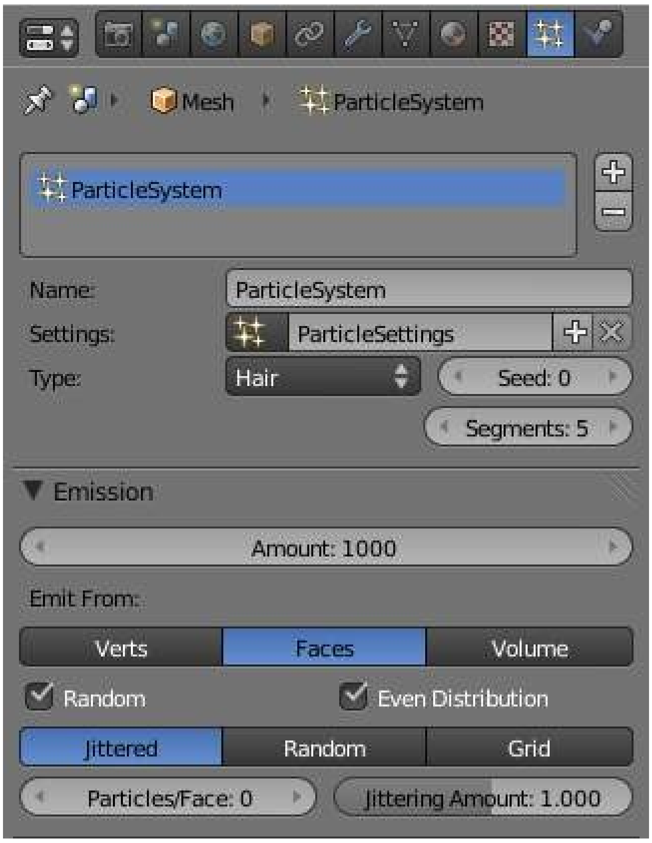
Hair can now be made dynamic using the cloth solver. This is covered in the *Hair Dynamics* page.

Rendering

Bforartists can render hairs in several different ways. Materials have a Strand section, which is covered in the materials section in the *Strands Page*.

Hair can also be used as a basis for the *Particle Instance modifier*, which allows you to have a mesh be deformed along the curves, which is useful for thicker strands, or things like grass, or feathers, which may have a more specific look.

Options



Hair particle system settings

Regrow
: Regrow Hair for each frame.

Advanced
: Enables advanced settings which reflect the same ones as working in Emitter mode.

Emission

Amount
: Set the amount of hair strands. Use as little particles as possible, especially if you plan to use softbody animation later. But you need enough particles to have good control. For a “normal” haircut I found some thousand (very roughly 2000) particles to give enough control. You may need a lot more particles if you plan to cover a body with fur. Volume will be produced later with *Children*.

Hair Dynamics

Settings for adding movement to hair see *Hair Dynamics*.

Display

Rendered
Draw hair as curves.
Path
Draw just the end points if the hairs.
Steps
The number of segments (control points minus 1) of the hair strand. In between the control points the segments are interpolated. The number of control points is important:

- for the softbody animation, because the control points are animated like vertices, so more control points mean longer calculation times.
- for the interactive editing, because you can only move the control points (but you may recalculate the number of control points in *Particle* Mode).

  10 Segments should be sufficient even for very long hair, 5 Segments are enough for shorter hair, and 2 or 3 segments should be enough for short fur.

Children

See *Children*.

Render

Hair can be rendered as a Path, Object, or Group. See *Particle Visualization* for descriptions.

See also

- Fur Tutorial, which produced The image above. It deals especially with short hair.
- Bforartists Hair Basics, a thorough overview of all of the hair particle settings.

Hair Dynamics

Hair particles can now be made dynamic using Cloth physics.

To enable hair physics, click the check box beside *Hair Dynamics*.

Material

Stiffness
Controls how stiff the root of the hair strands are.
Mass
Controls the mass of the cloth material.
Bending
Controls the amount of bend along the hairs. Higher values cause less bending.
Internal Friction

Amount of friction between individual hairs.

Collider Friction

Amount of friction between hairs and external collision objects.

Damping

Spring

Damping of cloth velocity. (higher = more smooth, less jiggling).

Air

Air has normally some thickness which slows falling things down.

Quality

Steps

Quality of the simulation in steps per frame. (higher is better quality but slower).

Simulation

..TODO

Warning

If you use motion blur in your animation, you will need to bake one extra frame past the last frame which you will be rendering.

Children

Children are *Hair* and *Keyed* particles assigned subparticles. They make it possible to work primarily with a relatively low amount of Parent particles, for whom the physics are calculated. The children are then aligned to their parents. Without recalculating the physics the number and visualization of the children can be changed.

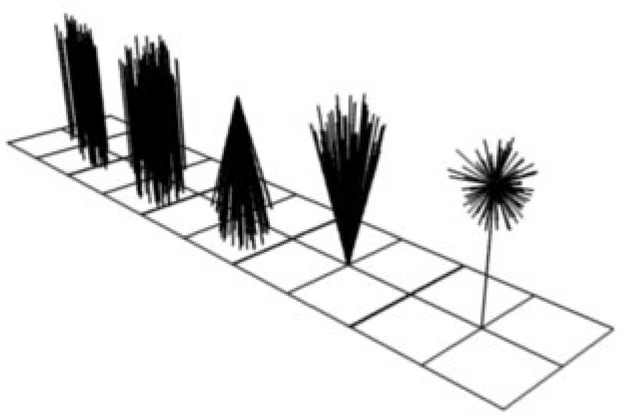
- Children can be emitted from particles or from faces (with some different options). Emission from *Faces* has some advantages, especially the distribution is more even on each face (which makes it better suitable for fur and the like). However, children from particles follow their parents better, e.g. if you have a softbody animation and don't want the hair to penetrate the emitting mesh. But see also our manual page about *Hair*.
- If you turn on children the parents are no longer rendered (which makes sense because the shape of the children may be quite different from that of their parents). If you want to see the parents additionally turn on the *Parents* button in the *Visualization* panel.
- Children carry the same material as their parents and are colored according to the exact place from where they are emitted (so all children may have different color or other attributes).

The possible options depend from the type of particle system, and if you work with *Children from faces* or *Children from particles*. We don't show every possible combination, only the settings for a *Hair* particle system.

Settings

Simple
Children are emitted from the parent hairs.
Interpolated
Children are emitted between the *Parent* particles on the faces of a mesh. They interpolate between adjacent parents. This is especially useful for fur, because you can achieve an even distribution. Some of the children can become virtual parents, which are influencing other particles nearby.
Display
The number of children in the 3D window.
Render
The number of children to be rendered (up to 10.000).
For Simple Mode
Size
Only for *Emitter*. A multiplier for children size.
Random
Random variation to the size of child particles.
Interpolated Mode
Seed
Offset the random number table for child particles, to get a different result.
Virtual
Relative amount of virtual parents.
Long Hair
Calculate children that suit long hair well.

Effects



From left to right: Round: 0.0 / Round: 1.0 / Clump: 1.0 / Clump: -1.0 / Shape: -0.99.

Clump
Clumping. The children may meet at their tip (1.0) or start together at their root (-1.0).
Shape
Form of *Clump*. Either inverse parabolic (0.99) or exponentially (-0.99).
Length
Length of child paths
Threshold

Amount of particles left untouched by child path length

Radius

The radius in which the children are distributed around their parents. This is 3D, so children may be emitted higher or lower than their parents.

Roundness

The roundness of the children around their parents. Either in a sphere (1.0) or in-plane (0.0).

Seed

Offset in the random number table for child particles, to get a different randomized result

Roughness

Uniform, Size

It is based on children location so it varies the paths in a similar way when the children are near.

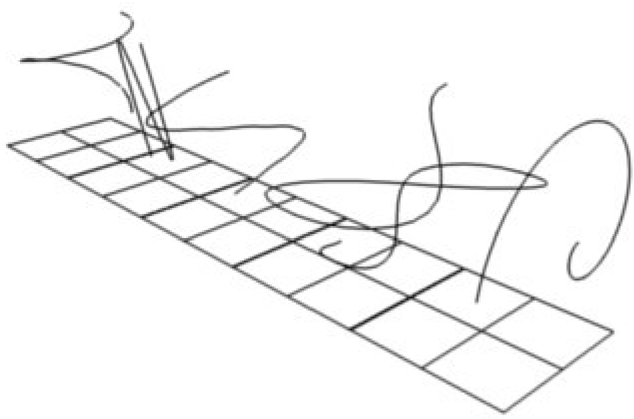
Endpoint, Shape

"Rough End" randomizes path ends (a bit like random negative clumping). Shape may be varied from <1 (parabolic) to 10.0 (hyperbolic).

Random, Size, Threshold

It is based on a random vector so it's not the same for nearby children. The threshold can be specified to apply this to only a part of children. This is useful for creating a few stray children that won't do what others do.

Kink



Child particles with Kink. From left to right: Curl / Radial / Wave / Braid / Roll.

With *Kink* you can rotate the children around the parent. See above picture for the different types of *Kink*.

Curl

Children grow in a spiral around the parent hairs.

Radial

Children form around the parent a wave shape that passes through the parent hair.

Wave

Children form a wave, all in the same direction.

Braid

Children braid themselves around the parent hair.

Amplitude

The amplitude of the offset.

Clump

How much clump effects kink amplitude.

Flatness

How flat the hairs are.

Frequency

The frequency of the offset (1/total length). The higher the frequency the more rotations are done.

Shape

Where the rotation starts (offset of rotation).

Vertex Groups

The Vertexgroups panel allows you to specify vertex groups to use for several child particle settings. You can also negate the effect of each vertex group with the check boxes. You can affect the following attributes:

- Density
- Length
- Clump
- Kink
- Roughness 1
- Roughness 2
- Roughness End

Examples

Particle Mode

Using *Particle Mode* you can edit the key-points (key-frames) and paths of *Baked Hair*, *Particle*, *Cloth*, and *Soft Body* simulations. (You can also edit and style hair before baking).

Since working in particle mode is pretty easy and very similar to working with vertices in the 3D window, we will show how to set up a particle system and then give a reference of the various functions.

Usage

Ways to use Particle Mode

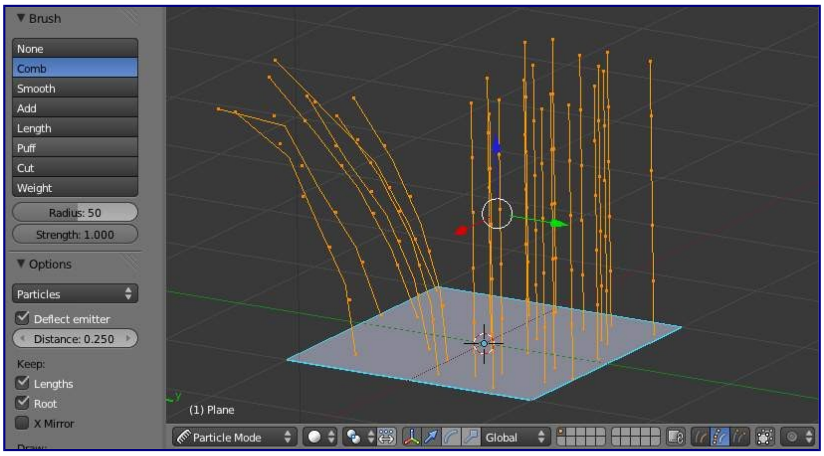
Tip
Only Frames Baked to Memory are Editable!

If you cannot edit the particles, check that you are not baking to a *Disk Cache*.

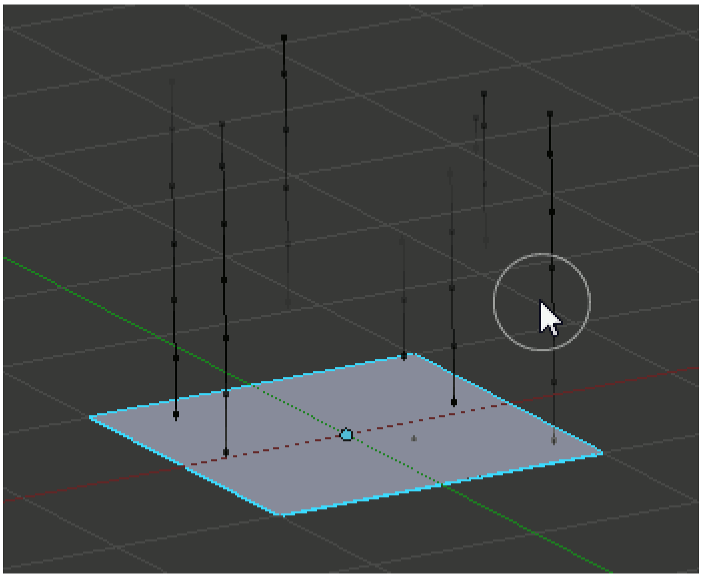
Setup for Hair Particles

- Create a *Hair* particle system - With your object selected, click the *Particle System* icon in the Properties panel. Create a new particle system by clicking the *Plus*.

- Give it an initial velocity in the *Normal* direction (first check the *Advanced* box, then modify the *Velocity* sub-panel), or adjust the *Hair Length*.
- Create a simulation - Place the camera at a good position (pop-up ‣ View ‣ Cameras ‣ Active Camera
- Check the *Hair Dynamics* box. Select pop-up ‣ Render ‣ Render OpenGL Animation in *Render Engine* mode.



Editing hair strands in Particle Mode



Editing a baked particle simulation’s particle paths in Particle Mode

Setup for Particle, Cloth, and Soft Body Simulations

- Use *Emitter* particles, or a cloth/soft-body simulation
- Create a simulation - set up objects and or emitters, set your time range (use a small range if you are just starting out and experimenting), set up the simulation how you want it, using `Alt-A` to preview it.

Bake the Simulation

- Once you are happy with the general simulation, *bake* the simulation from object mode. The simulation must be baked to enable editing. (remember to bake to memory, a disk cache will not be editable in *Particle Mode*)

Edit the Simulation

- Switch to *Particle Edit* from the *Mode dropdown menu* in the bottom menu bar of the *3D View* to edit the particle's paths/key-frames. You may need to press `T` from within the 3D viewport to see the *Particle Edit* panel. Move to the frame you want to edit and use the various *Particle Edit* tools to edit your simulation. Work slowly, previewing your changes and save often so that you can go back to the previous version should something happen, or that you do not like the latest changes you have made.

To be able to clearly see what you are working on:

- Turn on the *Particle Edit Properties* (*PEP*) panel
- Select *Point select mode*

in the header of the 3D window. This will display key points along the particle path.

Using Particle Mode

Selecting Points

You may use the *Select* Menu.

Tip
Selections Selections are extremely useful for modifying only the particles that you want. The method to select individual points is the same as in edit mode. click to select, shift+click to add/remove a point from the selection

Tip
Beware of Undo! Using *Undo* in *Particle Mode* can have strange results. Remember to save often!

Moving keypoints or particles

- To move selected keypoints use one of the various other methods to grab vertices.
- To move a particle root you have to turn off *Keep Root* in the *Tool Bar.*
- You can do many of the things like with vertices, including scaling, rotating and removing (complete particles or single keys).
- You may not duplicate or extrude keys or particles, but you can subdivide particles which adds new keypoints
- Alternatively you can rekey a particle and choose the number of keys.

How smoothly the hair and particle paths are displayed depends on the *Path Steps* setting in the *Tool Bar.* Low settings produce blocky interpolation between points, while high settings produce a smooth curve.

Mirroring particles

- If you want to create an X-Axis symmetrical haircut you have to do following steps: - Select all particles with A. - Mirror the particles - Turn on *X-Axis Mirror Editing* in the *Particle* menu.

It may happen that after mirroring two particles occupy nearly the same place. Since this would be a waste of memory and rendertime, you can *Remove doubles* from the *Particle* menu.

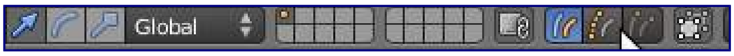
Hiding/Unhiding

Hiding and unhiding of particles works similar as with vertices in the 3D window. The particle in fact doesn't vanish, only the key points.

Hidden particles (i.e. particles whose keypoints are hidden) don't react on the various brushes. But:

If you use *Mirror Editing* even particles with hidden keypoints may be moved, if their mirrored counterpart is moved.

Select Modes



Path
: No keypoints are visible, you can select/deselect only all particles.

Point
: You see all of the keypoints.

Tip
: You can see and edit (including the brushes) only the tip of the particles, i.e. the last keypoint.

Brush

With the buttons you can select the type of "Comb" utility you want to use. Below the brush types, their settings appear:

Common Options:

- **Radius**
  - Set the radius if the brush.
- **Strength**
  - Set the strength of the brush effect (not for Add brush).
- **Add/Sub Grow/Shrink**
  - Sets the brush to add the effect or reverse it..

None
: No special tool, just edit the keypoints as "normal" vertices.

Comb
: Moves the keypoints (similar to "proportional editing").

Smooth
: Parallels visually adjacent segments.

Add

Adds new particles.

Count

The number of new particles per step.

Interpolate

Interpolate the shape of new hairs from existing ones.

Steps

Amount of brush steps

Keys

How many keys to make new particles with.

Length

Scales the segments, so it makes the hair longer(*Grow*) or shorter(*Shrink*).

Puff

Rotates the hair around it’s first keypoint (root). So it makes the hair stand up (*Add*) or lay down (*Sub*).

Puff Volume

Apply puff to unselected end-points, (helps maintain hair volume when puffing root)

Cut

Scales the segments until the last keypoint reaches the brush.

Weight

This is especially useful for softbody animations, because the weight defines the softbody *Goal*. A keypoint with a weight of 1 won’t move at all, a keypoint with a weight of 0 subjects fully to softbody animation. This value is scaled by the *GMin* - *GMax* range of softbody goals...

Options

Deflect Emitter, Dist

Don’t move keypoints through the emitting mesh. *Dist* is the distance to keep from the Emitter.

Keep

Length

Keep the length of the segments between the keypoints when combing or smoothing the hair. This is done by moving all the other keypoints.

Root

Keep first key unmodified, so you can’t transplant hair.

X Mirror

Enable mirror editing across the local x axis.

Draw

Path Steps

Drawing steps, sets the smoothness of the drawn path.

Show Children

Draws the children of the particles too. This allows to fine tune the particles and see their effects on the result, but it may slow down your system if you have many children.

9.6 Physics - Smoke Simulation

Smoke Simulation

Smoke simulation is used to simulate the fluid movement of air and generate animated voxel textures representing the density, heat, and velocity of other fluids or suspended particles (i.e. smoke) which can be used for rendering.

Smoke and fire are emitted into a *Domain* from a mesh object or particle system. Smoke movement is controlled by airflow inside the domain, which can be influenced by *smoke collision objects*. Smoke will also be affected by scene gravity and *force fields*. Airflow inside the domain can affect other physics simulations via the smoke flow force field.

Workflow

At least a *Domain Object* object and one *Flow object* are required to create a smoke simulation. A basic workflow looks like this:

1. Create a *Domain Object* that defines the bounds of the simulation volume.
2. Define a *Flow object* or objects which will emit smoke and fire.
3. Set *Collision objects* to make the smoke interact with objects in the scene.
4. Assign a *Volumetric material* to the domain object.
5. Save the `.blend`.
6. *Bake* the simulation.

Note

There is a *Quick Smoke* operator which will automatically create a domain object with a basic smoke/fire material. It can be found in 3D View ‣ Object ‣ Quick Effects ‣ Quick Smoke, or in the `Spacebar` search box.

Technical information

Bforartists's smoke simulation is based on the paper Wavelet Turbulence for Fluid Simulation and associated sample code.

It has been implemented in Bforartists by Daniel Genrich and Miika Hamalainen.

Smoke Domain

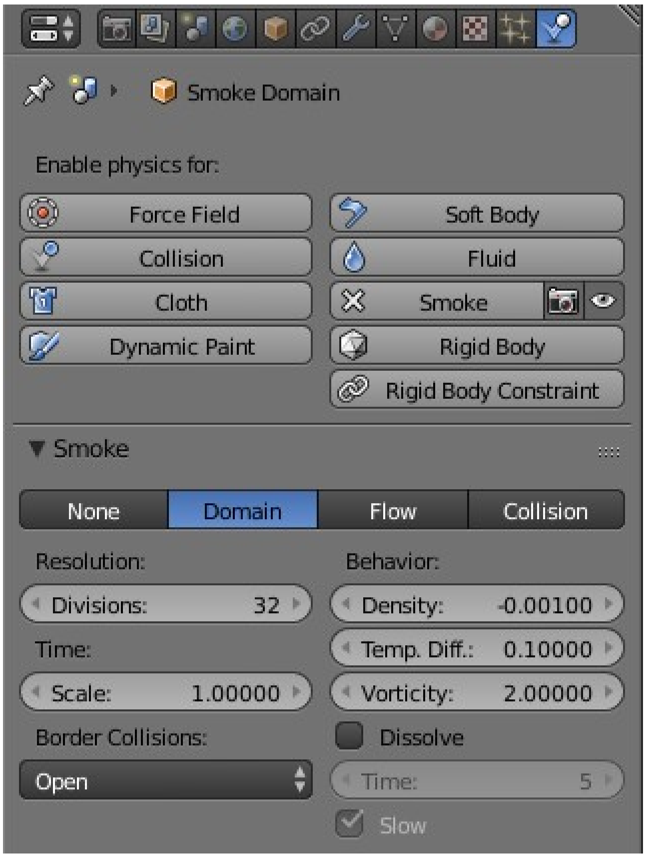
The domain object contains the entire simulation. Smoke and fire cannot leave the domain, it will either collide with the edge or disappear, depending on the domain's settings.

Keep in mind that large domains require higher resolutions and longer bake times. You'll want to make it just large enough that the simulation will fit inside it, but not so large that it takes too long to compute the simulation.

To create a domain, add a cube and transform it until it encloses the area where you want smoke. Translation, rotation, and scaling are all allowed. To turn it into a smoke domain, click *Smoke* in Properties ‣ Physics, then select *Domain* as the *Smoke Type*.

Note

You *can* use other shapes of mesh objects as domain objects, but the smoke simulator will use the shape's bounding box as the domain bounds. In other words, the actual shape of the domain will still be rectangular.



Smoke Domain settings.

Settings

Resolution

The smoke domain is subdivided into many “cells” called voxels (see voxel) which make up “pixels” of smoke. This setting controls the number of subdivisions in the domain. Higher numbers of subdivisions are one way of creating higher resolution smoke (See Smoke High Resolution)

Since the resolution is defined in terms of *subdivisions*, larger domains will need more divisions to get an equivalent resolution to a small domain.

Also see Note on Divisions and High Resolution.

Time Scale

Controls the speed of the simulation. Low values result in a “slow motion” simulation, while higher values can be used to advance the simulation faster (useful for generating smoke for use in still renders).

Border Collisions

Controls which sides of the domain will allow smoke “through” the domain, making it disappear without influencing the rest of the simulation, and which sides will deflect smoke as if colliding with a *Collision Object*.

Vertically Open

Smoke disappears when it hits the top or bottom of the domain, but collides with the walls.

Open

Smoke disappears when it hits any side of the domain.

Collide All

Smoke collides with all sides of the domain.

Density

Controls how much smoke is affected by density.

- Values above 0 will cause the smoke to rise (simulating smoke which is lighter than ambient air).
- Values below 0 will cause smoke to sink (simulating smoke which is heavier than ambient air).

Temp. Diff.

The *Temperature Difference* setting controls how much smoke is affected by temperature.

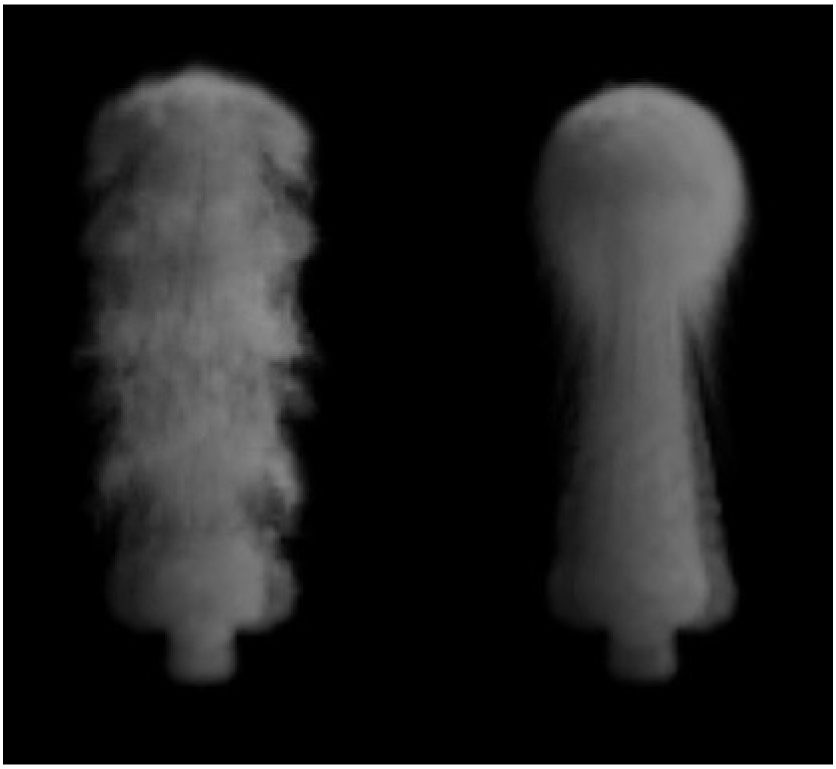
The effect this setting has on smoke depends on the per flow object *Temp. Diff.* setting:

- Values above 0 will result in the smoke rising when the flow object *Temp. Diff.* is set to a positive value, and smoke sinking when the flow object *Temp. Diff.* is set to a negative value.
- Values below 0 will result in the opposite of positive values, i.e. smoke emitted from flow objects with a positive *Temp. Diff.* will sink, and smoke from flow objects with a negative *Temp. Diff.* will rise.

Note that smoke from multiple flow objects with different temperatures will mix and warm up/cool down until an equilibrium is reached.

Vorticity

Controls the amount of turbulence in the smoke. Higher values will make lots of small swirls, while lower values make smoother shapes.



Comparison of different amounts of vorticity. The domain on the left has a vorticity of 3, while the domain on the right has a vorticity of .01.

Dissolve
Allow smoke to dissipate over time.
Time
Speed of smoke's dissipation in frames.
Slow
Dissolve smoke in a logarithmic fashion. Dissolves quickly at first, but lingers longer.

Smoke Flames

Speed
How fast fuel burns. Larger values result in smaller flames (fuel burns before it can go very far), smaller values result in larger flames (fuel has time to flow farther before being fully consumed).
Smoke
Amount of extra smoke created automatically to simulate burnt fuel.
Vorticity
Additional vorticity for flames.
Ignition
Minimum temperature of flames.
Maximum
Maximum temperature of flames.
Smoke Color
Color of smoke created by burnt fuel.

Smoke Adaptive Domain

When enabled, the domain will adaptively shrink to best fit the smoke, saving computation time by leaving voxels without smoke out of the simulation. Unless the *Additional* option is used, the adaptive domain will not exceed the bounds of the original domain.

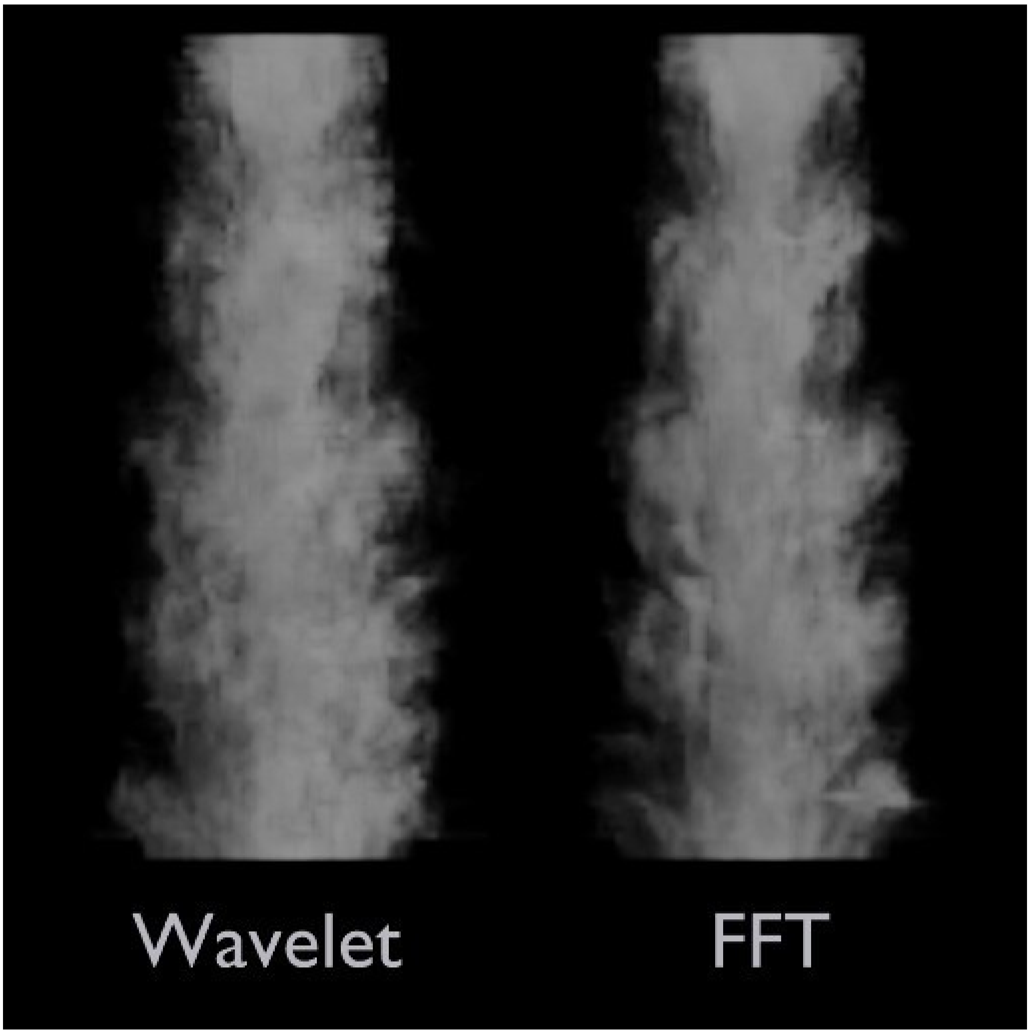
Additional
Number of voxels to add around the outside of the domain.
Margin
Amount of extra space to leave around smoke, measured in voxels. With very fast moving smoke larger margins may be required to prevent the smoke from being cut off by the adaptive boundary, but note this will increase the number of voxels which need to be computed.
Threshold
Smallest amount of smoke a voxel can contain before it's considered empty and the adaptive domain is allowed to cut it out of the simulation.

Smoke High Resolution

The High Resolution option lets you simulate at low resolution and then uses noise techniques to enhance the resolution without actually computing it. This allows animators to set up a low resolution simulation quickly and later add details without changing the overall fluid motion. Also see Note on Divisions and High Resolution.

Resolution/Divisions
Factor by which to enhance the resolution of smoke using the specified noise method.
Show High Resolution
Show high resolution in the viewport (may cause viewport responsiveness to suffer).
Noise Method

The two options, *Wavelet* and *FFT*, are very similar.



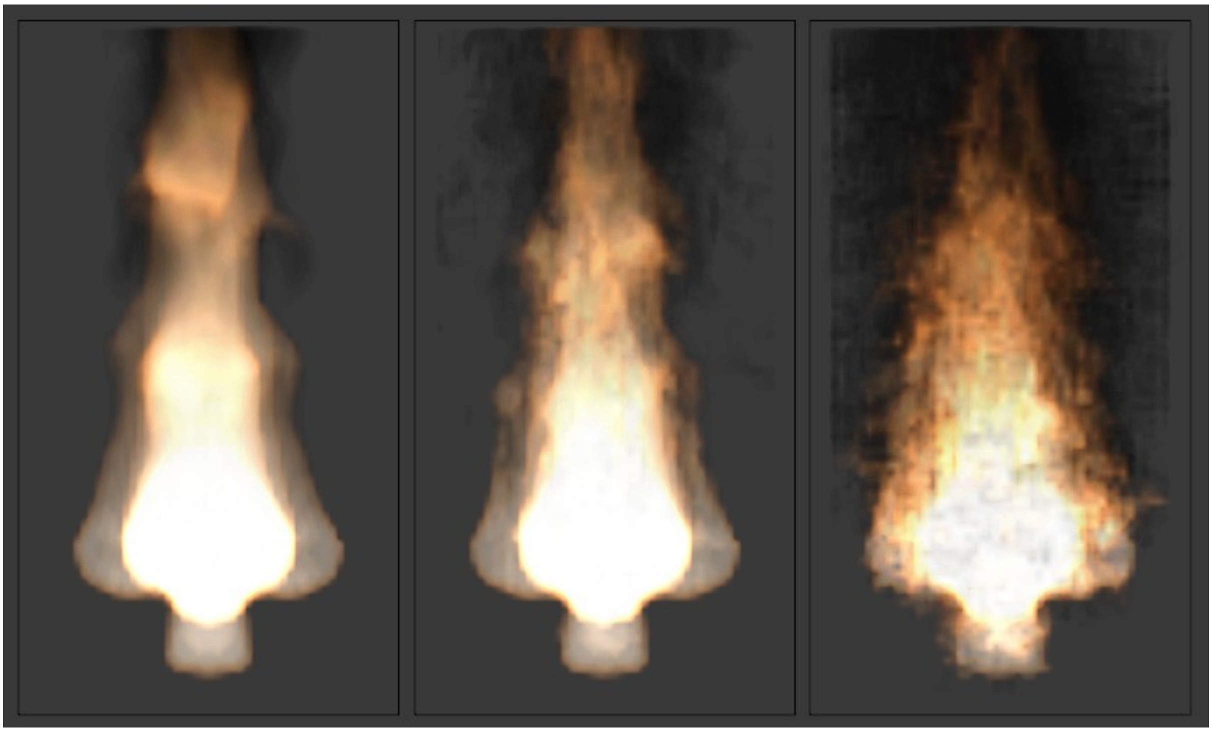
Comparison of noise methods. *Wavelet* on the left, *FFT* on the right.

Note

Wavelet is an implementation of Turbulence for Fluid Simulation.

Strength

Strength of noise.



From left to right, the domains' high resolution strengths are set to 0, 2, and 6.

Smoke Groups

Flow Group
If set, only objects in the specified Group will be allowed to act as flow objects in this domain.

Collision Group
If set, only objects in the specified Group will be allowed to act as collision objects in this domain.

Smoke Cache

See *Baking*.

Smoke Field Weights

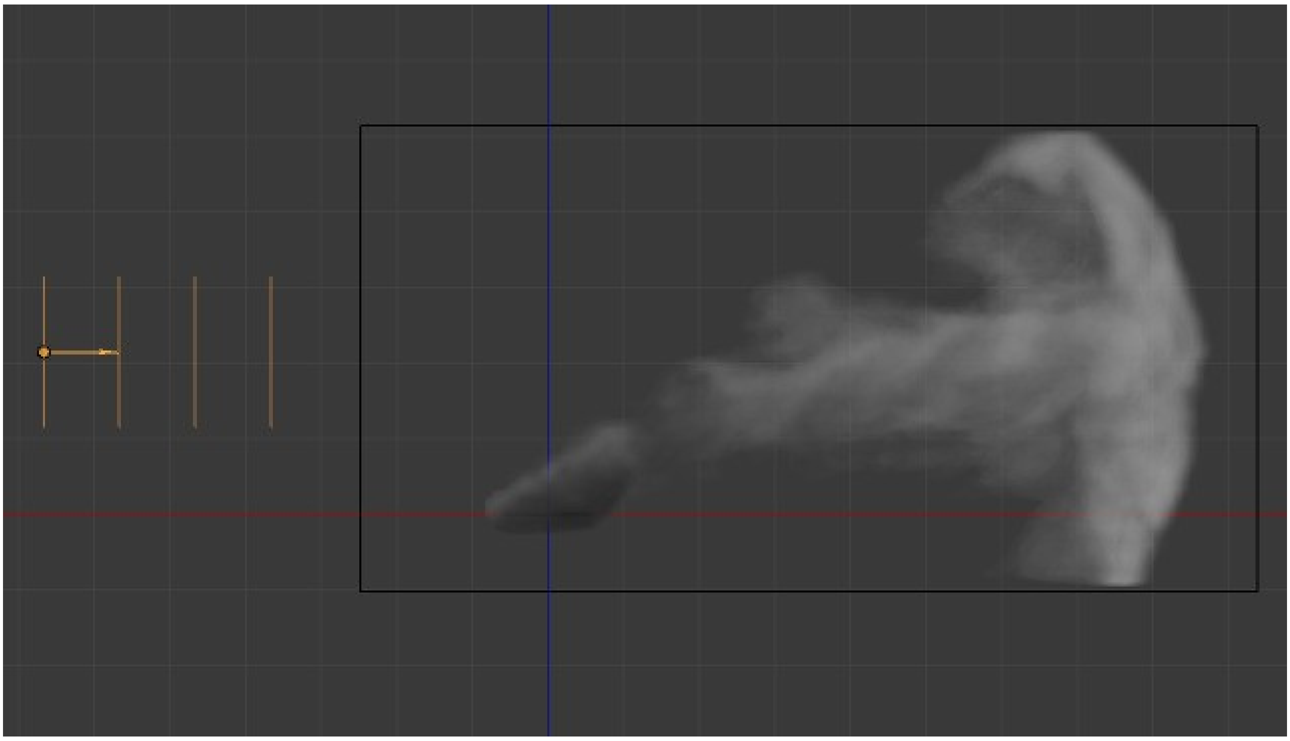
These settings determine how much gravity and *Force Fields* affect the smoke.

Effector Group
When set, smoke can only be influenced by force fields in the specified group.

Gravity
How much the smoke is affected by Gravity.

All
Overall influence of all force fields.

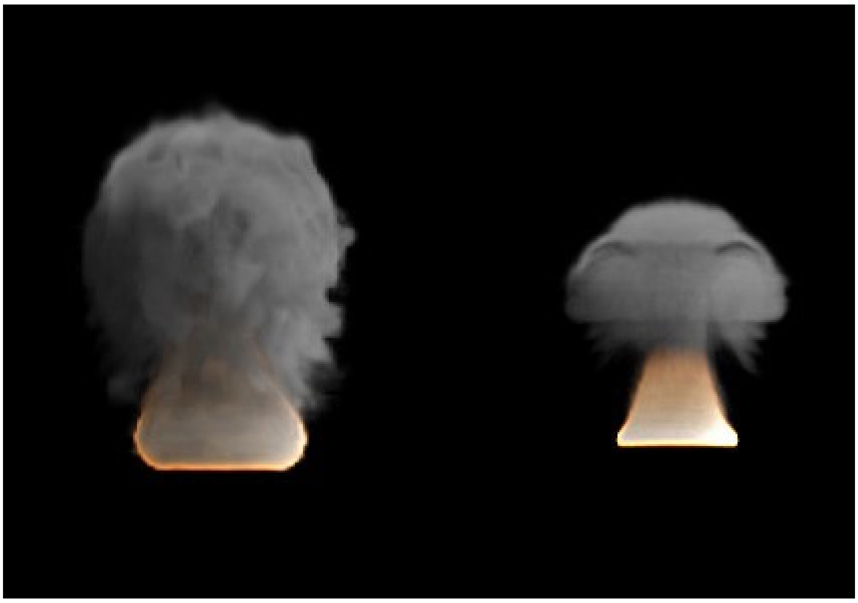
The other settings determine how much influence individual force field types have.



Smoke with a wind force field.

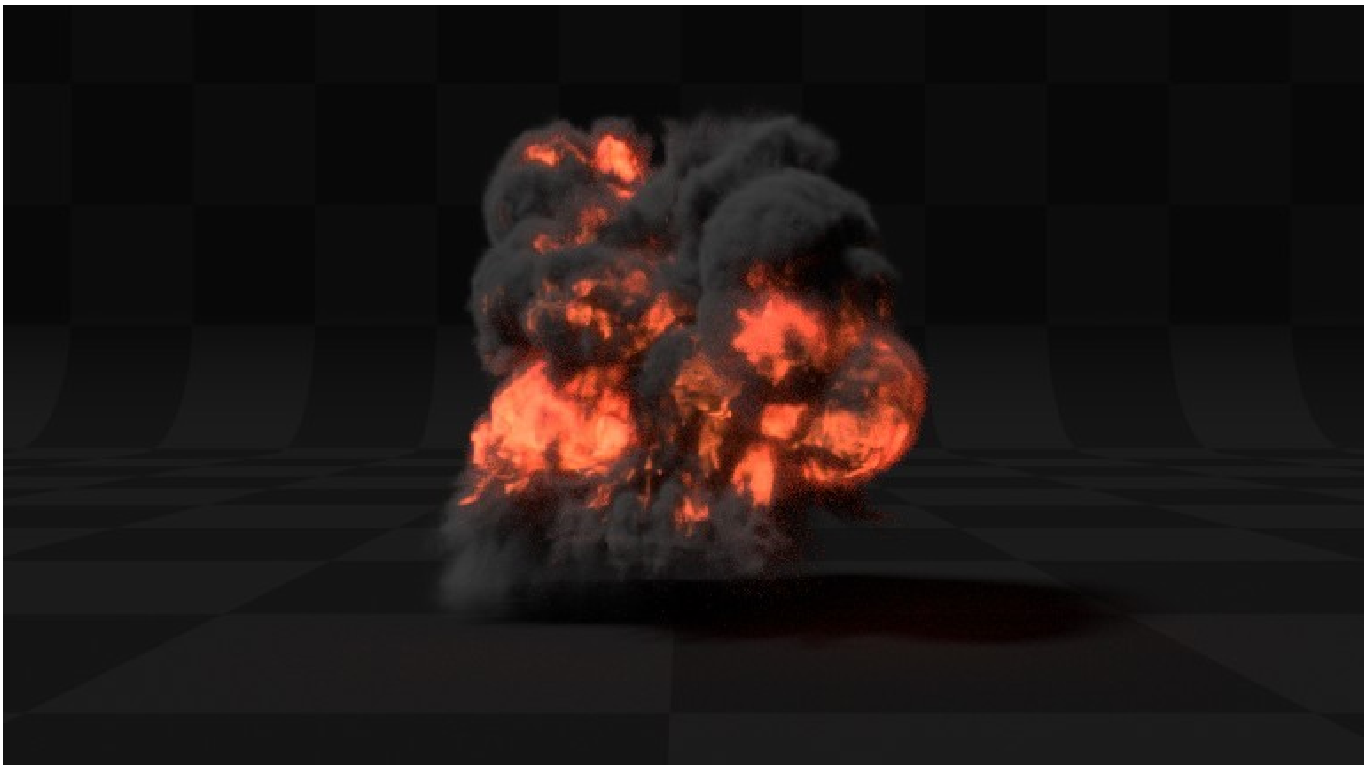
Note on Divisions and High Resolution

High Resolution Divisions and Domain Subdivisions are not equivalent. By using different combinations of these resolution settings you can obtain a variety of different styles of smoke.



Comparison between a domain with 24 divisions and 4 *High Resolution* divisions (left), and a domain with 100 divisions and 1 *High Resolution* division (right).

Low division simulations with lots of *High Resolution* divisions generally appear smaller in real-world scale (larger flames etc.) and can be used to achieve pyroclastic plumes such as this:



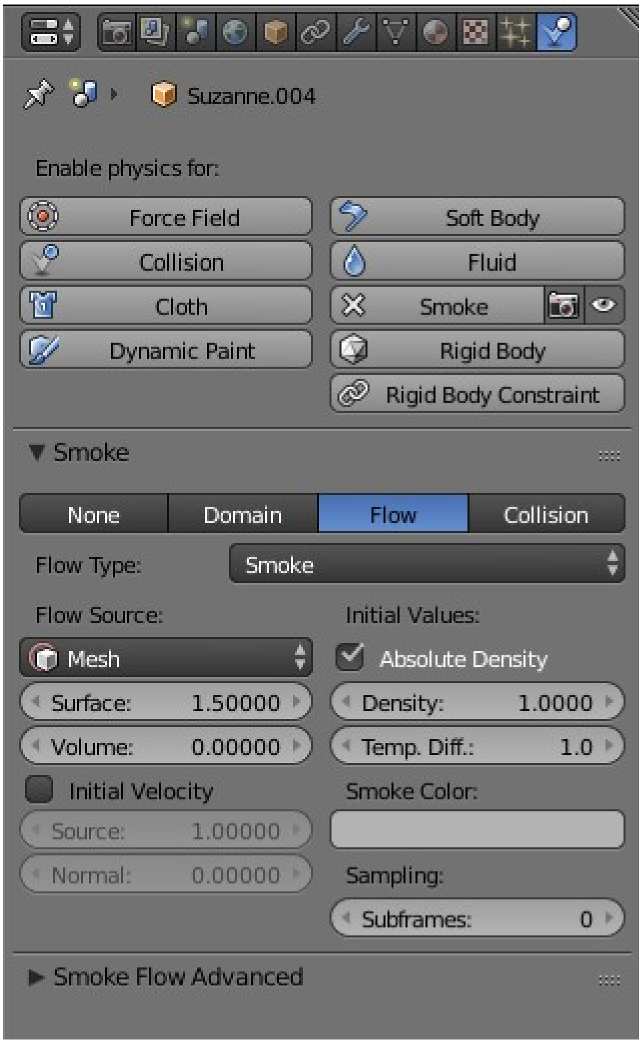
High *Domain Division* simulations tend to appear larger in real-world scale, with many smaller details.

Smoke Flow Object

Smoke Flow objects are used to add or remove smoke and fire to a *Smoke Domain* object.

To define any mesh object as a *Smoke Flow* object, add smoke physics by clicking *Smoke* in Properties ‣ Physics. Then select *Flow* as the *Smoke Type*. Now you should have a default smoke flow source object. You can test this by playing the animation from the first frame. If your source object is inside your domain, you should see smoke.

Settings



Smoke Flow settings

Flow Type

Fire
: Emit only fire. Note that the domain will automatically create some smoke to simulate smoke left by burnt fuel.

Smoke
: Emit only smoke.

Fire + Smoke
: Emit both fire and smoke.

Outflow
: Remove smoke and fire. Note that the shape of the outflow will use the object’s bounding box.

Flow Source

Source

This setting defines the method used to emit smoke and fire.

Mesh

Create smoke/fire directly from the object’s mesh. With this option selected there two additional settings, *Surface* and *Volume*.

Surface

Maximum distance in voxels from the surface of the mesh in which smoke is created (see voxel). Since this setting uses voxels to determine distance, results will vary depending on the domain’s resolution.

Volume

Amount of smoke to emit inside the emitter mesh, where 0 is none and 1 is Note that emitting smoke based on volume may have unpredictable results if your mesh is non-manifold.

Particle System

Create smoke/fire from a particle system on the flow object. Note that only *Emitter* type particle systems can add smoke. See *Particles* for information on how to create a particle system.

With this option selected there is a box to select a particle system and one addition setting, *Set Size*.

Set Size

When this setting is enabled it allows the *Size* setting to define the maximum distance in voxels at which particles can emit smoke, similar to the *Surface* setting for mesh sources.

When disabled, particles will fill the nearest voxel with smoke.

Initial Velocity

When enabled, smoke will inherit the momentum of the flow source.

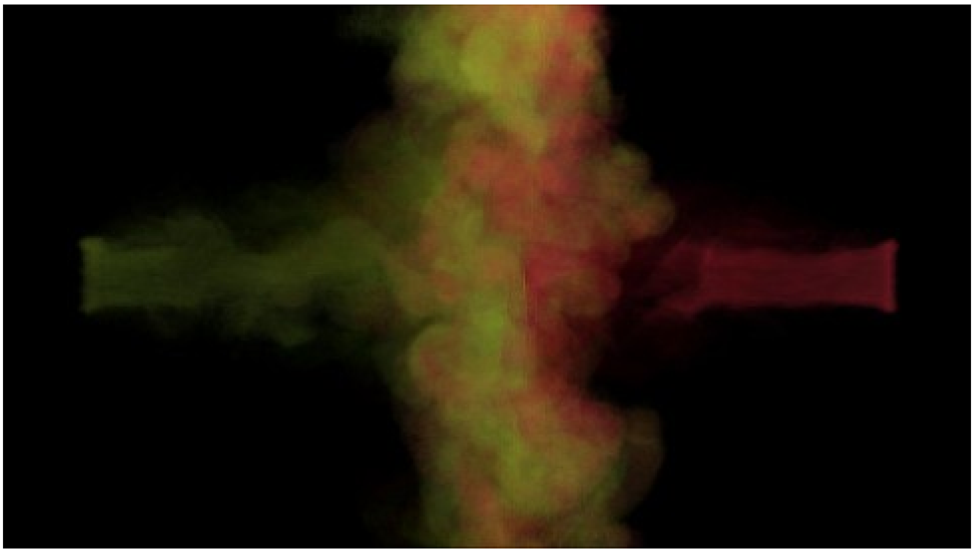
Source
Multiplier for inherited velocity. A value of 1 will emit smoke moving at the same speed as the source.

Normal
When using a mesh source, this option controls how much velocity smoke is given along the source’s normal.

Initial Values

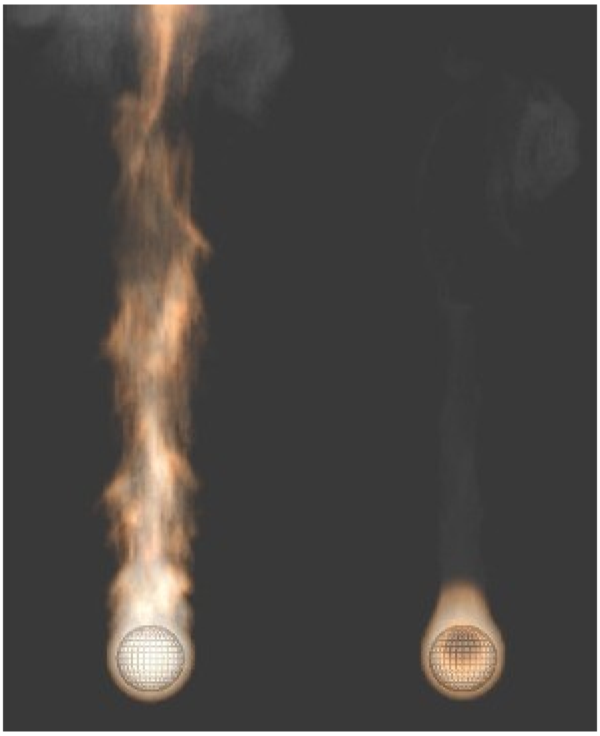
Smoke Color

Color of emitted smoke. When smoke of different colors are mixed they will blend together, eventually settling into a new combined color.



Flame Rate:

Amount of “fuel” being burned per second. Larger values result in larger flames, smaller values result in smaller flames:



Example showing two fire sources. The object on the left has a *Flame Rate* of 5, while the one on the right has 0.3.

Absolute Density

Maximum density of smoke allowed within range of the source.

Density

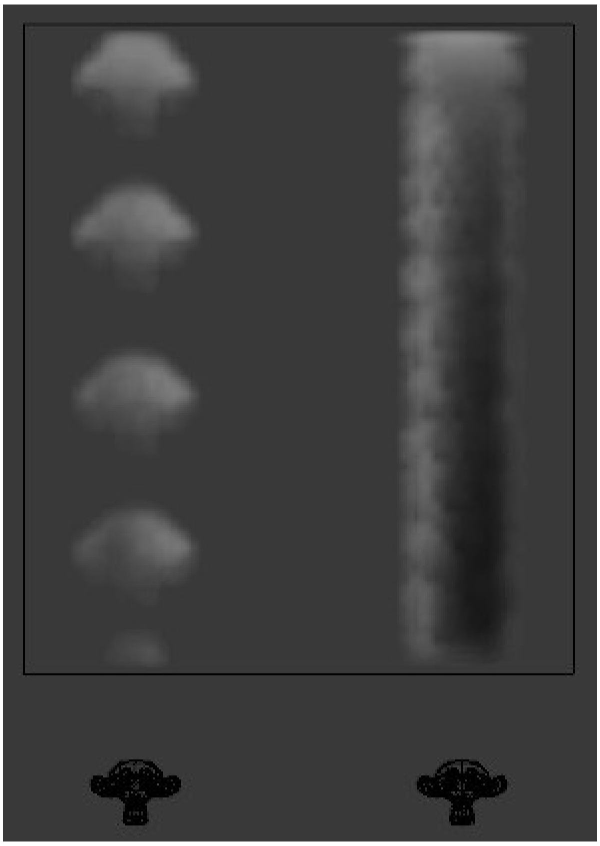
Amount of smoke to emit at once.

Temp. Diff.

Difference between the temperature of emitted smoke and the domain’s ambient temperature. This setting’s effect on smoke depends on the domain’s *Temp. Diff.* setting.

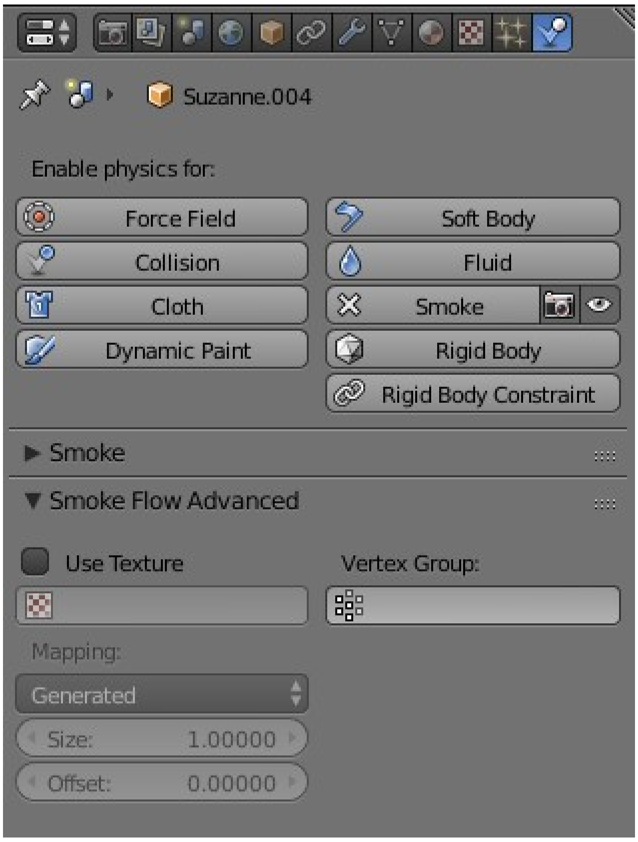
Sampling

Number of sub-frames used to reduce gaps in emission of smoke from fast-moving sources.



Example showing two fast moving sources. The object on the left uses 0 subframes, while the one on the right uses 6.

Smoke Flow Advanced

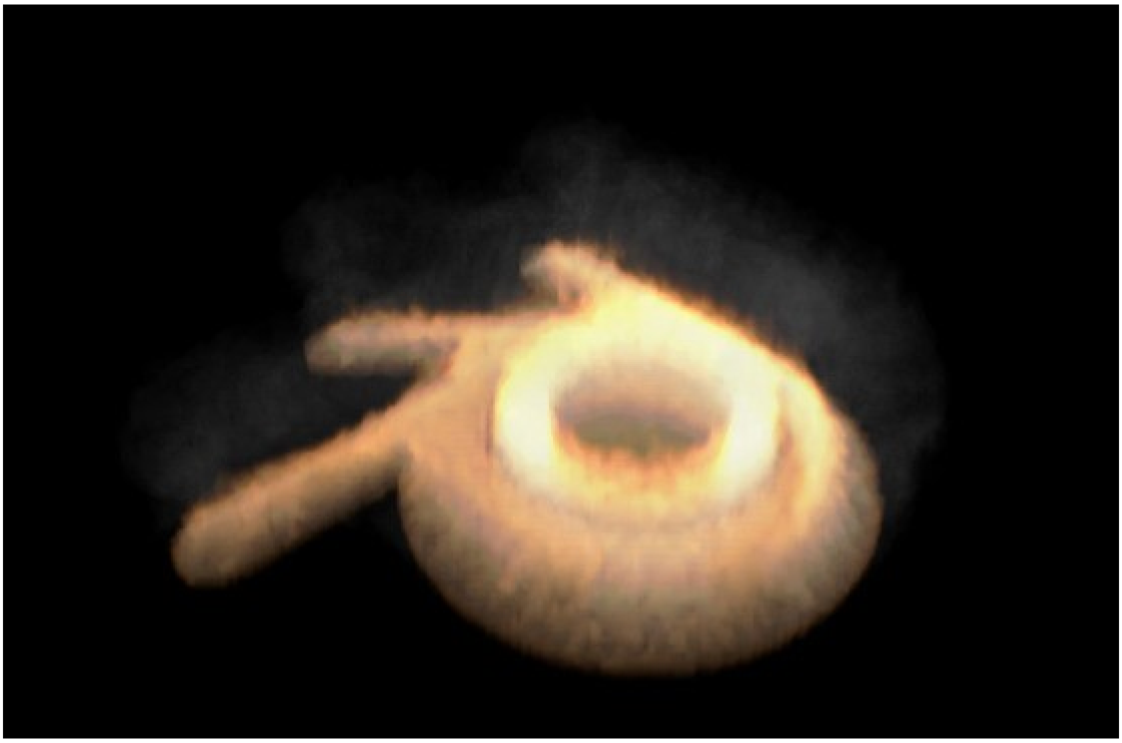


When using a mesh as the *Flow Source*, you can use these settings to control where on the mesh smoke can be emitted from. These settings have no effect on outflow objects.

Use Texture
: When enabled, use the specified texture to control where smoke is emitted.

Vertex Group
: When set, use the specified *Vertex Group* to control where smoke is emitted.

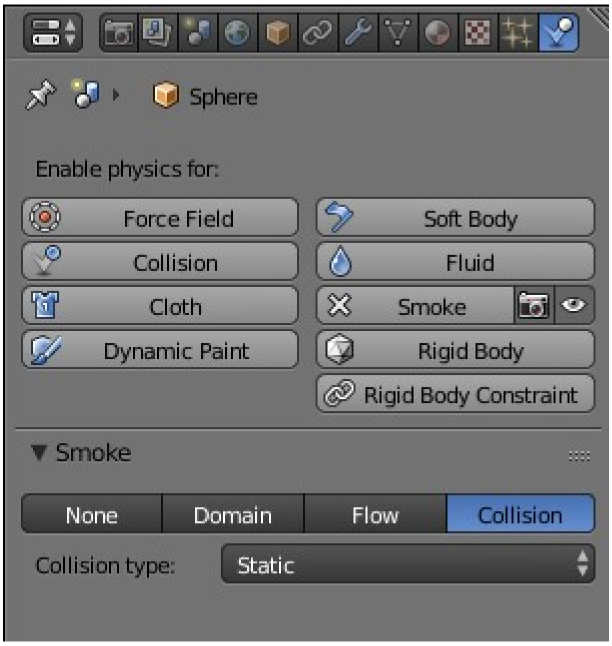
These settings are useful for effects like this:



Collisions

Smoke Collision objects are used to deflect smoke and influence airflow.

To define any mesh object as a *Smoke Collision* object, add smoke physics by clicking *Smoke* in Properties ‣ Physics. Then select *Collision* as the *Smoke Type*.



Smoke Collision settings

Collision type

Static

Simple collision model which can be calculated quickly, but may be inaccurate for moving objects.

Animated

More complex collision model which takes into account impulse imparted to smoke when the collider is moving. Calculations are slower, but more accurate for moving objects.

Rigid

Identical to *Static* (unfinished code).

Forces

Force Fields (such as wind or vortex) are supported, like most physics systems. The influence individual force types have can be controlled per domain object.

Smoke Material

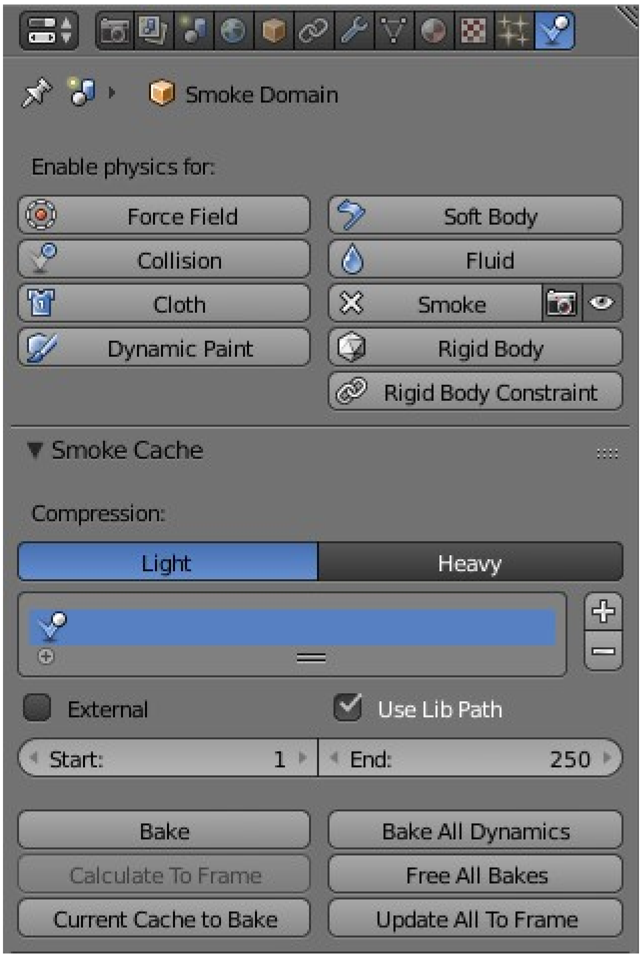
Bforartists has multiple render engines each with their own method of rendering smoke-data:

- *Bforartists Internal*
- *Cycles Render*

Baking Smoke Simulations

Baking is used to store the outcome of a simulation so it doesn't need to be recalculated.

Smoke baking settings are in Properties ‣ Physics ‣ Smoke ‣ Smoke Cache. See *Baking Physics Simulations*.



Smoke Cache options

Note

Baking can only been done once your .blend is saved. If your .blend has not been saved, the *Smoke Cache* panel will be disabled.

9.7 Physics - Soft Body

Soft Body

Image 1a: A softbody cloth uncovering a text. Animation - Blend file

A Soft Body in general, is a simulation of a soft or rigid deformable object. In Bforartists, this system is best for simple cloth objects and closed meshes. There is dedicated *Cloth Simulation* physics that use a different solver, and is better for cloth.

This simulation is done by applying forces to the vertices or controlpoints of the object. There are exterior forces like gravity or forcefields and interior forces that hold the vertices together. This way you can simulate the shapes that an object would take on in reality if it had volume, was filled with something, and was acted on by real forces.

Soft Bodies can interact with other objects (*Collision*). They can interact with themselves (*Self Collision*).

The result of the Soft Body simulation can be converted to a static object. You can also *bake edit* the simulation, i.e. edit intermediate results and run the simulation from there.

Typical scenarios for using Soft Bodies

Image 1b: A wind cone. The cone is a Soft Body, as the suspension. Animation - Blend file

Soft Bodies are well suited for:

- Elastic objects with or without collision.

- Flags, fabric reacting to forces.
- Certain modeling tasks, like a cushion or a table cloth over an object.
- Bforartists has another simulation system for clothing (see *Clothes*). But you can sometimes use Soft Bodies for certain parts of clothing, like wide sleeves.
- Hair (as long as you minimize collision).
- Animation of swinging ropes, chains and the like.

The following videos may give you some more ideas: http://youtube.com/watch?v=qdusMZlBbQ4, http://de.youtube.com/watch?v=3du8ksOm9Fo

Creating a Soft Body

Soft Body simulation works for all objects that have vertices or control points:

- Meshes.
- Curves.
- Surfaces.
- Lattices.

To activate the Soft Body simulation for an object:

- In the *Properties* window, go to the *Physics* tab (it is all the way on the right, and looks like a bouncing ball).
- Activate the *Soft Body* button.

A lot of options appear. For a reference of all the settings see *this page*.

- You start a Soft Body simulation with Play button
- You pause the simulation with Pause button
- You stop the simulation with `Esc`.

Simulation Quality

The settings in the *Soft Body Solver* panel determine the accuracy of the simulation.

Min Step
: Minimum simulation steps per frame. Increase this value, if the Soft Body misses fast moving collision objects.

Max Step
: Maximum simulation steps per frame. Normally the number of simulation steps is set dynamically (with the *Error Limit*) but you have probably a good reason to change it.

Auto-Step
: Use Velocities for automatic step sizes.

Error Limit
: Rules the overall quality of the solution delivered. Default 0.1. The most critical setting that says how precise the solver should check for collisions. Start with a value that is 1/2 the average edge length. If there are visible errors, jitter, or over-exaggerated responses, decrease the value. The solver keeps track of how “bad” it is doing and the *Error Limit* causes the solver to do some “adaptive step sizing”.

Fuzzy
: Simulation is faster, but less accurate.

Choke

Calms down (reduces the exit velocity of) a vertex or edge once it penetrates a collision mesh.

Diagnostics

Print Performance to Console
: Prints on the console how the solver is doing.

Estimate Matrix
: Estimate matrix. Split to COM , ROT ,SCALE

Cache and Bake

Soft Bodies and other physic simulations use a unified system for caching and baking. See *Particle Cache* for reference.

The results of the simulation are automatically cached to disk when the animation is played, so that the next time it runs, it can play again quickly by reading in the results from the disk. If you *Bake* the simulation the cache is protected and you will be asked when you're trying to change a setting that will make a recalculating necessary.

Tip

Beware of the *Start* and *End* settings

The simulation is only calculated for the frames in-between the *Start* and *End* frames (*Bake* panel), even if you don't actually bake the simulation! So if you want a simulation longer than the default setting of 250 frames you have the change the *End* frame.

- Caching:
  - As animation is played, each physics system writes each frame to disk, between the simulation start and end frames. These files are stored in folders with prefix `blendcache`, next to the `.blend` file.
  - The cache is cleared automatically on changes - but not on all changes, so it may be necessary to free it manually, e.g. if you change a force field. Note that for the cache to fill up, one has to start playback before or on the frame that the simulation starts.
  - If you are not allowed to write to the required sub-directory caching will not take place.
  - The cache can be freed per physics system with a button in the panels, or with the `Ctrl-B` shortcut key to free it for all selected objects.
  - You may run into trouble if your .blend file path is very long and your operating system has a limit on the path length that is supported.
- Baking:
  - The system is protected against changes after baking.
  - The *Bake* result is cleared for all selected objects or click on *Free Bake* for the current Soft Body system.
  - If the mesh changes the simulation is not calculated anew.

For renderfarms, it is best to bake all the physics systems, and then copy the blendcache to the renderfarm as well.

Interaction in real time

To work with a Soft Body simulation you will find it handy to use the *Timeline* window. You can change between frames and the simulation will always be shown in the actual state. The option *Continue Physics* in the *Playback* menu of the *Timeline* window lets you interact in real time with the simulation, e.g. by moving collision objects or shake a Soft Body object. And this is real fun!

You can than select the Soft Body object while running the simulation and *Apply* the modifier in the *Modifiers* panel of the *Editing* context. This makes the deformation permanent.

Tips

- Soft Bodies work especially well if the objects have an even vertex distribution. You need enough vertices for good collisions. You change the deformation (the stiffness) if you add more vertices in a certain region (see the animation of *Image 1b*).
- The calculation of collisions may take a long time. If something is not visible, why calculate it?
- To speed up the collision calculation it is often useful to collide with an additional, simpler, invisible, somewhat larger object (see the example to *Image 1a*).
- Use Soft Bodies only where it makes sense. If you try to cover a body mesh with a tight piece of cloth and animate solely with Soft Body, you will have no success. Self collision of Soft Body hair may be activated, but that is a path that you have to wander alone. We will deal with *Collisions* in detail later.
- Try and use a *Lattice* or a *Curve Guide* Soft Body instead of the object itself. This may be magnitudes faster.

Exterior Forces

Exterior forces are applied to the vertices (and nearly exclusively to the vertices) of Soft Body objects. This is done using Newtons Laws of Physics:

- If there is no force on a vertex, it stays either unmoved or moves with constant speed in a straight line.
- The acceleration of a vertex depends on its mass and the force. The heavier the mass of a vertex the slower the acceleration. The larger the force the greater the acceleration.
- For every action there is an equal and opposite reaction.

Well, this is done only in the range of computing accurateness, there is always a little damping to avoid overshoot of the calculation.

Example

We will begin with a very simple example - the default cube.

- To judge the effect of the external forces you should at first turn off the *Goal*, so that the vertices are not retracted to their original position.
- Click Play

What happens? The cube moves in negative Z-direction. Each of it’s eight vertices is affected by a global, constant force - the gravitation. Gravitation without friction is independent from the weight of an object, so each object you would use as a Soft Body here would fall with the same acceleration. The object does not deform, because every vertex moves with the same speed in the same direction.

Settings

Soft Body Panel

Friction
: The friction of the surrounding medium. The larger the friction, the more viscous is the medium. Friction always appears when a vertex moves relative to it’s surround medium.

Mass
: Mass value for vertices. Larger mass slows down acceleration, except for gravity where the motion is constant regardless of mass. Larger mass means larger inertia, so also braking a Soft Body is more difficult.

Mass Vertex Group
: You can paint weight values for an mesh’s mass, and select that vertex group here.

Speed
: You can control the internal timing of the Softbody system with this value. It sets the correlation between frame rate and tempo of the simulation. A free falling body should cover a distance of about five meters after one second. You can adjust the scale of your scene and your simulation with this correlation. If you render with 25 frames per second and 1 meter shall be 1 BU, you have to set *Speed* to 1.3.

Force Fields

To create other forces you have to use another object, often *Empty* objects are used for that. You can use some of the forces on Soft Body vertices as on *Particles*. Soft Bodies react only to:

- Spherical
- Wind
- Vortex

Soft bodies do react on *Harmonic* fields, but not in a useful way. So if you use a *Harmonic* field for particles move the Soft body to another layer.

See the section *Force Fields* for details. The force fields are quite strong, a *Spherical* field with a strength of -1.0 has the same effect that gravity has - approximately - a force of 10 Newton.

Aerodynamics

This special exterior force is not applied to the vertices but to the connecting edges. Technically, a force perpendicular to the edge is applied. The force scales with the projection of the relative speed on the edge (dot product). Note that the force is the same if wind is blowing or if you drag the edge through the air with the same speed. That means that an edge moving in its own direction feels no force, and an edge moving perpendicular to its own direction feels maximum force.

Simple
: Edges receive a drag force from surrounding media

Lift Force
: Edges receive a lift force when passing through surrounding media.

Factor
: How much aerodynamic force to use. Try a value of 30 at first.

Using a Goal

A goal is a shape that a soft body object tries to conform to.

You have to confine the movement of vertices in certain parts of the mesh, e.g. to attach a Soft Body object at other objects. This is done with the *Vertex Group* (target). The target position is the original position of the vertex, like it would result from the “normal” animation of an object including *Shape Keys*, *Hooks* and *Armatures*. The vertex tries to reach it’s target position with a certain, adjustable intensity.

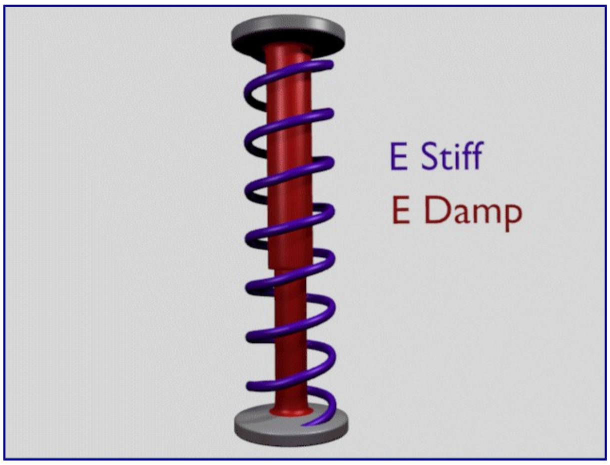


Image 2b: Shock absorber description.

Imagine the vertex is connected with it’s target through a spring (*Image 2b*).

Default

This parameter defines how strong the influence of this spring is. A strength of 1 means, that the vertex will not move as Soft Body at all, instead keep its original position. 0 *Goal* (or no *Goal*) means, that the vertex moves only according to Soft Body simulation. If no vertex group is used/assigned, this numeric field is the default goal weight for all vertices. If a vertex group is present and assigned, this button instead shows an pop-up selector button that allows you to choose the name of the goal vertex group. If you use a vertex group the weight of a vertex defines its goal.

Often Weight Paint is used to adjust the weight comfortably. For non-mesh objects the *Weight* parameter of their vertices/controlpoints is used instead (`W` in *Edit mode*, or use the *Transform Properties* panel). The weight of *Hair* particles can also be painted in *Particle Mode*.

Minimum / Maximum

When you paint the values in vertex-groups (using *WeightPaint* mode), you can use the *G Min* and *G Max* to fine-tune (clamp) the weight values. The lowest vertex-weight (blue) will become *G Min*, the highest value (red) becomes *G Max* (please note that the blue-red color scale may be altered by User Preferences).

Tip

For now all is applied to single vertices

For now we have discussed vertex movement independent of each other, similar to particles. Every object without *Goal* would collapse completely if a non uniform force is applied. Now we will move to the next step, the forces that keep the structure of the object and make the Soft Body to a real Body.

Stiffness

The spring stiffness for Goal. A low value creates very weak springs (more flexible “attachment” to the goal), a high value creates a strong spring (a stiffer “attachment” to the goal).

Dampimg

The friction of the spring. With a high value the movement will soon come to an end (little jiggle).

Interior Forces

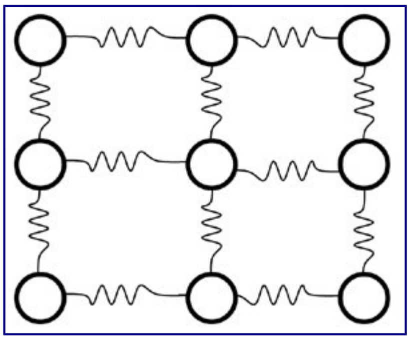


Image 1a: Vertices and forces along their connection edges.

To create a connection between the vertices of a Soft Body object there have to be forces that hold the vertices together. These forces are effective along the edges in a mesh, the connections between the vertices. The forces act like a spring. (*Image 1a*) illustrates how a 3×3 grid of vertices (a mesh plane in Bforartists) are connected in a Soft Body simulation.

But two vertices could freely rotate if you don’t create additional edges between them. Have you ever tried building a storage shelf out of 4 planks alone? Well - don’t do it, it will not be stable. The logical method to keep a body from collapsing would be to create additional edges between the vertices. This works pretty well, but would change your mesh topology drastically.

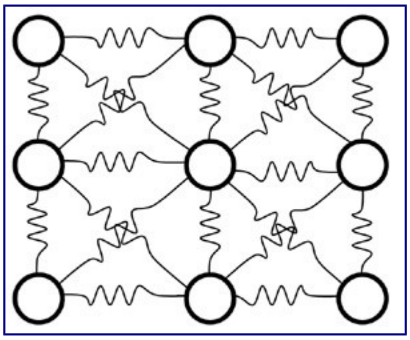


Image 1b: Additional forces with Stiff Quads enabled.

Luckily, Bforartists allows us to define additional *virtual* connections. On one hand we can define virtual connections between the diagonal edges of a quad face (*Stiff Quads*, *Image 1b*), on the other hand we can define virtual connections between a vertex and any vertices connected to it’s neighbors (*Bending Stiffness*). In other words, the amount of bend that is allowed between a vertex and any other vertex that is separated by two edge connections.

Edges Settings

The characteristics of edges are set with the *Soft Body Edge* properties.

Use Edges
: Allow the edges in a Mesh Object to act like springs.

Pull
: The spring stiffness for edges (how much the edges are allowed to stretch). A low value means very weak springs (a very elastic material), a high value is a strong spring (a stiffer material) that resists being pulled apart. 0.5 is latex, 0.9 is like a sweater, 0.999 is a highly-starched napkin or leather. The Soft Body simulation tends to get unstable if you use a value of 0.999, so you should lower this value a bit if that happens.

Push
: How much the Softbody resist being scrunched together, like a compression spring. Low values for fabric, high values for inflated objects and stiff material.

Damp
: The friction for edge springs. High values (max of 50) dampen the *Push* / *Pull* effect and calm down the cloth.

Plastic
: Permanent deformation of the object after a collision. The vertices take a new position without applying the modifier.

Bending
: This option creates virtual connections between a vertex and the vertices connected to it's neighbors. This includes diagonal edges. Damping also applies to these connections.

Length
: The edges can shrink or been blown up. This value is given in percent, 0 disables this function. 100% means no change, the body keeps 100% of his size.

Stiff Quads
: For quad faces, the diagonal edges are used as springs. This stops quad faces to collapse completely on collisions (what they would do otherwise).

Shear
: Stiffness of the virtual springs created for quad faces.

Preventing Collapse

To show the effect of the different edge settings we will use two cubes (blue: only quads, red: only tris) and let them fall without any goal onto a plane (how to set up collision is shown on the page *Collisions*).

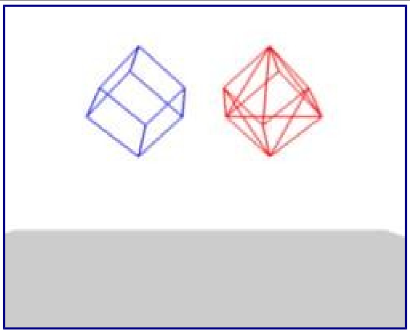


Image 3a: Frame 1 without Stiff Quads.

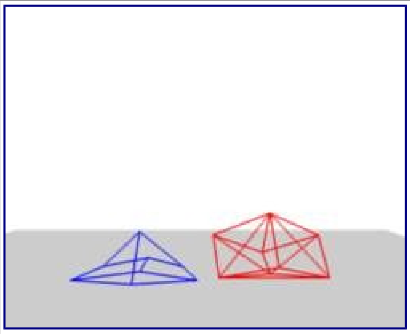


Image 3b: Frame 36.

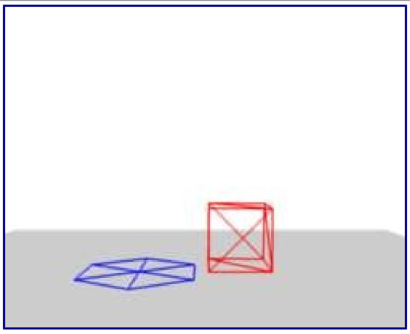


Image 3c: Frame 401.

In (*Image 3*), the default settings are used (without *Stiff Quads*). The "quad only" cube will collapse completely, the cube composed of tris keeps it's shape, though it will deform temporarily because of the forces created during collision.

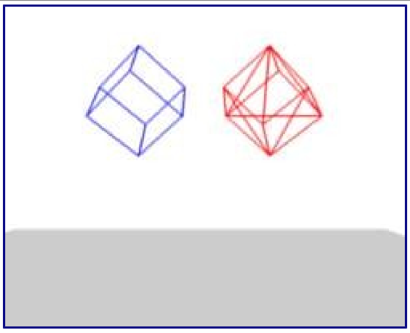


Image 4a: Frame 1 with Stiff Quads.

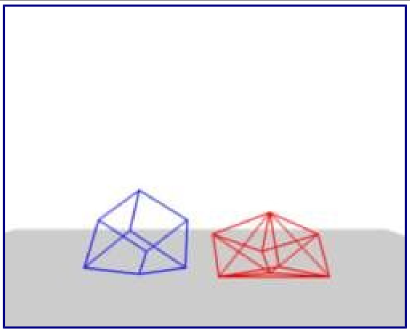


Image 4b: Frame 36.

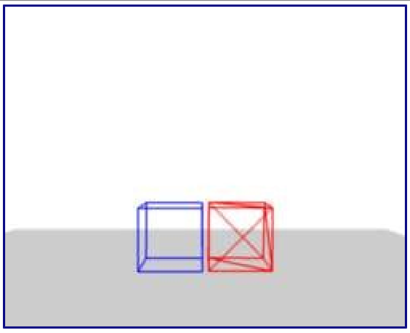


Image 4c: Frame 401.

In (*Image 4*), *Stiff Quads* is activated (for both cubes). Both cubes keep their shape, there is no difference for the red cube, because it has no quads anyway.

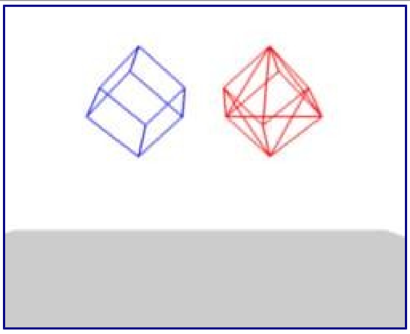


Image 5a: Frame 1 with Bending Stiffness. Blend file

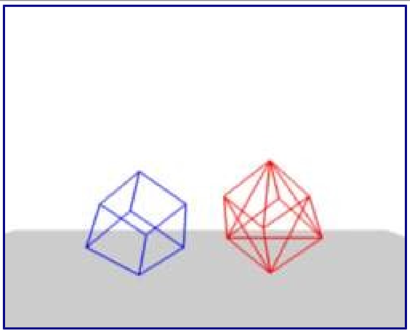


Image 5b: Frame 36.

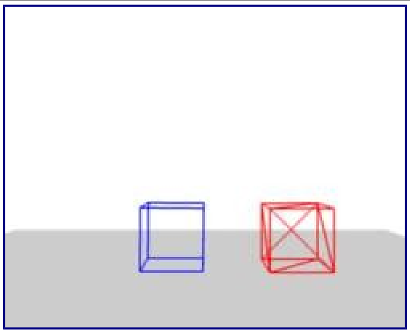


Image 5c: Frame 401.

The second method to stop an object from collapsing is to change it's *Bending Stiffness*. This includes the diagonal edges (Damping also applies to these connections).

In (*Image 5*), *Be* is activated with a strength setting of 1. Now both cubes are more rigid.

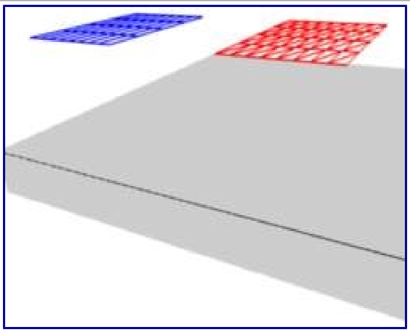


Image 6a: Two planes going to collide.

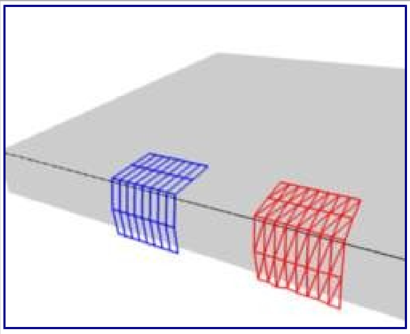


Image 6b: No bending stiffness, Frame 101.

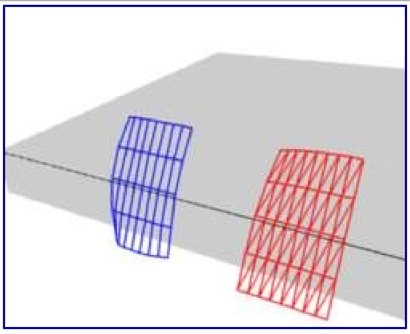


Image 6c: High bending stiffness (10), Frame 101.

Bending stiffness can also be used if you want to make a subdivided plane more plank like. Without *Be* the faces can freely rotate against each other like hinges (*Image 6b*). There would be no change in the simulation if you activated *Stiff Quads*, because the faces are not deformed at all in this example.

Bending stiffness on the other hand prevents the plane from being - well - bent.

Collisions

There are two different collision types that you may use: collision between different objects and internal collision. We should set one thing straight from the start: the primary targets of the collision calculation are the vertices of a Soft Body. So if you have too few vertices too few collision takes place. Secondarily, you can use edges and faces to improve the collision calculation.

Collisions with other objects

For a *Soft Body* to collide with another object there are a few prerequisites:

- Both objects have to share a layer, but the layer does not necessarily have to be visible.
- The collision object has to be a mesh object.
- You have to activate the option *Collision* in the *Collision* panel of the *Physics* sub-context (*Image 1*) for the collision object. The collision object may also be a Soft Body.
- If you use modifiers such as *Array* and *Mirror* you have to activate *EV.M.Stack* to ensure that collision calculation is based on the modified object. The sequence of *Modifiers* is not important.

Examples

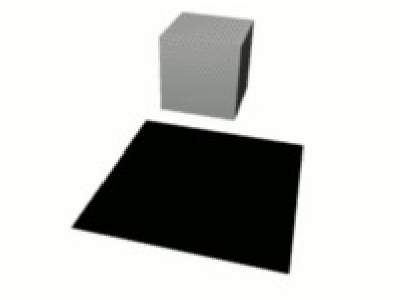


Image 2a: A Soft Body cube colliding with a plane.

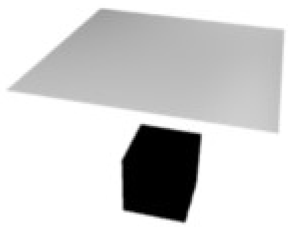


Image 2b: A Soft Body plane colliding with a cube - no interaction at all.

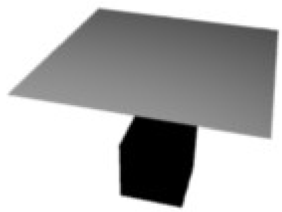


Image 2c: Collision with CFace activated.

A cube colliding with a plane works pretty well (*Image 2a*), but a plane falls right through a cube that it is supposed to collide with (*Image 2b*). Why is that? Because the default method of calculation only checks to see if the four vertices of the plane collides with the cube as the plane is pulled down by gravity. You can activate *CFace* to enable collision between the face of the plane and the object instead (*Image 2c*), but this type of calculation takes much longer.

Let’s have a closer look at the collision calculation, so you can get an idea of how we might optimize it.

Calculating Collisions

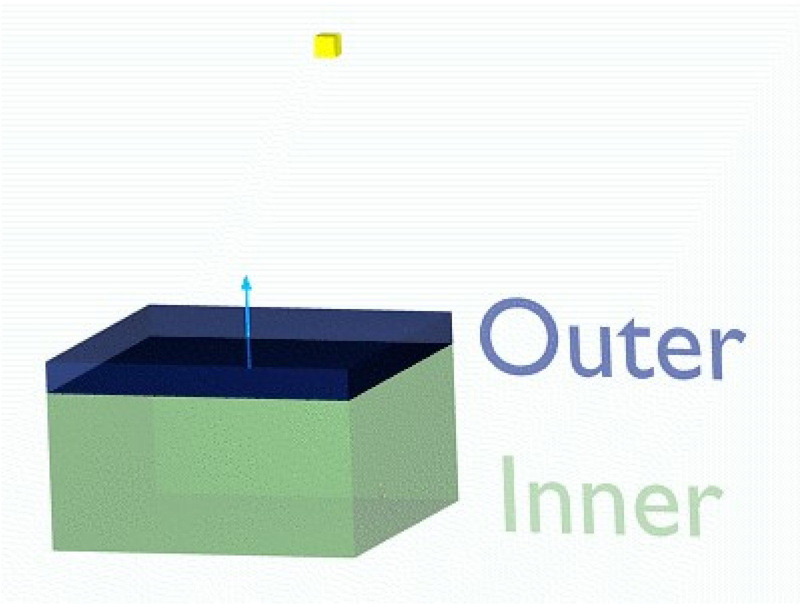


Image 3a: Visualization of the collision of a Soft Body vertex with a plane.

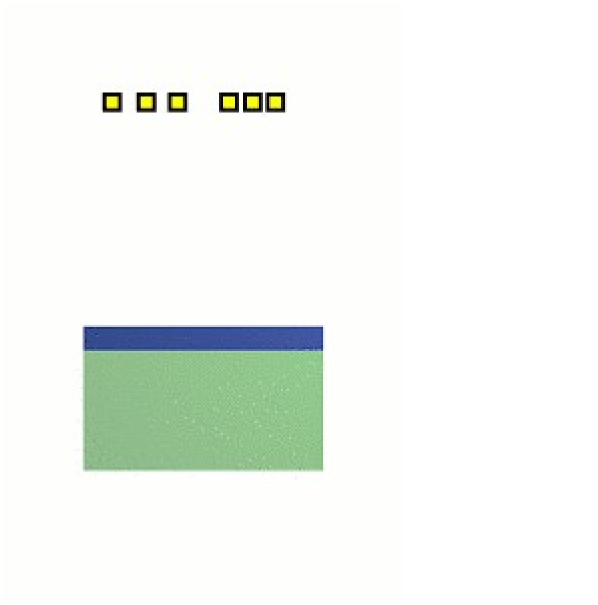


Image 3b: Six Soft Body vertices with different speed. Blend file

Soft Body simulation is by default done on a per vertex basis. If the vertices of the Soft Body do not collide with the collision object there will be no interaction between the two objects.

In (*Image 3a*), you can see a vertex colliding with a plane. If a vertex penetrates the zone between *Outer* and *Inner*, it is repulsed by a force in the direction of the face normal. The position that a vertex finally ends up in is dependent on the forces that act upon it. In the example gravity and the repulsion force of the face balance out. The speed at which the vertex is pulled out of the collision zone is influenced by the *Choke* parameter (*Image 4*).

Now lets see what happens if we make vertices heavier and let them travel at a faster speed. In (*Image 3b*), you can see vertices traveling at different speeds. The two on the far right (5 and 6) are traveling so fast that they pass right through the collision zone (this is because of the default solver precision - which we can fix later). You will notice that the fourth vertex also travels quite fast and because it is heavier it breaches the inner zone. The first three vertices collide OK.

Image 3d: Also Edges and Faces can be used for the collision calculation.

You can set up your collision so that edges and even faces are included in the collision calculation (*Image 3d*). The collision is then calculated differently. It is checked whether the edge or face intersects with the collision object, the collision zones are not used.

Good collisions

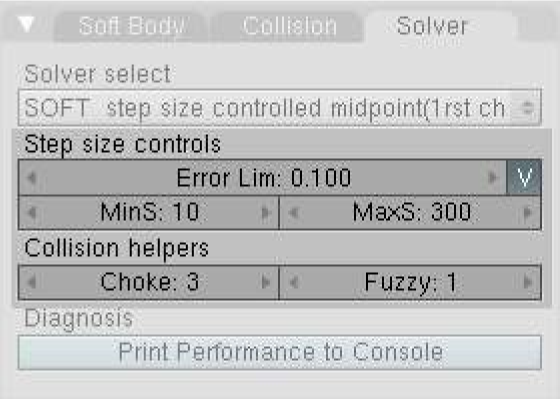


Image 4: Parameters for Soft Body calculation.

If the collision you have set up is not behaving properly, you can try the following:

Tip
The best way Add *Loop Cuts* to your Soft Body object in strategic areas that you know are most likely to be involved in a collision.

- The Soft Body object must have more subdivisions than the collision object.
- Check the direction of the face normals.
- If the collision object has sharp spikes they might penetrate the Soft Body.
- The resolution of the solver must match the speed at which Soft Body vertices are traveling. Lower the parameter *Error Lim* and carefully increase *Min S*.
- *Outer* and *Inner* should be large enough, but zones of opposite faces should not overlap, or you have forces in opposite directions.
- If you use strong forces you should use large zones.
- Set *Choke* to a high enough value (all the way up if necessary) if you have difficulties with repelled vertices.
- Colliding faces are difficult to control and need long calculation times. Try not to use them.

Often it is better to create a simplified mesh to use as your collision object, however this may be difficult if you are using an animated mesh.

Self Collision

Self Collision is working only if you have activated *Use Edges*.

When enabled, allows you to control how Bforartists will prevent the Soft Body from intersecting with itself. Every vertex is surrounded with an elastic virtual ball. Vertices may not penetrate the balls of other vertices. If you want a good result you may have to adjust the size of these balls. Normally it works pretty well with the default options.

Ball Size Calculation

Man (“manual”)

The *Ball Size* directly sets the ball size (in BU).

Av (“average”)
The average length of all edges attached to the vertex is calculated and then multiplied with the *Ball Size* setting. Works well with evenly distributed vertices.

Min / Max
The ball size is as large as the smallest/largest spring length of the vertex multiplied with the *Ball Size*.

AvMiMax (“average min/max”)
Size = ((Min + Max)/2) × *Ball Size*.

Ball Size

Default 0.49 BU or fraction of the length of attached edges. The edge length is computed based on the algorithm you choose. You know how when someone stands too close to you, and feel uncomfortable? We call that our “personal space”, and this setting is the factor that is multiplied by the spring length. It is a spherical distance (radius) within which, if another vertex of the same mesh enters, the vertex starts to deflect in order to avoid a self-collision.

Set this value to the fractional distance between vertices that you want them to have their own “space”. Too high of a value will include too many vertices all the time and slow down the calculation. Too low of a level will let other vertices get too close and thus possibly intersect because there won’t be enough time to slow them down.

Stiffness
Default 1.0. How elastic that ball of personal space is.

Damping
Default 0.5. How the vertex reacts. A low value just slows down the vertex as it gets too close. A high value repulses it.

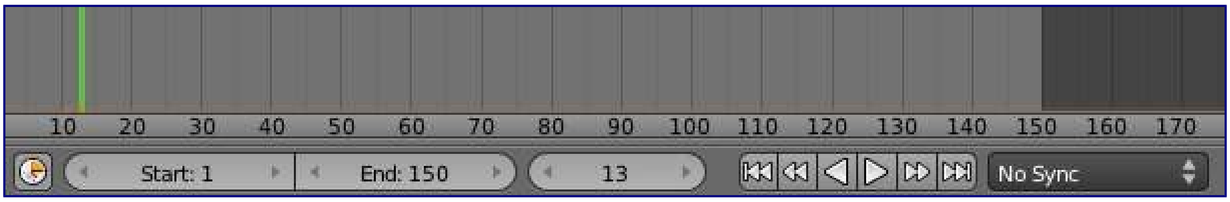
Collisions with other objects are set in the (other) *Collision panel*. To collide with another object they have to share at least one common layer.

Simple examples

some simple examples showing the power of softbody physics.

bouncing cube

change your start and end frames to 1 and 150.

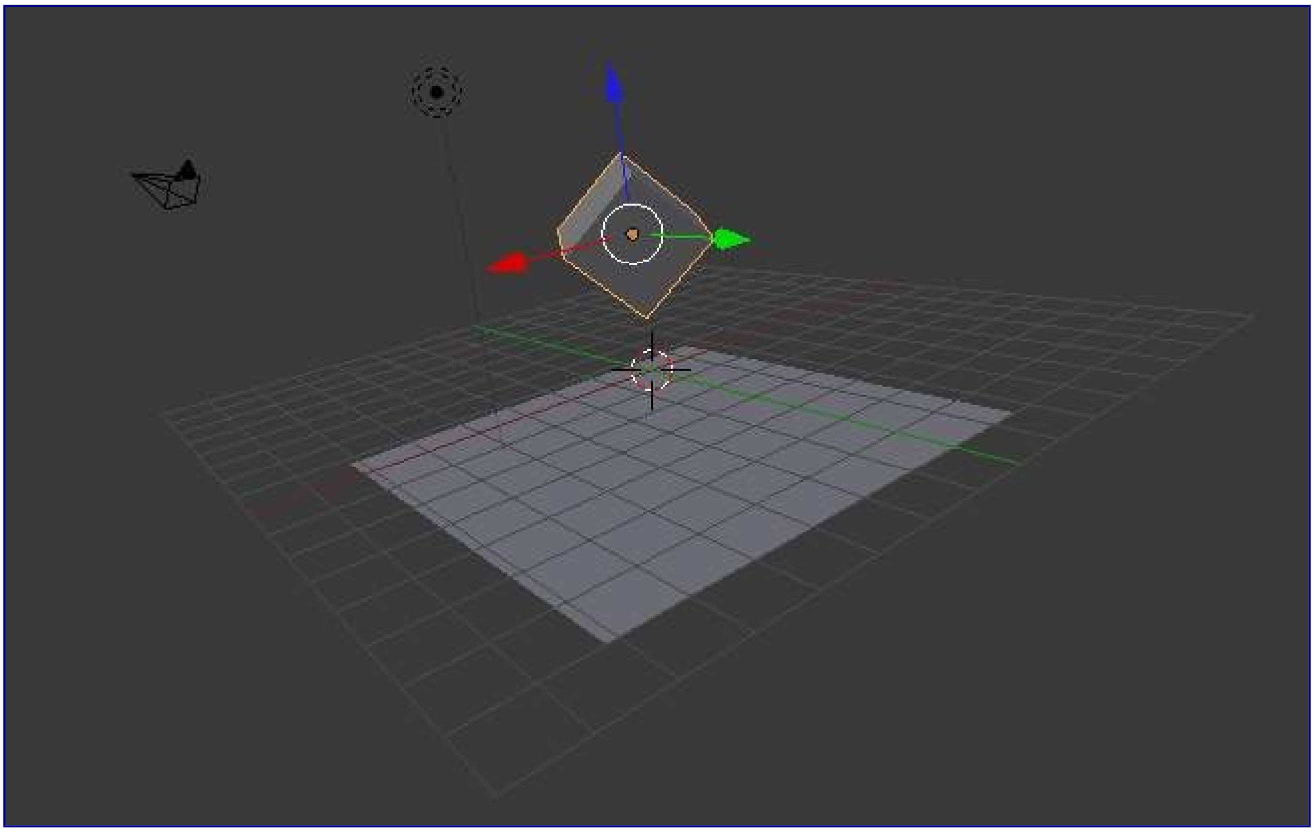


The timeline

add a plane, and scale it 5 times. next go to the physics tab, and add a collision. the default settings are fine for this example.

now add a cube, or use the default cube. Tab into edit mode and subdivide it thrice. then add a bevel modifier to it, to smoothen the edges. to add a little more, press r twice, and move your cursor a bit.

when finisht, your scene should look like this:



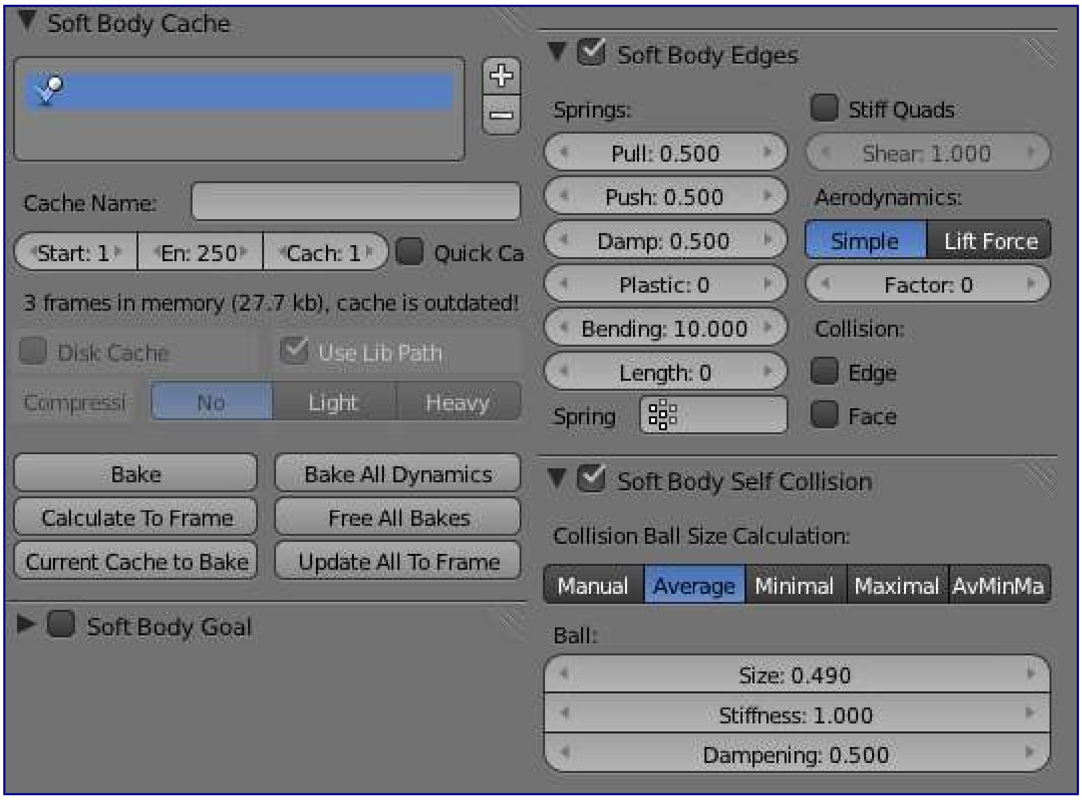
The scene, ready for softbody physics

Everything is ready to add the softbody physics. go to the physics tab and add ‘softbody’. uncheck the soft body goal , and check softbody self collision. under soft body edges, increase the bending to 10.

playing tha animation with alt a will now give a slow animation of a bouncing cube. to speed things up, we need to bake the softbody physics.

Under Soft Body Cache change start and end to your start and end frames. in this case 1 and 150. to test if everything is working, you can take a cache step of 5 or 10, but for the final animation it’s better to reduce it to 1, to cache everything.

when finisht, your physics panel should look like this:



The physics settings.

you can now bake the simulation, give the cube materials and textures and render the animation.

Combination With Armatures

To Do

Combination With Hair Particles

To Do

Soft Body settings

Soft Body
This creates the soft body modifier on the selected object
Render
Enable soft body during render
Display
Display soft body in real time.

Soft Body

Friction

The friction of the surrounding medium. Generally friction dampens a movement.

Mass
: Mass value for vertices. Larger mass slows down acceleration, except for gravity where the motion is constant regardless of mass. Larger mass means larger inertia, so also braking a Soft Body is more difficult.

Vertex Group Mass
: Use a specified vertex group for mass values

Speed
: You can control the internal timing of the Softbody system with this value.

Soft Body Cache

Note
Start- and Endframe The *Start* and *End* settings in the *Collision* panel are not only valid for the baking, but for all Soft Body simulations. So if your animation lasts longer than 250 frames, you have to increase the *End* value.

Cache
: Select cache to use for simulation. Add, and remove caches.

Cache Name
: Specify the name of the cache.

Start / End
: First and last frame of the simulation. Always valid, not only for *baking*.

Cache Step
: Number of frames between cache steps.

Disk Cache
: Save cache files to disk. Blend file must be saved first.

Use Lib Path
: Use this files path when library linked into another file.

Compression
: Compression method to be used

  No
  : No compression.

  Light
  : Fast but not so effective compression.

  Heavy
  : Effective but slow compression.

Bake
: Calculates the simulation and protects the cache. You need to be in *Object* mode to bake.

Free Bake
: Clears the cache.

Calculate to Frame
: Bake physics to current frame

Current Cache to Bake
: Bake from Cache.

Bake All Dynamics
: Bake all physics

Free All Bakes
Free all baked caches of all objects in the current scene
Update All To Frame
Update cache to current frame

If you haven't saved the blend file the cache is created in memory, so save your file first or the cache may be lost.

Soft Body Goal

Use Goal
Soft Body Goal acts like a pin on a chosen set of vertices; controlling how much of an effect soft body has on them. Enabling this tells Bforartists to use the position / animated position of a vertex in the simulation. Animating the vertices can be done in all the usual ways before the Soft Body simulation is applied. The *goal* is the desired end-position for vertices. How a softbody tries to achieve this goal can be defined using stiffness forces and damping.
Default
A *Goal* value of 1.0 means no Soft Body simulation, the vertex stays at its original (animated) position. When setting *Goal* to 0.0, the object is only influenced by physical laws. By setting goal values between 0.0 and 1.0, you can blend between having the object affected only by the animation system, and having the object affected only by the soft body effect.
Minimum / Maximum
When you paint the values in vertex-groups (using *Weight Paint* mode), you can use the *G Min* and *G Max* to fine-tune (clamp) the weight values. The lowest vertex-weight (blue) will become *G Min*, the highest value (red) becomes *G Max* (please note that the blue-red color scale may be altered by User Preferences).
Stiffness
The spring stiffness for *Goal*. A low value creates very weak springs (more flexible "attachment" to the goal), a high value creates a strong spring (a stiffer "attachment" to the goal).
Damping
The friction for *Goal*. Higher values dampen the effect of the goal on the soft body.
Vertex Group
Use a vertex group to allow per-vertex goal weights (multiplied by the *Default* goal).

Soft Body Edges

Use Edges
The edges in a Mesh Object can act as springs as well, like threads in fabric.
Pull
The spring stiffness for edges (how much the edges are stretched). A low value means very weak springs (a very elastic material), a high value is a strong spring (a stiffer material) that resists being pulled apart. 0.5 is latex, 0.9 is like a sweater, 0.999 is a highly-starched napkin or leather.
Push
How much the Softbody resist being scrunched together, like a compression spring. Low values for fabric, high values for inflated objects and stiff material.
Damp
The friction for edge springs. High values (max of 50) dampen the edge stiffness effect and calm down the cloth.
Plastic
Plasticity, permanent deformation of the object.
Bending
This option creates virtual connections between a vertex and the one after the next. This includes diagonal

edges. Damping applies also to these connections.

Length

The edges can shrink or been blown up. This value is given in percent, 0 disables this function. 100% means no change, the body keeps 100% of his size.

Stiff Quads

For quad faces, the diagonal edges are used as springs. This stops quad faces to collapse completely on collisions (what they would do otherwise).

Shear

Stiffness of the virtual springs for quad faces.

Aerodynamics

Simple

If you turn on *Aero* the force is not confined to the vertices, but has an effect also on the edges. The angle and the relative speed between medium and edge is used to calculate the force on the edge. This force results that vertices with little connecting edges (front of a plane) fall faster than vertices with more connecting edges (middle of a plane). If all vertices have the same amount of edges in a direction they fall with equal speed. An edge moving in its own direction feels no force, and an edge moving perpendicular to its own direction feels maximum force (think of a straw moving through air). Try it with an *Factor* of 30 at first.

Lift Force

Use an aerodynamic model that is closer to physical laws and looks more interesting. Disable for a more muted simulation.

Factor

How much aerodynamic effect to use

Edge

Checks for edges of the softbody mesh colliding.

Face

Checks for any portion of the face of the softbody mesh colliding (compute intensive!). While *CFace* enabled is great, and solves lots of collision errors, there doesn't seem to be any dampening settings for it, so parts of the softbody object near a collision mesh tend to "jitter" as they bounce off and fall back, even when there's no motion of any meshes. Edge collision has dampening, so that can be controlled, but Deflection dampening value on a collision object doesn't seem to affect the face collision.

Soft Body Self Collision

Self Collision is working only if you have activated *Use Edges*.

Self Collision

When enabled, allows you to control how Bforartists will prevent the Soft Body from intersecting with itself. Every vertex is surrounded with an elastic virtual ball. Vertices may not penetrate the balls of other vertices. If you want a good result you may have to adjust the size of these balls. Normally it works pretty well with the default options.

Manual

The *Ball Size* directly sets the ball size (in BU).

Averavge ("average")

The average length of all edges attached to the vertex is calculated and then multiplied with the *Ball Size* setting. Works well with evenly distributed vertices.

Minimal / Maximal

The ball size is as large as the smallest/largest spring length of the vertex multiplied with the *Ball Size*.

AvMiMax

Size = ((Min + Max)/2) × *Ball Size*.

Size

Default 0.49 BU or fraction of the length of attached edges. The edge length is computed based on the algorithm you choose. You know how when someone stands too close to you, and feel uncomfortable? We call that our “personal space”, and this setting is the factor that is multiplied by the spring length. It is a spherical distance (radius) within which, if another vertex of the same mesh enters, the vertex starts to deflect in order to avoid a self-collision. Set this value to the fractional distance between vertices that you want them to have their own “space”. Too high of a value will include too many vertices all the time and slow down the calculation. Too low of a level will let other vertices get too close and thus possibly intersect because there won’t be enough time to slow them down.

Stiffness
: Default 1.0. How elastic that ball of personal space is.

Dampening
: Default 0.5. How the vertex reacts. A low value just slows down the vertex as it gets too close. A high value repulses it.

Collisions with other objects are set in the (other) *Collision panel*. To collide with another object they have to share at least one common layer.

Soft Body Solver

These settings determine the accurateness of the simulation.

Min Step
: Minimum simulation steps per frame. Increase this value, if the Soft Body misses fast moving collision objects.

Max Step
: Maximum simulation steps per frame. Normally the number of simulation steps is set dynamically (with the *Error Limit*) but you have probably a good reason to change it.

Auto-Step
: helps the Solver figure out how much work it needs to do based on how fast things are moving.

Error Limit
: Rules the overall quality of the solution delivered. Default 0.1. The most critical setting that says how precise the solver should check for collisions. Start with a value that is 1/2 the average edge length. If there are visible errors, jitter, or over-exaggerated responses, decrease the value. The solver keeps track of how “bad” it is doing and the *Error Limit* causes the solver to do some “adaptive step sizing”.

Fuzzy
: Fuzziness while on collision, high values make collision handling faster but less stable.

Choke
: Calms down (reduces the exit velocity of) a vertex or edge once it penetrates a collision mesh.

Print Performance to Console
: Prints on the console how the solver is doing.

Estimate Matrix
Estimate matrix... split to COM, ROT, SCALE

9.8 Physics - Rigid Body

Rigid Body

The rigid body simulation can be used to simulate the motion of solid objects. It affects the position and orientation of objects and does not deform them.

Unlike the other simulations in Bforartists, the rigid body sim works closer with the animation system. This means that rigid bodies can be used like regular objects and be part of parent-child relationships, animation constraints and drivers.

Creating a Rigid Body

Creating the Rigid Body.

Right now only mesh objects can participate in the rigid body simulation. To create rigid bodies, either click on *Rigid Body* button in the *Physics* context of the *Properties* window or use the *Add Active*/*AddPassive* buttons in the *Physics* tab of the *Tool Shelf*.

There are two types of rigid body: active and passive. *Active* bodies are dynamically simulated, while *passive* bodies remain static. Both types can be driven by the animation system when using the *Animated* option.

During the simulation, the rigid body system will override the position and orientation of dynamic rigid body objects. Note however that the location and rotation of the objects is not changed, so the rigid body sim acts similar to a constraint. To apply the rigid body transformations you can use the *Apply Transformation* button in the *Physics* tab of the *Tool Shelf*.

The scale of the rigid body object also influences the simulation, but is always controlled by the animation system.

Rigid Body physics on the object can be *removed* with the *Rigid Body* button in the *Physics* context or *Remove* button in the *Physics* tab of the *Tool Shelf*.

Rigid Body Properties

Main properties

Rigid Body panel.

Type

Role of the rigid body in the simulation. Active objects can be simulated dynamically, passive object remain static.

Active
Object is directly controlled by simulation results. The possibility to select this type also available with *Add Active* button in the *Physics* tab of the *Tool Shelf*.

Passive
Object is directly controlled by animation system. Thus, this type is not available for Rigid Body Dynamics. The possibility to select this type also available with *Add Passive* button in the *Physics* tab of the *Tool Shelf*.

Dynamic
Enables/disables rigid body simulation for object.

Animated
Allows the rigid body additionally to be controlled by the animation system.

Mass

Specifies how heavy the object is and “weights” irrespective of gravity. There are predefined mass preset available with the *Calculate Mass* button in the *Physics* tab of the *Tool Shelf*.

Calculate Mass

Automatically calculate mass values for Rigid Body Objects based on volume. There are many useful presets available from the menu, patching real-world objects.

Also you can have *Custom* mass material type, which is achieved by setting a custom density value (kg/m^3).

Rigid Body Collisions

Rigid Body Collisions panel.

General settings

Surface Response

Friction

Resistence of object to movement. Specifies how much velocity is lost when objects collide with each other.

Bounciness

Tendency of object to bounce after colliding with another (“0” - stays still, “1” - perfectly elastic). Specifies how much objects can bounce after collisions.

Collision Groups

Allows rigid body collisions allocate on different groups (maximum 20).

Collision shapes

The *Shape* option determines the collision shape of the object. The following Collision Shapes are available:

- **Primitive shapes** : these are best in terms of memory/performance but don’t necessarily reflect the actual shape of the object. They’re calculated based on the object’s bounding box. The center of gravity is always in the middle for now.
    - ***Box***

      Box-like shapes (i.e. cubes), including planes (i.e. ground planes). The size per axis is calculated from the bounding box.
    - ***Sphere***

      Sphere-like shapes. The radius is the largest axis of the bounding box.
    - ***Capsule***

      This points up the Z-Axis.
    - ***Cylinder***

      This points up the Z-Axis. The height is taken from the z-axis, while the radius is the larger of the x/y-axes.
    - ***Cone***

      This points up the Z-Axis. The height is taken from the z-axis, while the radius is the larger of the x/y-axes.
- **Mesh based shapes** : these are calculated based on the geometry of the object so they are a better representation of the object. The center of gravity for these shapes is the object origin.
    - ***Convex Hull***

      A mesh-like surface encompassing (i.e. shrinkwrap over) all vertices (best results with fewer vertices). Convex approximation of the object, has good performance and stability.

- ***Mesh***

  Mesh consisting of triangles only, allowing for more detailed interactions than convex hulls. Allows to simulate concave objects, but is rather slow and unstable.

The changing collision shape is available also with *Change Shape* button in the *Physics* tab of the *Tool Shelf*.

Mesh source

Users can now specify the mesh *Source* for *Mesh* bases collision shapes:

Base
The base mesh of the object.

Deform
Includes any deformations added to the mesh (shape keys, deform modifiers).

Deforming
Rigid body deforms during simulation.

Final
Includes all modifiers.

Collision Margin

Margin
Threshold of distance near surface where collisions are still considered (best results when non-zero).

The collision margin is used to improve performance and stability of rigid bodies. Depending on the shape, it behaves differently: some shapes embed it, while others have a visible gap around them.

The margin is *embedded* for these shapes:

- Sphere
- Box
- Capsule
- Cylinder
- Convex Hull: Only allows for uniform scale when embedded.

The margin is *not embedded* for these shapes:

- Cone
- Active Triangle Mesh
- Passive Triangle Mesh: Can be set to 0 most of the time.

Rigid Body Dynamics

Rigid Body Dynamics panel.

This panel is available only for *Active* type of rigid bodies.

***Deactivation*:**

Enable Deactivation
Enable deactivation of resting rigid bodies. Allows object to be deactivated during the simulation (improves performance and stability, but can cause glitches).

Start Deactivated
Starts objects deactivated. They are activated on collision with other objects.

Linear Vel
Specifies the linear deactivation velocity below which the rigid body is deactivated and simulation stops simulating object.

Angular Vel
Specifies the angular deactivation velocity below which the rigid body is deactivated and simulation stops simulating object.

***Damping*:**

Translation
Amount of linear velocity that is lost over time.

Rotation
Amount of angular velocity that is lost over time.

Rigid Body World

Rigid Body World panel.

The rigid body world is a group of Rigid Body objects, which holds settings that apply to all rigid bodies in this simulation and can be found in *Rigid Body World* panel of *Scene* context.

When you add Rigid Body physics on an object, primary there is created a group of objects with default “RigidBodyWorld” name. Rigid body objects automatically are added to this group when you add Rigid Body physics for them.

You can be create several Rigid Body World groups and allocate there yours Rigid Body objects with *Groups* panel in *Object* context.

Rigid body objects and constraints are only taken into account by the simulation if they are in the groups specified in *Group* field of the *Rigid Body World* panel in the *Scene* context.

***Rigid Body World* checkbox**
Enable/disable evaluation of the Rigid Body simulation based on the rigid body objects participating in the specified group of Rigid Body World.

***Remove Rigid Body World* button**
Remove Rigid Body simulation from the current scene.

Group
Containing rigid body objects participating in this simulation.

Constraints
Containing rigid body object constraints participating in the simulation.

Simulation quality and timing settings:

Speed
Can be used to speed up/slow down the simulation.

Split Impulse
Enable/disable reducing extra velocity that can build up when objects collide (lowers simulation stability

a little so use only when necessary). Limits the force with which objects are separated on collision, generally produces nicer results, but makes the simulation less stable (especially when stacking many objects).

Steps Per Second
Number of simulation steps made per second (higher values are more accurate but slower). This only influences the accuracy and not the speed of the simulation.

Solver Iterations
Amount of constraint solver iterations made per simulation step (higher values are more accurate but slower). Increasing this makes constraints and object stacking more stable.

Rigid Body caching and baking

Rigid Body Cache panel.

Specifies the frame range in which the simulation is active. Can be used to bake the simulation.

Start/End
First and last frame of the simulation.

Bake

Calculates the simulation and protects the cache. You need to be in *Object* mode to bake.

Free Bake
Active after the baking of simulation. Clears the baked cache.

Calculate to Frame
Bake physics to current frame.

Current Cache to Bake
Bake from Cache.

Bake All Dynamics
Bake all physics.

Free All Bakes
Free all baked caches of all objects in the current scene.

Update All To Frame
Update cache to current frame.

If you haven't saved the blend file, the cache is created in memory, so save your file first or the cache may be lost.

External Force Influence on Rigid Body

Rigid Body Cache panel.

As other physics dynamics systems, Rigid Body simulation are also influenced by external force effectors.

Rigid Body Constraints

Constraints (also known as joints) for rigid bodies connect two rigid bodies.

The physics constraints available in the non-game modes are meant to be attached to an Empty object. The constraint then has fields which can be pointed at the two physics-enabled object which will be bound by the constraint. The *Empty* object provides a location and axis for the constraint distinct from the two constrained objects. The location of the entity hosting the physics constraint marks a location and set of axes on each of the two constrained objects. These two anchor points are calculated at the beginning of the animation and their position and orientation remain fixed *in the local coordinate system of the object* for the duration of the animation. The objects can move far from the constraint object, but the constraint anchor moves with the object. If this feature seems limiting, consider using multiple objects with a non-physics *Child-of* constraint and animate the relative location of the child.

The quickest way to constrain two objects is to select both and click the *Connect* button in the *Physics* tab of the *Tool Shelf*. This creates a new *Empty* object (named “Constraint”) with a physics constraint already attached and pointing at the two selected objects.

Also you can create *Rigid Body Constaint* on of the two constrained objects with *Rigid Body Constaint* button of the *Physics* context in the *Properties* window. This constraint be depend on the object location and rotation which on it created. Thereafterat, there are no *Empty* object created for the constraint. The role of the *Empty* object is put on this object. The constrained object can be then set as *Passive* type for better driving the constrain.

Additional parameters appear in the *Rigid Body Constaint* panel of the *Physics* context in the *Properties* window for the selected *Empty* object or the one of the two constrained objects with the created constraint.

Common Options

Rigid Body Constraint panel.

Enabled
: Specifies whether the constraint is active during the simulation.

Disable Collisions
: Allows constrained objects to pass through one another.

Object 1
: First object to be constrained.

Object 2
: Second object to be constrained.

Breakable
: Allows constraint to break during simulation. Disabled for the *Motor* constraint.

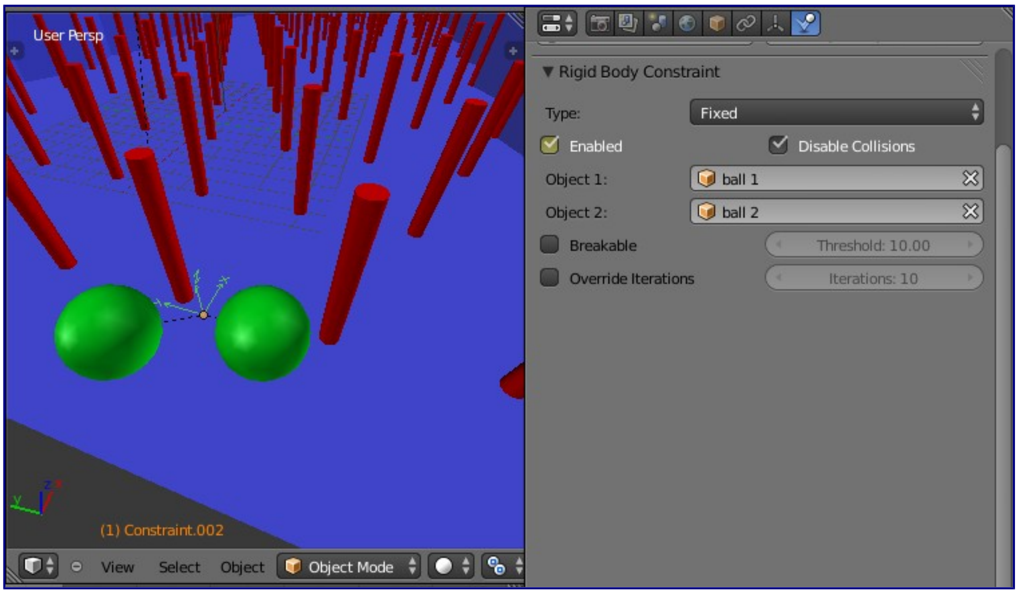
  Threshold
  : Impulse strength that needs to be reached before constraint breaks.

Override Iterations
: Allows to make constraints stronger (more iterations) or weaker (less iterations) than specified in the rigid body world.

  Iterations
  : Number of constraint solver iterations made per simulation step for this constraint.

Limits
: By using limits you can constrain objects even more by specifying a translation/rotation range on/around respectively axis (see below for each one individually). To lock one axis, set both limits to 0.

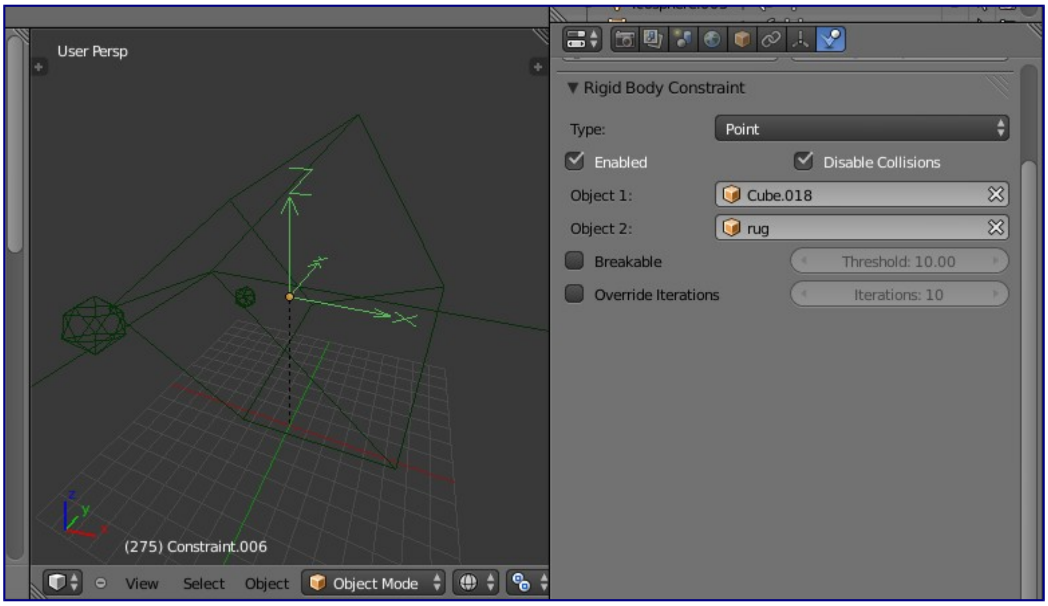
Fixed



Options available to a *Fixed* constraint.

This constraint cause the two objects to move as one. Since the physics system does have a tiny bit of slop in it, the objects don’t move as rigidly as they would if they were part of the same mesh.

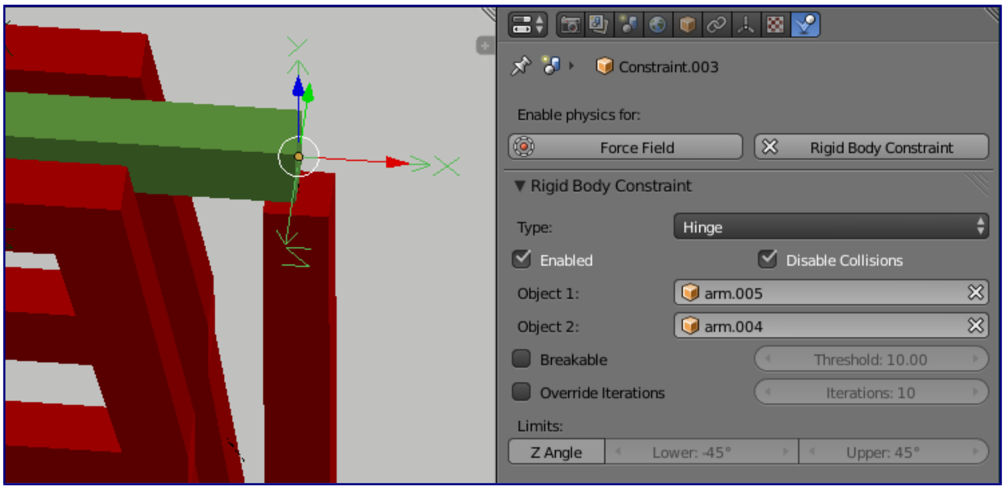
Point



Options available to a *Point* constraint.

The objects are linked by a point bearing allowing any kind of rotation around the location of the constraint object, but no relative translation is permitted. The physics engine will do its best to make sure that the two points designated by the constraint object on the two constrained objects are coincident.

Hinge



Options available to a *Hinge* constraint.

The hinge permits 1 degree of freedom between two objects. Translation is completely constrained. Rotation is permitted about the Z axis of the object hosting the Physics constraint (usually an Empty, distinct from the two objects that are being linked). Adjusting the position and rotation of the object hosting the constraint allows you to control the anchor and axis of the hinge.

The Hinge is the only 1-axis rotational constraint that uses the Z axis instead of the X axis. If something is wrong with your hinge, check your other constraints to see if this might be the problem.

***Limits*:**

Z Angle

Enables/disables limit rotation around Z axis.

Lower

Lower limit of Z axis rotation.

Upper

Upper limit of Z axis rotation.

Slider

The Slider constraint allows relative translation along the X axis of the constraint object, but permits no relative rotation, or relative translation along other axes.

***Limits*:**

X Axis

Enables/disables limit translation around X axis.

Lower

Lower limit of X axis translation.

Upper

Upper limit of X axis translation.

Piston

A piston permits translation along the X axis of the constraint object. It also allows rotation around the X axis of the constraint object. It's like a combination of the freedoms of a slider with the freedoms of a hinge (neither of which is very free alone).

***Limits*:**

X Axis

Enables/disables limit translation around X axis.

Lower

Lower limit of X axis translation.

Upper

Upper limit of X axis translation.

X Angle

Enables/disables limit rotation around X axis.

Lower

Lower limit of X axis rotation.

Upper

Upper limit of X axis rotation.

Generic

The generic constraint has a lot of available parameters.

The X, Y, and Z axis constraints can be used to limit the amount of translation between the objects. Clamping the min/max to zero has the same effect as the Point constraint.

Clamping the relative rotation to zero keeps the objects in alignment. Combining an absolute rotation and translation clamp would behave much like the Fixed constraint.

Using a non-zero spread on any parameter allows it to rattle around in that range throughout the course of the simulation.

Limits:

X Axis/Y Axis/Z axis

Enables/disables limit translation on X, Y or Z axis respectively.

Lower

Lower limit of translation for X, Y or Z axis respectively.

Upper

Upper limit of translation for X, Y or Z axis respectively.

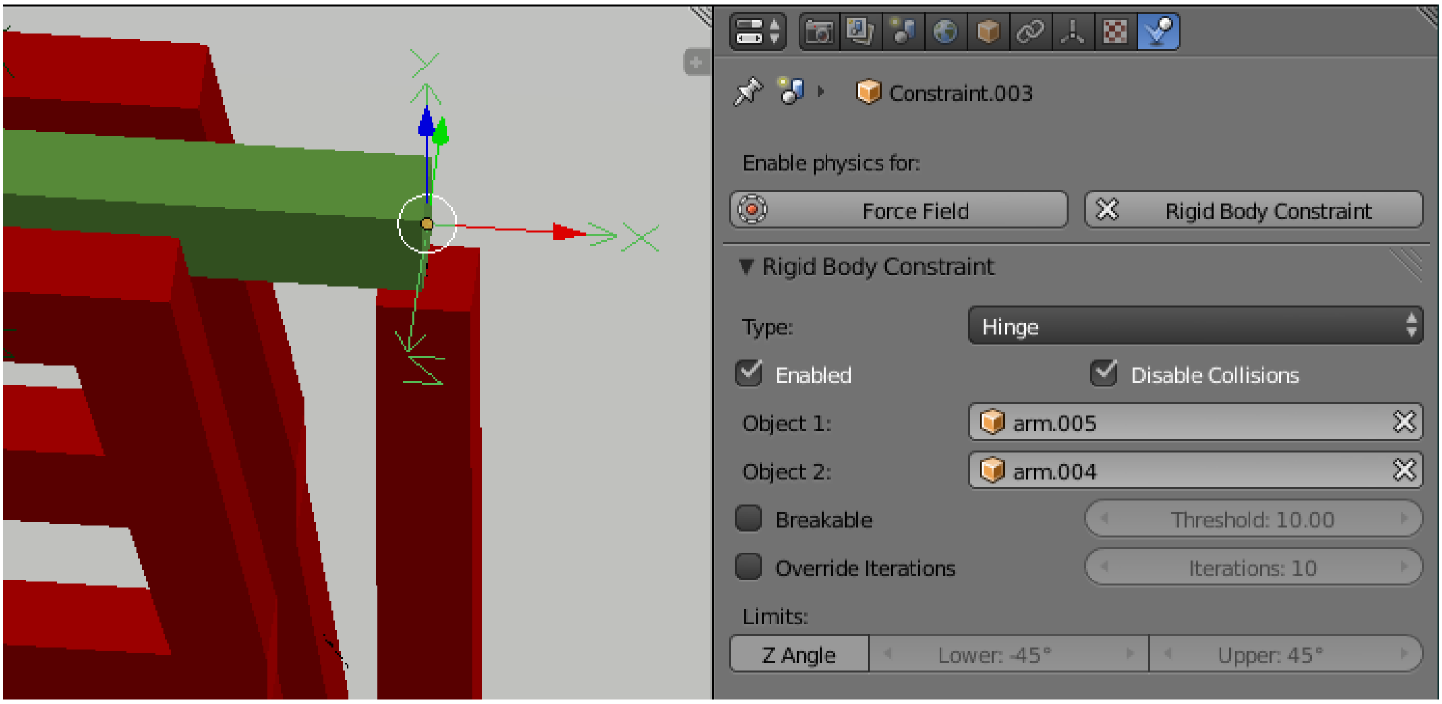
X Angle/Y Angle/Z Angle

Enables/disables limit rotation around X, Y or Z axis respectively.

Lower
Lower limit of rotation for X, Y or Z axis respectively.

Upper
Upper limit of rotation for X, Y or Z axis respectively.

Generic Spring



Options available to a *Generic Spring* constraint.

The generic spring constraint adds some spring parameters for the X/Y/Z axes to all the options available on the Generic constraint. Using the spring alone allows the objects to bounce around as if attached with a spring anchored at the constraint object. This is usually a little too much freedom, so most applications will benefit from enabling translation or rotation constraints.

If the damping on the springs is set to 1, then the spring forces are prevented from realigning the anchor points, leading to strange behavior. If your springs are acting weird, check the damping.

Limits:

X Axis/Y Axis/Z axis

Enables/disables limit translation on X, Y or Z axis respectively.

Lower
Lower limit of translation for X, Y or Z axis respectively.

Upper
Upper limit of translation for X, Y or Z axis respectively.

X Angle/Y Angle/Z Angle

Enables/disables limit rotation around X, Y or Z axis respectively.

Lower

Lower limit of rotation for X, Y or Z axis respectively.

Upper

Upper limit of rotation for X, Y or Z axis respectively.

Springs:

X/Y/Z

Enables/disables springs on X, Y or Z axis respectively.

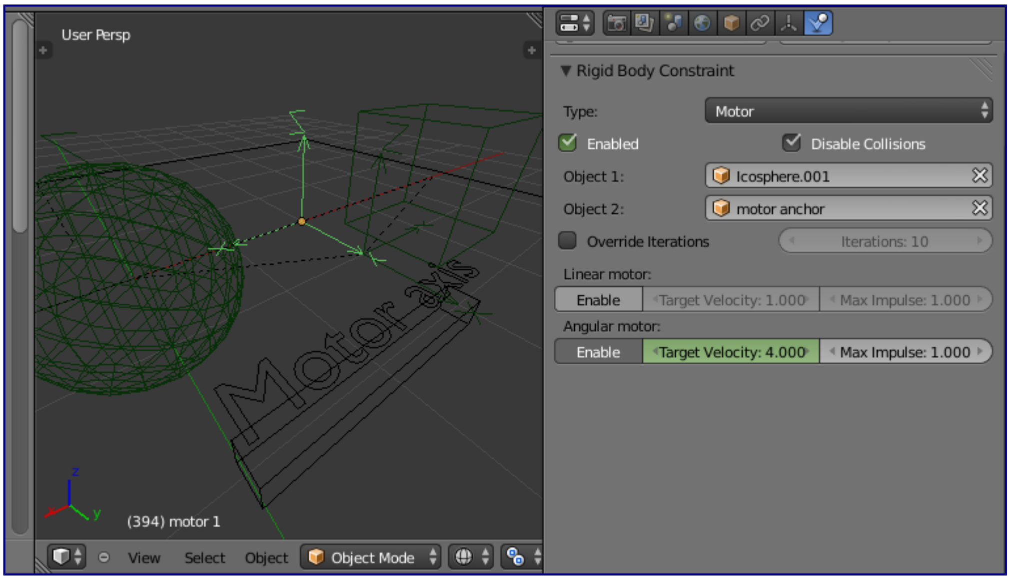
Stiffness

Spring Stiffness on X, Y or Z axis respectively. Specifies how “bendy” the spring is.

Damping

Spring Damping on X, Y or Z axis respectively. Amount of damping the spring has.

Motor



Options available to a *Motor* constraint.

The motor constraint causes translation and/or rotation between two entities. It can drive two objects apart or together. It can drive simple rotation, or rotation and translation (although it won’t be constrained like a screw since the translation can be blocked by other physics without preventing rotation).

The rotation axis is the X axis of the object hosting the constraint. This is in contrast with the Hinge which uses the Z axis. Since the Motor is vulnerable to confusing perturbations without a matching Hinge constraint, special care must be taken to align the axes. Without proper alignment, the motor will appear to have no effect (because the hinge is preventing the motion of the motor).

Linear motor/Angular motor:

Enable

Enable linear or angular motor respectively.

Target Velocity
Target linear or angular motor velocity respectively.
Max Impulse
Maximum linear or angular motor impulse respectively.

Tips

As with all physics-enabled objects, pay close attention to the *Animated* check box in the *Rigid Body* panel of the *Physics* context in the *Properties* window. A common mistake is to use keyframe animation on a *Passive* physics object without checking the *Animated* box. The object will move, but the physics engine will behave as if the *Passive* is still in its starting place, leading to disappointment.

Animation

The most common trick is to keyframe animate the location or rotation of an *Active* physics object as well as the *Animated* checkbox. When the curve on the *Animated* property switches to disabled, the physics engine takes over using the object’s last known location, rotation and velocities.

Animating the strengths of various other parameters (a *Motor’s* Target Velocity, a *Hinge’s* limits, etc) can be used to accomplish a wide variety of interesting results.

Enabling a constraint during the physics simulation often has dramatic results as the physics engine tries to bring into alignment two objects which are often dramatically out of alignment. It is very common for the affected objects to build up enough kinetic energy to bounce themselves out of camera (and into orbit, although the physics engine is not yet capable of simulating a planet’s gravity well, so scratch that).

Rigid Body dynamics can be baking to normal keyframes with *Bake To Keyframes* button in the *Physics* tab of the *Tool Shelf*.

Simulation Stability

The simplest way of improving simulation stability is to increase the steps per second. However, care has to be taken since making too many steps can cause problems and make the simulation even less stable (if you need more than 1000 steps, you should look at other ways to improve stability).

Increasing the number of solver iterations helps making constraints stronger and also improves object stacking stability.

It’s best to avoid small objects, as they’re currently unstable. Ideally, objects should be at least 20 cm in diameter. If it’s still necessary, setting the collision margin to 0, while generally not recommended, can help making small object behave more naturally.

When objects are small and/or move very fast, they can pass through each other. Besides what’s mentioned above it’s also good to avoid using mesh shapes in this case. Mesh shapes consist of individual triangles and therefore don’t really have any thickness, so objects can pass through more easily. You can give them some thickness by increasing the collision margin.

Combining Rigid Bodies with Other Simulations

Since the rigid body simulation is part of the animation system, it can influence other simulations just like the animation system can.

In order for this to work, the rigid body object needs to have a collision modifier. Simply click on *Collision* in the *Physics* context.

Scaling Rigid Bodies

Rigid body objects can be scaled, also during the simulation. This work well in most cases, but can sometimes cause problems.

If dynamic scaling is not needed, rigid body objects should have the scale applied by using the *Apply Scale* command

9.9 Physics - Force Fields

Force Fields

Force Fields offer a way to add extra movement to dynamic systems. *Particles*, *Soft Bodies*, Rigid Bodies and *Cloth objects* can all be affected by forces fields. Force Fields automatically affect everything. To remove a simulation or particle system from their influence, simply turn down the influence of that type of Force Field in its Field Weights panel.

- All types of objects and particles can generate fields, but only curve object can bear *Curve Guides* fields.
- Force Fields can also be generated from particles. See *Particle Physics*
- The objects need to share at least one common layer to have effect.

You may limit the effect on particles to a group of objects (see the *Particle Physics* page).

Creating a Force Field

Reference
Mode: *Object* Mode Panel: *Object* context –> *Physics* sub-context –> *Fields*

To create a single Force Field, you can select Add ‣ Force Field and select the desired force field. This method creates an Empty with the force field attached.

To create a field from an existing object you have to select the object and change to the *Physics* sub-context.

Select the field type in the *Fields* menu.

The fields have many options in common, these common options are explained for the *Spherical* field.

Note

After changing the fields (*Fields* panel) or deflection (*Collision* panel) settings, you have to recalculate the particle, softbody or cloth system (*Free Cache*), this is not done automatically. You can clear the cache for all selected objects with *Free cache selected*.

Particles react to all kind of *Force Fields*, *Soft Bodies* only to *Spherical* / *Wind* / *Vortex* (they react on *Harmonic* fields but not in a useful way).

Common Field Settings

Most Fields have the same settings, even though they act very differently. Settings unique to a field type are described below. Curve Guide and Texture Fields have very different options.

Shape
: The field is either a *Point*, with omnidirectional influence, or a *Plane*, constant in the XY-plane, changes only in Z direction.

Strength
: The strength of the field effect. This can be positive or negative to change the direction that the force operates in. A force field's strength is scaled with the force object's scale, allowing you to scale up and down scene, keeping the same effects.

Flow
: Convert effector force into air flow velocity.

Noise
: Adds noise to the strength of the force.

Seed
: Changes the seed of the random noise.

Effect Point
: You can toggle the field's effect on particle *Location* and *Rotation*

Collision Absorption
: Force gets absorbed by collision objects.

Falloff

Here you can specify the shape of the force field (if the *Fall-off* Power is greater than 0).

Sphere
: Falloff is uniform in all directions, as in a sphere.

Tube
: Fall off results in a tube shaped force field. The Field's *Radial falloff* can be adjusted, as well as the *Minimum* and *Maximum* distances of the field.

Cone
: Fall off results in a cone shaped force field. Additional options are the same as those of *Tube* options.

Z Direction
: *Fall-off* can be set to apply only in the direction of the positive Z Axis, negative Z Axis, or both.

Power (Power)
: How the power of the force field changes with the distance from the force field. If `r` is the distance from

the center of the object, the force changes with $1/r^{Power}$. A *Fall-off* of 2 changes the force field with $1/r^2$, which is the falloff of gravitational pull.

Max Distance

Makes the force field only take effect within a specified maximum radius (shown by an additional circle around the object).

Min Distance

The distance from the object center, up to where the force field is effective with full strength. If you have a *Fall-off* of 0 this parameter does nothing, because the field is effective with full strength up to *Max Dist* (or the infinity). Shown by an additional circle around the object.

Types

- Force
- Wind
- Vortex Field
- Magnetic
- Harmonic
- Charge
- Lennard Jones
- Texture Field
- Curve Guide
- Boid
- Turbulence
- Drag
- Smoke Flow

Force

The *Force* field is the simplest of the fields. It gives a constant force towards (positive strength) or away from (negative strength) the object's center. Newtonian particles are attracted to a field with negative strength, and are blown away from a field with positive strength.

For *Boids* a field with positive strength can be used as a *Goal*, a field with negative strength can be used as *Predator*. Whether *Boids* seek or fly goals/predators depends on the *Physics* settings of the Boids.

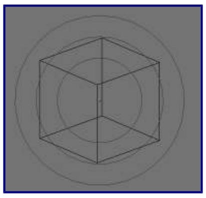


Image 2b: Spherical field indicator.

Wind

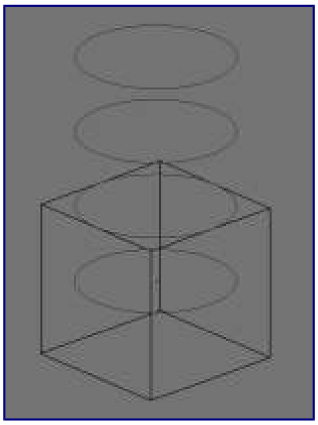


Image 3a: Wind field indicator.

Wind gives a constant force in a single direction, along the force object's local Z axis. The strength of the force is visualized by the spacing of the circles shown.

Vortex Field

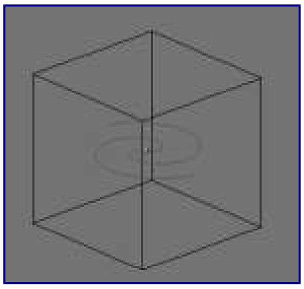


Image 3b: Vortex field indicator.

Vortex fields give a spiraling force that twists the direction of points around the force object's local Z axis. This can be useful for making a swirling sink, or tornado, or kinks in particle hair.

Magnetic

This field depends on the speed of the particles. It simulates the force of magnetism on magnetized objects.

Harmonic

The source of the force field is the zero point of a harmonic oscillator (spring, pendulum). If you set the *Damping* parameter to 1, the movement is stopped in the moment the object is reached. This force field is really special if you assign it to particles.

Rest Length
Controls the rest length of the harmonic force.
Multiple Springs

Causes every point to be affected by multiple springs.

Normally every particle of the field system influences every particle of the target system. Not with *Harmonic* ! Here every target particle is assigned to a field particle. So particles will move to the place of other particles, thus forming shapes. Tutorial: Particles forming Shapes

Charge

It is similar to spherical field except it changes behavior (attract/repulse) based on the effected particles charge field (negative/positive), like real particles with a charge. This mean this field has only effect on particles that have also a *Charge* field (else, they have no "charge", and hence are unaffected)!

Lennard Jones

This field is a very short range force with a behavior determined by the sizes of the effector and effected particle. At a distance smaller than the combined sizes the field is very repulsive and after that distance it's attractive. It tries to keep the particles at an equilibrium distance from each other. Particles need to be at a close proximity to each other to be effected by this field at all.

Particles can have for example both a charge and a Lennard-Jones potential - which is probably something for the nuclear physicists amongst us.

Texture Field

You can use a texture force field to create an arbitrarily complicated force field, which force in the 3 directions is color coded. Red is coding for the x-axis, green for the y-axis and blue for the z-axis (like the color of the coordinate axes in the 3D window). A value of 0.5 means no force, a value larger than 0.5 acceleration in negative axis direction (like -Z), a value smaller than 0.5 acceleration in positive axis direction (like +Z).

Texture mode

This sets the way a force vector is derived from the texture.

RGB
: Uses the color components directly as the force vector components in the color encoded directions. You need an RGB texture for this, e.g. an image or a colorband. So a *Blend* texture without a colorband would not suffice.

Gradient
: Calculates the force vector as the 3d-gradient of the intensity (grayscale) of the texture. The gradient vector always points to the direction of increasing brightness.

Curl
: Calculates the force vector from the curl of the 3d-rgb texture (rotation of rgb vectors). This also works only with a color texture. It can be used for example to create a nice looking turbulence force with a color clouds texture with perlin noise.

Nabla

It is the offset used to calculate the partial derivatives needed for *Gradient* and *Curl* texture modes.

Use Object Coordinates

Uses the emitter object coordinates (and rotation & scale) as the texture space the particles use. Allows for moving force fields, that have their coordinates bound to the location coordinates of an object.

Root Texture Coordinates

This is useful for hair as it uses the texture force calculated for the particle root position for all parts of the hair strand.

2D

The *2D* button disregards the particles z-coordinate and only uses particles x&y as the texture coordinates.

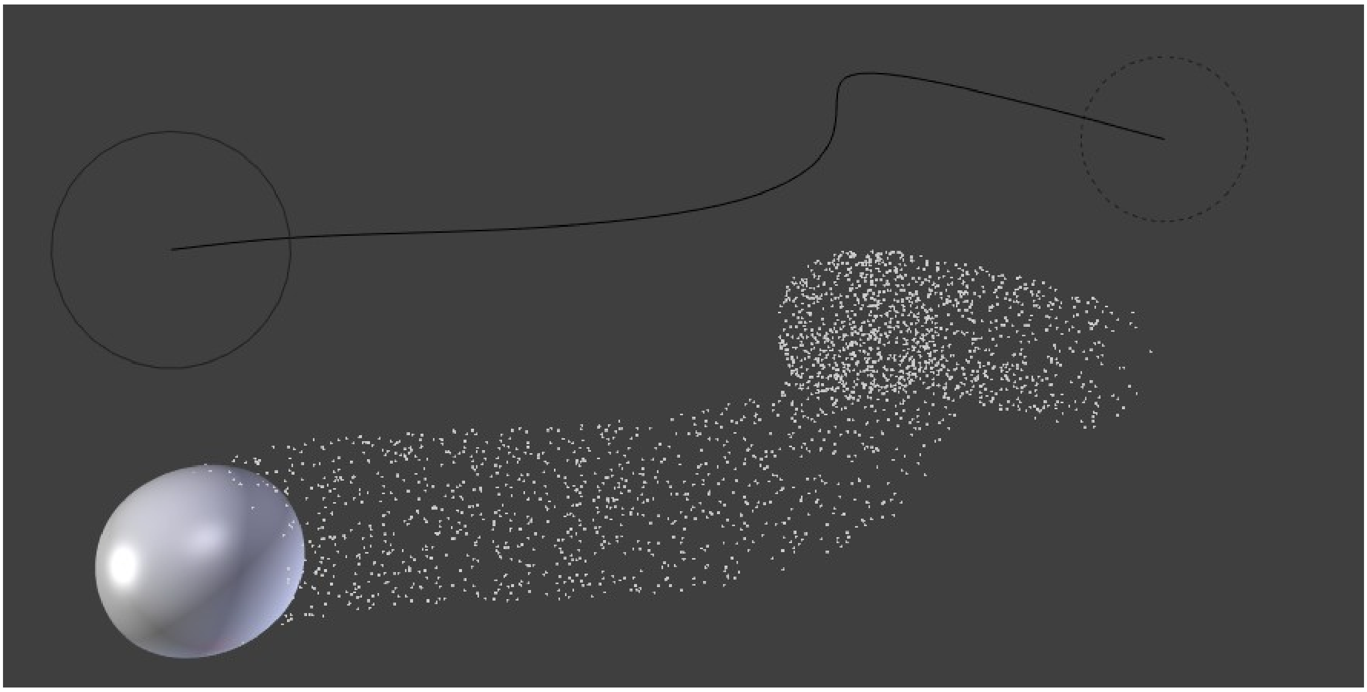
Remember that only procedural texture are truly 3D.

Examples

- A single colored texture 0.5/0.0/0.5 creates a force in the direction of the positive y-axis, e.g. hair is orientated to the y-axis.
- A blend texture with colorband can be used to created a force “plane”. E.g. on the left side 0.5/0.5/0.5, on the right side 1.0/0.5/0.5 you have a force plane perpendicular to XY (i.e. parallel to Z). If you use an object for the coordinates, you can use the object to push particles around.
- An animated wood texture can be used to create a wave like motion.

Curve Guide

The *Curve Guild* is used to force particles to follow a certain path defined by a *Curve Object*.



Example of Curve Guide.

A typical scenario would be to move a red blood cell inside a vein, or to animate the particle flow in a motor.

You can use *Curve Guide* s also to shape certain hair strands.

Note

You can also use the *Particle Mode* to define a path.

Since you can animate curves as Softbody or any other usual way, you may build very complex animations while keeping great control and keeping the simulation time to a minimum.

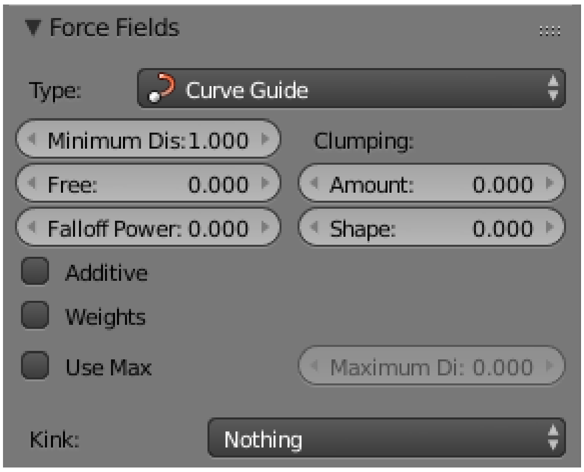
The option *Curve Follow* does not work for particles. Instead you have to set *Angular Velocity* (in the *Physics* panel of the *Particle* sub-context) to *Spin* and leave the rotation constant (i.e. don't turn on *Dynamic*).

Curve Guide s affect all particles on the same layer, independently from their distance to the curve. If you have several guides in a layer, their fields add up to each other (the way you may have learned it in your physics course). But you can limit their influence radius by changing there *Minimum Distance* (see below).

Note

The Curve Guide does not effect *Softbodys*.

Options



Curve Guide Settings.

Minimum Distance
: The distance from the curve, up to where the force field is effective with full strength. If you have a *Fall-off* of 0 this parameter does nothing, because the field is effective with full strength up to *MaxDist* (or the infinity). *MinDist* is shown with a circle at the endpoints of the curve in the 3D window.

Free
: Fraction of particle life time, that is not used for the curve.

Fall-off
: This setting governs the strength of the guide between *MinDist* and *MaxDist*. A *Fall-off* of 1 means a linear progression.

A particle follows a *Curve Guide* during it's lifetime, the velocity depends from it's lifetime and the length of the path.

Additive

If you use *Additive*, the speed of the particles is also evaluated depending on the *Fall-off*.

Weights

Use Curve weights to influence the particle influence along the curve.

Maximum Distance / Use Max

The maximum influence radius. Shown by an additional circle around the curve object.

The other settings govern the form of the force field along the curve.

Clumping Amount

The particles come together at the end of the curve (1) or they drift apart (-1).

Shape

Defines the form in which the particles come together. +0.99: the particles meet at the end of the curve. 0: linear progression along the curve. -0.99: the particles meet at the beginning of the curve.

Kink

Changes the shape that the particles can take:

Curl

The radius of the influence depends on the distance of the curve to the emitter.

Radial

A three dimensional, standing wave.

Wave

A two dimensional, standing wave.

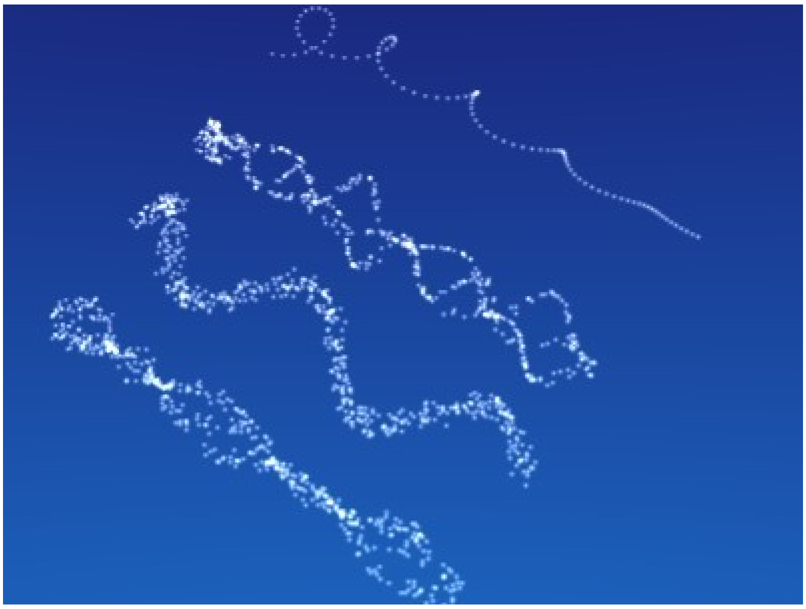
Braid

Braid.

Roll

A one dimensional, standing wave.

It is not so easy to describe the resulting shapes, so have a look at the example below.



Kink options of a curve guide. From left to right: Radial, Wave, Braid, Roll. Animation

Frequency

The frequency of the offset.

Shape

Adjust the offset to the beginning/end.

Amplitude

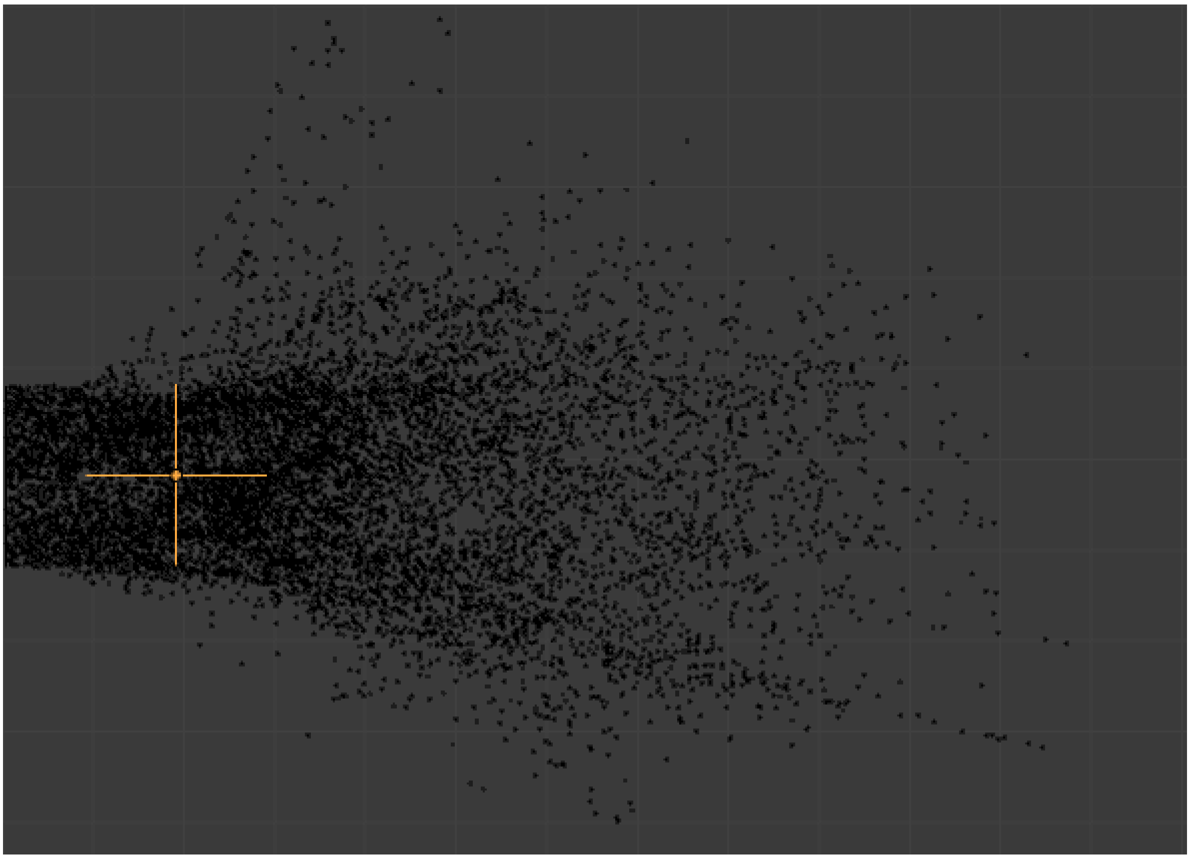
The Amplitude of the offset.

Boid

Boid probably comes from theoretical works. *Boids* is an artificial life program, developed by Craig Reynolds in 1986, which simulates the flocking behaviour of birds. His paper on this topic was published in 1987 in the proceedings of the ACM SIGGRAPH conference. The name refers to a “bird-like object”, but its pronunciation evokes that of “bird” in a stereotypical New York accent. As with most artificial life simulations, Boids is an example of emergent behavior; that is, the complexity of Boids arises from the interaction of individual agents (the boids, in this case) adhering to a set of simple rules. The rules applied in the simplest Boids world are as follows: separation: steer to avoid crowding local flockmates alignment: steer towards the average heading of local flockmates cohesion: steer to move toward the average position (center of mass) of local flockmates More complex rules can be added, such as obstacle avoidance and goal seeking.

Turbulence

Creates a random & chaotic 3d noise effect, similar to jets of water or geysers under the ocean.



Turbulence force field affecting a particle system.

Size

Indicates the scale of the noise.

Global

Makes the size and strength of the noise relative to the world, instead of the object it is attached to.

Drag

Drag is a force that works to resist particle motion by slowing it down.

Linear

Drag component proportional to velocity.

Quadratic

Drag component proportional to the square of the velocity.

Smoke Flow

Todo.

9.10 Physics - Baking Physics Simulations

Baking Physics Simulations

Baking refers to the act of storing or caching the results of a calculation.

It’s generally recommended to bake your physics simulations before rendering. Aside from no longer needing to go through the time-consuming process of simulating again, baking can help prevent potential glitches and ensure that the outcome of the simulation remains exactly the same every time.

Note

Most physics simulators in Bforartists use a similar system, but not all have exactly the same settings available. All the settings are covered here, but individual physics types may not provide all these options.

Compression

Compression level for cache files. Some physics caches can be very large (such as smoke). Bforartists can compress these caches in order to save space.

Light compression optimizes speed of compressing/decompressing operations over file size. *Heavy* compression will result in smaller cache files more than *Light*, however requires more CPU time to compress/decompress.

External

Read and write the cache to disk using a user-specified file path.

Index Number
This number specifies which cache should be used when the specified cache directory contains multiple caches. *0* refers to the top-most cache, *1* to the second from the top, *2* to the third, and so on.

Use Lib Path

Share the disk cache when the physics object is *linked* into another blendfile.

When this option is enabled, linked versions of the object will reference the same disk cache. When disabled, linked versions of the object will use independent caches.

Start
Frame on which to start the simulation.

End
Frame on which to stop the simulation.

Cache Step

Interval for storing simulation data.

Some physics systems (such as particles) allow for positions to be stored only on every nth frame, letting the positions for in-between frames be interpolated. Using a cache step greater than 1 will result in a smaller cache, but the result may differ from the original simulation.

Bake

Start baking. Bforartists will become unresponsive during most baking operations. The cursor will display as a number representing the bakes' progress.

Free Bake

Mark the baked cache as temporary. The data will still exist, but will be removed with the next object modification and frame change. This button is only available when the physics system has been baked.

Calculate To Frame

Bake only up to the current frame. Limited by *End* frame set in the cache settings.

Current Cache to Bake

Store any temporarily cached simulation data as a bake. Note that playing the animation will try to simulate any visible physics simulations. Depending on the physics type, this data may be temporarily cached. Normally such temporary caches are cleared when an object or setting is modified, but converting it to a bake will "save" it.

Bake All Dynamics

Bake all physics systems in the scene, even those of different types. Useful for baking complex setups involving interactions between different physics types.

See Bake

Free All Bakes

Free bakes of all physics systems in the scene, even those of different types.

See Free Bake.

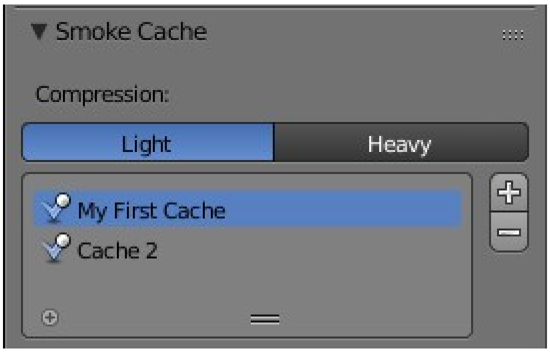
Update All To Frame

Bake all physics systems in the scene to the current frame.

See Calculate To Frame

Multiple Caches

Bforartists allows for storing and managing multiple caches at once for the same physics object.



Two different caches stored simultaneously.

Caches can be added and removed with the `Plus` and `Minus` buttons. Renaming a cache can be done by either double clicking or pressing `Ctrl-LMB` on the desired cache.

10.1 Render - General

Rendering

Rendering is the process of creating a 2D image (or video) from your 3D scene. What that image looks like is based on four factors which the user can control:

- A *Camera*
- The *Lighting* in your scene
- The *Material* of each object
- Various render settings (quality, image size, layers etc)

Your computer will perform various complex calculations based on those factors in order to give you your rendered image. This process may take some time depending on the complexity of the scene and your hardware.

Once the render is complete, it is possible to do additional manipulation of the image, called *Post Processing*.

Finally, the output can be saved to an image or video file using one of the *Output Formats*.

Workflow

In general, the process for rendering is:

1. Position the camera
2. Light the scene
3. Setup materials
4. Render a test image using lower quality settings
5. Change or fix anything you noticed in the render
6. Repeat the above two steps until you are satisfied
7. Render a high quality image, change or fix any issues and repeat until satisfied
8. Save your image to a file, or render the animation to a video or image sequence.

Render Engines

The Render Engine is the set of code which controls how your materials and lighting are used, and ultimately what the rendered image looks like.

Some engines may be better at certain things than others due to the math they use or core principles around which they were written.

Bforartists includes two render engines by default:

- *Bforartists Render*
- *Cycles*

More render engines from third-party developers can also be added using *Add-ons*

Render Output

The render output is what the render engines have produced. The result depends of the chosen render method. You can display the result, you can post process it in various ways, and you can save the result.

Displaying and Saving Images

Rendering still images is fairly simple. *Rendering Animations* is a bit more complex and is covered in the next sections.

To render an image from the active camera, in the Render Panel, press the *Render* button. By default the 3D view is replaced with the UV/Image Editor and the render appears.

Displaying Renders

Renders are displayed in the Image Editor. You can set the way this is displayed to several different options in the Display menu:

Keep UI

The image is rendered to the Image Editor, but the UI remains the same. You will need to open the Image Editor manually to see the render result.

New Window
: A new floating window opens up, displaying the render.

Image Editor
: One of the existing editors is replaced with the Image Editor, showing the render.

Full Screen
: The Image editor replaces the UI, showing the render.

For each of these options, pressing `Esc` will close the render view and return to the previous view.

Saving

Rendered images can be saved like any other image: Using Image ‣ Save As Image or by pressing `F3`

Display Options

When a rendered image is displayed in the Image Editor, several new menu items become available.

Slot Menu
: You can save successive renders into the render buffer by selecting a new slot before rendering. If an image has been rendered to a slot, it can be viewed by selecting that slot. Empty slots appear as blank grids in the image editor. Use the `J` and `Alt-J` to cycle forwards and backwards through saved renders.

Render Layer
: If you are using *Render Layers*, use this menu to select which layer is displayed.

Render Pass
: If you are using *Render Passes*, use this menu to select which pass is displayed.

Display Mode

The last four buttons set how the image is displayed.

RGB
: Draw image as rendered, without alpha channel.

RGBA
: Replaces transparent pixels with background checkerboard, denoting the alpha channel.

Alpha Channel
: Displays a gray-scale image. White areas are opaque, black areas have an alpha of 0.

Z Depth
: Display the depth from the camera, from Clip Start to Clip End, as specified in the *Camera settings*.

Animation Playback

The ‘Play’ button in the render panel will play back your rendered animation in a new window.

You can also drop images or movie files in a running animation player. It will then restart the player with the new data.

A external player can be used instead by selecting it in the *User Preferences*.

Output Options

The first step in the rendering process is to determine and set the output options. This includes render size, frame rate, pixel aspect ratio, output location, and file type.

Dimensions

Resolution

X/Y

The number of pixels horizontally and vertically in the image.

Percentage slider

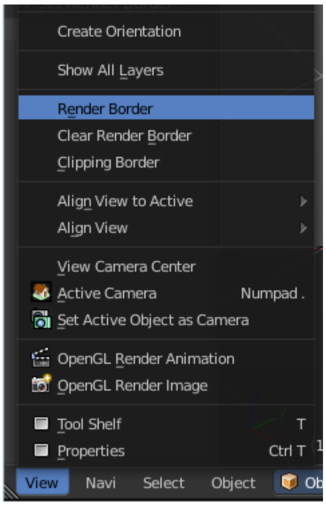
Reduce or increase the size of the rendered image relative to the X/Y values above. This is useful for small test renders that are the same proportions as the final image.

Aspect Ratio

Older televisions may have non-square pixels, so this can be used to control the shape of the pixels along the respective axis.

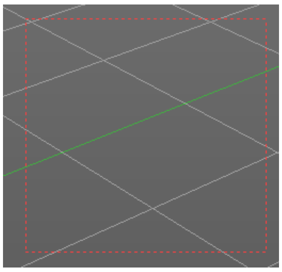
See *Video Output* for details on pixel aspect ratio.

Border

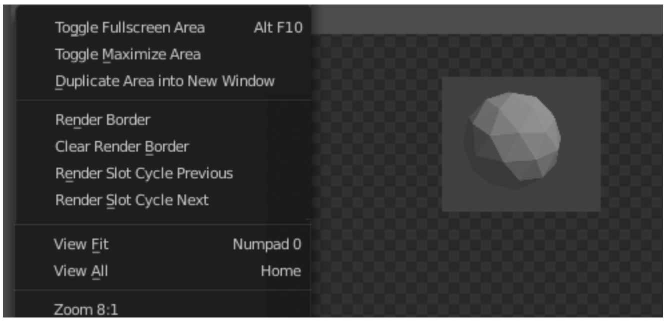


You can render just a portion of the view instead of the entire frame. While in Camera View, choose Render Border in the View menu. Then in the viewport drag a rectangle around the area that you want to render. When you render the image now, then just this area gets rendered.

To remove the render border choose the menu item Clear Render Border.



This works also in the Image Editor at the rendered result. The menu item is also in the View menu here. But here you don't have the red rectangle that shows the area to render.



Note

This disables the *Save Buffers* option in *Performance* and *Full Sample* option in *Anti-Aliasing*.

Enabling *Crop* will crop the rendered image to the *Border* size, instead of rendering a black region around it.

Frame Range
Set the *Start* and *End* frames for *Rendering Animations*. *Step* controls the number of frames to advance by for each frame in the timeline.

Frame Rate
For an *Animation* the frame rate is how many frames will be displayed per second.

Time Remapping
Use to remap the length of an animation.

Presets

To make life easier the topmost menu provides some common presets. You can add your own or remove one with the + and - buttons:

Output Panel

This panel provides options for setting the location of rendered frames for animations, and the quality of the saved images.

File Path

Choose the location to save rendered frames.

When rendering an animation, the frame number is appended at the end of the file name with 4 padded zeros (e.g. `image0001.png`). You can set a custom padding size by adding the appropriate number of # at the end of the file name (e.g. `image_##.png` would translate to `image_01.png`).

Overwrite
Overwrite existing files when rendering

Placeholders
Create empty placeholder frames while rendering

File Extensions
Adds the correct file extensions per file type to the output files

Cache Result
Saves the rendered image to your hard drive. This is helpful for heavy compositing.

Output Format
Choose the file format to save to. Based on which format is used, other options such as channels, bit-depth and compression level are available.

Hint

Primitive Render-Farm

An easy way to get multiple machines to share the rendering workload is to:

- Set up a shared directory over a network file-system.
- Disable *Overwrite*, enable *Placeholders* in the Render *Output* panel.
- Start as many machines as you wish rendering to that directory

Video Output

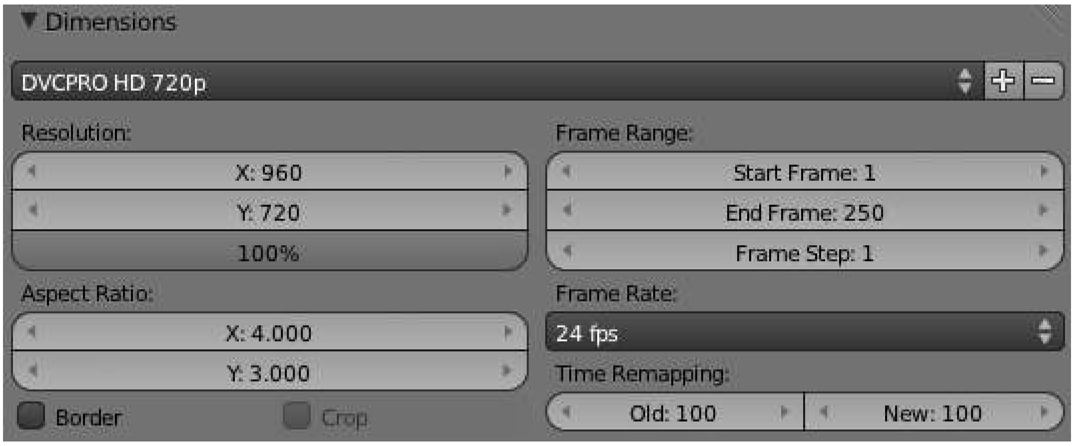
Preparing your work for video

Once you have mastered the trick of animation you will surely start to produce wonderful animations, encoded with your favorite codecs, and possibly you'll share them on the Internet with the rest of the community.

Sooner or later you will be struck with the desire to build an animation for television, or maybe burn your own DVDs. To spare you some disappointment, here are some tips specifically targeted at Video preparation. The first and principal one is to remember the double-dashed white lines in the camera view!

If you render for PC then the whole rendered image which lies within the *outer* dashed rectangle will be shown. For television, some lines and some part of the lines will be lost due to the mechanics of the electron beam scanning in your TV's cathode ray tube. You are guaranteed that what is within the *inner* dashed rectangle in camera view will be visible on the screen. Everything within the two rectangles may or may not be visible, depending on the given TV set that your audience watches the video on.

Dimensions Presets



The rendering size is strictly dictated by the TV standard. There are various popular presets included, more can be added for your convenience.

Saved information is:

Resolution:	X, Y & percentage scale
Aspect ratio:	pixel aspect ratio
Frame rate:	frames per second, for animation

See also Dimensions

Pixel Aspect Ratio

Unlike regular computer monitors, some screens (typically older TV sets) do *not* have the square pixels making it it necessary to generate *pre-distorted* images which will look stretched on a computer but which will display correctly on a TV set. It is important that you use the correct pixel aspect ratio when rendering to prevent re-scaling, resulting in lowered image quality.

Color Saturation

Most video tapes and video signals are not based on the RGB model but on the YCrCb model: more precisely, the YUV in Europe (PAL), and the YIQ in the USA (NTSC), the latter being quite similar to the former. Hence some knowledge of this is necessary too.

The YCrCb model sends information as ‘Luminance’, or intensity (Y) and two ‘Crominance’ signals, red and blue (Cr and Cb). Actually a Black and White TV set shows only luminance, while color TV sets reconstruct color from Crominances (and from luminance). Construction of the YCrCb values from the RGB ones takes two steps (the constants *in italics* depend on the system: PAL or NTSC):

First, the Gamma correction (*g* varies: 2.2 for NTSC, 2.8 for PAL):

- $R' = R^{1/g}$:*$G' = G^{1/g}$
- $B' = B^{1/g}$

Then, the conversion itself:

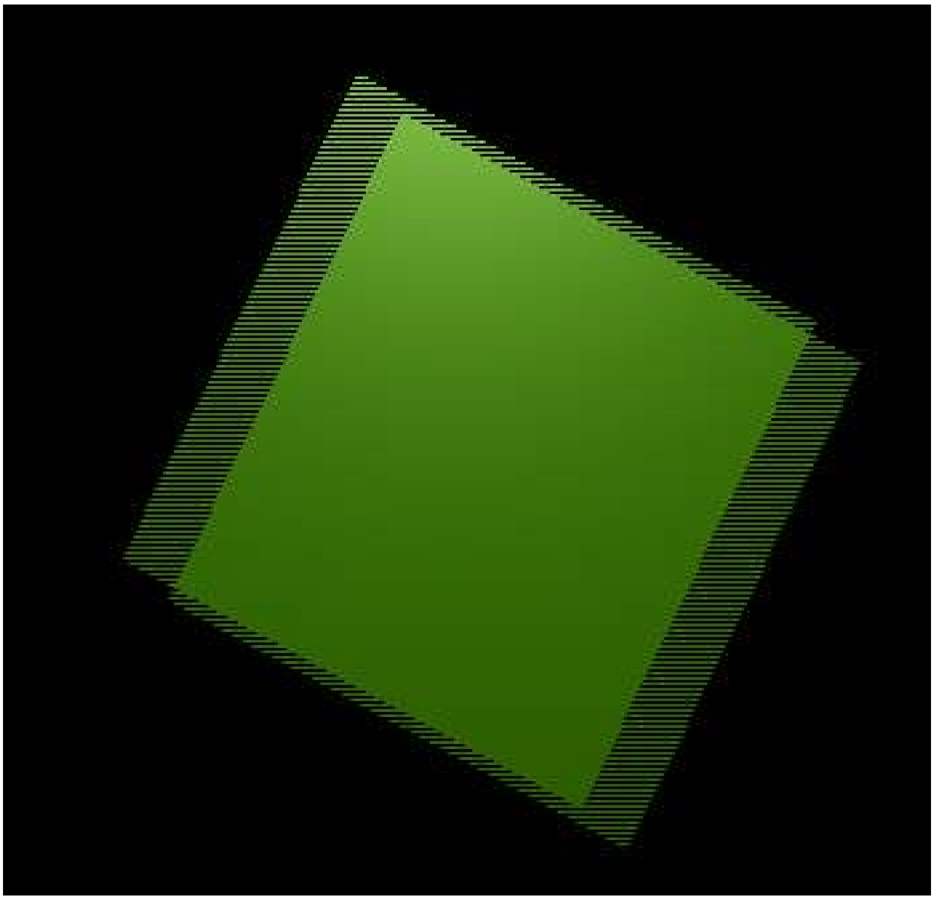
- $Y = 0.299R' + 0.587G' + 0.114B'$
- $Cr = a_1 (R' - Y) + b_1 (B' - Y)$
- $Cb = a_2 (R' - Y) + b_2 (B' - Y)$

Whereas a standard 24 bit RGB picture has 8 bits for each channel, to keep bandwidth down, and considering that the human eye is more sensitive to luminance than to chrominance, the luminance signal is sent with more bits than the two chrominance signals. This bit expansion results in a smaller dynamic of colors in video, than what you are used to on monitors. You hence have to keep in mind that not all colors can be correctly displayed.

A rule of thumb is to keep the colors as ‘grayish’ or ‘unsaturated’ as possible; this roughly means keeping the dynamics of your colors within 80% of one another. In other words, the difference between the highest RGB value and the lowest RGB value should not exceed 0.8 ([0-1] range) or 200 ([0-255] range).

This is not strict - something more than 0.8 is acceptable - but an RGB display with color contrast that ranges from 0.0 to 1.0 will appear to be very ugly (over-saturated) on video, while appearing bright and dynamic on a computer monitor.

Rendering to fields



Field Rendering result.

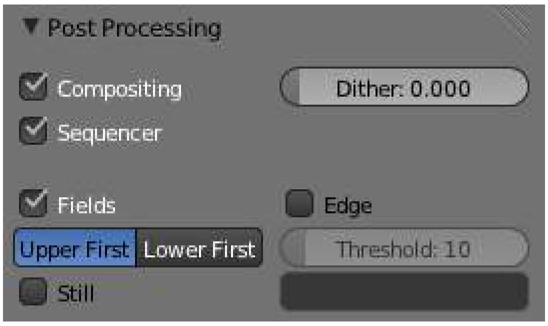
The TV standards prescribe that there should be 25 frames per second (PAL) or 30 frames per second (NTSC). Since the phosphors of the screen do not maintain luminosity for very long, this could produce a noticeable flickering.

To minimize this, a TV does not represent frames as a computer does (‘progressive’ mode), but rather represents half-frames, or *fields* at a double refresh rate, hence 50 half frames per second on PAL and 60 half frames per second on NTSC. This was originally bound to the frequency of power lines in Europe (50Hz) and the US (60Hz).

In particular, fields are “interlaced” in the sense that one field presents all the even lines of the complete frame and the subsequent field the odd ones.

Since there is a non-negligible time difference between each field (1/50 or 1/60 of a second) merely rendering a frame the usual way and splitting it into two half frames does not work. A noticeable jitter of the edges of moving objects would be present.

Options



Field Rendering setup.

Fields

Enable field rendering. When the *Fields* button in the *Render* Panel is pressed (*Post Processing* section), Bforartists prepares each frame in two passes. On the first it renders only the even lines, then it *advances in time by half a time step* and renders all the odd lines. This produces odd results on a PC screen *(Field Rendering result)*. but will show correctly on a TV set.

Upper First / Lower First

Toggles between rendering the even and odd frames first.

Still

Disables the half-frame time step between fields (*x*).

Note

Setting up the correct field order

Bforartists's default setting is to produce Even fields *before* Odd fields; this complies with European PAL standards. Odd fields are scanned first on NTSC.

Of course, if you make the wrong selection things are even worse than if no Field rendering at all was used!

If you are really confused, a simple trick to determine the correct field order is to render a short test animation of a white square moving from left to right on a black background. Prepare one version with odd field order and another with even field order, and look at them on a television screen. The one with the right field order will look smooth and the other one horrible. Doing this simple test will save you *hours* of wasted rendering time...

Note

Fields and Composite Nodes

Nodes are currently not field-aware. This is partly due to the fact that in fields, too much information is missing to do good neighborhood operations (blur, vector blur etc.). The solution is to render your animation at double the frame rate without fields and do the interlacing of the footage afterwards.

Post Processed Effects

There are several effects you can enable in the Render Settings that add visual elements to rendered images, after the rendering has completed. These are not done in camera, but rather composited on top of the image.

Composited and *Sequence* are discussed in *Output Options*.

Fields are discussed in *Video Output*.

Render Layers

Reference
Editor: *Properties* Context: *Render Layers*

Render layers allow you to render your scene in separate layers, usually with the intension of compositing them back together afterwards.

This can be useful for several purposes, such as color correcting certain elements differently, blurring the foreground as a fast manual method of creating DoF, or reducing the render quality for unimportant objects.

Using Render Layers can also save you from having to re-render your entire image each time you change something, allowing you to instead re-render only the layer(s) that you need.

Layer List

This is a list of all the Render Layers in the current scene.

Only layers which are enabled (checkbox on right is ticked) will be rendered. If the *Pin* icon at the bottom right of the list is enabled, only the active (highlighted) layer will be rendered.

Render Layers can be added and removed using the **+** and **-** buttons on the right, and existing layers can be renamed by double clicking on their name.

Layer Panel

The Layer Panel shows the settings of the active Render Layer from the list above.

You can select multiple layers using `Shift-LMB`.

Scene
: The Scene Layers, showing which are currently visible and will be rendered.

Layer
: The Scene Layers which are associated with the active Render Layer. Objects in those Scene Layers will be rendered in that Render Layer. When an object is in the Scene Layers but not the Render Layer, it will still cast shadows and be visible in reflections, so it is still indirectly visible.

Mask Layer
: Objects on these will mask out other objects appearing behind them.

Material Override

Overrides all material settings to use the Material chosen here.

Examples of where this might be used:

- To check lighting by using a plain diffuse material on all objects
- Render a wireframe of the scene
- Create a custom render pass such as an anti-aliased matte or global coordinates.

See also

Additional options shown in this panel are different for each render engine. See these options for:

- *Bforartists Render*
- *Cycles*

Using Render Layers

Each Render Layer has an associated set of *Scene Layers*. Objects which are on one of the associated Scene Layers are shown in that Render Layer, as long as that Scene Layer is also visible.

Warning

Only the objects in visible Scene Layers will be rendered. So, if only Scene Layer 1 is visible and your Render Layer set specifies to render only Layers 2 and 3, nothing will be rendered.

Post Processing Panel

Compositing
: Use compositing for the final image.

Sequencer
: If sequencer strips are used render them instead of an image.

Dithering

Dithering is a technique for blurring pixels to prevent banding that is seen in areas of gradients, where stair-stepping appears between colors. Banding artifacts are more noticeable when gradients are longer, or less steep. Dithering was developed for graphics with low bit depths, meaning they had a limited range of possible colors.

Dithering works by taking pixel values and comparing them with a threshold and neighboring pixels then does calculations to generate the appropriate color. Dithering creates the perceived effect of a larger color palette by creating a sort of visual color mixing. For example, if you take a grid and distribute red and yellow pixels evenly across it, the image would appear to be orange.

The *Dither* value ranges from 0 to 2.

Metadata

The *Metadata* panel includes options for writing meta-data into render output.

Stamping can include the following data:

Time
: Include the current scene time and render frame as `HH:MM:SS.FF`

Date
: Include the current date and time.

RenderTime
: Include the render time in the stamp image.

Frame
: Include the frame number.

Scene
: Include the name of the active scene.

Camera
: Include the name of the active camera.

Lens
: Include the name of the active camera’s lens value.

Filename
: Include the filename of the .blend file.

Marker
: Include the name of the last marker.

Seq. Strip
: Include the name of the foreground sequence strip.

Note
: Include a custom note.

> **Note**
>
> Only some image formats support metadata: See *image formats*.

Stamp Output

You can optionally stamp this into the image its self (adding text over the rendered image) which can be useful for test renders and animation previews.

Stamp Text Color
Set the color and alpha of the stamp text.

Stamp Background
Set the color and alpha of the color behind the text.

Font Size
Set the size of the text.

Hint

It can be useful to use the *Note* field if you're setting up a render-farm.

Since you can script any information you like into it, such as an identifier for the render-node or the job-number.

For details on stamping arbitrary values, see: this page

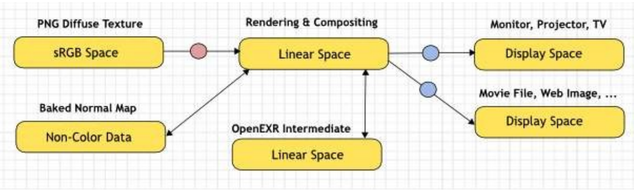
Color Management

Different views and exposures of the same render

OpenColorIO is integrated into Bforartists, meaning many color spaces are supported with fine control over which color transformations are used.

Scene Linear Color Space

For correct results, different color spaces are needed for rendering, display and storage of images. Rendering and compositing is best done in **scene linear color space**, which corresponds more closely to nature, and makes computations more physically accurate.

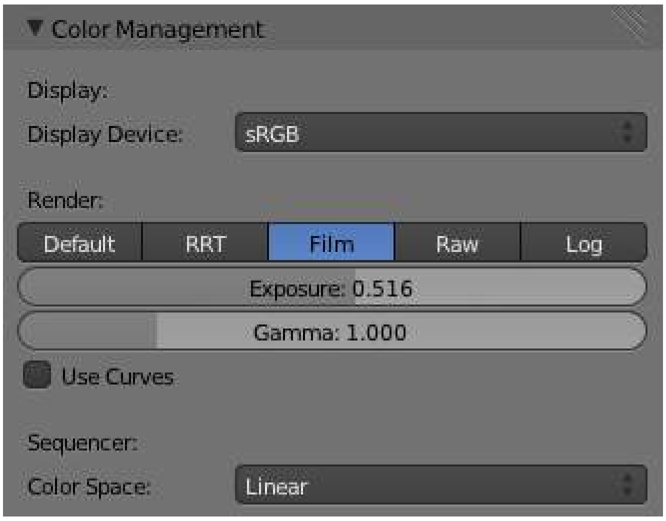


Example linear workflow

If the colors are linear, it means that if in reality we double the amount of photons, the color values are also doubled. Put another way, if we have two photos/renders each with one of two lights on, and add those images together, the result would be the same as a render/photo with both lights on. It follows that such a radiometrically linear space is best for photorealistic rendering and compositing.

However these values do not directly correspond to human perception or the way display devices work, and image files are often stored in different color spaces, so we have to take care to do the right conversion into and out of this linear color space.

Settings



Scene settings for color management

These settings are found in the scene context of the properties editor, under the *Color Management* panel.

Display

Correct display of renders requires a **conversion to the display device color space**, which can be configured here. A computer monitor works differently from a digital cinema project or HDTV. The scene properties have these settings:

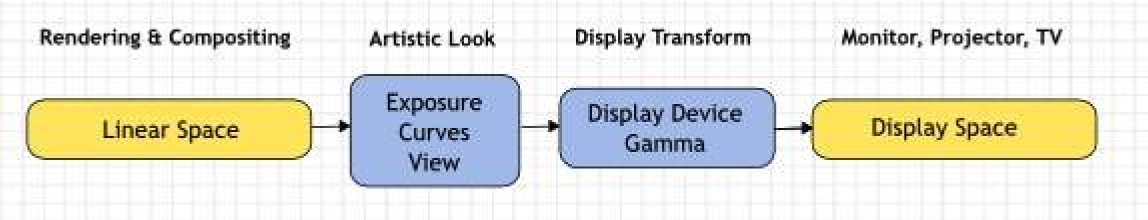
Display Device

> The device that the image is being viewed on.
>
> Most computer monitors are configured for the sRGB color space, and so when working on a computer usually this option should just be left to the default. It would typically be changed when viewing the image on another display device connected to the computer, or when writing out image files intended to

be displayed on another device.

Rec709 is commonly used for HDTVs, while XYZ and DCI-P3 are common for digital projectors.

Color management can be disabled by setting the device to None.



Conversion from linear to display device space

Render

There is also an **artistic choice** to be made for renders. Partially that's because display devices can't display the full spectrum of colors and only have limited brightness, so we can squeeze the colors to fit in the gamut of the device. Besides that it can also be useful to give the renders a particular look, e.g. as if they have been printed on real film.

Another common use case is when you want to inspect renders, to see details in dark shadows or bright highlights, or identify render errors. Such settings would be only used temporarily and not get used for final renders.

View

These are different ways to view the image on the same display device.

Default
Does no extra conversion besides the conversion for the display device.

RRT
Uses the ACES Reference Rendering Transform, to simulate a film-like look.

Film
This option is another film-like look.

Raw and Log
Intended for inspecting the image but not for final export. Raw gives the image without any color space conversion, while Log gives a more "flat" view of the image without very dark or light areas.

Exposure
Used to control the image brightness (in stops) applied before color space conversion.

Gamma
Extra gamma correction applied after color space conversion. Note that the default sRGB or Rec709 color space conversions already include a gamma correction of approximately 2.2 (except the Raw and Log views), so this would be applied in addition to that.

Look
Choose an artistic effect from set of measured film response data which roughly emulates the look of certain film types. Applied before color space conversion.

Use Curves
Adjust RGB Curves to control image colors before color space conversion. Read more about using the Curve Widget.

Sequencer

Color Space
: The color space that the sequencer operates in. By default the sequencer operates in sRGB space, but it can also be set to work in Linear space like the Compositing nodes, or another color space. Different color spaces will give different results for color correction, cross fades, and other operations.

Image Files

The other place to keep color management in mind is when **loading and saving image files**. File formats such as PNG or JPEG will typically store colors in a color space ready for display, not in a linear space. When they are, for example, used as textures in renders, they need to be converted to linear first, and when saving renders for display on the web, they also need to be converted to a display space. Other file formats like OpenEXR store linear color spaces and as such are useful as intermediate files in production.

When working with image files, the default color space is usually the right one. If this is not the case, the color space of the image file can be configured in the image settings. A common situation where manual changes are needed is when working with or baking normal maps or displacement maps, for example. Such maps do not actually store colors, just data encoded as colors. In such cases they should be marked as **Non-Color Data**.

Image data-blocks will always store float buffers in memory in the scene linear color space, while a byte buffer in memory and files on disk are stored in the color space specified with this setting:

Color Space
: The color space of the image on disk. This depends on the file format, for example PNG or JPEG images are often stored in sRGB, while OpenEXR images are stored in a linear color space. Some images such as normal, bump or stencil maps do not strictly contain 'colors', and on such values no color space conversion should ever be applied. For such images the color space should be set to None.

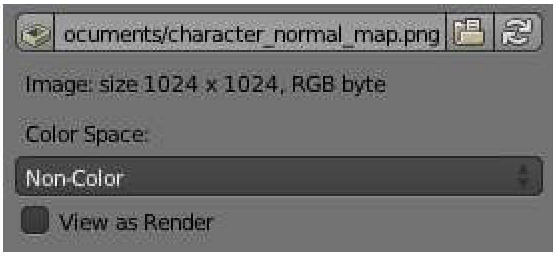


Image settings for color management

By default only renders are displayed and saved with the render view transformations applied. These are the Render Result and Viewer image data-blocks, and the files saved directly to disk with the Render Animation operator. However when loading a render saved to an intermediate OpenEXR file, Bforartists can't detect automatically that this is a render (it could be e.g. an image texture or displacement map). We need to specify that this is a render and that we want the transformations applied, with these two settings:

View as Render
: Display the image data-block (not only renders) with view transform, exposure, gamma, RGB curves applied. Useful for viewing rendered frames in linear OpenEXR files the same as when rendering them directly.

Save as Render
: Option in the image save operator to apply the view transform, exposure, gamma, RGB curves. This is useful for saving linear OpenEXR to e.g. PNG or JPEG files in display space.

OpenColorIO Configuration

Bforartists comes with a standard OpenColorIO configuration that contains a number of useful display devices and view transforms. The reference linear color space used is the linear color space with Rec. 709 chromaticities and D65 white point.

However OpenColorIO was also designed to give a consistent user experience across multiple applications, and for this a single shared configuration file can be used. Bforartists will use the standard OCIO environment variable to read an OpenColorIO configuration other than the default Bforartists one. More information about how to set up such a workflow can be found on the OpenColorIO website.

We currently use the following color space roles:

scene_linear
: color space used for rendering, compositing, and storing all float precision images in memory.

default_sequencer
: default color space for sequencer, *scene_linear* if not specified

default_byte
: default color space for byte precision images and files, *texture_paint* if not specified.

default_float
: default color space for float precision images and files, *scene_linear* if not specified.

The standard Bforartists configuration also includes some support for ACES (code and documentation), even though we have a different linear color space. It's possible to load and save EXR files with the Linear ACES color space, and the RRT view transform can be used to view images with their standard display transform. However the ACES gamut is larger than the Rec. 709 gamut, so for best results an ACES specific configuration file should be used. OpenColorIO provides an ACES configuration, though it may need a few more tweaks to be usable in production.

Compatibility

Compatibility with existing files should mostly be preserved. Files that had color management enabled should be entirely compatible, while older files with the color management option disabled are mostly compatible but different for vertex colors and viewport colors.

Workflows

The workflow to render depends of the chosen render and what you want to render. A still or an animation for example.

Rendering Animations

While rendering stills will allow you to view and save the image from the render buffer when it's complete, animations are a series of images, or frames, and are automatically saved directly out to disk after being rendered.

After rendering the frames, you may need to edit the clips, or first use the Compositor to do green-screen masking, matting, color correction, DOF, and so on to the images. That result is then fed to the Sequencer where the strips are cut and mixed and a final overlay is done.

Finally you can render out from the Sequencer and compress the frames into a playable movie clip.

Workflow

Generally, you do a lot of intermediate renders of different frames in your animation to check for timing, lighting, placement, materials, and so on. At some point, you are ready to make a final render of the complete animation for publication.

There are two approaches you can use when making a movie, or animation, with or without sound. The approach you should use depends on the amount of CPU time you will need to render the movie. You can render a “typical” frame at the desired resolution, and then multiply by the number of frames that will ultimately go into the movie, to arrive at an total render time.

If the total render time is an hour or more, you want to use the “Frame Sequence” approach. For example, if you are rendering a one-minute video clip for film, there will be (60 seconds per minute) * (24 frames per second) or 1440 frames per minute. If each frame takes 30 seconds to render, then you will be able to render two frames per minute, or need 720 minutes (12 hours) of render time.

Rendering takes all available CPU time; you should render overnight, when the computer is not needed, or set Bforartists to a low priority while rendering, and work on other things (be careful with the RAM space!).

The **Direct Approach** - highly **not** recommended and not a standard practice - is where you set your output format to an AVI or MOV format, and click ANIM to render your scene directly out to a movie file. Bforartists creates one file that holds all the frames of your animation. You can then use Bforartists’s VSE to add an audio track to the animation and render out to an MPEG format to complete your movie.

The **Frame Sequence** is a much more stable approach, where you set your output format to a still format (such as JPG, PNG or MultiLayer), and click ANIM to render your scene out to a set of images, where each image is the frame in the sequence.

Bforartists creates a file for each frame of the animation. You can then use Bforartists’s compositor to perform any frame manipulation (post processing). You can then use Bforartists’s VSE to load that final image sequence, add an audio track to the animation, and render out to an MPEG format to complete your movie. The Frame Sequence approach is a little more complicated and takes more disk space, but gives you more flexibility.

Here are some guidelines to help you choose an approach.

Direct Approach

- short segments with total render time < 1 hour
- stable power supply
- computer not needed for other uses

Frame Sequence Approach

- total render time > 1 hour
- **post-production work needed**

    - Color/lighting adjustment
    - Green screen / matte replacement
    - Layering/compositing
    - Multiple formats and sizes of ultimate product
- intermediate frames/adjustments needed for compression/codec
- precise timing (e.g. lip-sync to audio track) needed in parts
- may need to interrupt rendering to use the computer, and want to be able to resume rendering where you left off.

Frame Sequence Workflow

- First prepare your animation.
- In the *Dimensions* panel, choose the render size, Pixel Aspect Ratio, and the Range of Frames to use, as well as the frame rate, which should already be set.
- In the Output panel set up your animation to be rendered out as images, generally using a format that does not compromise any quality (I prefer PNG or MultiLayer because of their loss-less nature).
- Choose the output path and file type in the Output panel as well, for example `//render/my-anim-`.
- Confirm the range of your animation frame Start and End.
- Save your .blend file.
- Press the big *Animation* button. Do a long task [like sleeping, playing a video game, or cleaning your driveway] while you wait for your computer to finish rendering the frames.
- Once the animation is finished, use your OS file explorer to navigate into the output folder (“`render` in this example). You will see lots of images (.png or .exr, etc... depending on the format you chose to render) that have a sequence number attached to them ranging from 0000 to a max of 9999. These are your single frames.
- In Bforartists, now go into the *video sequence editor*.
- Choose *Add Image* from the add menu. Select all the frames from your output folder that you want to include in your animation (Press A to Select All easily). They will be added as a strip to the sequence editor.
- Now you can edit the strip and add effects or simply leave it like it is. You can add other strips, like an audio strip.
- Scrub through the animation, checking that you have included all the frames.
- In the Scene Render buttons, in the Post Processing panel, activate *Sequencer*.
- In the Format panel, choose the container and codec you want (e.g. MPEG H.264) and configure it. The video codecs are described on the previous page: *Output Options*.
- Click the ANIMATION render button and Bforartists will render out the sequence editor output into your movie.

Why go through all this hassle? Well, first of all, if you render out single frames you can stop the render at any time by pressing `Esc` in the render window. You will not lose the frames you have already rendered, since they have been written out to individual files. You can always adjust the range you want to continue from where you left off.

You can edit the frames afterwards and post-process them. You can add neat effects in the sequence editor. You can render the same sequence into different resolutions (640x480, 320x240, etc) and use different codecs (to get different file sizes and quality) with almost no effort whatsoever.

Options

Post Processing Panel

Sequencer

Renders the output of the sequence editor, instead of the view from the 3D scene's active camera. If the sequence contains scene strips, these will also be rendered as part of the pipeline. If Do Composite is also enabled, the Scene strip will be the output of the Compositor.

Compositing

Renders the output from the Compositing noodle, and then pumps all images through the Composite node map, displaying the image fed to the Composite Output node.

Hints

You accidentally turned off you're PC right in the middle of rendering my movie!

Unless your animation renders in a few minutes, it's best to render the animation as separate image files. Instead of rendering directly to a compressed movie file, use a loss-less format (PNG for example).

This allows you an easy recovery if there is a problem and you have to re-start the rendering, since the frames you have already rendered will still be in the output directory.

Just disable the *Overwrite* option to start rendering where you left off.

You can then make a movie out of the separate frames with Bforartists's sequence editor or using 3rd party encoding software.

Animation Preview

It can be useful to render a subset of the animated sequence, since only part of an animation may have an error.

Using an image format for output, you can use the *Frame Step* option to render every *N'th* frame. Then disable *Overwrite* and re-render with *Frame Step* set to 1.

Command Line

In some situations we want to increase the render speed, access Bforartists remotely to render something or build scripts that use the command line.

One advantage of using the command line is that we don't need the X server (in the case of Linux) and consequently we can render remotely by SSH or telnet.

To see a list of available flags (for example to specify which scene to render, the end frame number, etc...), simply run:

```
Bforartists --help
```

Note

Arguments are executed in the order they are given!

The following command won’t work, since the output and extension is set after Bforartists is told to render:

```
Bforartists -b file.blend -a -x 1 -o //render
```

The following command will behave as expected.

```
Bforartists -b file.blend -x 1 -o //render -a
```

Always position `-f` or `-a` as the last arguments.

Platforms

How to actually execute Bforartists from the command line depends on the platform and where you have installed Bforartists. Here are basic instructions for the different platforms.

Linux

Open a terminal, then go to the directory where Bforartists is installed, and run the Bforartists command like this.

```
cd <Bforartists installation directory>
./Bforartists
```

If you have Bforartists installed in your `PATH` (usually when Bforartists is installed through a distribution package), you can simply run:

```
Bforartists
```

Mac OSX

Open the terminal application, go to the directory where Bforartists is installed, and run the executable within the app bundle, with commands like this:

```
cd /Applications/Bforartists
./Bforartists.app/Contents/MacOS/Bforartists
```

If you need to do this often, you can make an alias so that typing just `Bforartists` in the terminal works. For that you can run a command like this in the terminal (with the appropriate path).

```
echo "alias
Bforartists=/Applications/Bforartists/Bforartists.app/Contents/MacOS/Bforartists" >>
~/.profile
```

If you then open a new terminal, the following command will work:

```
Bforartists
```

MS-Windows

Open the Command Prompt, go to the directory where Bforartists is installed, and then run the Bforartists command.

```
cd c:\<Bforartists installation directory>
Bforartists
```

You can also add the Bforartists folder to your system `PATH` so that do you do not have to change to it each time.

Examples

Here are some common examples of command line rendering:

Single Image

```
Bforartists -b file.blend -f 10
```

`-b`
: Render in the background (without UI).

`file.blend`
: Path to the blend file to render.

`-f 10`
: Render only the 10th frame.

```
Bforartists -b file.blend -o /project/renders/frame_##### -F EXR -f -2
```

`-o /project/renders/frame_#####`
: Path of where to save the rendered image, using 5 padded zeros for the frame number.

`-F EXR`
: Override the image format specified in the blend file and save to an OpenEXR image.

`-f -2`
: Render only the second last frame.

Warning
Arguments are case sensitive! `-F` and `-f` are not the same.

Animation

```
Bforartists -b file.blend -a
```

`-a`
: Render the whole animation using all the settings saved in the blend file.

```
Bforartists -b file.blend -E Bforartists_RENDER -s 10 -e 500 -t 2 -a
```

`-E Bforartists_RENDER`
: Use the “Bforartists Render” engine. For a list of available renderers, run `Bforartists -E help`.

`-s 10 -e 500`
: Set the start frame to `10` and the end frame to `500`.

`-t 2`
: Use only two threads.

Render Baking

Baking, in general, is the act of pre-computing something in order to speed up some other process later down the line. Rendering from scratch takes a lot of time depending on the options you choose. Therefore, Bforartists allows you to “bake” some parts of the render ahead of time, for select objects. Then, when you press Render, the entire scene is rendered much faster, since the colors of those objects do not have to be recomputed.

Render baking creates 2D bitmap images of a mesh object’s rendered surface. These images can be re-mapped onto the object using the object’s UV coordinates. Baking is done for each individual mesh, and can only be done if that mesh has been UV-unwrapped. While it takes time to set up and perform, it saves render time. If you are rendering a long animation, the time spent baking can be much less than time spent rendering out each frame of a long animation.

Use Render Bake in intensive light/shadow solutions, such as AO or soft shadows from area lights. If you bake AO for the main objects, you will not have to enable it for the full render, saving render time.

Use *Full Render* or *Textures* to create an image texture; baked procedural textures can be used as a starting point for further texture painting. Use *Normals* to make a low-resolution mesh look like a high-resolution mesh. To do that, UV-unwrap a high-resolution, finely sculpted mesh and bake its normals. Save that normal map, and *Mapping* (texture settings) the UV of a similarly unwrapped low-resolution mesh. The low-resolution mesh will look just like the high-resolution, but will have much fewer faces/polygons.

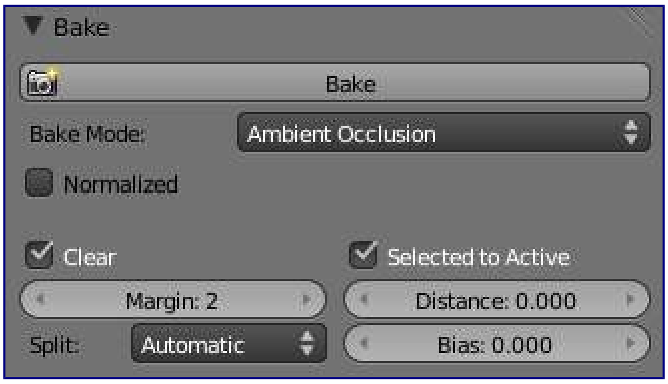
Advantages

- Can significantly reduce render times
- Texture painting made easier
- Reduced polygon count
- Repeated renders are made faster, multiplying the time savings

Disadvantages

- Object must be UV-unwrapped.
- If shadows are baked, lights and object cannot move with respect to each other.
- Large textures (eg 4096x4096) can be memory intensive, and be just as slow as the rendered solution.
- Human (labor) time must be spent unwrapping and baking and saving files and applying the textures to a channel.

Options



Ambient Occlusion

Bake Mode

Full Render

Bakes all materials, textures, and lighting except specularity and SSS.

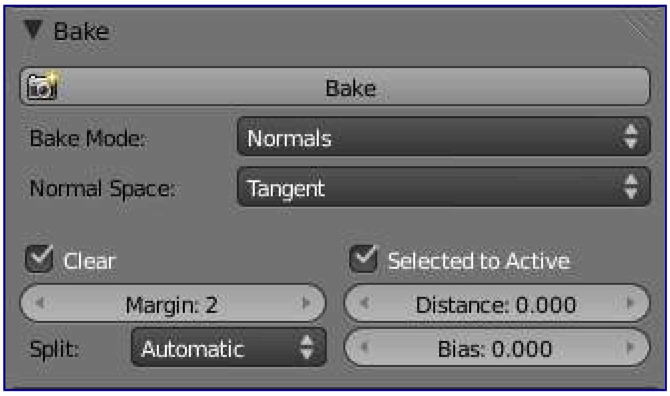
Ambient Occlusion

Bakes ambient occlusion as specified in the World panels. Ignores all lights in the scene.

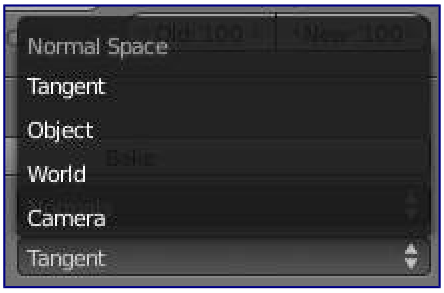
Normalized
: Normalize without using material's settings.

Shadow

Bakes shadows and lighting.



Normals



Normal Space

Normals

Bakes tangent and camera-space normals (amongst many others) to an RGB image.

Normal Space

Normals can be baked in different spaces:

Camera space
: Default method.

World space
: Normals in world coordinates, dependent on object transformation and deformation.

Object space

Normals in object coordinates, independent of object transformation, but dependent on deformation.

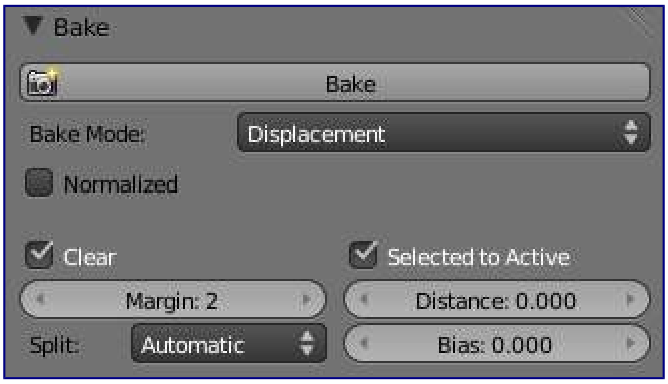
Tangent space

Normals in tangent space coordinates, independent of object transformation and deformation. This is the new default, and the right choice in most cases, since then the normal map can be used for animated objects too.

For materials the same spaces can be chosen as well, in the image texture options, next to the existing *Normal Map* setting. For correct results, the setting here should match the setting used for baking.

Textures

Bakes colors of materials and textures only, without shading.



Displacement

Displacement

Similar to baking normal maps, displacement maps can also be baked from a high-res object to an unwrapped low-res object, using the *Selected to Active* option.

Normalized

Normalize to the distance.

When using this in conjunction with a subsurf and displacement modifier within Bforartists, it’s necessary to temporarily add a heavy subsurf modifier to the ‘low res’ model before baking. This means that if you then use a displacement modifier on top of the subsurf, the displacement will be correct, since it’s stored as a relative difference to the subsurfed geometry, rather than the original base mesh (which can get distorted significantly by a subsurf). The higher the render level subsurf while baking, the more accurate the displacements will be. This technique may also be useful when saving the displacement map out for use in external renderers.

Emission

Bakes Emit, or the Glow color of a material.

Alpha

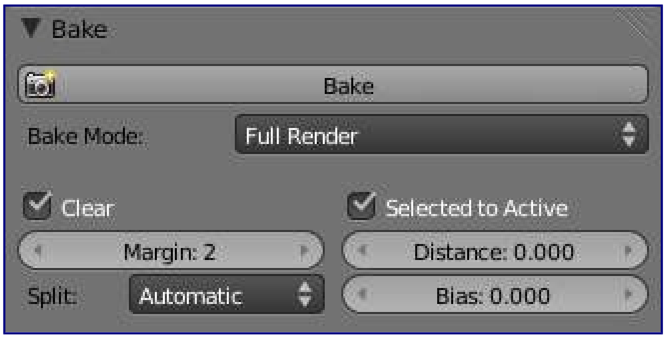
Bakes Alpha values, or transparency of a material.

Mirror Color and Intensity

Bakes Mirror color or intensity values.

Specular Color and Intensity

Bakes specular color or specular intensity values.



Full Render

Additional Options

Clear
: If selected, clears the image to selected background color (default is black) before baking render.

Margin
: Baked result is extended this many pixels beyond the border of each UV “island,” to soften seams in the texture.

Split

- **Fixed**
  : Slit quads predictably (0,1,2) (0,2,3).
- **Fixed alternate**
  : Slit quads predictably (1,2,3) (1,3,0).
- **Automatic**
  : Split quads to give the least distortion while baking.

Select to Active

Enable information from other objects to be baked onto the active object.

- **Distance**
  : Controls how far a point on another object can be away from the point on the active object. Only needed for *Selected to Active*. A typical use case is to make a detailed, high poly object, and then bake it’s normals onto an object with a low polygon count. The resulting normal map can then be applied to make the low poly object look more detailed.
- **Bias**
  : Bias towards further away from the object (in Bforartists units)

Note

Mesh Must be Visible in Render

If a mesh is not visible in regular render, for example because it is disabled for rendering in the Outliner or has the DupliVerts setting enabled, it cannot be baked to.

Workflow

- In a 3D View window, select a mesh and enter UV/Face Select mode
- Unwrap the mesh object

- In a UV/Image Editor window, either create a new image or open an existing one. If your 3D view is in textured display mode, you should now see the image mapped to your mesh. Ensure that all faces are selected.
- In the Bake panel at the bottom of the *Render menu*, bake your desired type of image (*Full Render* etcetera.)
- When rendering is complete, Bforartists replaces the image with the Baked image.
- Save the image.
- Apply the image to the mesh as a UV texture. For displacement and normal maps, refer to *Bump and Normal Maps*. For full and texture bakes, refer to *Textures*.
- Refine the image using the process described below, or embellish with Texture Paint or an external image editor.

Multi-View Render

For this 5-minute guide we will take an existent `.blend` file that was made for monoscopic rendering and transform it in stereo-3d ready.

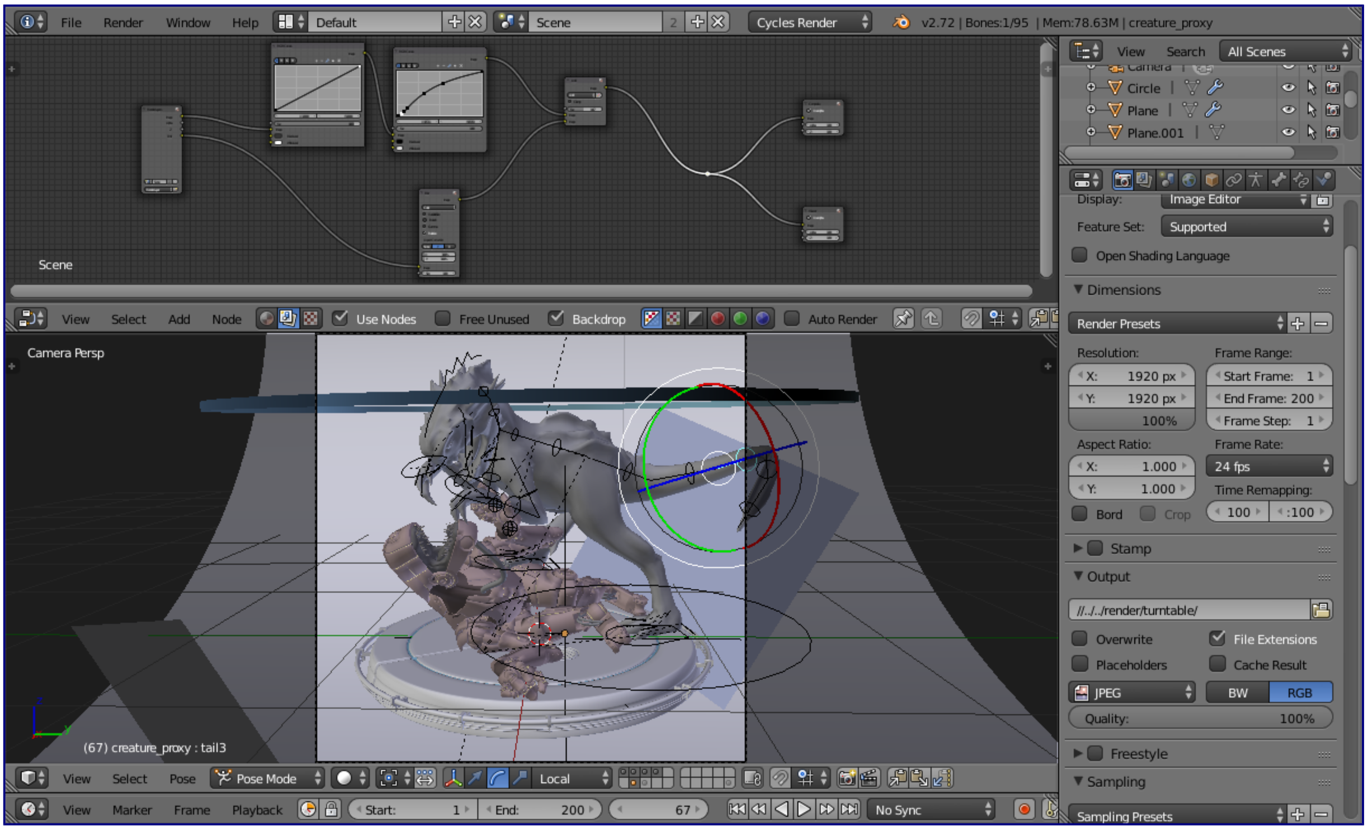
Creature Factory 2 by Andy Goralczyk Rendered in Stereo 3D (anaglyph)

Note

Multi-View drawing requires capable graphics card and drivers with *Triple Buffer* support. If the *Automatic* mode doesn't work, set the *Window Draw Method* in the *System User Preferences*.

Introduction

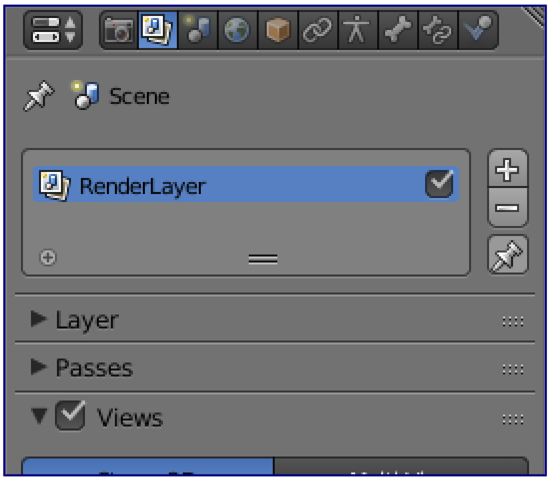
Start opening up your project file, in this case `turntable.blend` from the **Creature Factory 2** Open Movie Workshop series from the Bforartists Institute by **Andy Goralczyk**.



Turn Table Creature Factory 2

Views Setup

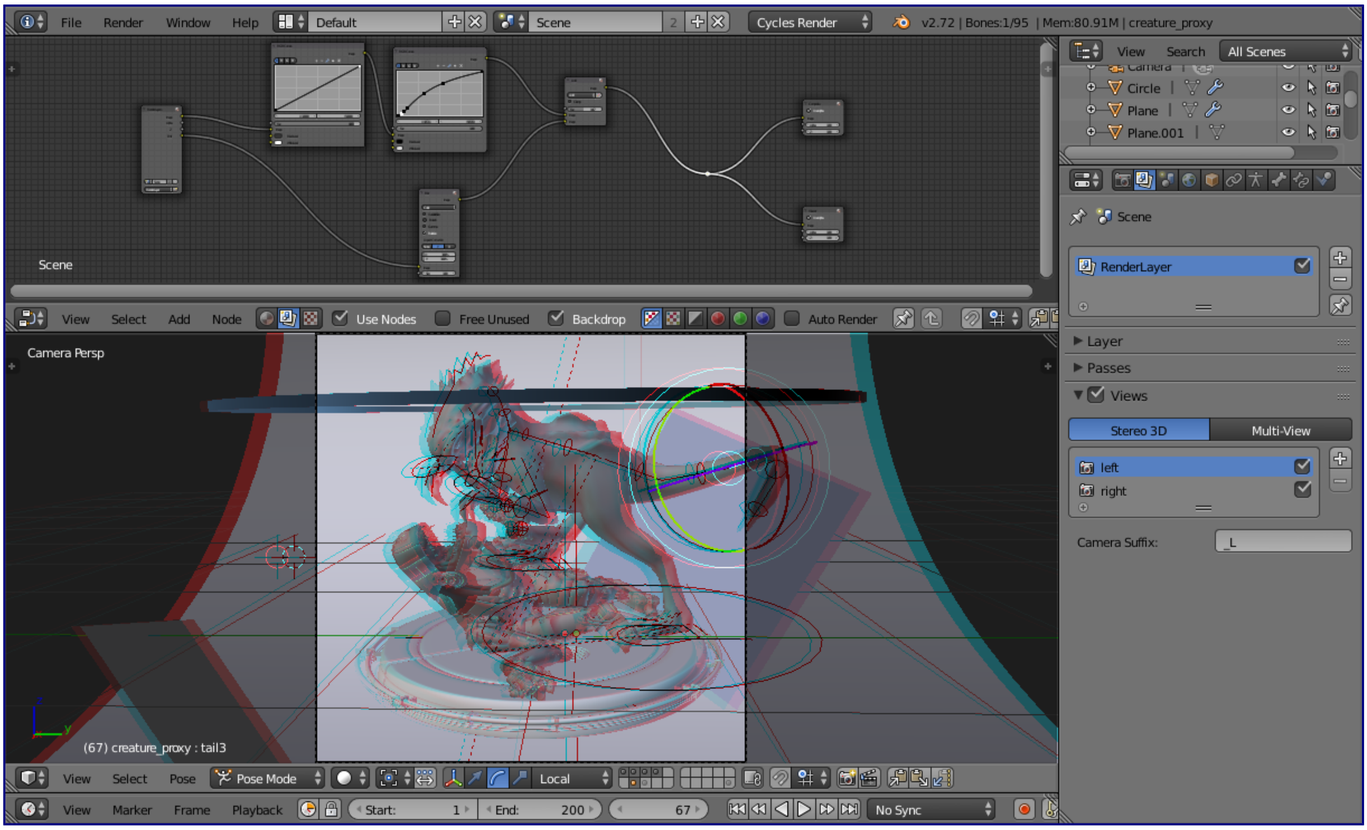
Go to the Render Layers panel and enable *Views* for this scene.



Scene Render Views

Note

When you turn on *Views* in the scene you get 3d preview in the viewport, as well as multiple panels that are now accessible all over the user interface.

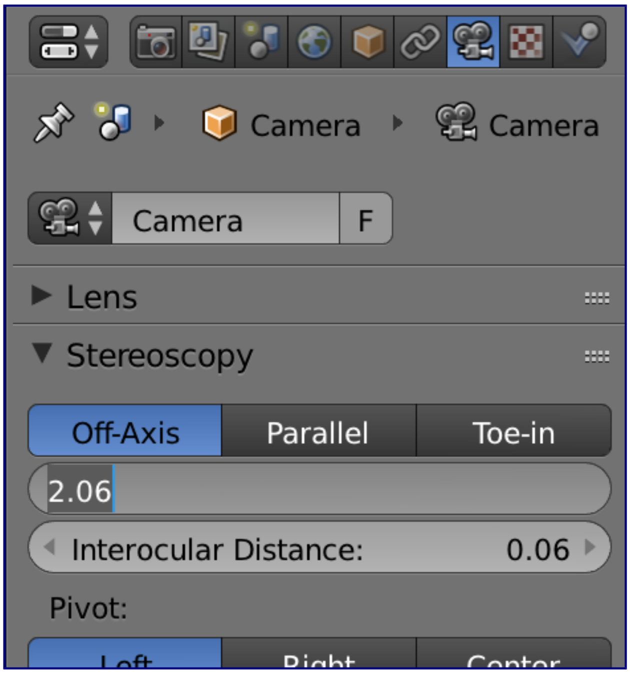


Viewport with 3D visualization

Camera

To tweak the stereo 3d parameters select the camera in the Outliner. In the Camera panel go to the Stereoscopy tab and change the *Convergence Distance*.

The viewport will respond in real-time to those changes allowing you to preview the current depth value of the scene.

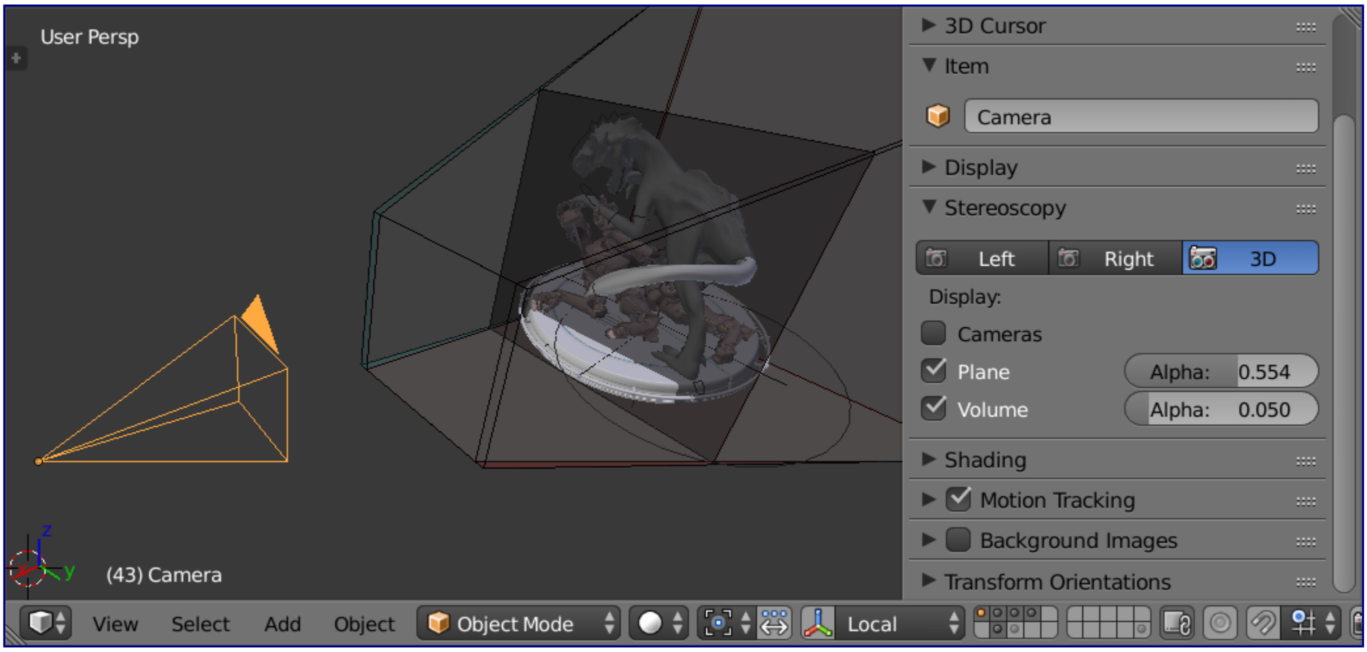


Stereo Convergence Distance

Viewport

Before fine-tuning the camera parameters you can set the convergence plane in the viewport based in your scene depth layout. Go outside the camera view and you will instantly see the convergence plane in front of the camera.

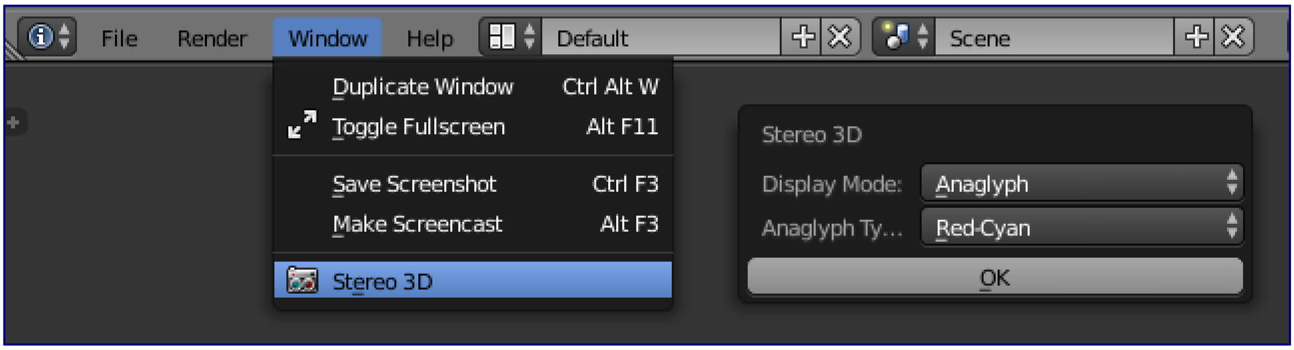
You can toggle this and other display settings in the Stereoscopy tab of the viewport properties panel. In the following image the cameras frustum volumes are also visible.



Viewport Plane and Volume Stereo Preview

Stereo 3D Display

If you have a real 3d display at some point you can change the 3D display mode in the Window menu, by calling the Stereo 3D operator. Be aware that some modes require a fullscreen editor to work.



Window Menu, Stereo 3D Operator

OpenGL Preview

Turn Table OpenGL Rendering Preview

Before rendering your scene you can save an OpenGL preview of the animation for testing in the final display. In the Render Output panel you can chose the output *Views Format*.

The options include individual files per view, top-bottom, anaglyph among others. Pick the one that fits your display requirements.

Rendering and Image Editor

Once you are happy with the results you can render out the final animation. In the Image Editor you can inspect the individual views and the stereo result.

Image Formats

Your final animation can be saved in more robust formats than the ones used by the OpenGL render preview. In this example we saved as cross-eyed side-by-side stereo 3d.

Side by Side Cross-Eye Format

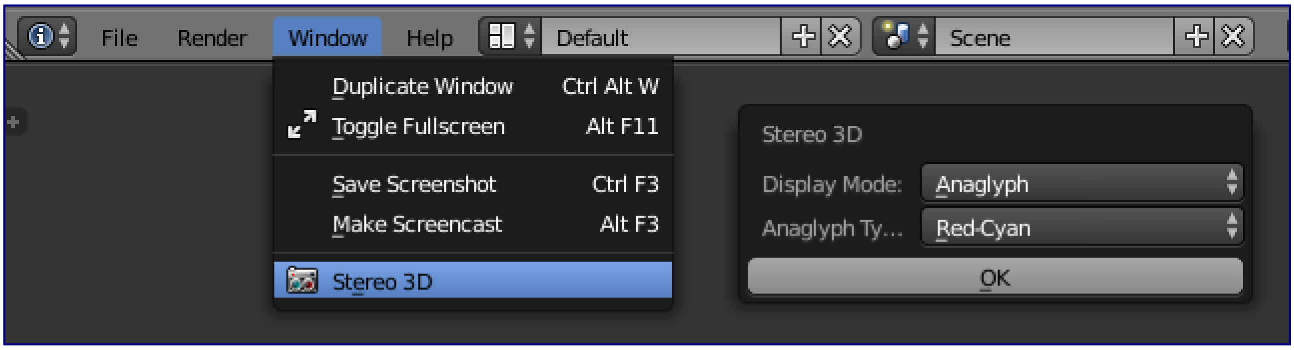
Final Considerations

As this guide showed, there is more to stereo 3d rendering than just generate two images. The earlier the stereo pipeline is considered the smoother it will get. The following sections are a more in-depth view of the individual components we visited in the workflow.

Window Stereo 3D Display

An essential component of the Stereoscopy pipeline is the ability to display the stereo image in a proper display. Bforartists supports from high-end 3D displays to simple red-cyan glasses. On top of that you can set a different display mode for each window.

The display mode can be changed via the Window menu or if you create your own shortcuts for the **wm.set_stereo_3d** operator.



Window Menu, Stereo 3D Operator

Display Mode

Anaglyph
Render two differently filtered colored images for each eye. Anaglyph glasses are required. We support

Red-Cyan, Green-Magenta and Yellow-Blue glasses.

Interlace

Render two images for each eye into one interlaced image. A 3D-ready monitor is required. We support Row, Column and Checkerboard Interleaved. An option to Swap Left/Right helps to adjust the image for the screen. This method works better in fullscreen.

Time Sequential

Renders alternate eyes. This method is also known as Page Flip. This requires the graphic card to support Quad Buffer and it only works in fullscreen.

Side-by-Side

Render images for left and right eye side-by-side. There is an option to support Cross-Eye glasses. It works only in fullscreen, and it should be used with the Full Editor operator.

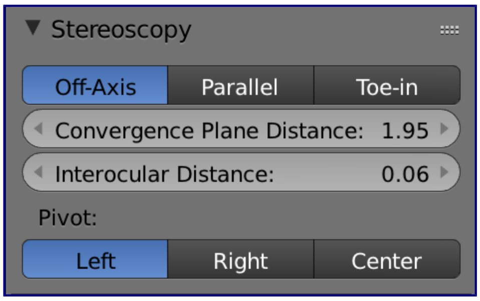
Top-Bottom

Render images for left and right eye one above another. It works only in fullscreen, and it should be used with the Full Editor operator.

> **Note**
>
> Full Screen Stereo 3D Modes
>
> If you have a 3D display most of the time you will use it to see in stereo 3D you will have to go to the fullscreen mode. In fact some modes will only work in the full window mode that hides most of the user interface from the work area. In this case it is recommended to work with two monitors, using the 3D screen for visualizing the stereo result while the other screen can be used for the regular Bforartists work.

Stereo 3D Camera

When using the Stereo 3D scene view setup a stereo pair is created on-the-fly and used for rendering and previsualization. For all the purposes this works as two cameras that share most parameters (focal length, clipping, ...). The stereo pair, however, is offsetted, and can have unique rotation and shift between itself.



Stereo 3D Camera Settings

Interocular Distance

Set the distance between the camera pair. Although the convergence of a stereo pair can be changed in post-production, different interocular distances will produce different results due to the parts of the scene being occluded from each point of view.

Convergence Plane Distance

The converge point for the stereo cameras. This is often the distance between a projector and the projection screen. You can visualize this in the 3D Viewport.

Convergence Mode

Off-Axis

The stereo camera pair is separated by the interocular distance, and shifted inwards so it converges in the convergence plane. This is the ideal format since it is the one closest to how the human vision works.

Parallel

This method produces two parallel cameras that do not converge. Since this method needs to be manually converged it can't be used for viewing. This method is common when combining real footage with rendered elements.

Toe-in

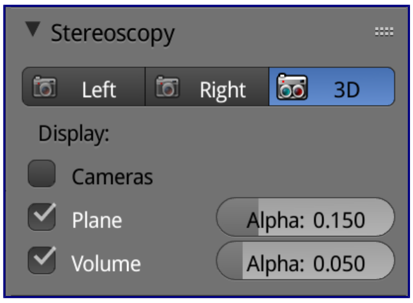
A less common approach is to rotate the cameras instead of shifting their frustum. The Toe-in method is rarely used in modern 3D productions.

Pivot

The stereo pair can be constructed around the active camera with a new camera built for each eye (Center Pivot) or using the existing camera and creating (Left or Right). The latter is what is used when only one eye needs to be rendered for an existing mono 2D project.

Viewport Stereo 3D

When you enable 'Views' in the Render Layer panel a new are is available in the 3D Viewport properties panel. In this panel you can pick whether to see the stereo 3d in the viewport, or which camera to see. It also allow you to see the Cameras, the Plane and the Volume of the stereo cameras.



Viewport Stereo 3D Settings

Cameras

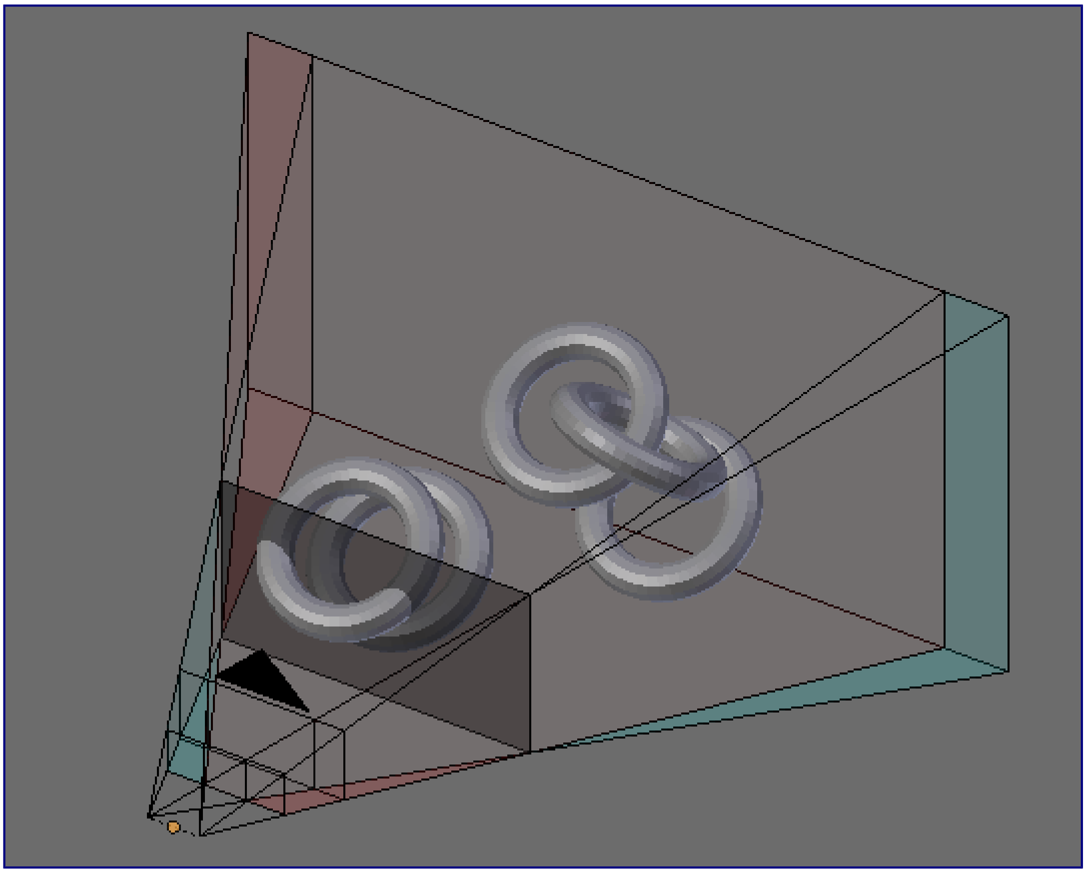
When working with the Stereo 3D views setup you can inspect what each individual generated camera is looking or the combined result of them. In the Multi-View mode you can see the combined result of the left and right cameras (when available) or the current selected camera.

Plane

The convergence plane represents the screen as it is perceived by the audience. Visualizing it in the 3D Viewport allows you to layout your scene based on your depth script outside the camera view.

Volume

The intersection of the stereo cameras frustums helps planning the show by avoiding elements being visible by only one camera. The volume is defined by the cameras start and end clipping distances. The areas that are in the frustum of one camera only are known as **retinal rivalry areas**. They are tolerated in the negative space (the region from the convergence plane into the image) but are to be avoided at all costs in the positive space (the area from the convergence plane to the camera).



Viewport 3D: Convergence Plane and Volume Display

Multi-View and Stereo 3D Image I/O

Multi-View and Stereo 3D

Multi-View images can be saved in special formats according to the production requirements. By default the system saves each view as an individual file, thus generating as many files as views to be rendered. In stereo 3d productions, for the final deployment or even intermediary previews it's convenient to save stereo 3d images, that are ready to use with 3D displays or simple anaglyph glasses. The formats supported match the display modes available for the window.

Lossy-Formats

Some stereo 3D formats represent a considerable loss of data. For example, the Anaglyph format will cap out entire color channels from the original image. The Top-Bottom compressed will discard half of your vertical resolution data. The Interlace will mash your data considerably. Once you export in those formats, you can still import the image back in Bforartists, for it to be treated as Stereo 3D. You will need to match the window stereo 3d display mode to the image stereo 3d format though.

Lossless Formats

Some formats will preserve the original data, leading to no problems on exporting and importing the files back in Bforartists. The Individual option will produce separate images that (if saved in a lossless encoding such as `PNG` or `OpenEXR`) can be loaded back in production with no loss of data. For the Stereo 3D formats the only lossless options are *Top-Bottom* and *Side-by-Side* without the Squeezed Frame option.

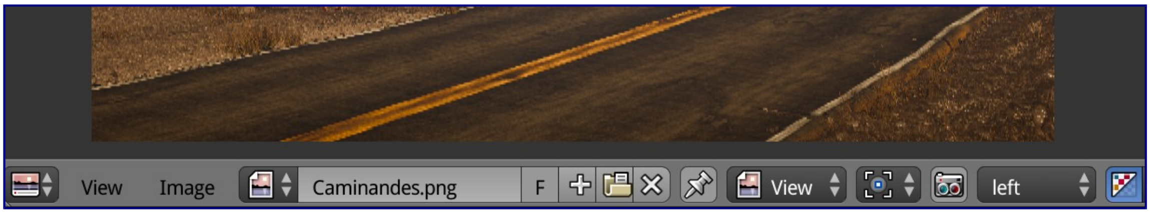
Multi-View Openexr

Another option is to use Multi-View OpenEXR files. This format can save multiple views in a single file and is backward compatible with old OpenEXR viewers (you see only one view though). Multi-View native support is only available to OpenEXR.

Image Editor

View Menu

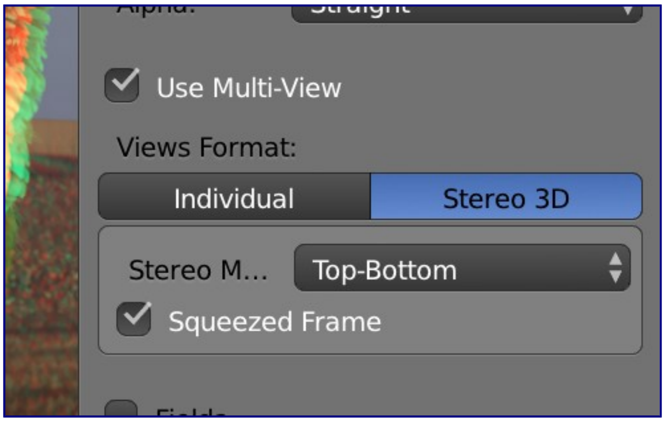
After you render your scene with Stereo 3D you will be able to see the rendered result in the combined stereo 3d or to inspect the individual views. This works for Viewer nodes, render results or opened images.



Stereo 3D and View menu

Views Format

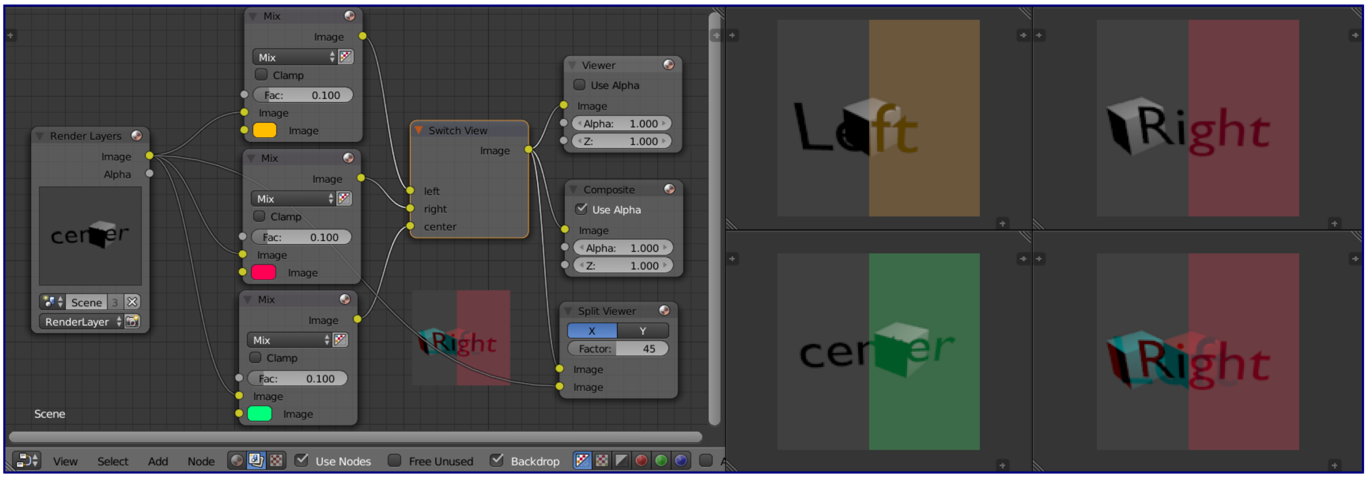
When you drag and drop an image into the Image Editor, Bforartists will open it as a individual images at first. If your image was saved with one of the Stereo 3D formats you can change how Bforartists should interpret the image by switching the mode to Stereo 3D, turning on Use Multi-View and picking the corresponding stereo method.



Views Formats and Stereo 3D

Compositor

The compositor works smoothly with Multi-View. The compositing of a view is completed before the remaining views start to be composited. The pipeline is the same as the single-view workflow, with the difference that you can use Image, Movies or Image Sequences in any of the supported Multi-View formats.



Compositor, Backdrop and Split Viewer Node

The views to render are defined in the current scene views, in a similar way as you define the composite output resolution in the current scene render panel, regardless of the Image nodes resolutions or RenderLayers from different scenes.

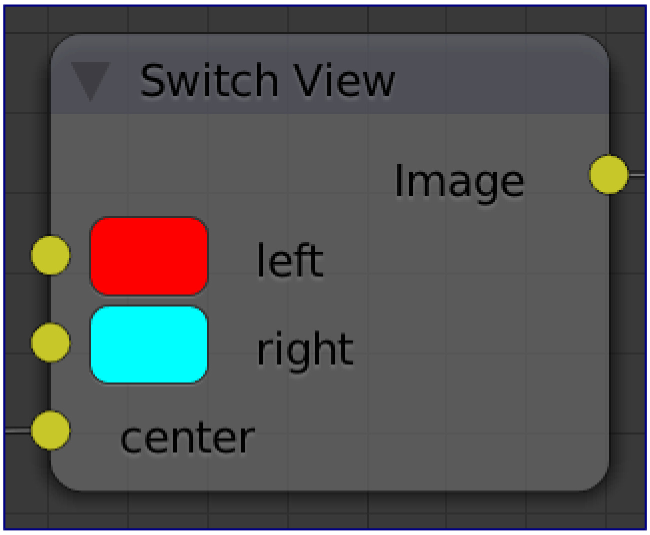
Note

Single-View Images

If the image from an Image Node does not have the view you are trying to render, the image will be treated as a single-view image.

Switch View Node

If you need to treat the views separately you can use the Switch View node to combine the views before an output node.



Switch View Node

Performance

By default when compositing and rendering from the user interface all views are rendered and then composited. During test iterations you can disable all but one view from the Scene Views panel, and re-enable it after you get the final look.

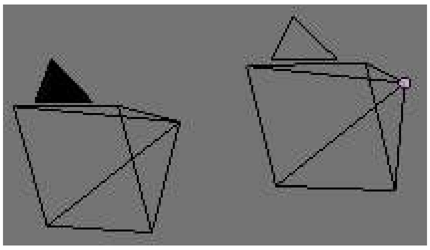
10.4 Render - Camera

Camera

A *Camera* is an object that provides a means of rendering images from Bforartists. It defines which portions of a scene is visible in the rendered image. By default a scene contains one camera. However, A scene can contain more than one camera, but only one of them will be used at a time. So you will only need to add a new camera if you are making cuts between them. See *Animating Cameras*.

Changing the Active Camera

Reference
Mode: *Object* mode Hotkey: `Ctrl-Numpad0`



Active camera (left one).

The *active* camera is the camera that is currently being used for rendering and camera view (`Numpad0`).

Select the camera you would like to make active and press `Ctrl-Numpad0` (by doing so, you also switch the view to camera view). In order to render, each scene **must** have an active camera.

The active camera can also be set in the *Scene* context of the *Properties Editor*

The camera with the solid triangle on top is the active camera.

Warning

The active camera, as well as the layers, can be specific to a given view, or global (locked) to the whole scene - see *Local Camera*.

Camera Settings

Reference

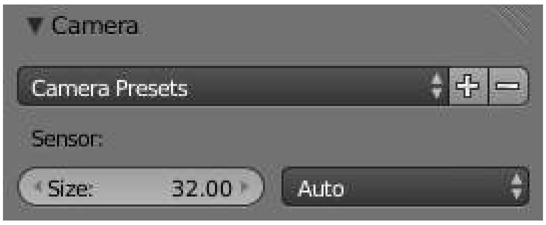
Mode: Object mode
Editor: Properties
Context: Object Data

Cameras are invisible in renders, so they don't have any material or texture settings. However, they do have *Object* and *Editing* setting panels available which are displayed when a camera is the selected (active!) object.

Lens

The camera lens options control the way 3D objects are represented in a 2D image. See *Camera Lens* for details.

Camera

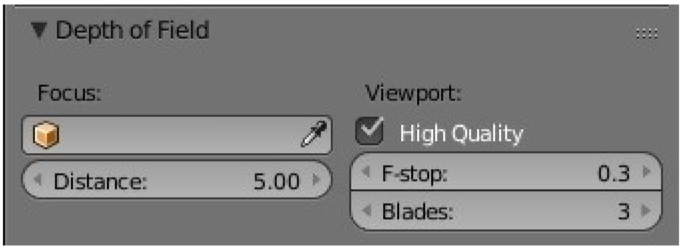


Camera Presets panel.

Sensor size

This setting is an alternative way to control the focal-length, it's useful to match the camera in Bforartists to a physical camera & lens combination, e.g. for *motion tracking*.

Depth of Field



Camera Depth of Field Panel

Real world cameras transmit light through a lens that bends and focuses it onto the sensor. Because of this, objects that are a certain distance away are in focus, but objects in front and behind that are blurred.

The area in focus is called the *focal point* and can be set using either an exact value, or by using the distance between the camera and a chosen object:

Focus Object
: Choose an object which will determine the focal point. Linking an object will deactivate the distance parameter. Typically this is used to give precise control over the position of the focal point, and also allows it to be animated or constrained to another object.

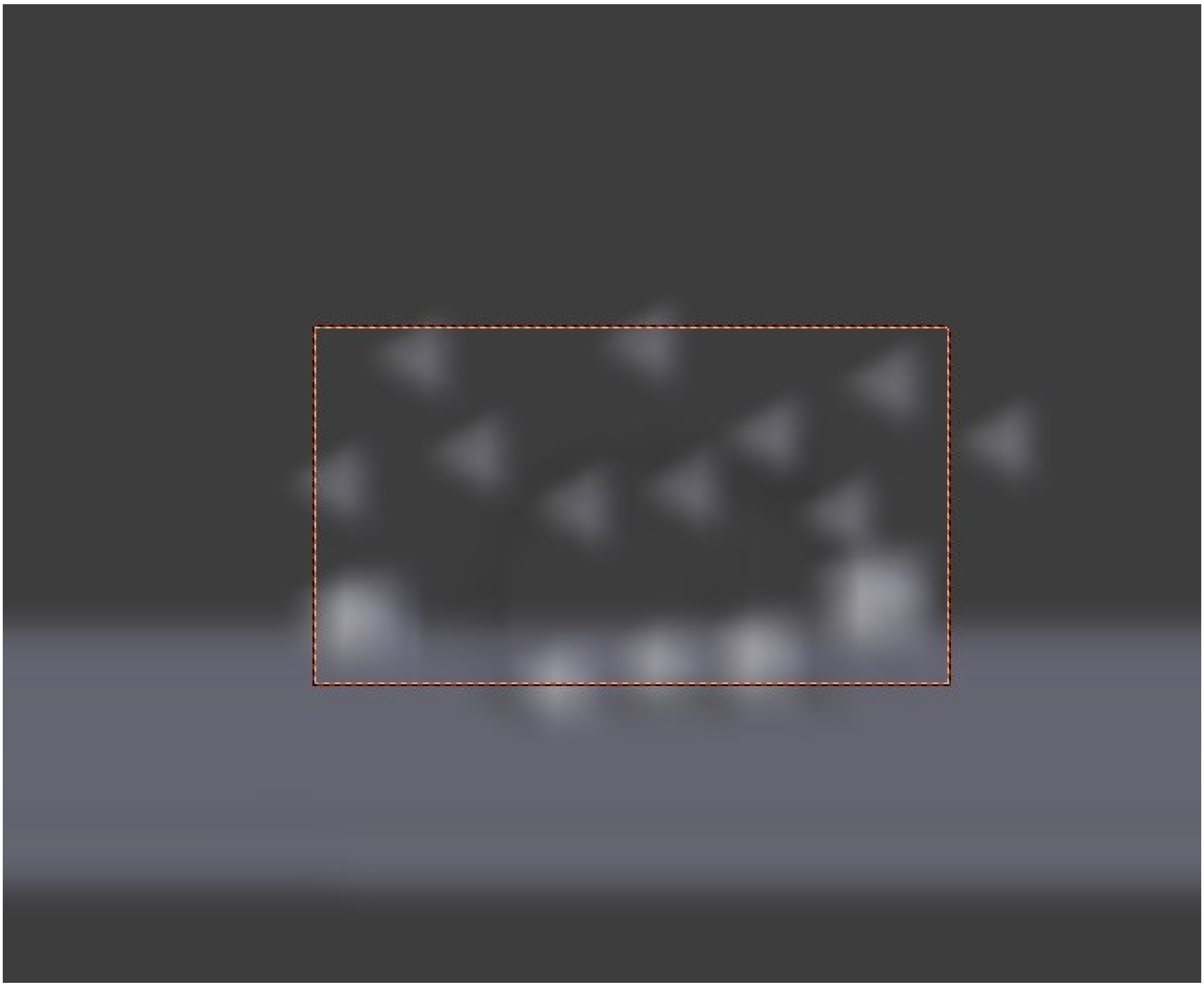
Distance
: Sets the distance to the focal point when no *Focus Object* is specified. If *Limits* are enabled, a yellow cross is shown on the camera line of sight at this distance.

> **Hint**
>
> Hover the mouse over the *Distance* property and press E to use a special *Depth Picker*. Then click on a point in the 3D View to sample the distance from that point to the camera.

High Quality
: In order for the viewport to offer an accurate representation of depth of field, like a render, you must enable High Quality. Without it, you may notice a difference in shading.

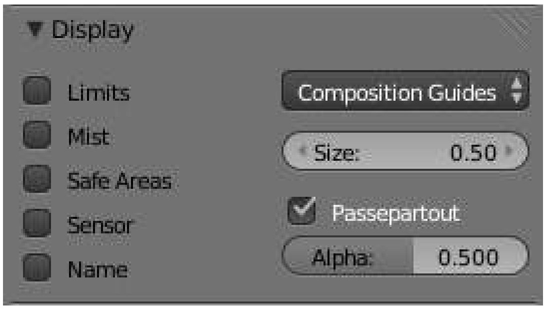
Viewport F-stop
: Controls the real-time focal blur effect used during sequencer or OpenGL rendering and, when enabled, camera views in the 3D viewport. The amount of blur depends on this setting, along with Focal Length and Sensor Size. Smaller Viewport F-stop values result in more blur.

Blades
: Add a number of polygonal *blades* to the blur effect, in order to achieve a a *bokeh effect* in the viewport. To enable this feature, the blades must be set to at least 3 (3 sides, triangle)



The viewport bokeh effect with the blades set to 3

Display



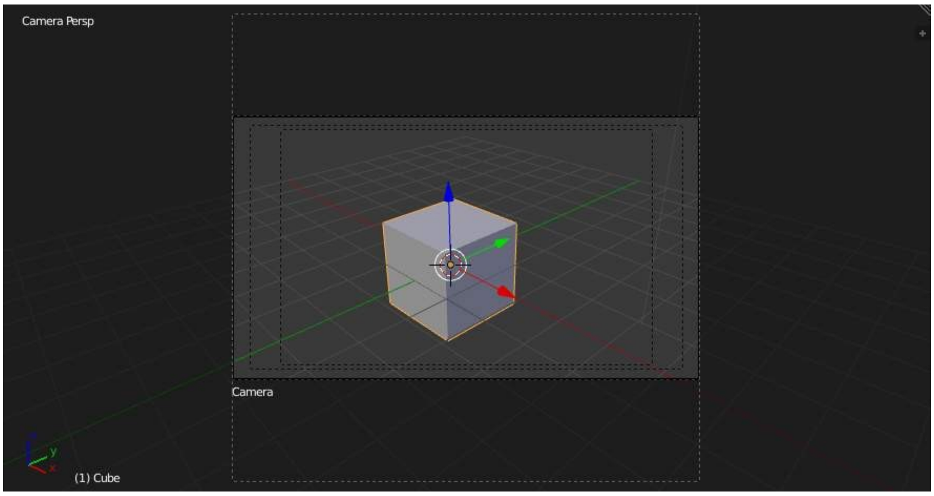
Camera Display panel

Limits

Shows a line which indicates *Start* and *End Clipping* values.

Mist

Toggles viewing of the mist limits on and off. The limits are shown as two connected white dots on the camera line of sight. The mist limits and other options are set in the *World* panel, in the *Mist section*.



Camera view displaying safe areas, sensor and name

Sensor
Displays a dotted frame in camera view.

Name
Toggle name display on and off in camera view.

Size
Size of the camera icon in the 3D view. This setting has no effect on the render output of a camera, and is only a cosmetic setting. The camera icon can also be scaled using the standard Scale S transform key.

Passepartout, Alpha
This mode darkens the area outside of the camera’s field of view, based on the *Alpha* setting.

Composition Guides

Composition Guides are available from the drop-down menu, which can help when framing a shot. There are 8 types of guides available:

Center
Adds lines dividing the frame in half vertically and horizontally.

Center Diagonal
Adds lines connecting opposite corners.

Thirds
Adds lines dividing the frame in thirds vertically and horizontally.

Golden
Divides the width and height into Golden proportions (About 0.618 of the size from all sides of the frame).

Golden Triangle A
Draws a diagonal line from the lower-left to upper-right corners, then adds perpendicular lines that pass through the top left and bottom right corners.

Golden Triangle B
Same as A, but with the opposite corners.

Harmonious Triangle A
Draws a diagonal line from the lower-left to upper-right corners, then lines from the top left and bottom right corners to 0.618 the lengths of the opposite side.

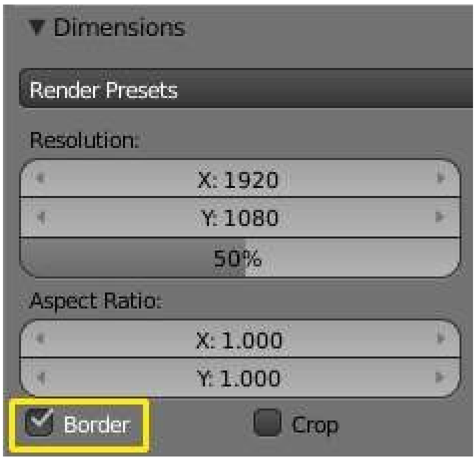
Harmonious Triangle B
Same as A, but with the opposite corners.

Safe Areas

When this is enabled, extra dotted frames are drawn when in camera view, delimiting the area considered as "safe" for important elements. *More information about them in the safe areas section*.

Render Border

Reference
Mode: All modes Menu: View ‣ Render Border Hotkey: `Ctrl-B`

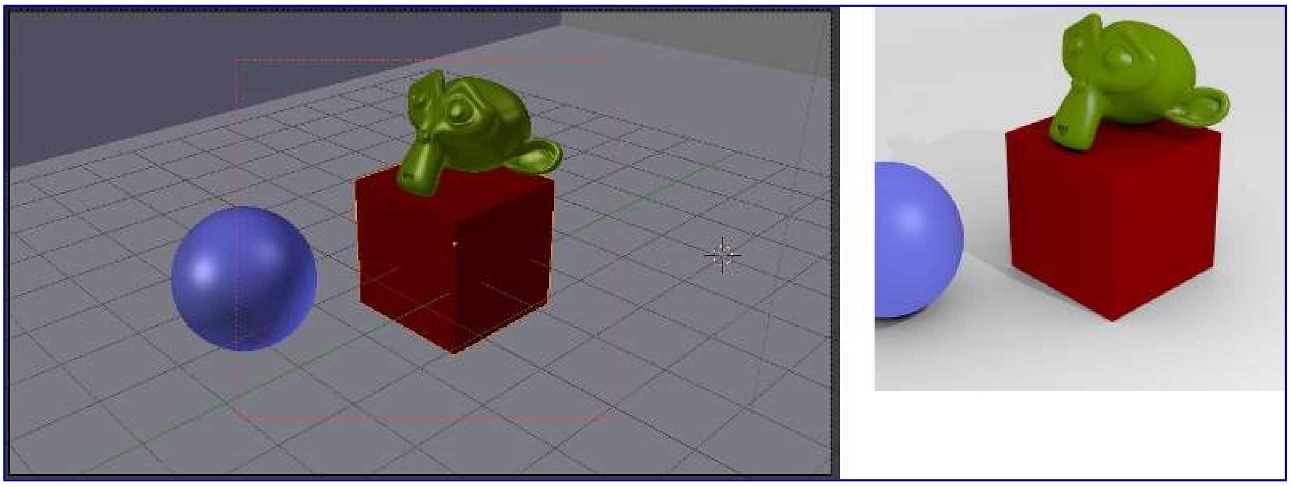


Render Border toggle

While in camera view, you can define a subregion to render by drawing out a rectangle within the cameras frame. Your renders will now be limited to the part of scene visible within the render border. This can be very useful for reducing render times for quick previews on an area of interest.

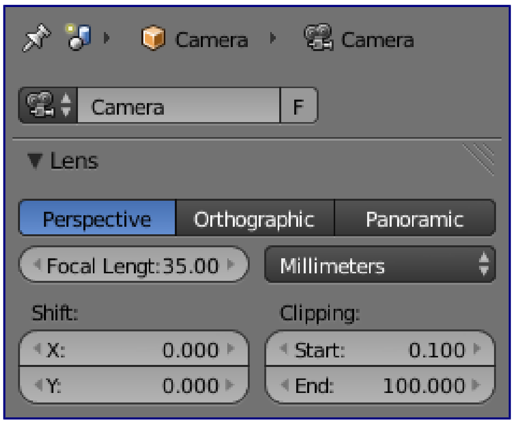
The border can be disabled by disabling the *Border* option in the *Dimensions* panel of the *Render* context or by activating the option again and selecting *Render Border* larger than the camera view.

Note
Anti-Aliasing and blur options with borders Note that when Render Borders are activated, Full Sampling Anti-Aliasing will be disabled while Sampled Motion Blur will become available. *Read more about Anti-Aliasing Read more about Motion Blur*



Render border and associated render.

Camera Lens



Camera Lens panel.

The camera lens options control the way 3D objects are represented in a 2D image.

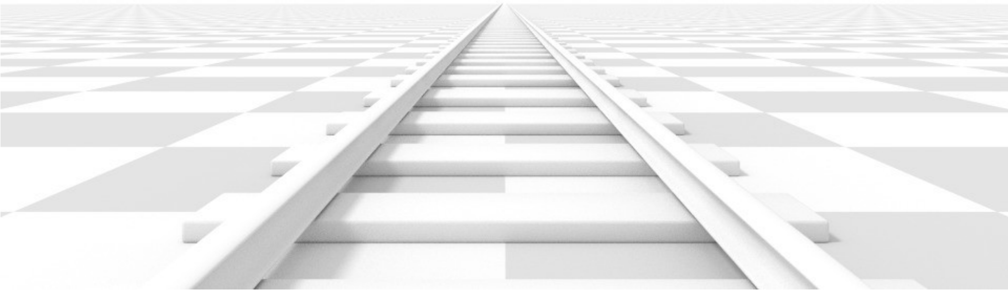
Lens Types

There are three different lens types:

- Perspective
- Orthographic
- Panoramic

Perspective

This matches how you view things in the real-world. Objects in the distance will appear smaller than objects in the foreground, and parallel lines (such as the rails on a railroad) will appear to converge as they get farther away.



Render of a train track scene with a *Perspective* camera.

Settings which adjust this projection include:

- Focal length
- Shift
- Sensor size

Focal length

The focal length setting controls the amount of zoom, i.e. the amount of the scene which is visible all at once. Longer focal lengths result in a smaller FOV (more zoom), while short focal lengths allow you to see more of the scene at once (larger FOV, less zoom).

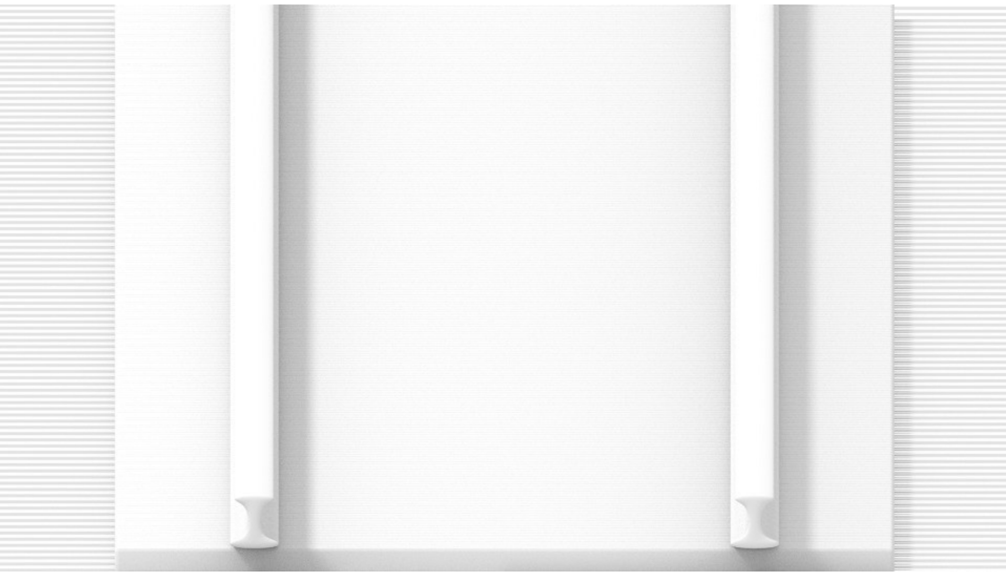
Render of the same scene as above, but with a focal length of 210mm instead of 35mm.

Lens Unit

The focal length can be set either in terms of millimeters or the actual Field of View as an angle.

Orthographic

With *Orthographic* perspective objects always appear at their actual size, regardless of distance. This means that parallel lines appear parallel, and do not converge like they do with *Perspective*.



Render from the same camera angle as the previous examples, but with orthographic perspective.

Orthographic Scale

This controls the apparent size of objects in the camera.

Note that this is effectively the only setting which applies to orthographic perspective. Since parallel lines do not converge in orthographic mode (no vanishing points), the lens shift settings are equivalent to translating the camera in the 3D view.

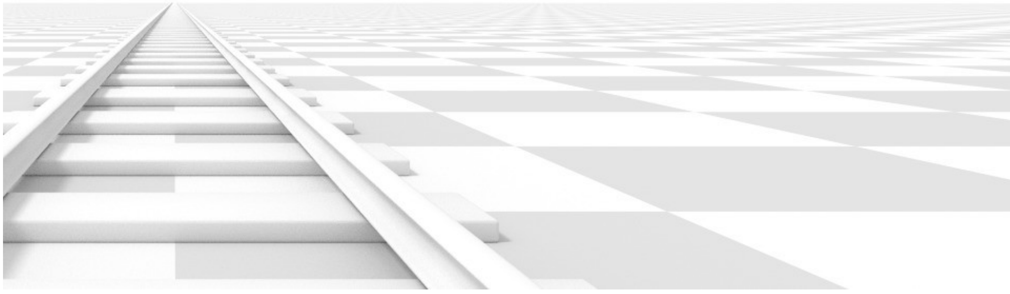
Panoramic

Panoramic cameras are only supported in the Cycles render engine. See the Cycles documentation.

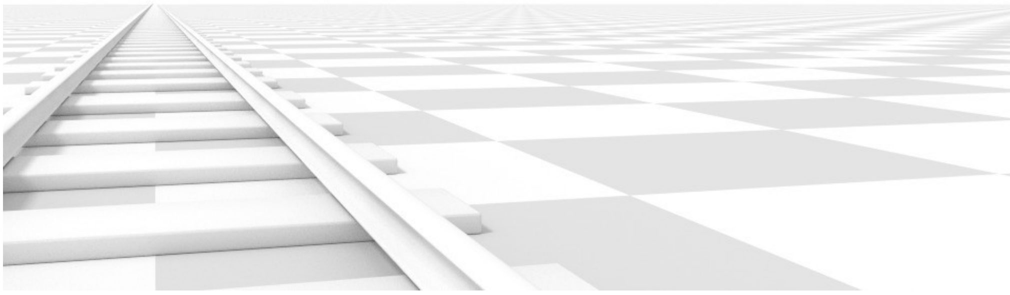
Shift

The *Shift* setting allows for the adjustment of *vanishing points*. *Vanishing points* refer to the positions to which parallel lines converge. In this example, the most obvious vanishing point is at the end of the railroad.

To see how this works, take the following examples:



Render of a train track scene with a horizontal lens shift of 0.330.



Render of a train track scene with a rotation of the camera object instead of a lens shift.

Notice how the horizontal lines remain perfectly horizontal when using the lens shift, but do get skewed when rotating the camera object.

Using lens shift is equivalent to rendering an image with a larger FOV and cropping it off-center.

Clipping

Set the clipping limits with the *Start* and *End* values.

Only objects within the limits are rendered.

For OpenGL display, setting clipping distances to limited values is important to ensure sufficient rasterization precision. Ray tracing renders don’t suffer from this issue so much, and as such more extreme values can safely be set.

When *Limits* in the *Display* panel is enabled, the clip bounds will be visible as two yellow connected dots on the camera line of sight.

Note

The *3D View* window contains settings similar to the camera, see the *3D view options page* for more details.

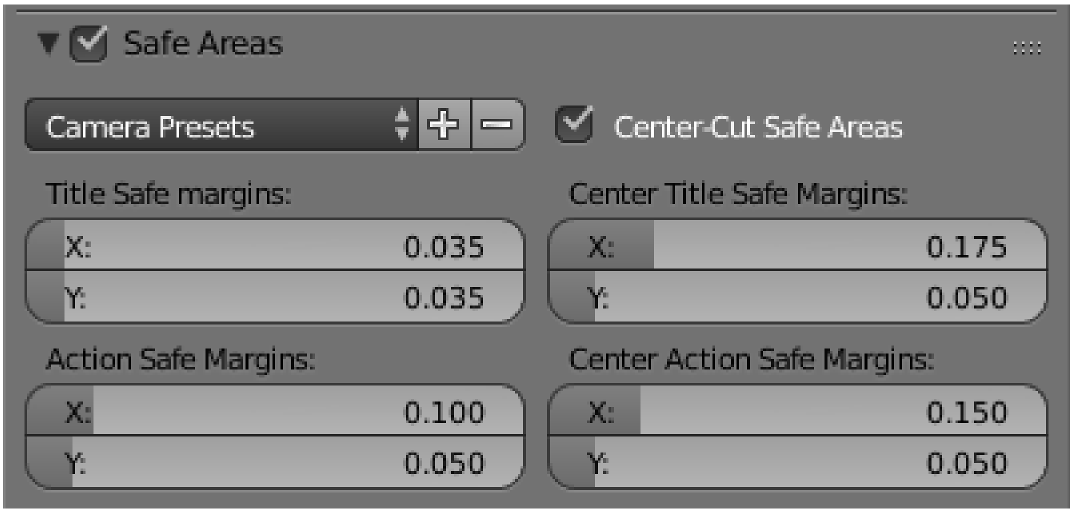
Safe Areas

Safe areas are guides used to position elements to ensure that the most important parts of the content can be seen across all screens.

Different screens have varying amounts of overscan. (specially older TV sets). That means that not all content will be visible to all viewers, since parts of the image surrounding the edges are not shown. To work around this problem TV producers defined two areas where content is guaranteed to be shown: action safe and title safe.

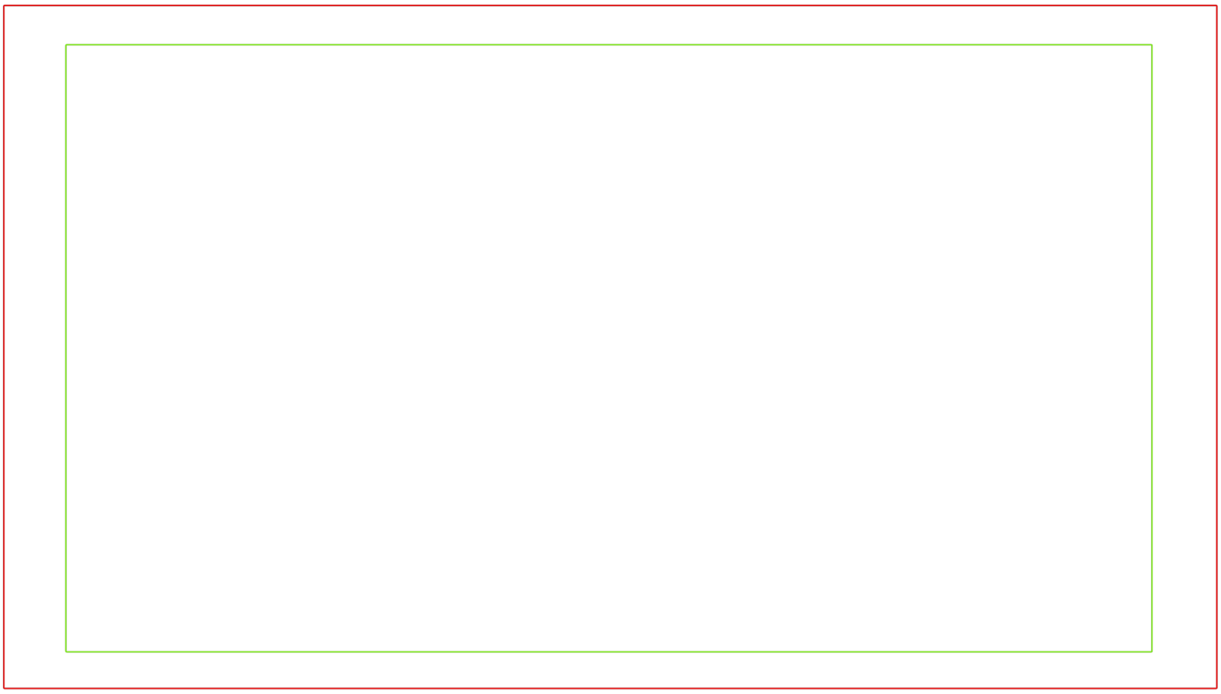
Modern LCD/plasma screens with purely digital signals have no overscan, yet safe areas are still considered best practice and may be legally required for broadcast.

In Bforartists, safe areas can be set from the Camera and Sequencer views.



The Safe areas panel found in the camera properties, and the view mode of the sequencer.

Main Safe Areas



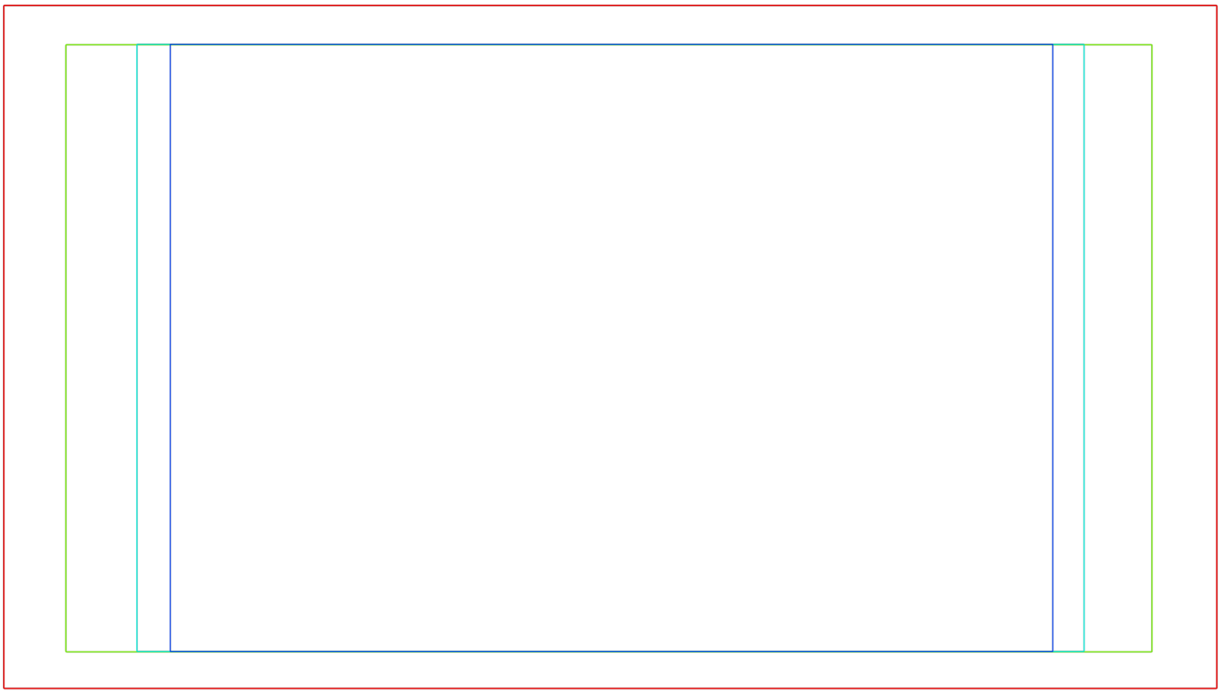
Red line: Action safe. Green line: Title safe

Title Safe
: Also known as *Graphics Safe*. Place all important information (graphics or text) inside this area to ensure it can be seen by the majority of viewers.

Action Safe
: Make sure any significant action or characters in the shot are inside this area. This zone also doubles as a sort of "margin" for the screen which can be used to keep elements from piling up against the edges.

Tip
Legal Standards Each country sets a legal standard for broadcasting. These include, among other things, specific values for safe areas. Bforartists defaults for safe areas follow the EBU (European Union) standard. Make sure you're using the correct values when working for broadcast to avoid any trouble.

Center-Cuts



Cyan line: action center safe. Blue line: title center safe

Center-cuts are a second set of safe areas to ensure content is seen correctly on screens with a different aspect ratio. Old TV sets receiving `16:9` or `21:9` video will cut off the sides. Position content inside the center-cut areas to make sure the most important elements of your composition can still be visible in these screens.

Bforartists defaults show a `4:3` (square) ratio inside `16:9` (wide-screen).

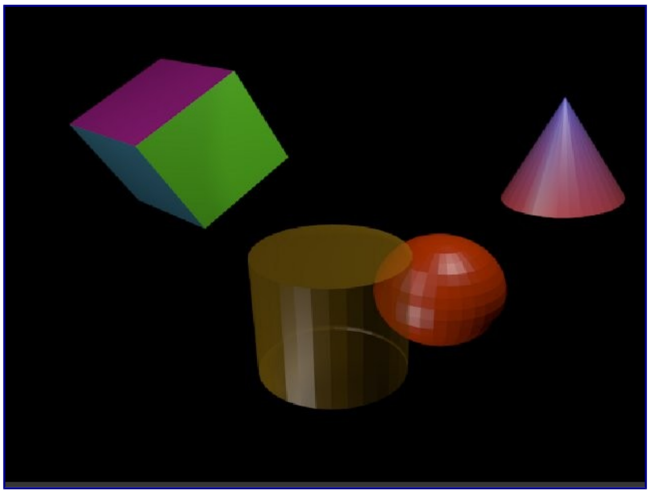
10.2.1 Render - Blender Render Engine - Materials

Bforartists Render Engine

The Bforartists render engine is the first render engine that existed in Bforartists. It's the old render engine, present since pre 2.5 days. It still delivers some good results. But it is aged. And not longer in active development. The render engine under active development is Cycles.

Introduction to Materials

A material defines the artistic qualities of the substance that an object is made of. In its simplest form, you can use materials to show the substance an object is made of, or to “paint” the object with different colors. Usually, the substance is represented by its surface qualities (color, shininess, reflectance, etc.) but it can also exhibit more complicated effects such as transparency, diffraction and sub-surface scattering. Typical materials might be brass, skin, glass, or linen.



Various basic materials (single, multiple material, transparency, vertex paint).

The basic (un-textured) Bforartists material is uniform across each face of an object (although the various pixels of each face of the object may appear differently because of lighting effects). However, different faces of the object may use different materials (see *Multiple Materials*).

In Bforartists, materials can (optionally) have associated textures. Textures *describe* the substance: e.g. *polished* brass, *dirty* glass or *embroidered* linen. The *Textures* chapter describes how to add textures to materials.

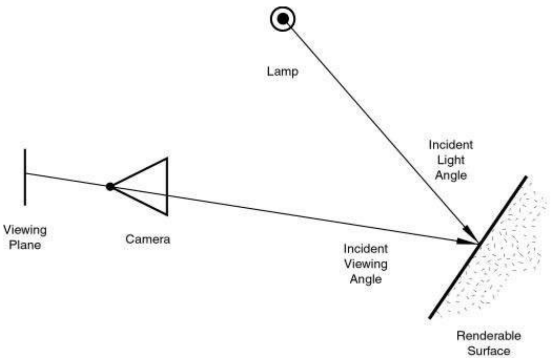
How Materials Work

Before you can understand how to design effectively with materials, you must understand how simulated light and surfaces interact in Bforartists's rendering engine and how material settings control those interactions. A deep understanding of the engine will help you to get the most from it.

The rendered image you create with Bforartists is a projection of the scene onto an imaginary surface called the *viewing plane*. The viewing plane is analogous to the film in a traditional camera, or the rods and cones in the human eye, except that it receives simulated light, not real light.

To render an image of a scene we must first determine what light from the scene is arriving at each point on the viewing plane. The best way to answer this question is to follow a straight line (the simulated light ray) backwards through that point on the viewing plane and the focal point (the location of the camera) until it hits a renderable surface in the scene, at which point we can determine what light would strike that point.

The surface properties and incident light angle tell us how much of that light would be reflected back along the incident viewing angle *(Rendering engine basic principle)*.



Rendering engine basic principle.

Two basic types of phenomena take place at any point on a surface when a light ray strikes it: diffusion and specular reflection. Diffusion and specular reflection are distinguished from each other mainly by the relationship between the incident light angle and the reflected light angle.

The shading (or coloring) of the object during render will then take into account the base color (as modified by the diffusion and specular reflection phenomenon) and the light intensity.

Using the internal ray tracer, other (more advanced) phenomena could occur. In ray-traced reflections, the point of a surface struck by a light ray will return the color of its surrounding environment, according to the rate of reflection of the material (mixing the base color and the surrounding environment's) and the viewing angle.

On the other hand, in ray-traced refractions, the point of a surface struck by a light ray will return the color of its background environment, according to the rate of transparency (mixing the base color and the background environment's along with its optional filtering value) of the material and the optional index of refraction of the material, which will distort the viewing angle.

Of course, shading of the object hit by a light ray will be about mixing all these phenomena at the same time during the rendering. The appearance of the object, when rendered, depends on many inter-related settings:

- World (Ambient color, Radiosity, Ambient Occlusion)
- Lights
- Material settings (including ambient, emission, and every other setting on every panel in that context)

- Texture(s) and how they are mixed
- Material Nodes
- Camera
- Viewing angle
- Obstructions and transparent occlusions
- Shadows from other opaque/transparent objects
- Render settings
- Object dimensions (SS settings are relevant to dimensions)
- Object shape (refractions, fresnel effects)

Using Materials

Tip

Check your Render

When designing materials (and textures and lighting), frequently check the rendered appearance of your scene, using your chosen render engine/shader settings. The appearance might be quite different from that shown in the texture display in the 3D panel.

As stated above, the material settings usually determine the surface properties of the object. There are several ways in which materials can be set up in Bforartists. Generally speaking, these are not compatible - you must choose which method you are going to use for each particular object in your scene.

First, you can set the *Properties* in the various Material panels.

Second, you can use *Nodes*; a graphical nodes editor is available.

Last, you can directly set the color of object surfaces using various special effects. Strictly speaking, these are not materials at all, but they are included here because they affect the appearance of your objects. These include Vertex Painting, *Wire Rendering*, *Volume Rendering*, and *Halo Rendering*.

The exact effect of Material settings can be affected by a number of system settings. First and foremost is the Render Engine used - Cycles and the Bforartists Render Engine (aka Bforartists Internal or BI) require quite different illumination levels to achieve similar results, and even then the appearance of objects can be quite different. Also, the material properties settings can be affected by the texture method used (Single Texture, Multitexture or GLSL). So it is recommended to always select the appropriate system settings before starting the design of materials.

Assigning a Material

Materials available in the currently-open Bforartists file can be investigated by clicking on the Materials button

in the Properties Window Header. In this section we look at how to assign or remove a material to/from the Active Object in Bforartists, either by:

- creating a new material,
- re-using an existing material, or
- deleting a material.

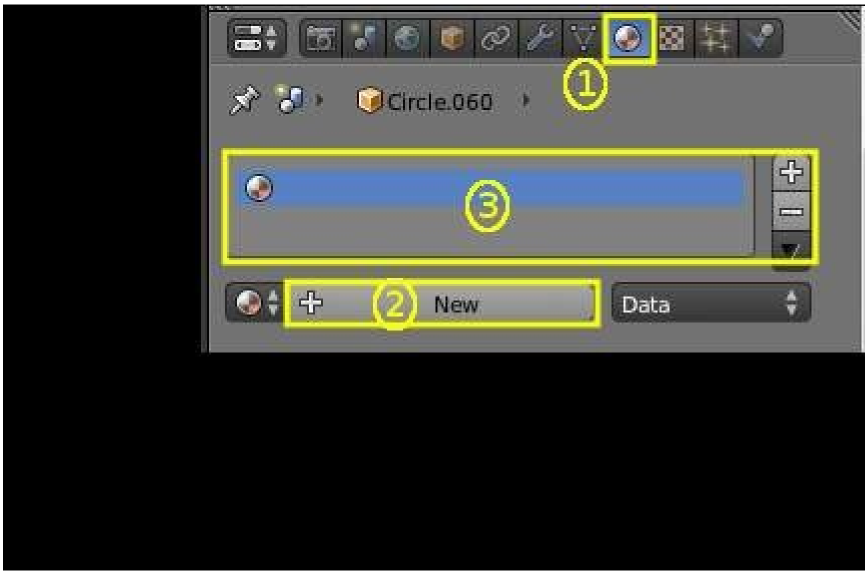
We also give hints about practical material usage.

Creating a new Material

Every time a new Object is created it has no material linked to it. You can create a new material for the object by

- Selecting the object
- In the Properties window, click on the object button
- Click on the Materials button in the Properties Panel Header (1)

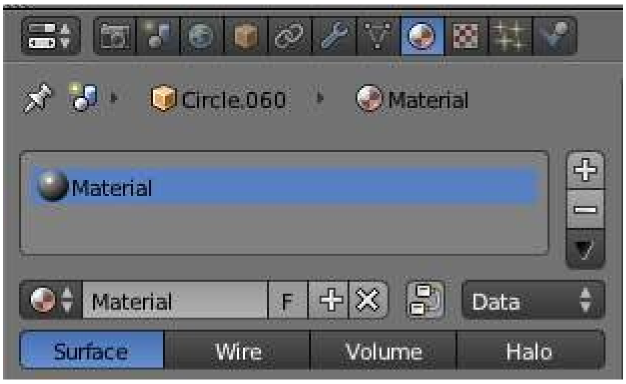
The Shading context window then appears. This contains the following elements:



Add new material

- Context - The currently-selected scene and object
- Object Material Slots (3) - this window shows the “slots” for the material (or materials) that this object data contains.
- Active Material (2). Initially empty, asking for “New”.

To add a new material, click “+” in the Active Material box. This action has a series of effects:



Materials Panel with New Entry

- opens the new material in the Active Material box,
- brings up additional buttons in the immediate panel,
- adds the new material to the Available Materials list,
- adds the new material to the Object Material Slots list for the active object (or its object data - see below)
- brings up a *preview* of the new material,
- provides you with a range of panels allowing you to select the *properties* of the new material.

New Material Panel Buttons

Details of the additional buttons which appear in the Material panel for a new Active Material are as follows:

Active Material

Available Materials See Reusing Existing Materials below.

Name
: Like other data-blocks, Bforartists will automatically set the name of the new material to `Material`, `Material.001` and so on. You can change this by over-typing with your own choice of name.

Number of Users
: Specifies the number of meshes which use this material.

F - Fake User
: When enabled, this material will always be saved within the Bforartists file, even if it has no meshes which use it (see Deleting a Material).

X
: Delete this material (see Deleting a Material).

Tip
Naming materials It's a very good idea to give your materials clear names so you can keep track of them, especially when they're linked to multiple objects. Try to make your names descriptive of the material, not its function (e.g. "Yellow Painted" rather than "Kitchen Table Color")

Nodes

If dark, use the Shader Nodes to generate the material.

Data
: Specifies whether the material is to be linked to the Object or to the Object Data.

Link material to object or to object's data

The Link pop-up menu has two choices, Data and Object. These two menu choices determine whether the material is linked to the object or to the data, (in this case) the mesh (or curve, nurbs, etc.). The Data menu item determines that this material will be linked to the mesh's data-block which is linked to the object's data-block. The Object menu item determines that the material will be linked to the object's data block directly. This has consequences of course. For example, different objects may share the same mesh data-block. Since this data-block defines the shape of the object, any change in edit mode will be reflected on all of those objects. Moreover, anything linked to that mesh data-block will be shared by every object that shares that mesh. So, if the material is linked to the mesh, every object will share it. On the other hand, if the material is linked directly to the object data-block, the objects can have different materials and still share the same mesh. Short explanation: If connected to the object, you can have several instances of the same obData using different materials. If linked to mesh data, you can't. See *Data System* for more information.

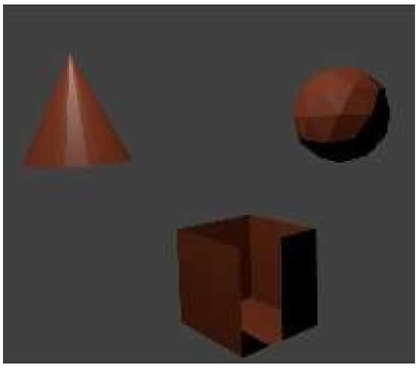
Object Render Format (menu)
: This menu has four options which define how the object is to be rendered:

Surface
: Material applied to object planes.

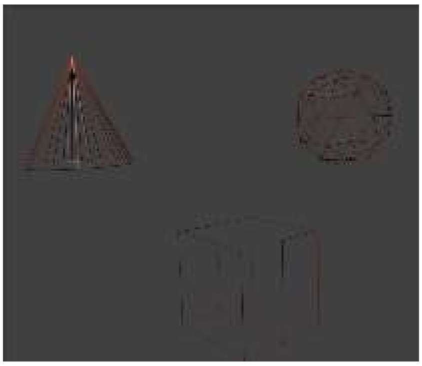
Wire
: Material applied to wires following the object edges

Volume
: Material applied to the object volume.

Halos
: Material applied to halos around each object vertex.

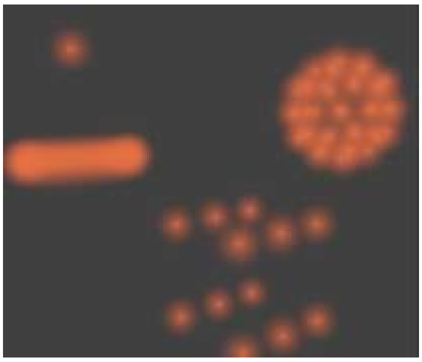


Surface



Wire

Volume

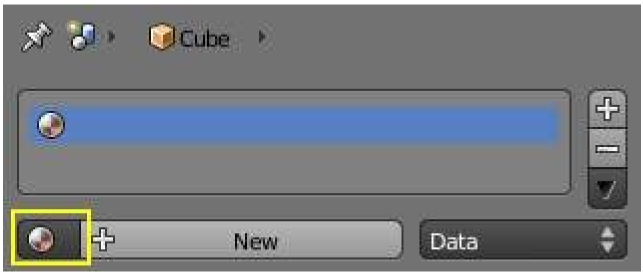


Halo

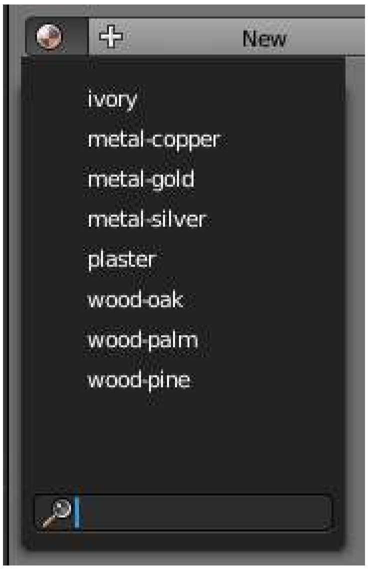
Reusing Existing Materials

Bforartists is built to allow you to reuse *anything*, including material settings, between many objects. Instead of creating duplicate materials, you can simply re-use an existing material. There are several ways to do this using the Available Materials menu:

> *Single Object* - With the object selected, click the sphere located to the left of the Material name. A drop-down list appears showing all the materials available in the current Bforartists file. To use one, just click on it.



Select an existing material.



List of available materials

Tip

Searching for Materials

The search field at the bottom of the material list allows you to search the names in the list. For example, by entering “wood” all existent materials are filtered so that only materials containing “wood” are displayed in the list.

Multiple Objects - In the 3D View, with `Ctrl-L` you can quickly link all selected objects to the material (and other aspects) of the active object. Very useful if you need to set a large number of objects to the same material; just select all of them, then the object that has the desired material, and `Ctrl-L` link them to that “parent”. (See Tip on Linking Data in Creating about data linking.)

Deleting a Material

To delete a material, select the material and click X in the Available Materials List entry.

Although the material will seem to disappear immediately, the Delete action can depend on how the material is used elsewhere.

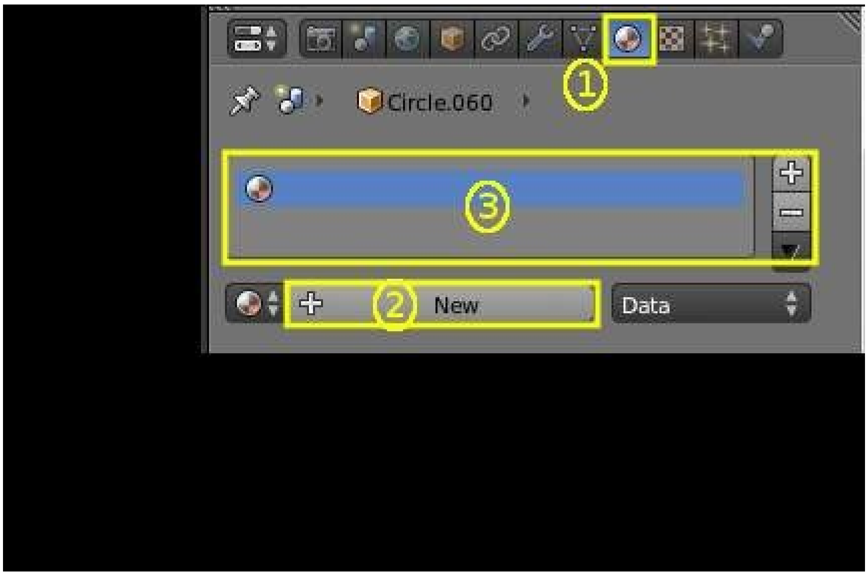
If the material is linked to the Object and there are other objects which use this material, then the material will be removed from that object (but remain on all its other objects).

If the “Fake User” button (F) has been lit in the Available Materials list, then the material will be retained when the file is saved, even if it has no users.

Only if it has 0 “real” users, and no “Fake” user, will the material be permanently deleted. Note that it will still remain in the Materials list until the Bforartists file is saved, but will have disappeared when the file is reloaded.

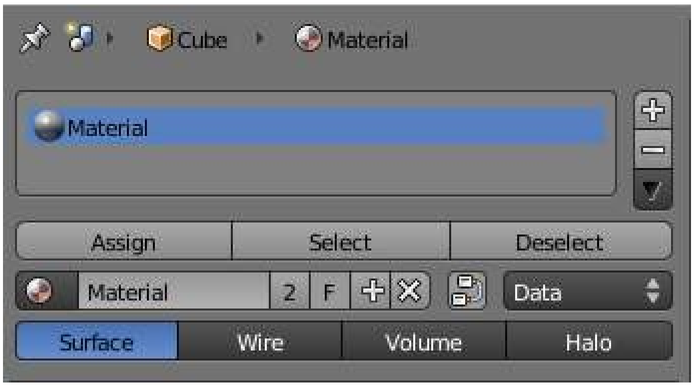
Multiple Materials

Normally, different colors or patterns on an object are achieved by adding textures to your materials. However, in some applications you can obtain multiple colors on an object by assigning different materials to the individual faces of the object.



Add new material

To apply several materials to different faces of the same object, you use the Material Slots options (3) in the Materials header panel.



Material menu in edit mode

The workflow for applying a second material to some faces of an object covered by a base material is as follows:

- In Object mode, apply the base material to the whole object (as shown in *Assigning a material*)
- Create/select the second material (the whole object will change to this new material).
- In the Active Material box (2), re-select the base material.
- Go to Edit Mode - Face Select (a new box appears above the Active Material box with Assign/Select/Deselect).
- Select the face/faces to be colored with the second material.
- In the Object Material Slots box (3), click the `Plus` to create a new slot, and while this is still active, click on the second material in the Available Materials list.
- Click the Assign button, and the second material will appear on the selected object faces.
- You can also make this new material a copy of an existing material by adding the data block:

Select object, get the material, (R Click) - Copy data to clipboard. When you have renamed the material, click "Data - Data" to link to the existing material. Proceed to assign faces as required. NB: If you change the material on the original object, the new object color changes too.

Introduction to Properties

Material Properties

Materials can have a wide array of properties. It is the combination of all of these things that define the way a material looks, and how objects using that material will appear when rendered. These properties are set using the various Properties panels.

Remember that the appearance of your materials are affected by the way that they are rendered (surface, wire, volume or halo), and by the rendering engine (Bforartists, Cycles, or Game) used. Most properties for images rendered using Cycles can only be controlled using the Node system.

The list below sets out the various Properties panels available in Bforartists Render and Game Engine, and brief details of their scope. Details of their controls and settings are given on the relevant pages.

Preview
: A preview of the current material mapped on to one of several basic objects.

Diffuse Shaders
: The basic color of the material, together with different models for dispersion.

Specular Shaders
: The reflected highlights: color, strength and different models for dispersion.

Color Ramps
: How to vary the base color over a surface in both Diffuse ans Specular shaders.

Shading
: Properties of various characteristics of the shading model for the material.

Transparency
: Can other objects be seen through the object, and if so, how?

Mirror
: (Only Bforartists Render): Reflective properties of the material.

SubSurface Scattering
: (Only Bforartists Render): Simulates semi-translucent objects in which light enters, bounces around, then exits in a different place.

Strand

(Only Bforartists Render): For use when surfaces are covered with hair, fur, etc.

Options

Various options for shading and coloring the object.

***Shadow*:**

Controls how objects using this material cast and receive shadows.

Game Settings

(Only Bforartists Render): Controls settings for real-time rendering of Game Engine objects.

Material Preview

Reference
Mode: All Modes Panel: Shading/Material Context –> Preview

The Preview panel gives a quick visualization of the active material and its properties, including its *Shaders*, *Ramps*, *Mirror Transp* properties and *Textures*. It provides several shapes that are very useful for designing new shaders: for some shaders (like those based on *Ramp* colors, or a Diffuse shader like *Minnaert*), one needs fairly complex or specific previewing shapes to decide if the shader being designed achieves its goal.

Options

Flat XY plane

Useful for previewing textures and materials of flat objects, like walls, paper and such.

Sphere

Useful for previewing textures and materials of sphere-like objects, but also to design metals and other reflective/transparent materials, thanks to the checkered background.

Cube

Useful for previewing textures and materials of cube-like objects, but also to design procedural textures. Features a checkered background.

Monkey

Useful for previewing textures and materials of organic or complex non-primitive shapes. Features a checkered background.

Hair strands

Useful for previewing textures and materials of strand-like objects, like grass, fur, feathers and hair. Features a checkered background.

Large Sphere with Sky

Useful for previewing textures and materials of sphere-like objects, but also to design metals and other reflective materials, thanks to the gradient Sky background.

Preview uses OSA (oversampling). Whatever the preview option, it will make use of OSA (oversampling) in order to provide better quality. Disable this option if your computer is already slow or old.

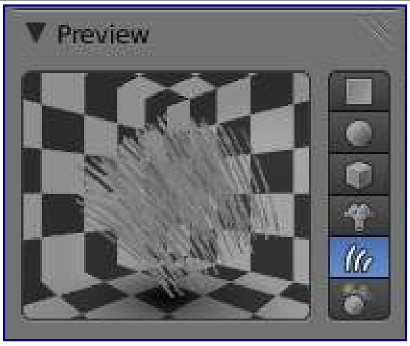
Examples

Plane preview.

Sphere preview.

Cube preview.

Monkey preview.



Hair Strands preview.

Sky Sphere preview.

Diffuse Shaders

Reference
Mode: All Modes Panel: Shading/Material Context –> Diffuse

A diffuse shader determines, simply speaking, the general color of a material when light shines on it. Most shaders that are designed to mimic reality give a smooth falloff from bright to dark from the point of the strongest illumination to the shadowed areas, but Bforartists also has other shaders for various special effects.

Common Options

All diffuse shaders have the following options:

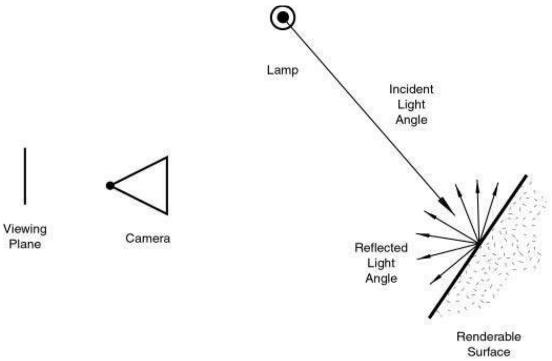
Color
: Select the base *diffuse color* of the material.

Intensity
: The shader’s brightness, or more accurately, the amount of incident light energy that is actually diffusely reflected towards the camera.

Ramp
: Allows you to set a range of colors for the *Material*, and define how the range will vary over a surface. See *Color Ramps* for details.

Technical Details

Light striking a surface and then re-irradiated via a Diffusion phenomenon will be scattered, i.e., re-irradiated in all directions isotropically. This means that the camera will see the same amount of light from that surface point no matter what the *incident viewing angle* is. It is this quality that makes diffuse light *viewpoint independent*. Of course, the amount of light that strikes the surface depends on the incident light angle. If most of the light striking a surface is reflected diffusely, the surface will have a matte appearance (*Light re-irradiated in the diffusion phenomenon.*).

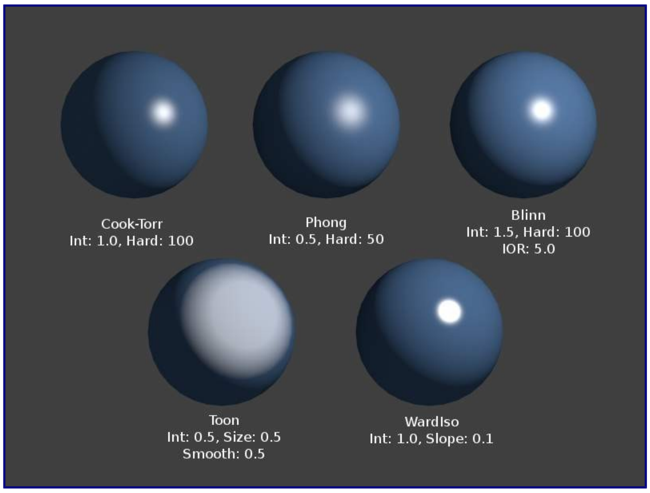


Light re-irradiated in the diffusion phenomenon.

Tip
Shader Names Some shaders' names may sound odd - they are traditionally named after the people who first introduced the models on which they are based.

Lambert

Reference
Mode: All Modes Panel: Shading/Material Context –> Shaders



Lambert Shader

This is Bforartists’s default diffuse shader, and is a good general all-around workhorse for materials showing low levels of specular reflection.

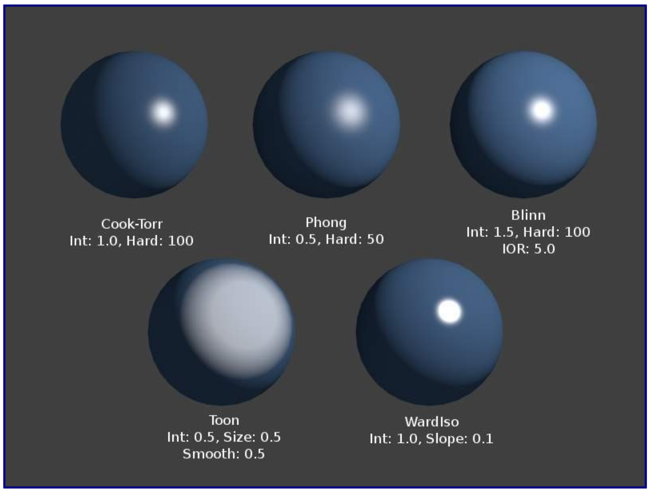
Johann Heinrich Lambert (1728-1777)
was a Swiss mathematician, physicist and astronomer who published works on the reflection of light, most notably the Beer-Lambert Law which formulates the law of light absorption.

This shader has only the default option, determining how much of available light is reflected. Default is 0.8, to allow other objects to be brighter.

The Lambert diffuse shader settings.

Oren-Nayar

Reference
Mode: All Modes Panel: Shading/Material Context –> Shaders



Oren-Nayar Shader

Oren-Nayar takes a somewhat more ‘physical’ approach to the diffusion phenomena as it takes into account the amount of microscopic roughness of the surface. Michael Oren and Shree K. Nayar Their reflectance model, developed in the early 1990s, is a generalization of Lambert’s law now widely used in computer graphics.

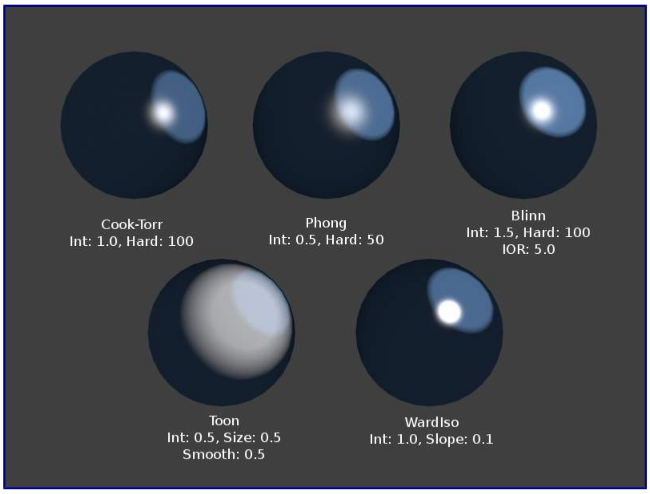
Options

Roughness
The roughness of the surface, and hence, the amount of diffuse scattering.

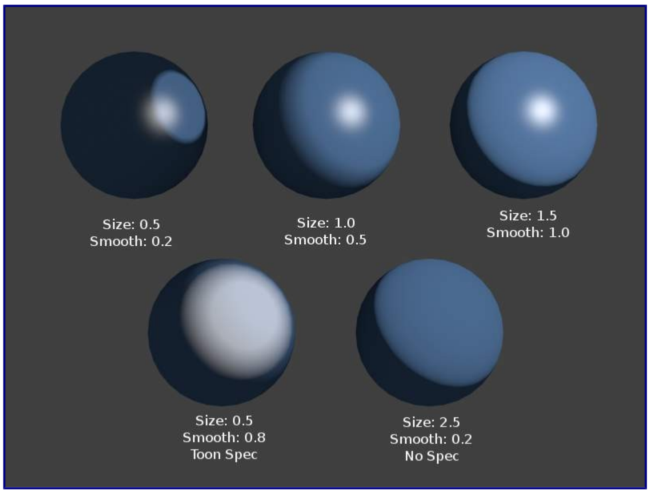
The Oren-Nayar diffuse shader settings.

Toon

Reference
Mode: All Modes Panel: Shading/Material Context –> Shaders



Toon Shader, Different Spec



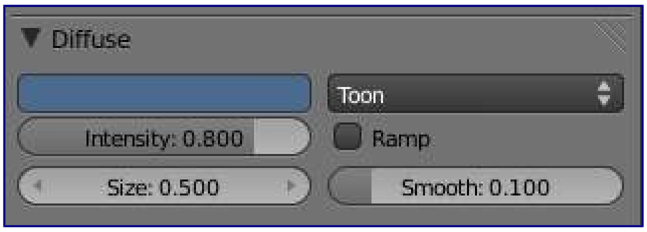
Toon Shader Variations

The Toon shader is a very ‘un-physical’ shader in that it is not meant to fake reality but to produce cartoon cel styled rendering, with clear boundaries between light and shadow and uniformly lit/shadowed regions.

Options

Size
: The size of the lit area

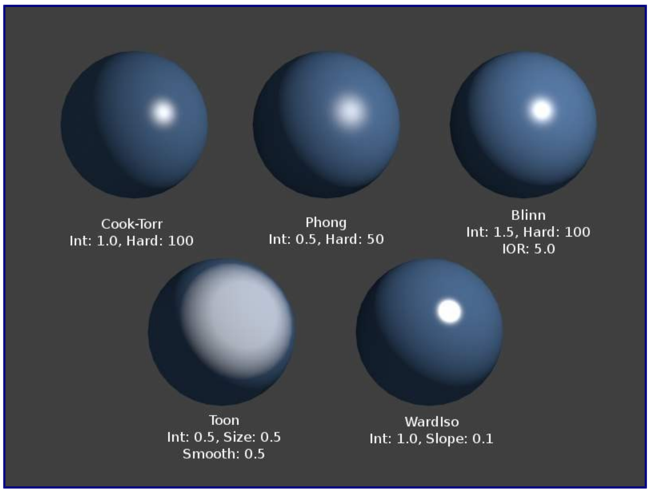
Smooth
: The softness of the boundary between lit and shadowed areas



The Toon diffuse shader settings.

Minnaert

Reference
Mode: All Modes Panel: Shading/Material Context –> Shaders



Minnaert Shader

Minnaert works by darkening parts of the standard Lambertian shader, so if *Dark* is 1 you get exactly the Lambertian result. Higher darkness values will darken the center of an object (where it points towards the viewer). Lower darkness values will lighten the edges of the object, making it look somewhat velvet. Marcel Minnaert (1893-1970) was a Belgian astronomer interested in the effects of the atmosphere on light and images who in 1954 published a book entitled *The Nature of Light and Color in the Open Air.*

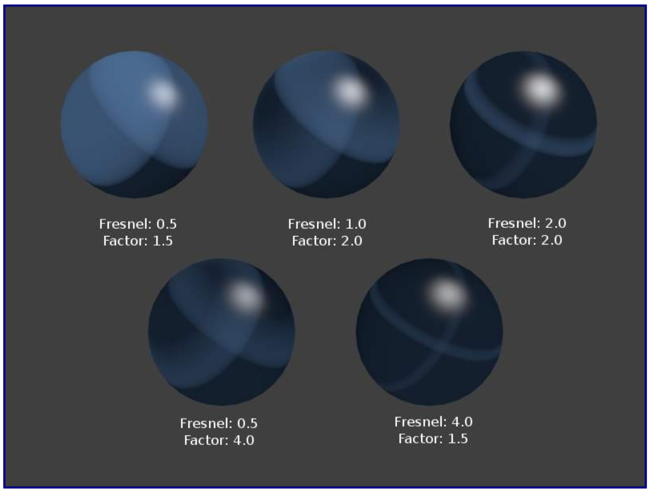
Options

Dark
: The darkness of the 'lit' areas (higher) or the darkness of the edges pointing away from the light source (lower).

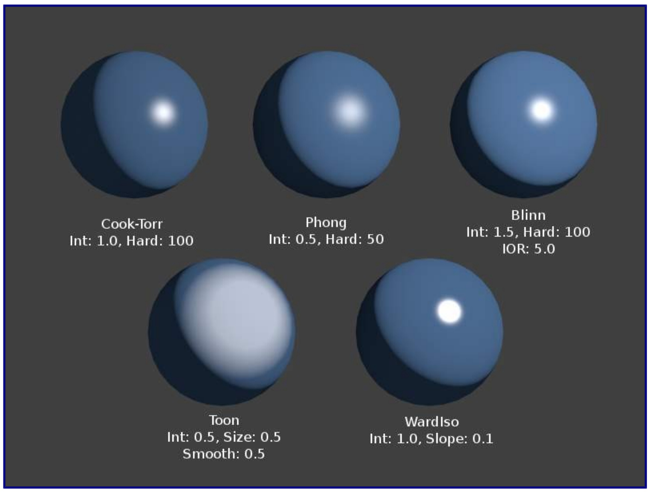
The Minnaert diffuse shader settings.

Fresnel

Reference
Mode: All Modes Panel: Shading/Material Context –> Shaders



Various settings for the Fresnel shader, Cook-Torr Specular shader kept at Intensity 0.5, Hardness: 50



Fresnel Shader, Different Spec

With a Fresnel shader the amount of diffuse reflected light depends on the incidence angle, i. e. from the direction of the light source. Areas pointing directly towards the light source appear darker; areas perpendicular to the incoming light become brighter. Augustin-Jean Fresnel (1788-1827) was a French physicist who contributed significantly to the establishment of the theory of wave optics.

Options

Fresnel
: Power of the Fresnel effect, 5.0 is max.

Factor
: Blending factor of the Fresnel factor to blend in, 5.0 is max.

The Fresnel diffuse shader settings.

Specular Shaders

Reference
Mode: All Modes
Panel: Shading/Material Context –> Specular

Specular shaders create the bright highlights that one would see on a glossy surface, mimicking the reflection of light sources. Unlike *diffuse shading*, specular reflection is *viewpoint dependent*. According to Snell’s Law, light striking a specular surface will be reflected at an angle which mirrors the incident light angle (with regard to the surface’s normal), which makes the viewing angle very important.

Tip

Not a Mirror!

It is important to stress that the *specular reflection* phenomenon discussed here is not the reflection we would see in a mirror, but rather the light highlights we would see on a glossy surface. To obtain true mirror-like reflections you would need to use the internal raytracer. Please refer to section *RENDERING* of this manual.

Common Options

Each specular shader share the following common options:

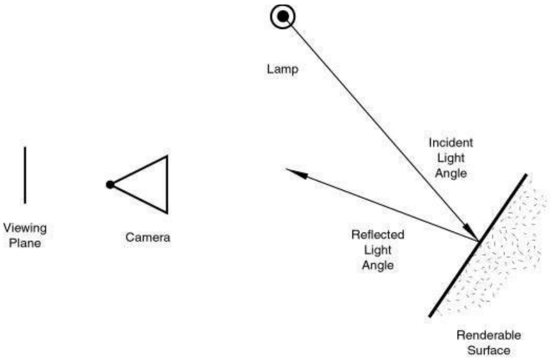
Specular Color
: The color of the specular highlight

Intensity
: The intensity, or brightness of the specular highlight. This has a range of [0-1].

Ramp
: Allows you to set a range of specular colors for *Material*, and define how the range will vary over a surface. See *Ramps* for details.

As a result, a material has at least two different colors, a diffuse, and a specular one. The specular color is normally set to pure white (the same “pure white” as the reflected light source), but it can be set to different values for various effects (e.g. metals tend to have colored highlights).

Technical Details



Specular Reflection.

In reality, the quality of Diffuse and Specular reflection are generated during the same process of light scattering, but are not the same. Diffusion is actually subsurface scattering at a very small scale.

Imagine that a surface is made up of extremely microscopic semi-transparent, reflective facets. The sharpness of Specular reflection is determined by the distribution of the angle of these microfacets on the surface of an object. The more deep and jagged these facets are, the more the light spreads when it hits the surface. When these facets are flatter against the “macrosurface”, the surface will have a tighter reflection, closer to a mirror. This is a condensed explanation of the generally accepted microfacet theory of reflectance, which is the basis of all modern BRDFs (Bi-directional Reflectance Distribution Functions), or shading models.

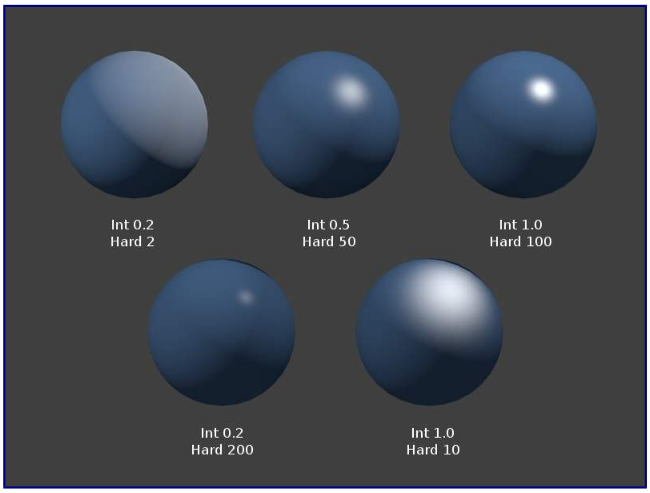
Because these microfacets are transparent, some light that hits them travels into the surface and diffuses. The light that makes it back out is roughly Lambertian most of the time, meaning that it spreads evenly in all directions. It is also attenuated by the pigmentation in the surface, hence creating what we perceive as diffuse, and the color of an object.

Note that at glancing angles, the reflectivity of a surface will always go to 1.

If it is difficult for you to understand this relationship, try to imagine a ball (say, of centimeter scale): if you throw it against a wall of raw stones (with a scale of roughness of a decimeter), it will bounce in a different direction each time, and you will likely quickly lose it! On the other hand, if you throw it against a smooth concrete wall (with a roughness of, say, a millimeter scale), you can quite easily anticipate its bounce, which follow (more or less!) the same law as the light reflection.

CookTorr

Reference
Mode: All Modes Panel: Shading/Material Context –> Shaders



CookTorr Shader (Lambert 0.8)

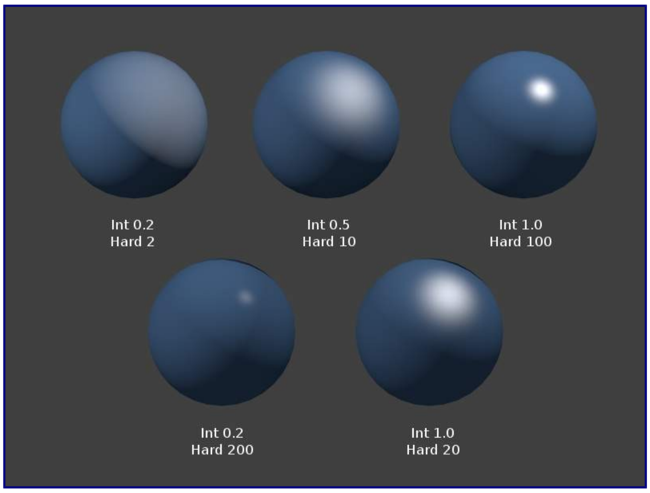
CookTorr (Cook-Torrance) is a basic specular shader that is most useful for creating shiny plastic surfaces. It is a slightly optimized version of Phong. Robert L. Cook (LucasFilm) and Kenneth E. Torrance (Cornell University) In their 1982 paper A Reflectance Model for Computer Graphics (PDF), they described “a new reflectance model for rendering computer synthesized images” and applied it to the simulation of metal and plastic.

Options

Hardness
    Size of the specular highlight

Phong

Reference
Mode: All Modes Panel: Shading/Material Context –> Shaders



Phong Shader (Lambert 0.8)

Phong is a basic shader that’s very similar to CookTorr, but is better for skin and organic surfaces. Bui Tuong Phong (1942-1975) was a Vietnamese-born computer graphics pioneer that developed the first algorithm for simulating specular phenomenon. His model included components not only for specular lighting, but also diffuse and ambient lighting.

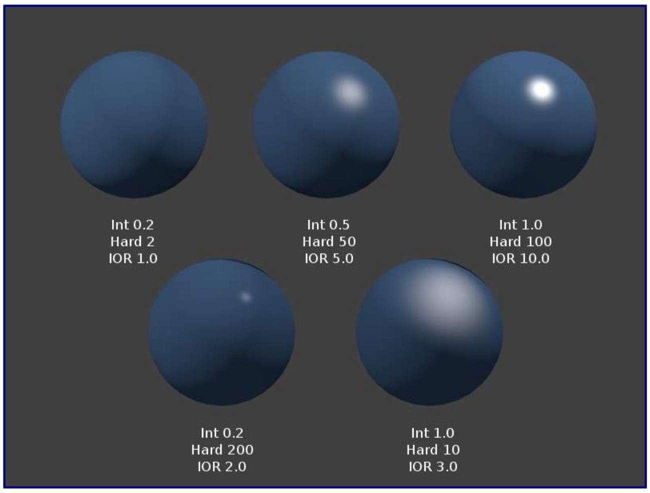
Options

Hardness
Size of the specular highlight.

Tip
Planet Atmosphere Because of its fuzziness, this shader is good for atmosphere around a planet. Add a sphere around the planet, slightly larger than the planet. For its material, use a phong specular shader. Set it to a very low alpha (.05), zero diffuse, low hardness (5) but high specularity (1).

Blinn

Reference
Mode: All Modes Panel: Shading/Material Context –> Shaders



Blinn Shader (Oren-Nayar Int 0.8, Rough 0.5)

Blinn is a more ‘physical’ specular shader, often used with the Oren-Nayar diffuse shader. It can be more controllable because it adds a fourth option, an index of refraction, to the aforementioned three. James F. Blinn worked at NASA’s Jet Propulsion Laboratory and became widely known for his work on Carl Sagan’s TV documentary *Cosmos*. The model he described in his 1977 paper Models of Light Reflection for Computer Synthesized Pictures (PDF) included changes in specular intensity with light direction and more accurately positioned highlights on a surface.

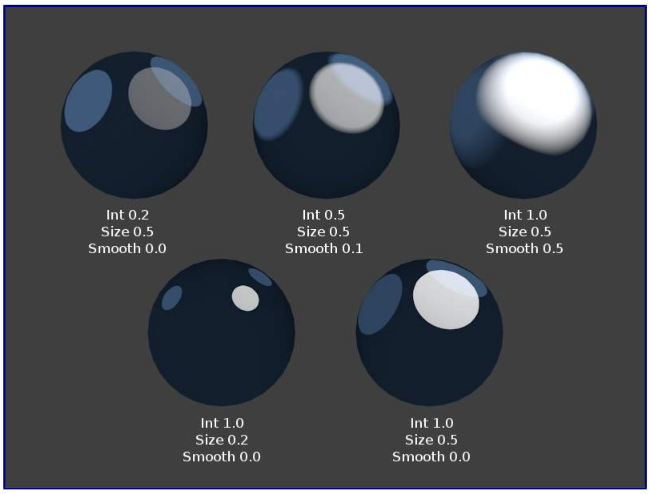
Options

Hardness
: Size of the specular highlight. The Blinn shader is capable of much tighter specular highlights than Phong or CookTorr.

IOR
: 'Index of Refraction'. This parameter is not actually used to compute refraction of light rays through the material (a ray tracer is needed for that), but to correctly compute specular reflection intensity and extension via Snell's Law.

Toon

Reference
Mode: All Modes Panel: Shading/Material Context –> Shaders



Toon Specular Shader (Toon Diffuse, Int 0.8, Size & Smooth match)

The Toon specular shader matches the Toon diffuse shader. It is designed to produce the sharp, uniform highlights of cartoon cels.

Options

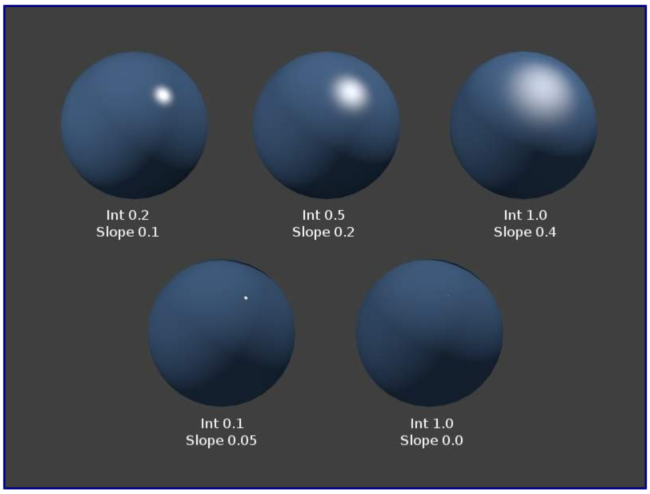
Size
: Size of the specular highlight.

Smooth
: Softness of the highlight's edge.

Tip
Alternative Method The Toon shader effect can also be accomplished in a more controllable way using ColorRamps.

WardIso

Reference
Mode: All Modes Panel: Shading/Material Context –> Shaders



WardIso Shader

WardIso is a flexible specular shader that can be useful for metal or plastic.

Gregory J. Ward
: developed a relatively simple model that obeyed the most basic laws of physics. In his 1992 paper, *Measuring and modeling anisotropic reaection*, Ward introduced a Bidirectional Re?ectance Distribution Function (BRDF) since then widely used in computer graphics because the few parameters it uses are simple to control. His model could represent both isotropic surfaces (independent of light direction) and anisotropic surfaces (direction dependent). In Bforartists, the Ward specular shader is still called **Ward Isotropic** but is actually anisotropic. (PDF)

Options

Slope
: Standard deviation for of surface slope. Previously known as the root-mean-square or rms value, this parameter in effect controls the size of the specular highlight, though using a different method to that of the other specular shaders. It is capable of extremely sharp highlights.

Color Ramps

Reference
Mode: All Modes Panel: Context *Shading* –> sub-context *Material* –> *Ramps*

In many real life situations - like skin or metals - the color of diffuse and specular reflections can differ slightly, based on the amount of energy a surface receives or on the light angle of incidence. The *Ramp Shader* options in Bforartists allow you to set a range of colors for a *Material*, and define how the range will vary over a surface, and how it blends with the ‘actual color’ (typically from a material or as output of a texture).

Ramps allow you to precisely control the color gradient across a material, rather than just a simple blend from a brightened color to a darkened color, from the most strongly lit area to the darkest lit area. As well as several options for controlling the gradient from lit to shadowed, ramps also provide ‘normal’ input, to define a gradient from surfaces facing the camera to surfaces facing away from the camera. This is often used for materials like some types of metallic car paint that change color based on viewing angle.

Since texture calculations in Bforartists happen before shading, the *Ramp Shader* can completely replace texture or material color. But by use of the mixing options and Alpha values it is possible to create an additional layer of shading in Bforartists materials.

Options

Ramps Panel

The separate *Ramp* panels for the *Diffuse* shader and the *Specular* shader respectively can be toggled on and off using the

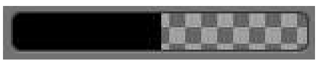
button.

By default the Ramp panel opens with two colors; the first stop (*0*) is black and transparent (Alpha=0) and the second stop (*1*) is white and opaque (Alpha=1).

The position of the color stop markers can be altered by either (1) dragging the stop marker in the colorband or (2) by changing the *Pos* value in the

box.

Color and alpha values for each marker can be set by clicking the



box.

Input

The input menu contains the following options for defining the gradient:

Shader

The value as delivered by the material's shader (*Lambert*, *CookTorr*) defines the color. Here the amount of light doesn't matter for color, only the direction of the light.

Energy

As *Shader*, now also lamp energy, color, and distance are taken into account. This makes the material change color when more light shines on it.

Normal

The surface normal, relative to the camera, is used for the *Ramp Shader.* This is possible with a texture as well, but added for convenience.

Result

While all three previous options work per lamp, this option only works after shading calculations. This allows full control over the entire shading, including 'Toon' style results. Using alpha values here is most useful for tweaking a finishing touch to a material.

Blend pop-up menu

Blend

A list of the various *blending modes* available for blending the ramp shader with the color from *Input*.

Factor

This slider denotes the overall factor of the ramp shader with the color from *Input*.

Colorbands

Reference
Mode: All Modes
Panel: Context *Shading* –> sub-context *Material* –> *Ramps*

A colorband can contain a gradient through a sequence of many colors (with alpha), each color acting across a certain position in the spectrum. Colorbands are used in both materials and textures, as well in other places where a range of colors can be computed and displayed.

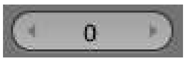
Options

Add
: Add a new mark to the center of the colorband with the default color (neutral gray). New marks can also be added by `Ctrl-LMB` clicking in the colorband itself, which will add the mark at the position of the click with the same color that already exists underneath the mouse pointer.

Delete
: Remove the currently selected mark from the colorband.

F
: Flip the colorband.

0
: The number of the active mark. The values for this mark are those being displayed, and in the colorband, the active mark is displayed as a dashed line. Another marker can be selected (1) using the arrows in the



slider, (2) by clicking on the number being displayed and entering a number of a color mark, or (3) by LMB clicking a marker in the colorband.

Pos
: The position of the active color mark in the colorband (range 0.0–1.0). The position of the color marks can also be changed by `LMB` dragging them in the colorband.

Note
Reordering colors If the position of the color marks are reordered, they will be automatically renumbered so that they always start with `0` from the left and increment to the right.

The *Colorswatch* right of the *Position* slider displays the color of the active mark. `LMB` click it to display a color picker in which values for color (*RGB*) and transparency (*Alpha*) can be set.

Interpolation pop-up menu

Interpolation

: Various modes of interpolation between marker’s values can be chosen in the Interpolation menu:

Ease
: Ease by quadratic equation.

Cardinal
: Cardinal.

Linear
: Linear (default). A smooth, consistent transition between colors.

B-Spline
: B-Spline.

Constant
: Constant.

Color Ramps

Reference
Mode: All Modes
Panel: Context *Shading* –> sub-context *Material* –> *Ramps*

In many real life situations - like skin or metals - the color of diffuse and specular reflections can differ slightly, based on the amount of energy a surface receives or on the light angle of incidence. The *Ramp Shader* options in Bforartists allow you to set a range of colors for a *Material*, and define how the range will vary over a surface, and how it blends with the 'actual color' (typically from a material or as output of a texture).

Ramps allow you to precisely control the color gradient across a material, rather than just a simple blend from a brightened color to a darkened color, from the most strongly lit area to the darkest lit area. As well as several options for controlling the gradient from lit to shadowed, ramps also provide 'normal' input, to define a gradient from surfaces facing the camera to surfaces facing away from the camera. This is often used for materials like some types of metallic car paint that change color based on viewing angle.

Since texture calculations in Bforartists happen before shading, the *Ramp Shader* can completely replace texture or material color. But by use of the mixing options and Alpha values it is possible to create an additional layer of shading in Bforartists materials.

Options

Ramps Panel

The separate *Ramp* panels for the *Diffuse* shader and the *Specular* shader respectively can be toggled on and off using the

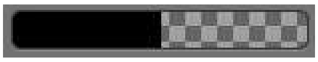
button.

By default the Ramp panel opens with two colors; the first stop (*0*) is black and transparent (Alpha=0) and the second stop (*1*) is white and opaque (Alpha=1).

The position of the color stop markers can be altered by either (1) dragging the stop marker in the colorband or (2) by changing the *Pos* value in the

box.

Color and alpha values for each marker can be set by clicking the



box.

Input

The input menu contains the following options for defining the gradient:

Shader
: The value as delivered by the material's shader (*Lambert*, *CookTorr*) defines the color. Here the amount of light doesn't matter for color, only the direction of the light.

Energy
: As *Shader*, now also lamp energy, color, and distance are taken into account. This makes the material change color when more light shines on it.

Normal
: The surface normal, relative to the camera, is used for the *Ramp Shader*. This is possible with a texture as well, but added for convenience.

Result
: While all three previous options work per lamp, this option only works after shading calculations. This allows full control over the entire shading, including 'Toon' style results. Using alpha values here is most useful for tweaking a finishing touch to a material.

Blend pop-up menu

Blend
A list of the various *blending modes* available for blending the ramp shader with the color from *Input*.

Factor
This slider denotes the overall factor of the ramp shader with the color from *Input*.

Colorbands

Reference
Mode: All Modes
Panel: Context *Shading* –> sub-context *Material* –> *Ramps*

A colorband can contain a gradient through a sequence of many colors (with alpha), each color acting across a certain position in the spectrum. Colorbands are used in both materials and textures, as well in other places where a range of colors can be computed and displayed.

Options

Add
Add a new mark to the center of the colorband with the default color (neutral gray). New marks can also be added by `Ctrl-LMB` clicking in the colorband itself, which will add the mark at the position of the click with the same color that already exists underneath the mouse pointer.

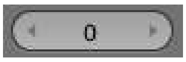
Delete
Remove the currently selected mark from the colorband.

F

Flip the colorband.

0

The number of the active mark. The values for this mark are those being displayed, and in the colorband, the active mark is displayed as a dashed line. Another marker can be selected (1) using the arrows in the



slider, (2) by clicking on the number being displayed and entering a number of a color mark, or (3) by LMB clicking a marker in the colorband.

Pos

The position of the active color mark in the colorband (range 0.0–1.0). The position of the color marks can also be changed by `LMB` dragging them in the colorband.

Note
Reordering colors If the position of the color marks are reordered, they will be automatically renumbered so that they always start with `0` from the left and increment to the right.

The *Colorswatch* right of the *Position* slider displays the color of the active mark. `LMB` click it to display a color picker in which values for color (*RGB*) and transparency (*Alpha*) can be set.

Interpolation pop-up menu

Interpolation

Various modes of interpolation between marker’s values can be chosen in the Interpolation menu:

Ease
Ease by quadratic equation.

Cardinal
Cardinal.

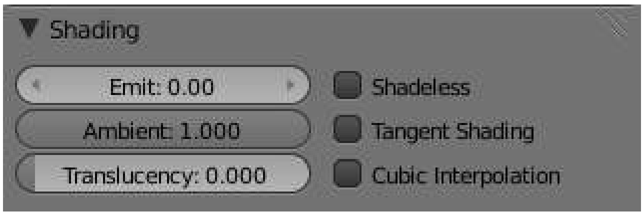
Linear
Linear (default). A smooth, consistent transition between colors.

B-Spline
B-Spline.

Constant
Constant.

Shading

In the separate *Shading* tab six more options are available:



Shading menu, default settings

Emit
: Amount of light to emit

Ambient
: Amount of global ambient color the material receives. Each material has an *Ambient* slider that lets you choose how much ambient light that object receives. Set to 1.0 by default.

  You should set this slider depending on the amount of ambient light you think the object will receive. Something deep in the cave will not get any ambient light, whereas something close to the entrance will get more. Note that you can animate this effect, to change it as the object comes out of the shadows and into the light.

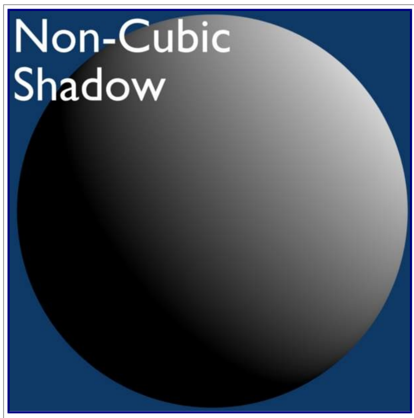
Settings for *Ambient Occlusion* and *Environment Lighting* can be found in the *World* menu, with parameters affecting both these lighting components found in the *World Gather* menu.

Translucency
: Amount of diffuse shading on the back side

Shadeless
: Make this material insensitive to light or shadow; gives a solid, uniform color to the whole object.

Tangent Shading
: Use the material’s tangent vector instead of the normal for shading - for anisotropic shading effects (e.g. soft hair and brushed metal). This shading was introduced in 2.42, see also settings for strand rendering in the menu further down and in the Particle System menu.

Cubic Interpolation
: Use cubic interpolation for diffuse values. Enhances the contrast between light areas and shadowed areas



Without Cubic enabled.

With Cubic enabled.

Transparency

Reference
Mode: All Modes Panel: Shading/Material Context –> Transparency

Materials in Bforartists can be set to be transparent, so that light can pass through any objects using the material. Transparency is controlled using an "alpha" channel, where each pixel has an additional value, range 0-1, in addition to its RGB color values. If alpha=0, then the pixel is transparent, and the RGB values for the surface contribute nothing to the pixel's appearance; for alpha=1, the surface is fully opaque, and the color of the surface determines the final color of the pixel.

Transparency Panel

In Bforartists, there are three ways in which the transparency of a material can be set: Mask, Z-Buffer and Ray-trace. Each of these is explained in more detail below. The *Material Preview* option with a sphere object gives a good demonstration of the capabilities of these three options.

Common Options

The following property controls are available for all transparency options:

Alpha
: Sets the transparency of the material by setting all pixels in the alpha channel to the given value.

Fresnel
: Sets the power of the Fresnel effect. The Fresnel effect controls how transparent the material is, depending on the angle between the surface normal and the viewing direction. Typically, the larger the angle, the more opaque a material becomes (this generally occurs on the outline of the object).

Specular -
: Controls the alpha/falloff for the specular color.

Blend
: Controls the blending between transparent and non-transparent areas. Only used if Fresnel is greater than 0.

Mask

This option simply masks the Background. It uses the alpha channel to mix the color of each pixel on the active object plane with the color of the corresponding background pixel, according to the alpha channel of the pixel.

Thus for alpha = 1, the object color is seen - the object is completely opaque; but if alpha = 0, only the background is seen - the object is transparent (but note that any other object behind the active object disappears).

This is useful for making textures of solid or semi-transparent objects from photographic reference material - a mask is made with alpha opaque for pixels within the object, and transparent for pixels outside the object.

See *Mask Transparency.*

Z Buffer

This uses the alpha buffer for transparent faces. The alpha value of each pixel determines the mix of the basic color of the material, and the color of the pixel is determined from the objects/background behind it. Only basic settings are available with this option; it does not calculate refractions.

Raytraced Transparency

Uses ray tracing to calculate refractions. Ray tracing allows for complex refractions, falloff, and blurring, and is used for simulating the refraction of light rays through a transparent material, like a lens.

Note that the RayTrace option is only available in the Bforartists Render and Cycles render engines, but not in the Game Engine.

A ray is sent from the camera and travels through the scene until it encounters an object. If the first object hit by the ray is non-transparent, then the ray takes the color of the object.

If the object is transparent, then the ray continues its path through it to the next object, and so on, until a non-transparent object is finally encountered which gives the whole chain of rays its color. Eventually, the first transparent object inherits the colors of its background, proportional to its *Alpha* value (and the Alpha value of each transparent Material hit in between).

But while the ray travels through the transparent object, it can be deflected from its course according to the Index of Refraction (IOR) of the material. When you actually look through a plain sphere of glass, you will notice that the background is upside-down and distorted: this is all because of the Index of Refraction of glass.

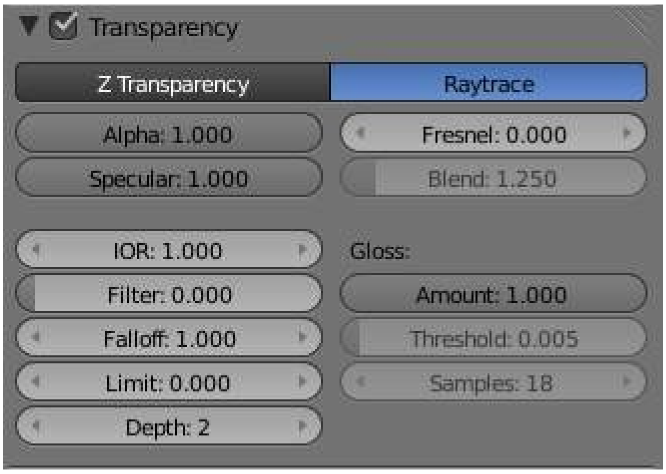
Note

Enable Raytracing

To get ray-traced transparency, you need to:

- enable ray tracing in your Render settings. This is done in the Render context –> Shading Panel. Ray tracing is enabled by default.
- set your Alpha value to something other than 1.0.
- in order for the background material to receive light passing through your transparent object, *Receive Transparent* must be turned on for that material in the Material –> Shadow panel.

Options



The Transparency Panel.

In addition to the common options given above, the following property controls are available:

IOR
: Index of Refraction. Sets how much a ray traveling through the material will be refracted, hence producing a distorted image of its background. See IOR values for Common Materials below.

Filter
: Amount of filtering for transparent ray trace. The higher this value, the more the base color of the material will show. The material will still be transparent but it will start to take on the color of the material. Disabled (0.0) by default.

Falloff
: How fast light is absorbed as it passes through the material. Gives ‘depth’ and ‘thickness’ to glass.

Limit
: Materials thicker than this are not transparent. This is used to control the threshold after which the filter color starts to come into play.

Depth
: Sets the maximum number of transparent surfaces a single ray can travel through. There is no typical value. Transparent objects outside the *Depth* range will be rendered pitch black if viewed through the transparent object that the *Depth* is set for. In other words, if you notice black areas on the surface of a transparent object, the solution is probably to increase its *Depth* value (this is a common issue with ray tracing transparent objects). You may also need to turn on transparent shadows on the background object.

Gloss

Settings for the glossiness of the material.

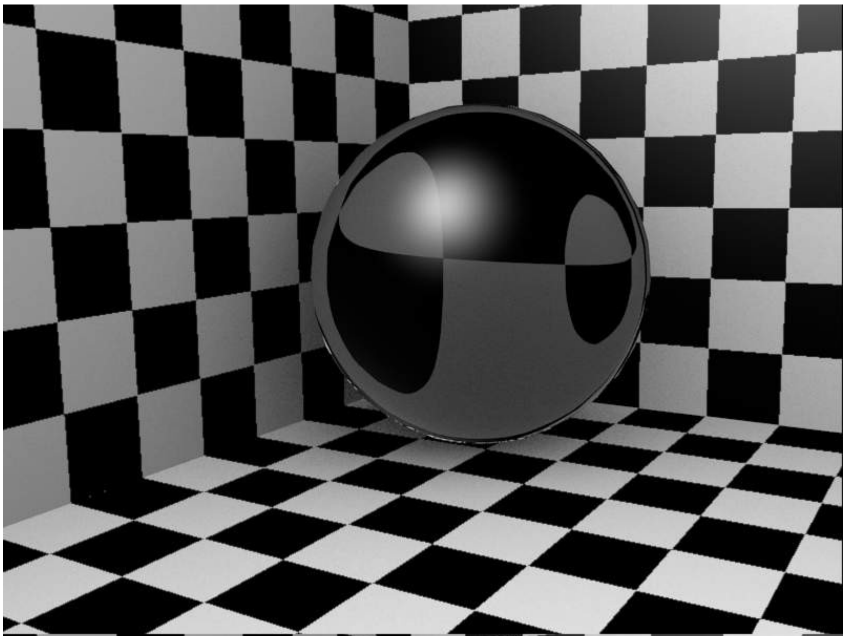
Amount
: The clarity of the refraction. Set this to something lower than zero to get a blurry refraction.

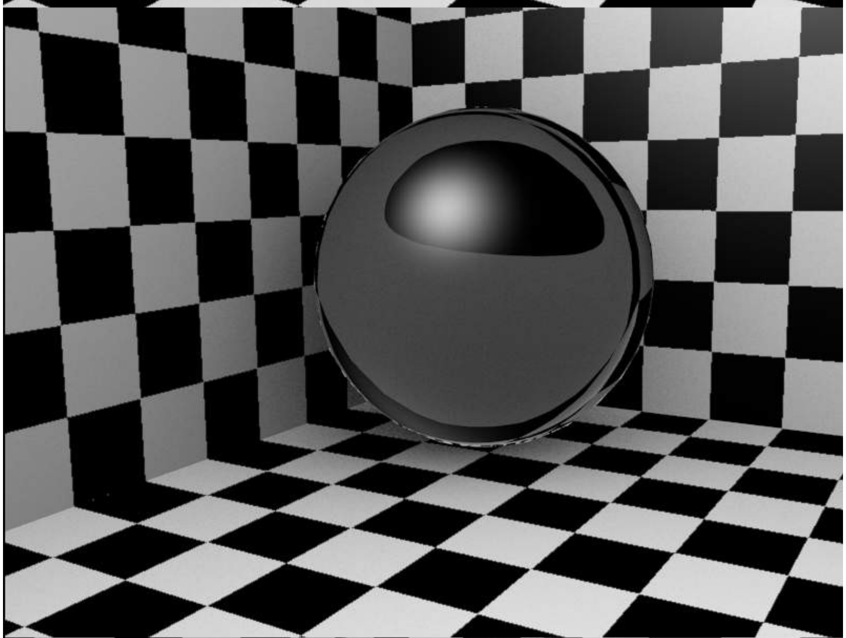
Threshold
: Threshold for adaptive sampling. If a sample contributes less than this amount (as a percentage), sampling is stopped.

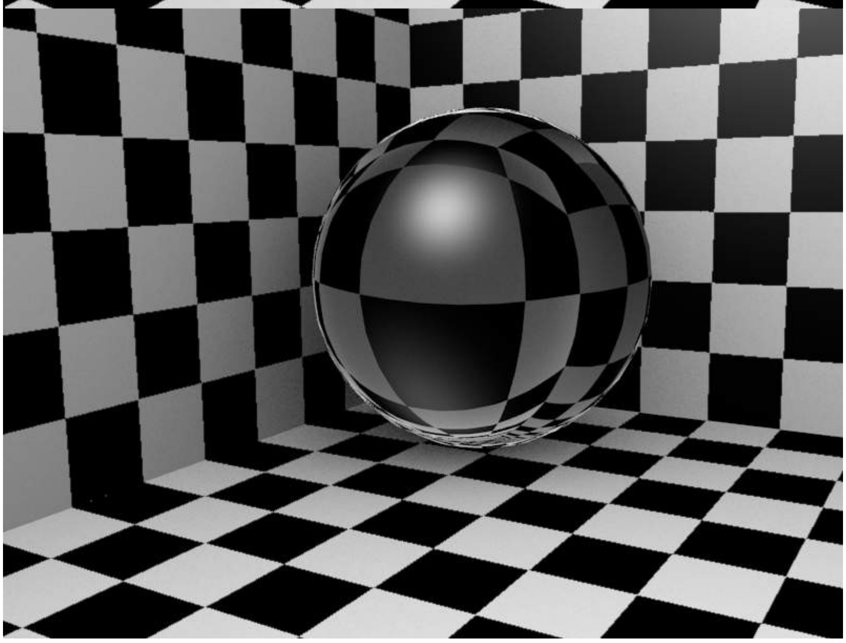
Samples
: Number of cone samples averaged for blurry refraction.

Examples

Index of Refraction



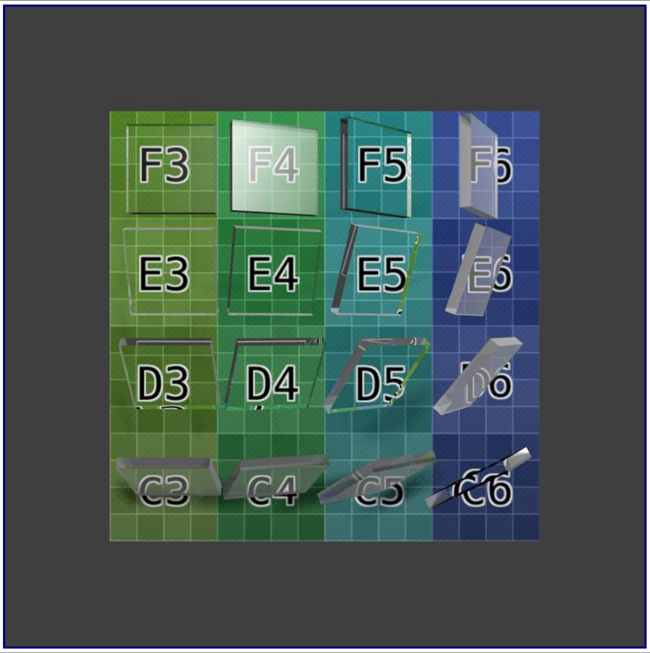


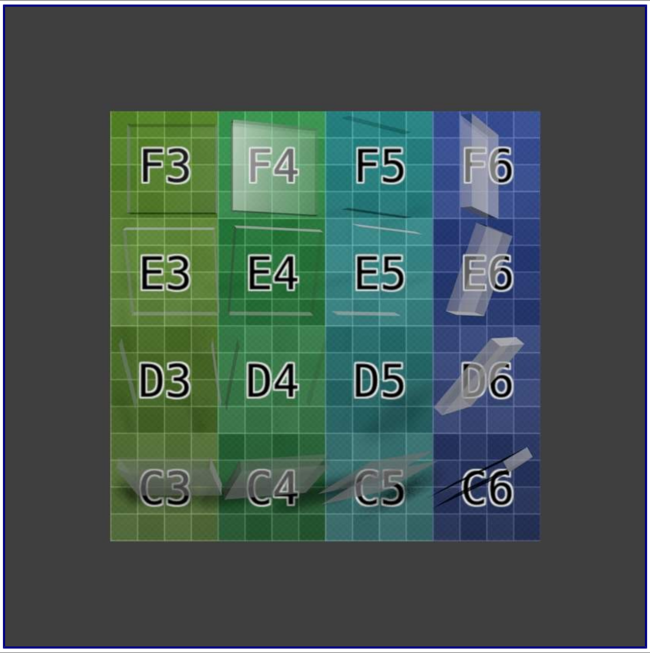


Influence of the IOR of an Object on the distortion of the background: spheres of Water, Glass and Diamond (top to bottom).

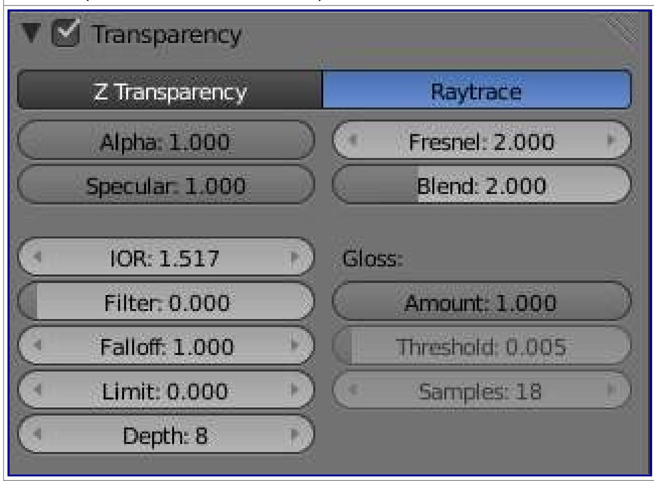
(*Influence of the IOR of an Object on the distortion of the background: spheres of Water, Glass and Diamond (top to bottom).*). There are different values for typical materials: Air is **1.000** (no refraction), Alcohol is **1.329**, Glass is **1.517**, Plastic is **1.460**, Water is **1.333** and Diamond is **2.417**.

Fresnel





16 pieces of glass rotated in various directions demonstrate the angle-dependent Fresnel effect with ray-traced (left) and alpha buffered transparency (right). Note that the major difference is the lack of IOR effect in the latter case. (Download .blend.)

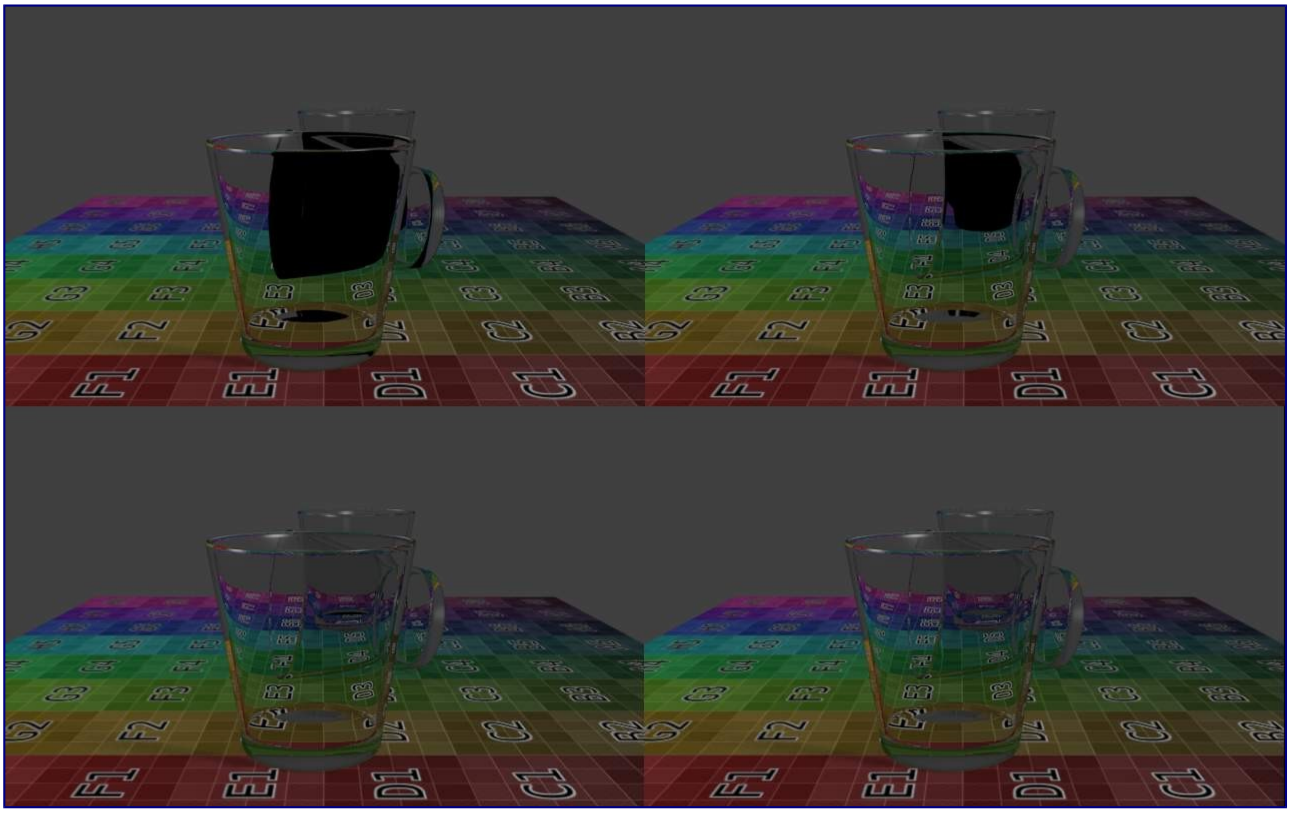


Settings for Fresnel using ray-traced (left) and Z transparency (right).

Note the specular highlight in the F4 glass tile (which is facing midway between the light and the camera); the Fresnel effect can be seen in row C and column 6 where the faces are turned away from the camera.

The amount of Fresnel effect can be controlled by either increasing the *Blend* value or decreasing the *Alpha* value.

Depth



A simple scene with three glasses on a surface, and three lamps. Depth was set to 4, 8, 12, and 14, resulting in render times of 24 sec, 34 sec, 6 min, and 11 min respectively. (Download .blend.)

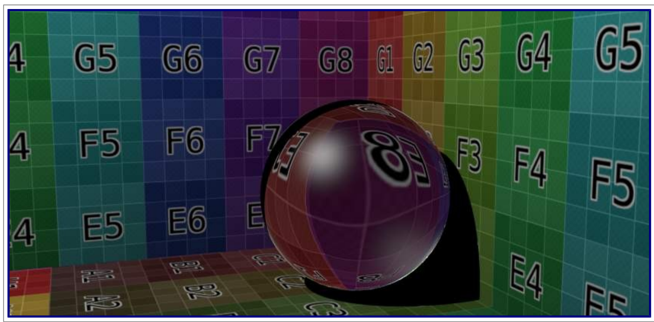
Increasing *Depth* also considerably increases render time. Each time a light ray passes through a surface, the ray-tracing algorithm is called recursively. In the example above, each side of each glass has an exterior and an interior surface. Light rays thus have to pass through four surfaces for each glass.

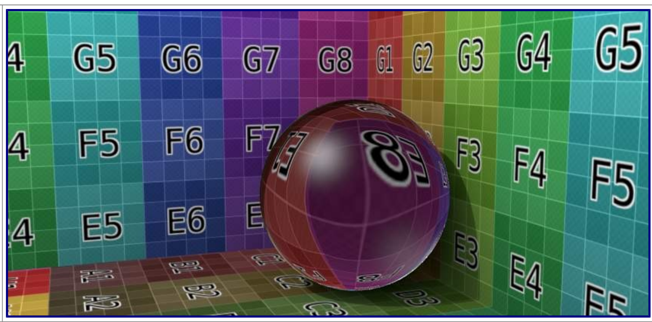
But not only that, at every point on a surface, some of the light can be reflected, or mirrored off the surface in various directions. This results in multiple rays needing to be calculated for each point (often referred to as a tree of rays). In each of the rendered images above there are 640×400=256 000 pixels. By increasing *Depth*, at least one tree of rays is added to each pixel.

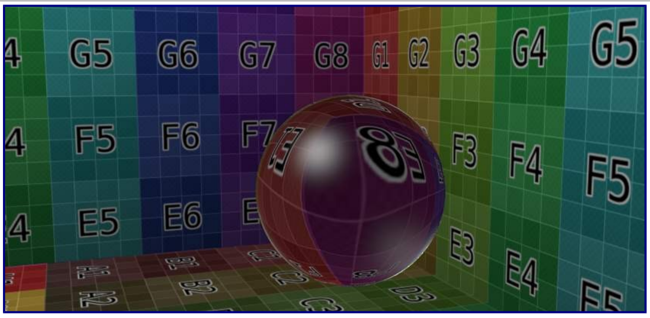
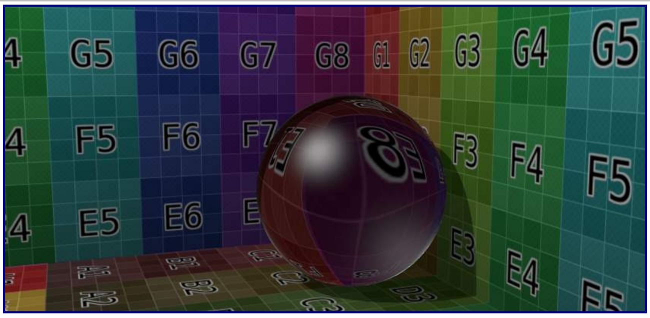
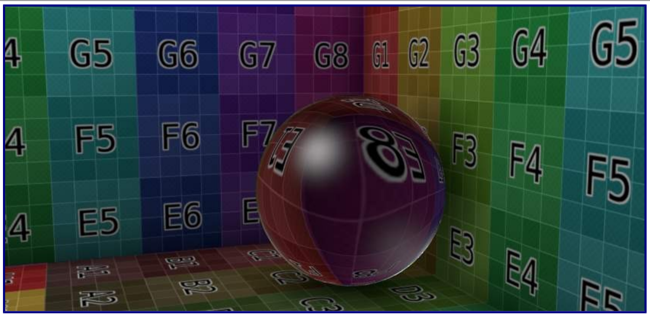
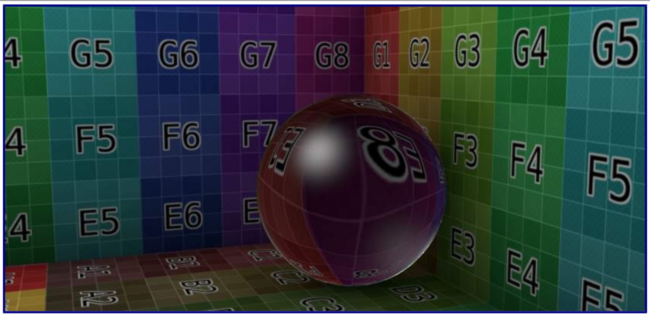
Be kind to your computer. Carefully placing objects in a scene to avoid overlapping transparent objects is often an interesting alternative.

Hints

Transparent shadows





No transparent shadows	No transparent shadows, environment lighting enabled
 Transparent shadows enabled, alpha set to 0.0	 As previous, alpha set to 0.25
 Transparent shadows with ambient occlusion set to multiply, distance 1 (radius of sphere)	 As previous, distance increased to 2 (diameter of sphere)

By default, the shadows of transparent objects are rendered solid black, as if the object was not transparent at all. But in reality, the more transparent an object is, the lighter its shadow will be.

In Bforartists, transparent shadows are set on the materials that receive the shadows from the transparent object. This is enabled and disabled with the *Receive Transparent* button, in the *Material* context –> *Shadow* panel. The shadow's brightness is dependent on the *Alpha* value of the shadow casting material.

Alternatives to transparent ray-traced shadows can be found in the *World* context, namely the *Ambient Occlusion*, *Environment Lighting*, and *Gather* panels. Alternatively, a texture can be used to control the *Intensity* value of the shadow-receiving material.

IOR values for Common Materials

The following list provides some index of refraction values to use when ray-traced transparency is used for various liquids, solids (gems), and gases:

Gasses

- Air `1.000`
- Carbon Dioxide `1.000449`
- Oxygen `1.000276`

Common Liquids

- Alcohol `1.329`
- Milk `1.35`
- Oil, vegetable (50- C) `1.47`
- Shampoo `1.362`
- Water (0- C) `1.33346`
- Water (100- C) `1.31766`
- Water (20- C) `1.33283`
- Water (gas) `1.000261`
- Water (35- C, room temp) `1.33157`
- Vodka `1.363`

Common Transparent Materials

- Glass `1.51714`
- Ice `1.309`
- Rock Salt `1.544`

Common Opaque Materials

- Asphalt `1.635`
- Chalk `1.510`
- Plastic `1.46`
- Rubber, Natural `1.5191`
- Silicon `4.24`

Gemstones

- Diamond `2.417`
- Jade, Nephrite `1.61`
- Opal `1.45`
- Ruby `1.757 - 1.779`

Metals

- Aluminum `1.44`
- Bronze `1.18`
- Copper `1.10`
- Gold `0.47`
- Iron `1.51`
- Lead `2.01`
- Platinum `2.33`
- Silver `0.18`
- Steel `2.50`
- Titanium `2.16`

Mirror Reflections

Mirror reflections are computed in the Bforartists Render and Cycles render engines using ray tracing. (NB: Reflections are not available in the Game Engine.) Ray tracing can be used to make a material reflect its surroundings, like a mirror. The principle of ray-traced reflections is very simple: a ray is fired from the camera and travels through the scene until it encounters an object. If the first object hit by the ray is not reflective, then the ray takes the color of the object. If the object is reflective, then the ray bounces from its current location and travels up to another object, and so on, until a non-reflective object is finally met and gives the whole chain of rays its color.

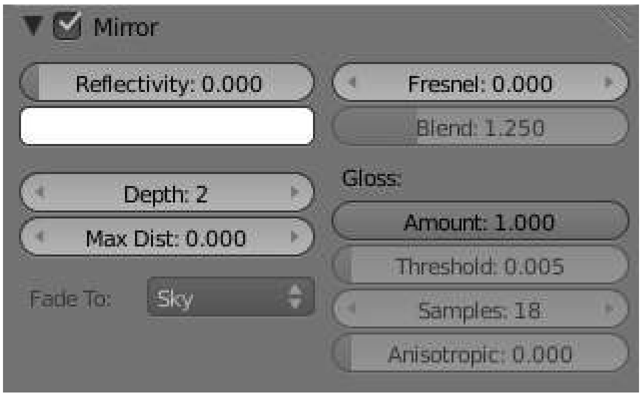
Eventually, the first reflective object inherits the colors of its environment, proportional to its *Reflectivity* value. Obviously, if there are only reflective objects in the scene, then the render could last forever. This is why a mechanism for limiting the travel of a single ray is set through the *Depth* value: this parameter sets the maximum number of bounces allowed for a single ray.

Note

You need to enable ray tracing in your scene settings if you want to use ray-traced reflections. This is done in the Scene/Render context –> Render Panel. Ray tracing is enabled by default in Bforartists 2.37 and higher.

The *Color Swatch* in the mirror panel is the color of the light reflected back. Usually, for normal mirrors, use white. However, some mirrors color the reflection (e.g. metals), so you can change the color by clicking on the swatch. The amount of mirrored reflection is determined by the *Reflectivity* value. If set to something greater than 0, mirrored reflectivity will be activated and the reflection will be tinted the color set in the swatch.

Options



The Mirror Panel

Enable ray-traced reflections
: Enable or disable ray-traced reflections

Reflectivity
: Sets the amount of reflectiveness of the object. Use a value of 1.0 if you need a perfect mirror, or set it to 0.0 if you don't want any reflection.

Picking a mirror color

Color swatch
: Color of mirrored reflection By default, an almost perfectly reflective material like chrome, or a mirror object, will reflect the exact colors of its surrounding. But some other equally reflective materials tint the reflections with their own color. This is the case for well-polished copper and gold, for example. In order to replicate this within Bforartists, you have to set the Mirror Color accordingly. To set a mirror color, simply click the color swatch in the mirror panel and select a color.

Fresnel
: Sets the power of the Fresnel effect. The Fresnel effect controls how reflective the material is, depending on the angle between the surface normal and the viewing direction. Typically, the larger the angle, the more reflective a material becomes (this generally occurs on the outline of objects).

Blend
: A controlling factor to adjust how the blending happens between the reflective and non-reflective areas.

Depth
: Maximum allowed number of light inter-reflections. If your scene contains many reflective objects and/or

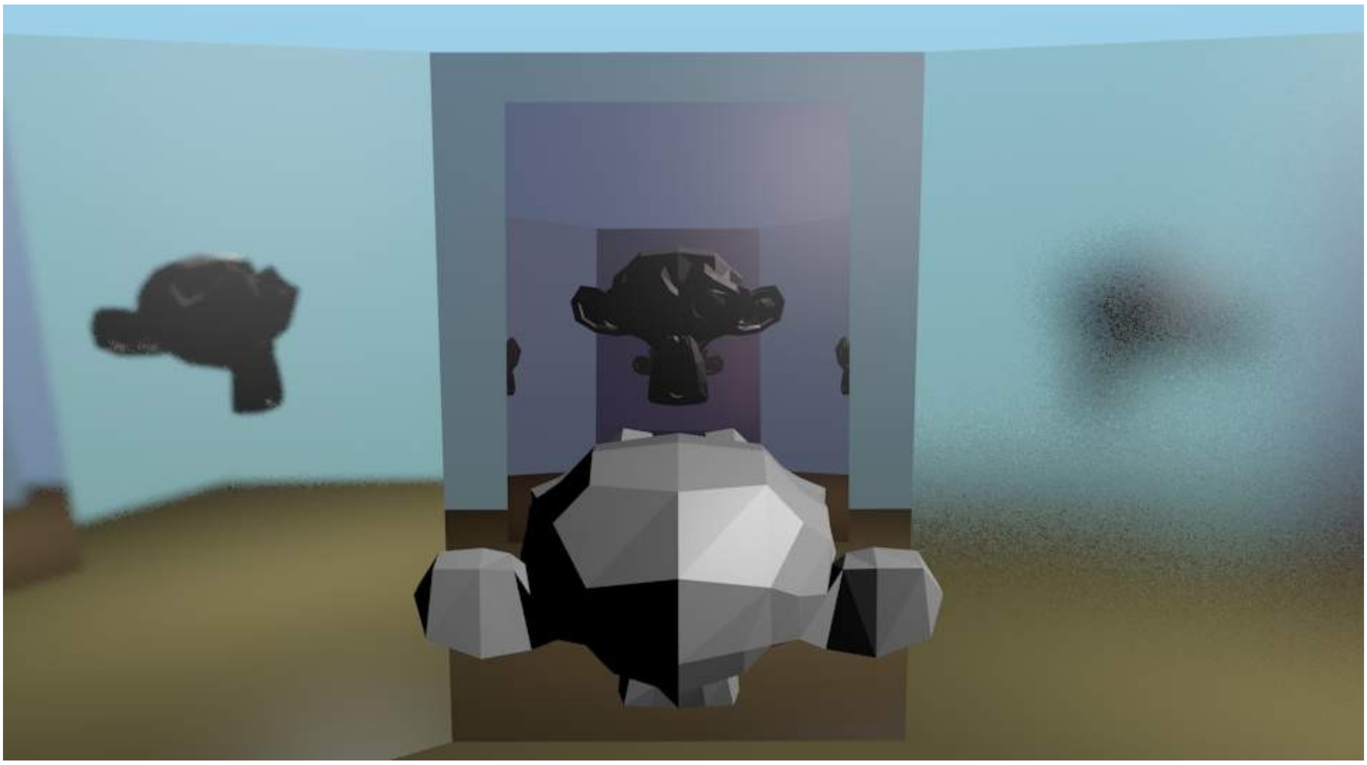
if the camera zooms in on such a reflective object, you will need to increase this value if you want to see surrounding reflections in the reflection of the reflected object (!). In this case, a Depth of 4 or 5 is typically a good value.

Max Dist

Maximum distance of reflected rays away from camera (Z-Depth) in Bforartists units. Reflections further than this range fade out to reduce compute time.

Fade to

The color that rays with no intersection within the *Max Distance* take. *Material* color can be best for indoor scenes, *Sky* color (World settings) for outdoor scenes.



Suzanne in the Fun House (.blend)

Gloss

In paint, a high-gloss finish is very smooth and shiny. A flat, or low gloss, finish disperses the light and gives a very blurry reflection. Also, uneven or waxed-but-grainy surfaces (such as car paint) are not perfect and therefore slightly need a Gloss < 1.0. In the example to the right, the left mirror has a Gloss of 0.98, the middle is Gloss = 1.0, and the right one has Gloss of 0.90. Use this setting to make a realistic reflection, all the way up to a completely foggy mirror. You can also use this value to mimic depth of field in mirrors.

Amount

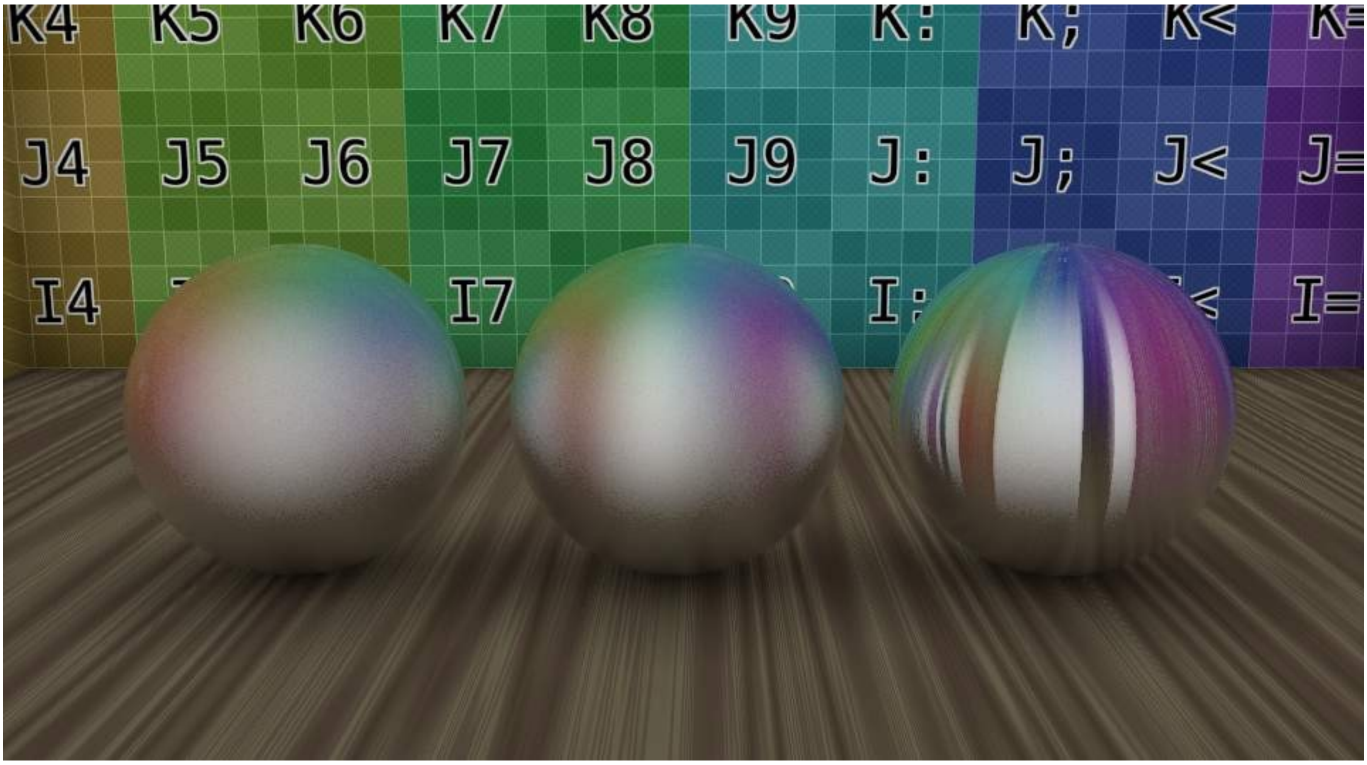
The shininess of the reflection. Values < 1.0 give diffuse, blurry reflections and activate the settings below.

Threshold

Threshold for adaptive sampling. If a sampling contributes less than this amount (as percentage), sampling is stopped. Raising the threshold will make the adaptive sampler skip more often, however the reflections could become noisier.

Samples

Number of cone samples averaged for blurry reflection. More samples will give a smoother result, but will also increase render time.



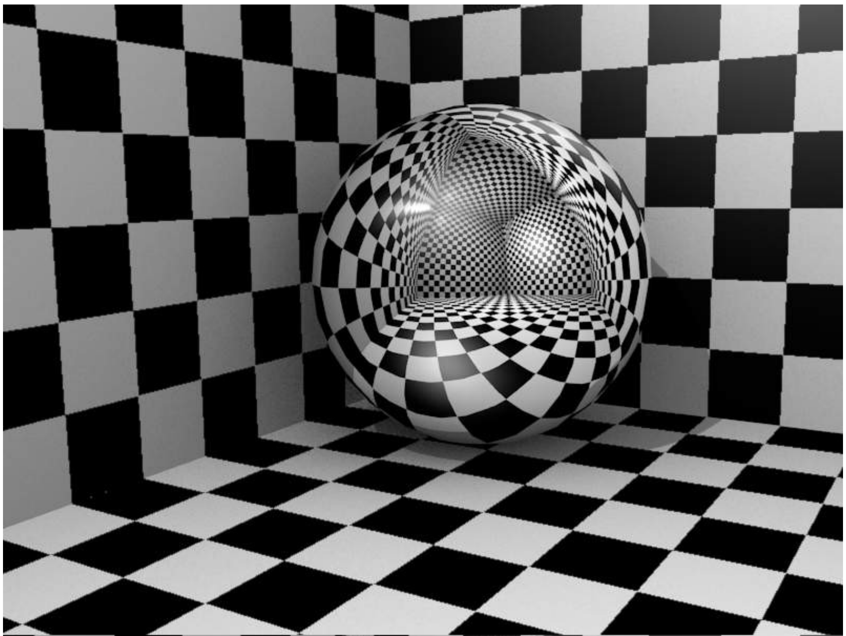
Anisotropic tangent reflecting spheres with anisotropic set to 0.0, 0.75, 1.0. (.blend)

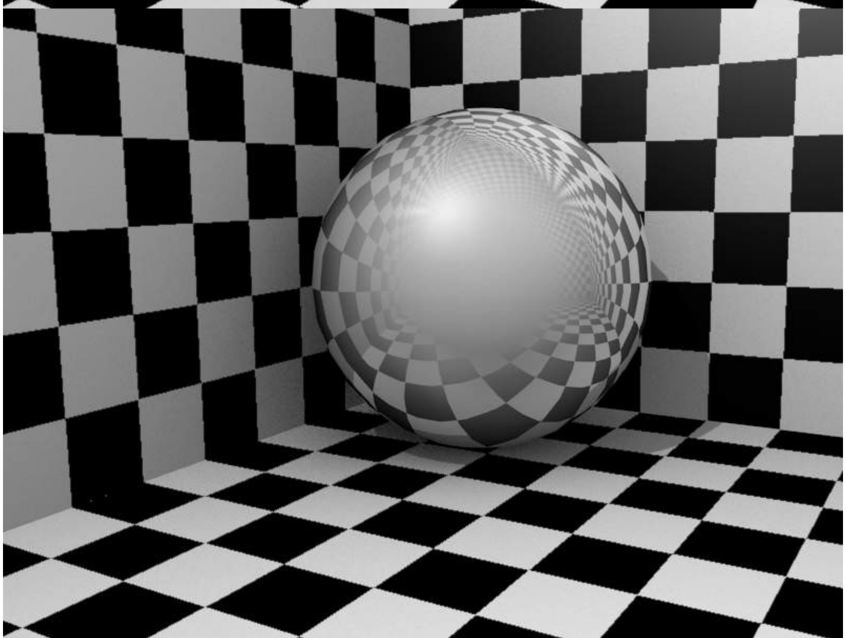
Anisotropic

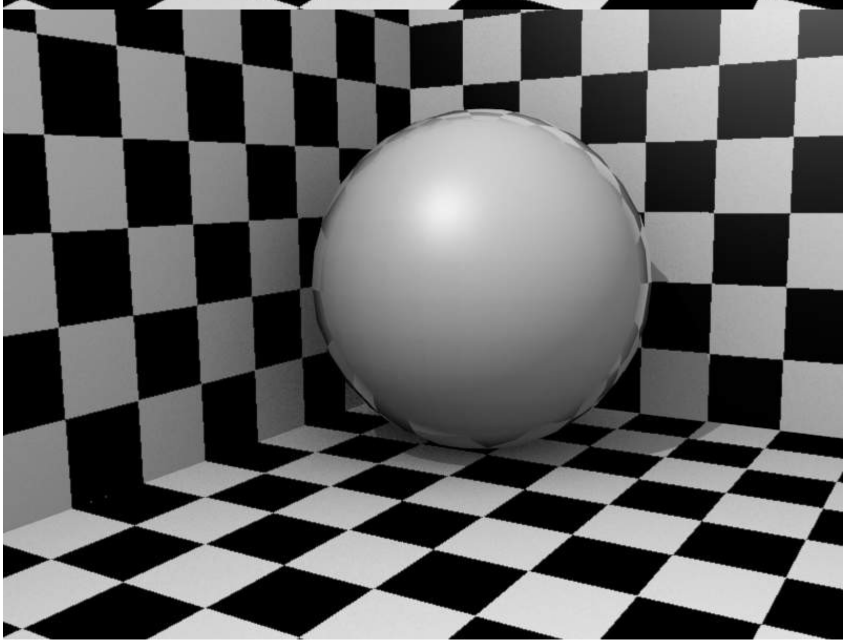
The shape of the reflection, from 0.0 (circular) to 1.0 (fully stretched along the tangent). If the *Tangent Shading* is on, Bforartists automatically renders blurry reflections as anisotropic reflections. When Tangent is switched on, the *Anisotropic* slider controls the strength of this anisotropic reflection, with a range of 1.0 (default) being fully anisotropic and 0.0 being fully circular, as is when tangent shading on the material is switched off. Anisotropic ray-traced reflection uses the same tangent vectors as for tangent shading, so you can modify the angle and layout the same way, with the auto-generated tangents, or based on the mesh’s UV co-ordinates.

Examples

Fresnel







Demonstration of Fresnel effect with values equal to (from top to bottom) 0.0, 2.5 and 5.0

Let’s undertake a small experiment in order to understand what Fresnel is really about. After a rainy day, go out and stand over a puddle of water. You can see the ground through the puddle. If you kneel just in front of the puddle, your face close to the ground, and look again at a distant point on the puddle of water, the liquid surface part which is closer to you lets you see the ground, but if you move your gaze towards the other end of the puddle, then the ground is gradually masked until all you see is the reflection of the sky. This is the Fresnel effect: having a surface sharing reflective and non-reflective properties according to the viewing angle and the surface normal.

In *Demonstration of Fresnel effect with values equal to (from top to bottom) 0.0, 2.5 and 5.0*, this behavior is demonstrated for a perfectly reflective Material (Mirror Reflectivity 1.0).

Fresnel 0.0 stands for a perfect mirror Material, while Fresnel 5. 0 could stand for a glossy Material. It’s barely noticeable but in the lower picture, the Material is perfectly reflective around the edges.

The smoothness of the Fresnel limit can be further controlled using the *Blend* slider.

Subsurface Scattering

Many organic and inorganic materials are not totally opaque right at the surface, so light does not just bounce off the top surface. Instead, some light also penetrates the skin surface deeply, and scatters around inside, taking on the color of the insides and emerging back out at a different location. Human/animal skin, the skin of grapes, tomatoes, fruits, wax, gels (like honey, or Jello) and so on all have subsurface scattering (SSS), and photo-realism really cannot be achieved without it.

It is important to understand that subsurface scattering and diffuse are one and the same. The difference is in how far light can diffuse beneath the surface before it is absorbed or transmitted back out.

How it works

Actually calculating the light path beneath the surface of an object is not practical. But it has been shown that it is not necessary to do this, and that one can use a different approach.

Bforartists calculates SSS in two steps:

- At first the irradiance, or brightness, of the surface is calculated, from the front side of the object as well as from its back side. This is pretty much the same as in a normal render. Ambient Occlusion, Radiosity, the type of diffuse Shader, the light color, etc. are taken into account.
- In the second step, the final image is rendered, but now the SSS shader replaces the diffuse shader. Instead of the lamps, the calculated lightmap is used. The brightness of a surface point is the calculated “Average” of the brightness of its surrounding points. Depending on your settings the whole surface may be taken into account, and it’s a bit more complicated than simply calculating the average, but don’t bother too much with the math behind it.

Instead let’s see what SSS does to a distinct light point.

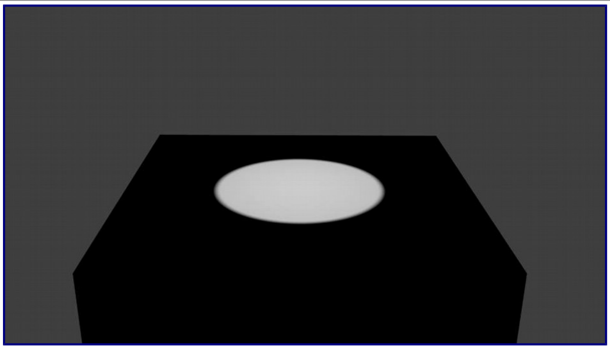


Image 3a: No SSS.

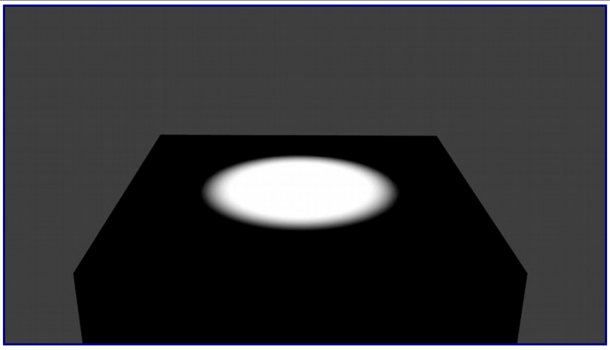


Image 3b: Small SSS radius.

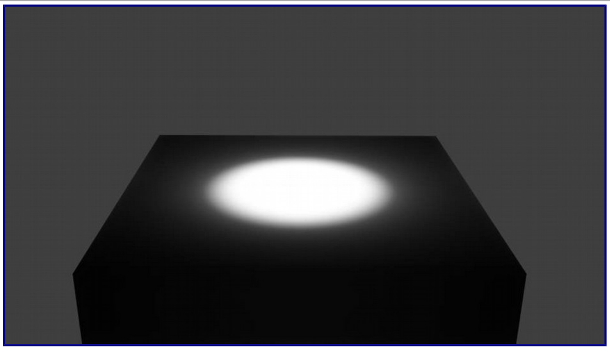


Image 3c: SSS radius enlarged.

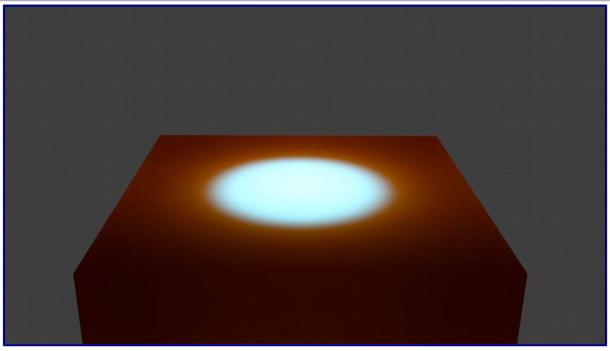


Image 3d: SSS with very large red radius value.

If you turn on SSS, the light is distributed over a larger area. The size of this area depends on the radius values. Instead of distributing all colors with the same amount, you may choose different radius values for each of the RGB colors.

If you use a very large radius value for a color, its light is evenly distributed over the whole object.

Note

Note about scatter radius

Because of the way this scattering is calculated, when using large radius values, you will notice fringing artifacts that appear as the complementary color to the predominant color of the scattering. Above, you see in the last image a bluish band in the illuminated area. This is an unfortunate limitation. A way to lessen this effect is use multiple passes with different scatter radii, and average them.

Enabling Subsurface Scattering

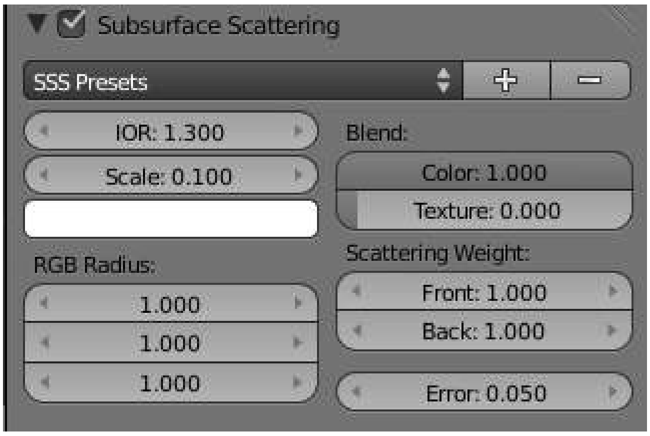


Image 4: The SSS Panel. SSS is already enabled.

- Enable SSS by clicking on the *Subsurface Scattering* button.
- Accessible at the top are various presets. Add new or remove old presets by clicking the + and - buttons. When you select a preset, the *Radius* values, the *RGB Radius* and the IOR are set for you. The remaining options are not set (because they are mostly dependent on the size of your object).

SubSurface Scattering doesn’t need ray tracing. But since it is dependent on the incident light and shadows, [you need proper shadow calculation (which may need ray tracing).

Options

The numeric sliders control how the light is scattered:

IOR

The Index Of Refraction value determines the falloff of incident light. Higher values means that light falls off faster. The effect is quite subtle and changes the distribution function only a little bit. By the examination of many different materials, values of **1.3** to **1.5** have been found to work well for most materials. If you know the exact material you are trying to simulate, see IOR values for Common Materials.

Scale

The scale of your object, in Bforartists units, across which you want the scattering effect to take place. Scale *1.0* means **1** Bforartists unit equals **1** millimeter, scale **0.001** means **1** Bforartists unit equals **1** meter. If you want to work out what scale value to use in your scene, just use the formula: (size in Bforartists units)/(real world size in millimeters)=scale.

The SSS Color Swatch

Scattering Color (Albedo)

Albedo is the probability that light will survive a scattering event. If you think of scattering as a filter, this is the height of the filter. It is multiplied by the surface color. In practice, this is unintuitive. It should be the same as the surface color, however changing this value has unintuitive results on the scattering effect:

The darker the color the more light is scattered. A value of 1 will produce no scattering effect.

So if you set it to green, the lit areas of the object will appear as green, and green is scattered only a little. Therefore the darker areas will appear in red and blue. You can compensate the different scattering by setting a larger radius for the color.

RGB Radius

This is not in fact the radius of the subsurface scattering, but the average path length between scattering events. As the light travels through the object it bounces around then emerges from the surface at some other point. This value corresponds to the average length the light travels between each bounce. The longer the path length is, the further the light is allowed to scatter. This is the main source of a material’s perceived “scatter color.” A material like skin will have a higher red radius than green and blue. Subsurface scattering is the diffusion of light beneath the surface. You control how far the light spreads to achieve a specific result.

Blend :

Color

This controls how much the R, G, B option modulates the diffuse color and textures. Note that even with this option set to **0.0**, the R, G, B option still influences the scattering behavior.

Texture

How much the surface texture is blurred along with the shading.

Scattering Weight :

Front

Factor to increase or decrease the front scattering. When light enters through the front of the object, how much is absorbed or added? (Normally **1.0** or **100%**).

Back

Factor to increase or decrease the back scattering. Light hitting an object from behind can go all the way through the object and come out on the front of the object. This happens mostly on thin objects, like hands and ears.

Error

This parameter controls how precisely the algorithm samples the surrounding points. Leaving it at **0.05** should give images without artifacts. It can be set higher to speed up rendering, potentially with errors.

Setting it at **1.0** is a good way to quickly get a preview of the look, with errors.

Developing your own SSS material

The Traditional Approach

A more common but less intuitive approach is to use “layering”. This is a simplified version of the layering approach. See the external links for more information:

- Set the SSS color on a value of your choice, normally the predominant color of the object. If you want to use different radii for the colors, don’t make it too dark.
- Set the scale factor. If you want to see much translucency you need small objects or large scale values.
- Set the radius values.
- Adjust the brightness with the *Front* and *Back* values.

A more intuitive approach

- Set the Scattering color to .5
- Set the Front weight to 2.
- Set the scale factor based on the size of your object relative to the scene. If you want to see much translucency you need small objects or large scale values.
- Set the radius values appropriately.

Examples

Skin

Increasing SSS scale (.blend)

1 2 3 4 5

See also

- Development Release Log: Subsurface Scattering
- Ben Simonds: Three Layer SSS in Bforartists Demystified

Strands

The Strand section of the Material editor is specific to the rendering of Hair particles. There are two different strand methods available:

Polygon strands
: This is the default (old) method. The strands are rendered as flat polygons. The number of polygons depend on the *Steps* settings in the *Render* panel of the *Object* context, *Particles* sub-context.

Strand Primitive
: You activate Strand Primitive with the button *Strand render* in the *Render* panel of the particle system. The hair curves are not stored as polygons; only the key points are stored, which are then converted to polygons on the fly. A second difference is the way transparency works. Rather than rendering using the existing system, all strand segments in a part are sorted front to back and rendered in that order.

Strand Primitives:

- Are more memory efficient and faster, to make rendering of large amounts of fur and grass possible. For good performance, the render steps button should be lowered (e.g. 2 should be good enough fur), since the result will be a smoothed curve anyway. You need 1 to 2 render steps less than steps in the 3D window. Also, using more render parts helps to reduce memory usage.
- Have a distance of vision reduction (in the *Render* panel under *Child Simplification*) for children from faces.
- May be faded out towards the tip without an additional texture.
- Are not ray traced. So they are not visible through ray-transparent materials or in a ray mirror (you can use *Environment Mapping* for that).
- Have shape problems if they are rendered with a greater width.
- Cannot carry a UV-Texture along the strand.

Polygon strands:

- Work well with greater width, so you can use them as an alternative to billboards because the strands may have an animated shape.
- Can be textured with a UV-Texture along the strands.
- Are seen by ray tracing.

Strands Shading

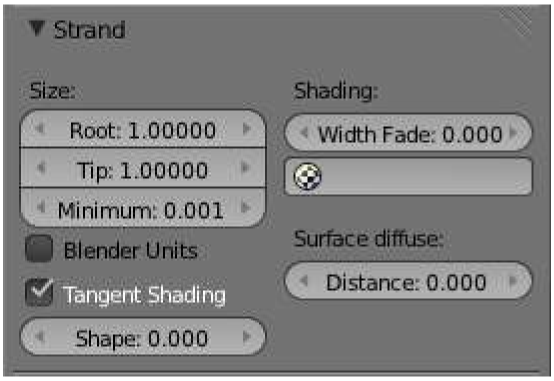


Image 1: Strands Panel.

Strands are rendered with the material of the underlying face/vertex, including shading with a UV-Texture.

Since you can assign more than one material to each face, each particle system may have its own material and the material of the underlying face can be different from the material of the strands.

Additionally strands can be shaded along the strand (from root to tip) with a mono-dimensional texture; only polygon strands can carry a two-dimensional UV-Texture.

The options for strand shading are in the *Strands* section of the *Material* context.

Root
: Width of the hair at the root.

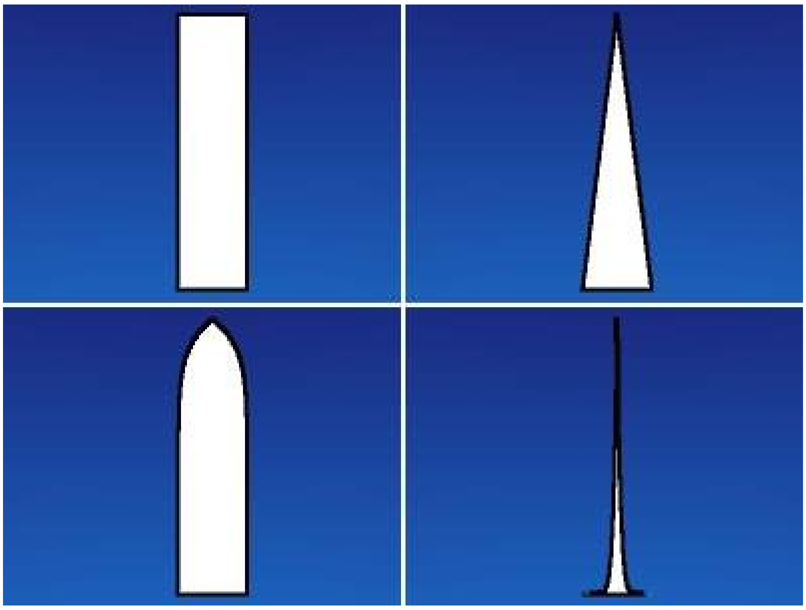
Tip
: Width of the hair at the tip.

    Minimum
    : This is the minimum thickness (in pixels) of the strands. Strands below that size are not rendered smaller, but are faded to alpha (well, the fading works only for strand primitives). This gives a much better rendering result for thin hair.

Bforartists Units
: Normally strands are quite thin; the thickness is given in screenpixels. If you use Bforartists units (BU) you may set the root value up to 2 BU, and the tip value up to 1 BU. You have to consider the overall object size, because the smallest possible size is 0.001 BU. So if you use 1 BU for 1 meter the smallest possible size would be 1 mm (too thick for thin hair).

Use Tangent Shading
: Calculates the light as if the strands were very thin and round. This makes the hair appear brighter and shinier. Disabling the “Tangent Shading” option will still render nicely, but resembles more solid strands, as though made of metal or wood.

Shape
: This slider allows you to control the interpolation. Default (0.0) is a linear interpolation between *Root* and *Tip*. A negative value will make the strand narrower (spiky), a positive value will make it fatter.



Width Fade
: To fade out along the width of the strand. This works only for Strand Primitives. 0.0 is no fading at all, 1.0 linear fading out.

UV Layer
: You can texture polygon strands with a UV-Texture. Fill in the name of the UV-Set (not the texture) here.

You also have to load the texture in the *Shading* context, *Texture* and *Material* sub-contexts (*Mapping*: *UV*; you may use every *Influence* setting you like - especially the alpha value; see *Image 3*).

Surface Diffuse

Computes the strand normal, taking the normal at the surface into account. This eases the coloring and lighting of hair a lot, especially for Strand Primitives. Essentially hair reacts similar to ordinary surfaces and don't show exaggerated strong and large specular highlights.

Distance

The distance in Bforartists units over which to blend in the normal at the surface (if you want to use *Surface Diffuse* only for Grass/Fur at greater distances).

Texturing along the Strand

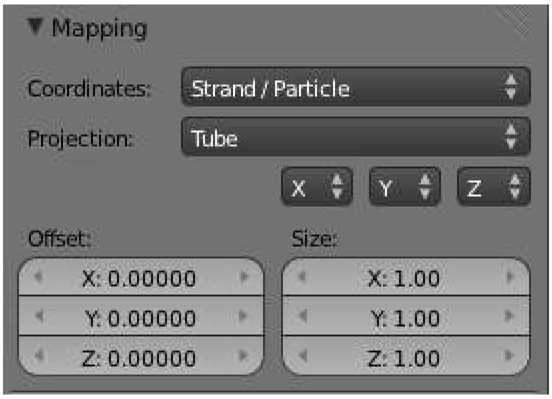


Image 4: Fading a strand to alpha...

Image 5: ...And the render result.

Strands can be textured along the strand, i.e. from root to tip. To do that you have to select *Strand/Particle* in the *Coordinates* drop-down in the *Mapping* panel of the *Material* sub-context.

Pretty much the most important setting is shown in (*Image 4*), how to fade the tip of a strand to alpha to make nice, fuzzy-looking hair. Normally you would use a linear blend texture for this.

You may of course set any attribute you like, especially color. Be careful with specularity; hairs tend to get too shiny.

Strand render Simplification

Image 5: Strand render child simplification.

If you use Strand Primitives (*Strand render* button) and have activated *Interpolated Children*, the *Child Simplification* option appears. The strand render has options to remove child strands as the object's faces become smaller.

Reference Size
: This is the approximate size of the object on screen (in pixels), after which simplification starts.

Rate
: How fast strands are removed.

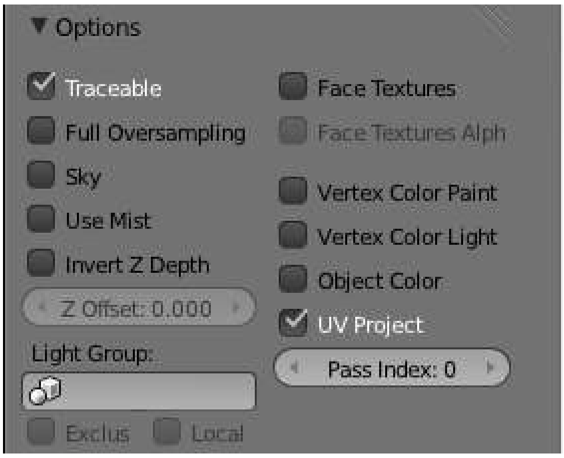
Transition
: The transition period for fading out strands as they are removed.

Viewport

: This removes strands on faces that are outside of the viewport.

  Rate
  : Controls how fast these are removed.

Options



Material Options Panel

This panel provides a series of control options concerning how objects using this material will appear in the rendered image. All controls are default "Off" unless otherwise stated.

Traceable (default On)
: Include this material and the geometry that uses it in ray-tracing calculations. See *Transparency* for details of ray-tracing.

Full Oversampling
: Force this material to render full shading/textures for all *anti-aliasing* samples.

Sky
: Render this material with zero alpha, but with *sky background* in place (scanline only)

Use Mist
: Use *mist* on this material (see “World Settings” for more details)

Invert Z depth
: Render material’s faces with an inverted Z buffer (scanline only)

Z Offset
: Give faces an artificial Z offset for Z transparency.

Light Group
: Limit lighting to lamps in this *light group*.

Exclusive
: Uses the *light group* exclusively - these lamps are excluded from other scene lighting

Local
: When linked in, uses local *light group* with the same name.

Face Textures
: Replace object’s base color with color from UV map image textures.

Face Textures Alpha
: Replace object’s base alpha with alpha from UV map image textures.

Vertex Color Paint
: Replace object’s base color with vertex paint colors (multiply with ‘texture face’ face assigned textures)

Vertex Color Light
: Add vertex paint colors as additional lighting. (This can be used to produce good incandescence effects).

Object Color
: Modulate the result with a per object color

UV Project (default On)
: Use to ensure UV interpolation is correct for camera projections (use with *UV project* modifier).

Pass Index
: Index number for the IndexMA render pass.

Shadows

The shadows that appear in a scene are affected by a combination of the layout of objects, the shape of the objects, the materials of the objects, and the lighting. In Bforartists, the Display Mode (Single Texture, Multitexture,or GLSL) also affects the appearance of shadows. See *Shadows* for a more complete description of this subject.

Tip

Shadows in 3D mode

To see shadows in 3D (textured) mode, you must have switched to GLSL mode before making any materials. In MultiTexture mode, shadows only appear in the rendered image: none of these can be seen in the preview image.

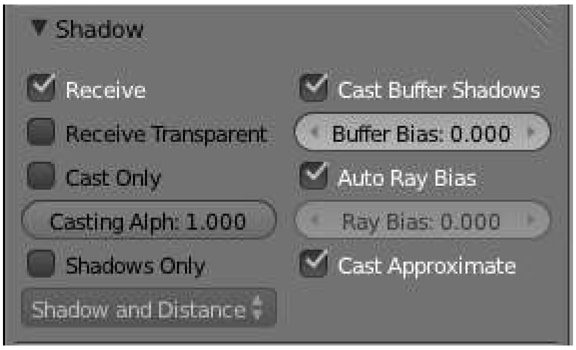


Fig. 1: Shadow Panel.

The Shadow panel in the Materials Properties window (Fig. 1) controls the effects that the material can have on the shadows that appear in the scene. The various properties are described in the sections below.

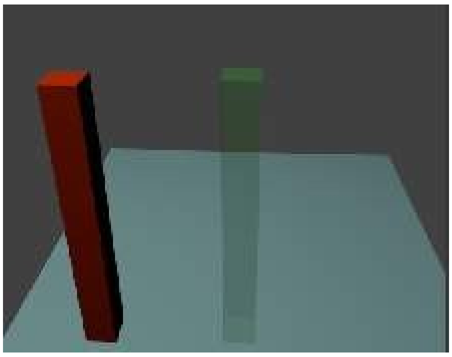


Fig. 2: Scene- all shadow properties off.

Options

The following properties can be set for each individual material with which objects in the scene are shaded. The effects are illustrated with rendered images for a simple scene (Fig. 2) consisting of two “posts”, one with a red (totally non-transparent) material; one green (partially transparent) material, set up on a light blue plane to receive the shadows. The illustrations were all taken in Bforartists Render engine, with Multitexture mode.

Shadow Receiving Object Material

The following options affect the material that receives shadows:

Receive
: Allows this material to receive full-intensity shadows (Fig. 3).

Receive Transparent
: Allows this material to receive shadows whose intensity is modified by the transparency and color of the shadow-casting object (Fig. 4).

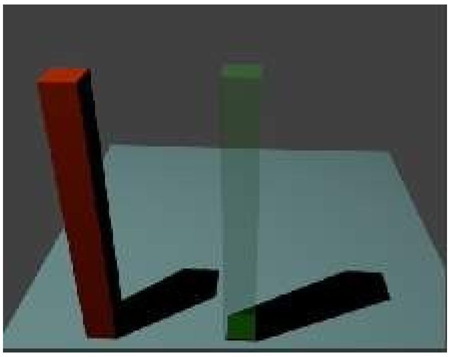


Fig. 3: Plane - Receive.

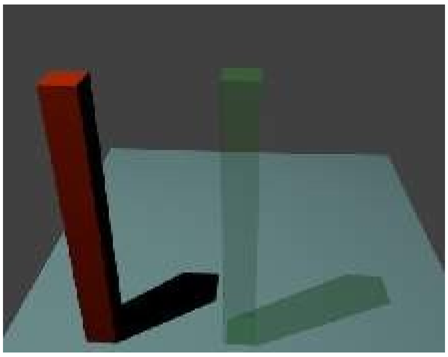


Fig. 4: Plane - Receive + Receive Transparency.

Shadow Casting Object Material

The following options affect the material that casts shadows:

Cast Only
Material appears transparent, but it still casts shadows (Fig. 5).

Casting Alpha
??

Shadows Only
Material appears transparent except for where it receives shadows from other objects, and also it retains its own transparency (Fig. 6). Note the faint image of the partly-transparent post.

Shadow and Distance
???

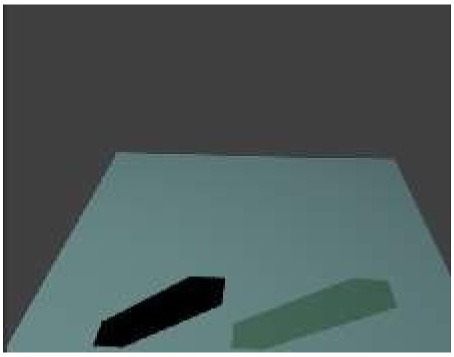


Fig. 5: Posts - Cast Only.

Fig. 6: Posts - Shadows Only.

Buffered Shadow Options

In addition to the shadow options described above, there are further material properties which control buffered shadow features. See section on *Spot Buffered Shadows* for further discussion of these techniques.

Cast Buffer Shadow
: Casts shadows from shadow buffer lamps.

Buffer Bias
: Multiplication factor for Buffer shadows (0 = ignore)

Auto Ray Bias -
: Prevent raytraced shadow errors on surfaces with smooth shaded normals.

Ray Bias
: Bias value to be used.

Cast Approximate
: Allow this material to cast shadows when using approximate ambient occlusion.

Introduction to Material Nodes

In addition to creating materials as just described using all the settings on all the materials panels, Bforartists allows you to create a material by routing basic materials through a set of nodes. Each node performs some operation on the material, changing how it will appear when applied to the mesh, and passes it on to the next node. In this way, very complex material appearances can be achieved.

You should already be familiar with general material concepts and how to create materials/textures using the material menu. You should also have a general understanding of the texture coordinate systems available in Bforartists (e.g. Generated, UV, etc.). Also, many aspects of a node will be skipped here because in later sections you will see the function expanded upon. Each section builds off the previous.

To start, the node system does not make the material menu obsolete. Many features and material settings are still only accessible through the material panel (e.g. Ray Mirror). However with the advent of nodes, more complex and fantastic materials can be created since we now have greater control.

Just in case you’re not (yet) familiar with the concepts: when you create a system of nodes (otherwise known as a “noodle”), you’re describing a data-processing pipeline of sorts, where data “flows from” nodes which describe various *sources*, “flows through” nodes which represent various processing and filtering stages, and finally “flows into” nodes which represent outputs or destinations. You can connect the nodes to one another in many different ways, and you can adjust “knobs, ” or parameters, that control the behavior of each node. This gives you a tremendous amount of creative control. And, it will very quickly become intuitive.

Having said all that, let's begin with a normal material.

Here we have the standard material we have added to a cube mesh. We could, as we have in the past, add color and other settings to this material and it would certainly look nice. But let's say we are just not getting what we are looking for? What if we want to control the creation more tightly or add more complexity? Here is where nodes come in.

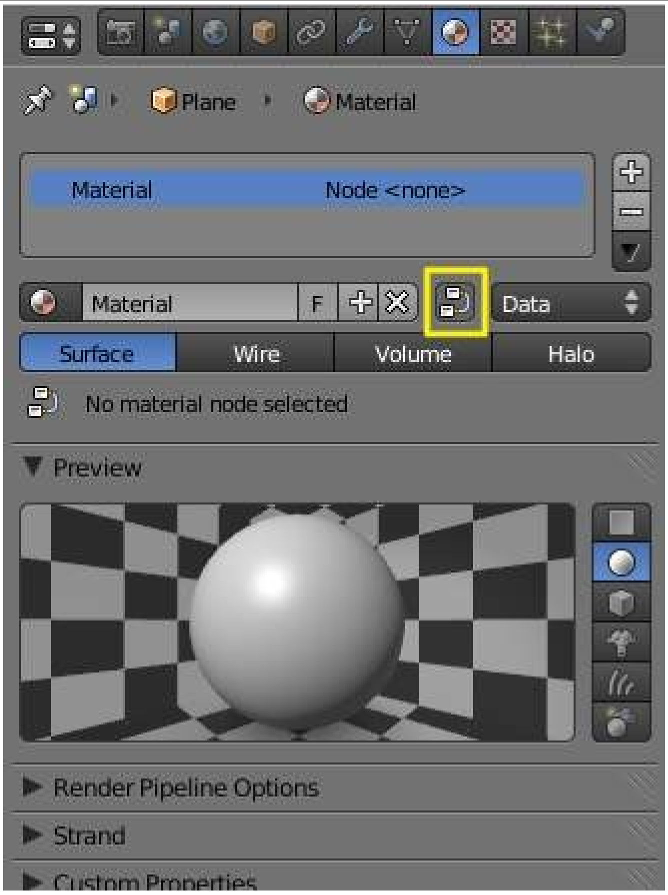
Making this node map is accomplished by working in a *Node Editor window.* This section covers:

- Enabling Material Nodes.
- The Node Editor window, its basic controls, and working with nodes.
- The specific types of nodes available for materials.

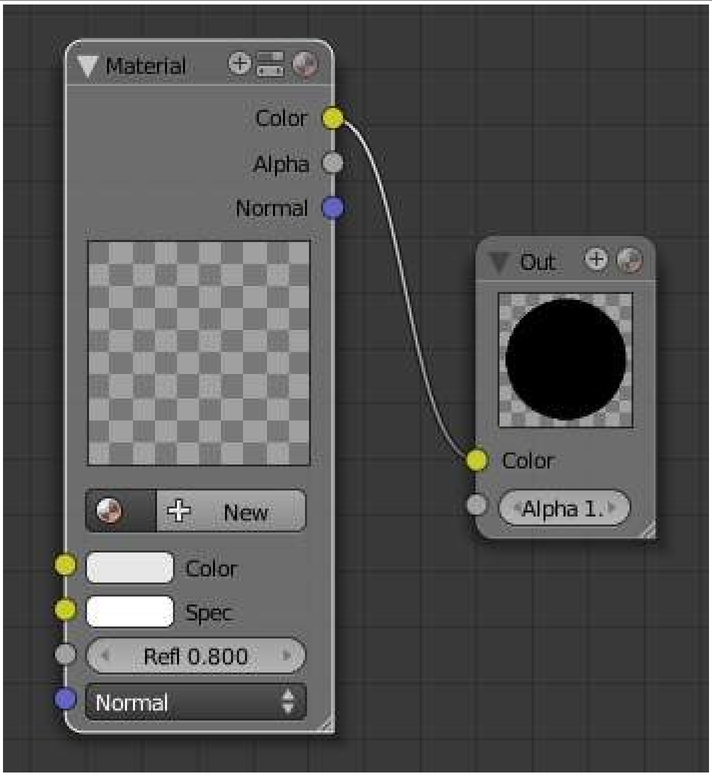
Accessing The Node Editor

First lets enter the *node editor* and make sure that the node editor has the material node button (the sphere icon) pressed, not the composite or texture node buttons.

Enabling Node Materials in the Material Buttons



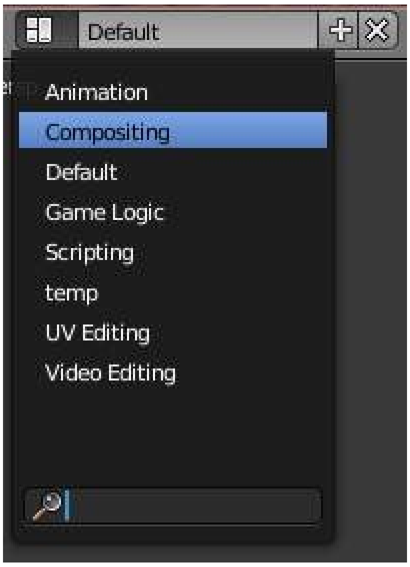
Material's menu with Nodes enabled



Default nodes

Let's take the base material and hit the Nodes button next to the material name in the material panel or the node editor. You will see a change in the material panel.

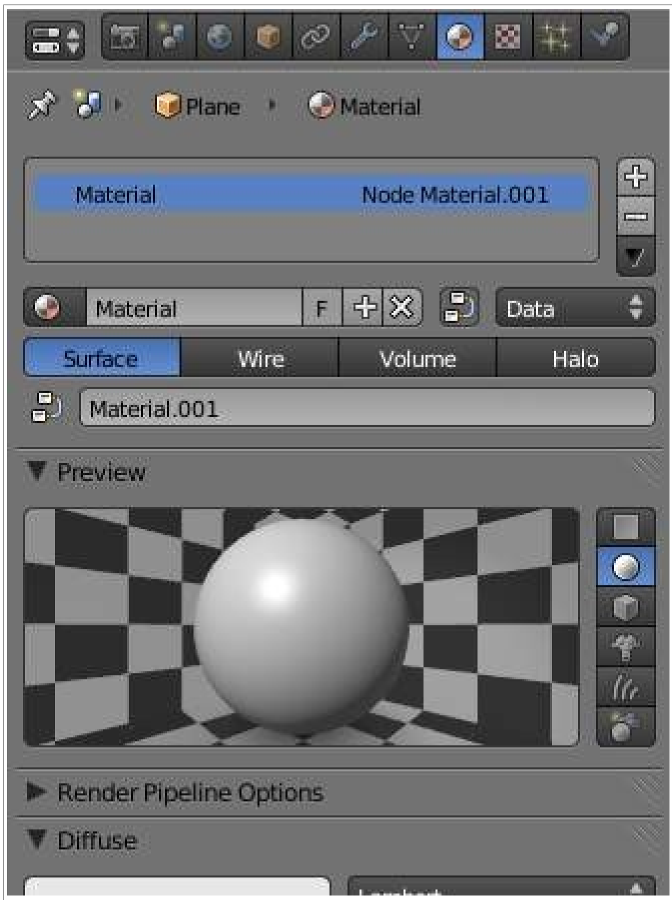
What you have just done is told Bforartists to make the material you were on to become the node tree. Most of the panels we normally find in the material menu are now gone.



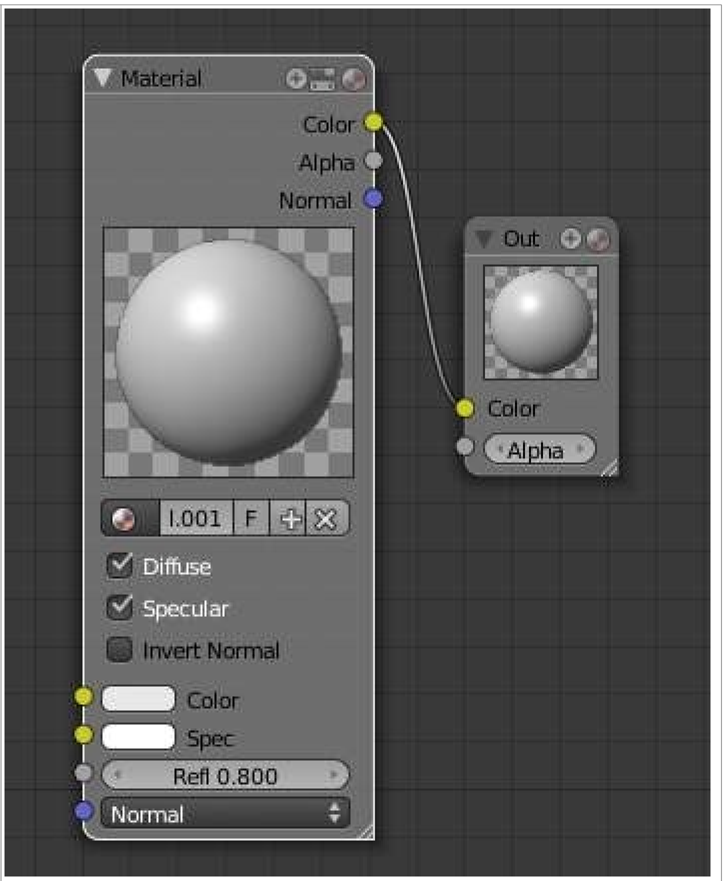
Accessing the Compositing screen

If you switch to the *Compositing* screen (`Ctrl-Left` if you are on the default screen) you'll find a *Node Editor* on the top half of the screen. When you enabled material nodes, a material node and an output node were automatically added to the node editor.

You can also split the 3D view in the default screen in two and change one into a *Node Editor.*



Material's menu with a first material added to the Node Editor



A first material added to the noodle

It is important to note that you can add a new material (which you can edit and change like any other material in the material panel), add an already created material or append a material from another Bforartists file, and also use the material that you used to create the node tree.

Here, we added a new material in the *Node editor* (*Material.001*), and as we did, we can access the properties of this material in the material's menu.

Types of Material Nodes

This section is organized by type of node, which are grouped based on similar functions:

Input
Introduces a material or component to the node map.

Output
Displays the result in progress as a small image.

Color
Manipulates the colors of the material.

Vector
Change the way light is reflected off the material.

Convertors
Convert colors to other material colors.

Node Types

- Color Nodes
  - MixRGB
  - RGB Curves
  - Invert
  - Hue Saturation Value
- Convertor Nodes
  - ColorRamp Node
  - RGB to BW Node
  - Math Node
  - Vector Math Node
  - Squeeze Value Node
  - Separate RGB Node
  - Combine RGB Node
  - Separate HSV Node
  - Combine HSV Node
- Input Nodes
  - Material Node
  - Extended Material Node
  - Camera Data Node
  - Lamp Data Node
  - Value Node
  - RGB Node
  - Texture Node
  - Geometry Node

- Output Node
- Vector Nodes
    - Normal Node
    - Mapping Node
    - Vector Curves

Color Nodes

MixRGB

MixRGB node

This node mixes a base color or image (threaded to the top socket) together with a second color or image (bottom socket) by working on the individual and corresponding pixels in the two images or surfaces. The way the output image is produced is selected in the drop-down menu. The size (output resolution) of the image produced by the mix node is the size of the base image. The alpha and Z channels (for compositing nodes) are mixed as well.

Not one, not two, but count 'em, sixteen mixing choices include:

See also

Color Blend Modes for details on each blending mode.

Inputs

Fac

The amount of mixing of the bottom socket is selected by the Factor input field (Fac:). A factor of zero does not use the bottom socket, whereas a value of `1.0` makes full use. In Mix mode, `0.5` is an even mix between the two, but in Add mode, `0.5` means that only half of the second socket's influence will be applied.

Color 1

Input color value. The value can be provided by another node or set manually. Includes a color swatch, allowing you to select the color directly on the node.

Color 2

Input color value. The value can be provided by another node or set manually. Includes a color swatch, allowing you to select the color directly on the node.

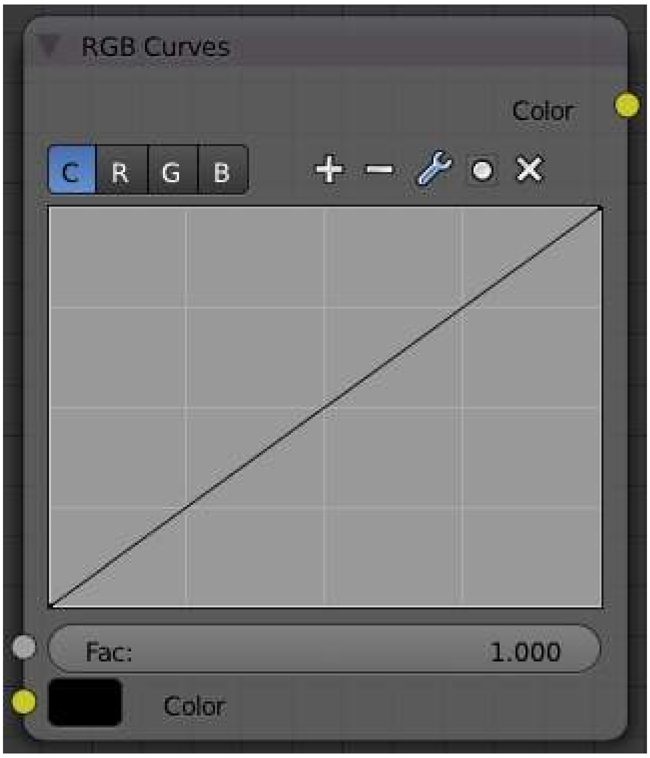
Outputs

Color
Value of the color, combined by the node.

Controls

Clamp
Clamp result of the node to 0...1 range.

RGB Curves



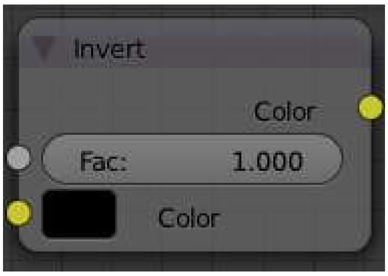
RGB Curves node

For each color component channel (RGB) or the composite (C), this node allows you to define a bezier curve that varies the input (x-axis) to produce an output value (y-axis). Clicking on one of the *C R G B* components displays the curve for that channel.

Note

- Read more about using the Curve Widget.
- *RGB Curves node in the compositor* (includes examples)

Invert



Invert node

This node simply inverts the input values and colors.

Inputs

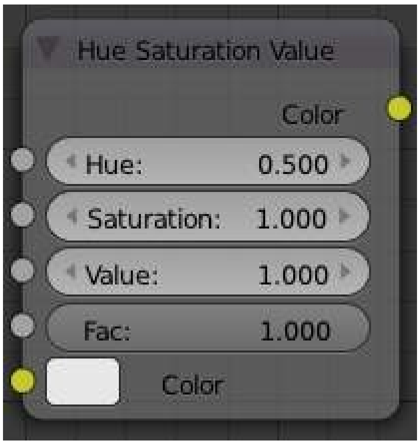
Fac:
: Factor. The degree of node's influence in node tree. The value can be provided by another node or set manually.

Color
: Input color value. The value can be provided by another node or set manually. Includes a color swatch, allowing you to select the color directly on the node.

Outputs

Color
: Value of the color, combined by the node.

Hue Saturation Value



Hue Saturation Value node

Use this node to adjust the Hue, Saturation, and Value of an input.

Inputs

Fac
: Factor. The degree of node's influence in node tree. The value can be provided by another node or set manually.

Hue

Input hue value of color. The value can be provided by another node or set manually.

Saturation

Input saturation value of color. The value can be provided by another node or set manually.

Value

Input HSV-Value of color. The value can be provided by another node or set manually.

Fac

Factor. The degree of node’s influence in node tree. The value can be provided by another node or set manually.

Color

Input color value. The value can be provided by another node or set manually. Includes a color swatch, allowing you to select the color directly on the node.

Outputs

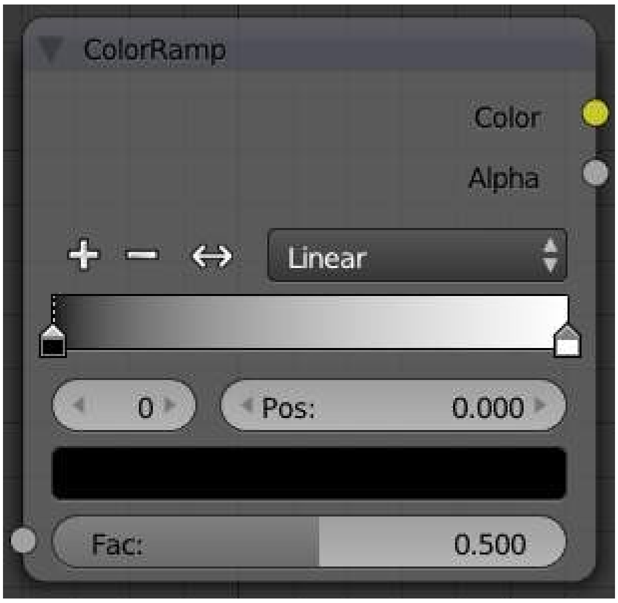
Color

Value of the color, combined by the node.

Convertor Nodes

As the name implies, these nodes convert the colors in the material in some way.

ColorRamp Node



ColorRamp node

The ColorRamp Node is used for mapping values to colors with the use of a gradient. It works exactly the same way as a *Colorband for textures and materials*, using the Factor value as a slider or index to the color ramp shown, and outputting a color value and an alpha value from the output sockets.

By default, the ColorRamp is added to the node map with two colors at opposite ends of the spectrum. A completely black black is on the left (Black as shown in the swatch with an Alpha value of 1.00) and a whitewash white is on the right.

To select a color, `LMB` click on the thin vertical line/band within the colorband. The example picture shows the black color selected, as it is highlighted white. The settings for the color are shown above the colorband as (left to right): color swatch, Alpha setting, and interpolation type.

Inputs

Fac:

Factor. The degree of node's influence in node tree. The value can be provided by another node or set manually.

Outputs

Color

Value of the color, combined by the node.

Alpha

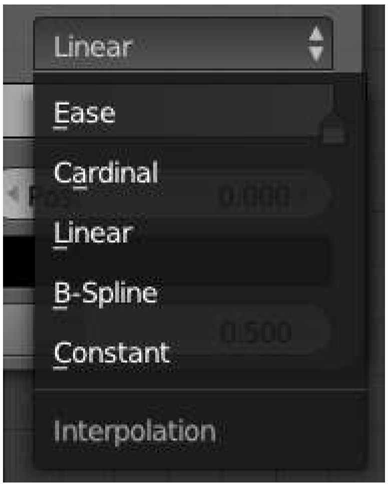
Value of the alpha, combined by the node.

Controls

Add a new mark to the center of the colorband with the default color (neutral gray).

Remove the currently selected mark from the colorband.

Flip the colorband.



Modes of interpolation between marker's values color ramp

Interpolation

Various modes of interpolation between marker's values can be chosen in the Interpolation menu:

Ease

Ease by quadratic equation.

Cardinal
Cardinal.
Linear
Linear (default). A smooth, consistent transition between colors.
B-Spline
B-Spline.
Constant
Constant.

Colorband

Colorband
Contain a gradient through a sequence of many colors (with alpha), each color acting across a certain position in the spectrum.

The number of the active mark.

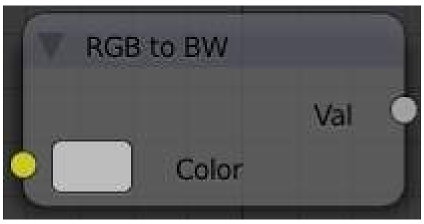
Pos. The position of the active color mark in the colorband (range 0.0–1.0). The position of the color marks can also be changed by LMB dragging them in the colorband.

Color swatch to color selection for a mark

Color *Selector*
Allows set color and alpha values for each marker.

See more details about node controls' functions *here*.

RGB to BW Node



RGB to BW node

This node converts a color image to black-and-white.

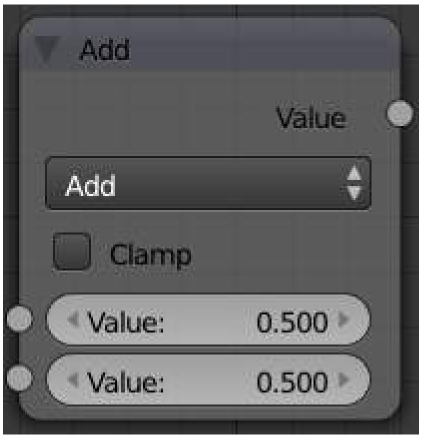
Inputs

Color:
Input color value. Includes a color swatch, allowing you to select the color directly on the node.

Outputs

Value
Black-and-white value of the input color, converted by the node.

Math Node



Math node

This node performs the selected math operation on an image or buffer. All common math functions are supported. If only an image is fed to one Value socket, the math function will apply the other Value consistently to every pixel in producing the output Value. Select the math function by clicking the up-down selector where the “Add” selection is shown.

Inputs

Value
Input value 1 (upper). The value can be provided by another node or set manually.
Value
Input value 2 (lower). The value can be provided by another node or set manually.

Outputs

Value
Output value, converted by the node.

Controls

Clamp
Clamps the result between 0 and 1.
Operation

Selector the math function for conversion.

Add

Add the two inputs

Subtract
: Subtract input 2 from input 1

Multiply
: Multiply the two inputs

Divide
: Divide input 1 by input 2

Sine
: The sine of input 1 (degrees)

Cosine
: The cosine of input 1 (degrees)

Tangent
: The tangent of input 1 (degrees)

Arcsine
: The arcsine (inverse sine) of input 1 (degrees)

Arccosine
: The arccosine (inverse cosine) of input 1 (degrees)

Arctangent
: The arctangent (inverse tangent) of input 1 (degrees)

Power
: Input 1 to the power of input 2 (input1^input2)

Logarithm
: Log base input 2 of input 1

Minimum
: The minimum of input 1 and input 2

Maximum
: The maximum of input 1 and input 2

Round
: Rounds input 1 to the nearest integer

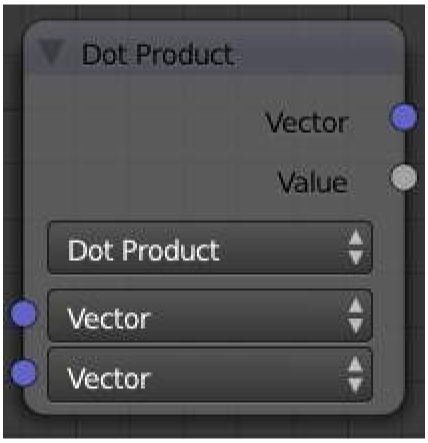
Less Than
: Test if input 1 is less than input 2, returns 1 for true, 0 for false

Greater Than
: Test if input 1 is greater than input 2, returns 1 for true, 0 for false

Modulo
: Division of input 1 by input 2 with remainder.

Absolute
: Always return non-negative value from any operation input 2 between input 1.

Vector Math Node



Vector Math node

This node performs the selected math operation on vectors. Select the math function by clicking the up-down selector where the “Add” selection is shown.

Inputs

Vector
: Input vector 1 (upper). The value can be provided by another node or set manually.

Vector
: Input vector 2 (lower). The value can be provided by another node or set manually.

Outputs

Vector
: Output vector, converted by the node.

Value
: Output value, converted by the node.

Controls

Operation

Selector the math function for conversion.

Add
: Adding input 1 and 2.

Subtract
: Subtracting input 1 and 2.

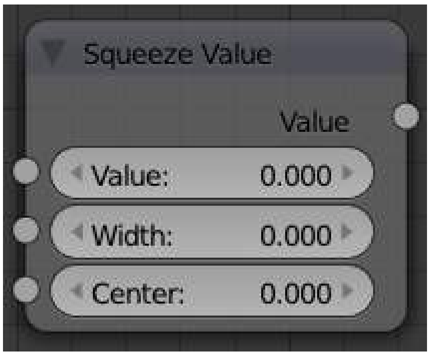
Average
: Averaging input 1 and 2.

Dot Product
: Algebraic operation that takes two equal-length sequences of vectors 1 and 2 and returns a single number. Result - scalar.

Cross Product
: Geometric binary operation on two vectors 1 and 2 in three-dimensional space. It results in a vector which is perpendicular to both and therefore normal to the plane containing them. Result - vector.

Normalize
: Normalizing input 1 and 2.

Squeeze Value Node



Squeeze Value node

This node is used primarily in conjunction with the Camera Data node used. The camera data generate large output values, both in terms of the depth information as well as the extent in the width. With the squeeze Node high output values to an acceptable material for the node degree, ie to values between 0.0 - 1.0 scaled down.

Inputs

Value
Any numeric value. The value can be provided by another node or set manually.

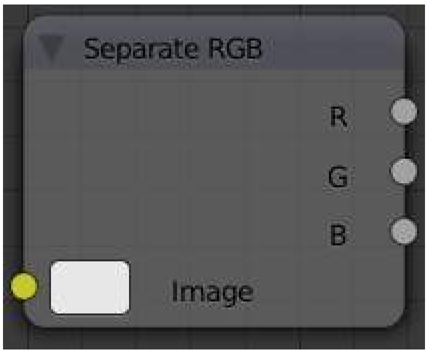
Width
Determines the curve between sharp S-shaped (width = 1) and stretched (Width = 0.1). Negative values reverse the course. The value can be provided by another node or set manually.

Center
The center of the output value range. This input value is replaced by the output value of 0.5. The value can be provided by another node or set manually.

Outputs

Value
A value between 0 and 1, converted by the node.

Separate RGB Node



Separate RGB node

This node separates an image into its red, green and blue channels. The colors are then converted to intensity, which returns a greyscale to the output. For example, if you have an image with pure green, then the red and blue outputs will be black and the green output will be completely white. Mixed colors will return mixed values according to their RGB intensity.

Inputs

Image
Input color value. Includes a color swatch, allowing you to select the color directly on the node.

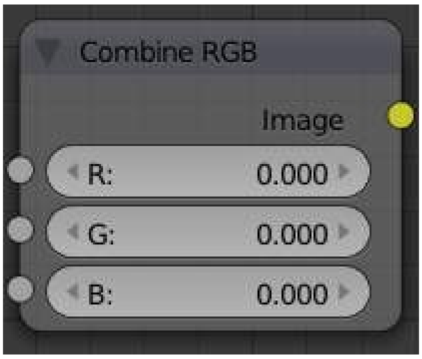
Outputs

R
Value of the red color channel, separated out by the node.

G
Value of the green color channel, separated out by the node.

B
: Value of the blue color channel, separated out by the node.

Combine RGB Node



Combine RGB node

This node combines a color (image) from separated red, green, blue channels.

Inputs

R
: Input value of red color channel. The value can be provided by another node or set manually.

G
: Input value of green color channel. The value can be provided by another node or set manually.

B
: Input value of blue color channel. The value can be provided by another node or set manually.

Outputs

Image
: Output value of the color, combined by the node.

Separate HSV Node

Separate HSV node

This node separates an image into image maps for the hue, saturation, value channels. Three values, often considered as more intuitive than the RGB system (nearly only used on computers)

Use and manipulate the separated channels for different purposes; i.e. to achieve some compositing/color adjustment result. For example, you could expand the Value channel (by using the multiply node) to make all the colors brighter. You could make an image more relaxed by diminishing (via the divide or map value node) the Saturation channel. You could isolate a specific range of colors (by clipping the Hue channel via the Colorramp node) and change their color (by the Add/Subtract mix node).

Inputs

Color
: Input color value. Includes a color swatch, allowing you to select the color directly on the node.

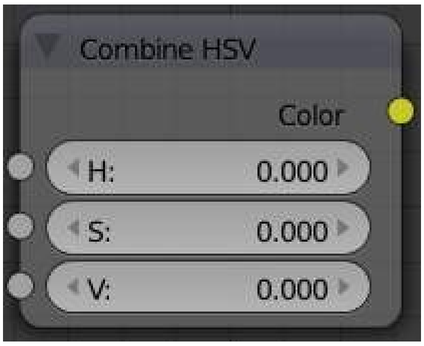
Outputs

H
: Value of the **hue** color channel, separated out by the node (choose a color of the rainbow).

S
: Value of the saturation color channel, separated out by the node (the *quantity* of hue in the color (from desaturate - shade of gray - to saturate - brighter colors)).

V
: Value of the value color channel, separated out by the node (the **luminosity** of the color (from ‘no light’ - black - to ‘full light’ - ‘full’ color, or white if Saturation is 0.0)).

Combine HSV Node



Combine HSV node

This node combines a color from separated hue, saturation, value color channels.

Inputs

H
: Input value of hue color channel. The value can be provided by another node or set manually.

S
: Input value of saturation color channel. The value can be provided by another node or set manually.

V
: Input value of value color channel. The value can be provided by another node or set manually.

Outputs

Color
: Output value of the color, combined by the node.

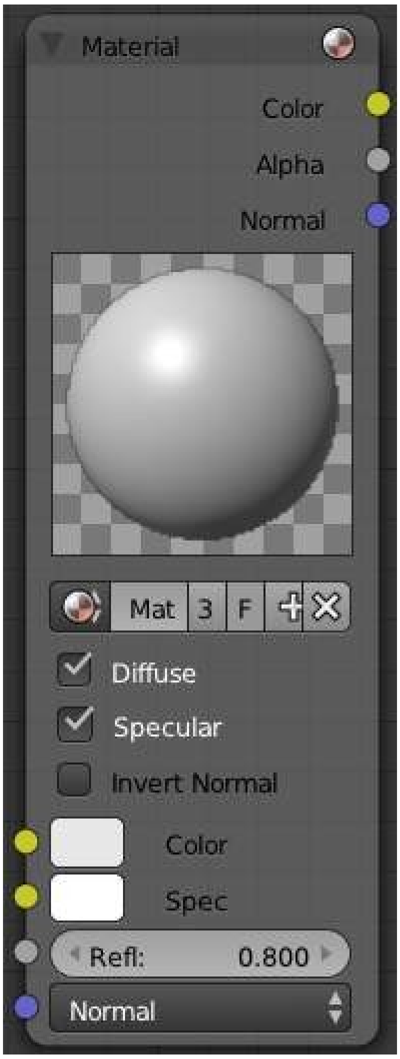
Input Nodes

A starting material is created in the Materials Panel. The *Nodes* button is enabled to add that material to the list of noded materials shown in the Node Editor window header. Other inputs to the node map include:

- A value
- A color
- A texture
- Geometry
- Material
- Camera Data
- Lamp Data

Material Node

Reference
Panel: *Node Editor –> Material Nodes* Menu: Input –> Material



Material node

The Material node is used to add a material to the node program. Materials can be anything from pure shading to fully layered with textures. It inputs the main attributes of a material (color, alpha and normal vector) into the map.

Output

Materials can output color (which includes shading and any textures assigned to it), alpha, and the final normal calculated from any textures it has.

Color
value of the color, combined by the node.

Alpha
value of the alpha, combined by the node.

Normal
direction of the normal, combined by the node.

Input

Materials can take inputs for colors, inputs for diffuse color and specularity color, a value for reflectivity, and a normal.

Color

The base color of the paint. Can be set

- manually by `LMB` clicking on the color swatch applet next to the socket, choosing a color using the control panel that pops up, and pressing `Return`
- based on an Active Material which is specified using the material panels, or
- plugged in from an RGB color generator.

Spec

The color that is reflected as you get perpendicular to the light source reflecting off the surface. The color can be

- plugged in from another node or...
- set manually by `LMB` clicking on and using the color swatch applet.

Refl:
The degree to which the material reflects light and gives off its color. The value can be provided by another node or set manually.

Normal
The lighting condition.

Controls

Material field
You can browse and select materials here.

Diffuse toggle
Turn on/off Diffuse Color.

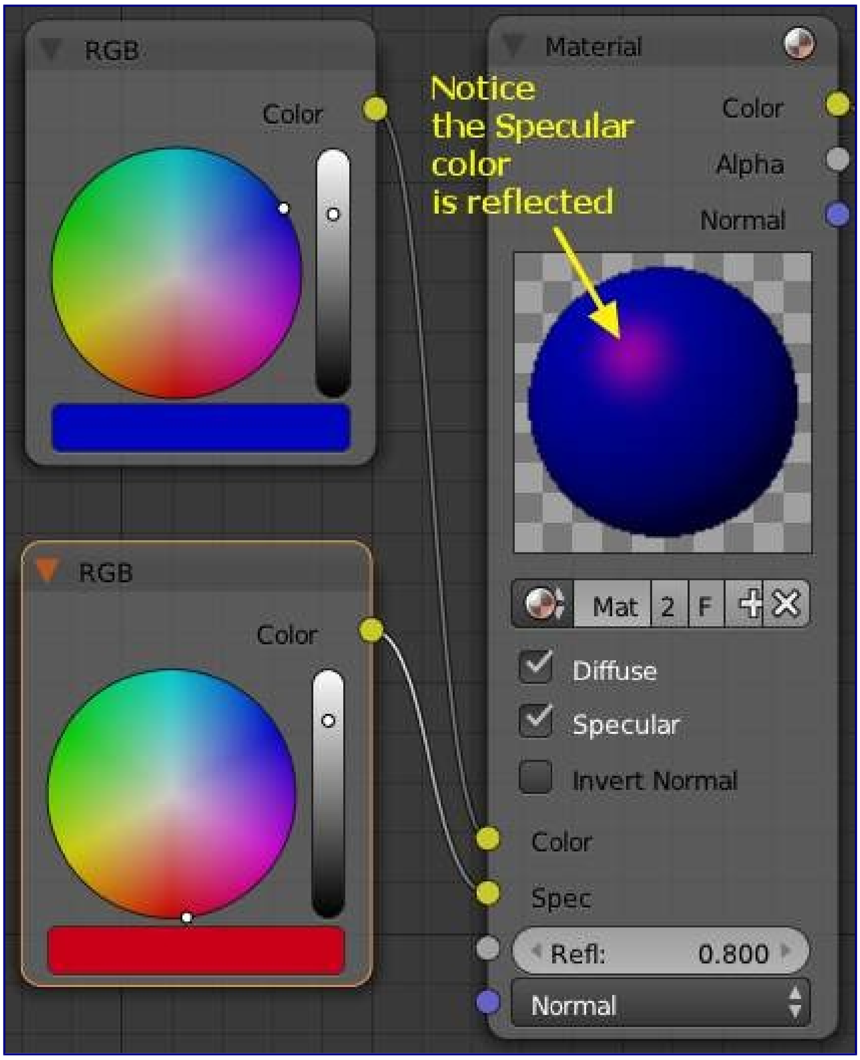
Specular toggle
Turns on/off Specularity calculation.

Invert Normal toggle

Inverts the material input normal when activated (which, of course, is a combination of the 3D normal given to it by the 3D object plus the normal input point).

Note
Normal Override The normal input socket does not in any way blend the source normal with the underlying geometry. Any plugged in Geometry here overrides the Normal lighting conditions.

Using the Material Node with Specularity



Material Node using Specularity

To make a material node actually generate a color, you have to specify at least a basic input color, and optionally a specularity color. The specularity color is the color that shines under intense light.

For example, consider the mini-map to the right. The base color, a dark blue, is connected from an RGB color generator node to the *Color* input socket. The specular color, yellow, is connected to the *Spec* input. Under *Normal* lighting conditions on a flat surface, this material will produce a deep blue color and, as you approach a spot perpendicular to the light, you will see the yellow specular color mix in.

Note
Enable Spec To see specularity, you have to enable it by clicking the blue Spec button located just below the material color swatch in the node.

Extended Material Node

Extended Material node

Adds additional input and output channels to the material node.

Input

Color
: Includes a color swatch, allowing you to select the color directly on the node.

Mirror Color
: Color of mirrored reflection.

Ambient
: Amount of global ambient color the material receives.

Emit
: Amount of light to emit.

SpecTra
: Alpha for the specular color.

Ray Mirror
: Amount of reflectiveness of the object.

Alpha
: Transparency of the material by setting all pixels in the alpha channel to the given value.

Translucency
: Amount of diffuse shading on the back side

Output

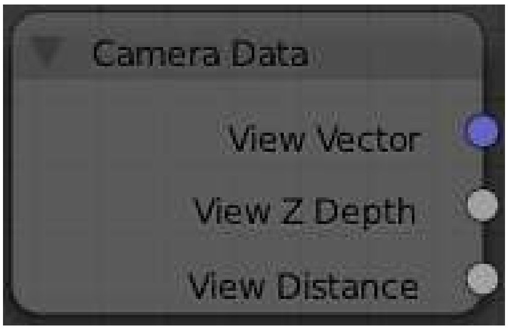
Materials can additionaly output the followings:

Diffuse
: value of the diffuse color, combined by the node.

Spec
: value of the specular color, combined by the node.

AO
: value of the Ambient Occlusion, combined by the node.

Camera Data Node



Camera Data node

View Vector
: A Camera space vector from the camera to the shading point.

View Z Depth
: How far away each pixel is from the camera

View Distance
: Distance from the camera to the shading point.

Lamp Data Node

Lamp Data node

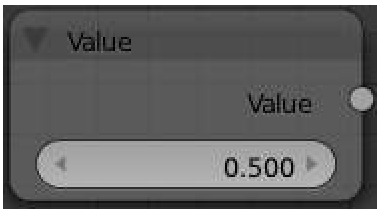
The Lamp Data node is used to obtain information related to a specified lamp object. Select a lamp object listed in the Lamp field, then the following outputs will be available:

Color
  Lamp color multiplied by the lamp energy.
Light Vector
  An unit vector in the direction from the shading point to the lamp.
Distance
  Distance from the shading point to the lamp.
Shadow
  Shadow color that the other objects cast on the shading point.
Visibility Factor
  Light falloff ratio at the shading point.

The light textures and the shadow textures affect the Color and Shadow outputs, respectively.

Note
Portability to Various Scenes If multiple materials use a Lamp Data node linking to the same lamp object, including the Lamp Data node into a node group is recommended. Otherwise, when the mesh objects are imported to the other scene, all the materials may need to be modified.

Value Node



Value node

The Value node has no inputs; it just outputs a numerical value (floating point spanning 0.00 to 1.00) currently entered in the NumButton displayed in its controls selection.

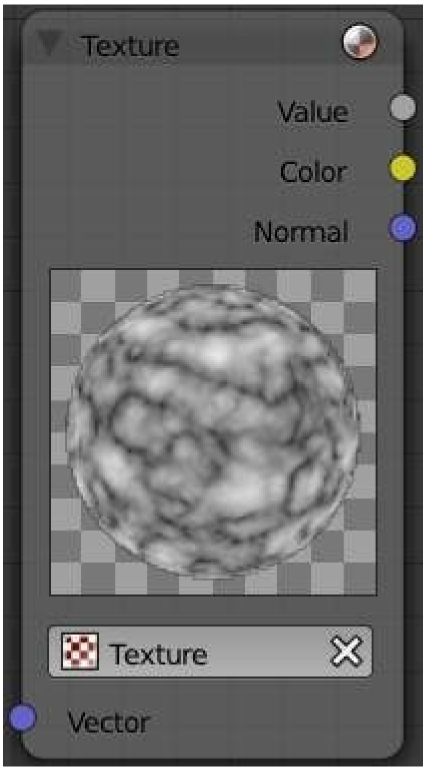
Use this node to supply a constant, fixed value to other nodes' value or factor input sockets.

RGB Node

RGB node

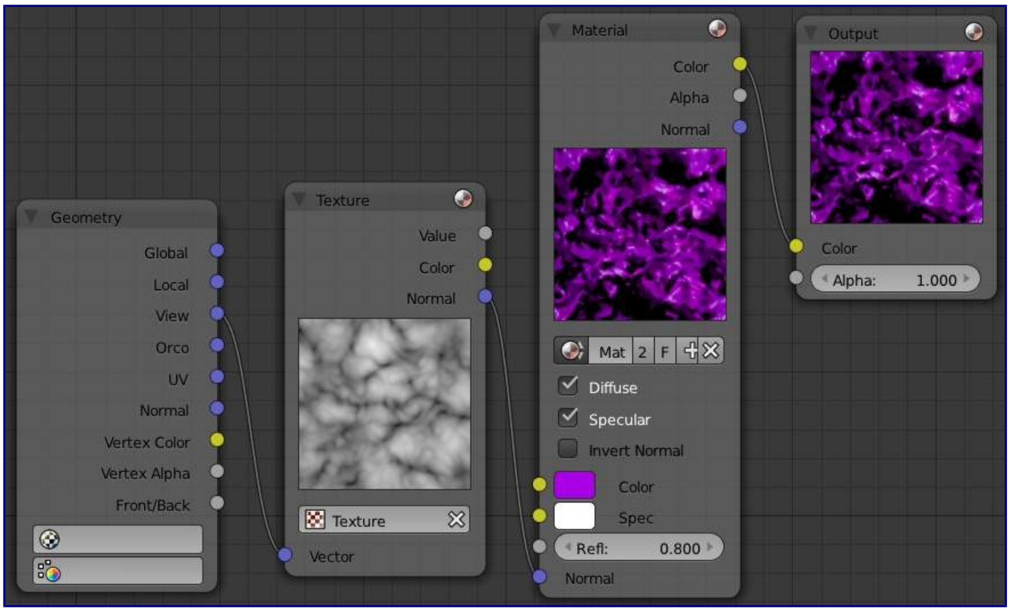
The RGB node has no inputs. It just outputs the value Color currently selected in its controls section.

Texture Node



Texture node

A texture, from the list of textures available in the current blend file, is selected and introduced through the value and/or color socket.



Example of the applying Texture node

Input

Vector

Uses for map the texture to a specific geometric space.

Outputs

Value

Straight black-and-white value of the texture, combined by the node.

Color

Texture color output, combined by the node.

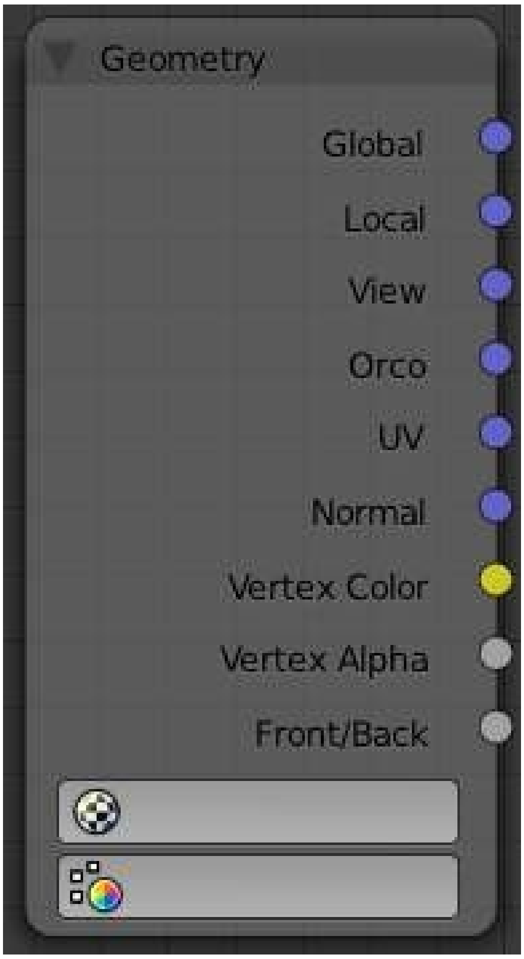
Normal

Direction of normal texture, combined by the node.

In the example to the right, a cloud texture, as it would appear to a viewer, is added to a base purple material, giving a velvet effect.

Note that you can have multiple texture input nodes. With nodes, you simply add the textures to the map and plug them into the map.

Geometry Node



Geometry node

The geometry node is used to specify how light reflects off the surface. This node is used to change a material's Normal response to lighting conditions.

Use this node to feed the Normal vector input on the Material node, to see how the material will look (i.e. shine, or reflect light) under different lighting conditions. Your choices are:

Global
: Global position of the surface.

Local
: Local position of the surface.

View
: Viewed position of the surface.

Orco
: Using the Original Coordinates of the mesh.

UV
: Using the UV coordinates of the mesh, selected in the field in bottom node.

Normal
: Surface Normal; On a flat plane with one light above and to the right reflecting off the surface.

Vertex Color
: Allows for output value of group vertex colors, selected in the field in bottom node.

Vertex Alpha
: Allows for output alpha value of vertex.

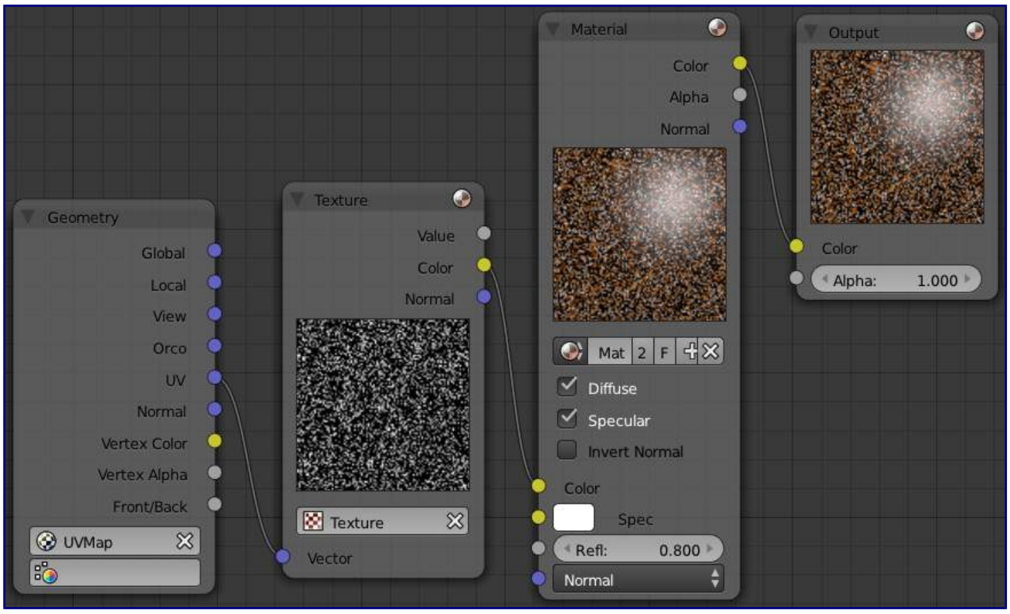
Front/Back

Allows for output to take into account front or back of surface is light relative the camera.

Note

These are exactly the same settings as in the *Mapping* panel for *Textures*, though a few settings - like *Stress* or *Tangent* - are missing here. Normally you would use this node as input for a Texture Node.

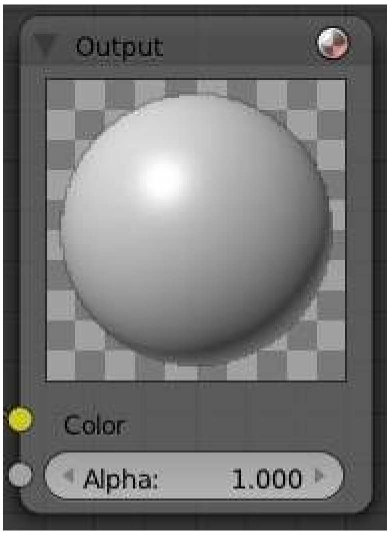
Geometry Node Example using a UV image



Setup to render an UV-Mapped Image Texture.

E.g.: To render an UV-mapped image, you would use the *UV* output and plug it into the *Vector* Input of a texture node. Then you plug the color output of the texture node into the color input of the material node - which corresponds to the setting on the *Map To* panel.

Output Node



Output material node

At any point, you may want to see the work in progress, especially right after some operation by a node. Simply create another thread from the output socket of the node to the picture input socket of an Output node to see a mini-picture.

Connect the alpha channel to set/see transparency.

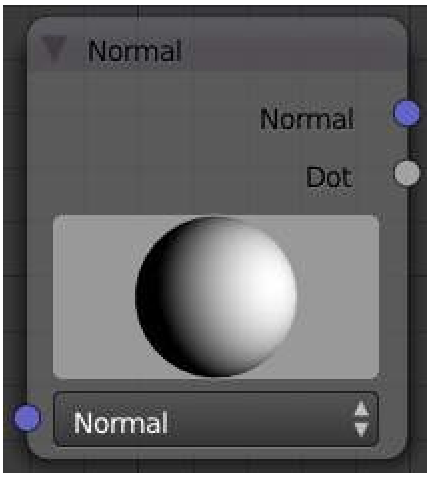
Note
Effective Output Node The only Output node that is used for the Material in the end (i.e the only non-Preview) has a little **red sphere** on the upper right.

Vector Nodes

Vector nodes manipulate information about how light interacts with the material, multiplying vector sets, and other wonderful things which can become quite advanced. Even if you don't have experience with vector maths, you'll find these nodes to be very useful.

Vectors, in general, are two or three element values, for example, surface normals are vectors. Vectors are also important for calculating shading.

Normal Node



Normal node

The Normal node generates a normal vector and a dot product. Click and Drag on the sphere to set the direction of the normal.

This node can be used to input a new normal vector into the mix. For example, use this node as an input to a Color Mix node. Use an Image input as the other input to the Mixer. The resulting colorized output can be easily varied by moving the light source (click and dragging the sphere).

The (face) normal is the direction of the face in relation to the camera. You can use it to do the following:

- Use this node to create a fixed direction –> output *Normal*.
- Calcuate the *Dot* -Product with the *Normal* -Input. The *Dot* -Product is a scalar value (a number).
    - If two normals are pointing in the same direction the *Dot* -Product is 1.
    - If they are perpendicular the *Dot* -Product is zero (0).
    - If they are antiparallel (facing directly away from each other) the *Dot* -Product is -1. *And you never thought you would use the Vector Calculus class you took in college - shame on you!*

So now we can do all sorts of things that depends on the viewing angle (like electron scanning microscope effect). And the best thing about it is that you can manipulate the direction interactively.

Note

One caveat

The normal is evaluated per face, not per pixel. So you need enough faces, or else you don't get a smooth result

Inputs

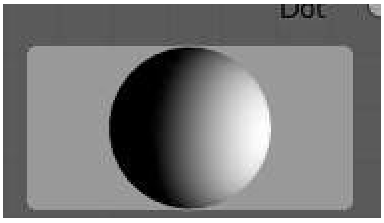
Normal
: 3D-direction of the face in relation to the camera. The value can be provided by another node or set manually.

Outputs

Normal
: Fixed 3D-direction, combined by the node.

Dot
: Scalar value (a number), combined by the node.

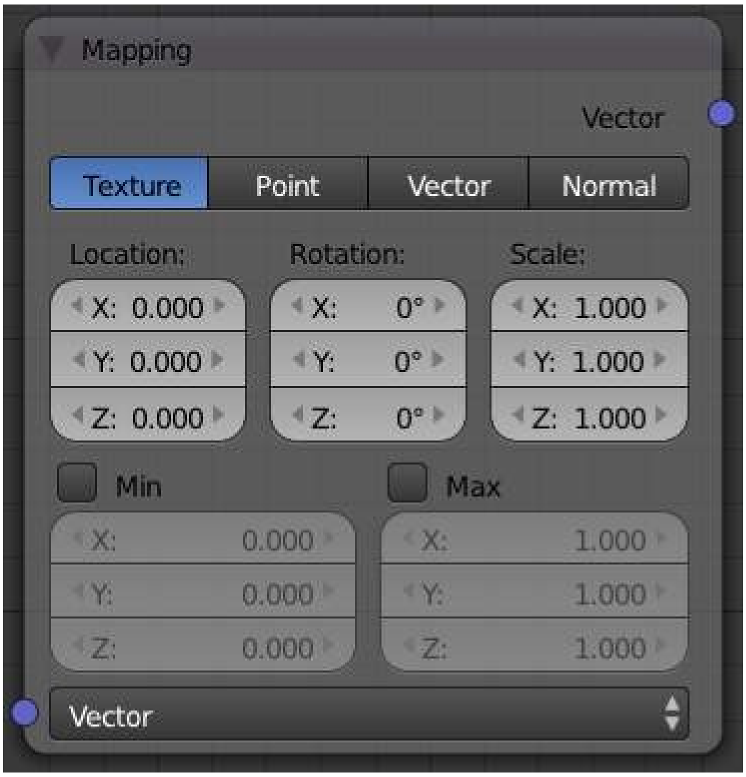
Controls



Interactive Normal node preview

Interactive node preview
: Allows click and drag on the sphere in node center to set the direction of the normal.

Mapping Node



Mapping node

Essentially mapping node allows the user to modify a mapping of system of 3D-coordinates. Typically used for modifying texture coordinates.

Mapping can be rotated and clamped if desired.

Inputs

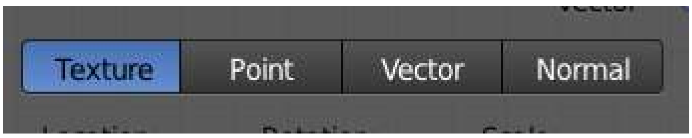
Vector
: The input vector (3D-direction in relation to the camera) of some the coordinates' mapping. The value can be provided by another node or set manually.

Outputs

Vector
: The output vector, combined by the node.

Controls

The controls of the node have been ordered in X, Y, Z order. If you want to use the clamping options, try enabling Min and Max.

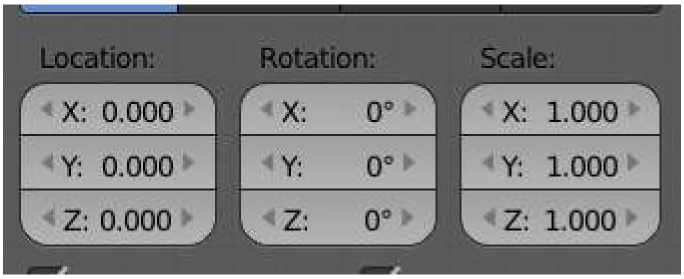


Mapping Node Vector Types controls

Vector type selector

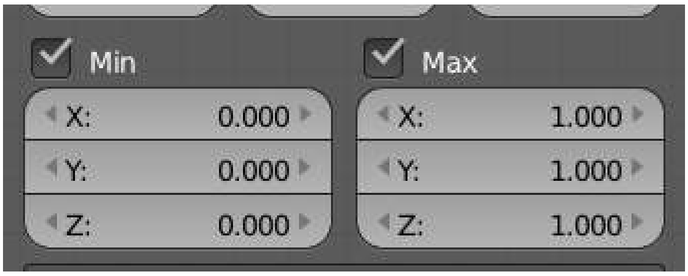
Type of vector that the mapping transforms.

Texture
Transform a texture by inverse mapping the texture coordinates.
Point
Transform a point.
Vector
Transform a direction vector.
Normal
Transform a normal vector with unit length.



Mapping Node Transforms controls

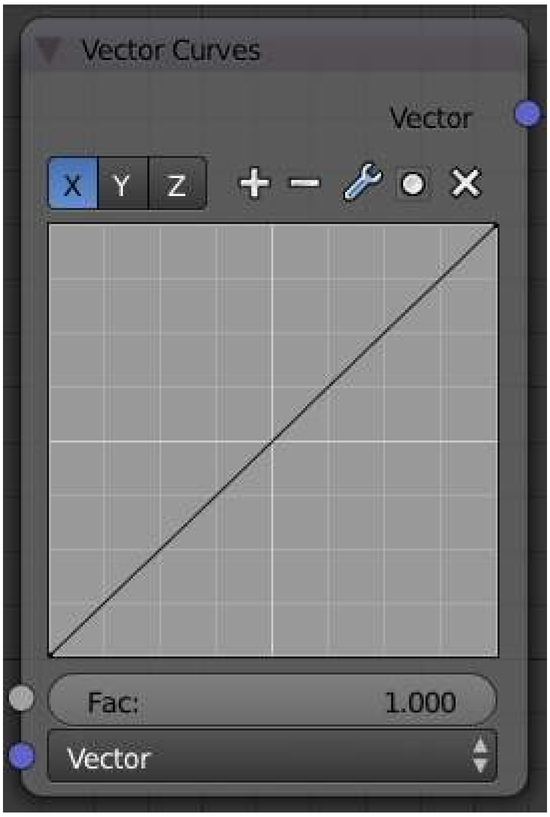
Location
Transform position vector.
Rotation
Transform rotation vector.
Scale
Transform scale vector.



Mapping Node Clipping controls

Min
Minimum clipping value.
Max
Maximum clipping value.

Vector Curves



Vector Curves node

The Vector Curves node maps an input vector X, Y, and Z components to a diagonal curve. Use this node to remap a vector value using curve controls.

See also

- Read more about using the Curve Widget.

Inputs

Fac:
Factor. The degree of node's influence in node tree. The value can be provided by another node or set manually.

Vector
The input vector (3D-direction in relation to the camera). The value can be provided by another node or set manually.

Outputs

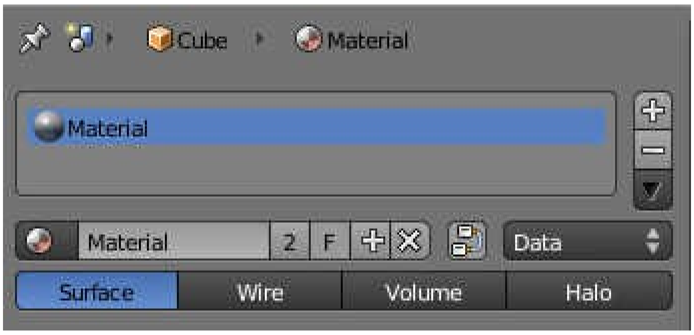
Vector
The output vector, combined by the node.

Options

Materials

Materials can be linked to objects and Object's data in the materials panel, of the Shading/Material context. Here is where you can manage how materials are linked to objects, meshes, etc. and activate a material for editing in the rest of the panels.

Context



Material panel

At the top of the material menu a list of icons explains the context in which the material is being edited. In the example above, the material *Material* is linked to the object *Cube* which is linked to the scene *Scene*.

By toggling the pin symbol on the left side on and off, Bforartists can be told to display only the selected material or to follow context.

Material slots

With a material linked or created, one or several material slots can be created and further options become available:

Plus sign
: Add a new material slot or copy the one selected

Minus sign
: Remove selected material slot

Down arrow
: Copy and paste the selected material slot

Multiple materials

Meshes can handle having more than one material. Materials can be mapped on a per-face basis, as detailed on the *Multiple Materials* page. In edit mode, the following tools appear:

Assign
: Assign the material in the selected material slot to selected vertices

Select
: Select vertices assigned to the selected material slot

Deselect
: Deselect vertices assigned to the selected material slot

Material naming and linking

Link material to object or to object's data

Material's name field
click into this field to rename your material

Number of users (number field)
The number of objects or object's data that use the material. This material is linked between the various objects, and will update across all of them when edited. Clicking this number will make a 'single user copy', duplicating the material, with it linked only to the active object/object's data.

F (Fake user)
Gives the material a 'fake user', to keep the material data-block saved in the .blend file, even if it has no real users.

Plus sign
Add a new material.

X sign
Remove link to this material.

Nodes
Designates this material to be a material node noodle, and not from the Material/Ramps/Shaders settings.

Data-block links

The Link pop-up menu has two choices, Data and Object. These two menu choices determine whether the material is linked to the object or to the data, (in this case, the mesh). The Data menu item determines that this material will be linked to the mesh's data-block which is linked to the object's data-block. The Object menu item determines that the material will be linked to the object's data block directly.

This has consequences of course. For example, different objects may share the same mesh data-block. Since this data-block defines the shape of the object any change in edit mode will be reflected on all of those objects. Moreover, anything linked to that mesh data-block will be shared by every object that shares that mesh. So, if the material is linked to the mesh, every object will share it.

On the other hand, if the material is linked directly to the object data-block, the objects can have different materials and still share the same mesh.

Short explanation: If connected to the object, you can have several instances of the same obData using different materials. If linked to mesh data, you can't.

Material type

Material added in edit mode These toggles tell Bforartists where this material fits into the Render Pipeline, and what aspects of the material are to be rendered.

Surface
Render object as a surface

Wire
Render the edges of faces as wires (not supported in ray tracing)

Volume
  Render object as a volume. See Volume Material
Halo
  Render object as halo particles. See Halo Material

Material Properties Overview

The usage of each section of the material properties are detailed in the next section.

Surface and Wire materials

Surface material types are the most common materials. They represent objects with a defined surface.

Wire materials simply turn all of an object’s edges into rods, which then become renderable, but uses the same shading options as surface materials.

Preview

This is a preview of the current material mapped on to one of several objects.

- Flat Plane
- Sphere
- Cube
- Monkey
- Strands
- Large Sphere with Sky

See *Preview*

Diffuse

Diffuse shading simulates light hitting a surface and bouncing off in a very wide angle. You can set the color of the diffuse shading, and set what model is used for the diffuse calculation.

See *Diffuse Shaders*

Specular

Specularity simulates reflections of light sources, that are often sharp, bright spots. You can set the color of the specular shading, and set what model is used for the specular calculation.

See *Specular Shaders*

Shading

Emit
  Adds extra illumination, as if the material is glowing.
Ambient
  Sets the global amibient light the material receives
Translucency
  Amount of shading on the back side that shows through. Use to simulate thin objects, like leaves or paper.
Shadeless
  This disables the calculation of any shading, so only color information is visible. This is essentially makes

it a “surface shader”

Tangent Shading

Use the material’s tangent vector instead of the normal for shading - for anisotropic shading effects (e.g. soft hair and brushed metal). This shading was introduced in 2.42, see also settings for strand rendering in the menu further down and in the Particle System menu.

Cubic Interpolation

Use cubic interpolation for diffuse values, for smoother transitions between light areas and dark areas

Transparency

Set options for objects in which light can pass through

See *Transparency*

Mirror

Here you can set options for materials that are reflective

See *Mirror*

Subsurface Scattering

Subsurface scattering simulates semi translucent objects in which light enters, bounces around, then exits in a different place. Examples are candles, human skin, cheese, etc.

See *Subsurface Scattering*

Strand

These settings are used when rendering the material on fur or hair

See *Strands*

Options

Traceable

Allows material to calculated raytracing, for reflections and refractions.

Full Oversampling

Forces material to render full shading and textures for all Anti-Aliasing Samples.

Sky

Renders material with no alpha, replacing the background with the sky

Use Mist

Uses Mist with this material.

Invert Z Depth

Renders materials faces with an inverted Z buffer.

Z Offset

If using Invert Z Depth, this is an artificial offset to z values.

Light Group

Limit material’s lighting calculation to a specific light group

Exclusive

Material uses light group exclusively

Face Textures

Replaces object’s base color with color from face assigned image textures.

Face Textures Alpha

Replaces object’s base alpha value with alpha from face assigned image textures.

Vertex Color Paint
    Replaces object’s base color with vertex colors.
Vertex Color Light
    Adds vertex color as additional light.
Object Color
    Modulate the result with a per object color.

Shadow

Receive
    Allows the material to receive shadows cast by other objects
Receive Transparent
    Allows material to receive transparent shadows cast by other transparent objects.
Cast Only
    Causes objects with the material to only cast a shadow, and not appear in renders.
Casting Alpha
    Sets the Alpha of shadow casting. Used for irregular and deep shadow buffering.
Shadows Only
    Renders shadows as materials alpha value, making materials transparent, except for shadowed areas.
Shadow Only Type

    Set the type of shadows used when Shadows Only is enabled

- Shadow and Distance
- Shadow Only
- Shadows and Shading

Cast Buffer Shadow
    Allows material to cast shadows from buffer lamps.
Buffer Bias
    Factor to multiply shadow buffer by.
Auto Ray Bias
    Prevents raytraced shadow errors on surfaces with smooth normals
Ray Bias
    Shadow raytracing bias value to prevent terminator artifacts on shadow boudary.
Cast Approximate
    Allow material to cast shadows when using Approximate Ambient Occlusion}}

Volume Material

Volume materials represent volumes of tiny particles, like clouds or smoke. They are very different from standard materials, but are detailed in the *Volume* Page.

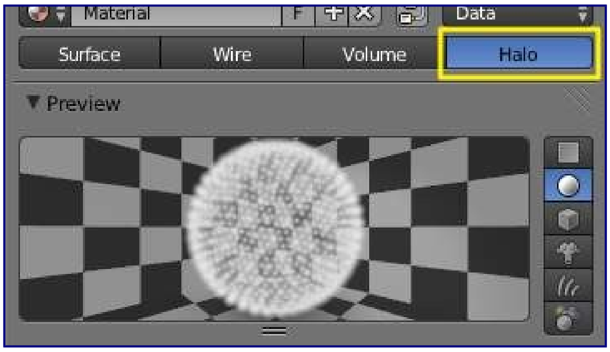
Halo Material

Halo materials renders each of the objects points as glowing dots. This is a useful material for simulating particle effects or lens flares. They are detailed on the *Halo* Page.

Special Material Effects

- Halo Rendering

Halo Rendering

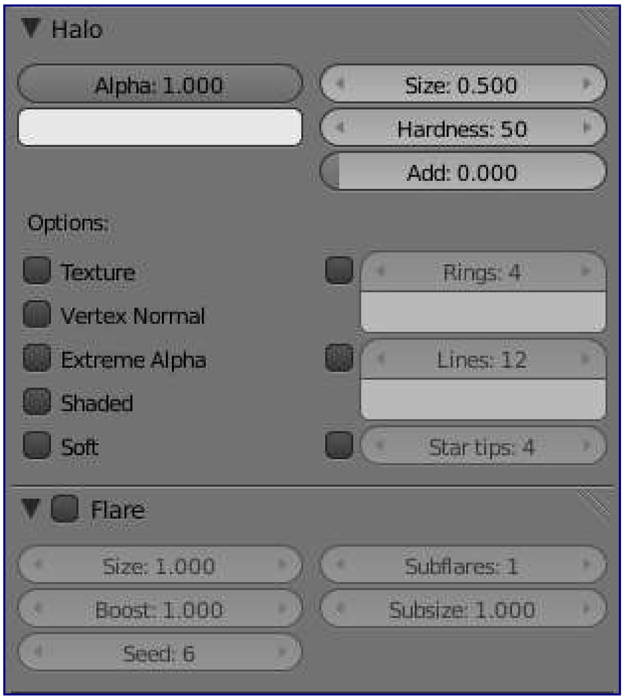


Activating helo rendering

Bforartists provides a set of materials which do not obey the face-shader paradigm and which are applied on a per-vertex rather than on a per-face basis. These are called *Halos* because you can see them, but they do not have any substance. They are like little clouds of light; although they are not really lights because they do not cast light into the scene like a lamp.

Halos come in very handy when creating certain special effects, when making an object glow, or when creating a viewable light or fog/atmospherics around an actual light.

Options



Halo panels

To enable *Halos*, press the *Halo* button in the *Material* menu’s top panel.

As you will see in the 3D View, the mesh faces are no longer rendered. Instead just the vertex is rendered, since that is where each halo will originate. Halos can be hard to find in a crowded scene, so name it well for easy location in *the outliner.*

In the properties window, where we normally find the *Diffuse*, *Specular,* and *Shading* panels, we now see panels relative to the *Halo* characteristics:

Halo Panel

Alpha
: The transparency

Color Swatch
: The color of the halo itself

Seed
: If non-zero, randomizes the ring dimension and line location. To use, give any (integer) number to start the random-number generator.

Size
: Sets the dimension of the halo

Hardness
: Sets the hardness of the halo. Similar to specular hardness

Effect of Add

Add
: The *Add* slider determine how much the halo colors are ‘added to’, rather than mixed with, the colors of the objects behind and together with other halos. By increasing Add, the Halo will appear to light up objects that move behind it or through the Halo field.

Texture
: Gives halo a texture. By default, textures are applied to objects with Object coordinates and reflects on the halos by affecting their color, as a whole, on the basis of the color of the vertex originating the halo. Enable this feature to have the texture take effect *within* the halo, and hence to have it with varying colors or transparencies; this will map the whole texture to *every* halo. This technique proves very useful when you want to create a realistic rain effect using particle systems, or similar.

Vertex Normal
: Use the vertex normal to specify the dimension of the halo

Extreme Alpha

Boosts alpha

Shaded

Lets halo receive light and shadows from external objects

When shaded is enabled, the Halo will be affected by local light; a lamp will make it brighter and affect its diffuse color and intensity.

Soft

Softens the edges of the halos at intersections with other geometry

In addition, several other special effects are available. To enable some or all of these effects, set the number of points/rings, or set the color of each effect individually:

Rings

Adds circular rings around to the halo.

Lines

Adds lines from the center of the halo.

Star tips

Gives the halo a star shape.

You can not use color ramps. Lines, Rings and an assortment of special effects are available with the relevant toggle buttons, which include Flare, Rings, Lines, Star, Texture, Extreme Alpha, and Shaded. *Halo Variations* shows the result of applying a halo material to a single vertex mesh.

Halo Variations

The halo size, hardness and alpha can be adjusted with the pertinent sliders. These are very similar to traditional material settings

The *Add* slider determine how much the halo colors are 'added to', rather than mixed with, the colors of the objects behind and together with other halos. By increasing Add, the Halo will appear to light up objects that move behind it or through the Halo field.

To set the number of rings, lines, and star points independently, once they are enabled with the relative Toggle Button, use the Num Buttons *Rings:*, *Lines:* and *Star:*. Rings and lines are randomly placed and oriented, to change their pattern you can change the *Seed:* Num Button which sets the random numbers generator seed.

Flare Panel

Enabling Flare Renders the halo as a lens flare

Size
: Sets the factor by which the flare is larger than the halo

Boost
: Give the flare extra strength.

Seed
: Specifies an offset in the flare seed table

Subflares
: Sets the number of subflares

Subsize
: Sets the dimensions of the subflares, dots, and circles

Lens Flares

Our eyes have been trained to believe that an image is real if it shows artifacts that result from the mechanical process of photography. *Motion blur, Depth of Field*, and *lens flares* are just three examples of these artifacts. The first two are discussed in the *chapter_rendering*; the latter can be produced with special halos. A simulated lens flare tells the viewer that the image was created with a camera, which makes the viewer think that it is authentic.

We create lens flares in Bforartists from a mesh object using first the *Halo* button and then the *Flare* options in the *Shaders* Panel of the material settings. Try turning on *Rings* and *Lines*, but keep the colors for these settings fairly subtle. Play with the *Flares:* number and *Fl. seed:* settings until you arrive at something that is pleasing to the eye. You might need to play with *Boost:* for a stronger effect (*Lens Flare settings*).

Note that this tool does not simulate the physics of photons traveling through a glass lens; it's just a eye candy.

Bforartists's lens flare looks nice in motion, and disappears when another object occludes the flare mesh.

Lens Flare

Halo Texturing

By default, textures are applied to objects with Object coordinates and reflects on the halos by affecting their color, as a whole, on the basis of the color of the vertex originating the halo. To have the texture take effect *within* the halo, and hence to have it with varying colors or transparencies press the *Texture* button; this will map the whole texture to *every* halo. This technique proves very useful when you want to create a realistic rain effect using particle systems, or similar.

Another Option is Shaded. When shaded is enabled, the Halo will be affect by local light; a lamp will make it brighter and affect its diffuse color and intensity.

Examples

Dotmatrix display

Let's use a halo material to create a dotmatrix display.

- To begin, add a grid with the dimensions 32x16. Then add a camera and adjust your scene so that you have a nice view of the billboard.
- Use a 2D image program to create some red text on a black background, using a simple and bold font (if you are a lazy lizard [I hope this not offensive, I just like how it sounds!], you can just save the picture

below on your hard drive...). *Dot matrix image texture.* shows an image 512 pixels wide by 64 pixels high, with some black space at both sides.

Dot matrix image texture.

- Add a material for the billboard, and set it to the type *Halo*. Set the *HaloSize* to 0.06 and when you render the scene you should see a grid of white spots.
- Add a Texture, then change to the Texture Buttons and make it an image texture. When you load your picture and render again you should see some red tinted dots in the grid.
- Return to the Material Buttons and adjust the *sizeX* parameter to about 0.5 then render again; the text should now be centered on the Billboard.
- To remove the white dots, adjust the material color to a dark red and render. You should now have only red dots, but the billboard is still too dark. To fix this enter EditMode for the board and copy all vertices using the `Shift-D` shortcut (take care not to move them!). Then adjust the brightness with the *Add* value in the MaterialButtons.

Dot Matrix display.

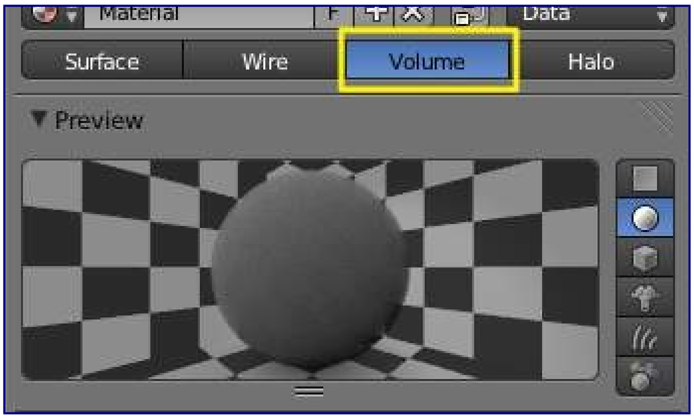
You can now animate the texture to move over the billboard, using the *ofsX* value in the *Texture* panel of the MaterialButtons. (You could use a higher resolution for the grid, but if you do you will have to adjust the size of the halos by shrinking them, or they will overlap. (*Dot Matrix display*).

Note

Note about material indices

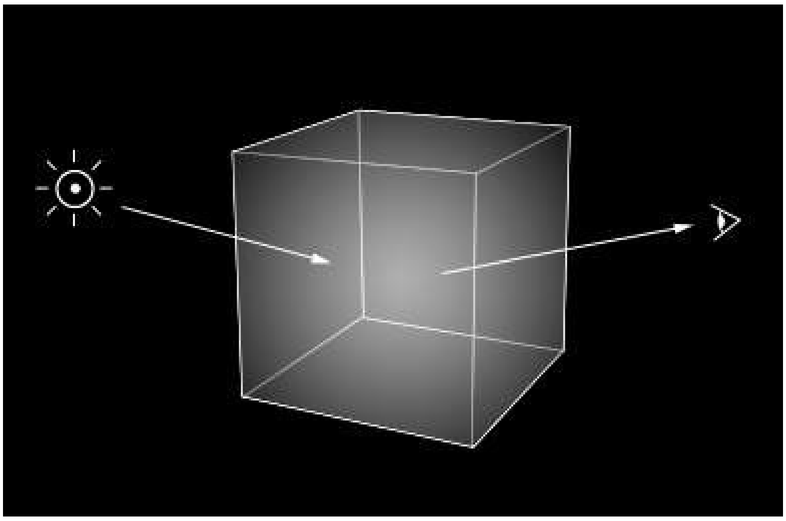
Halo materials only work when applied using the first material index. Any material(s) in a subsequent material index will not be rendered.

Volume Rendering



Activation volume rendering

Volume rendering is a method for rendering light as it passes through participating media, within a 3d region. The implementation in Bforartists a physically based model, which represents the various interactions of light in a volume relatively realistically.

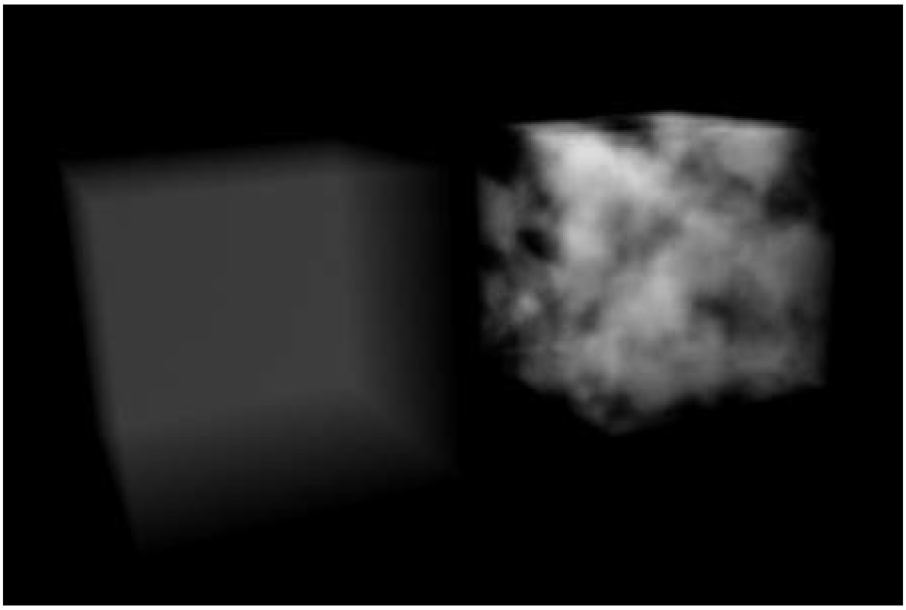


Volume rendering

Rendering a volume is different then *Solid Render.* For volume light enters a 3D region of space (defined as the volume) that may be filled with small particles, such as smoke, mist or clouds. The light bounces around off the various molecules, being scattered or absorbed, until some light passes through the volume and reaches the camera. In order for that volume to be visible, the renderer must figure out how much material the light has passed through and how it has acted and reacted within that volume, the volume object needs to contain a 3D region of space, for example a manifold closed mesh, such as a cube, not just a flat surface like a plane. To get an image, the renderer has to step through that region, and see how much ‘stuff’ is there (density) in order to see how light is absorbed or scattered or whatever. This can be a time consuming process since it has to check a lot of points in space and evaluate the density at each.

Options

Density



Constant density vs textured density

Many things can happen to the light as it passes through the volume, which will influence the final color that arrives at the camera. These represent physical interactions that happen in the real world, and most of these are dependent on the density of the volume, which can either be a constant density throughout, or varied, controlled by a texture. It is by controlling the density that one can get the typical ‘volumetric’ effects such as clouds or thick smoke.

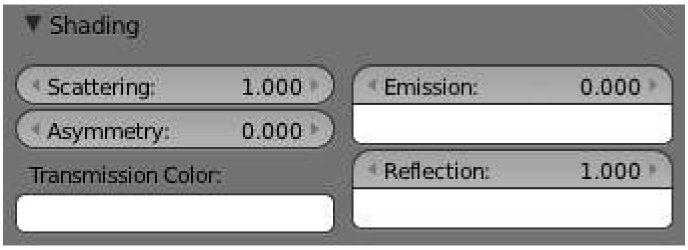
Density
: The base density of the material - other density from textures is added on top

Density Scale
: A global multiplier to increase or decrease the apparent density. This can be useful for getting consistent results across different scene scales.

Shading

Spot lamp scattering in a constant volume

When light enters a volume from an external source, it doesn't just pass straight through. Light gets scattered off tiny particles in the volume, and some proportion of that light reaches the camera. This property makes it possible to see light beams as they travel though a volume and are scattered towards the eye.

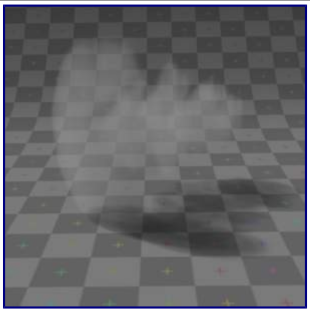
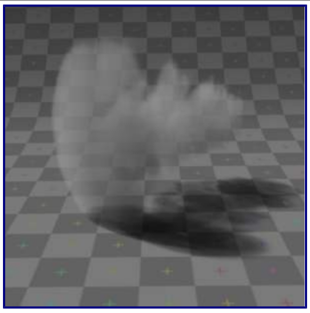
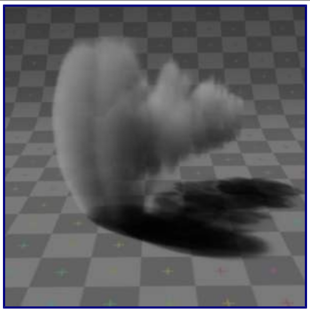
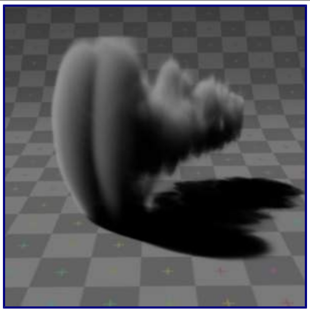


Shading options

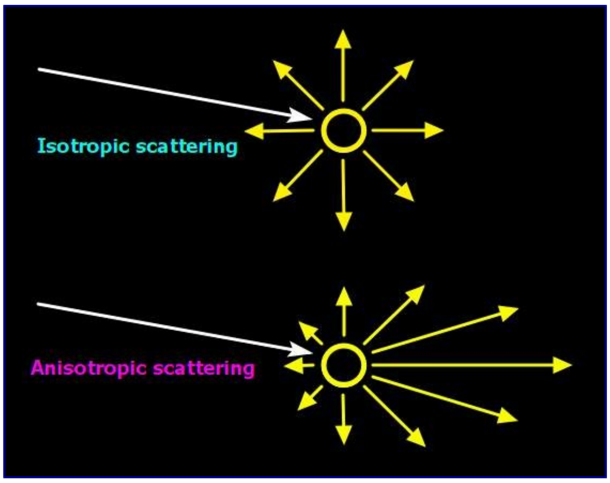
Scattering

The amount of light that is scattered out of the volume. The more light that is scattered out of the volume, the less it will penetrate through the rest of the volume. Raising this parameter can have the effect of making the volume seem denser, as the light is scattered out quickly at the 'surface' of the volume, leaving the areas internal to the volume darker, as the light doesn't reach it.

Note in the examples below, the less light that is scattered out of the volume, the more easily it penetrates throughout the volume and to the shadow.

 Scattering: 0.5	 Scattering: 1.0	 Scattering: 2.0	 Scattering: 5.0

Asymmetry



Isotropic and Anisotropic scattering

The default method for scattering light in a volume is for the light to be deflected evenly in all directions - known as Isotropic scattering. In real life different types of media can scatter light in different angular directions, known as Anisotropic scattering. Back-scattering means that light is scattered more towards the incoming light direction, and forward-scattering means it's scattered along the same direction as the light is traveling.

Asymmetry
: Asymmetry controls the range between back-scattering (-1.0) and forward-scattering (1.0). The default value of 0.0 gives Isotropic scattering (even in all directions).

Transmission

Transmission is a general term for light that is transmitted throughout a volume.

This transmitted light can be the result of various different interactions, for example:

- the left over result of incoming light after it has reflected/scattered out of the volume
- the left over result of light after being absorbed by the volume (and converted to heat)

Here, the transmission color is used to set the end result color that light becomes after it is transmitted through the volume.

Transmission Color
: The resultant color of light that is transmitted through the volume.

Note in the examples below, as more light is scattered out of the volume, there is less available to be transmitted through.

			
Transmission color: Yellow, Scattering: 0.5	Transmission color: Yellow, Scattering: 1.0	Transmission color: Yellow, Scattering: 2.0	Transmission color: Yellow, Scattering: 5.0

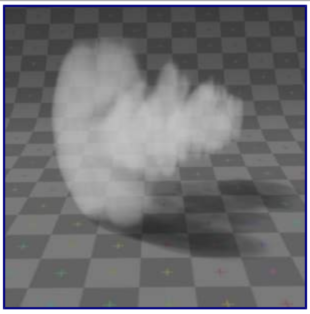
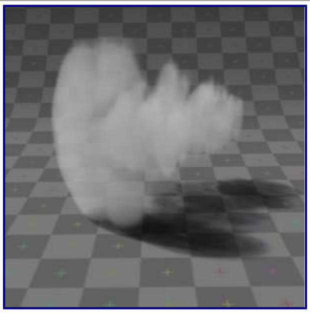
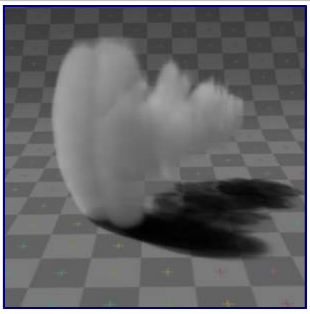
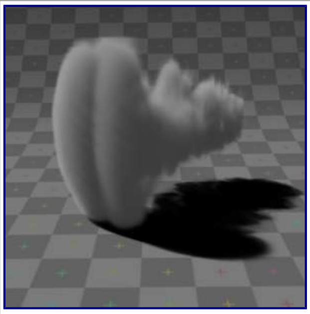
Emission

Some volumes can emit light where there was none before, via chemical or thermal processes, such as fire. This light is generated from the volume itself and is independent of light coming from external sources.

Currently, this emitted light does not affect other volumes or surfaces (similar to surface material type, ‘Emit’ option).

Emission Color
: The color of light that is emitted by the volume.

Emission
: An intensity multiplier for the emitted color, for scaling up and down.

			
Emission 0.25, Scattering: 0.5	Emission 0.25, Scattering: 1.0	Emission 0.25, Scattering: 2.0	Emission 0.25, Scattering: 5.0

Reflection

The ‘reflection’ parameters can be used to tint or scale the light that’s scattered out of the volume. This only affects light that has come from lamps and been scattered out, it doesn’t affect the color of transmitted or emitted light and is.

These settings are not physically correct because they don’t conserve energy - the light scattering out doesn’t affect the remaining light that is transmitted throughout the rest of the volume. For example, physically speaking, if the orange components of the light are scattered out of the volume towards the camera, only the inverse of that (blue) will remain to continue penetrating through the volume, causing the volume to take on a multi-colored appearance, which can be difficult to use. To make it a bit easier to plainly set the color of the volume, you can use the reflection parameters to quickly set an overall tint.

Reflection Color

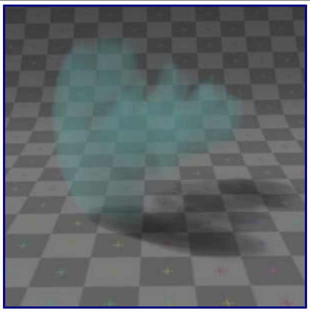
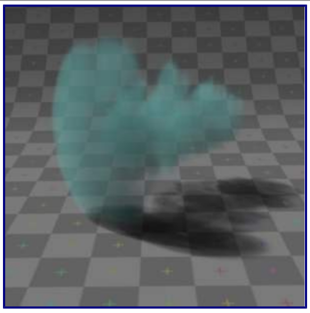
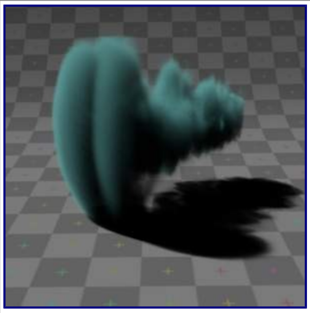
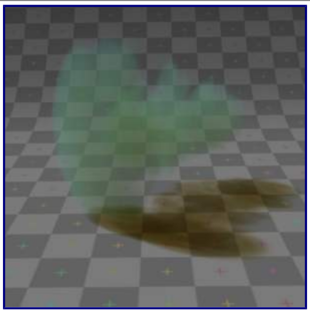
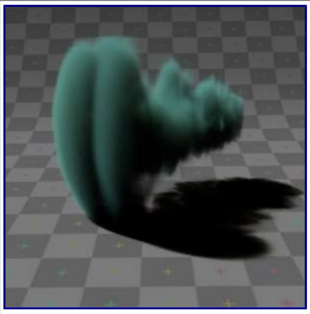
The color of light that is scattered out of the volume.

Reflection

An intensity multiplier for the reflection, for scaling up and down.

Hints

Ideally try to accomplish as much as you can with the other volume settings and lighting before using the reflection controls. If you stick to what’s physically plausible, the material will act correctly, and be more predictable and usable in a wider range of lighting scenarios. Of course you can always break the rules too!

			
Reflection: Green, Scattering: 0.5	Reflection: Green, Scattering: 1.0	Reflection: Green, Scattering: 2.0	Reflection: Green, Scattering: 5.0
			
Reflection: Green, Transmission: Yellow, Scattering: 0.5	Reflection: Green, Transmission: Yellow, Scattering: 1.0	Reflection: Green, Transmission: Yellow, Scattering: 2.0	Reflection: Green, Transmission: Yellow, Scattering: 5.0

Lighting

Lighting options

Several shading modes are available, providing a range of options between fast to render and physically accurate.

Lighting Mode

Shadeless

Shadeless is the simplest, useful for thin, wispy mist or steam.

Shadowed

Shadowed is similar, but with shadows of external objects.

Shaded
: Shaded uses a volumetric single-scattering method, for self-shading the volume as light penetrates through.

Multiple Scattering
: Allows multiple scatter calculations.

Shaded+Multiple Scattering
: Combines Shaded and Multiple Scattering functionality.

Shaded Options:

External Shadows
: Receive shadows from sources outside the volume (temporary).

Light Cache
: Pre-calculate the shading information into a voxel grid, speeds up shading at slightly less accuracy.

Resolution
: Resolution of the voxel grid, low resolutions are faster, high resolutions use more memory.

Multiple Scattering Options:

Diffusion
: Diffusion factor, the strength of the blurring effect.

Spread
: Proportional distance over which the light is diffused.

Intensity
: Multiplier for multiple scattered light energy.

Transparency

The transparency settings are the same as *Solid Render* except you have less settings. For volume rendering you only have:

- Mask
- Z Transparency
- Raytrace

Integration

Integration options

Step Calculation Method

Method of calculating the step through the volume.

Randomized
: Randomized method of calculating the step.

Constant
: Constant method of calculating the step.

Step Size
: Distance between subsequent volume depth samples. Step Sizes determine how noisy the volume is. Higher values result in lower render times and higher noise.

Depth Cutoff
: Stop ray marching early if transmission drops below this luminance - higher values give speedups in

dense volumes at the expense of accuracy.

Options

Material volume options

Traceable
: Allow this material to calculate raytracing.

Full Oversample
: Force this material to render full shading/textures for all anti-aliasing samples.

Use Mist
: Use mist with this material (in world settings).

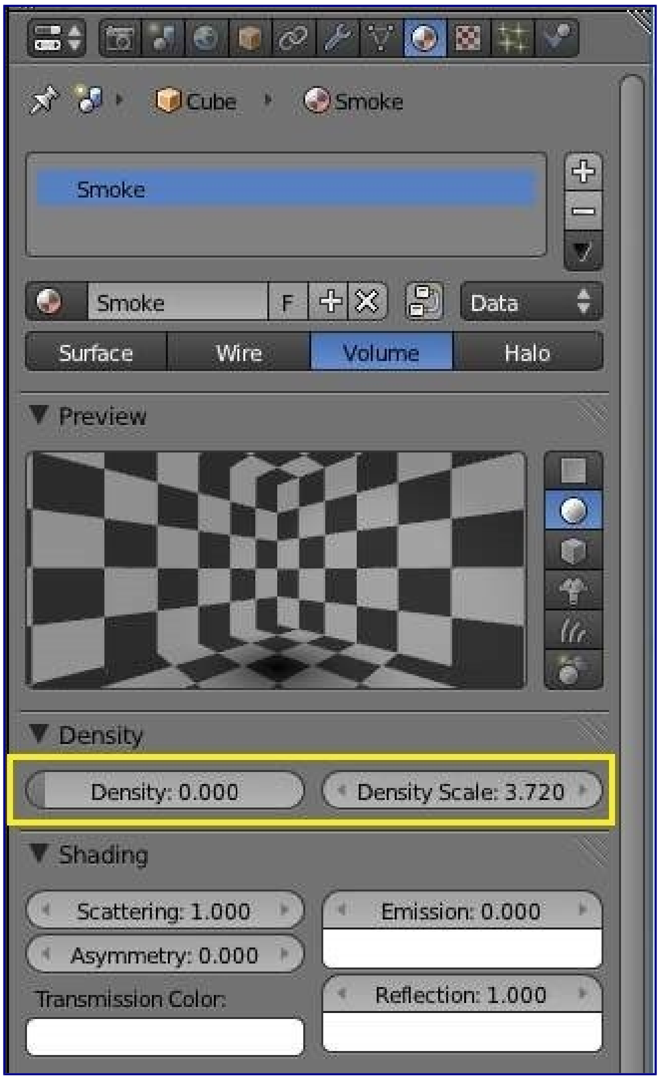
Light Group
: Limit lighting of this material to lamps in this group.

Exclusive
: Material uses this group exclusively. Lamps are excluded from other scene lighting.

Smoke and Fire

Create the Material

The material must be a volumetric material with a Density of 0, and a high Density Scale.

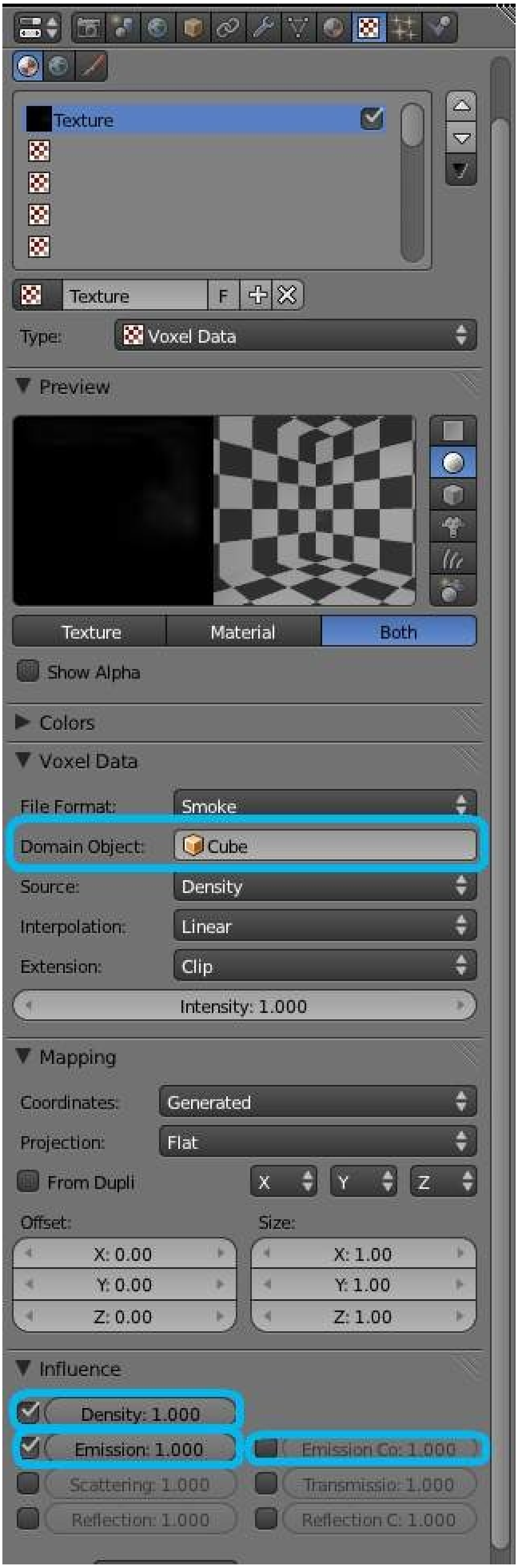


The Material Settings

Smoke requires a complex material to render correctly. Select the big cube and go to the material tab. There change the material to ‘Volume’ and set the density to 0. If you set the density to values bigger than 0 the domain cube will be filled with the volume material. The other settings will affect the smoke, though. We’ll cover those later.

Add the Texture

In addition, Smoke requires its own texture, you can use a volumetric texture known as *Voxel Data*. You must remember to set the domain object and change the influence.


Texture
Texture
F
Type:
Voxel Data
Preview
Texture
Material
Both
Show Alpha
Colors
Voxel Data
File Format:
Smoke
Domain Object:
Cube
Source:
Density
Interpolation:
Linear
Extension:
Clip
Intensity: 1.000
Mapping
Coordinates:
Generated
Projection:
Flat
From Dupli
X
Y
Z
Offset:
Size:
X: 0.00
Y: 0.00
Z: 0.00
X: 1.00
Y: 1.00
Z: 1.00
Influence
Density: 1.000
Emission: 1.000
Emission Co: 1.000
Scattering: 1.000
Transmissio: 1.000
Reflection: 1.000
Reflection C: 1.000

The texture settings.

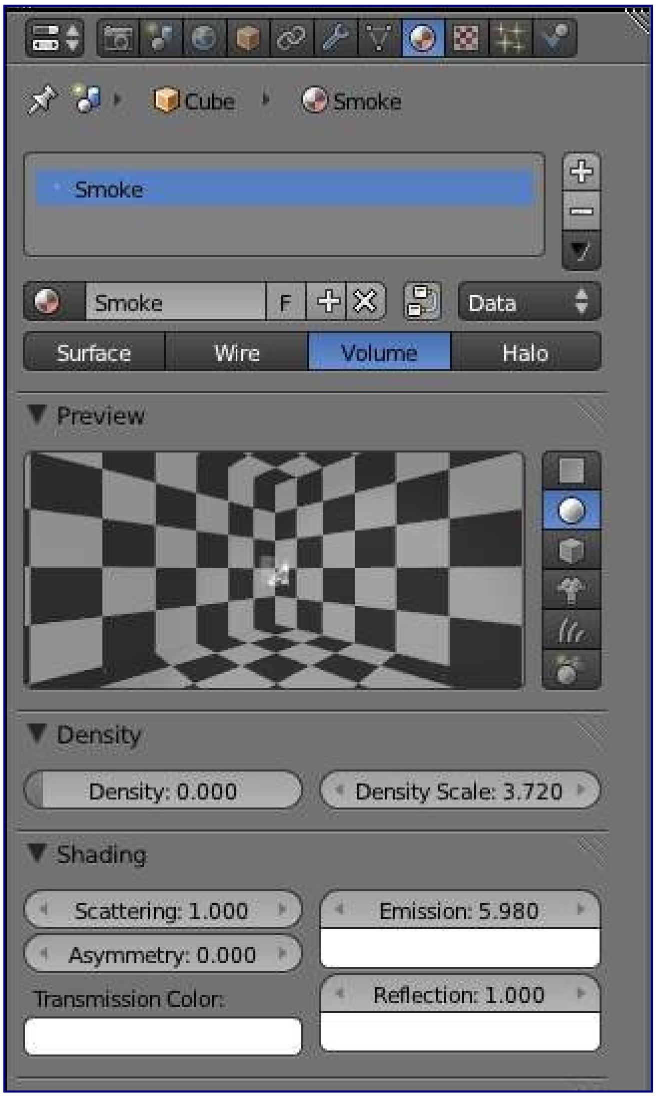
Go to the texture tab and change the type to *Voxel Data*. Under the Voxel Data-Settings set the domain object to our domain cube (it should be listed just as ‘Cube’ since we are using Bforartists’s default cube. Under Influence check ‘Density’ and leave it at 1.000 (Emission should be automatically checked, too). Now you should be able to render single frames. You can choose to color your smoke as well, by turning *Emission Color* back on.

Finished Result

Tip
To see the smoke more clearly Under the world tab, chose a very dark color for the horizon.

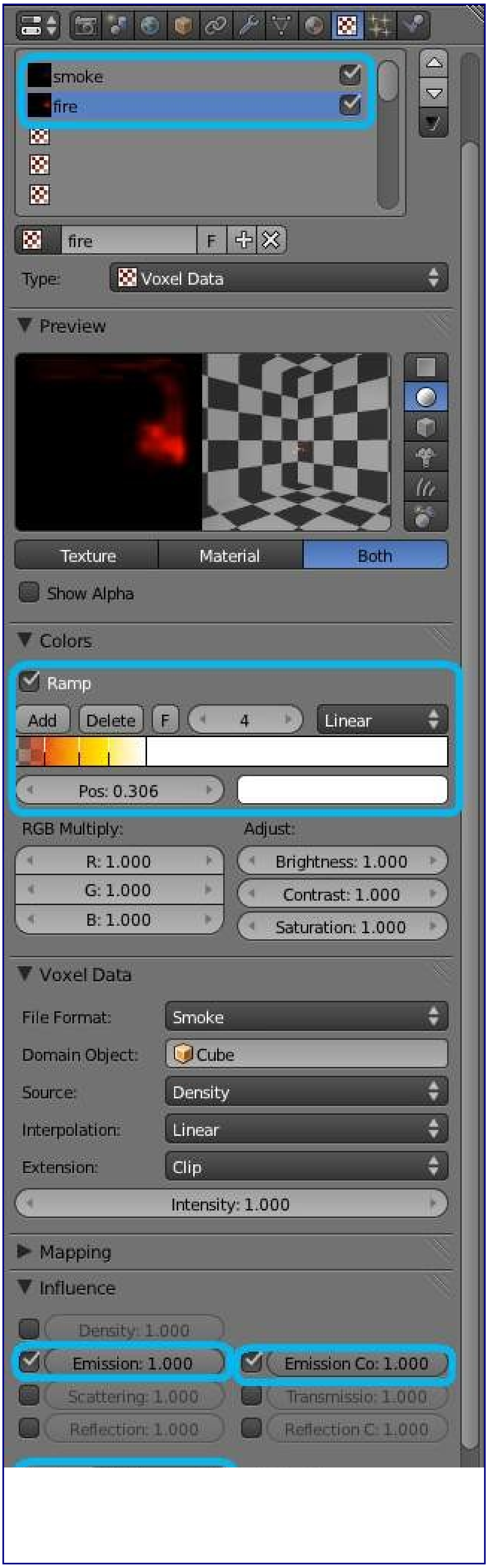
Extending the Smoke Simulator: Fire!

You can also turn your smoke into fire with another texture! To make fire, turn up the Emission Value in the Materials panel.

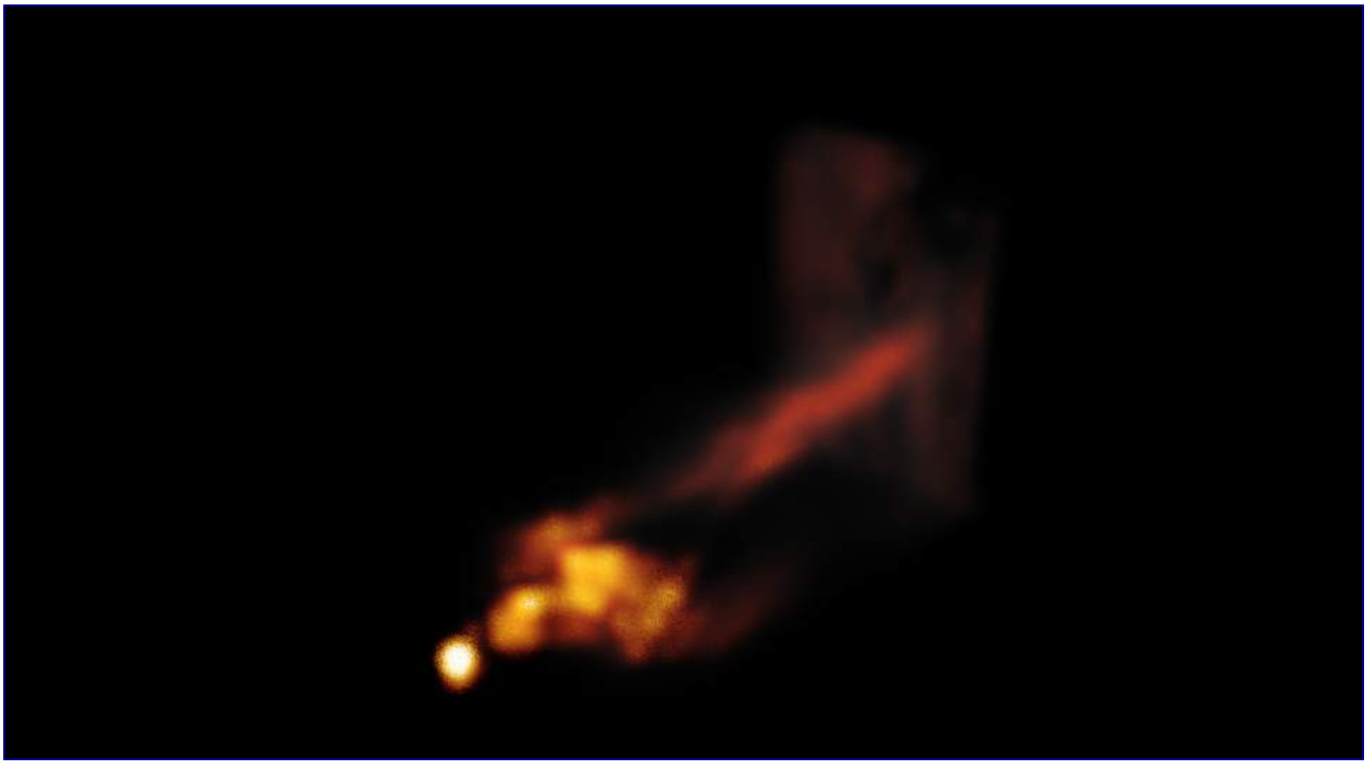


The Fire material.

Then, add another texture (Keep the old texture or the smoke won’t show). Give it a fiery color ramp- which colors based on the alpha, and change the influence to emission and emission color. Change the blend to Multiply.


smoke
fire
fire
F
Type:
Voxel Data
Preview
Texture
Material
Both
Show Alpha
Colors
Ramp
Add
Delete
F
4
Linear
Pos: 0.306
RGB Multiply:
Adjust:
R: 1.000
G: 1.000
B: 1.000
Brightness: 1.000
Contrast: 1.000
Saturation: 1.000
Voxel Data
File Format:
Smoke
Domain Object:
Cube
Source:
Density
Interpolation:
Linear
Extension:
Clip
Intensity: 1.000
Mapping
Influence
Density: 1.000
Emission: 1.000
Emission Co: 1.000
Scattering: 1.000
Transmissio: 1.000
Reflection: 1.000
Reflection C: 1.000

The fire texture settings.

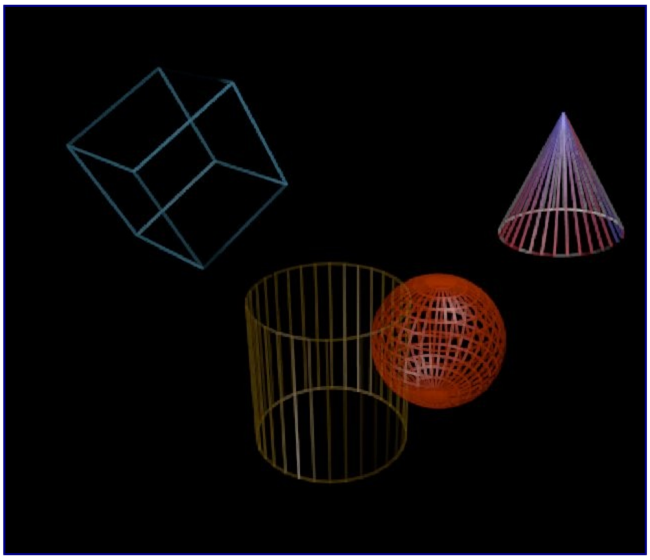


The fire render.

Wire Render

Wire Render

The Wire Render option in the Materials section provides a way of showing a rendered image of the edges in an object. Each edge is rendered as a single-pixel image of the edges which make up the mesh. The colors, alpha and other relevant properties of the lines are selected with the same control panels as provided by the Surface rendered image.



Wire Render

10.2.2 Render - Blender Render Engine - Textures

Introduction to Textures

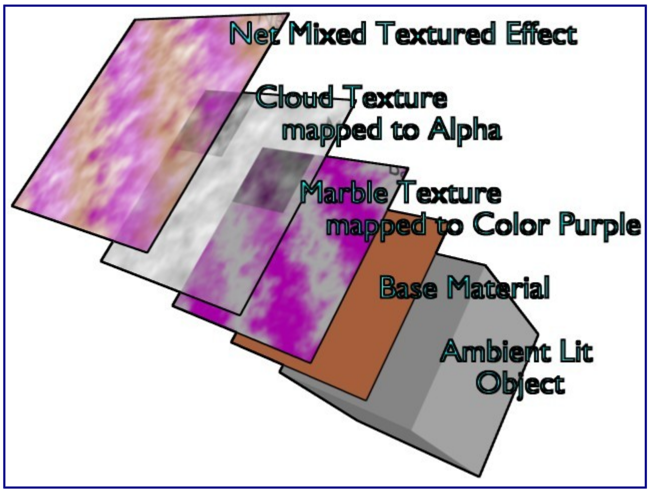
In CGI, texture mapping is a method to add detail to surfaces by projecting images and patterns onto those surfaces. The projected images and patterns can be set to affect not only color, but also specularity, reflection, transparency, and even fake 3-dimensional depth. Most often, the images and patterns are projected during render time, but texture mapping is also used to sculpt, paint and deform objects.

In Bforartists, *Texture* s can be:

- applied to a *Material*
- applied to a *light*, that coming from lamp
- applied to the *World Background*
- applied to a *Brush*, see for example: - Sculpting - Texture Paint
- associated with *Modifiers*, see: - Particles textures - Ocean textures

Material Textures

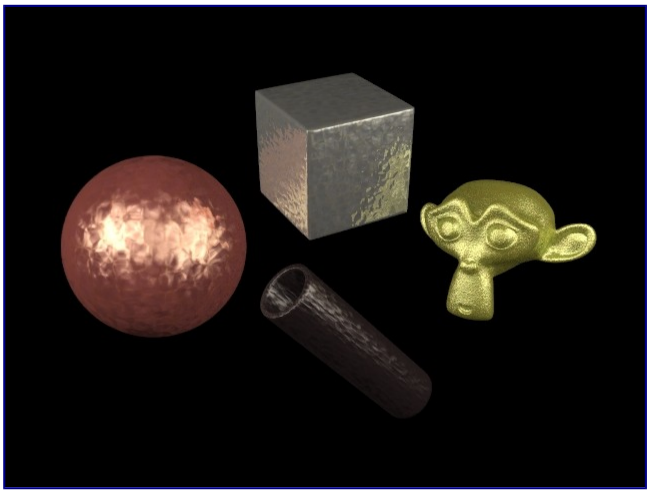
The material settings that we’ve seen so far produce smooth, *uniform* objects, but such objects aren’t particularly true to reality, where uniformity tends to be uncommon and out of place. In order to deal with this unrealistic uniformity, Bforartists allows the user to apply *textures* which can modify the reflectivity, specularity, roughness and other surface qualities of a material.



Textures Layer on base Material

Textures are like additional layers on top of the base material. Textures affect one or more aspects of the object’s net coloring. The net color you see is a sort of layering of effects, as shown in this example image. The layers, if you will, are:

- Your object, lit with **ambient** light based on your world settings.
- Your base **material**, which colors the whole surface in a uniform color that reacts to light, giving different shades of the diffuse, specular, and mirror colors based on the way light passes through and into the surface of the object.
- A **primary texture** layer that overlays a purple marble coloring.
- A **second cloud texture** that makes the surface transparent in a misty/foggy sort of way by affecting the Alpha value.
- These two textures are **mixed** with the base material to provide the net effect: a cube of purplish-brown fog.



Some Metal Textures

This notion of using *more than one* texture, to achieve a combined effect, is one of the “hidden secrets” of creating realistic-looking objects. If you carefully “look at the light” while examining any real-life object, you will observe that the final appearance of that object is best described as the combination, in different ways and in different amounts, of several distinct underlying visual characteristics. These characteristics might be more (or less) strongly apparent at different angles, under different lighting conditions, and so forth. Bforartists allows you to achieve this in many ways. You can use “a stack of texture layers” as described in *this section*, or you can also use arbitrarily-complex networks (“noodles”...) of “texture nodes” as discussed *here*; the choice is yours.

Materials Textures fall into three primary categories:

Procedural Textures
: Textures generated by a mathematical formula. For example, *Wood*, *Clouds*, and *Distorted Noise*

Images or Movies
: Photos and films projected onto objects. For example, a flat map of Earth mapped to a sphere.

Environment Maps
: Textures used to create the impression of reflections and refractions. For example, an image of a street reflected in a car window.

Data or Modifiers Textures
: Textures obtained from raw data or obtained by a certain modifier in the scene. For example:

- volumetric materials use Voxel Data textures, or Point Density textures
- textures can be obtained from an Ocean Modifier

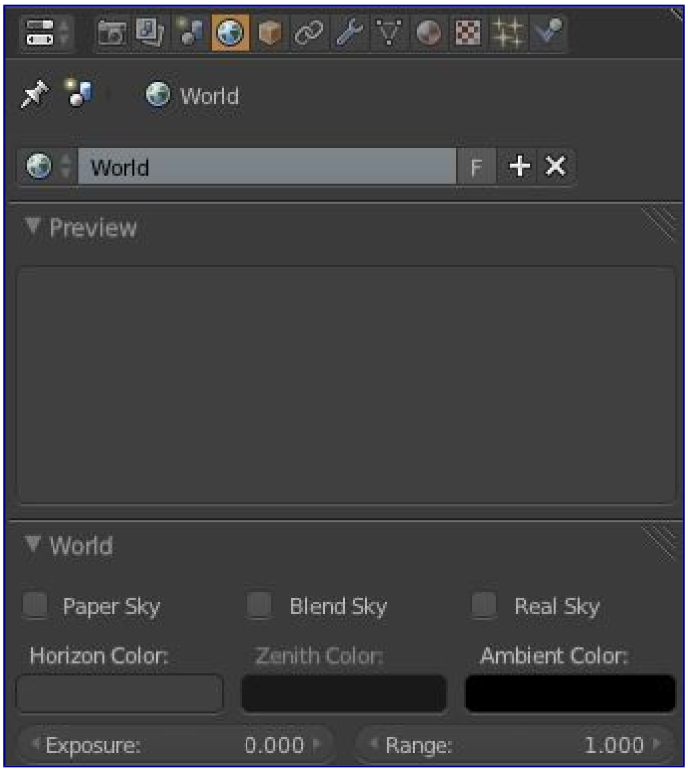
CRL 02:25, 26 May 2014 (UTC)(Sign)

World Textures

Reference
Mode: All Modes Panel: Shading/World Context –> Preview Hotkey:

Description

The world buttons let you set up the shading of your scene in general. It can provide ambient color, and special effects such as mist, but a very common use of a *World* is to shade a background color.



Textures Layer on base Material

HoR, HoG, HoB
: The RGB color at the horizon

ZeR, ZeG, ZeB
: The RGB color at the zenith (overhead)

These colors are interpreted differently, according to the Buttons in the *Preview* Panel (*Background colors*):

None Enabled
: If none of these three buttons is checked, your background will just be plain flat color (using the horizon one).

Blend

The background color is blended from horizon to zenith. If only this button is pressed, the gradient runs from the bottom to the top of the rendered image regardless of the camera orientation.

Real

If this option is added, the gradient produced has two transitions, from nadir (same color as zenith) to horizon to zenith; the blending is also dependent on the camera orientation, which makes it more realistic. The horizon color is exactly at the horizon (on the x-y plane), and the zenith color is used for points vertically above and below the camera.

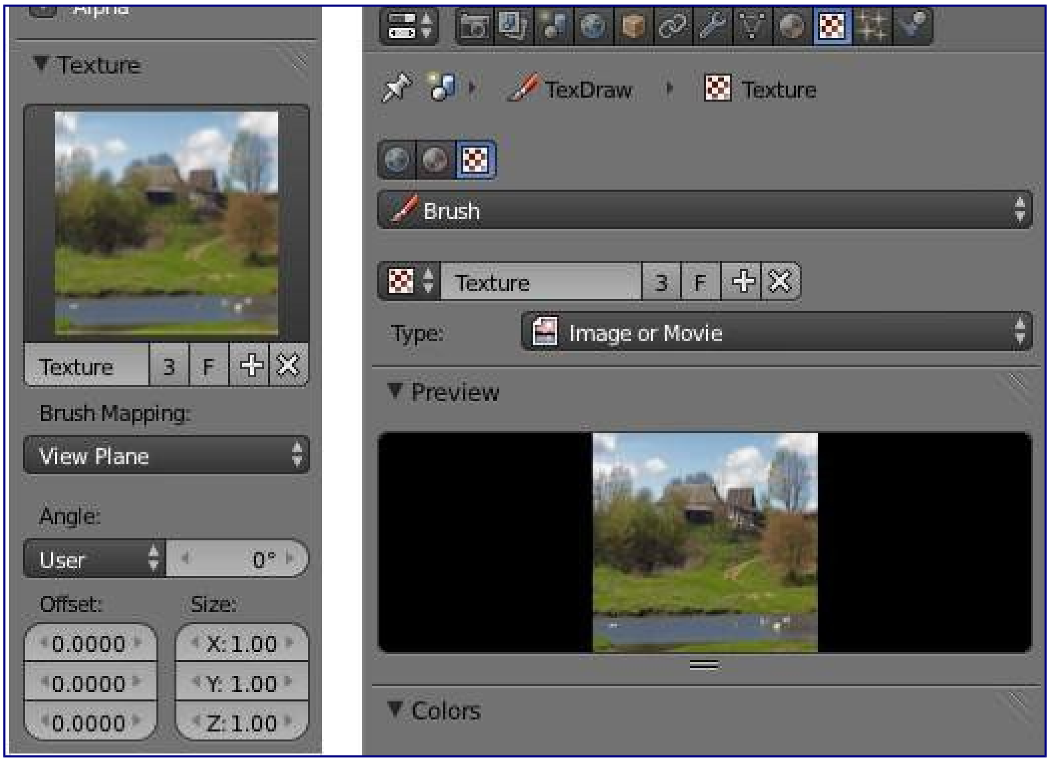
Paper

If this option is added, the gradient keeps its characteristics, but it is clipped in the image (it stays on a horizontal plane (parallel to x-y plane): what ever the angle of the camera may be, the horizon is always at the middle of the image).

CRL 02:31, 26 May 2014 (UTC)(Sign)

Brush Textures

Image textures can be loaded into Bforartists. These images can then be applied to a mesh model that has been unwrapped and assigned an image of user defined size.



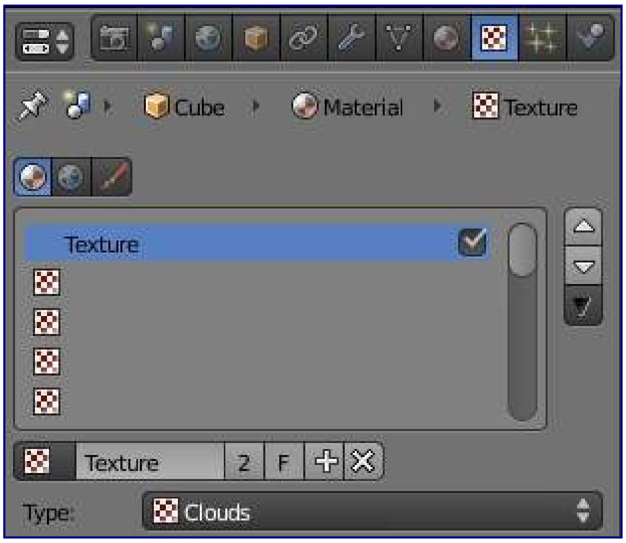
Applied Brush texture in different painting modes

- Brush textures can be used to Texture Paint textures.
- Brush textures can be used to Vertex Paint vertices.
- Brush textures can also be used in Sculpting to create topology.

Assigning a Texture

This page just shows how to add a texture to a slot. The textures' commons options are explained *here*.

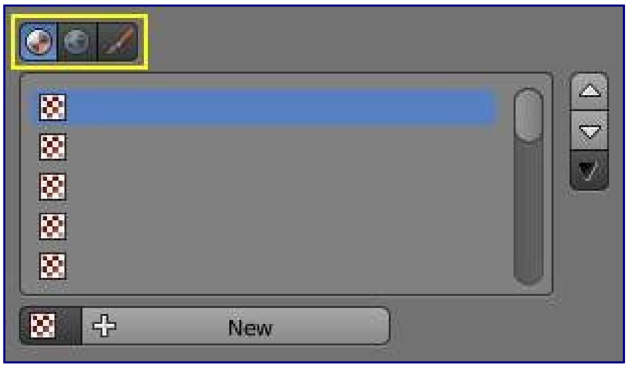
Choosing the Texture context



Texture panel

In the Properties editor, choose the Texture context: this will show the Texture panel.

Choosing the Texture data type

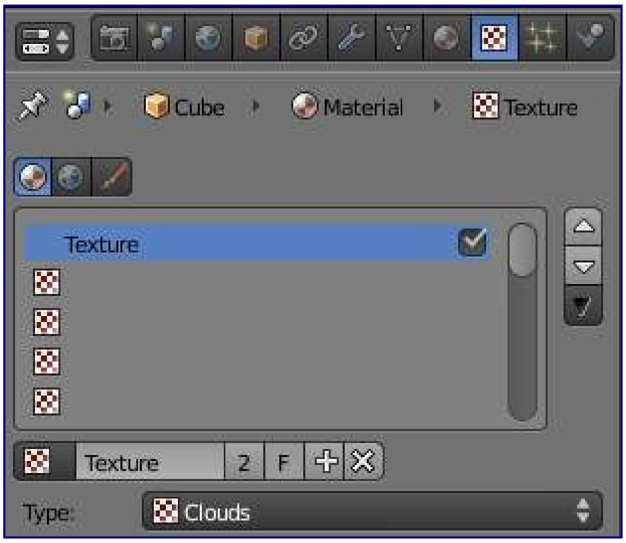


Texture panel with buttons for Material, World, and Brush textures highlighted

The three buttons *Material*, *World*, *Brush* at the top of the texture panel indicate the texture data type, that is, the kind of texture that is being edited.

Texture panel with button for Lamp textures highlighted

Textures Slots



Texture panel

The list below these buttons represent the *Stack* of textures that we can manage. It can have up to eighteen *Texture Slots*:

- Tick or untick a texture to enable/disable it.
- Use the three buttons on the right side to move individual textures up and down in the stack or to copy/paste material's settings between slots.

Creating a new Texture Data-Block in a new Texture Slot

Select an empty slot, then click on the *New* button.

This will do two things:

- it will create a new texture data-block
- also, it will add a new slot in the textures stack

Creating a new Texture Data-Block in a non-empty slot

Select a non-empty slot, then click on the *Plus* button.

This will do two things:

- it will create a new texture data-block, with a new name, **making a copy of the texture data-block assigned to the selected slot**
- it will assign this new data-block to the selected slot

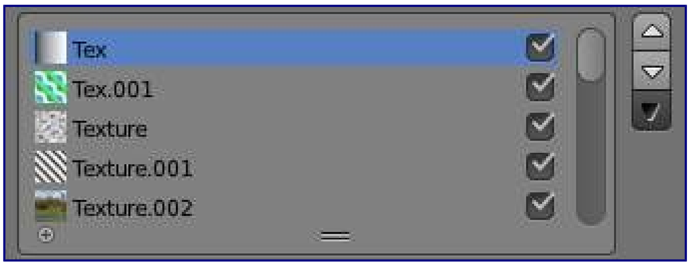
Sharing a Texture Data-Block in a non-empty slot

- Select a non-empty slot, then click on the *Browse* button. This will open a menu showing all the available Texture data-blocks in this file.
- Choose a texture data-block in the menu to assign it to the selected slot. This will share the chosen texture with more than one object, hence the *Number of users* shown in the texture data-block will increase by one.

Textures common options

In the Properties editor, choose the Texture context: this will show the Texture panel.

Textures Stack



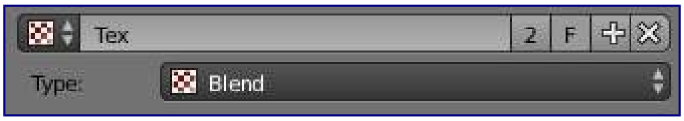
Textures Stack

The list below these buttons represents the *Stack* of textures that we can manage. It can have up to eighteen *Texture Slots*:

- Tick or untick a texture to enable/disable it.
- Use the three buttons on the right side to move individual textures up and down in the stack or to copy/paste material's settings between slots.

The order in the Stack Textures defines how textures overlay each other for finally result image.

Texture Data-Block



Active Texture Data-Block

Select a slot in the Textures Stack to see its settings.

The first group of buttons below the stack displays the texture currently selected in the stack.

Browse
: The first button below the stack displays the all available textures in the current file. Textures are stored globally, and can be linked to more than one material. If you have already created a texture that you want to reuse, select from this list.

Name
: A name field where the name of the material can be changed.

Number of users
: If the active texture is used by another material, a *2* button appears that can be used to make a single-user copy of the active texture. Use this button to quickly create a new texture based on an existing texture.

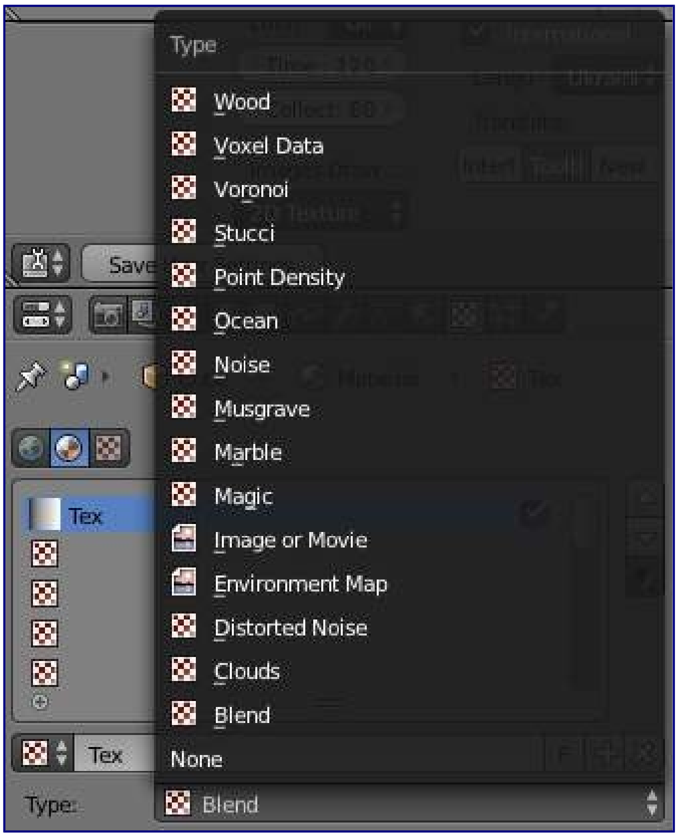
Fake
: The *F* button assigns the active texture to a "Fake" material, so that the texture is saved with the file even if it has no "real" users.

Add
: Replaces the texture of the active slot with a new texture.

Unlink

Removes the texture from the active slot.

Texture Type



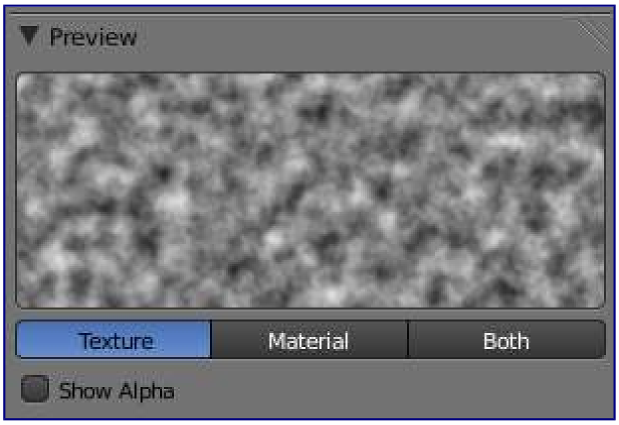
Texture Types

Choose the type of texture that is used for the current texture data-block.

- *Procedural Textures*
- *Image* and *Video* Textures
- *Environment Map*
- *Volume Textures*
- Ocean Texture

These types are described in detail *in this section*.

Preview



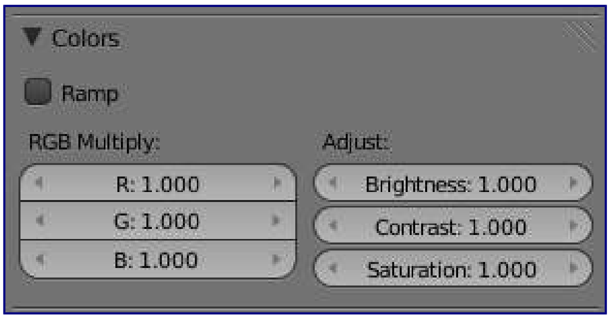
Preview panel

The texture preview panel provides a quick pre-visualisation of how the texture looks on its own, without mapping.

Texture, Material, or Both
: Choose to display only the texture, only the material, or both.

Show Alpha
: Show alpha in preview. If Alpha: Use is checked in the *Image Sampling* panel, the image's alpha channel is displayed. If Alpha: Use is unchecked, an alpha channel based on averaged rgb values is displayed like it would be used by the Alpha slider in the *Influence* panel.

Colors



Colors panel

The *Ramp* button activates a color ramp which allows you to remap the colors of a texture to new ones. See *Ramps* for information on using ramps.

The color of a texture can be modified with the *Brightness*, *Contrast*, and *Saturation* buttons. All textures with RGB-Values - including *Images* and *Environment Maps* - may be modified with the RGB sliders.

R, G, B
: Tint the color of a texture by brightening each red, green and blue channel.

Brightness
: Change the overall brightness/intensity of the texture

Contrast
: Change the contrast of the texture

Saturation
: Change the saturation of the texture

Mapping

Here you can control how the texture will be mapped on the object.

Note

Brushes

These options are not available for brushes because they wouldn’t make sense

See *Mapping* section for details.

Influence

Here you can control what properties the texture will affect, and by how much.

They are detailed on the *Influence* section.

Note

Brushes

These options are not available for brushes because they wouldn’t make sense

Texture types

These are the available texture types:

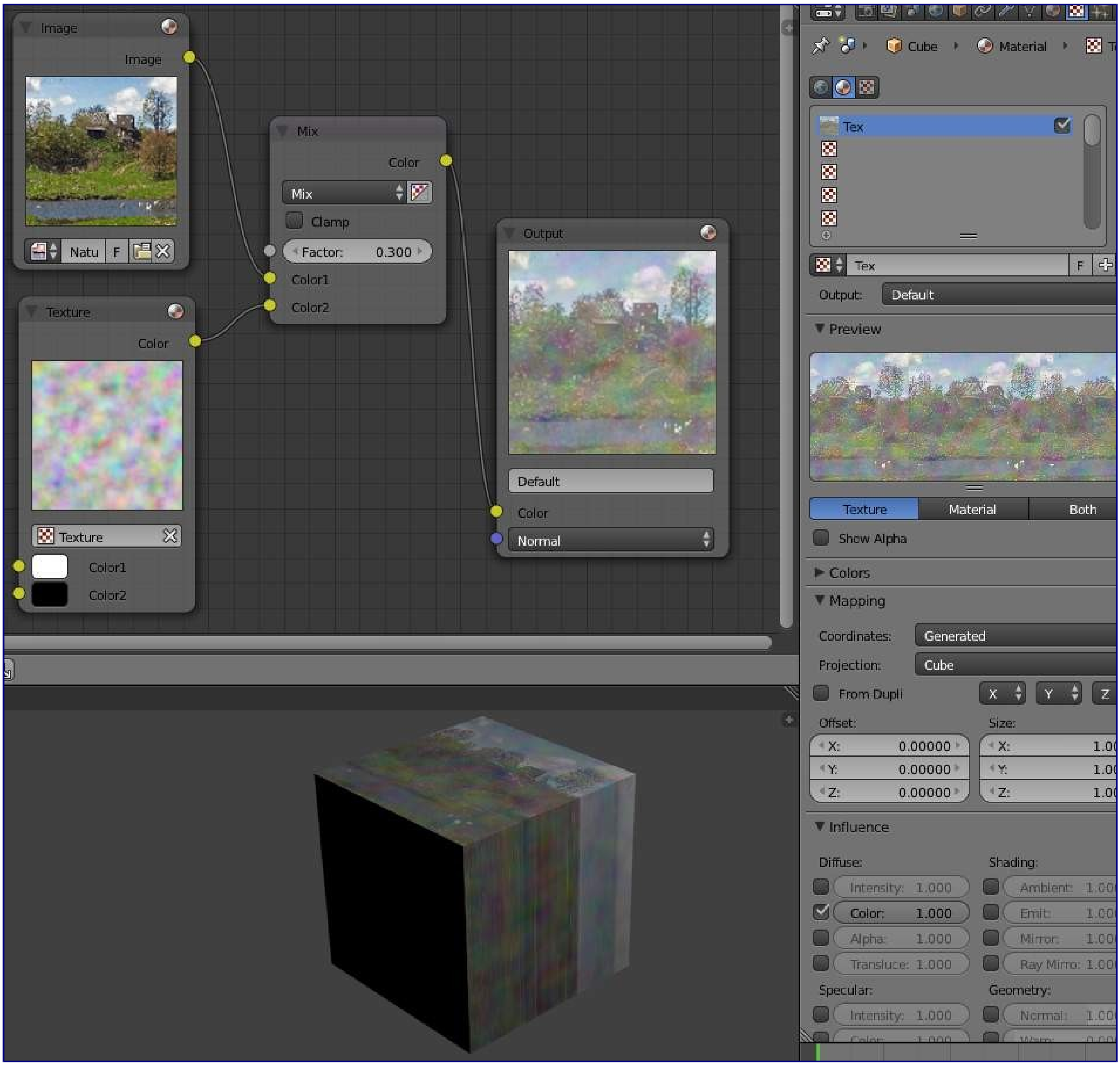
- *Procedural Textures*

Textures generated by a mathematical formula.

- *Image Textures*
- *Video Textures*

Photos and films projected onto objects.

- *Combined Textures*

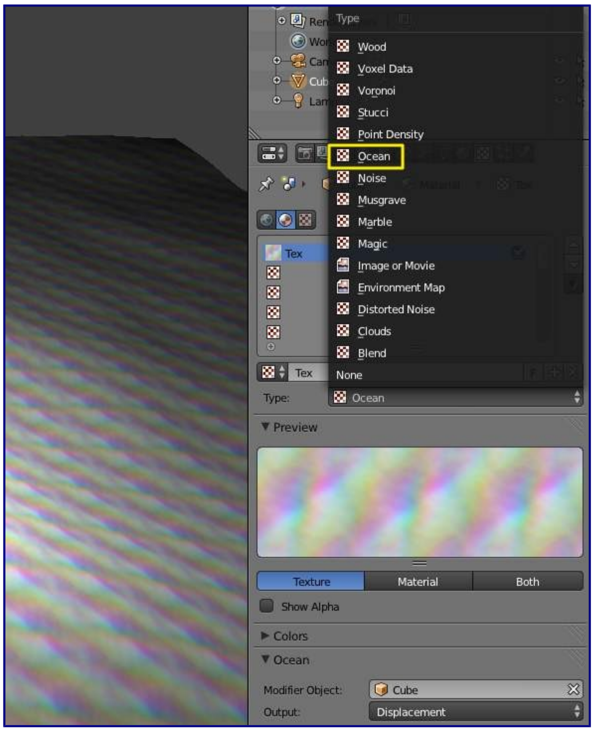


Combined textures based on nodes.

- *Volume Textures*

Textures that can be applied to volumetric data.

- *Ocean Textures*



Texture generated by an *Ocean* modifier.

Image Textures

The term *Image Texture* simply means that a graphic image - a pixel grid composed of R, G, B, and sometimes Alpha values - is used as the input source to the texture. As with other types of textures, this information can be used in a number of ways, not only as a simple "decal".

When the Texture Type *Image or Movie* is selected, three new panels present themselves allowing us to control most aspects of how image textures are applied: *Image*, *Image Sampling*, and *Image Mapping*.

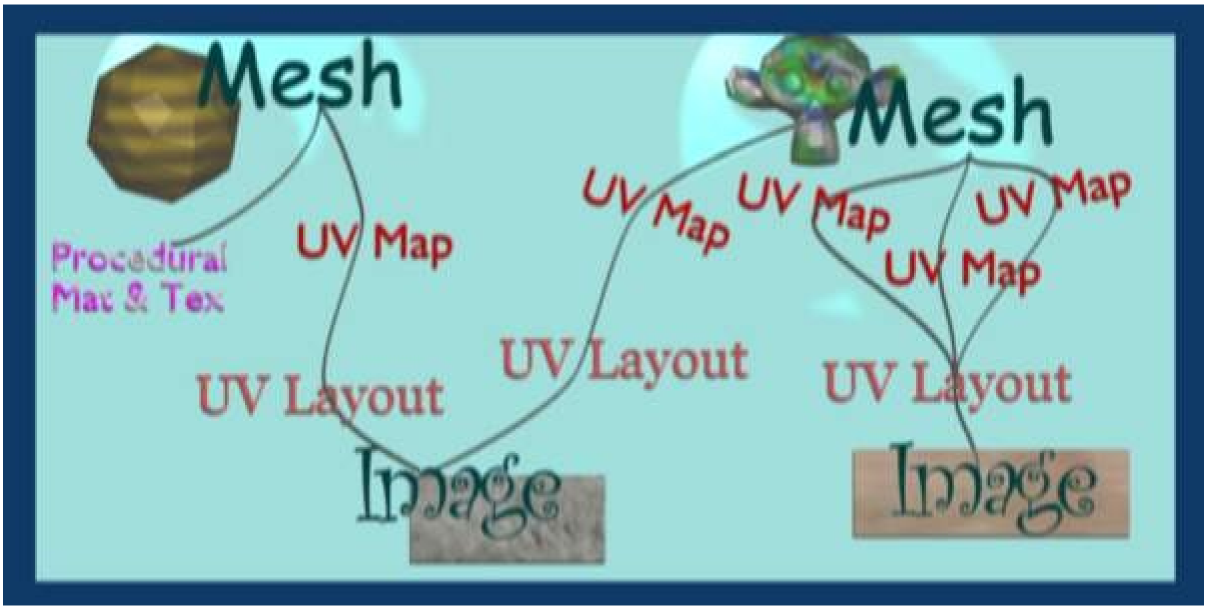
About Image Based Texturing

Texture images take up precious memory space, often being loaded into a special video memory bank that is very fast and very expensive, so it is often very small. So, keep the images as small as possible. A 64x64 image takes up only one fourth the memory of a 128x128 image.

For photo-realistic rendering of objects in animations, often larger image textures are used, because the object might be zoomed in on in camera moves. In general, you want to use a texture sized proportionally to the number of pixels that it will occupy in the final render. Ultimately, you only have a certain amount of physical RAM to hold an image texture and the model and to provide work space when rendering your image.

For the most efficient memory usage, image textures should be square, with dimensions as powers of 2, such as 32x32, 64x64, 128x128, 256x256, 1024x1024, 2048x2048, and 4096x4096.

If you can re-use images across different meshes, this greatly reduces memory requirements. You can re-use images if you map those areas of the meshes that "look alike" to a layout that uses the common image. In the overview below, the left image is re-used for both the sphere and a portion of the monkey. The monkey uses two layouts, one which has one UV map of a few faces, and another that has three maps.



How all the parts of UV Texturing work together

When using file textures, it is very important that you have *Mapped the UVs* of the mesh, and they are laid out appropriately.

You don't have to UV map the *entire* mesh. The sphere above on the left has some faces mapped, but other faces use procedural materials and textures. Only use UV Textures for those portions of your mesh where you want very graphic, precise detail. For example, a model of a vase only needs UV Texture for the rim where decorative artwork is incorporated. A throw pillow does not need a different image for the back as the front; in fact many throw pillows have a fabric (procedural material) back.

As another example, you should UV map both eyes of a head to the same image (unless you want one bloodshot and the other clear). Mapping both sides of a face to the same image might not be advisable, because the location of freckles and skin defects are not symmetrical. You could of course change the UV map for one side of the face to slightly offset, but it might be noticeable. Ears are another example where images or section of an images can be mapped to similar faces.

Workflow

The process consists of the following steps.

- Create the Mesh. *Unwrap* it into one or more *UV Layouts*.
- Create one or more Materials for the Mesh.
- Create one or more images for each UV Layout and aspect of the texture. Either - paint directly on the mesh using Texture Paint in the 3D window, - load and/or edit an image in the UV Editor window, or - Bake the existing materials into an image for the UV Editor window.
- Apply those images as UV Textures to the mesh to affect one or more aspects of the mesh. This is done by using one or more of the numerous Map To options. For example, - map to Color to affect the diffuse coloring of the mesh, - map to Nor to affect the normal direction to give the surface a bumpy or creased look, or - map to Spec (specularity) to make certain areas look shiny and oily.
- Layer the Textures to create a convincing result.

Using Images and Materials

To use an image as the color and alpha (transparency) of the texture, you can create an image in an external paint program and tell the UV/Image Editor to Open that file as the texture, or you can create a New image and save it as the texture.

If you want to start off by creating an image using an external paint program, you will want to save an outline of your UV faces by using the *Save UV Face Layout* tool located in the UVs menu. This is discussed here.

Creating an Image Texture

To create an image within Bforartists, you have to first create a *New Blank* Image with a uniform color or test grid. After that, you can color the image using the:

- Vertex colors as the basis for an image
- Render Bake image based on how the mesh looks in the scene

After you have created your image, you can modify it using Bforartists’s built-in *Texture Paint* or any external image painting program.

Note

See Texture in 3D View but does not Render

You may be able to see the texture in Textured display mode in the 3D View; this is all that is required to have textures show up in Bforartists’s Game Engine. Rendering, however, requires a material. You must have a *Face Textures* material assigned to the mesh for it to render using the UV Texture. In the Material settings, ADD NEW material to a selected object and enable *Face Textures*.

Examples

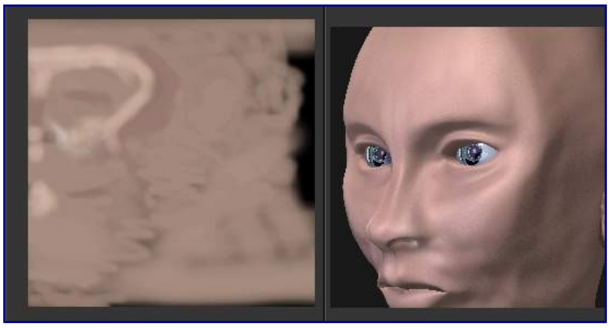
There may be one UV Layout for the face of a character, and another for their clothes. Now, to texture the clothes, you need to create an image at least for the Color of the clothes, and possible a “bump” texture to give the fabric the appearance of some weave by creating a different image for the Normal of the clothes. Where the fabric is worn, for example at the elbows and knees, the sheen, or Specularity, of the fabric will vary and you will want a different image that tells Bforartists how to vary the Specularity. Where the fabric is folded over or creased, you want another image that maps Displacement to the mesh to physically deform the mesh. Each of these are examples of applying an image as a texture to the mesh.

As another example, the face is the subject of many questions and tutorials. In general, you will want to create a Material that has the basic skin color, appropriate shaders, and sub-surface scattering. Then you will want to layer on additional UV Textures for:

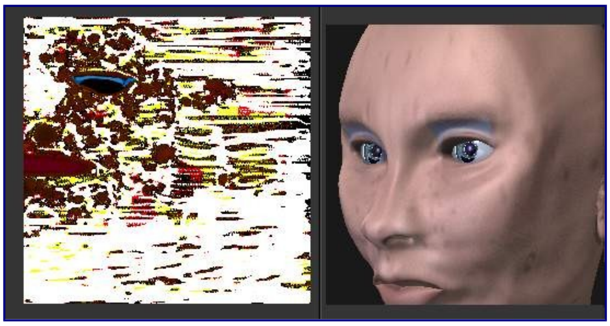
- Freckle map for Color and Normal aspects
- Subdermal veins and tendons for Displacement
- Creases and Wrinkles and skin cell stratification for Normal
- Makeup images for Color
- Oily maps for Specularity
- For a zombie, Alpha transparency where the flesh has rotted away *(ewwww....)*
- Under chin and inside nostrils that receive less Ambient light
- Thin skin is more translucent, so a map is needed for that

Each image is mapped by using another Texture Channel. Each of these maps are images which are applied to the different aspects (Color, Normal, Specularity) of the image. Tileable images can be repeated to give a smaller, denser pattern by using the Texture controls for repeat or size.

Layering UV Textures



Base UV Texture



Layered UV Texture

Great textures are formed by layering images on top of one another. You start with a base layer, which is the base paint. Each successive layer on top of that is somewhat transparent to let the bottom layers show through, but opaque where you want to add on to details.

To avoid massive confusion, all image textures for a mesh usually use the same UV map. If you do, each image will line up with the one below it, and they will layer on top of one another like the examples shown to the right. To do this, just create one UV Texture (map) as described in this section. Then, create material image textures as described in the procedural materials section. Instead of mapping to Original Coordinates (OrCo), map to UV.

Use that map name repeatedly in the Material–>Textures–>Map Input panel by selecting UV and typing the name in the text field. In the example to the right, our UV Texture is called “Head” (you may have to expand the image to see the panel settings). Then, the image texture shown will be mapped using the UV coordinates. In the “Base UV Texture” example to the right, the face has two textures UV mapped; one for a base color, and another for spots, blemishes and makeup.

Both textures use the same UV Texture map as their Map Input, and both affect Color. The Makeup texture is transparent except where there is color, so that the base color texture shows through. Note that the colors were too strong on the image, so they amount of Col affects is turned down to 60% in the second layer (the blemish layer).

Normally, we think of image textures affecting the color of a mesh. Realism and photo-realistic rendering is a combination of many different ways that light interacts with the surface of the mesh. The image texture can be Mapped To not only color, but also *Normal* (bumpiness) or *Reflection* or any of the other attributes specified in the Map To panel.

If you paint a grey-scale image (laid out according to the UV Layout) with white where the skin is oily and shiny, and dark where it is not, you would map that input image according to the UV Layout, but have it affect Specularity (not color).

To make portions of a mesh transparent and thus reveal another mesh surface underneath, you would paint a grey-scale image with black where you want the texture transparent, map input to UV, and map it to Alpha (not color). To make portions of a mesh, like a piece of hot metal, appear to glow, you would use a grey-scale image mapped to Emit.

Believe it or not, this is only “the tip of the iceberg!” If everything that’s been described here just isn’t enough for you, the *texture nodes* feature, introduced in recent versions of Bforartists, enables you to layer and combine textures in almost any way you can imagine.

Mix and Match Materials

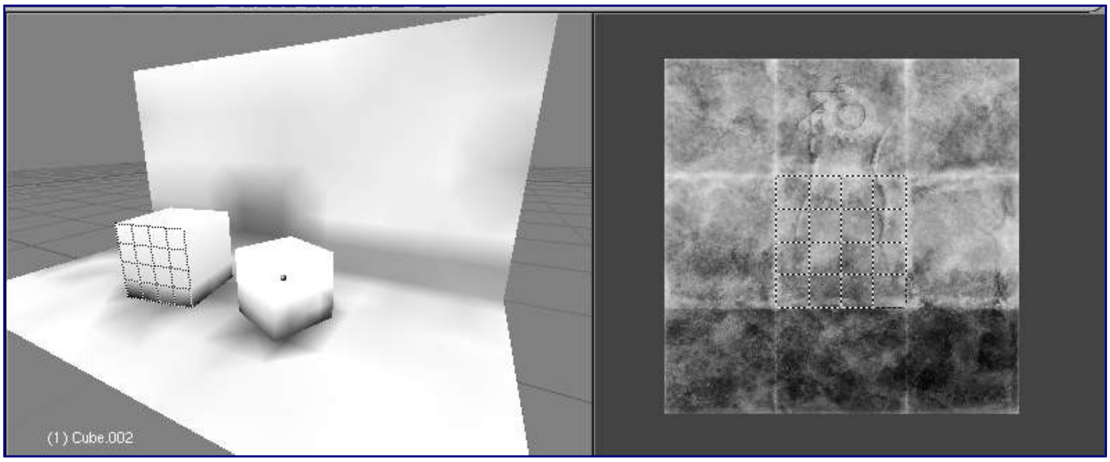
You can mix and match procedural materials and textures, vertex paint, and UV textures onto the same mesh.

The image to the right has a world with a red ambient light. The material has both VCol Paint and Face Textures enabled, and receives half of ambient light. A weak cloud texture affects color, mixing in a tan color. The right vertices are vertex painted yellow and the left is unpainted procedural gray. The UV Texture is a stock arrow image from the public domain texture CD. Scene lighting is a white light off to the right. From this information and the User Manual thus far, you should now be able to recreate this image.

You can also assign *multiple materials* to the mesh based on which faces you want to be procedural and which you want to be texture-mapped. Just don’t UV map the faces you want to be procedural.

You can use UV Textures and VertexPaint (V in the 3D View window) simultaneously, if both are enabled in the Material settings. The vertex colors are used to modulate the brightness or color of the UV image texture:

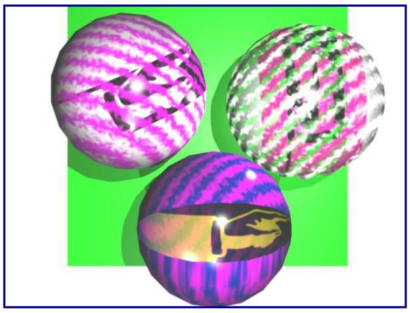
- UV Texture is at the base *(Face Textures)*
- Vertex paint affects its colors, then
- Procedural textures are laid on top of that,
- Area lights shine on the surface, casting shadows and what not, and finally
- Ambient light lights it up.



Vertex colors modulate texture.

A UV Layout can only have one image, although you can tile and animate the image. Since a layout is a bunch of arranged UV Maps, and a UV Map maps many mesh faces, a face can therefore only have one UV Texture image, and the UV coordinates for that face must fit entirely on the image. If you want a face to have multiple images, split the face into parts, and assign each part its own image. *(Or* you can get fancy with Nodes, but that's another story ...)

Using Alpha Transparency



Alpha UV Textures

Alpha 0.0 (transparent) areas of a UV Image render as black. Unlike a procedural texture, they do not make the base material transparent, since UV Textures do not operate on the base procedural material. The UV texture overrides any procedural color underneath. Procedural Textures are applied on top of UV Textures, so a procedural image texture would override any UV Texture. Transparent (black) areas of a procedural texture mapped to alpha operate on top of anything else, making the object transparent in those places. The only thing that modulates visible parts of a UV Texture are the Vertex Colors. In the example to the right, the finger image is transparent at the cuff and top of the finger and is used as a UV Texture. All three balls have a base material of blue and a marbling texture. The base material color is not used whenever Face Textures is enabled.

The top left ball has not had any vertex painting, and the finger is mapped to the middle band, and the texture is mapped to a pink color. As you can see, the base material has VCol Paint and Face Textures enabled; the base color blue is not used, but the texture is. With no vertex painting, there is nothing to modulate the UV Texture colors, so the finger shows as white. Transparent areas of the UV Image show as black.

The top right ball has had a pink vertex color applied to the vertical band of faces (in the 3D View window, select the faces in UV Paint mode, switch to Vertex Paint mode, pick a pink color, and *Paint–>Set Vertex Colors*). The finger is mapped to the middle vertical band of faces, and VCol and Face Textures are enabled. The texture is mapped to Alpha black and multiplies the base material alpha value which is `1.0`. Thus, white areas of the texture are `1.0`, and `1.0` times `1.0` is `1.0` (last time I checked, at least), so that area is opaque and shows. Black areas of the procedural texture, `0.0`, multiply the base material to be transparent. As you can see, the unmapped faces (left and right sides of the ball) show the vertex paint (none, which is gray) and the painted ones show pink, and the middle stripe that is both painted and mapped change the white UV Texture areas to pink. Where the procedural texture says to make the object transparent, the green background shows through. Transparent areas of the UV Texture insist on rendering black.

The bottom ball uses multiple materials. Most of the ball (all faces except the middle band) is a base material that does not have Face Textures (nor Vertex Color Paint - VCol Paint) enabled. Without it enabled, the base blue material color shows and the pink color texture is mixed on top. The middle band is assigned a new material (2 Mat 2) that *does* have vertex paint and Face Textures enabled. The middle band of faces were vertex painted yellow, so the white parts of the finger are yellow. Where the pink texture runs over the UV texture, the mixed color changes to green, since pink and yellow make a green.

If you want the two images to show through one another, and mix together, you need to use Alpha. The base material can have an image texture with an Alpha setting, allowing the underlying UV Texture to show through.

To overlay multiple UV images, you have several options:

- Create multiple UV Textures which map the same, and then use different images (with Alpha) and Bforartists will overlay them automatically.
- Use the *Composite Nodes* to combine the two images via the AlphaOver node, creating and saving the composite image. Open that composited image as the UV Texture.
- Use an external paint program to alpha overlay the images and save the file, and load it as the face's UV Texture
- Define two objects, one just inside the other. The inner object would have the base image, and the outer image the overlaid image with a material alpha less than one (1.0).
- Use the *Material nodes* to combine the two images via the AlphaOver or Mix node, thus creating a third noded material that you use as the material for the face. Using this approach, you will not have to UV map; simply assign the material to the face using the Multiple Materials

UV Textures vs. Procedural Textures

A Material Texture, that has a Map Input of UV, and is an image texture that is mapped to Color, is equivalent to a UV Texture. It provides much more flexibility, because it can be sized and offset, and the degree to which it affects the color of your object can be controlled in the Map To panel. In addition, you can have different images for each texture channel; one for color, one for alpha, one for normals, one for specularity, one for reflectivity, *etc.* Procedural textures, like Clouds, are INCREDIBLY simple and useful for adding realism and details to an image.

UV Texture	Procedural Texture
Image maps to precise coordinates on the selected faces of the mesh	Pattern is generated dynamically, and is mapped to the entire mesh (or portion covered by that material)
The Image maps once to a range of mesh faces specifically selected	Maps once to all the faces to which that material is assigned; either the whole mesh or a portion
Image is mapped once to faces.	Size XYZ in the MapInput allows tiling the texture many times across faces. Number of times depends on size of mesh
Affect the color and the alpha of the object.	Can also affect normals (bumpiness), reflectivity, emit, displacement, and a dozen other aspects of the mesh's appearance; can even warp or stencil subsequent textures.
Can have many for a mesh	Can be layered, up to 10 textures can be applied, layering on one another. Many mix methods for mixing multiple channels together.
Any Image type (still, video, rendered). Preset test grid available	Many different presents: clouds, wood grain, marble, noise, and even magic.
Provides the UV layout for animated textures	Noise is the only animated procedural texture
Takes very limited graphics memory	Uses no or little memory; instead uses CPU compute power

So, in a sense, a single UV texture for a mesh is simpler but more limited than using multiple textures (mapped to UV coordinates), because they do one specific thing very well: adding image details to a range of faces of a mesh. They work together if the procedural texture maps to the UV coordinates specified in your layout. As discussed earlier, you can map multiple UV textures to different images using the UV Coordinate mapping system in the Map Input panel.

Settings

Image Settings

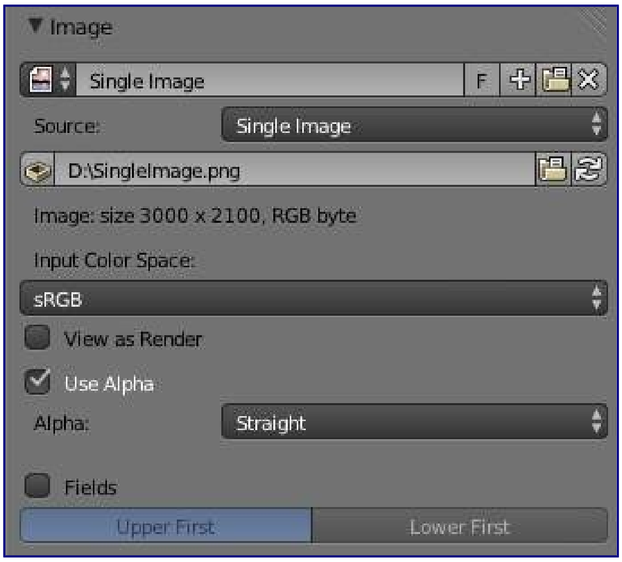


Image panel

In the *Image Sampling* panel we tell Bforartists which source file to use.

Image or Movie Data-block:

Browse
Select an image or video among linked to the .blend file

Name field
Internal name of image

F
Create a fake user for the image texture

+
Replace active texture with a new one

Folder
Browse for an image on your computer

X
Unlink this image or movie.

Source:

Where the image come from. What kind of source file to use.

Generated
Generated image in Bforartists.

Movie
Movie file.

Image Sequence
Multiple image files as a sequence.

Single Image
Single image file.

File for Image or Movie texture:

See about supported *Image* formats.

Pack image
: Embed image into current .blend file

Path
: Path to file

File Browser
: Find a file on your computer. Hold `Shift` to open the selected file and `Ctrl` to browse a containing directory.

Reload
: Reloads the file. Useful when an image has been rework in an external application.

Input Color Space

Color space of the image or movie on disk

XYZ
: XYZ space.

VD16
: The simple video conversion from a gamma 2.2 sRGB space.

sRGB
: Standart RGB display space.

Raw
: Raw space.

Non-Color
: Color space used for images which contains non-color data (i.e. normal maps).

Linear ACES
: ACES linear space.

Linear
: 709 (full range). Bforartists native linear space.

View as Render
: Apply render part of display transformation when displaying this image on the screen.

Use Alpha

Use the alpha channel information from the image or make image fully opaque

Straight
: Transparent RGB and alpha pixels are unmodified.

Premultiplied
: Transparent RGB pixels of an image are multiplied by the image's alpha value.

Fields

Work with field images. Video frames consist of two different images (fields) that are merged. This option ensures that when *Fields* are rendered, the correct field of the image is used in the correct field of the rendering. *MIP Mapping* cannot be combined with *Fields*.

Upper First
: Order of video fields - upper field first.

Lower First
: Order of video fields - lower field first.

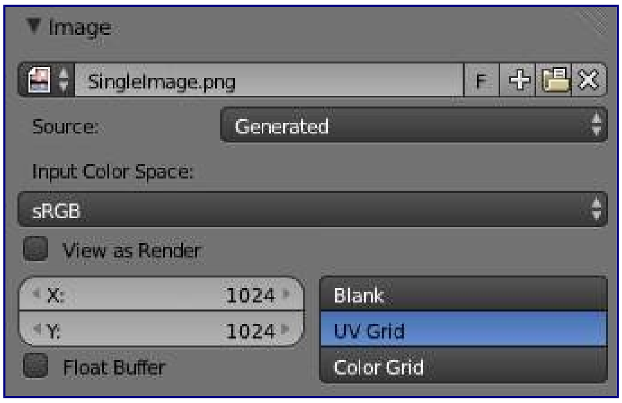


Image panel for Generated source of Image texture

For *Generated* source there are the specific options: *X* and *Y* size

Width and height of image to be generated.

Generated Image Type

Which kind of image to be generated

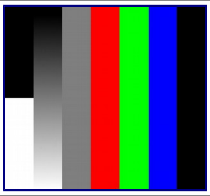
Blank
Generate a blank image.
UV Grid
Generated grid to test UV mappings.
Color Grid
Generated improved UV grid to test UV mappings.

Float Buffer
Generate floating point buffer.

About specific options for **movie** and **image sequence** source. see *here*

Image Sampling

In the *Image Sampling* panel we can control how the information is retrieved from the image.

	
Background image	Foreground image

The two images presented here are used to demonstrate the different image options. The *background image* is an ordinary JPG-file, the *foreground image* is a PNG-file with various alpha and greyscale values. The vertical bar on the right side of the foreground image is an Alpha blend, the horizontal bar has 50% alpha.

	
Foreground image with *Use* alpha. The alpha values of	Foreground image with *Calculate* alpha

the pixels are evaluated	

Alpha

Options related to transparency

Use
: Works with PNG and TGA files since they can save transparency information (Foreground Image with UseAlpha). Where the alpha value in the image is less than 1.0, the object will be partially transparent and stuff behind it will show.

Calculate
: Calculate an alpha based on the RGB values of the Image. Black (0,0,0) is transparent, white (1,1,1) opaque. Enable this option if the image texture is a mask. Note that mask images can use shades of gray that translate to semi-transparency, like ghosts, flames, and smoke/fog.

Invert
: Reverses the alpha value. Use this option if the mask image has white where you want it transparent and vice-versa.

Flip X/Y Axis
: Rotates the image 90 degrees counterclockwise when rendered.

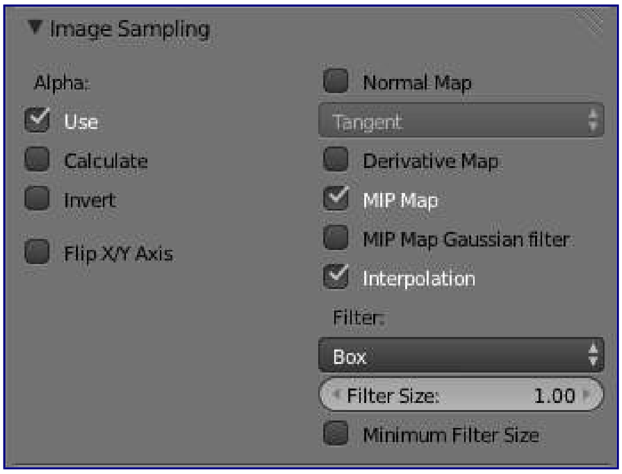


Image Sampling panel

Normal Map

This tells Bforartists that the image is to be used to create the illusion of a bumpy surface, with each of the three RGB channels controlling how to fake a shadow from a surface irregularity. Needs specially prepared input pictures. See *Bump and Normal Maps*.

Normal Map Space:
: *Tangent*: *Object*: *World*: *Camera*:

Derivative Map
: Use red and green as derivative values.

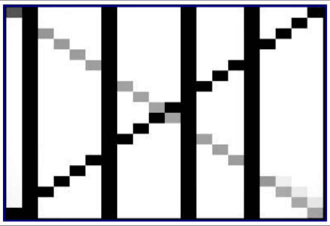
MIP Map

MIP Maps are pre-calculated, smaller, filtered Textures for a certain size. A series of pictures is generated, each half the size of the former one. This optimizes the filtering process. By default, this option is enabled and speeds up rendering (especially useful in the game engine). When this option is OFF, you generally get a sharper image, but this can significantly increase calculation time if the filter dimension (see below) becomes large. Without MIP Maps you may get varying pictures from slightly different camera angles, when the Textures become very small. This would be noticeable in an animation.

MIP Map Gaussian filter

Used in conjunction with MIP Map, it enables the MIP Map to be made smaller based on color similarities. In the game engine, you want your textures, especially your MIP Map textures, to be as small as possible to increase rendering speed and frame rate.

Enlarged Image texture without and with *Interpolation*



Interpolation

This option interpolates the pixels of an image. This becomes visible when you enlarge the picture. By default, this option is on. Turn this option OFF to keep the individual pixels visible and if they are correctly anti-aliased. This last feature is useful for regular patterns, such as lines and tiles; they remain ‘sharp’ even when enlarged considerably. When you enlarge this 10x10 pixel Image

the difference with and without *Interpolation* is clearly visible. Turn this image off if you are using digital photos to preserve crispness.

Filter

The filter size used in rendering, and also by the options *MipMap* and *Interpolation*. If you notice gray lines or outlines around the textured object, particularly where the image is transparent, turn this value down from 1.0 to 0.1 or so.

Texture Filter Type

Texture filter to use for image sampling. Just like a *pixel* represents a *pic* ture *el* ement, a *texel* represents a *tex* ture *el* ement. When a texture (2D texture space) is mapped onto a 3D model (3D model space), different algorithms can be used to compute a value for each pixel based on samplings from several texels.

Box

A fast and simple nearest-neighbor interpolation known as Monte Carlo integration

EWA (Elliptical Weighted Average)

One of the most efficient direct convolution algorithms developed by Paul Heckbert and Ned Greene in the 1980s. For each texel, EWA samples, weights, and accumulates texels within an elliptical footprint and then divides the result by the sum of the weights.

Eccentricity

Maximum Eccentricity. Higher values give less blur at distant/oblique angles, but is slower

FELINE (Fast Elliptical Lines)

Uses several isotropic probes at several points along a line in texture space to produce an anisotropic filter to reduce aliasing artifacts without considerably increasing rendering time.

Probes
Number of probes to use. An integer between 1 and 256. Further reading: McCormack, J; Farkas, KI; Perry, R; Jouppi, NP (1999) Simple and Table Feline: Fast Elliptical Lines for Anisotropic Texture Mapping, WRL

Area

Area filter to use for image sampling

Eccentricity
Maximum Eccentricity. Higher values give less blur at distant/oblique angles, but is slower

Filter Size
The filter size used by MIP Map and Interpolation

Minimum Filter Size
Use Filter Size as a minimal filter value in pixels

Image Mapping

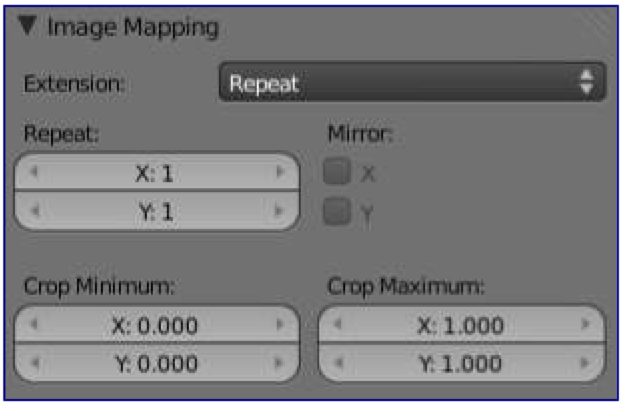


Image Mapping panel

In the *Image Mapping* panel, we can control how the image is mapped or projected onto the 3D model.

Extension:

Extend

Outside the image the colors of the edges are extended

Clip

Clip to image size and set exterior pixels as transparent. Outside the image, an alpha value of 0.0 is returned. This allows you to 'paste' a small logo on a large object.

Clip Cube

Clips to cubic-shaped area around the images and sets exterior pixels as transparent. The same as Clip, but now the 'Z' coordinate is calculated as well. An alpha value of 0.0 is returned outside a cube-shaped area around the image.

Repeat

The image is repeated horizontally and vertically

Repeat

X/Y repetition multiplier

Mirror

Mirror on X/Y axes. This buttons allow you to map the texture as a mirror, or automatic flip of the image, in the corresponding X and/or Y direction.

Checker

Checkerboards quickly made. You can use the option *size* on the *Mapping* panel as well to create the desired number of checkers.

Even / Odd

Set even/odd tiles

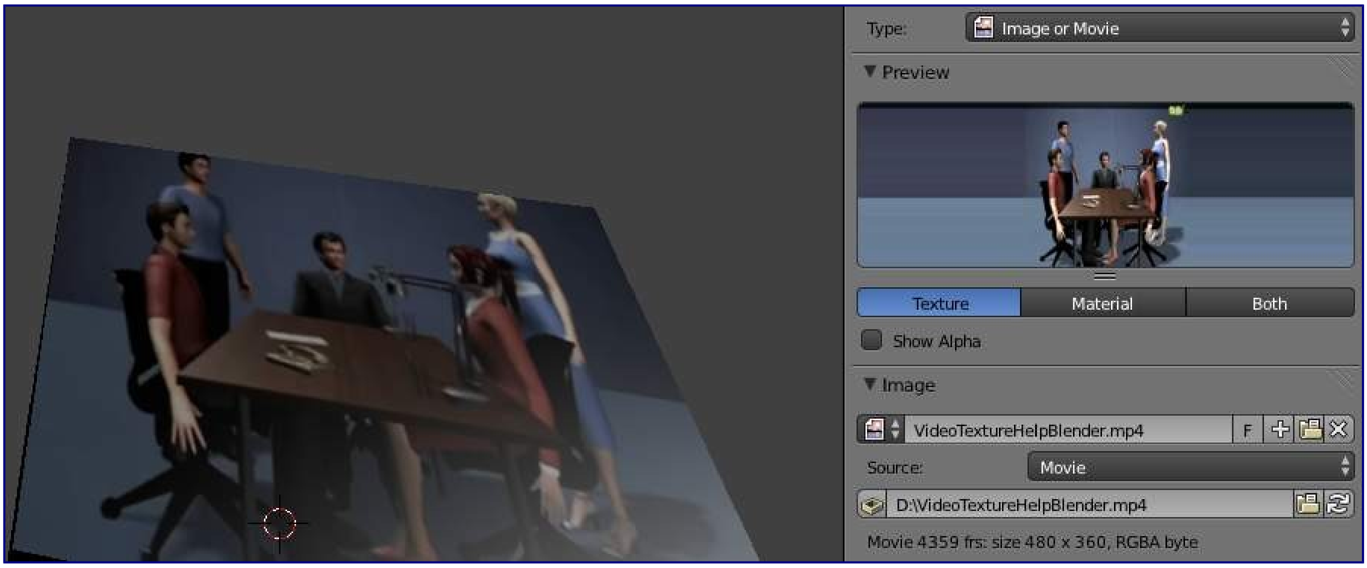
Distance

Governs the distance between the checkers in parts of the texture size

Crop Minimum / Crop Maximum

The offset and the size of the texture in relation to the texture space. Pixels outside this space are ignored. Use these to crop, or choose a portion of a larger image to use as the texture.

Video Textures



Video texture

Video textures are a some kind of *Image* textures and based on movie file or sequence of successive numbered separate images. They are added in the same way that image textures are.

Options

Image

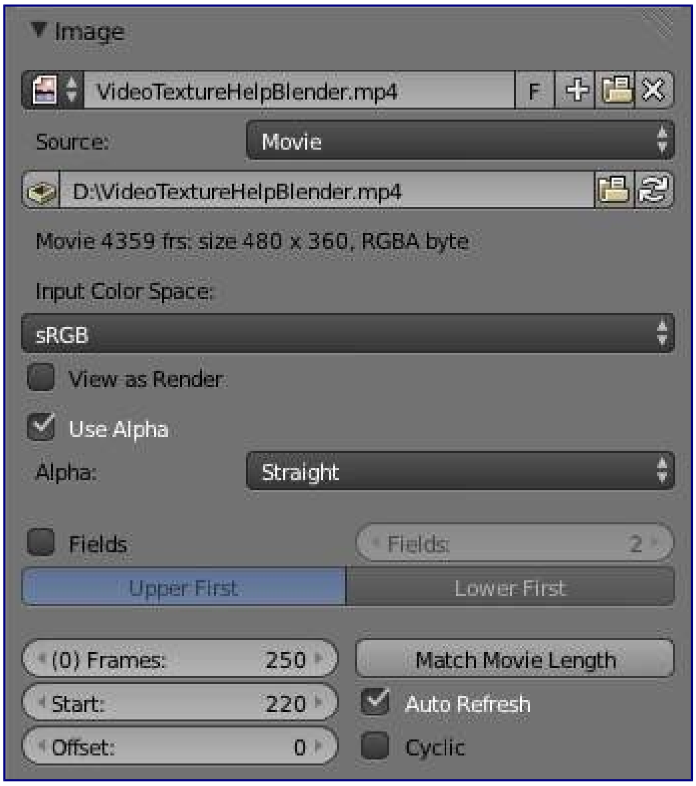


Image panel for video texture

Source

For video texture the kind of source file to use is

Movie
: See about supported *Movie* formats.

Image Sequence
: See about supported *Image* formats. To load image sequence in any of the supported image file formats first click on the first frame and then Accept. Then change the Source to Image Sequence, and enter the ending frame number of this sequence.

More about loading source file for video texture see here.

Fields

Work with field images. Video frames consist of two different images (fields) that are merged. This option ensures that when *Fields* are rendered, the correct field of the image is used in the correct field of the rendering.

Upper First
: Order of video fields - upper field first.

Lower First
: Order of video fields - lower field first.

Fields
: Number of fields per rendered frame. Used with Fields and interlaced video, it says whether each image has both odd and even, or just one.

Frames
: Number of frames/images in the movie or sequence to use

Start
: Global starting frame of the sequence/movie

Offset
: Offset the number of the frame to use in the animation. What frame number inside the movie/sequence to start grabbing.

Match Movie Length
: This button set image’s user’s length to the one of selected movie/sequence.

Auto Refresh
: Automatically refresh images on frame changes

Cyclic
: When the video ends, it will loop around the to the start and begin playing again.

For *Movie* source:

Use Alpha

Use the alpha channel information from the image or make image fully opaque

Straight
: Transparent RGB and alpha pixels are unmodified.

Premultiplied
: Transparent RGB pixels of an image are multiplied by the image’s alpha value.

See also

For sampling and mapping documentation see *Image Texture*

Texture Nodes

As an alternative to using the *Texture Stack*, Bforartists includes a node-based texture generation system which enables you to create textures by combining colors, patterns and other textures in much the same way that you combine *Material Nodes*.

You can use these textures wherever you can use regular textures: you can place them in texture channels, in material nodes, in particle systems, and even inside other textures.

Note

Node-based textures do **not** work for realtime display, they will only be visible in rendered images.

Using Texture Nodes

To use texture nodes with the current texture, open a *Node Editor window*, set it to *Texture* mode by clicking the “Texture” icon (

Texture

) in its header.

To start adding nodes, you first need to select a material. Now you can either click the *New* button in the Node editor, or the *New* button in the texture panel. Once you have a texture selected, you can toggle it to function as a regular texture or a node texture by clicking the *Use Nodes* option in the Node Editor.

The default node setup will appear: a red-and-white checkerboard node connected to an *Output* named `Default`. For *texture* nodes, you can create as many Outputs as you like in your node setup. (Other types of node networks, as you may recall, are limited to only one Output node.) See the next section for details.

For instructions on how to add, remove and manipulate the nodes in the tree, see the *Node Editor manual*.

Using Multiple Outputs

Each texture that you define with Texture Nodes can have several outputs, which you can then use for different things. For example, you might want your texture to define both a diffuse (color) map and a normal map. To do this, you would:

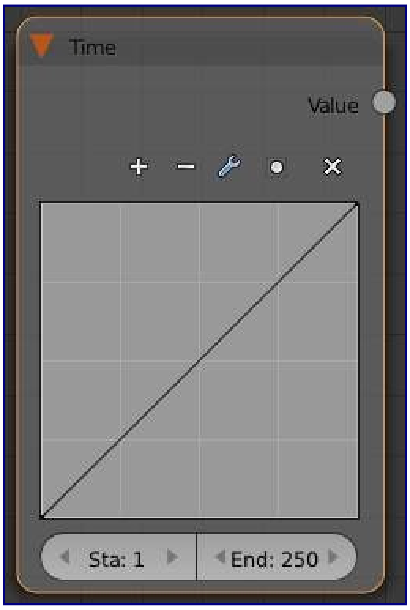
- Create two texture slots in the texture list, and set them to the same texture data-block.
- Add two *Output* nodes to the node tree, and type new names into their *Name* text-boxes: *e.g.* `Diffuse` for one and `Normal` ” for the other.
- Underneath the texture picker in the texture panel, you’ll see a dropdown list with the names of your outputs. For each entry in the texture list, select the desired output by changing the menu entry e.g. set on to `Diffuse` and the other to `Normal`).

You can also use these named outputs if you’ve decided to define your material using Material Nodes. In this case, you probably won’t be using Texture Channels. Instead, you’ll insert *Texture* nodes into your Material Node tree using *Add –> Input –> Texture*. Then, inside the texture node that you’ve just added, you can select which output you want to use *(e.g.* `Diffuse` or `Normal`).

Input Nodes

Input nodes provide input data for other nodes.

Time



Time node

The time node uses a frame range to output a value between 0 and 1. By default the node output a linear transition from 0 to 1 from frame 1 to 250. The shape of the curve can be manipulated to vary the output over time in different ways.

`Plus`:Zoom in. `Minus`:Zoom out *Tools*:

Reset View

Resets curve view

Vector Handle

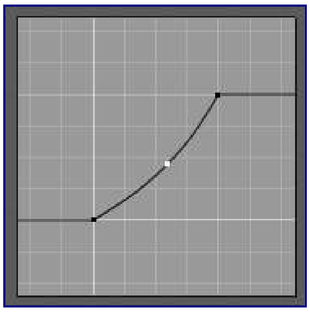
Breaks tangent at curve handle, making a angle.

Auto Handle

Default smooth interpolation of curve segments

Extend Horizontal

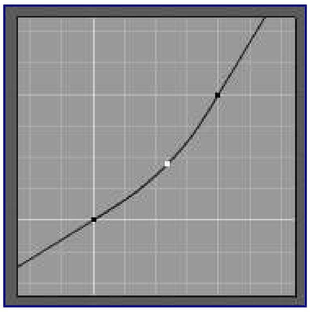
Causes the curve to stay horizontal before the first point and after the last point.



Extend Horizontal

Extend Extrapolated

Causes the curve to extrapolate before the first point and after the last point, based on the shape of the curve.



Extend Extrapolate

Reset Curve

Resets shape of curve to original linear shape.

Clipping Options:

Use Clipping

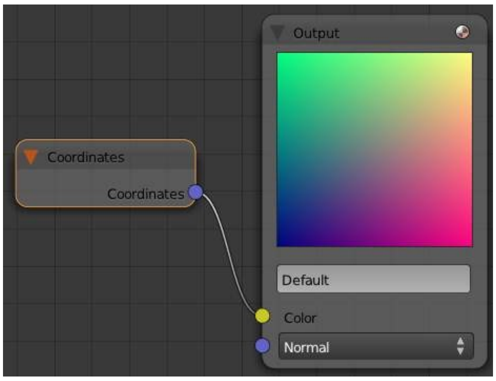
Forces curve points to stay between specified values.

Min X/Y and Max X/Y

Set the minimum and maximum bounds of the curve points.

X:Delete curve points. The first and last points cannot be deleted. *X and Y* The coordinates of the selected edit point. *Sta*:Specify the start frame to use. *End*:Specify the end frame to use.

Coordinates



Coordinates node

The Coordinates node outputs the geometry local coordinates, relative to its bounding box as RGB colors:

- Red channel corresponds to X value.
- Green channel corresponds to Y value.
- Green channel corresponds to Z value.

Texture Node

Texture node

The texture node can be used to load a another node based or non-node based texture.

Color 1 and Color 2
These can be used to remap a greyscale texture using two colors.

Image Node

Image node

The image node can be used to load an external image.

Browse for image
Select an image that already exists in the scene.

Data-block name
Set the name of the image data-block.

F
Save this image data-block, even if it has no users.

Open image
Select image to use from file browser.

Unlink data-block
Remove the image data-block from the node.

Output Nodes

These node serves a outputs for node textures

Output

This node contains the result of the node texture. Multiple output nodes can exist in a node texture, however only one of them is active. The active one is set in the Texture Panel in the *Output* drop down.

Color
    The color data that the texture renders
Normal
    The normal map that the texture will output.

Viewer

The viewer node can be used to preview the results of a node.

Texture Color Nodes

Mix

mix node

This node mixes a base color or image (threaded to the top socket) together with a second color or image (bottom socket) by working on the individual and corresponding pixels in the two images or surfaces. The way the output image is produced is selected in the drop-down menu. The size (output resolution) of the image produced by the mix node is the size of the base image. The alpha and Z channels (for compositing nodes) are mixed as well.

See also

Color Blend Modes for details on each blending mode.

Note

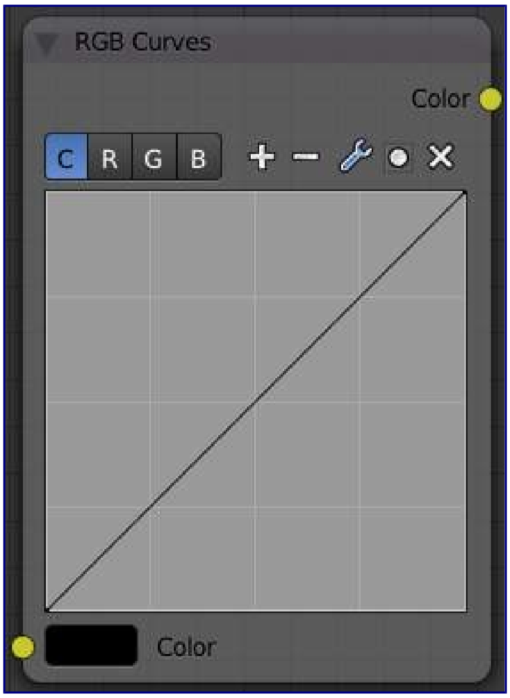
Color Channels

There are two ways to express the channels that are combined to result in a color: RGB or HSV. RGB stands for the Red,Green,Blue pixel format, and HSV stands for Hue,Saturation,Value pixel format.

Clamp
Clamps the result of the mix operation between 0 and 1. Some of the mix types can produce reults above 1 even if the inputs are both between 0 and 1, such as Add.

Factor
The amount of mixing of the bottom socket is selected by the Factor input field (Fac:). A factor of zero does not use the bottom socket, whereas a value of 1.0 makes full use. In Mix mode, `0.5` is an even mix between the two, but in Add mode, `0.5` means that only half of the second socket's influence will be applied.

RGB Curves



RGB Curves node

For each color component channel (RGB) or the composite (C), this node allows you to define a bezier curve that varies the input (x-axis) to produce an output value (y-axis). Clicking on one of the *C R G B* components displays the curve for that channel.

See also

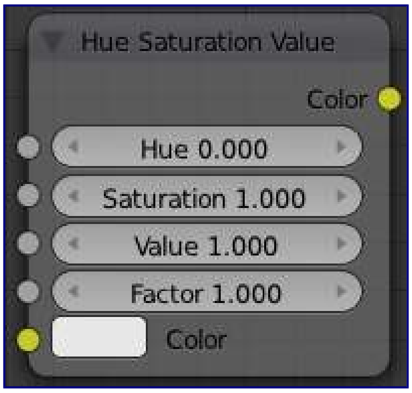
- Read more about using the Curve Widget.
- *RGB Curves node in the compositor* (includes examples)

Invert

invert node

This node simply inverts the input values and colors.

Hue Saturation Value



Hue Saturation Value node

Use this node to adjust the Hue, Saturation, and Value of an input.

Combine and Separate RGB

Combine RGB node

These two nodes allow you to convert between float values and color values. Colors are composed of 3 or 4 channels; red, green, blue, and sometimes alpha.

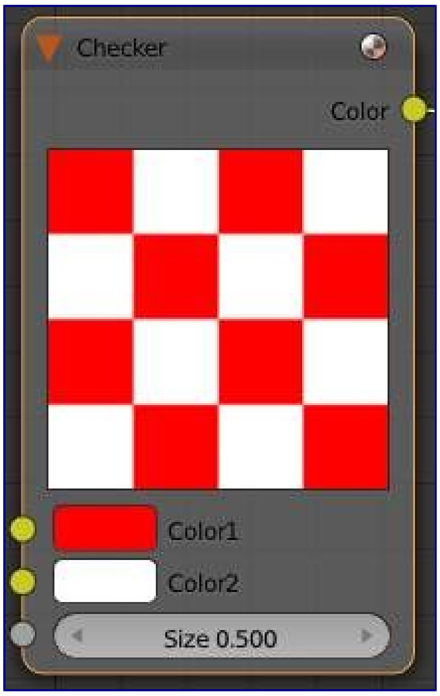
With Combine RGB, you can specify the values of each channel, and the node will combine them into a color value.

Separate RGB node

With Separate RGB, you can specify a color value, and get each channel value out of it.

Pattern Nodes

Checker



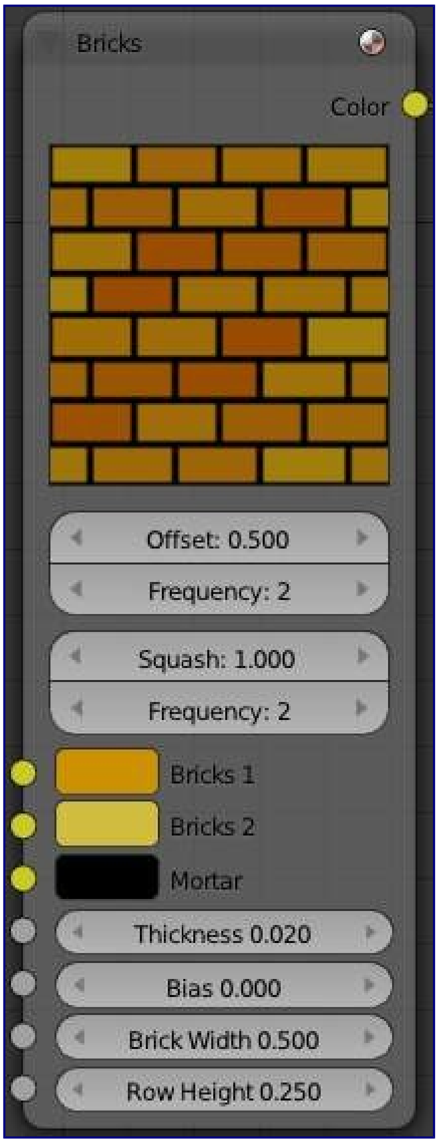
Checker node

The checker node creates a checkerboard pattern

color 1/color 2
: Sets the color of the squares

Size
: The scale of the checker pattern

Bricks



Bricks node

The Bricks node creates a brick like pattern

Offset
: The relative offset of the next row of bricks

Frequency
: Offset every N rows. The brick pattern offset repeats every N rows.

Squash
: Scales the bricks in every N rows by this amount.

Frequency
: Squash every N rows.

Bricks 1, Bricks 2
: Sets the color range of the bricks. Brick colors are chosen randomly between these two colors.

Mortar
: Sets the mortar color, in between the bricks.

Thickness
: Sets the thickness of the mortar

Bias
: The bias of randomly chosen colors, between -1 and 1. -1 Makes all bricks Color 1, and a value of 1

makes them all Color 2.

Brick Width

Sets the horizontal size of all the bricks.

Row Height

Sets the verticalsize of all the bricks.

Texture Nodes

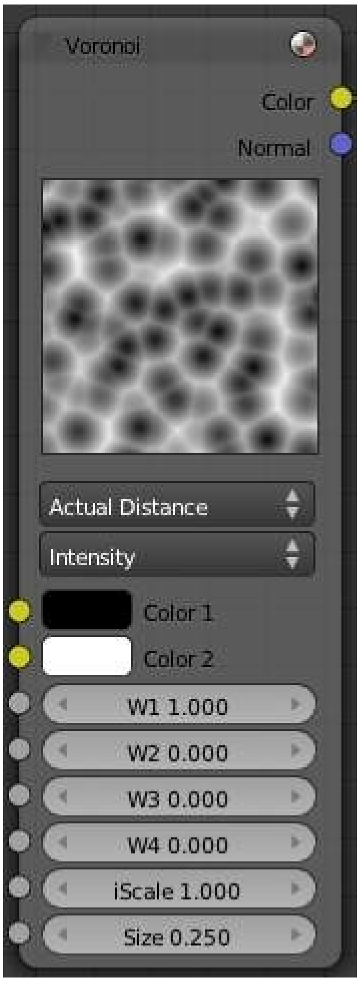
These nodes generat procedural textures, and function just like their non node based counterparts.

Common Options

Color 1/Color 2

Remaps the procedural texture with these colors. These do not function in the Magic node.

Voronoi



Voronoi node

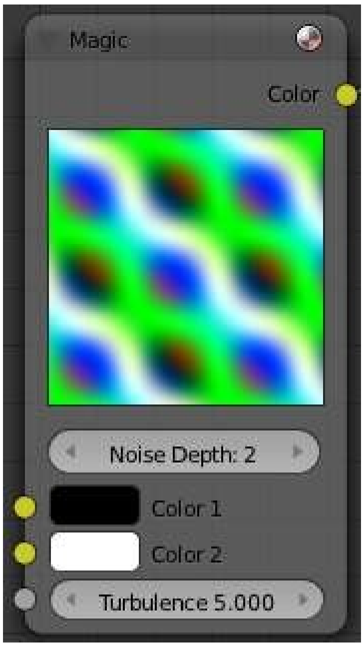
See *Here*

Blend

Blend node

See *Here*

Magic



Magic node

See *Here*

Marble

Marble node

See *Here*

Clouds

Clouds node

See *Here*

Wood

Wood node

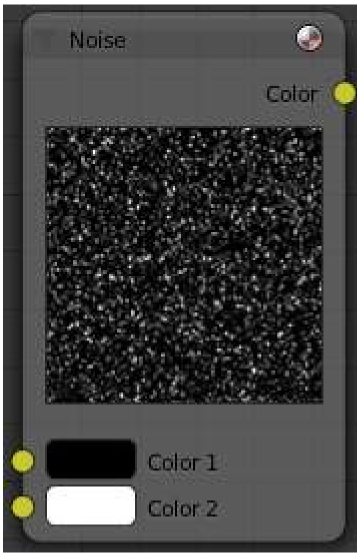
See *Here*

Musgrave

Musgrave

See *Here*

Noise



Noise

See *Here*

Stucci

Stucci

See *Here*

Distorted Noise

Distorted Noise node

See *Here*

Texture Convertor Nodes

As the name implies, these nodes convert the colors in the material in some way.

Math

math node

The math node performs one of several math functions on one or two inputs

Clamp
Clamps the result between 0 and 1.

Add
Add the two inputs

Subtract
Subtract input 2 from input 1

Multiply
Multiply the two inputs

Divide
Divide input 1 by input 2

Sine
The sine of input 1 (degrees)

Cosine
The cosine of input 1 (degrees)

Tangent
The tangent of input 1 (degrees)

Arcsine
The arcsine (inverse sine) of input 1 (degrees)

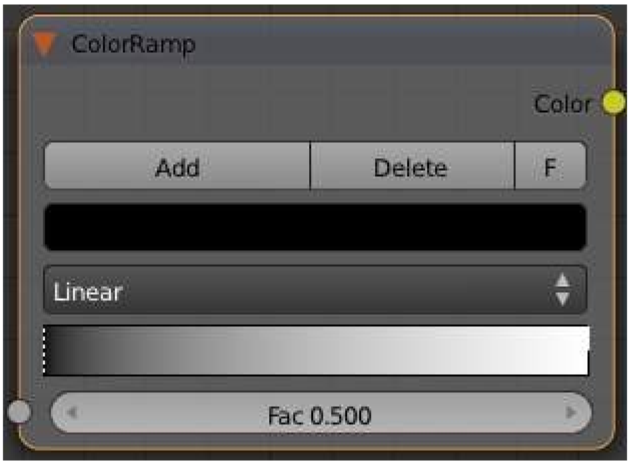
Arccosine
The arccosine (inverse cosine) of input 1 (degrees)

Arctangent
The arctangent (inverse tangent) of input 1 (degrees)

Power
Input 1 to the power of input 2 (input1^input2)

Logarithm
log base input 2 of input 1
Minimum
The minimum of input 1 and input 2
Maximum
The maximum of input 1 and input 2
Round
Rounds input 1 to the nearest integer
Less Than
Test if input 1 is less than input 2, returns 1 for true, 0 for false
Greater Than
Test if input 1 is greater than input 2, returns 1 for true, 0 for false

ColorRamp Node



ColorRamp Node

The ColorRamp Node is used for mapping values to colors with the use of a gradient. It works exactly the same way as a *Colorband for textures and materials*, using the Factor value as a slider or index to the color ramp shown, and outputting a color value and an alpha value from the output sockets.

By default, the ColorRamp is added to the node map with two colors at opposite ends of the spectrum. A completely black black is on the left (Black as shown in the swatch with an Alpha value of 1.00) and a whitewash white is on the right.

See Color Ramp Widget for editing info.

RGB to BW Node

RGB to BW Node

This node converts a color image to black-and-white by computing the luminance of the rgb values.

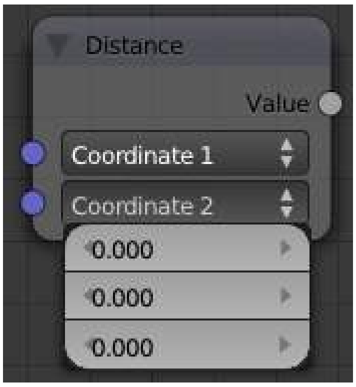
Value to Normal

Value to Normal node

Computes a normal map based on greyscale values of an input

Val
The texture to compute the normal map from
Nabla
Size of derivative offset used for calculating normals.

Distance



Distance node. Coordinate 2 dropdown is displayed

Computes the distance between two 3d coordinates.

Distort Nodes

These nodes allow you to change the mapping of a texture.

Rotate

Rotate node

Rotate the texture coordinates of an image or texture.

Turns
: The number of times to rotate the coordinates 360 degrees about the specified axis.

Axis
: The axis to rotate the mapping about

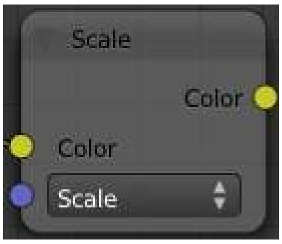
Translate

Translate node

Translate the texture coordinates of an image or texture.

Offset
: The amount to offset the coordinates in each of the 3 axes.

Scale



Scale node

Scale the texture coordinates of an image or texture.

Scale
: The amount to scale the coordinates in each of the 3 axes.

At

At node

Returns the color of a texture at the specified coordinates. If the coordinates are not spatially varying, the node will return a single color.

Coordinates
The point at which to sample the color. For images, the space is between -1 and 1 for x and y.

Volume Textures

Bforartists has two textures that can be applied to volumetric data:

Voxel Data
Voxel data renders a voxel source. It can be used for rendering Bforartists's internal smoke simulations. Other sources include binary raw formats, and Image Sequence, which can be used to stack a sequence of images into a 3D representation

Point Density
Point density renders a given point cloud (object vertices or particle system) as a 3D volume

- Voxel Data
- Point Density Texture

Voxel Data

Voxel data renders a voxel source, working very similarly to an image texture, but in 3d. Various input data source types are available (such as smoke voxel data, or external files), as well as various interpolation methods.

The voxels are stored in a flat z/y/x grid of floats. Functions for sampling this based on location within the (0,1) bounds are available in:

- source/Bforartists/blenlib/intern/voxel.c

The default voxel data source, Smoke, is used for rendering Bforartists's internal smoke simulations. Other sources include binary raw formats, and Image Sequence, which can be used to stack a sequence of images into a 3D representation, which is a common format for medical volume data such as CT scans.

Settings

File Format
Bforartists Voxel
Default binary voxel file format.
8 bit RAW
8 bit grayscale binary data.
Image Sequence
Generate voxels from a sequence of image slices.
Smoke
Render voxels from a Bforartists smoke simulation.

Source Path
The external source data file to use for 8 bit Raw data and Bforartists Voxel formats

Domain Object (Smoke)
    Object used as the smoke simulation domain
Source
    Smoke
        Use smoke density and color as texture data.
    Flame
        Use flame temperature as texture data.
    Heat
        Use smoke heat as texture data. Values from -2.0 to 2.0 are used.
    Velocity
        Use smoke velocity as texture data.
Resolution
    Resolution of the voxel grid when using 8 bit Raw data.
Interpolation
    Nearest Neighbor
        No interpolation, fast but blocky and low quality.
    Linear
        Good smoothness and speed.
    Quadratic
        Mid-range quality and speed.
    Cubic Catmull-Rom
        Smoothed high quality interpolation, but slower.
Extension
    Extend
        Extend by repeating edge pixels of the image.
    Clip
        Clip to image size and set exterior pixels as transparent.
    Repeat
        Cause the image to repeat horizontally and vertically.
Intensity
    Multiplier for intensity values

Point Density Texture

Point density renders a given point cloud (object vertices or particle system) as a 3D volume, using a user-defined radius for the points. Internally, the system uses a BVH data structure for fast range lookups.

The rendered points are spherical by default, with various smooth falloff options, as well as simple Turbulence options for displacing the result with noise, adding fine detail. When using Point Density with a particle system, additional particle info such as particle velocity, age, and speed, can be visualized using a color/alpha ramp gradient.

Options

Particle System
    Particle System, Generate point density from a particle system.
Object Vertices
    Object Vertices, Generate point density from an object’s vertices.

Object Radius System Falloff

Standard Smooth Soft Softness

Constant

Density is constant within lookup radius.

Root Particle Age Particle Velocity Velocity Scale

Falloff Curve
Use a custom falloff

Cache
Coordinate system to cache particles in Global Space Emit Object Space Emit Object Location

Color Source

Data to derive the color results from

Constant
Constant color

Particle Age
Lifetime mapped as 0.0 - 1.0 intensity.

Particle Speed

Particle speed (absolute magnitude of velocity) mapped as 0.0-1.0 intensity.

Scale
Multiplier to bring particle speed within an acceptable range.

Particle Velocity

XYZ velocity mapped to RGB colors.

Scale
Multiplier to bring particle speed within an acceptable range.

Turbulence

Adds directed noise to the density at render time

Influence

Method for driving added turbulent noise

Static
Noise patterns will remain unchanged, faster and suitable for stills.

Particle Velocity
Turbulent noise driven by particle velocity.

Particle Age
Turbulent noise driven by the particle’s age between birth and death.

Global Time
Turbulent noise driven by the global current frame.

Noise Basis
See *Here*

Size

Scale of the turbulent noise

Depth

Level of detail in the added turbulent noise

Turbulence Strength

Strength of the added turbulent noise

Texture Mapping

Textures need mapping coordinates, to determine how they are applied to the object. The mapping specifies how the texture will ultimately wrap itself to the object.

For example, a 2D image texture could be configured to wrap itself around a cylindrical shaped object.

Coordinates

Mapping Coordinate menu

Coordinates

Mapping works by using a set of coordinates to guide the mapping process. These coordinates can come from anywhere, usually the object to which the texture is being applied to.

Global

The scene's global 3D coordinates. This is also useful for animations; if you move the object, the texture moves across it. It can be useful for letting objects appear or disappear at a certain position in space.

Object

Uses an object as source for coordinates. Often used with an *Empty*, this is an easy way to place a small image at a given point on the object. This object can also be animated, to move a texture around or through a surface.

Object

Select the name of an object.

Generated

The original undeformed coordinates of the object. This is the default option for mapping textures.

UV

UV mapping is a very precise way of mapping a 2D texture to a 3D surface. Each vertex of a mesh has its own UV co-ordinates which can be unwrapped and laid flat like a skin. You can almost think of UV coordinates as a mapping that works on a 2D plane with its own local coordinate system to the plane on which it is operating on. This mapping is especially useful when using 2D images as textures, as seen in UV Mapping. You can use multiple textures with one set of UV coordinates.

Layer
Select your UV layer to use it for mapping.

Strand/Particle
Uses normalized 1D strand texture coordinate or particle age(X) and trail position (Y). Use when texture is applied to hair strands or particles.

Window
The rendered image window coordinates. This is well suited to blending two objects.

Normal
Uses the direction of the surface's normal vector as coordinates. This is very useful when creating certain special effects that depend on viewing angle.

Reflection
Uses the direction of the reflection vector as coordinates. This is useful for adding reflection maps - you will need this input when Environment Mapping.

Stress
Uses the difference of edge length compared to original coordinates of the mesh. This is useful, for example, when a mesh is deformed by modifiers.

Tangent
Uses the optional tangent vector as texture coordinates.

Projection

Flat
Flat mapping gives the best results on single planar faces. It does produce interesting effects on the sphere, but compared to a sphere-mapped sphere the result looks flat. On faces that are not in the mapping plane the last pixel of the texture is extended, which produces stripes on the cube and cylinder.

Cube
Cube mapping often gives the most useful results when the objects are not too curvy and organic (notice the seams on the sphere).

Tube
Tube mapping maps the texture around an object like a label on a bottle. The texture is therefore more stretched on the cylinder. This mapping is of course very good for making the label on a bottle or assigning stickers to rounded objects. However, this is not a cylindrical mapping so the ends of the cylinder are undefined.

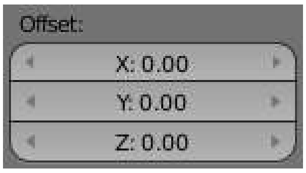
Sphere
Sphere mapping is the best type for mapping a sphere, and it is perfect for making planets and similar objects. It is often very useful for creating organic objects. It also produces interesting effects on a cylinder.

Inheriting coordinates from the parent object

From Dupli
Duplis instanced from vertices, faces, or particles, inherit texture coordinates from their parent.

Todo: explaination

Coordinate Offset, Scaling and Transformation



Offset panel

Offset

The texture co-ordinates can be translated by an offset. Enlarging of the Ofs moves the texture towards the top left.

Size panel

Size

These buttons allow you to change the mapping of axes between the texture’s own coordinate system, and the mapping system you choose (Generated, UV, etcetera.) More precisely, to each axis of the texture corresponds one of four choices, that allow you to select to which axis in the mapping system it maps! This implies several points:

- For 2D textures (such as images), only the first two rows are relevant, as they have no Z data.
- You can rotate a 2D picture a quarter turn by setting the first row (i.e. X texture axis) to Y, and the second row (Y texture axis) to X.
- When you map no texture axis (i.e. the three “void” buttons are set), you’ll get a solid uniform texture, as you use zero dimension (i.e. a dot, or pixel) of it (and then Bforartists extends or repeats this point’s color along all axes.)
- When you only map one texture axis (i.e. two “void” buttons are enabled) you’ll get a “striped” texture, as you only use one dimension (i.e. a line of pixel) of it, (and then Bforartists stretches this line along the two other axes).
- The same goes, for 3D textures (i.e. procedural ones), when one axis is mapped to nothing, Bforartists extends the plan (“slice”) along the relevant third axis.

So, all this is a bit hard to understand and master. Fortunately, you do not have to change these settings often, except for some special effects... Anyway, the only way to get used to them is to practice!

Environment Maps

Environment maps take a render of the 3D scene and apply it to a texture, to use for faking reflections. If you want to achieve a very realistic result, raytraced reflections are a good solution. Environment Maps are another way to create reflective surfaces, but they are not so simple to set up.

So why should one use Environment Maps?

- The main reason is probably that they can be much faster than raytracing reflections. In certain situations they need to be calculated only once, and may be reused like any ordinary texture. You may even modify the precalculated Environment Map in an image editor.
- Environment maps can also be blurred and render even faster because the resolution can then be lowered. Blurring a reflection with the raytracer always adds to the render time, sometimes quite a lot.
- *Halos* (a visualization type for particles) are not visible to raytraced reflections, so you need to setup environment maps to reflect them.
- *Keypoint strands* (another visualization type for particles) are also not visible to raytraced reflections, so you need to setup environment maps to reflect them.

Just as we render the light that reaches the viewing plane using the camera to define a viewpoint, we can render the light that reaches the surface of an object (and hence, the light that might ultimately be reflected to the camera). Bforartists's environment mapping renders a cubic image map of the scene in the six cardinal directions from any point. When the six tiles of the image are mapped onto an object using the *Refl* input coordinates, they create the visual complexity that the eye expects to see from shiny reflections.

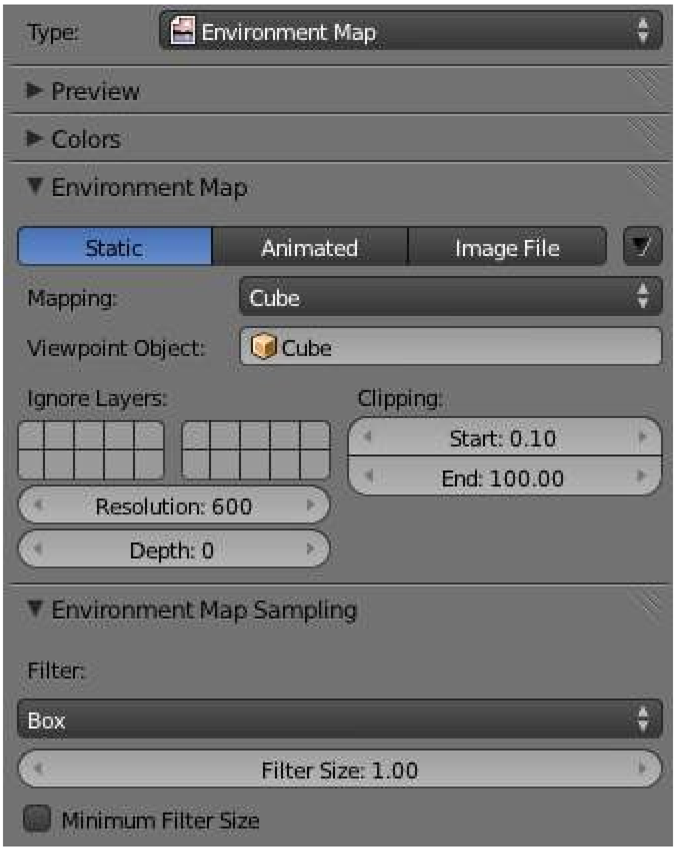
Note

It's useful to remember here that the true goal of this technique is *believability*, not *accuracy*. The eye doesn't need a physically accurate simulation of the light's travel; it just needs to be lulled into believing that the scene is real by seeing the complexity it expects. The most unbelievable thing about most rendered images is the sterility, not the inaccuracy.

Options

Important

For correct results, the mapping of an environment map texture must be set to 'Refl' (reflection co-ordinates) in the Map Input panel of the Material context.



Reflecting plane EnvMap settings.

Bforartists allows three types of environment maps, as you can see in *Reflecting plane EnvMap settings.* :

Static
: The map is only calculated once during an animation or after loading a file.

Animated
: The map is calculated each time a rendering takes place. This means moving Objects are displayed correctly in mirroring surfaces.

Image File

: When saved as an image file, environment maps can be loaded from disk. This option allows the fastest rendering with environment maps, and also gives the ability to modify or use the environment map in an external application.

: When using planar reflections, if the camera is the only moving object and you have a reflecting plane, the Empty must move too and you must use *Anim* environment map. If the reflecting object is small and the Empty is in its center, the environment map can be *Static*, even if the object itself rotates since the Empty does not move. If, on the other hand, the Object translates the Empty should follow it and the environment map be of *Anim* type.

Options in dropdown menu:

Clear Environment Map
: Clears the currently rendered environment map from memory. This is useful to refresh a *Static* environment maps and you have changed things in your scene since the last time the environment map was rendered. *Anim* environment maps do this automatically on every render.

Save Environment Map
: Saves the currently stored static environment map to disk as an image file. This can be loaded again with

Load.

Clear All Environment Maps

Does the same as *Free Data*, but with all environment maps in the scene. This is a useful shortcut when using recursive environment maps (when the *Depth* is greater than 0).

Note
EnvMap calculation can be disabled at a global level by the EnvMap Tog Button in the Render Panel of the Rendering Buttons.

Viewpoint Object

Environment maps are created from the perspective of a specified object. The location of this object will determine how 'correct' the reflection looks, though different locations are needed for different reflecting surfaces. Usually, an Empty is used as this object.

- For planar reflections, the object should be in a location mirrored from the camera, on the other side of the plane of reflection (see Examples). This is the most accurate usage of Environment maps.
- For spherical reflections, the object should be in the center of the sphere. Generally, if the reflecting sphere's object center point is in the center of its vertices, you can just use the name of the actual sphere object as the *Ob:*
- For irregular reflections, there's no hard and fast rule, you will probably need to experiment and hope that the inaccuracy doesn't matter.

Ignore Layers

The layers to exclude from the environment map creation. Since environment maps work by rendering the scene from the location of the *Ob:* object, you will need to exclude the actual reflecting surface from the environment map, otherwise it will occlude other objects that should be reflected on the surface itself.

Eg. If you are rendering an environment map from the center of a sphere, all the environment map will show by default is the inside of the sphere. You will need to move the sphere to a separate layer, then exclude that layer from the environment map render, so that the environment map will show (and hence reflect) all the objects outside the sphere.

Resolution

The resolution of the cubic environment map render. Higher resolutions will give a sharper texture (reflection), but will be slower to render.

Depth

The number of recursive environment map renders. If there are multiple reflecting objects using environment maps in the scene, some may appear solid, as they won't render each other's reflections. In order to show reflections within reflections, the environment maps need to be made multiple times, recursively, so that the effects of one environment map can be seen in another environment map. See Examples.

Clipping Start/End

The clipping boundaries of the virtual camera when rendering the environment map. Sets the minimum and maximum distance from the camera that will be visible in the map.

Environment Map Sampling

Filter

Box
: Box Filter

EWA

Elliptical Weighted Average - one of the most efficient direct convolution algorithms developed by Paul Heckbert and Ned Greene in the 1980s. For each texel, EWA samples, weights, and accumulates texels within an elliptical footprint and then divides the result by the sum of the weights.

Eccentricity
: Maximum eccentricity (higher gives less blur at distant/oblique angles, but is also slower)

FELINE

FELINE (Fast Elliptical Lines), uses several isotropic probes at several points along a line in texture space to produce an anisotropic filter to reduce aliasing artifacts without considerably increasing rendering time.

Probes
: Maximum number of samples (higher gives less blur at distant/oblique angles, but is also slower)

Area

Eccentricity

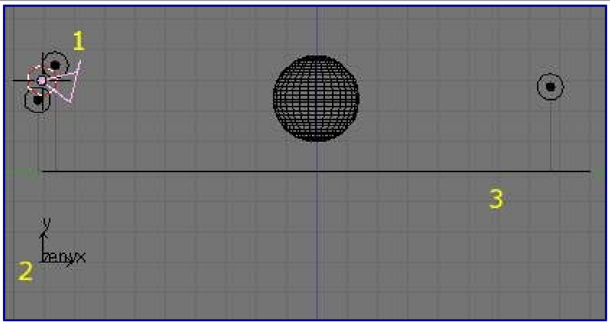
Maximum eccentricity (higher gives less blur at distant/oblique angles, but is also slower)

Filter Size
: The amount of blurring applied to the texture. Higher values will blur the environment map to fake blurry reflections.

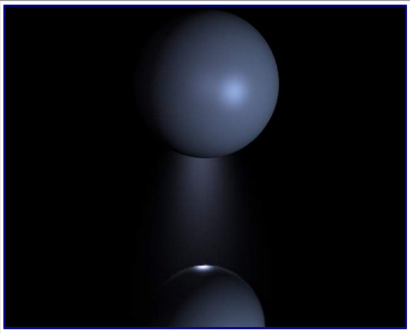
Minimum Filter Size
: Use Filter Size as a minimal filter value in pixels

Examples

In this example, an empty is used as the *Ob:* of the reflecting plane’s environment map. It is located in the specular position of the camera with respect to the reflecting surface. (This is possible, strictly speaking, only for planar reflecting surfaces.) Ideally, the location of the empty would mirror the location of the camera across the plane of the polygon onto which it is being mapped.

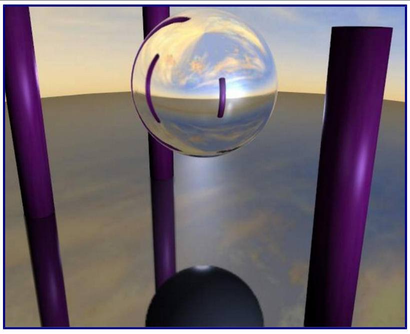
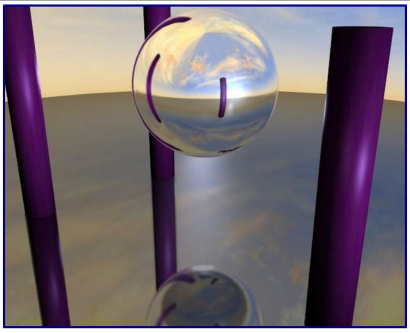


Planar reflection example. 1: Camera, 2: Empty, 3: Reflecting



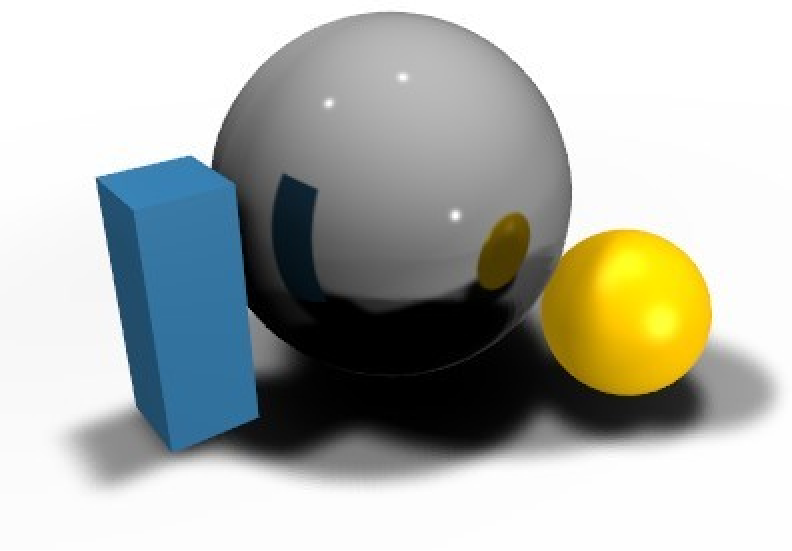
Plane.	Sphere on a reflecting surface.

The following images show the effect of the *Depth*. The first render has depth set to 0. This means the environment map on the plane has rendered before the environment map of the sphere, so the sphere's reflection isn't shown. By raising the *Depth*, the environment map is rendered recursively, in order to get reflections of reflections.

	
Reflecting sphere on a reflecting surface.	Reflecting sphere on a reflecting surface with multiple reflections.

Limitations

Because environment maps are calculated from the exact location of the *Viewpoint Object's* object center, and not from actual reflecting surface, they can often be inaccurate, especially with spheres. In the following image, the rectangular prism and the smaller spheres are touching the sides of the large reflecting sphere, but because the environment map is calculated from the center of the sphere, the surrounding objects look artificially far away.



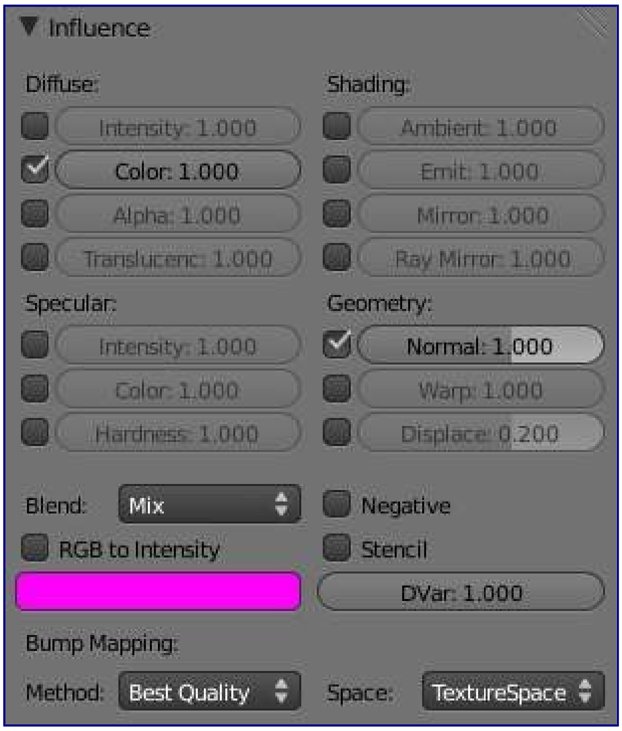
Inaccurate spherical reflection, the colored objects are artificially offset

Material Textures Influence

Not only can textures affect the color of a material, they can also affect many of the other properties of a material. The different aspects of a material that a texture influences are controlled in the *Influence* panel.

Note
Texture options for *Surface* and *Wire* materials and in some cases also for *Volume* and *Halo* materials.

Surface and Wire materials



Texture Influence panel for a Surface material

Diffuse

Intensity
: Amount texture affects affects diffuse reflectivity

Color
: Amount texture affect the basic color or RGB value of the material

Alpha
: Influences the opacity of the material. Also use *Z Transparency* for light and if combining multiple channels.

Translucency
: Influences the Translucency amount.

Specular

Intensity
: Amount texture affect specular reflectivity

Color
: Influences the *Specular* color, the color of the reflections created by the lamps on a glossy material.

Hardness
: Influences the specular hardness amount. A DVar of 1 is equivalent to a Hardness of 130, a DVar of 0.5 is equivalent to a Hardness of 65.

Shading

Ambient
Influences the amount of Ambient light the material receives.
Emit
Influences the amount of light Emitted by the material.
Mirror
Influences the mirror color. This works with environment maps and raytraced reflection.
Ray Mirror
Influences the strength of raytraced mirror reflection.

Geometry

Normal
Commonly called bump mapping, this alters the direction of the surface normal. This is used to fake surface imperfections or unevenness via bump mapping, or to create reliefs.
Warp
Warp allows textures to influence/distort the texture coordinates of a next texture channel. The distortion remains active over all subsequent channels, until a new Warp has been set. Setting the factor at zero cancels out the effect.
Displace
Influences the Displacement of vertices, for using *Displacement Maps*.

Other Controls

Blend
Blending operation to perform. See *Texture Blending Modes* for details.
RGB to intensity
With this option enabled, an RGB texture (affects color) is used as an intensity texture (affects a value).
Blend Color
If the texture is mapped to Col, what color is blended in according to the intensity of the texture? Click on the swatch or set the RGB sliders.
Negative
The effect of the Texture is negated. Normally white means on, black means off, *Negative* reverses that.
Stencil
The active texture is used as a mask for all following textures. This is useful for semitransparent textures and “Dirt Maps”. Black sets the pixel to “untexturable”. The *Stencil* mode works similar to a layer mask in a 2D program. The effect of a stencil texture can not be overridden, only extended. You need an intensity map as input.
DVar
Destination Value (not for RGB). The value with which the Intensity texture blends with the current value. Two examples:

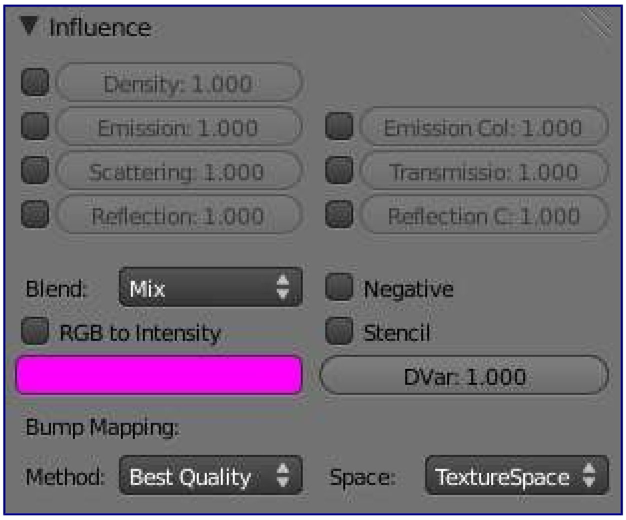
- The *Emit* value is normally 0. With a texture mapped to *Emit* you will get maximal effect, because *DVar* is 1 by default. If you set *DVar* to 0 no texture will have any effect.
- If you want transparent material, and use a texture mapped to *Alpha*, nothing happens with the default settings, because the *Alpha* value in the *Material* panel is 1. So you have to set *DVar* to 0 to get transparent material (and of course *Z Transparency* also). This is a common problem for beginners. Or do it the other way round - set *Alpha* to 0 and leave *Dvar* on 1. Of course the texture is used inverted then.

Bump Mapping

Settings for bump mapping. *Method Best Quality*, *Default*, *Compatible*, *Original Space*

Texture Space, *Object Space*, *View Space*

Volume materials



Texture Influence panel for Volume material

Special texture options for *Volume* materials

Density
: Causes the texture to affect the volume’s density.

Emission
: Causes the texture to affect the volume’s emission.

Scattering
: Amount the texture affects scattering.

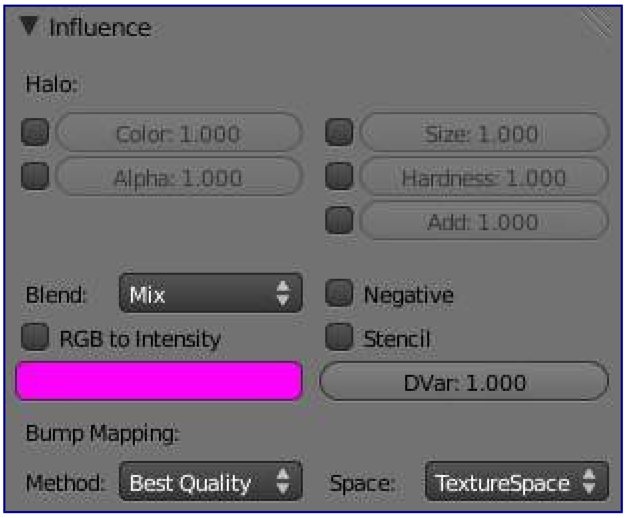
Reflection
: Amount the texture affects brightness of out-scattered light

Emission Color
: Amount the texture affects emission color.

Transmission
: Amount the texture affects result color after light has been scattered/absorbed.

Reflection Color
: Amount the texture affects color of out-scattered light.

Halo materials



Texture Influence panel for a Halo material

Special texture options for *Halo* materials

Size
: Amount the texture affects ray mirror.

Hardness
: Amount the texture affects hardness.

Add
: Amount the texture affects translucency.

Texture Blending Modes

Blending Modes are different methods of controlling how the texture influences material properties. While a blending mode defines the specific operation performed, blending factor controls the amount, the overall “strength” of this operation. For textures such blending factor is set via sliders in the Influence panel. Throughout this section, the term *base layer* refers to the base material color being manipulated (as defined by texture’s Influence) and *blend layer* refers to the texture. Following is a list of available texture blending modes:

See also

Color Blend Modes for details on each blending mode.

Bump and Normal Maps

Description

Normal Maps and *Bump Maps* both serve the same purpose: they simulate the impression of a detailed 3D surface, by modifying the shading as if the surface had lots of small angles, rather than being completely flat.

Because it's just modifying the shading of each pixel, this will not cast any shadows and will not obstruct other objects. If the camera angle is too flat to the surface, you will notice that the surface is not really shaped.

Both *Bump Maps* and *Normal Maps* work by modifying the normal angle (the direction pointing perpendicular from a face), which influences how a pixel is shaded. Although the terms *Normal Map* and *Bump Map* are often used synonymously, there are certain differences.

Bump maps

These are textures that store an **intensity**, the relative height of pixels from the viewpoint of the camera. The pixels seem to be moved by the required distance in the direction of the face normals. (The "bump" consists only of a displacement, which takes place along the existing, and unchanged, normal-vector of the face.) You may either use greyscale pictures or the intensity values of a RGB-Texture (including images).

Normal maps

These are images that store a **direction**, the direction of normals directly in the RGB values of an image. They are much more accurate, as rather than only simulating the pixel being away from the face along a line, they can simulate that pixel being moved at any direction, in an arbitrary way. The drawbacks to normal maps are that unlike bump maps, which can easily be painted by hand, normal maps usually have to be generated in some way, often from higher resolution geometry than the geometry you're applying the map to.

Normal maps in Bforartists store a normal as follows:

- Red maps from (0-255) to X (-1.0 - 1.0)
- Green maps from (0-255) to Y (-1.0 - 1.0)
- Blue maps from (0-255) to Z (0.0 - 1.0)

Since normals all point towards a viewer, negative Z-values are not stored (they would be invisible anyway). In Bforartists we store a full blue range, although some other implementations also map blue colors (128-255) to (0.0 - 1.0). The latter convention is used in "Doom 3" for example.

Workflow

The steps involved in making and using Bump and Normal Maps is:

- Model a highly detailed ("hi-poly") model
- Bake the Bump and/or Normal maps
- Make a low-poly, less detailed model
- Map the map to the low-poly model using a common coordinate system

Consult the Modeling section for how to model a highly detailed model using the Mesh tools. How much detail you put in is totally up to you. The more ridges and details (knobs, creases, protrusions) you put in, the more detailed your map will be.

Baking a map, simply put, is to take the detail of a high polygon mesh, and apply it to a similar object. The similar object is identical to the high-poly mesh except with less vertices. Use the *Render Bake* feature in Bforartists to accomplish this.

Modeling a low-poly using Bforartists's Mesh editing tools. In general, the same or similar faces should exist that reflect the model. For example, a highly detailed ear may have 1000 faces in the high-poly model. In the low-poly model, this may be replaced with a single plane, oriented in the same direction as the detailed ear mesh. *(Tip:* Bforartists's *multi-resolution mesh* modeling feature can be used to good effect here.)

Mapping is the process of applying a texture to the low-poly mesh. Consult the *Textures Mapping section* for more information on applying a texture to a mesh's material.Special considerations for Bump and Normal Maps is:

- When using a Bump map, map the texture to *Normal* and enable *No RGB*.
- When using a Normal map, map the texture to *Normal*.

The coordinate systems of the two objects must match. For example, if you bake using a UV map of the high-poly model, you must UV map the low poly model and line up its UV coordinates to match the outline of the high-poly image (see UV unwrapping to line up with the high-poly map edges.

Displacement Maps

Description

Displacement mapping allows a texture input to manipulate the position of vertices on rendered geometry. Unlike *Normal or Bump mapping*, where the shading is distorted to give an illusion of a bump (discussed on the previous page), Displacement Maps create real bumps, creases, ridges, etc in the actual mesh. Thus, the mesh deformations can cast shadows, occlude other objects, and do everything that changes in real geometry can do, but, on the other hand, requires a lot more vertices to work.

Options

In the *Influence panel*, the strength of the displacement is controlled by the *Displace* and *Normal* sliders.

- If a texture provides only normal information (e.g. *Stucci*), vertices move according to the texture's normal data. The normal displacement is controlled by the *Normal* slider.
- If a texture provides only intensity information (e.g. *Magic*, derived from color), vertices move along the directions of their normals (a vertex has no normal itself, it's the resulting vector of the adjacent faces). White pixels move outward in the direction of the normal, black pixels move in the opposite direction. The amount of displacement is controlled with the *Displace* slider.

The two modes are not exclusive. Many texture types provide both information (*Clouds*, *Wood*, *Marble*, *Image*). The amount of each type can be mixed using the respective sliders. Intensity displacement gives a smoother, more continuous surface, since the vertices are displaced only outward. Normal displacement gives a more aggregated surface, since the vertices are displaced in multiple directions.

The depth of the displacement is scaled with an object's scale, but not with the relative size of the data. This means if you double the size of an object in object mode, the depth of the displacement is also doubled, so the relative displacement appears the same. If you scale inside *Edit Mode*, the displacement depth is not changed, and thus the relative depth appears smaller.

Hints

Displacement maps move the rendered faces, not the physical mesh faces. So, in 3D View the surface may appear smooth, but render bumpy. To give a detailed surface, there has to be faces to displace and have to be very small. This creates the trade-off between using memory and CPU time versus render quality.

From best to worst, displacement works with these object types using the methods listed to control the render face size:

***Subdivision Surface* Meshes**
Rendered face size is controlled with render subsurf level. Displacement really likes smooth normals.

Manually (*Edit Mode*) *subdivided* meshes
Control render faces with number of subdivides. (This can be combined with the above methods). Displaces exactly the same Simple Subsurf, however the overhead of drawing extra faces can slow down editing.

Meta Objects
Control render faces with render wiresize. Small wire == more faces.

The following are available, but currently don't work well. It is recommended that you convert these to meshes before rendering.

Open *NURBS Surfaces*
Control render faces with U/V *Surface Resolution*. Higher numbers give more faces. (Note normal errors).

Closed NURBS Surfaces
Control with *Surface Resolution* controls. (Note the normal errors, and how implicit seam shows).

Curves* and *Text
Control with *Surface Resolution* controls. Higher gives more render faces. (Note that the large flat surfaces have few render faces to displace).

> **Note**
>
> Displace Modifier
>
> If you want more control over your displacement, you'll probably want to use the *Displace Modifier.* This feature has lots of different options so that you can customize the displacement exactly to your liking.

World

TODO: https://developer.Bforartists.org/T46363

Particles

TODO: https://developer.Bforartists.org/T46363

10.2.3 Render - Blender Render Engine - Lighting

Lighting

Lighting is a very important topic in rendering, standing equal to modeling, materials and textures. The most accurately modeled and textured scene will yield poor results without a proper lighting scheme, while a simple model can become very realistic if skillfully lit.

Viewing Restrictions

The color of an object and the lighting of your scene is affected by:

- Your ability to see different colors (partial color blindness is common).
- The medium in which you are viewing the image (e.g. an LCD panel versus printed glossy paper).
- The quality of the image (e.g. a JPEG at `0.4` compression versus `1.0`).
- The environment in which you are viewing the image (e.g. a CRT monitor with glare versus in a dark room, or in a sunshiny blue room).
- Your brain’s perception of the color and intensity relative to those objects around it and the world background color, which can be changed using color manipulation techniques using Bforartists *Composite Nodes*.

Global Influences

In Bforartists, the elements under your control which affect lighting are:

- The color of the world *ambient light*.
- The use of *Ambient Occlusion* as a way to cast that ambient light onto the object.
- The degree to which the ambient light colors the *material* of the object.
- The use of *Indirect lighting*, where the color of one object radiates onto another.
- The *lamps* in your scene.

The physics of light bouncing around in the real world is simulated by Ambient Occlusion (a world setting), buffer shadows (which approximate shadows being cast by objects), ray tracing (which traces the path of photons from a light source). Also, within Bforartists you can use *Indirect lighting*. Ray tracing, ambient occlusion, and indirect lighting are computer-intensive processes. Bforartists can perform much faster rendering with its internal scan line renderer, which is a very good scan line renderer indeed. This kind of rendering engine is much faster since it does not try to simulate the real behavior of light, assuming many simplifying hypotheses.

Lighting Settings

Only after the above global influences have been considered, do you start adding light from lamps in your scene. The main things under your control are the:

- Type of light used (*Sun*, *Spot*, *Lamp*, *Hemi*, etc.).
- Color of the light.
- Position of the light and its direction.
- Settings for the light, including energy and falloff.

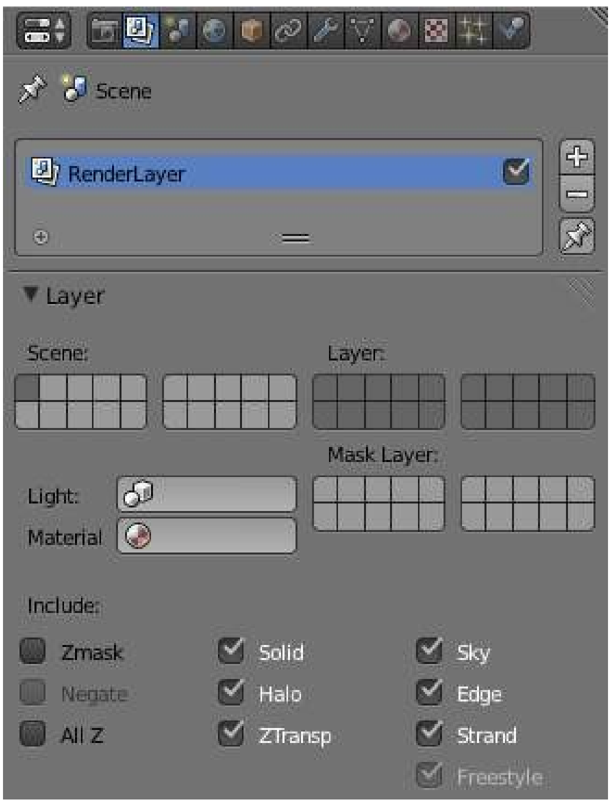
Then you are back to how that material's *shader* reacts to the light.

This chapter attempts to address the above, including how lights can work together in rigs to light your scene. In this chapter we will analyze the different type of lights in Bforartists and their behavior; we will discuss their strong and weak points. We also describe many lighting rigs, including the ever-popular three-point light method.

Lighting in the Workflow

In this user manual we have placed Lighting before Materials; you should set up your lighting before assigning materials to your meshes. Since the material shaders react to light, without proper lighting, the material shaders will not look right, and you will end up fighting the shader, when it is really the bad lighting that is causing you grief. All of the example images in this section do not use any material setting at all on the ball, cube or background.

Overriding Materials to Reset Lighting



Material field in the Render Layers panel

If you have started down the road of assigning materials, and are now fiddling with the lighting, we suggest that you create a default, generic gray material–no *Vertex Color*, no *Face Texture*, no *Shadeless*, just plain old middle gray with RGB of (`0.8`, `0.8`, `0.8`). Name this `Gray`.

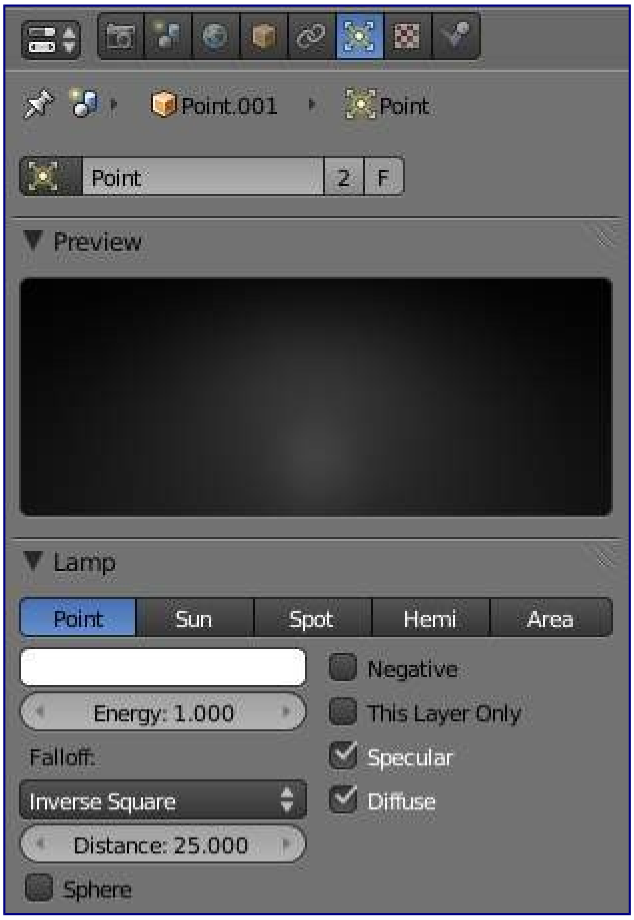
Next go to the *Render* context. In the *Render Layers* panel, select your new `Gray` material in the *Material* field. This will override any materials you may have set, and render everything with this color. Using this material, you can now go about adjusting the lighting. Just empty this field to get back to your original materials.

Lights

As previously stated, there are multiple types of lighting in Bforartists, like indirect light or ambient light. However, one of the most used are “lights”, or “lamps”. In this section, we will discuss general info and settings for these lights (you will find more lamp-specific details in the *Lamps* section):

- *Light Properties* - settings common to all lamps.
- *Light Attenuation*.
- *Textures* - how to apply texture(s) to lamps.
- *What Light Affects*.
- *Lights In Other Contexts* - lamp-related setting in other contexts.

Lights Common Options



Lamp Properties panels

There are five types of lamps in Bforartists. They share all or some of the options listed here:

Object Data

Browse Light Object Data
Click to view all lights in the current scene.
Name
The name of the currently selected light object data. Edit to change the name.
Number of Users
The number of light objects sharing the light object data.
F
Create a fake user for this object data.

Preview

A quick preview of the light settings.

Lamp

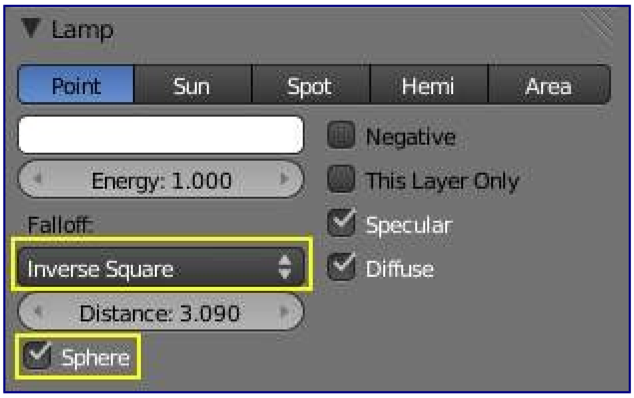
Distance
The *Dist* field indicates the number of Bforartists Units (BU) at which the intensity of the current light source will be half of its intensity. Objects less than the number of BU away from the lamp will get more light, while objects further away will receive less light. Certain settings and lamp falloff types affect how the *Distance* field is interpreted, meaning that it will not always react the same; see the page about *light falloff*.

- The *Sun* and *Hemi* Lamps are another class of Lamps which uses a constant falloff. Those lamps don't have a *Dist* field, and are often called "Base Lighting Lamps".

Energy
The intensity of the light source's illumination (from `0.0` to `10.0`).
Color
The color of the light source's illumination. Opens a color swatch.
Negative
Let the lamp cast negative light.
This Layer Only
The Lamp only illuminates objects on the same layer the lamp is on.
Specular
The Lamp creates specular highlights.
Diffuse
The Lamp does diffuse shading.

Light Attenuation

Description



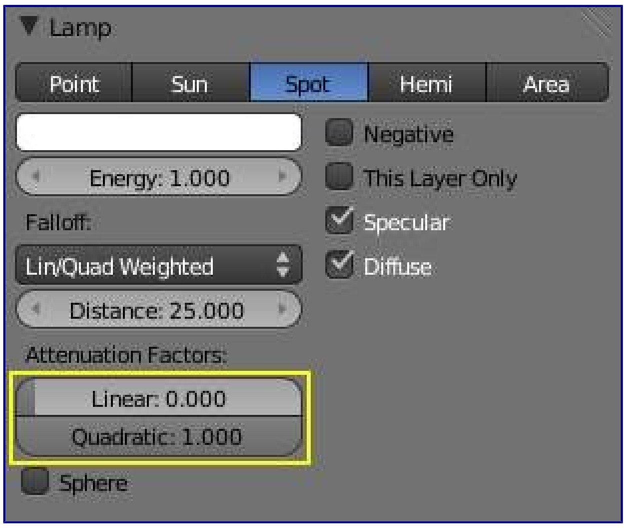
Lamp panel, falloff options highlighted

There are two main controls for light falloff for *Point* and *Spot* lamps.

- The lamp *Falloff* type drop-down list, and
- The *Sphere* button.

Falloff types

Lin/Quad Weighted



Lamp panel with Lin/Quad Weighted Falloff options highlighted

When this setting is chosen, two sliders are shown, *Linear* and *Quadratic*, which control respectively the “linearness” and “quadraticness” of the falloff curve.

This lamp falloff type is in effect allowing the mixing of the two light attenuation profiles (linear and quadratic attenuation types).

Linear

This slider input field can have a value between `0.0` and `1.0`. A value of `1.0` in the *Linear* field and `0.0` in the *Quadratic* field in effect means that the light from this source is completely linear. This means that at the number of Bforartists Units distance specified in the *Distance* field, this light source's intensity will be half the value it was originally.

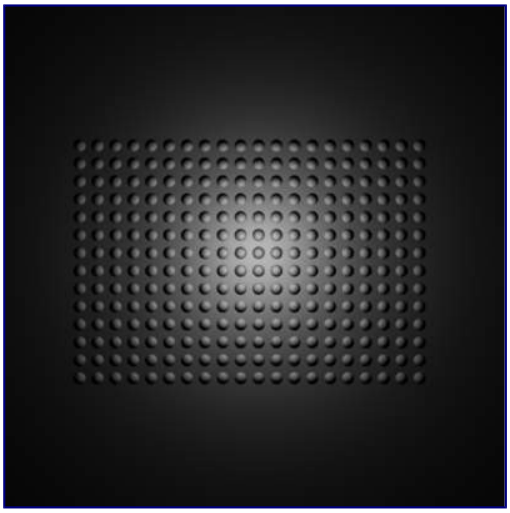
When the *Quadratic* slider is set to `0.0`, the formula for working out the attenuation at a particular range for full linear attenuation is:

$$I = E \times (D / (D + L \times r))$$

Where

- `I` is the calculated Intensity of light.
- `E` is the current *Energy* slider setting.
- `D` is the current setting of the *Dist* field.
- `L` is the current setting of the *Linear* slider.
- `r` is the distance from the lamp where the light intensity gets measured.

Quadratic



Lamp with Lin/Quad Weighted falloff default settings

This slider input field can have a value between `0.0` and `1.0`. A value of `1.0` in the *Quadratic* field and `0.0` in the *Linear* field means that the light from this source is completely quadratic.

Quadratic attenuation type lighting is considered a more accurate representation of how light attenuates (in the real world). In fact, fully quadratic attenuation is selected by default for *Lin/Quad Weighted* lamp fallout (see *Lamp with Lin/Quad Weighted falloff default settings*).

Here again, the light intensity is half when it reaches the *Distance* value from the lamp. Comparing the quadratic falloff to the linear falloff, the intensity decays much slower at distances lower than the set *Distance*, but it attenuates much quicker after *Distance* is reached.

When the *Linear* slider is set to `0.0`, the formula for working out the attenuation at a particular range for full quadratic attenuation is:

$$I = E \times (D^2 / (D^2 + Q \times r^2))$$

Where

- `I` is the calculated Intensity of light.
- `E` is the current *Energy* slider setting.
- `D` is the current setting of the *Dist* field.
- `Q` is the current setting of the *Quad* slider.
- `r` is the distance from the lamp where the light intensity gets measured.

Mixing “Linear” and “Quad”

If both the *Linear* and *Quad* slider fields have values greater than `0.0`, then the formula used to calculate the light attenuation profile changes to this:

$$I = E \times (D / (D + L \times r)) \times (D^2 / (D^2 + Q \times r^2))$$

Where

- `I` is the calculated Intensity of light.
- `E` is the current *Energy* slider setting.
- `D` is the current setting of the *Dist* field.
- `L` is the current setting of the *Linear* slider.
- `Q` is the current setting of the *Quad* slider.
- `r` is the distance from the lamp where the light intensity gets measured.

Zeroing both “Linear” and “Quad”

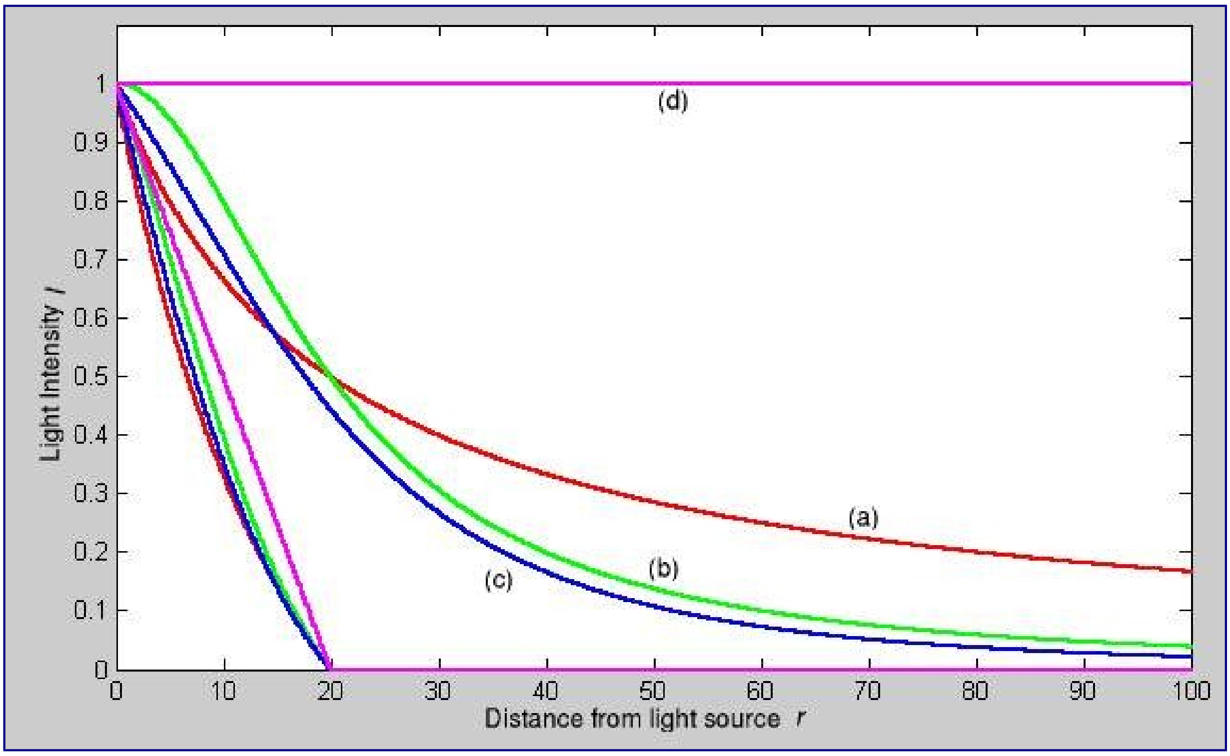
If both the *Linear* and *Quadratic* sliders have `0.0` as their values, the light intensity will not attenuate with distance. This does not mean that the light will not get darker - it will, but only because the energy the light has is spread out over a wider and wider distance. The total amount of energy in the spread-out light will remain the same, though. The light angle also affects the amount of light you see. It is in fact the behavior of light in the deep space vacuum.

If what you want is a light source that doesn’t attenuate and gives the same amount of light intensity to each area it hits, you need a light with properties like the *Constant* lamp *Falloff* type.

Also, when the *Linear* and *Quad* sliders are both `0.0` values the *Distance* field ceases to have any influence on the light attenuation, as shown by the equation above.

Graphical Summary

Below is a graph summarizing the lin/quad attenuation type, showing attenuation with or without the *Sphere* option (described later).



Custom Curve

The *Custom Curve* lamp *Falloff* type is very flexible.

Most other lamp falloff types work by having their light intensity start at its maximum (when nearest to the light source) and then with some predetermined pattern decrease their light intensity when the distance from the light source increases.

When using the *Custom Curve* Lamp Falloff type, a new panel is created called *Falloff Curve*. This *Falloff Curve* profile graph allows the user to alter how intense light is at a particular point along a light's attenuation profile (i.e. at a specific distance from the light source).

The *Falloff Curve* profile graph has two axes, the `Distance` axis and the `Intensity` axis.

Distance axis

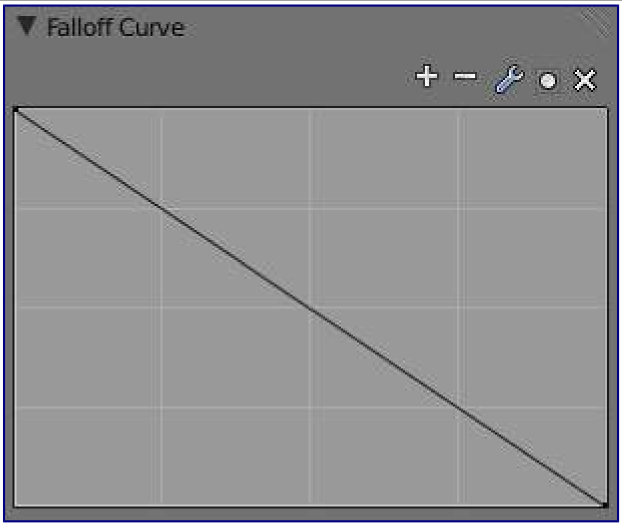
It represents the position at a particular point along a light source's attenuation path. The far left is at the position of the light source and the far right is the place where the light source's influence would normally be completely attenuated. I say "normally would" because the *Falloff Curve* can be altered to do the exact opposite if required.

Intensity axis

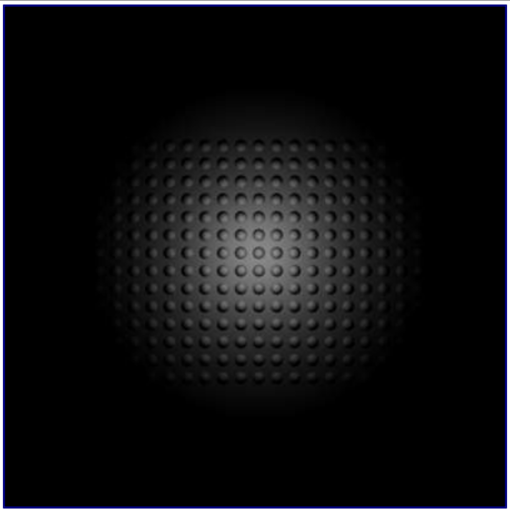
It represents the intensity at a particular point along a light source's attenuation path. Higher intensity is represented by being higher up the intensity axis, while lower intensity light is represented by being lower down on the intensity axis.

Altering the *Falloff Curve* profile graph is easy. Just `LMB` click on a part of the graph you want to alter and drag it where you want it to be. If when you click you are over or near one of the tiny black square handles, it will turn white, indicating that this handle is now selected, and you will be able to drag it to a new position. If when you click on the graph you are not near a handle, one will be created at the point that you clicked, which you can then drag where you wish. You can also create handles at specific parts of the graph, clicking with `LMB` while holding `Ctrl` key; it will create a new handle at the point you have clicked.

In the example below (the default for the *Falloff Curve* Profile Graph), the graph shows that the intensity of the light starts off at its maximum (when near the light), and linearly attenuates as it moves to the right (further away from the light source).

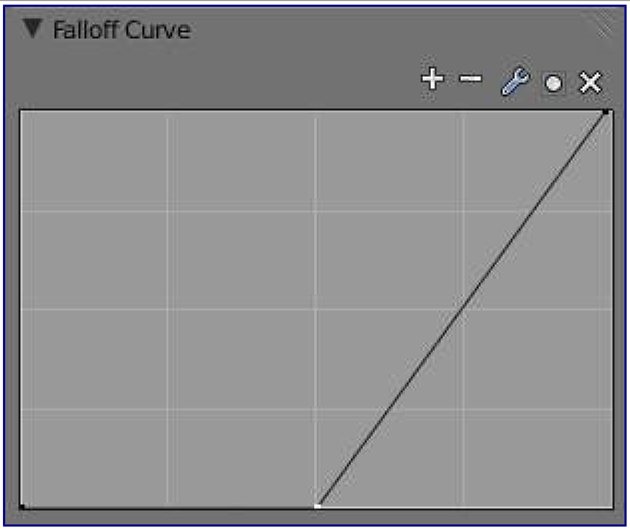


Default Falloff Curve panel graph.

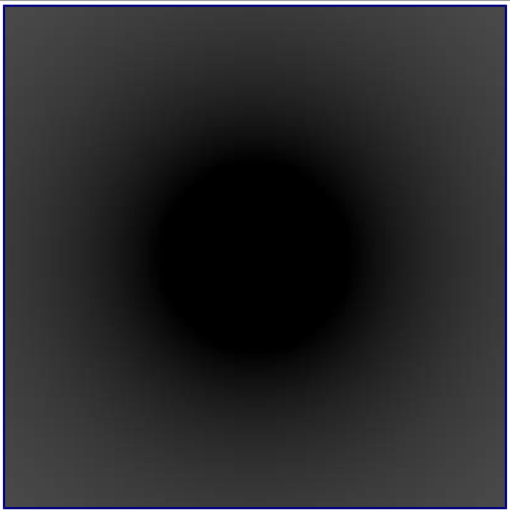


Render showing the Custom Curve lamp falloff type effect with default settings.

If you want to have a light attenuation profile that gets more intense as it moves away from the light source, you could alter the graph as below:



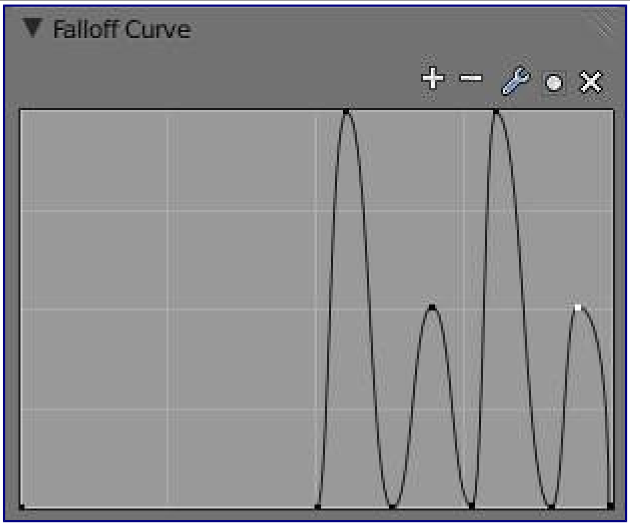
Falloff Curve for reversed attenuation.



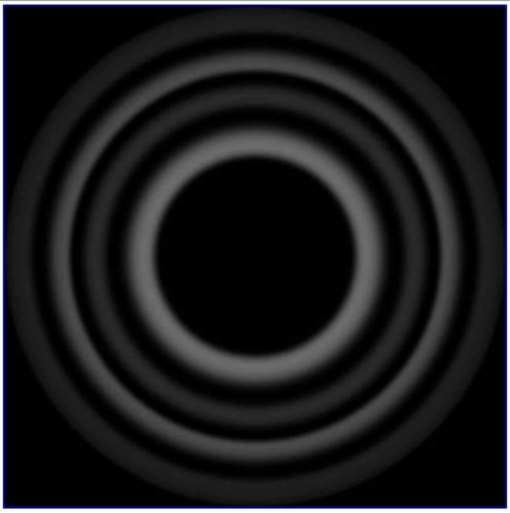
Falloff Curve for reversed attenuation rendered.

You are obviously not just limited to simple changes such as reversing the attenuation profile, you can have almost any profile you desire.

Here is another example of a different *Falloff Curve* profile graph, along with its resultant render output:

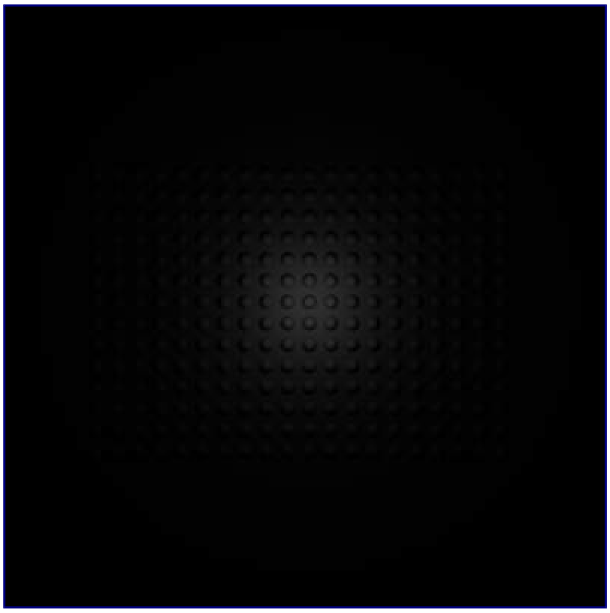


Oscillating attenuation profile.



Render showing the effects of a “wavelet” profile graph on the light attenuation.

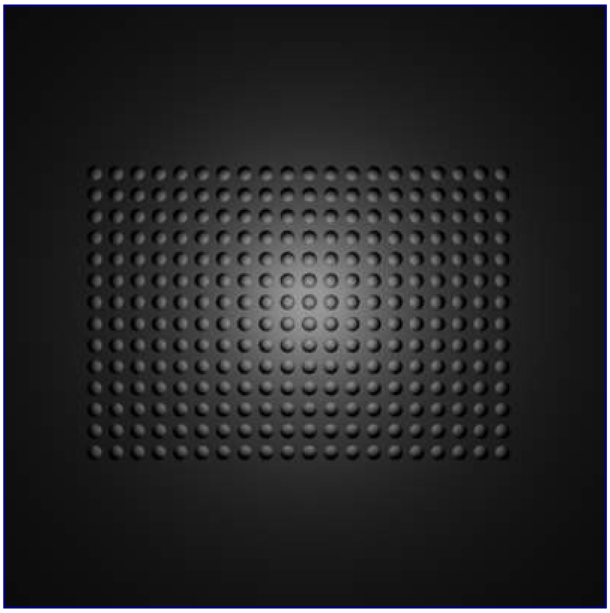
Inverse Square



Render showing the Inverse Square lamp falloff type effect with default settings.

This lamp falloff type attenuates its intensity according to inverse square law, scaled by the *Distance* value. Inverse square is a sharper, realistic decay, useful for lighting such as desk lamps and street lights. This is similar to the old *Quad* option (and consequently, to the new *Lin/Quad Weighted* option with *Linear* to `0.0` and *Quad* to `1.0`), with slight changes.

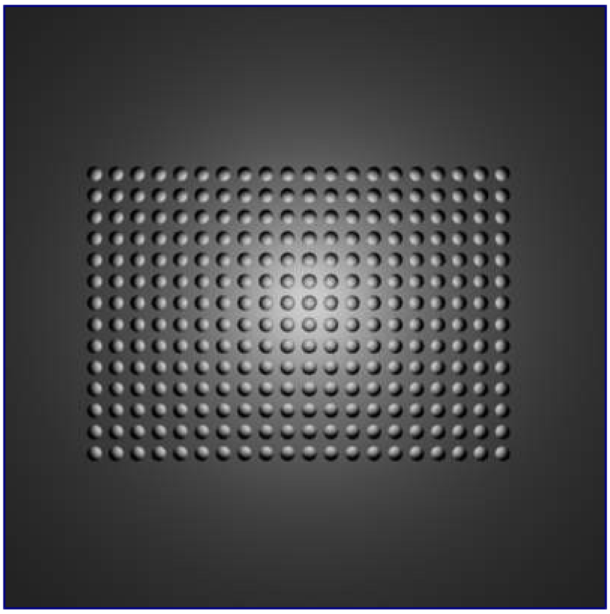
Inverse Linear



Render showing the Inverse Linear lamp falloff type effect with default settings.

This lamp falloff type attenuates its intensity linearly, scaled by the *Dist* value. This is the default setting, behaving the same as the default in previous Bforartists versions without *Quad* switched on, and consequently, like the new *Lin/Quad Weighted* option with *Linear* to `1.0` and *Quad* to `0.0`. This isn't physically accurate, but can be easier to light with.

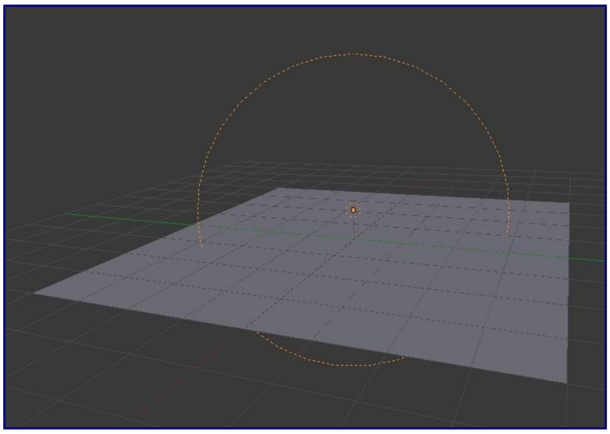
Constant



Render showing the Constant lamp falloff type effect with default settings.

This lamp falloff type does not attenuate its intensity with distance. This is useful for distant light sources like the sun or sky, which are so far away that their falloff isn't noticeable. *Sun* and *Hemi* lamps always have constant falloff.

Sphere



Screenshot of the 3D view window, showing the Sphere light clipping circle.

The *Sphere* option restricts the light illumination range of a *Lamp* or *Spot* lamp, so that it will completely stop illuminating an area once it reaches the number of Bforartists Units away from the Lamp, as specified in the *Dist* field.

When the *Sphere* option is active, a dotted sphere will appear around the light source, indicating the demarcation point at which this light intensity will be null.

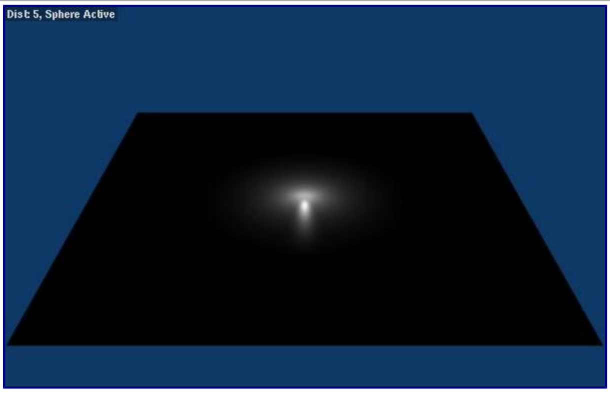
The *Sphere* option adds a term to the chosen attenuation law, whatever it is:

$$I' = I \times (D - r) / D \text{ \textit{if} } r < D;\ 0 \text{ \textit{otherwise}}$$

Where:

- `I'` is the required Intensity of light (with the *Sphere* option activated).
- `I` is the intensity of light calculated by the chosen attenuation law (without the *Sphere* option).
- `D` is the current setting of the *Dist* field.
- `r` is the distance from the lamp where the light intensity gets measured.

See the graphic at the end of the description of the *Lin/Quad Weighted* attenuation option.



Render showing the light attenuation of a Constant falloff light type with the Sphere option active.

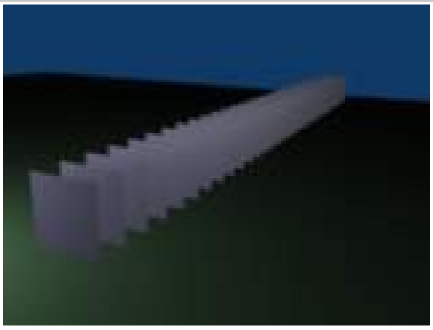
Render showing the light attenuation of a Constant falloff light type with the Sphere option deactivated.

Examples

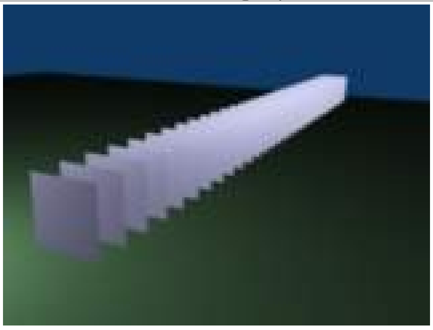
Distance Example

In this example, the *Lamp* has been set pretty close to the group of planes. This causes the light to affect the front, middle and rear planes more dramatically. Looking at (*Various Dist ance settings*), you can see that as the *Dist* is increased, more and more objects become progressively brighter.

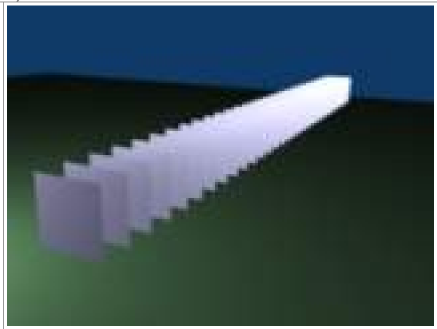
Various *Distance* settings (shadows disabled).



Distance: 10.



Distance: 100.



Distance: 1000.

The *Distance* parameter is controlling where the light is falling - at a linear rate by default - to half its original value from the light's origin. As you increase or decrease this value, you are changing where this half falloff occurs. You could think of *Distance* as the surface of a sphere and the surface is where the light's intensity has fallen to half its strength in all directions. Note that the light's intensity continues to fall even after *Distance*. *Distance* just specifies the distance where half of the light's energy has weakened.

Notice in (*Distance :* `1000`) that the farthest objects are very bright. This is because the falloff has been extended far into the distance, which means the light is very strong when it hits the last few objects. It is not until `1000` units that the light's intensity has fallen to half of its original intensity.

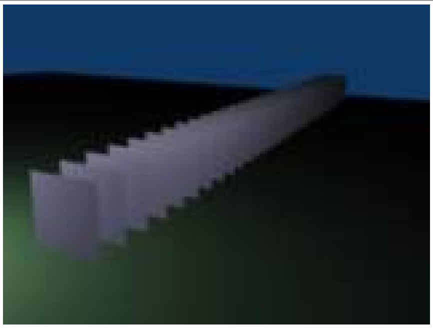
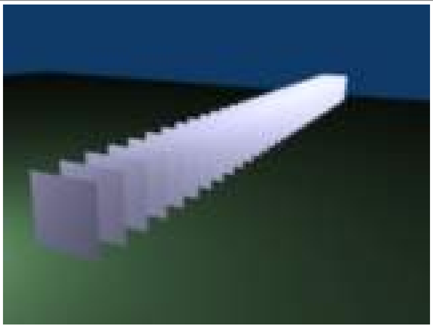
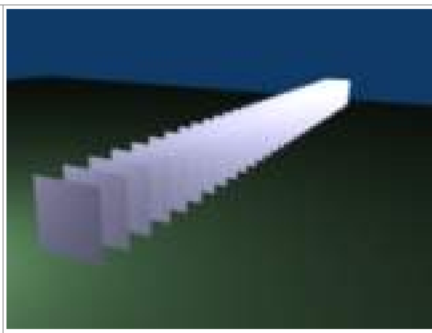
Contrast this with (*Distance :* `10`), where the falloff occurs so soon that the farther objects are barely lit. The light's intensity has fallen by a half by time it even reaches the tenth object.

You may be wondering why the first few planes appear to be dimmer? This is because the surface angle between the light and the object's surface normal is getting close to oblique. That is the nature of a *Lamp* light object. By moving the light infinitely far away you would begin to approach the characteristics of the *Sun* lamp type.

Inverse Square Example

Inverse Square makes the light's intensity falloff with a non-linear rate, or specifically, a quadratic rate. The characteristic feature of using *Inverse Square* is that the light's intensity begins to fall off very slowly but then starts falling off very rapidly. We can see this in the (*Inverse Square selected*) images.

Inverse Square selected (with the specified distances).

		
Inverse Square with 10.	Inverse Square with 100.	Inverse Square with 1000.

With *Inverse Square* selected, the *Distance* field specifies where the light begins to fall off faster, roughly speaking; see the light attenuation description in Falloff types for more info.

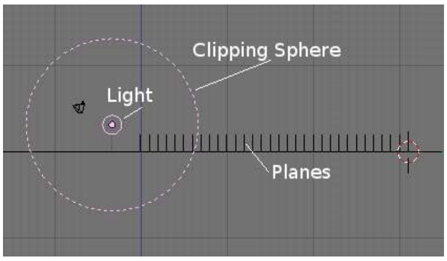
In (*Inverse Square with* `10`), the light's intensity has fallen so quickly that the last few objects aren't even lit.

Both (*Inverse Square with* `100`) and (*Inverse Square with* `1000`) appear to be almost identical and that is because the *Distance* is set beyond the farthest object's distance which is at about **40 BU** out. Hence, all the objects get almost the full intensity of the light.

As above, the first few objects are dimmer than farther objects because they are very close to the light. Remember, the brightness of an object's surface is also based on the angle between the surface normal of an object and the ray of light coming from the lamp.

This means there are at least two things that are controlling the surface's brightness: intensity and the angle between the light source and the surface's normal.

Sphere Example



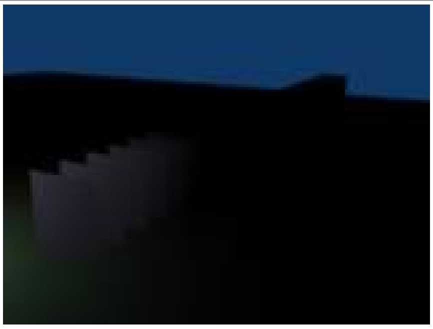
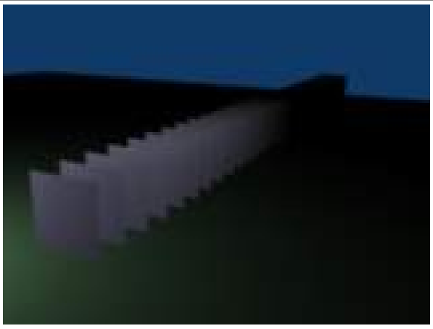
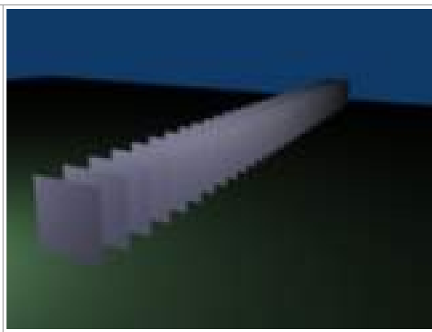
Clipping Sphere.

Sphere indicates that the light's intensity is null at the *Distance* distance and beyond, regardless of the chosen light's falloff. In (*Clipping Sphere*) you can see a side view example of the setup with *Sphere* enabled and a distance of `10`.

Any objects beyond the sphere receive no light from the lamp.

The *Distance* field is now specifying both where the light's rays become null, and the intensity's ratio falloff setting. Note that there is no abrupt transition at the sphere: the light attenuation is progressive (for more details, see the descriptions of the Sphere and Falloff types above).

Sphere enabled with the specified distances, *Inverse Linear* light falloff.

		
Sphere with 10.	Sphere with 20.	Sphere with 40.

In (*Sphere with* `10`), the clipping sphere's radius is `10` units, which means the light's intensity is also being controlled by `10` units of distance. With a linear attenuation, the light's intensity has fallen very low even before it gets to the first object.

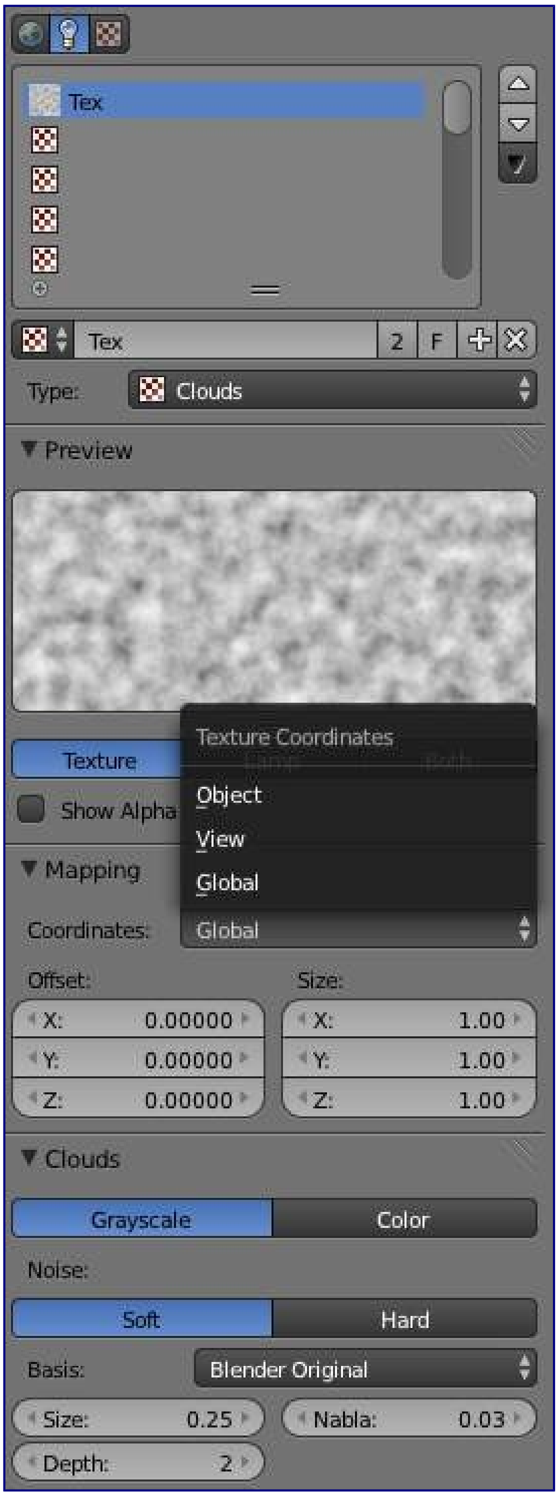
In (*Sphere with* `20`), the clipping sphere's radius is now **20 BU** and some light is reaching the middle objects.

In (*Sphere with* `40`), the clipping sphere's radius is now `40` units, which is beyond the last object. However, the light doesn't make it to the last few objects because the intensity has fallen to nearly `0`.

Hint

If a *Lamp* light is set to not cast shadows, it illuminates through walls and the like. If you want to achieve some nice effects like a fire, or a candle-lit room interior seen from outside a window, the *Sphere* option is a must. By carefully working on the *Distance* value you can make your warm firelight shed only within the room, while illuminating outside with a cool moonlight, the latter achieved with a *Sun* or *Hemi* light or both.

Lamps Textures



Lamp Texture panels

When a new lamp is added, it produces light in a uniform, flat color. While this might be sufficient in simple renderings, more sophisticated effects can be accomplished through the use of *textures*. Subtle textures can add visual nuance to a lamp, while hard textures can be used to simulate more pronounced effects, such as a disco ball, dappled sunlight breaking through treetops, or even a projector. These textures are assigned to one of ten channels, and behave exactly like material textures, except that they affect a lamp's color and intensity, rather than a material's surface characteristics.

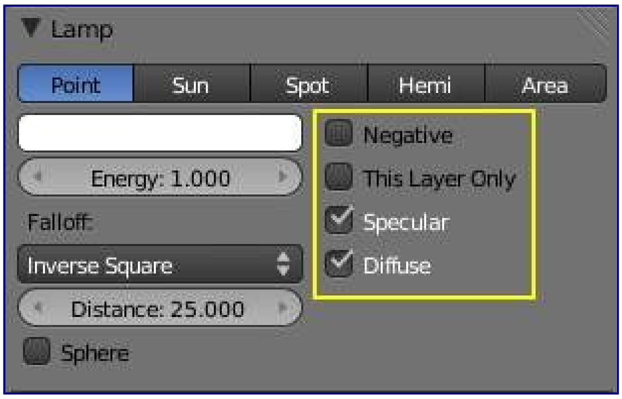
Options

The lamp textures settings are grouped into two panels. Here we will only talk about the few things that differ from object material textures; see the *Materials* and *Textures* chapters for details about the standard options.

The texture-specific and the *Mapping* panels remain the same. However, you'll note there are much fewer *Mapping* options - you can only choose between *Global*, *View* or another *Object* 's texture *coordinates* (since a lamp has no texture coordinates by itself), and you can scale or offset the texture.

The *Mapping* panel is also a subset of its regular material's counterpart. You can only map a lamp texture to its regular, basic *Color* and/or to its *Shadow* color. As you can only affect colors, and a lamp has no texture coordinates on its own, the *Diffuse*, *Specular, Shading*, and *Geometry* options have disappeared.

What the Light Affects



Lamp panel with the light affecting options highlighted

Every lamp has a set of switches that control which objects receive its light, and how it interacts with materials.

Negative
: The light produced by the lamp is **subtracted** from the one "available" on the surfaces it hits, which darkens these surfaces instead of brightening them.

This Layer Only
: Causes the lamp to only light objects on the same layer.

Diffuse
: Prevents the lamp from producing *diffuse light* (it doesn't really "light" things).

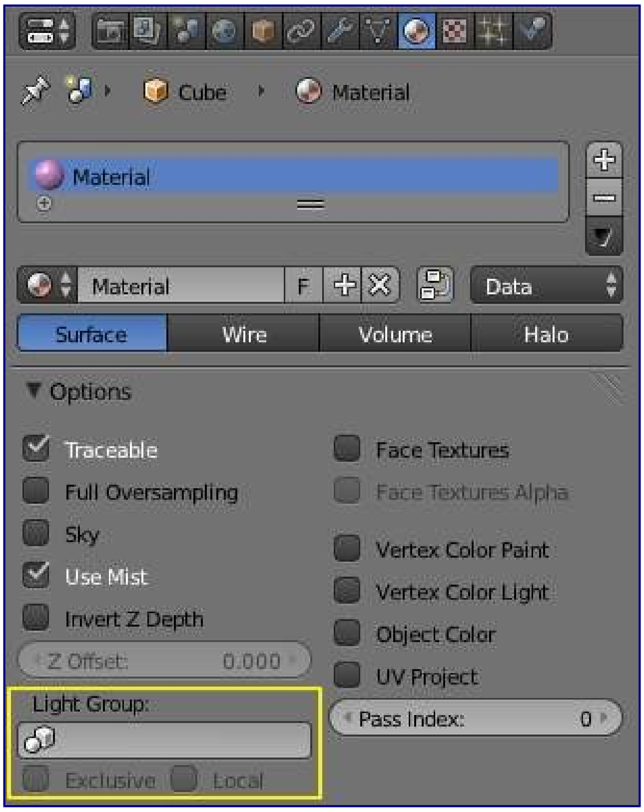
Specular
: Prevents the lamp from producing *specular highlights*.

Lamps Related Settings

Here are some options closely related to light sources, without being lamps settings.

Lighting Groups

Materials

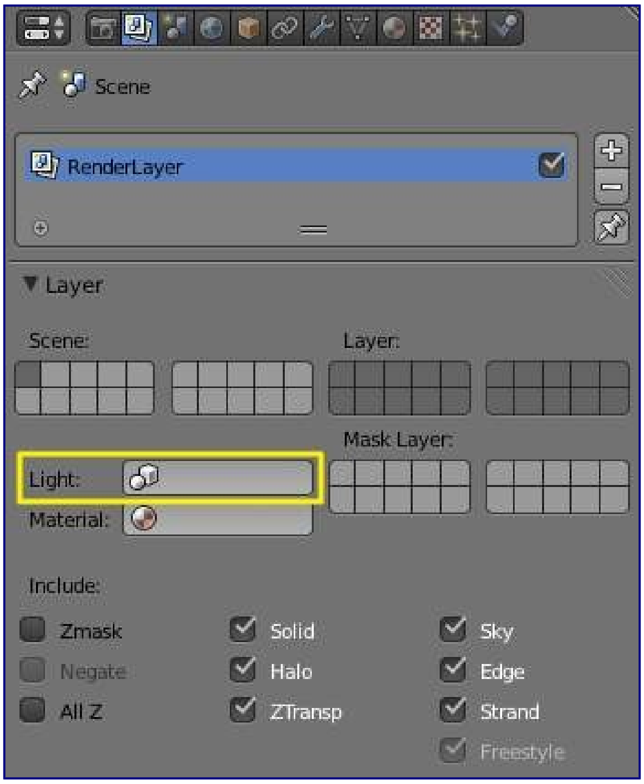


Light Group options for Materials

By default, materials are lit by all lamps in all visible layers, but a material (and thus all objects using that material) can be limited to a single group of lamps. This sort of control can be incredibly useful, especially in scenes with complex lighting setups. To enable this, navigate to the *Material* menu's *Options* panel and select a group of lamps in the *Light Group* field. Note that a *light group* must be created first.

If the *Exclusive* button is enabled, lights in the specified group will *only* affect objects with this material.

Render Layers



Light Group options for Render Layers

There’s a similar control located in the *Layer panel* of the context *Render Layers*. If a light group name is selected in this *Light* field, the scene will be lit exclusively by lamps in the specified group.

See Also

- *Lamps Introduction*
- *Shadows*
- *Materials Introduction*

Shadows

Light wouldn’t even exist without its counterpart: shadows. Shadows are a darkening of a portion of an object because light is being partially or totally blocked from illuminating the object. They add contrast and volume to a scene; there is nearly no place in the real world without shadows, so to get realistic renders, you will need them. Bforartists supports the following kinds of shadows:

- Lamps: Ray-traced Shadows
- Lamps: Buffered Shadows
- *Ambient occlusion*
- *Indirect lighting*

Ambient occlusion really isn’t a shadow based on light *per se*, but based on geometry. However, it does mimic an effect where light is prevented from fully and uniformly illuminating an object, so it is mentioned here. Also, it is important to mention ambient lighting, since increasing *Ambient* decreases the effect of a shadow.

You can use a combination of ray-traced and buffer shadows to achieve different results. Even within ray-traced shadows, different lamps cast different patterns and intensities of shadow. Depending on how you arrange your lamps, one lamp may wipe out or override the shadow cast by another lamp.

Shadows is one of those trifectas in Bforartists, where multiple things have to be set up in different areas to get results:

- The lamp has to cast shadows (ability and direction).
- An opaque object has to block light on its way (position and layer).
- Another object's material has to receive shadows (*Shadow* and *Receive Transparent* enabled).
- The render engine has to calculate shadows (*Shadow* for buffered shadows, *Shadow* and *Ray* for ray-traced shadows).

For example, the simple *Lamp*, *Area*, and *Sun* light has the ability to cast ray shadows, but not buffer shadows. The *Spot* light can cast both, whereas the *Hemi* light does not cast any. If a *Sun* lamp is pointing sideways, it will not cast a shadow from a sphere above a plane onto the plane, since the light is not traveling that way. All lamps able to cast shadows share some common options, described *here*.

Just to give you more shadow options (and further confuse the issue), lamps and materials can be set to respectively **only** cast and receive shadows, and not light the diffuse/specular aspects of the object. Also, render layers can turn on/off the shadow pass, and their output may or may not contain shadow information...

Lamps: Ray-traced Shadows

Ray Shadow enabled for a lamp

Ray-traced shadows produce very precise shadows with very low memory use, but at the cost of processing time. This type of shadowing is available to all lamp types except *Hemi*.

As opposed to buffered shadows (Lamps: Buffered Shadows), ray-traced shadows are obtained by casting rays from a regular light source, uniformly and in all directions. The ray-tracer then records which pixel of the final image is hit by a ray light, and which is not. Those that are not are obviously obscured by a shadow.

Each light casts rays in a different way. For example, a *Spot* light casts rays uniformly in all directions within a cone. The *Sun* light casts rays from a infinitely distant point, with all rays parallel to the direction of the *Sun* light.

For each additional light added to the scene, with ray-tracing enabled, the rendering time increases. Ray-traced shadows require more computation than buffered shadows but produce sharp shadow borders with very little memory resource usage.

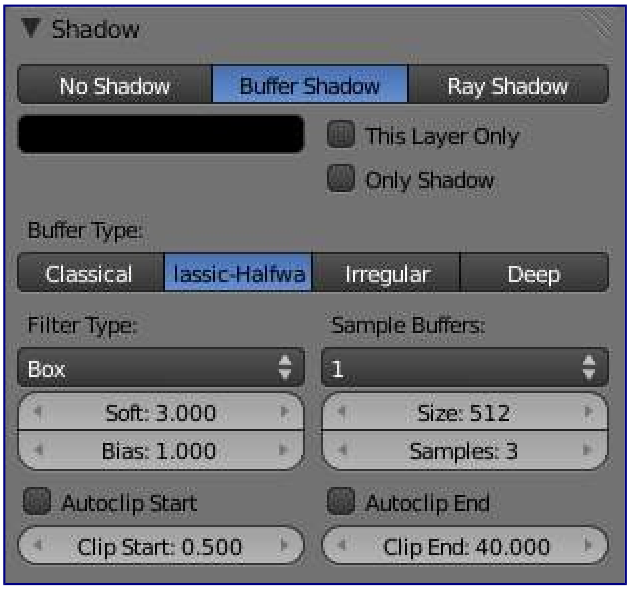
To enable ray-traced shadows, three actions are required:

- Enable *Shadows* globally in the *Render* menu's *Shading* panel.
- Enable *Ray tracing* globally from the same panel.
- Enable ray-traced shadows for the light using the *Ray Shadow* button in the *Light* menu's *Shadow* panel. This panel varies depending on the type of light.
    - All lamps able to cast ray-traced shadows share some common options, described in *Ray-traced Properties*.

Ray-traced shadows can be cast by the following types of lamp:

- *Point lamp*
- *Spot lamp*
- *Area lamp*
- *Sun lamp*

Lamps: Buffered Shadows



Buffer Shadow enabled for a Spot lamp

Cast Buffer Shadows enabled for a material

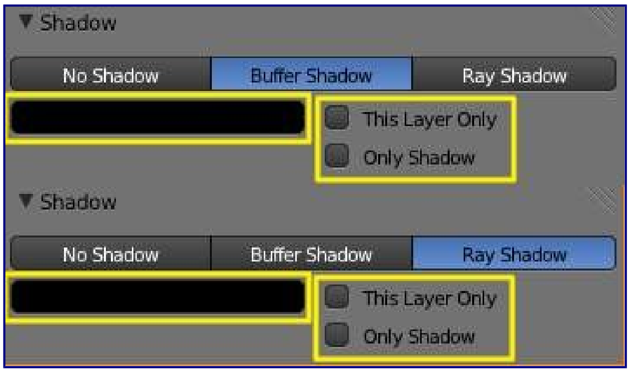
Buffered shadows provide fast-rendered shadows at the expense of precision and/or quality. Buffered shadows also require more memory resources as compared to ray tracing. Using buffered shadows depends on your requirements. If you are rendering animations or can’t wait hours to render a complex scene with soft shadows, buffer shadows are a good choice.

For a scanline renderer - and Bforartists’s built-in engine *is*, among other things, a scanline renderer - shadows can be computed using a *shadow buffer*. This implies that an “image”, as seen from the spot lamp’s point of view, is “rendered” and that the distance - in the image - for each point from the spot light is saved. Any point in the “rendered” image that is farther away than any of those points in the spot light’s image is then considered to be in shadow. The shadow buffer stores this image data.

To enable buffered shadows these actions are required:

- Enable shadows globally from the *Scene* menu’s *Gather* panel by selecting *Approximate*.
- Enable shadows for the light using the *Buffer Shadow* button in the *Lamp* menu’s *Shadow* panel.
- Make sure the *Cast Buffer Shadows* options is enabled in each *Material* ‘s *Shadow* panel.
- The *Spot lamp* is the only lamp able to cast buffered shadows.

Common Shadowing Lamps Options



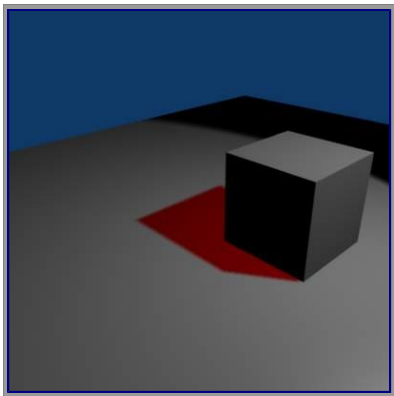
Common shadowing options for lamps

All lamps able to cast shadows (*Lamp*, *Spot*, *Area* and *Sun*) share some options, described below:

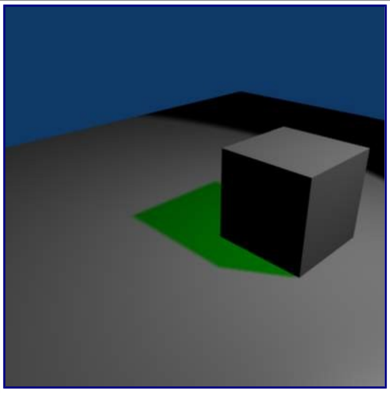
This Layer Only
: When this option is enabled, only the objects on the same layer as the light source will cast shadows.

Only Shadow
: The light source will not illuminate an object but will generate the shadows that would normally appear. This feature is often used to control how and where shadows fall by having a light which illuminates but has no shadow, combined with a second light which doesn’t illuminate but has *Only Shadow* enabled, allowing the user to control shadow placement by moving the “Shadow Only” light around.

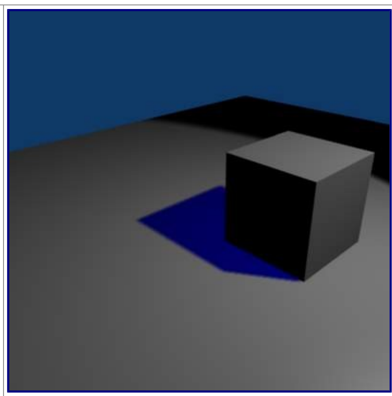
Shadow color
: This color picker control allows you to choose the color of your cast shadows (black by default). The images below were all rendered with a white light and the shadow color was selected independently.



Red colored shadow example



Green colored shadow example



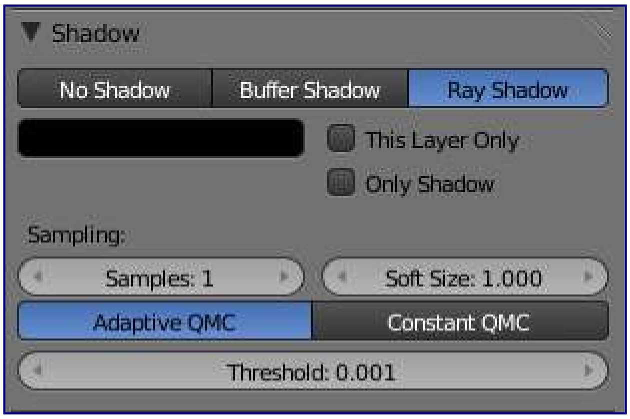
Blue colored shadow example

Although you can select a pure white color for a shadow color, it appears to make a shadow disappear.

See Also

- *Shadows*
- *Common Raytraced Options*
- *Lamp Light Raytraced Shadows*
- *Spot Light Raytraced Shadows*
- *Area Light Raytraced Shadows*
- *Sun Light Raytraced Shadows*
- *Spot Light Buffered Shadows*

Lamps Raytraced Shadows



Ray shadowing options for lamps

Most lamp types (*Lamp*, *Spot* and *Sun*) share the same options for the ray-traced shadows generation, which are described below. Note that the *Area* lamp, even though using most of these options, have some specifics described in its *own ray-traced shadows page*.

Ray Shadow

The *Ray Shadow* button enables the light source to generate ray-traced shadows. When the *Ray Shadow* button is selected, another set of options is made available, those options being:

Shadow sample generator type

Method for generating shadow samples: Adaptive QMC is fastest, Constant QMC is less noisy but slower. This allows you to choose which algorithm is to be used to generate the samples that will serve to compute the ray-traced shadows (for now, mainly two variants of Quasi-Monte Carlo, see What is Quasi-Monte Carlo?):

Constant QMC
: The *Constant QMC* method is used to calculate shadow values in a very uniform, evenly distributed way. This method results in very good calculation of shadow value but it is not as fast as using the *Adaptive QMC* method; however, *Constant QMC* is more accurate.

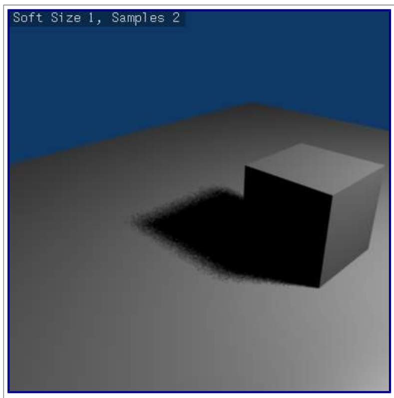
Adaptive QMC
: The *Adaptive QMC* method is used to calculate shadow values in a slightly less uniform and distributed way. This method results in good calculation of shadow value but not as good as *Constant QMC*. The advantage of using *Adaptive QMC* is that it is in general much quicker while being not much worse than *Constant QMC* in terms of overall results.

Samples
: Number of extra samples taken (samples x samples). This slider sets the maximum number of samples that both *Constant QMC* and *Adaptive QMC* will use to do their shadow calculations. The maximum value is `16` - the real number of samples is actually the square of it, so setting a sample value of `3` really means $3^2 = 9$ samples will be taken.

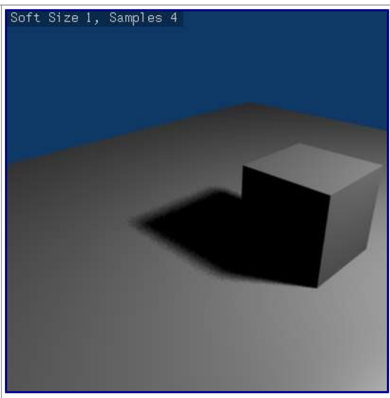
Soft Size

Light size for ray shadow sampling. This slider determines the size of the fuzzy/diffuse/penumbra area around the edge of a shadow. *Soft Size* only determines the width of the soft shadow size, not how graded and smooth the shadow is. If you want a wide shadow which is also soft and finely graded, you must also set the number of samples in the *Samples* field higher than `1`; otherwise this field has no visible effect and the shadows generated will not have a soft edge. The maximum value for *Soft Size* is `100.0`.

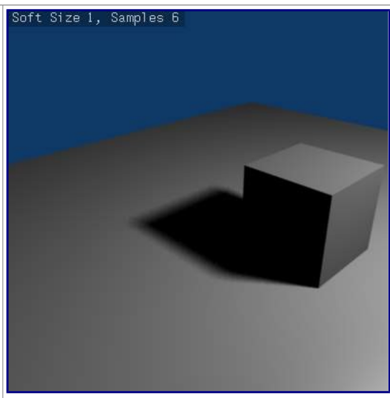
Below is a table of renders with different *Soft Size* and *Samples* settings showing the effect of various values on the softness of shadow edges:



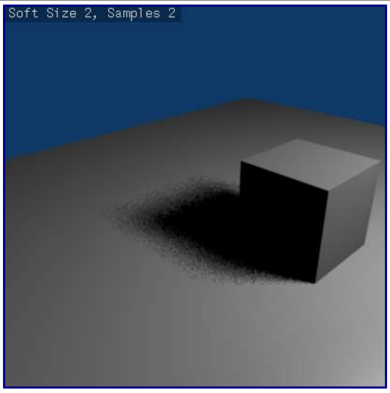
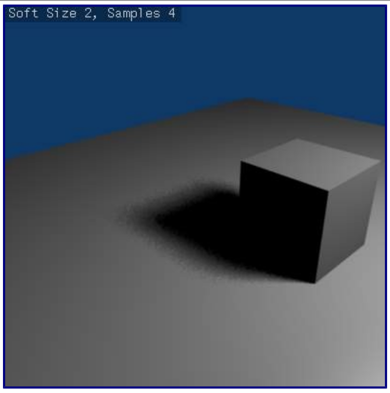
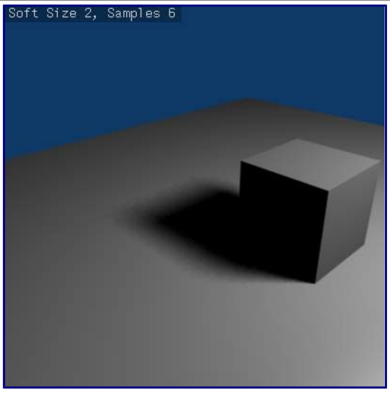
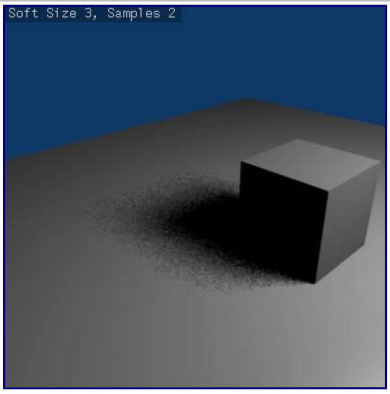
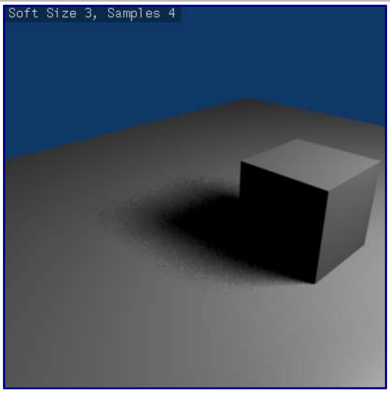
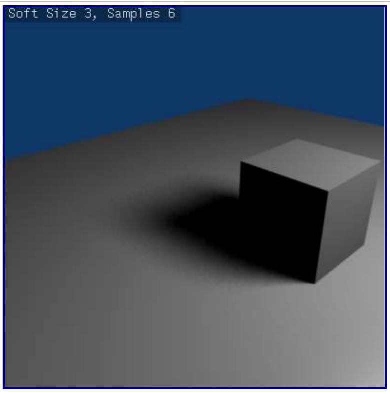
Soft Size: 1.0, Samples: 2.



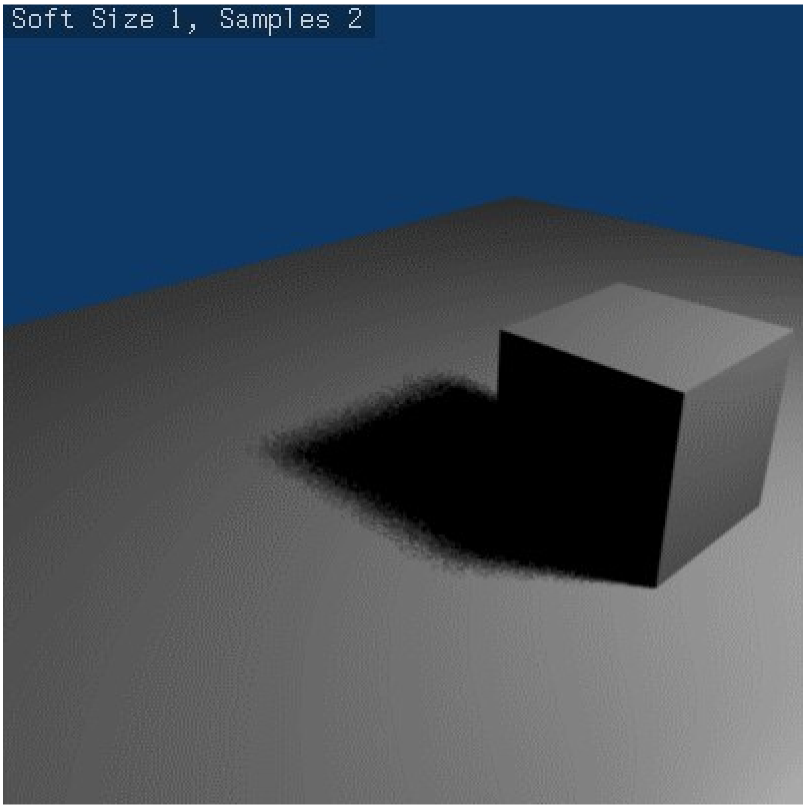
Soft Size: 1.0, Samples: 4.



Soft Size: 1.0, Samples: 6.

 Soft Size: 2.0, Samples: 2.	 Soft Size: 2.0, Samples: 4.	 Soft Size: 2.0, Samples: 6.
 Soft Size: 3.0, Samples: 2.	 Soft Size: 3.0, Samples: 4.	 Soft Size: 3.0, Samples: 6.

Below is an animated version of the above table of images showing the effects:



Animated version renders with different Soft Size and Samples settings showing the effect of various values on the softness of shadow edges.

Threshold

Threshold for Adaptive Sampling. This field is used with the *Adaptive QMC* shadow calculation method. The value is used to determine if the *Adaptive QMC* shadow sample calculation can be skipped based on a threshold of how shadowed an area is already. The maximum *Threshold* value is `1.0`.

What is Quasi-Monte Carlo?

The Monte Carlo method is a method of taking a series of samples/readings of values (any kind of values, such as light values, color values, reflective states) in or around an area at random, so as to determine the correct actions to take in certain calculations which usually require multiple sample values to determine overall accuracy of those calculations. The Monte Carlo method tries to be as random as possible; this can often cause areas that are being sampled to have large irregular gaps in them (places that are not sampled/read). This in turn can cause problems for certain calculations (such as shadow calculation).

The solution to this was the Quasi-Monte Carlo method.

The Quasi-Monte Carlo method is also random, but tries to make sure that the samples/readings it takes are also better distributed (leaving less irregular gaps in its sample areas) and more evenly spread across an area. This has the advantage of sometimes leading to more accurate calculations based on samples/reading.

Volumetric Lighting

According to Wikipedia, volumetric lighting

is a technique used in 3D computer graphics to add lighting effects to a rendered scene. It allows the viewer to see beams of light shining through the environment; seeing sunbeams streaming through an open window is an example of volumetric lighting, also known as God rays. The term seems to have been introduced from cinematography and is now widely applied to 3D modeling and rendering especially in the field of 3D gaming. In volumetric lighting, the light cone emitted by a light source is modeled as a transparent object and considered as a container of a "volume": as a result, light has the capability to give the effect of passing through an actual three dimensional medium (such as fog, dust, smoke, or steam) that is inside its volume, just like in the real world.

A classic example is the search light with a visible halo/shaft of light being emitted from it as the search light sweeps around.

By default Bforartists does not model this aspect of light. For example when Bforartists lights something with a *Spot* light, you see the objects and area on the floor lit but not the shaft/halo of light coming from the spotlight as it progresses to its target and would get scattered on the way.

The halo/shaft of light is caused in the real world by light being scattered by particles in the air, some of which get diverted into your eye and that you perceive as a halo/shaft of light. The scattering of light from a source can be simulated in Bforartists using various options, but by default is not activated.

The only lamp able to create volumetric effects is the *Spot lamp* (even thought you might consider some of the *"Sky & Atmosphere" effects* of the *Sun* lamp as volumetric as well).

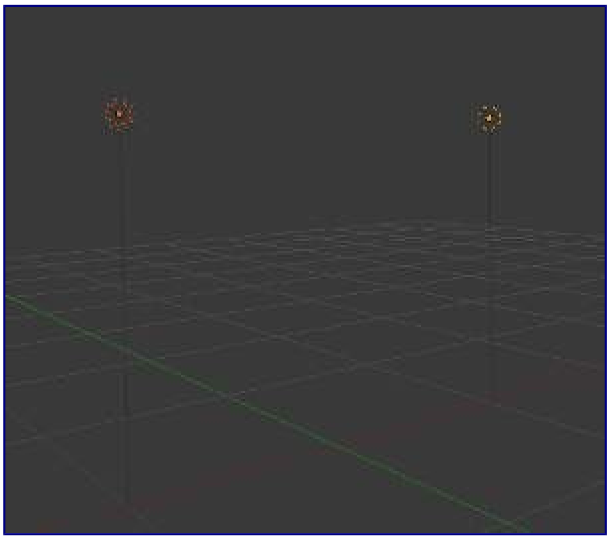
See also

- *Mist*
- *Smoke*
- *Volumetric Materials*

Lamps

Bforartists comes equipped with five different lamp types, each with its own unique strengths and limitations. Here are the available lamps:

- *Point* is an omni-directional point light source, similar to a light bulb.
- *Spot* is a directional point light source, similar to ... a spot.
- *Area* is a source simulating an area which is producing light, as windows, neons, TV screens.
- *Hemi* simulates a very wide and far away light source, like the sky.
- *Sun* simulates a very far away and punctual light source, like the sun.



Visual height and shadow markers of two points lamps. Ray Shadow is enabled on the left lamp.

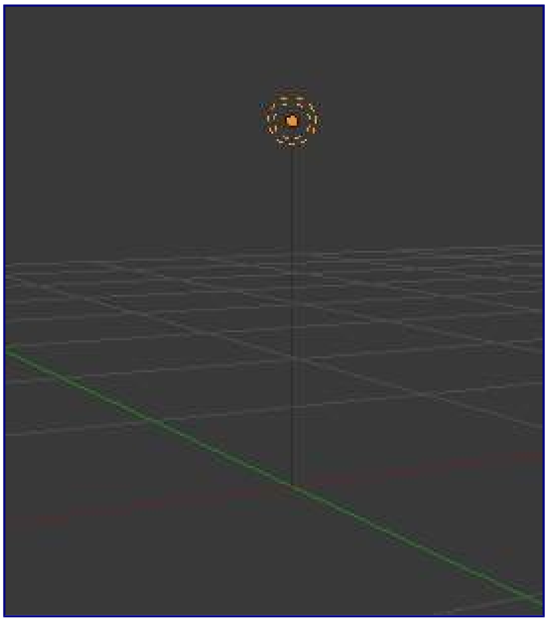
You can add new lamps to a scene using the *Add* menu in the top header, or with ([Shift][A] ‣ Add ‣ Lamp).

Once added, a lamp's position is indicated in the 3D View by a solid dot in a circle, but most types also feature dashed wire-frames that help describe their orientation and properties. While each type is represented differently, there are some visual indicators common to all of them:

Shadows
: If shadows are enabled, an additional dashed circle is drawn around the solid circle. This makes it easier to quickly determine if a lamp has shadows enabled.

Vertical Height Marker
: This is a dim gray line, which helps locate the lamp's position relative to the global X-Y plane.

Point



Point lamp

The *Point* lamp is an omni-directional point of light, that is, a point radiating the same amount of light in all directions. It’s visualized by a plain, circled dot. Being a point light source, the direction of the light hitting an object’s surface is determined by the line joining the lamp and the point on the surface of the object itself.

Light intensity/energy decays based on (among other variables) distance from the *Point* lamp to the object. In other words, surfaces that are further away are rendered darker.

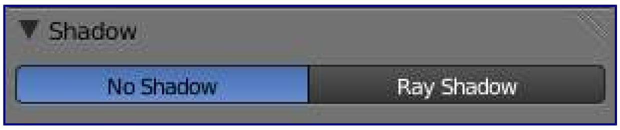
Lamp Options

Distance, Energy and Color
: These settings are common to most types of lamps, and are described in *Light Properties*.

Negative, This Layer Only, Specular, and Diffuse
: These settings control what the lamp affects, as described in *What Light Affects*.

Falloff and Sphere
: These settings control how the light of the *Lamp* decays with distance. See *Light Attenuation* for details.

Shadows



Without ray shadows

Point lamp with ray shadows and Adaptive QMC sample generator enabled

The *Point* light source can only cast ray-traced shadows. It shares with other lamp types the common shadow options described in *Shadow Properties*.

The ray-traced shadows settings of this lamp are shared with other lamps, and are described *Raytraced Properties*.

Raytraced Shadows

Shadow panel

The *Point* light source can only cast raytraced shadows. It shares with other lamp types the same common shadowing options, described in *Shadows Properties*.

The raytraced shadows settings of this lamp are shared with other ones, and are described in *Raytraced Properties*.

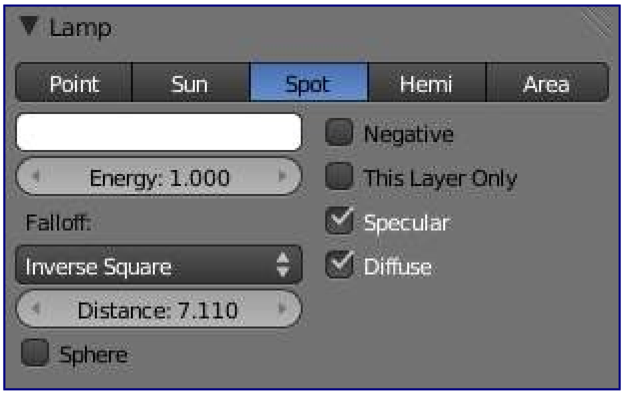
Spot

A *Spot* lamp emits a cone-shaped beam of light from the tip of the cone, in a given direction.

The *Spot* light is the most complex of the light objects and indeed, for a long time, among the most used thanks to the fact that it was the only one able to cast shadows. Nowadays, with a ray tracer integrated into

Bforartists’s internal render engine, all lamps can cast shadows (except *Hemi*). Even so, *Spot* lamps’ shadow buffers are much faster to render than ray-traced shadows, especially when blurred/softened, and spot lamps also provide other functionality such as “volumetric” halos.

Lamp options



Common Lamp options of a Spot

Distance, Energy and Color

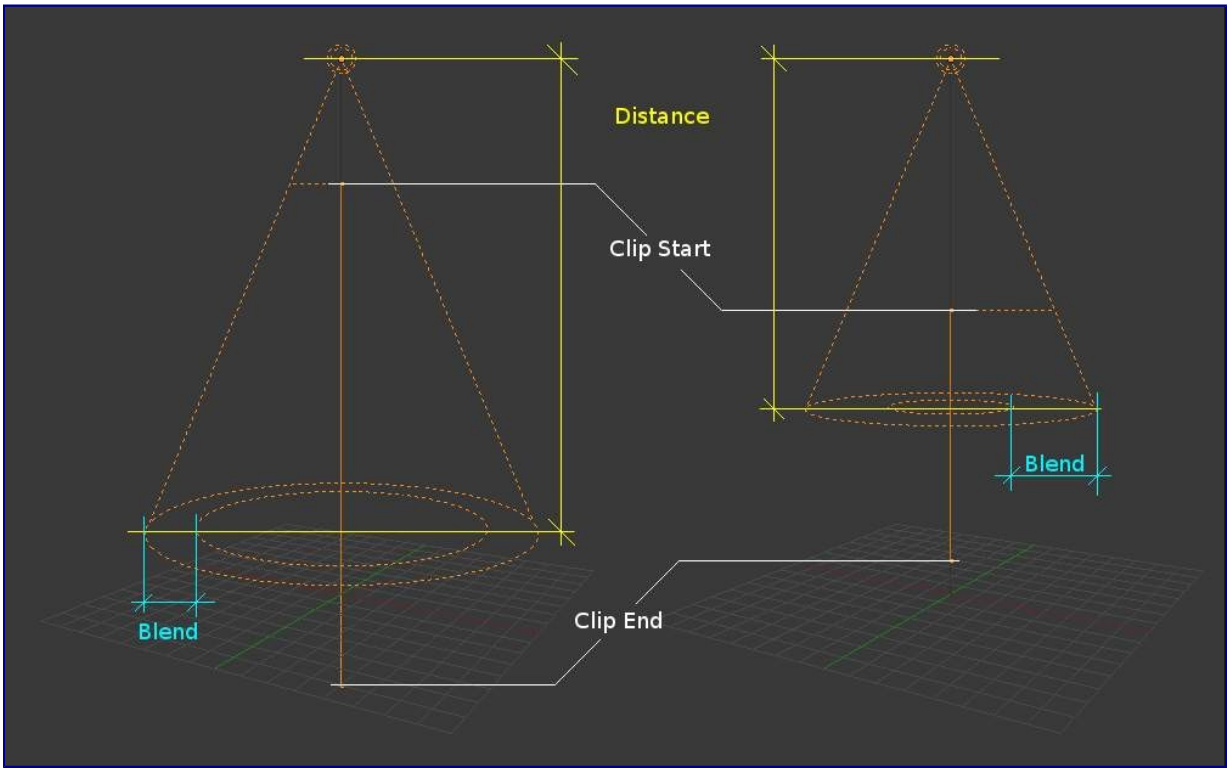
These settings are common to most types of lamps, and are described in *Light Properties*.

This Layer Only, Negative, Diffuse and Specular

These settings control what the lamp affects, as described in *What Light Affects*.

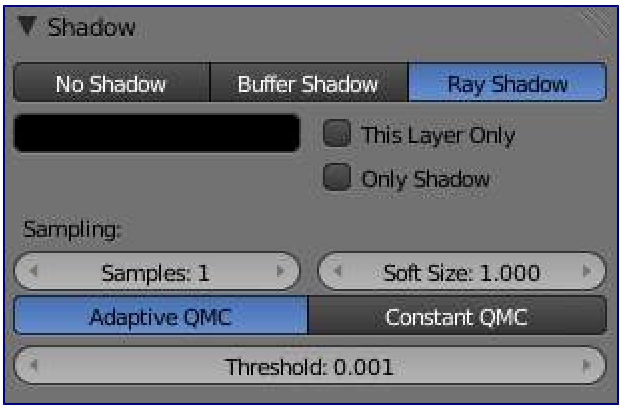
Light Falloff and Sphere

These settings control how the light of the *Spot* decays with distance. See *Light Attenuation* for details.



Changing the Spot options also changes the appearance of the spotlight as displayed in the 3D View

Shadows



Shadow panel set to Ray Shadow

Spotlights can use either ray-traced shadows or buffered shadows. Either of the two can provide various extra options. Ray-traced shadows are generally more accurate, with extra capabilities such as transparent shadows, although they are quite slower to render.

No Shadow
: Choose this to turn shadows off for this spot lamp. This can be useful to add some discreet directed light to a scene.

Buffer Shadow
: *Buffered Shadows* are also known as depth map shadows. Shadows are created by calculating differences in the distance from the light to scene objects. See *Buffered Shadows* for full details on using this feature. Buffered shadows are more complex to set up and involve more faking, but the speed of rendering is a definite advantage. Nevertheless, it shares with other lamp types common shadow options described in *Shadows Properties*.

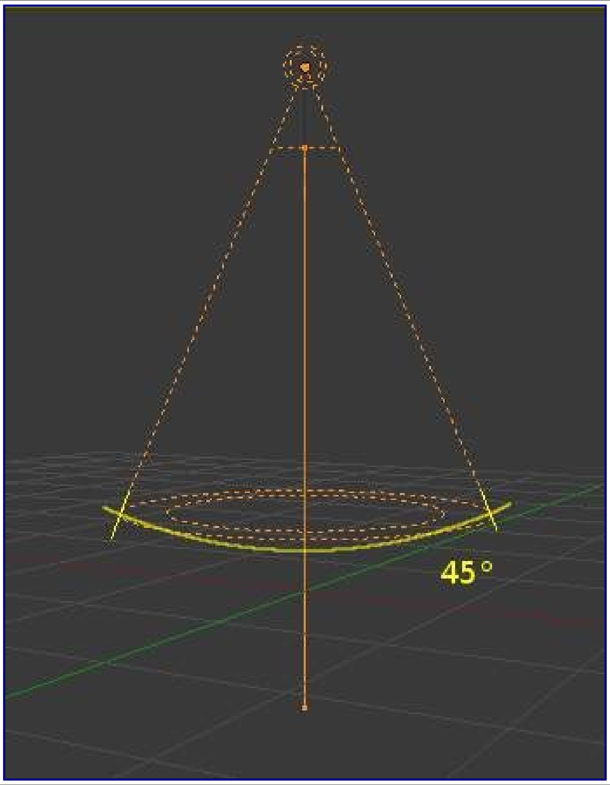
Ray Shadow
: The ray-traced shadows settings of this lamp are shared with other lamps, and are described in *Raytraced Properties*.

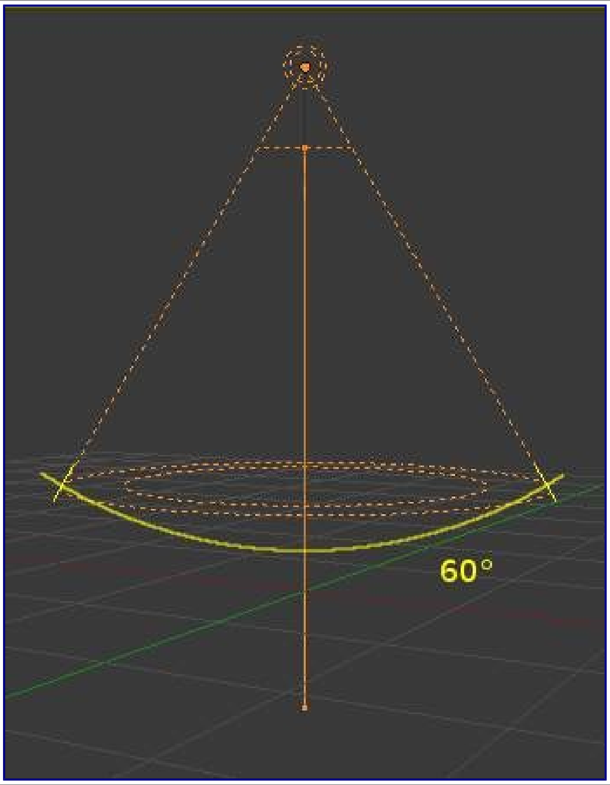
Spot Shape

Size

The size of the outer cone of a *Spot*, which largely controls the circular area a *Spot* light covers. This slider in fact controls the angle at the top of the lighting cone, and can be between `1.0- `` and ``180.0`.

Changing the spot *Size* option





Blend

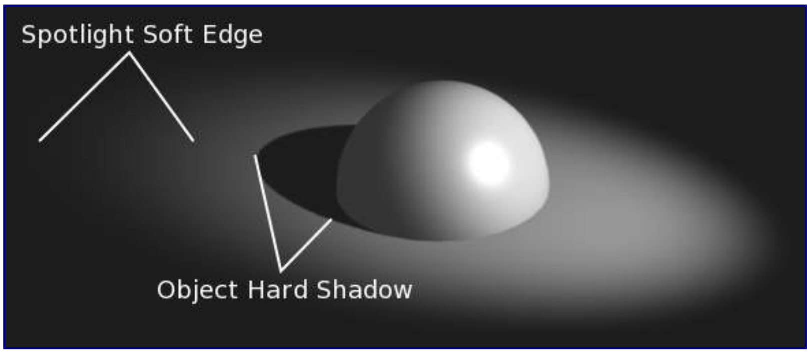
The *Blend* slider controls the inner cone of the *Spot*. The *Blend* value can be between `0.0` and `1.0`. The value is proportional and represents that amount of space that the inner cone should occupy inside the outer cone (*Size*).

The inner cone boundary line indicates the point at which light from the *Spot* will start to blur/soften; before this point its light will mostly be full strength. The larger the value of *Blend* the more blurred/soft the edges of the spotlight will be, and the smaller the inner cone's circular area will be (as it starts to blur/soften earlier).

To make the *Spot* have a sharper falloff rate and therefore less blurred/soft edges, decrease the value of *Blend*. Setting *Blend* to `0.0` results in very sharp spotlight edges, without any transition between light and shadow.

The falloff rate of the *Spot* lamp light is a ratio between the *Blend* and *Size* values; the larger the circular gap between the two, the more gradual the light fades between *Blend* and *Size*.

Blend and *Size* only control the *Spot* light cone's aperture and softness ("radial" falloff); they do not control the shadow's softness as shown below.



Render showing the soft edge spotlighted area and the sharp/hard object shadow

Notice in the picture above that the object's shadow is sharp as a result of the ray tracing, whereas the spotlight edges are soft. If you want other items to cast soft shadows within the *Spot* area, you will need to alter other shadow settings.

Square
: The *Square* button makes a *Spot* light cast a square light area, rather than the default circular one.

Show Cone
: Draw a transparent cone in 3D view to visualize which objects are contained in it.

Halo
: Adds a volumetric effects to the spot lamp. See *Spot Halos*.

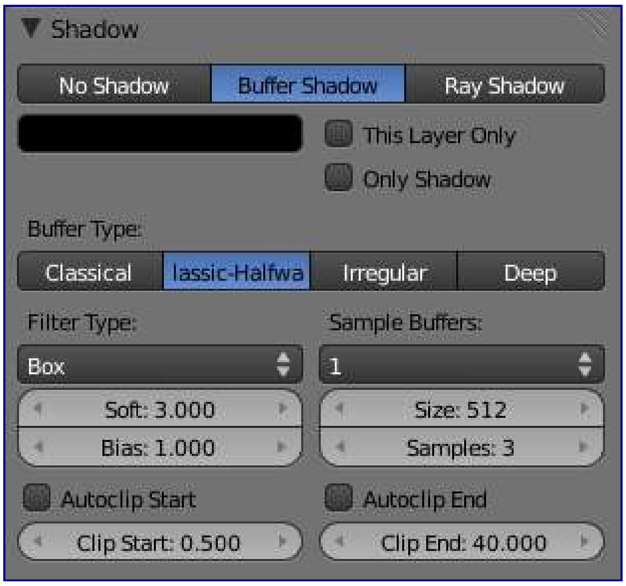
Raytraced Shadows

Shadow panel

The *Spot* light source can only cast raytraced shadows. It shares with other lamp types the same common shadowing options, described in *Shadows Properties*.

The raytraced shadows settings of this lamp are shared with other ones, and are described in *Raytraced Properties*.

Spot Buffered Shadows



Buffer Shadow enabled for a Spot lamp

Spotlights can use either *Raytraced Shadows* or buffered shadows. Either of the two can provide various extra options.

Raytraced shadows are generally more accurate, with extra capabilities such as transparent shadows, although they are quite slower to render.

Buffered shadows are more complex to set up and involve more faking, but the speed of rendering is a definite advantage. Nevertheless, it shares with other lamp types common shadows options described in *Shadows Properties*.

Shadow Buffer Types

When the *Buffer Shadow* button is activated, the currently selected *Spot* light generates shadows, using a “shadow buffer” rather than using raytracing, and various extra options and buttons appear in the *Shadow* panel.

Buffer Type

There more than one way to generate buffered shadows. The shadow buffer generation type controls which generator to use.

There are four shadow generation types, those being:

- Classical
- Classic-Halfway
- Irregular
- Deep

For more information on the different shadow generation methods see these links:

- Development Release Logs 2.43: Irregular Shadow Buffer
- Bforartists Nation: Bforartists Gets Irregular Shadow Buffers
- Development Release Logs 2.43: Shadow Buffer Halfway Average

“Classical” and “Classic-Halfway”

Buffer Shadowset to Classic-Halfway

Classical

A shadow generation which used to be the Bforartists default and unique method for generation of buffered shadows. It used an older way of generating buffered shadows, but it could have some problems with accuracy of the generated shadows and can be very sensitive to the resolution of the shadow buffer (*Shadow Buffer –> Size*), different *Bias* values, and all the self-shadowing issues that brings up.

The *Classical* method of generating shadows is obsolete and is really only still present to allow for backward compatibility with older versions of Bforartists. In most other cases you will want to use *Classic-Halfway* instead.

Classic-Halfway

This shadow buffer type is an improved shadow buffering method and is the default option selected in Bforartists. It works by taking an averaged reading of the first and second nearest Z depth values allowing the *Bias* value to be lowered and yet not suffer as much from self-shadowing issues.

Not having to increase *Bias* values helps with shadow accuracy, because large *Bias* values can mean small faces can lose their shadows, as well as preventing shadows being overly offset from the larger *Bias* value.

Classic-Halfway doesn’t work very well when faces overlap, and biasing problems can happen.

Here are now the options specific to these generation methods:

Size

The *Size* numeric field can have a value from `512` to `10240`. *Size* represents the resolution used to create a shadow map. This shadow map is then used to determine where shadows lay within a scene.

As an example, if you have a *Size* with a value of `1024`, you are indicating that the shadow data will be written to a buffer which will have a square resolution of **1024×1024** pixels/samples from the selected spotlight.

The higher the value of *Size*, the higher resolution and accuracy of the resultant shadows, assuming all other properties of the light and scene are the same, although more memory and processing time would be used. The reverse is also true - if the *Size* value is lowered, the resultant shadows can be of lower quality, but would use less memory and take less processing time to calculate.

As well as the *Size* value affecting the quality of generated shadows, another property of *Spot* lamps that affects the quality of their buffered shadows is the angle of the spotlights lighted area (given in the *Spot Shape* panel's *Size* field).

As the spot shape *Size* value is increased, the quality of the cast shadows degrades. This happens because when the *Spot* lighted area is made larger (by increasing spot shape *Size*), the shadow buffer area has to be stretched and scaled to fit the size of the new lighted area.

The *Size* resolution is not altered to compensate for the change in size of the spotlight, so the quality of the shadows degrades. If you want to keep the generated shadows the same quality, as you increase the spot shape *Size* value, you also need to increase the buffer *Size* value.

Note

The above basically boils down to

If you have a spotlight that is large you will need to have a larger buffer *Size* to keep the shadows good quality. The reverse is true also - the quality of the generated shadows will usually improve (up to a point) as the *Spot* lamp covers a smaller area.

Filter Type

The *Box*, *Tent*, and *Gauss* filter types control what filtering algorithm to use to anti-alias the buffered shadows.

They are closely related to the *Samples* numeric field, as when this setting is set to `1`, shadow filtering is disabled, so none of these buttons will have any effect what soever.

Box
: The buffered shadows will be anti-aliased using the “box” filtering method. This is the original filter used in Bforartists. It is relatively low quality and is used for low resolution renders, as it produces very sharp anti-aliasing. When this filter is used, it only takes into account oversampling data which falls within a single pixel, and doesn’t take into account surrounding pixel samples. It is often useful for images which have sharply angled elements and horizontal/vertical lines.

Tent
: The buffered shadows will be anti-aliased using the “tent” filtering method. It is a simple filter that gives sharp results, an excellent general purpose filtering method. This filter also takes into account the sample values of neighboring pixels when calculating its final filtering value.

Gauss
: The buffered shadows will be anti-aliased using the “Gaussian” filtering method. It produces a very soft/blurry anti-aliasing. As result, this filter is excellent with high resolution renders.

The *Anti-Aliasing page* in the Render chapter will give more information on the various filtering/distribution methods and their uses.

Samples

The *Samples* numeric field can have a value between `1` and `16`. It controls the number of samples taken per pixel when calculating shadow maps.

The higher this value, the more filtered, smoothed and anti-aliased the shadows cast by the current lamp will be, but the longer they will take to calculate and the more memory they will use. The anti-aliasing method used is determined by having one of the *Box*, *Tent* or *Gauss* buttons activated (see above).

Having a *Samples* value of `1` is similar to turning off anti-aliasing for buffered shadows.

Soft

The *Soft* numeric field can have a value between `1.0` and `100.0`. It indicates how wide an area is sampled when doing anti-aliasing on buffered shadows. The larger the *Soft* value, the more graduated/soft the area that is anti-aliased/softened on the edge of generated shadows.

Sample Buffers

The *Sample Buffers* setting can be set to values `1`, `4` or `9`, and represents the number of shadow buffers that will be used when doing anti-aliasing on buffered shadows.

This option is used in special cases, like very small objects which move and need to generate really small shadows (such as strands). It appears that normally, pixel width shadows don’t anti-alias properly, and that increasing *Buffer Size* doesn’t help much.

So this option allows you to have a sort of extra sample pass, done above the regular one (the one controlled by the *Box* / *Tent* / *Gauss*, *Samples* and *Soft* settings).

The default `1` value will disable this option.

Higher values will produce a smoother anti-aliasing - but be careful: using a *Sample Buffers* of `4` will require four times as much memory and process time, and so on, as Bforartists will have to compute that number of sample buffers.

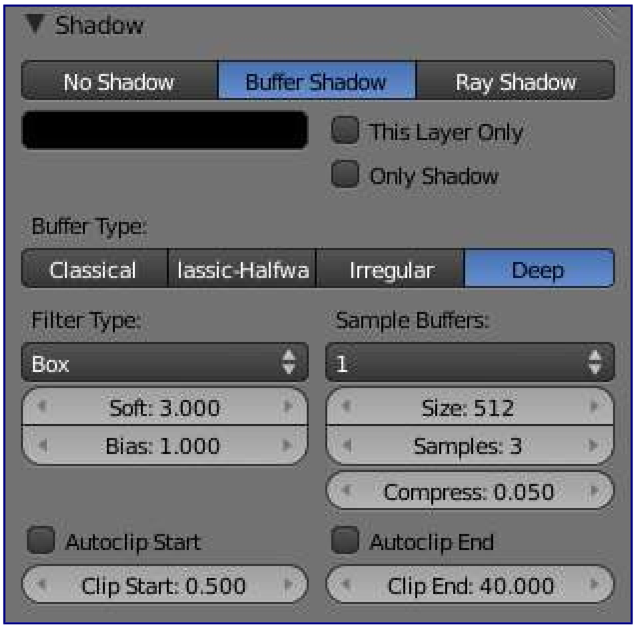
“Irregular”

Buffer Shadow set to Irregular

Irregular shadow method is used to generate sharp/hard shadows that are placed as accurately as raytraced shadows. This method offers very good performance because it can be done as a multi-threaded process.

This method supports transparent shadows. To do so, you will first need to setup the shadow setting for the object which will receive the transparent shadow. (*Material –> Shadow –> Cat Buffer Shadows* and *Buffer Bias*)

Deep generation method



Buffer Shadow set to Deep

Deep Shadow buffer supports transparency and better filtering, at the cost of more memory usage and processing time

Compress
: Deep shadow map compression threshold.

Common options

The following settings are common to all buffered shadow generation method.

Bias

> The *Bias* numeric field can have a value between `0.001` and `5.0`. *Bias* is used to add a slight offset distance between an object and the shadows cast by it. This is sometimes required because of inaccuracies in the calculation which determines weather an area of an object is in shadow or not.
>
> Making the *Bias* value smaller results in the distance between the object and its shadow being smaller. If the *Bias* value is too small, an object can get artifacts, which can appear as lines and interference patterns on objects. This problem is usually called "self shadowing", and can usually be fixed by increasing the *Bias* value, which exists for that purpose!
>
> Other methods for correcting self shadowing include increasing the size of the *Shadow Buffer Size* or using a different buffer shadow calculation method such as *Classic-Halfway* or *Irregular.*
>
> Self shadowing interference tends to affect curved surfaces more than flat ones, meaning that if your scene has a lot of curved surfaces it may be necessary to increase the *Bias* value or *Shadow Buffer Size*

value.

Having overly large *Bias* values not only places shadows further away from their casting objects, but can also cause objects that are very small to not cast any shadow at all. At that point altering *Bias*, *Shadow Buffer Size* or *Spot Size* values, among other things, may be required to fix the problem.

Note

Finer Bias tuning

You can now refine the *Bias* value independently for each *Material*, using the *Bias* slider (*Material* menu, *Shadow* panel). This value is a factor by which the *Bias* value of each *Spot* buffered shadows lamp is multiplied, each time its light hits an object using this material. The `0.0` and `1.0` values are equivalent - they do not alter the lamp's *Bias* original value.

Clip Start & Clip End

When a *Spot* light with buffered shadows is added to a scene, an extra line appears on the *Spot* 3D view representation.

The start point of the line represents *Clip Start* 's value and the end of the line represents *Clip End* 's value. *Clip Start* can have a value between `0.1` and `1000.0`, and *Clip End*, between `1.0` and `5000.0`. Both values are represented in Bforartists Units.

Clip Start indicates the point after which buffered shadows can be present within the *Spot* light area. Any shadow which could be present before this point is ignored and no shadow will be generated.

Clip End indicates the point after which buffered shadows will not be generated within the *Spot* light area. Any shadow which could be present after this point is ignored and no shadow will be generated.

The area between *Clip Start* and *Clip End* will be capable of having buffered shadows generated.

Altering the *Clip Start* and *Clip End* values helps in controlling where shadows can be generated. Altering the range between *Clip Start* and *Clip End* can help speed up rendering, save memory and make the resultant shadows more accurate.

When using a *Spot* lamp with buffered shadows, to maintain or increase quality of generated shadows, it is helpful to adjust the *Clip Start* and *Clip End* such that their values closely bound around the areas which they want to have shadows generated at. Minimizing the range between *Clip Start* and *Clip End*, minimizes the area shadows are computed in and therefore helps increase shadow quality in the more restricted area.

Autoclip Start & Autoclip End

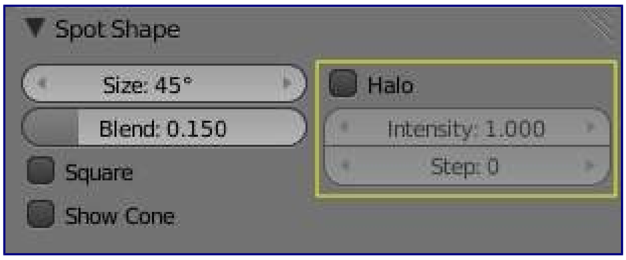
As well as manually setting *Clip Start* and *Clip End* fields to control when buffered shadows start and end, it is also possible to have Bforartists pick the best value independently for each *Clip Start* and *Clip End* field.

Bforartists does this by looking at where the visible vertices are when viewed from the *Spot* lamp position.

Hints

Any object in Bforartists can act as a camera in the 3D view. Hence you can select the *Spot* light and switch to a view from its perspective by pressing `Ctrl-Numpad0`.

Spot Volumetric Effects



Spot lamps's Halo options

Spot lights also can produce "volumetric" effects. See *Volumetric Light* for more information about what it means.

Halo
: The *Halo* button allows a *Spot* lamp to have a volumetric effect applied to it. This button must be active if the volumetric effect is to be visible. Note that if you are using buffered shadows, you have extra options described in the *Spot Buffered Shadows* page.

Intensity
: The *Intensity* slider controls how intense/dense the volumetric effect is that is generated from the light source. The lower the value of the *Intensity* slider, the less visible the volumetric effect is, while higher *Intensity* values give a much more noticeable and dense volumetric effect.

Step
: This field can have a value between `0` and `12`. It is used to determine whether this *Spot* will cast volumetric shadows, and what quality those volumetric shadows will have. If *Step* is set to a value of `0`, then no volumetric shadow will be generated. Unlike most other controls, as the *Step* value increases, the quality of volumetric shadows decreases (but take less time to render), and *vice versa*.

Tip

Step values

A value of `8` for *Halo Step* is usually a good compromise between speed and accuracy.

Bforartists only simulates volumetric lighting in *Spot* lamps when using its internal renderer. This can lead to some strange results for certain combinations of settings for the light's *Energy* and the halo's *Intensity*. For example, having a *Spot* light with null or very low light *Energy* settings but a very high halo *Intensity* setting can result in a dark/black halo, which would not happen in the real world. Just be aware of this possibility when using halos with the internal renderer.

Note

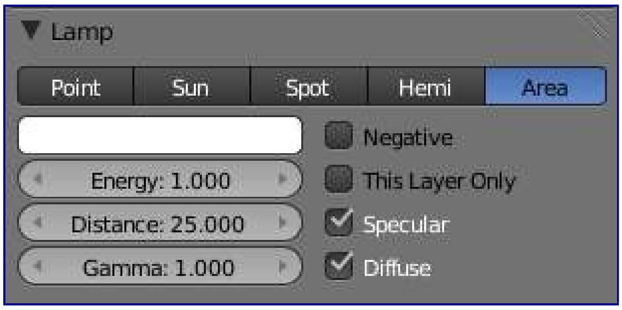
The halo effect can be greatly enhanced when using buffered shadows: when the halo's *Step* is not null, they can create “volumetric shadows”. See the page about *Spot Buffered Shadows* for more information.

See Also

- *Shadows*
- *Spot Lamp*
- *Spot Buffered Shadows*

Area

The *Area* lamp simulates light originating from a surface (or surface-like) emitter. For example, a TV screen, your supermarket’s neon lamps, a window, or a cloudy sky are just a few types of area lamp. The area lamp produces shadows with soft borders by sampling a lamp along a grid the size of which is defined by the user. This is in direct contrast to point-like artificial lights which produce sharp borders.



Commons Options

Lamp options

Distance, Energy and Color

These settings are common to most types of lamps, and are described in *Light Properties*.

Note that the *Distance* setting is much more sensitive and important for *Area* lamps than for others; usually any objects within the range of *Distance* will be blown out and overexposed. For best results, set the *Distance* to just below the distance to the object that you want to illuminate.

Gamma

Amount to gamma correct the brightness of illumination. Higher values give more contrast and shorter falloff.

The *Area* lamp doesn’t have light falloff settings. It uses an “inverse quadratic” attenuation law. The only way to control its falloff is to use the *Distance* and/or *Gamma* settings.

This Layer Only, Negative, Specular and Diffuse

These settings control what the lamp affects, as described in *What Light Affects*.

Shadows

Area light ray-traced shadows are described here: *Raytraced Shadows*.

When an *Area* light source is selected, the *Shadow* panel has the following default layout:

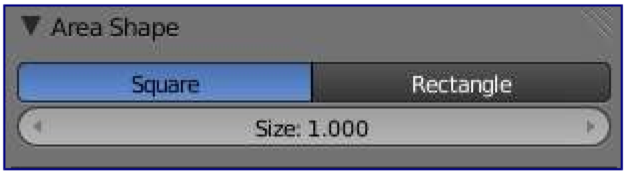
The *Shadow* panel when *Area* light source is selected.

Adaptive QMC settings

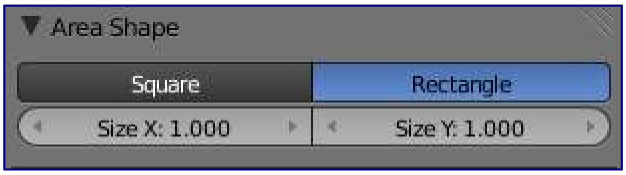
Constant Jittered settings

Area Shape

The shape of the area light can be set to *Square* or *Rectangle*.



Square options



Rectangle options

Square / Rectangular
: Emit light from either a square or a rectangular area

Size / Size X / Size Y
: Dimensions for the *Square* or *Rectangle*

Note

Shape Tips

Choosing the appropriate shape for your *Area* light will enhance the believability of your scene. For example, you may have an indoor scene and would like to simulate light entering through a window. You could place a *Rectangular* area lamp in a window (vertical) or from neons (horizontal) with proper ratios for *Size X* and *Size Y*. For the simulation of the light emitted by a TV screen a vertical *Square* area lamp would be better in most cases.

Area Raytraced Shadows

Adaptive QMC settings

The *Area* light source can only cast ray-traced shadows. The ray-traced shadows settings of this lamp are mostly shared with other lamps, as described in *Raytraced Properties*. However, there are some specifics with this lamp, which are detailed below:

Shadow Samples

Samples
: This have the same role as with other lamps, but when using a *Rectangle Area* lamp, you have two samples settings: *Samples X* and *Samples Y*, for the two axes of the area plane. Note also that when using the *Constant Jittered* sample generator method, this is more or less equivalent to the number of virtual lamps in the area. With QMC sample generator methods, it behaves similarly to with *Lamp* or *Spot* lamps.

Sample Generator Types

Adaptive QMC / Constant QMC
: These common setting are described in *Shadow Properties*.

Constant Jittered settings

Constant Jittered

The *Area* lamp has a third sample generator method, *Constant Jittered*, which is more like simulating an array of lights. It has the same options as the old one: *Umbra*, *Dither* and *Jitter.*

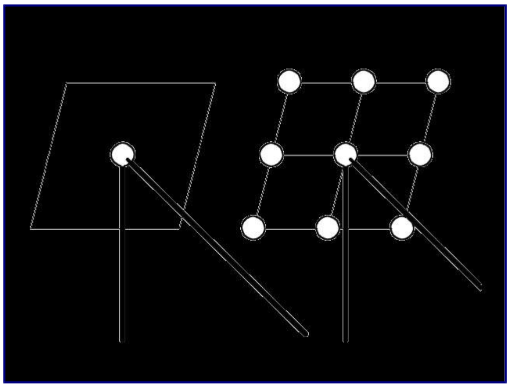
The following three parameters are only available when using the *Constant Jittered* sample generator method, and are intended to artificially boost the “soft” shadow effect, with possible loss in quality:

Umbra
: Emphasizes the intensity of shadows in the area fully within the shadow rays. The light transition between fully shadowed areas and fully lit areas changes more quickly (i.e. a sharp shadow gradient). You need *Samples* values equal to or greater than `2` to see any influence of this button.

Dither
: Applies a sampling over the borders of the shadows, similar to the way anti-aliasing is applied by the *OSA* button on the borders of an object. It artificially softens the borders of shadows; when *Samples* is set very low, you can expect poor results, so *Dither* is better used with medium *Samples* values. It is not useful at all with high *Samples* values, as the borders will already appear soft.

Jitter
: Adds noise to break up the edges of solid shadow samples, offsetting them from each other in a pseudo-random way. Once again, this option is not very useful when you use high *Samples* values where the drawback is that noise generates quite visible graininess.

Technical Details



Principles behind the Area light

The (*Principles behind the Area light*) picture helps to understand how the soft shadows are simulated.

`(a)` is the *Area* light as defined in Bforartists. If its shape is *Square*, then the softness of the shadow is defined by the number of light *Samples* in each direction of the shape. For example, `(b)` illustrates the equivalent case of an *Area* light (*Square* shape), with *Samples* set at `3` on the *Shadow and Spot* panel.

The *Area* lamp is then considered as a grid with a resolution of three in each direction, and with a light “dupliverted” at each node for a total of nine lights.

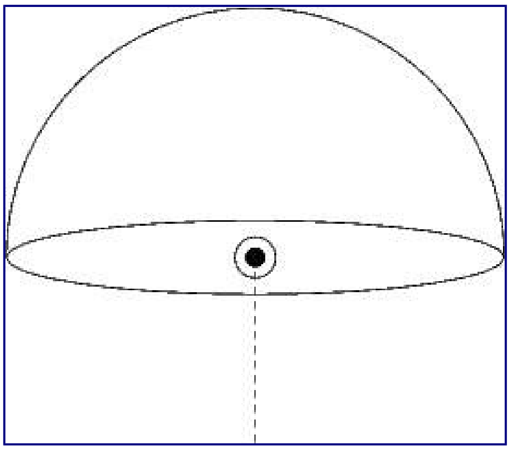
In case `(a)`, the energy (`E`) is `E/1`, and in case `(b)`, the energy of each individual pseudo-light is equal to `E/(Nbr of lights)`. Each pseudo-light produces a faint shadow (proportional to its energy), and the overlay of the shadows produces the soft shadow (it is darker where the individual shadows overlap, and lighter everywhere else).

Hints

You will note that changing the *Size* parameter of your area lamp doesn’t affect the lighting intensity of your scene. On the other hand, rescaling the lamp using the S in the 3D View could dramatically increase or decrease the lighting intensity of the scene. This behavior has been coded this way so that you can fine tune all your light settings and then decide to scale up (or down) the whole scene without suffering from a drastic change in the lighting intensity. If you only want to change the dimensions of your *Area* lamp, without messing with its lighting intensity, you are strongly encouraged to use the *Size* button(s) instead.

If your computer isn't very fast, when using the *Constant Jittered* sample generator method, you could find it useful to set a low *Samples* value (like 2) and activate *Umbra*, *Dither*, and/or *Jitter* in order to simulate slightly softer shadows. However, these results will never be better than the same lighting with high *Samples* values.

Hemi Lamp



Hemi light conceptual scheme

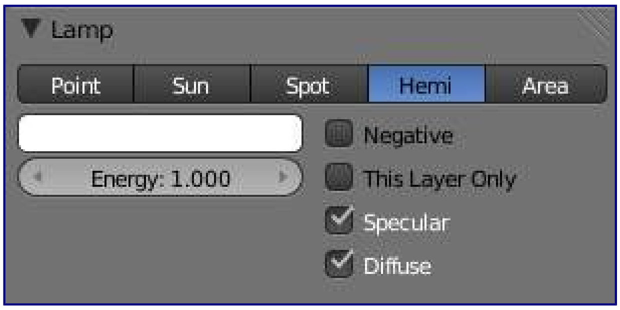
The *Hemi* lamp provides light from the direction of a 180- hemisphere,

designed to simulate the light coming from a heavily clouded or otherwise uniform sky. In other words, it is a light which is shed, uniformly, by a glowing dome surrounding the scene.

Similar to the *Sun* lamp, the *Hemi* 's location is unimportant, while its orientation is key.

The *Hemi* lamp is represented with four arcs, visualizing the orientation of the hemispherical dome, and a dashed line representing the direction in which the maximum energy is radiated, the inside of the hemisphere.

Options



Hemi lamp's panel

Energy and Color

These settings are common to most types of lamps, and are described in *Light Properties*.

Layer, Negative, Specular, and Diffuse

These settings control what the lamp affects, as described in *What Light Affects*.

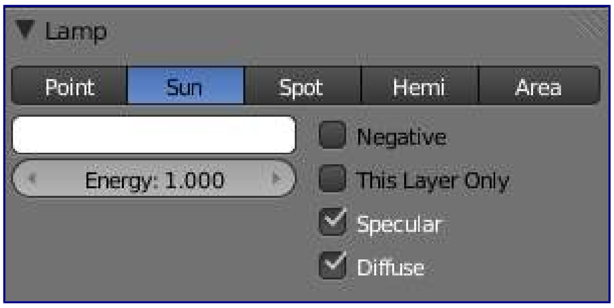
The *Hemi* lamp has no light falloff settings: it always uses a constant attenuation (i.e. no attenuation).

Since this lamp is the only lamp which cannot cast any shadow, the *Shadow* panel is absent.

Sun

A *Sun* lamp provides light of constant intensity emitted in a single direction. A *Sun* lamp can be very handy for a uniform clear daylight open-space illumination. In the 3D view, the *Sun* light is represented by an encircled black dot with rays emitting from it, plus a dashed line indicating the direction of the light.

This direction can be changed by rotating the *Sun* lamp, like any other object, but because the light is emitted in a constant direction, the location of a *Sun* lamp does not affect the rendered result (unless you use the *"sky & atmosphere" option*).



Sun lamp panel

Lamp options

Energy and Color

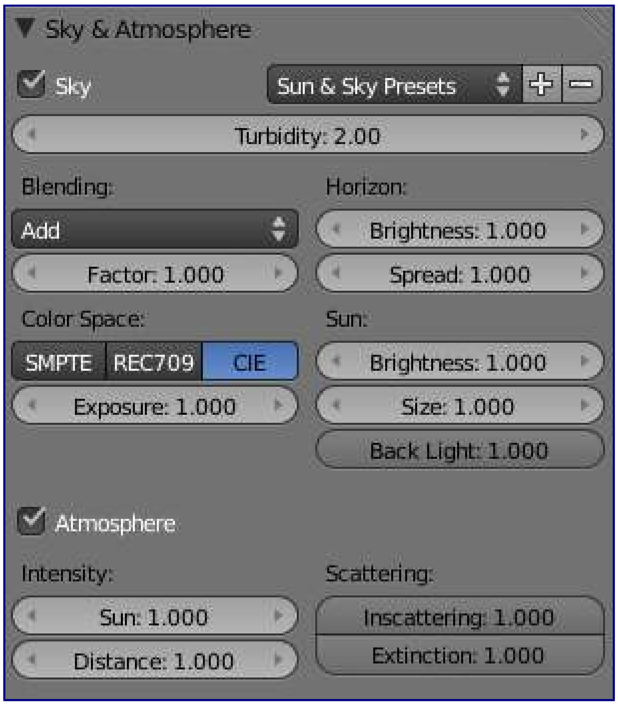
These settings are common to most types of lamps, and are described in *Light Properties*.

Negative, This Layer Only, Specular, and Diffuse

These settings control what the lamp affects, as described in *What Light Affects*.

The *Sun* lamp has no light falloff settings: it always uses a constant attenuation (i.e. no attenuation!).

Sky & Atmosphere



Sky & Atmosphere panel

Various settings for the appearance of the sun in the sky, and the atmosphere through which it shines, are available. For details, see *Sky and Atmosphere*.

Shadow

Shadow panel

The *Sun* light source can only cast ray-traced shadows. It shares with other lamp types the same common shadowing options, described in *Shadows Properties*.

The ray-traced shadows settings of this lamp are shared with other lamps, and are described in *Raytraced Properties*.

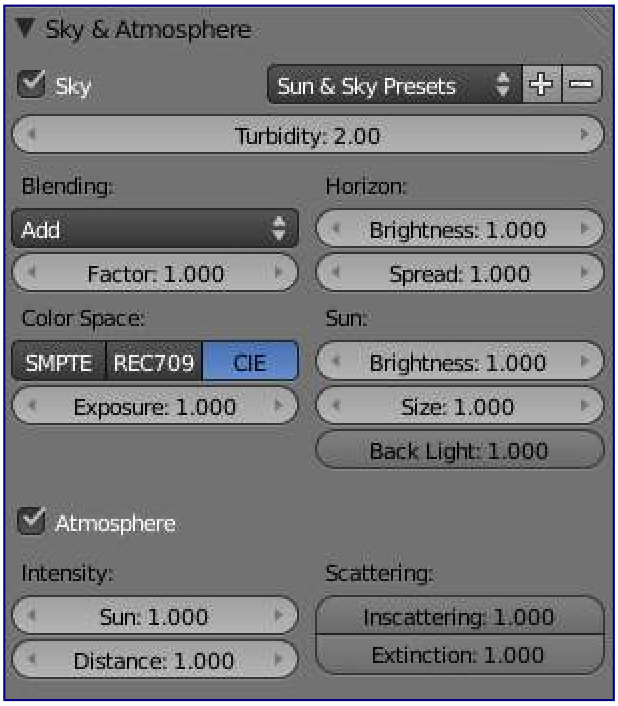
Raytraced Shadows

Shadow panel

The *Sun* light source can only cast raytraced shadows. It shares with other lamp types the same common shadowing options, described in *Shadows Properties*.

The raytraced shadows settings of this lamp are shared with other ones, and are described in *Raytraced Properties*.

Sun: Sky & Atmosphere

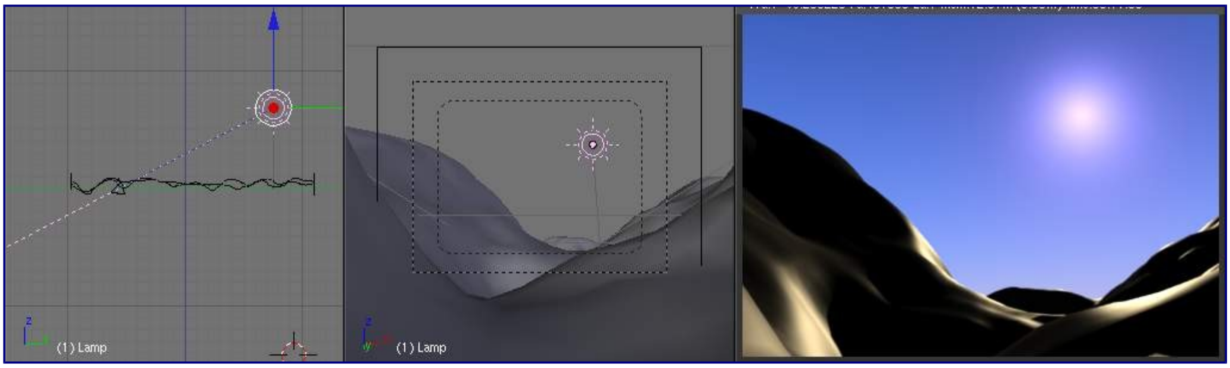


Sky & Atmosphere panel

This panel allows you to enable an effect that simulates various properties of real sky and atmosphere: the scattering of sunlight as it crosses the kilometers of air overhead. For example, when the Sun is high, the sky is blue (and the horizon, somewhat whitish). When the Sun is near the horizon, the sky is dark blue/purple, and the horizon turns orange. The dispersion of the atmosphere is also more visible when it is a bit foggy: the farther away an object is, the more “faded” in light gray it is... Go out into the countryside on a nice hot day, and you will see.

To enable this effect, you have to use a *Sun* light source. If, as usual, the *position* of the lamp has no importance, its *rotation* is crucial: it determines which hour it is. As a starting point, you should reset rotation of your *Sun* (with `Alt-R`, or typing `0` in each of the three *Rotation* fields *X* / *Y* / *Z* in the *Transform Properties* panel - `N`). This way, you'll have a nice mid-day sun (in the tropics).

Now, there are two important angles for the *Sky/Atmosphere* effect: the "incidence" angle (between the light direction and the X-Y plane), which determines the "hour" of the day (as you might expect, the default rotation - straight down - is "mid-day", a light pointing straight up is "midnight", and so on...). And the rotation around the Z axis determines the position of the sun around the camera.



The dashed "light line" of the Sun lamp crossing the camera focal point.

In fact, to have a good idea of where the sun is in your world, relative to the camera in your 3D view, you should always try to have the dashed "light line" of the lamp crossing the center of the camera (its "focal" point), as shown in (*The dashed "light line" of the Sun lamp crossing the camera focal point*). This way, in camera view (`Numpad0`, center window in the example picture), you will see where the "virtual" sun created by this effect will be.

It is important to understand that the *position* of the sun has no importance for the effect: only its *orientation* is relevant. The position just might help you in your scene design.

Options

Sun & Sky Presets:

- Classic
- Desert
- Mountain

Sky

Sky
: This button enables the sky settings: it will create a "sky", with a "sun" if visible, and mix it with the background as defined in *World* settings.

Turbidity
: This is a general parameter that affects sun view, sky and atmosphere; it's an atmosphere parameter where low values describe clear sky, and high values shows more foggy sky. In general, low values give a clear, deep blue sky, with "little" sun; high values give a more reddish sky, with a big halo around the sun. Note that this parameter is one which can really modify the "intensity" of the sun lighting. See examples below.

Here are its specific controls:

Blending

The first drop-down list shows you a menu of various mix methods. The one selected will be used to blend the sky and sun with the background defined in the *World* settings. The mixing methods are the same as described e.g. in the *Mix Compositing Node* page.

Factor

Controls how much the sky and sun effect is applied to the World background.

Color space

These buttons allows you to select which color space the effect uses, with the following choices:

- CIE
- REC709
- SMPTE
- Exposure

This numeric field allows you to modify the exposure of the rendered Sky and Sun (`0.0` for no correction).

Horizon

Brightness

Controls brightness of colors at the horizon. Its value should be in the range `0.0` to `10.0`; values near zero means no horizontal brightness, and large values for this parameter increase horizon brightness. See examples below.

Spread

Controls spread of light at the horizon. Its value should be in the range `0.0` to `10.0`; values low in the range result in less spread of light at horizon, and values high in the range result in horizon light spread in through all the sky.

Sun

Brightness

Controls the sun brightness. Its value should be in the range `0.0` to `10.0`; with low values the sky has no sun and with high values the sky only has sun.

Size

Controls the size of sun. Its values should be in the range `0.0` to `10.0`, but note that low values result in large sun size, and high values result in small sun size. Note that the overall brightness of the sun remains constant (set by *Brightness*), so the larger the sun (the smaller *Size*), the more it “vanishes” in the sky, and *vice versa*.

Back Light

For “Back Scatter Light”, result on sun’s color, high values result in more light around the sun. Its values range is `-1.0` to `1.0`. Negative values result in less light around sun.

Atmosphere

Atmosphere

This button enables the atmosphere settings. It will not modify the background, but it tries to simulate the effects of an atmosphere: scattering of the sunlight in the atmosphere, its attenuation, ...

Intensity

Sun

Sets sun intensity. Its values are in range `0.0` to `10.0`. High values result in bluer light on far objects.

Distance

This factor is used to convert Bforartists units into an understandable unit for atmosphere effect, it starts from `0` and high values result in more yellow light in the scene.

Scattering

Inscattering

This factor can be used to decrease the effect of light inscattered into atmosphere between the camera and objects in the scene. This value should be `1.0` but can be changed to create some nice, but not realistic, images.

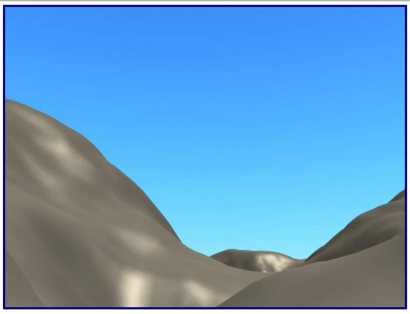
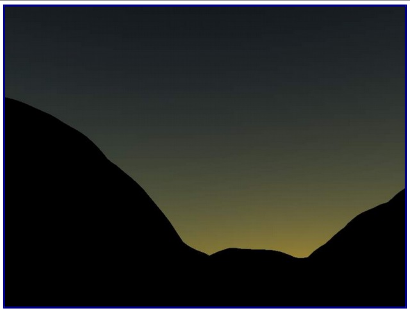
Extinction

This factor can be use to decrease the effect of extinction light from objects in the scene. Like *Inscattering* factor, this parameter should be `1.0` but you can change it; low values result in less light extinction. Its value is in the range `0.0` to `1.0`.

Examples

First, let's see what happens when we modify the orientation of the sun:

Variations in *Sun* orientation, *Sun Size* to 5.0, all other settings to default.

 With sun right overhead (mid-day).	 With sun deep "under the Earth" (midnight).
 Sun slightly above the horizon (start of twilight).	 Sun slightly below the horizon (end of twilight).

The 2.4 .blend file of these examples.

And now, the effects of various settings (examples created with this 2.4 .blend file):

Variations in *Turbidity* parameter, all other settings to default.

 Turbidity: 2.0.	 Turbidity: 2.3.
 Turbidity: 5.0.	 Turbidity: 10.0.

Sky

Variations in *Horizon Brightness* parameter, all other settings to default.

 Horizon Brightness: 0.0.	 Horizon Brightness: 0.85.
	

Horizon Brightness: 1.04.	Horizon Brightness: 1.13.

Variations in *Horizon Spread* parameter, all other settings to default.

 Horizon Spread: 0.7.	 Horizon Spread: 1.2.
 Horizon Spread: 2.2.	 Horizon Spread: 5.0.

Variations in *Sun Brightness* parameter, all other settings to default.

 Sun Brightness: 0.2.	 Sun Brightness: 0.5.

 Sun Brightness: 0.75.	 Sun Brightness: 1.0.

Variations in *Sun Size* parameter, all other settings to default.

 Sun Size: 2.0.	 Sun Size: 4.0.
 Sun Size: 7.0.	 Sun Size: 10.0.

Variations in *Back Light* parameter, *Sun Bright* to 2.5, all other settings to default.

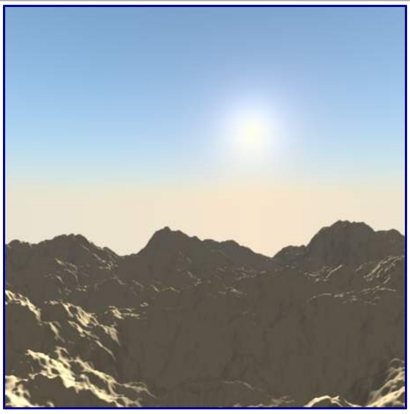
	

Back Light: -1.0.	Back Light: -0.33.
 Back Light: 0.33.	 Back Light: 1.0.

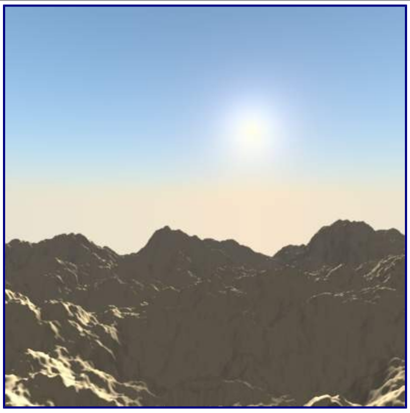
Atmosphere

For all renders below, *Hor.Bright* is set to `0.2`, and *Sun Bright* to `2.0`.

Variations in *Sun Intensity* parameter, all other settings to default.

 Sun Intensity: 1.0.	 Sun Intensity: 3.33.
 Sun Intensity: 6.66.	 Sun Intensity: 10.0.

Variations in *Inscattering* parameter, all other settings to default.



Inscattering: 0.1.

Inscattering: 0.33.

Inscattering: 0.66.

Inscattering: 1.0.

Variations in *Extinction* parameter, all other settings to default.

Extinction: 0.0.

Extinction: 0.33.

Extinction: 0.66.

Extinction: 1.0.

Variations in *Distance* parameter, all other settings to default.

 Distance: 1.0.	 Distance: 2.0.
 Distance: 3.0.	 Distance: 4.0.

Hints and limitations

To always have the *Sun* pointing at the camera center, you can use a *TrackTo constraint* on the sun object, with the camera as target, and *-Z* as the “To” axis (use either *X* or *Y* as “Up” axis). This way, to modify height/position of the sun in the rendered picture, you just have to move it; orientation is automatically handled by the constraint. Of course, if your camera itself is moving, you should also add e.g. a *Copy Location constraint* to your *Sun* lamp, with the camera as target - and the *Offset* option activated... This way, the sun light won’t change as the camera moves around.

If you use the default *Add* mixing type, you should use a very dark-blue world color, to get correct “nights”...

This effect works quite well with a *Hemi* lamp, or some ambient occlusion, to fill in the *Sun* shadows.

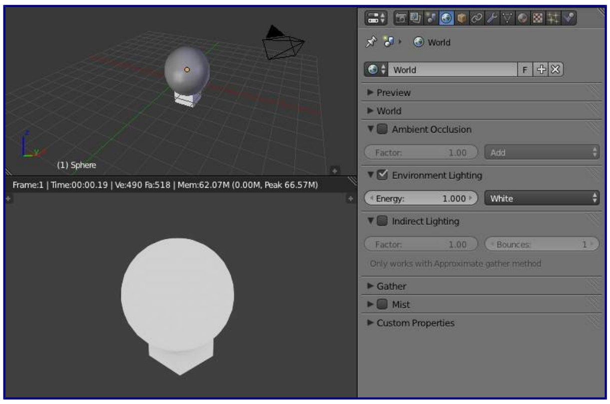
Atmosphere shading currently works incorrectly in reflections and refractions and is only supported for solid shaded surfaces. This will be addressed in a later release.

Lighting Rigs

A rig is a standard setup and combination of objects; there can be lighting rigs, or armature rigs, etc. A rig provides a basic setup and allows you to start from a known point and go from there. Different rigs are used for different purposes and emulate different conditions; the rig you start with depends on what you want to convey in your scene. Lighting can be very confusing, and the defaults do not give good results. Further, very small changes can have a dramatic effect on the mood and colors.

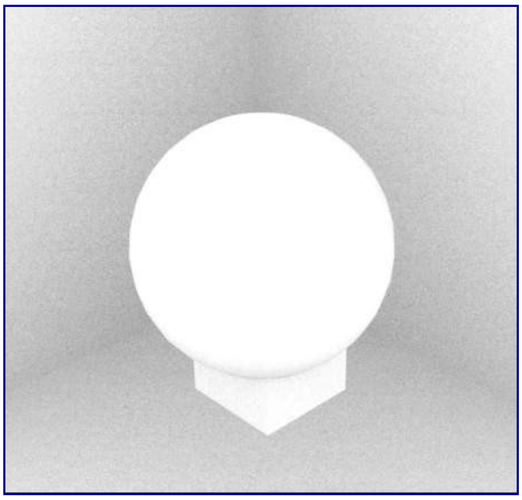
In all the lighting rigs, the default camera is always positioned nearly 15 degrees off dead-on, about **25 BU** (Bforartists Units) back and **9 BU** to the side of the subject, at eye level, and uses a long lens (**80mm**). Up close, a **35mm** lens will distort the image. A long lens takes in more of the scene. A dead-on camera angle is too dramatic and frames too wide a scene to take in. So now you know; next time you go to a play, sit off-center and you won't miss the action happening on the sidelines and will have a greater appreciation for the depth of the set. Anyway, enough about camera angles; this is about lighting.

Environment or Ambient Only



Environment (Ambient) lighting only.

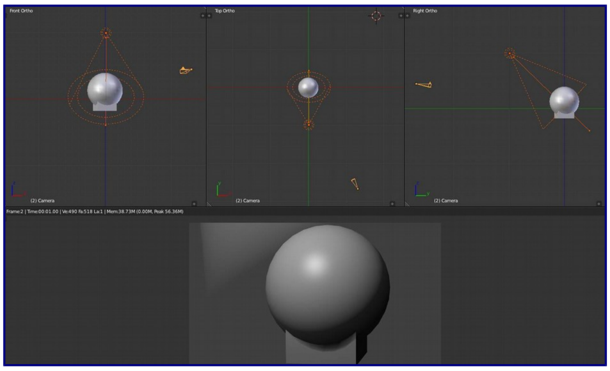
In the *World* context, there is a panel *Environment Lighting*, where you enable environment or ambient lighting of your scene. Ambient light is the scattered light that comes from sunlight being reflected off every surface it hits, hitting your object, and traveling to camera.



Ambient occlusion.

Ambient light illuminates, in a perfectly balanced, shadeless way, without casting shadows. You can vary the intensity of the ambient light across your scene via *ambient occlusion*. The ambient color is a sunny white.

Single Rig



Standard Spot light rig.

The sole, or key, spot light rig provides a dramatic, showy, yet effective illumination of one object or a few objects close together. It is a single *Spot* light, usually with a hard edge. Halos are enabled in this render to remind you of a smoky nightclub scene. It is placed above and directly in front of the subject; in this case **10 BU** in front and **10 BU** high, just like a stage, it shines down at about a `40` degrees angle. We use quadratic attenuation.

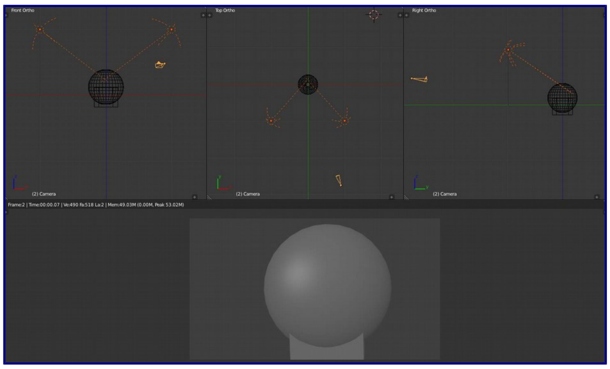
You can make the spot wider by increasing *Size Spot Shape* and softening the edge by increasing *Blend Spot Shape*, and parent it to the main actor, so that the spot follows him as he moves around. Objects close to the main actor will naturally be more lit and your viewer will pay attention to them.

Moving this spot directly overhead and pointing down gives the interrogation effect. At the opposite end of the show-off emotional spectrum is one soft candlelight (*Point* lamp, short falloff *Distance*, yellow light) placed really up close to the subject, dramatizing the fearful “lost in the darkness” effect.

Somewhere in the macabre spectrum is a hard spot on the floor shining upward. For fun, grab a flashlight, head into the bathroom and close the door. Turn out the light and hold the flashlight under your chin, pointing up. Look in the mirror and turn it on. Ghoulies! Don’t blame me for nightmares, and I hope you get the point: lighting, **even with a single light, varying the intensity, location and direction, changes everything** in a scene.

Use this rig, with *Environment Lighting* light (and props receiving and being lit by ambient light in their material settings) for scenes that feature one main actor or a product being spotlighted. Do not use this rig for big open spaces or to show all aspects of a model.

Two-Point Rig



Standard two-point light rig.

The two-point lighting rig provides a balanced illumination of an object. Shown to the right are the views of the standard two-point lighting rig. It is called the two-point because there are two points of light. The standard two-point lighting rig provides a balanced illumination of untextured objects hanging out there in 3D space. This rig is used in real studios for lighting a product, especially a glossy one.

Both lights are almost the same but do different things. Both emulate very wide, soft light by being *Hemi*. In real life, these lights bounce light off the inside of a silver umbrella.

Notice how we use low *Energy* to bring out the dimensionality of the sphere; I can’t stress that enough. Hard, bright lights actually flatten it and make you squint. Soft lights allow your eye to focus. We disable specular for right *Hemi*, so we don’t get that shiny forehead or nose.

The lamp on the left however, lets it be known that it is there by enabling specular; specular flare is that bright spot that is off center above midline on the sphere.

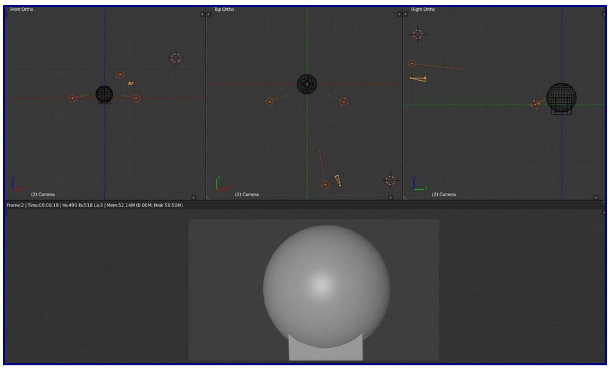
Use this rig to give even illumination of a scene, where there is no main focus. The *Hemi* ‘s will light up background objects and props, so *Environment Lighting* is not that important. At the opposite end of the lighting spectrum, two narrow *Spot* lights at higher power with a hard edge gives a “This is the Police, come out with your hands up” kind of look, as if the subject is caught in the crossfire.

Three-Point Rigs

The standard three-point lighting rig is the most common illumination of objects and scenes bar none. If you want to show off your model, use this rig. As you can see, the untextured unmaterialized sphere seems to come out at you. There are multiple thesis on this rig, and you will use one of two:

- Studio - used in a real studio to film in front of a green screen or backdrop. Use this rig when you are rendering your CG objects to alpha into the scene so that the lighting on the actors *and* your CG objects is the same.
- Standard - used in real life to light actors on a set, and gives some backlighting to highlight the sides of actors, making them stand out more and giving them depth.

Studio rig



Studio three-point light rig.

Shown to the right are the “Studio” top, front, and side views of the standard three-point lighting rig. It changes the dynamics of the scene, by making a brighter “key” light give some highlights to the object, while two side “fill” lights soften the shadows created by the key light.

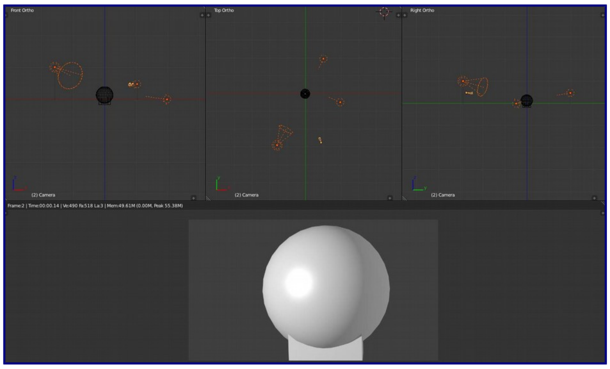
In the studio, use this rig to film a talking head (actor) in front of a green screen, or with multiple people, keeping the key light on the main actor. This rig is also used to light products from all angles, and the side fill lights light up the props.

The key light is the *Area* light placed slightly above and to the left of the camera. It allows the specular to come out. It is about **30 BU** back from the subject, and travels with the camera. A little specular shine lets you know there's a light there, and that you're not looking at a ghost. In real life, it is a spot with baffles, or blinders, that limit the area of the light.

The two sidelights are reduced to only fill; each of them are *Hemi* lights placed **20 BU** to the side and **5 BU** in front of the subject, at ground level. They don't cause a spotshine on the surface by disabling specular, and at ground level, light under the chin or any horizontal surfaces, countering the shadows caused by the key light.

Use this rig to give balanced soft lighting that also highlights your main actor or object. It combines the best of both the single rig and the two-point rig, providing balanced illumination and frontal highlights. For a wide scene, you may have to pull the sidelights back to be more positioned like the two-point rig.

Standard Rig



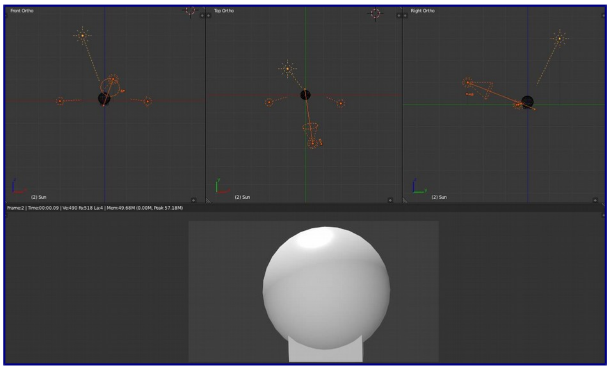
Standard three-point light rig.

Without a curtain in back of your main subject, you have depth to work with. The left fill light has been moved behind the subject (so it is now called a backlight) and is just off-camera, while the right side fill light remains the same. The keylight gives you specular reflection so you can play with specularity and hardness in your object's material settings. The key light gives that "in-the-spotlight" feel, highlighting the subject, while the backlight gives a crisp edge to the subject against the background. This helps them stand out.

In this rig, the key light is a fairly bright spot light. Use a slighter tinge of yellow because the light is so bright; it is the only light for that side. The other sidelight has been moved in back and raised to eye (camera) level. You need to cut the energy of the backlight in half, or when it is added to the remaining sidelight, it will light up the side too much and call too much attention to itself. You can vary the angle and height of the backlight to mimic a sun lighting up the objects.

Use this rig in normal 3D animations to light the main actor. Use this rig especially if you have transparent objects (like glass) so that there is plenty of light to shine through them to the camera. The tricky part here is balancing the intensities of the lights so that no one light competes with or overpowers the others, while making sure all three work together as a team.

Four-point Rig



Four-point light rig.

The four-point lighting rig provides a better simulation of outside lighting, by adding a *Sun* lamp `30` Bforartists Units above, `10` to the side, and **15 BU** behind the subject. This sunlight provides backlighting and fills the top of the subject; even producing an intentional glare on the top of their head, telling you there is a sun up there. Notice it is colored yellow, which balances out the blue sidelights.

Changing the key light to a *Spot*, select *Inverse Square*, disable *Specular* and pure white light combines with and softens the top sun flare while illuminating the face, resulting in a bright sunshine effect. Two lights above means sharper shadows as well, so you might want to adjust the side fill lights. In this picture, they are still *Hemi*, disable *Specular.*

Use this rig when the camera will be filming from behind the characters, looking over their shoulder or whatnot, because the sun provides the backlight there. Also use this rig when you have transparent objects, so there is light to come through the objects to the camera.

Another spot for the fill light is shining up onto the main actor’s face, illuminating the underside of his chin and neck. This gets rid of a sometimes ugly shadow under the chin, which if not corrected, can make the actor look fat or like they have a double chin; otherwise distracting. It evens out the lighting of the face.

Troubleshooting

If you run into a problem with your render, where there are really bright areas, or really dark ones, or strange shadows, or lines on your objects, here is what I suggest you do:

- First, try deactivating all materials (create a default, gray one, and enter its name in the *Mat* field, *Layer* panel, *Render Layers* context - to get back all your normal materials, just erase this text field!). See if you get those problems with just grayness objects. If you don’t have the problem anymore, that should tell you that you’ve got a materials-interacting-with-light problem. Check the material settings, especially ambient, reflection and all those little buttons and sliders in the *Material* context. You can set some lights to affect only certain materials, so if there’s an issue with only a few objects being really bright, start with those.
- Then start “killing” lights (e.g. moving them to an unused layer); regress all the way back to one light, make sure it’s smooth, then add them in one by one. As they add together, reduce power in the tested ones so they merge cleanly, or consider not adding it at all, or, especially, reduce the energy of the lamp you just introduced.
- You can also set lights to only light objects on a layer, so again, if some of the gray spheres have

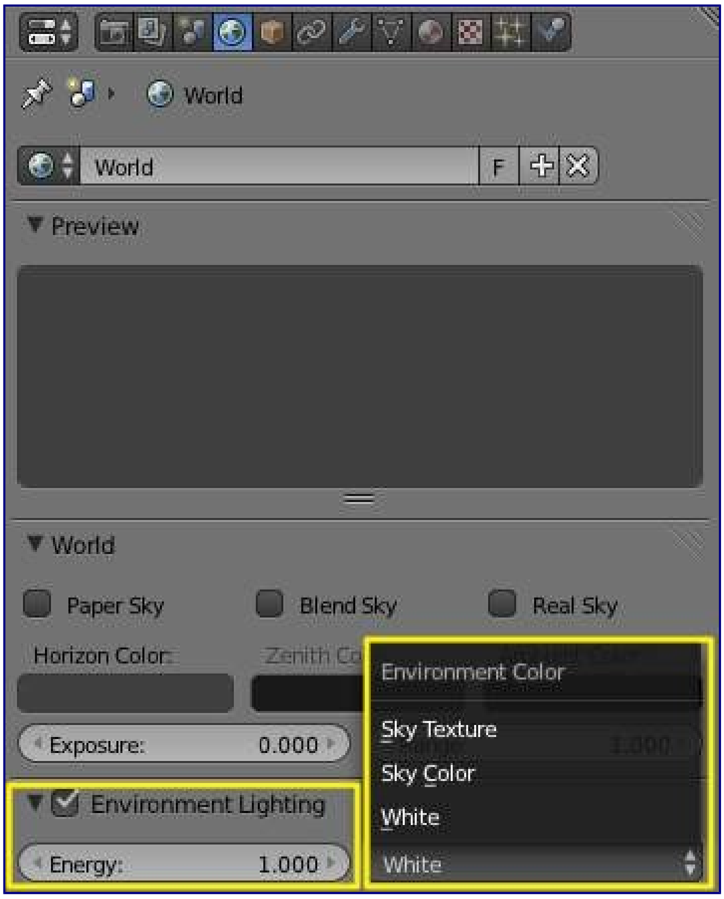
weirdness, check for that as well. Again, you may have done some of this accidentally, so sometimes deleting the light and re-adding it with defaults helps you reset to a known-good situation.

- Negative lights can be very tricky, and make your model blotchy, so pay special attention to your use of those special lights. Shadow-only lights can throw off the look of the scene as well. Overly textured lights can make your scene have random weird colors. Don’t go too far off a slight tinge of blue or yellow or shades of white, or your material may show blue in the *Material* context but render green, and you will be very confused.
- Look at your environment settings *World* context: *Horizon*, *Zenith*, and *Environment Lighting*.

Environment Lighting

Environment light provides light coming from all directions.

Light is calculated with a ray-traced method which is the same as that used by Ambient Occlusion. The difference is that Environment lighting takes into account the “ambient” parameter of the material shading settings, which indicates the amount of ambient light/color that that material receives.



Environment Lighting panel.

Also, you can choose the environment color source (white, sky color, sky texture) and the light energy.

Energy
: Defines the strength of environment light.

Environment Color

Defines where the color of the environment light comes from.

Using both settings simultaneously produces better global lighting.

It’s good for mimicking the sky in outdoor lighting. Environment lighting can be fairly noisy at times.

Ambient Occlusion

Ambient Occlusion is a sophisticated ray-tracing calculation which simulates soft global illumination shadows by faking darkness perceived in corners and at mesh intersections, creases, and cracks, where ambient light is occluded, or blocked.

There is no such thing as AO in real life; AO is a specific not-physically-accurate (but generally nice-looking) rendering trick. It basically samples a hemisphere around each point on the face, sees what proportion of that hemisphere is occluded by other geometry, and shades the pixel accordingly.

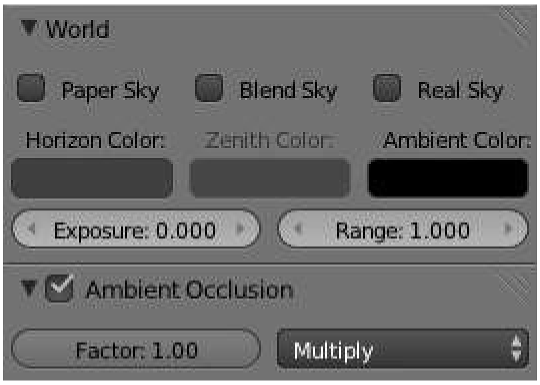
It’s got nothing to do with light at all; it’s purely a rendering trick that tends to look nice because generally in real life surfaces that are close together (like small cracks) will be darker than surfaces that don’t have anything in front of them, because of shadows, dirt, etc.

The AO process, though, approximates this result; it’s not simulating light bouncing around or going through things. That’s why AO still works when you don’t have any lights in the scene, and it’s why just switching on AO alone is a very bad way of “lighting” a scene.

You must have ray tracing enabled as a *Render* panel option in the *Shading* section for this to work.

You must have an ambient light color set as you desire. By default, the ambient light color (world) is black, simulating midnight in the basement during a power outage. Applying that color as ambient will actually darken all colors. A good outdoor mid-day color is RGB (`0.9`, `0.9`, `0.8`) which is a whitish yellow sunny kind of color on a bright-but-not-harshly-bright day.

Options



The World panel with ambient color sliders highlighted.

Factor
The strength of the AO effect, a multiplier for addition.

Ambient Occlusion is composited during the render. Two blending modes are available:

Add
: The pixel receives light according to the number of non-obstructed rays. The scene is lighter. This simulates global illumination.

Multiply
: Ambient occlusion is multiplied over the shading, making things darker.

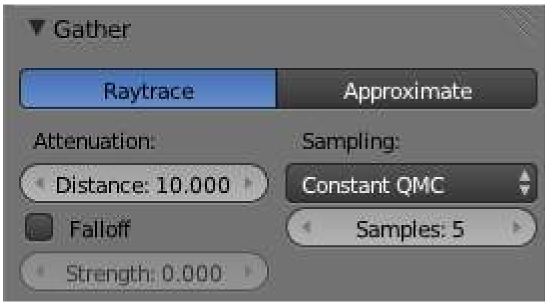
> **Note**
>
> If *Multiply* is chosen, there must be other light sources; otherwise the scene will be pitch black. In the other two cases the scene is lit even if no explicit light is present, just from the AO effect. Although many people like to use AO alone as a quick shortcut to light a scene, the results it gives will be muted and flat, like an overcast day. In most cases, it is best to light a scene properly with Bforartists's standard lamps, then use AO on top of that, set to *Multiply*, for the additional details and contact shadows.

The *Gather* panel contains settings for the ambient occlusion quality. Note that these settings also apply to Environment Lighting and Indirect Lighting.

Ambient occlusion has two main methods of calculation: *Raytrace* and *Approximate*.

Gather

Raytrace



The Amb Occ panel, Raytrace method.

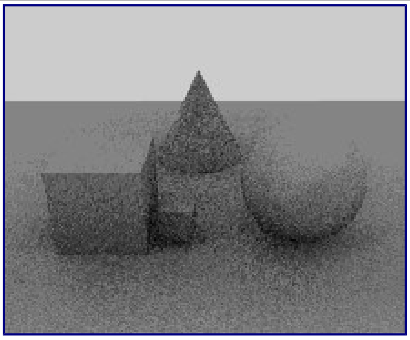
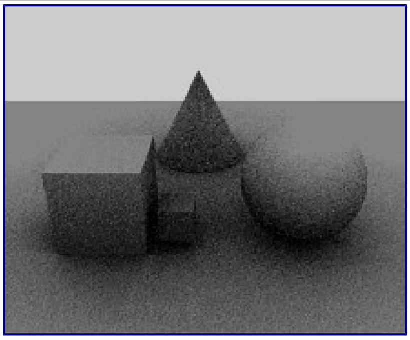
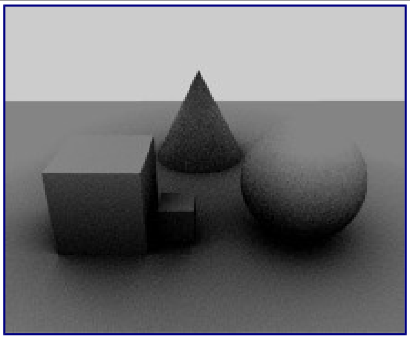
The *Raytrace* method gives the more accurate, but also the more noisy results. You can get a nearly noiseless image, but at the cost of render time... It is the only option if you want to use the colors of your sky's texture.

Attenuation
: Length of rays defines how far away other faces may be and still have an occlusion effect. The longer this distance, the greater impact that far-away geometry will have on the occlusion effect. A high *Distance* value also means that the renderer has to search a greater area for geometry that occludes, so render time can be optimized by making this distance as short as possible for the visual effect that you want.

Sampling

Samples

The number of rays used to detect if an object is occluded. Higher numbers of samples give smoother and more accurate results, at the expense of slower render times. The default value of 5 is usually good for previews. The actual number of rays shot out is the square of this number (i.e. *Samples* at 5 means 25 rays). Rays are shot at the hemisphere according to a random pattern (determined by the sample methods described above); this causes differences in the occlusion pattern of neighboring pixels unless the number of shot rays is big enough to produce good statistical data.

		
Ambient Occlusion with 3 Samples.	Ambient Occlusion with 6 Samples.	Ambient Occlusion with 12 Samples.

You have the three standard sampling options:

Constant QMC

The base Quasi-Monte Carlo, gives evenly and randomly distributed rays.

Adaptive QMC

An improved method of QMC, that tries to determine when the sample rate can be lowered or the sample skipped, based on its two settings:

Threshold

The limit below which the sample is considered fully occluded (“black”) or un-occluded (“white”), and skipped.

Adapt to Speed

A factor to reduce AO sampling on fast-moving pixels. As it uses the *Vec* render pass, that must also be enabled (see *render passes page*).

Note

About QMC

See also the raytraced shadows page for more info about the Quasi-Monte Carlo sampling method.

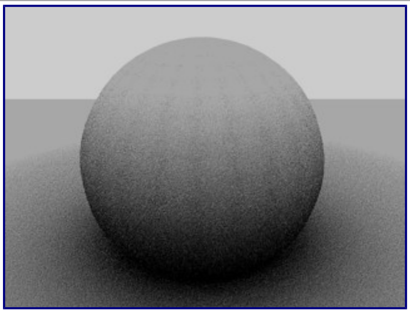
Constant Jittered

The historical sample method, more prone to “bias” artifacts...

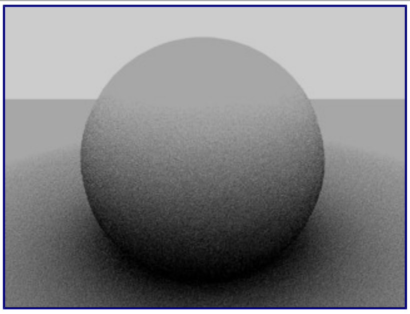
Bias

The angle (in radians) the hemisphere will be made narrower (i.e. the hemisphere will no longer be a real hemisphere: its section will no longer be a semicircle, but an arc of a circle of `pi - bias` radians).

The bias setting allows you to control how smooth “smooth” faces will appear in AO rendering. Since AO occurs on the original faceted mesh, it is possible that the AO light makes faces visible even on objects with “smooth” on. This is due to the way AO rays are shot, and can be controlled with the *Bias* slider. Note that while it might even happen with QMC sampling methods, it is much more visible with the *Constant Jittered* one - and anyway, you have no *Bias* option for QMC.

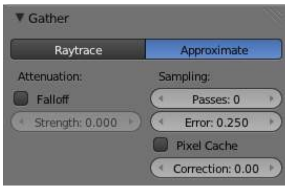


24×24 UV Sphere with Bias: 0.05 (default). Note the facets on the sphere’s surface even though it is set to smooth.



Raising the Bias to 0.15 removes the faceted artifacts.

Approximate



The Amb Occ panel, Approximate method.

The *Approximate* method gives a much smoother result for the same amount of render time, but as its name states, it is only an approximation of the *Raytrace* method, which implies it might produce some artifacts - and it cannot use the sky’s texture as the base color

This method seems to tend to “over-occlude” the results. You have two complementary options to reduce this problem:

Passes
: Set the number of pre-processing passes, between `0` (no pre-processing) to `10`. Keeping the pre-processing passes high will increase render time but will also clear some artifacts and over-occlusions.

Error
: This is the tolerance factor for approximation error (i.e. the max allowed difference between approximated result and fully computed result). The lower, the slower the render, but the more accurate the results... Ranges between `0.0` and `10.0`, defaults to `0.250`.

Pixel Cache
: When enabled, it will keep values of computed pixels to interpolate it with its neighbors. This further speeds up the render, generally without visible loss in quality...

Correction

A correction factor to reduce over-occlusion. Ranges between `0.0` (no correction) to `1.0`.

Common Settings

Falloff

When activated, the distance to the occluding objects will influence the “depth” of the shadow. This means that the further away the occluding geometry is, the lighter its “shadow” will be. This effect only occurs when the *Strength* factor is higher than `0.0`. It mimics light dispersion in the atmosphere...

Strength
Controls the attenuation of the shadows enabled with *Use Falloff*. Higher values give a shorter shadow, as it falls off more quickly (corresponding to a more foggy/dusty atmosphere). Ranges from `0.0` (default, no falloff) to `10.0`.

Technical Details

Ambient occlusion is calculated by casting rays from each visible point, and by counting how many of them actually reach the sky, and how many, on the other hand, are obstructed by objects.

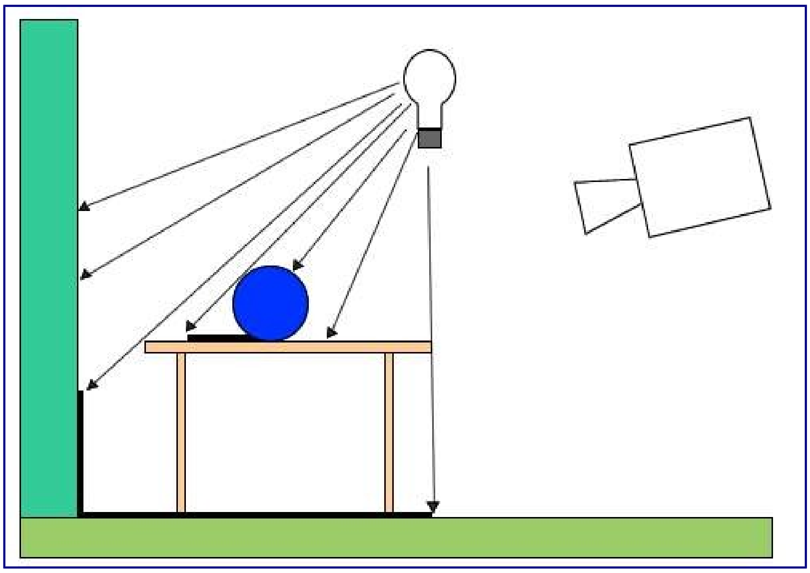
The amount of light on the point is then proportional to the number of rays which have “escaped” and have reached the sky. This is done by firing a hemisphere of shadow rays around. If a ray hits another face (it is occluded) then that ray is considered “shadow”, otherwise it is considered “light”. The ratio between “shadow” and “light” rays defines how bright a given pixel is.

Hints

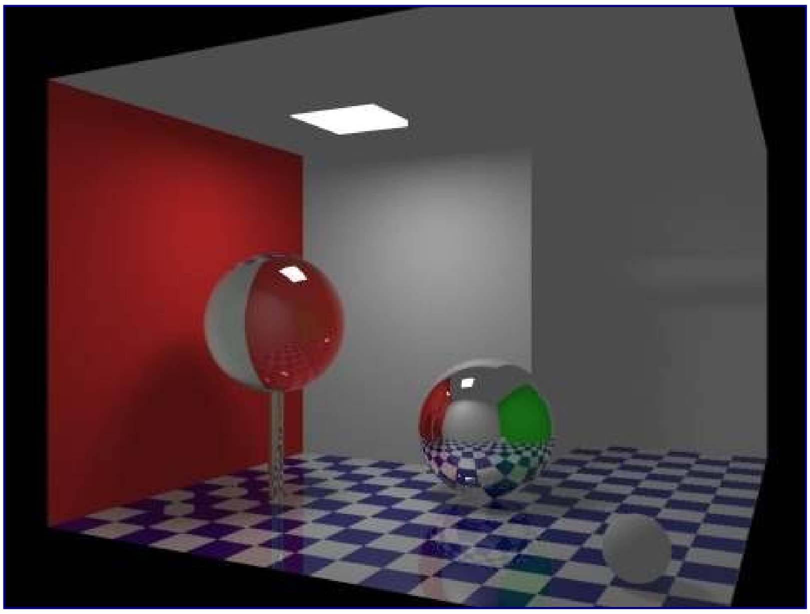
Ambient occlusion is a ray-tracing technique (at least with the *Raytrace* method), so it tends to be slow. Furthermore, performance severely depends on octree size, see the *rendering chapter* for more information.

Indirect Lighting

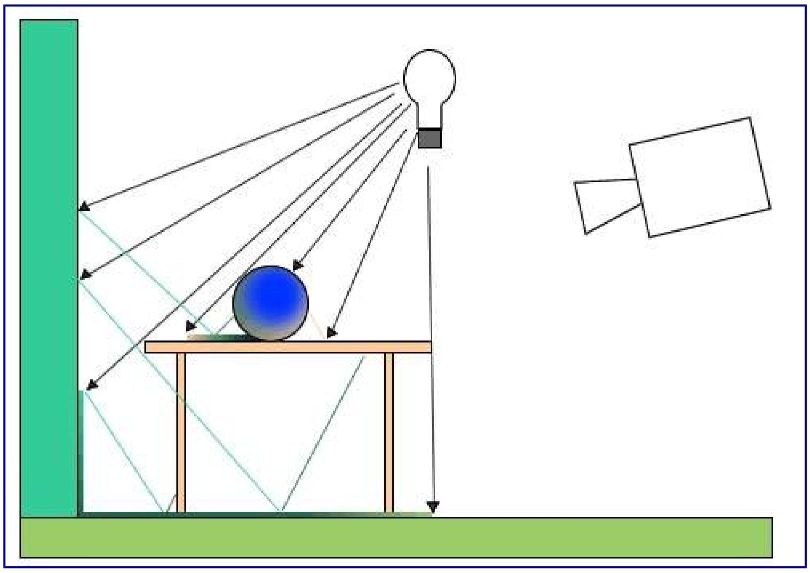
Indirect Lighting adds indirect light bouncing of surrounding objects. It’s modes the light that is reflected from other surfaces to the current surface. Is more comprehensive, more physically correct, and produces more realistic images. It is also more computationally expensive. Take a look at the following examples of a scene lit with Direct Lighting and both Direct+Indirect Lighting:



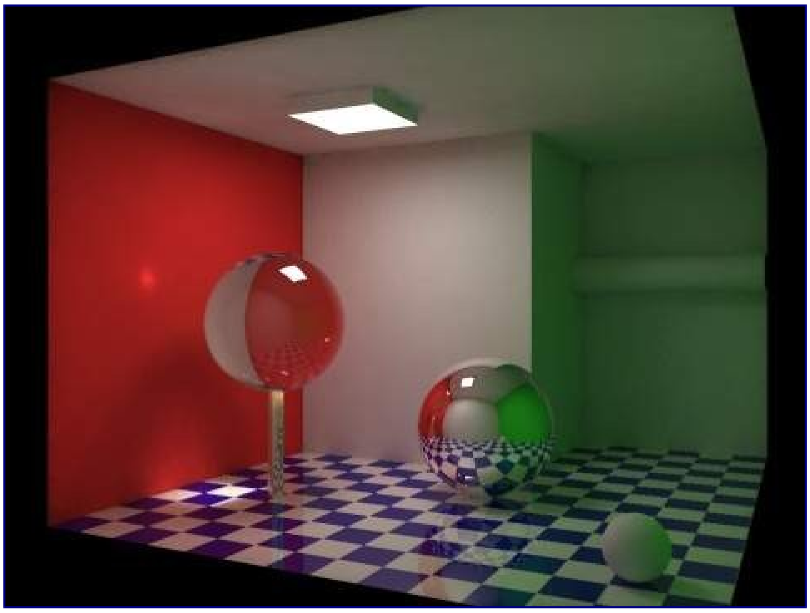
Direct Lighting Schematic.



Direct Lighting Render



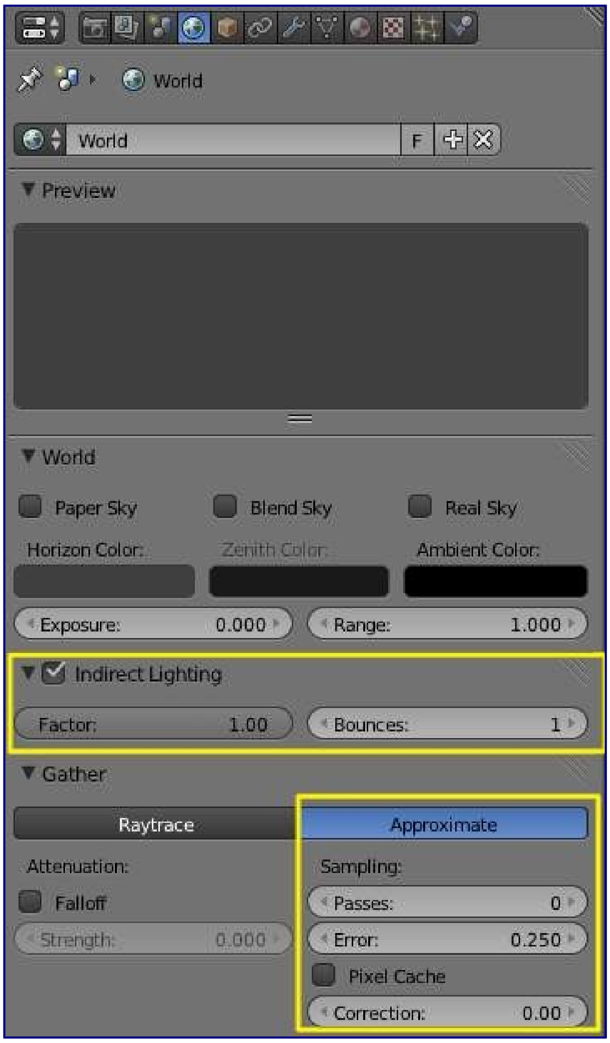
Direct+Indirect Lighting Schematic



Direct+Indirect Lighting Render

Images courtesy of rastermon.com

Indirect Lighting only works with Approximate gather method.



Indirect Lighting parameters.

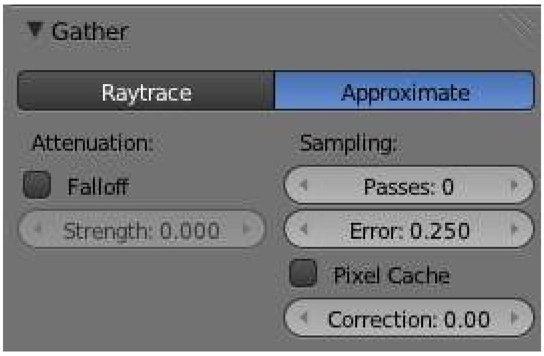
Options

The *Indirect Lighting* panel contains two options:

Factor
    Defines how much surrounding objects contribute to light.
Bounces
    Number of indirect diffuse light bounces.

The *Gather* panel contains settings for the indirect lighting quality. Note that these settings also apply to Environment Lighting and Ambient Occlusion.

Approximate



The Indirect Lighting panel, Approximate method.

The *Approximate* method gives a much smoother result for the same amount of render time, but as its name states, it is only an approximation of the *Raytrace* method, which implies it might produce some artifacts - and it cannot use the sky's texture as the base color

This method seems to tend to "over-occlude" the results. You have two complementary options to reduce this problem:

Passes
    Set the number of pre-processing passes, between `0` (no pre-processing) to `10`. Keeping the pre-processing passes high will increase render time but will also clear some artifacts and over-occlusions.
Error
    This is the tolerance factor for approximation error (i.e. the max allowed difference between approximated result and fully computed result). The lower, the slower the render, but the more accurate the results... Ranges between `0.0` and `10.0`, defaults to `0.250`.
Pixel Cache
    When enabled, it will keep values of computed pixels to interpolate it with its neighbors. This further speeds up the render, generally without visible loss in quality...
Correction
    A correction factor to reduce over-occlusion. Ranges between `0.0` (no correction) to `1.0`.

Exposure and Range

Reference
Mode: All modes Panel: *World* (*Shading* context, *World* sub-context)

Description

Exposure and *Range* are similar to the “Color Curves” tool in Gimp or Photoshop.

These controls affect the rendered image, and the results are baked into the render. For information on achieving similar affects with render controls, see *Color Management and Exposure*.

Previously Bforartists clipped color directly with `1.0` (or 255) when it exceeded the possible RGB space. This caused ugly banding and overblown highlights when light overflowed (*An overexposed teapot*).

Using an exponential correction formula, this now can be nicely corrected.

Options

Exposure and Range sliders.

Exposure
: The exponential curvature, with `0.0` being linear, and `1.0` being curved.

Range
: The range of input colors that are mapped to visible colors `(0.0 - 1.0)`.

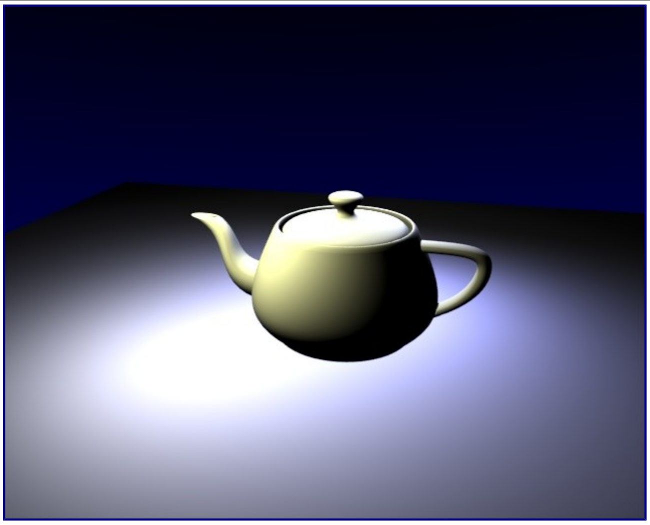
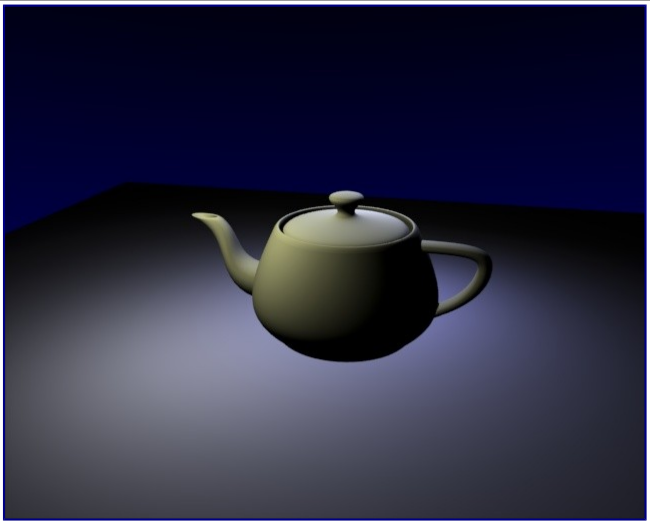
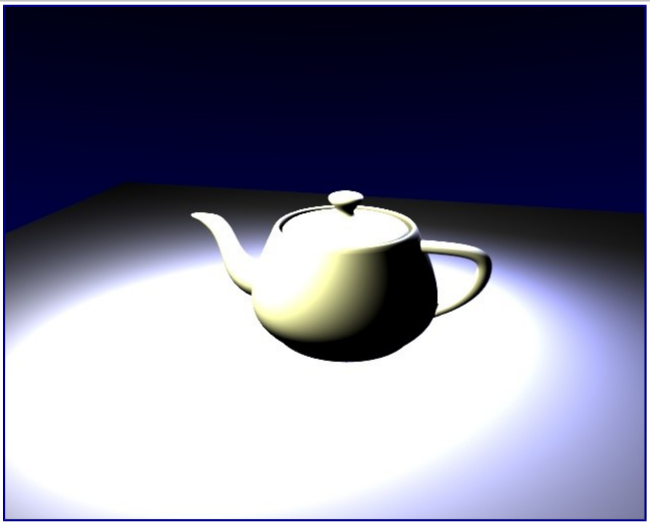
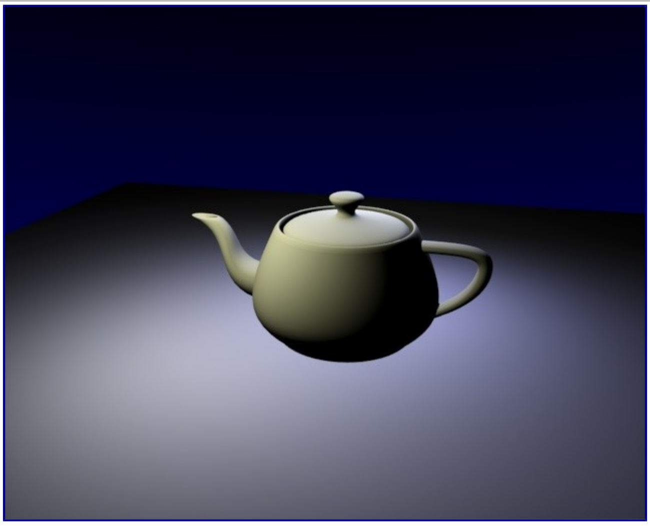
So without *Exposure* we will get a linear correction of all color values:

Range` > `1.0`
: the picture will become darker; with *Range* = `2.0`, a color value of `1.0` (the brightest by default) will be clipped to `0.5` (half bright) (*Range :* `2.0`).

Range` < `1.0`
: the picture will become brighter; with *Range* = `0.5`, a color value of `0.5` (half bright by default) will be clipped to `1.0` (the brightest) (*Range :* `0.5`).

Examples

With a linear correction every color value will get changed, which is probably not what we want. *Exposure* brightens the darker pixels, so that the darker parts of the image won’t be changed at all (*Range* : `2.0`, *Exposure* : `0.3`).

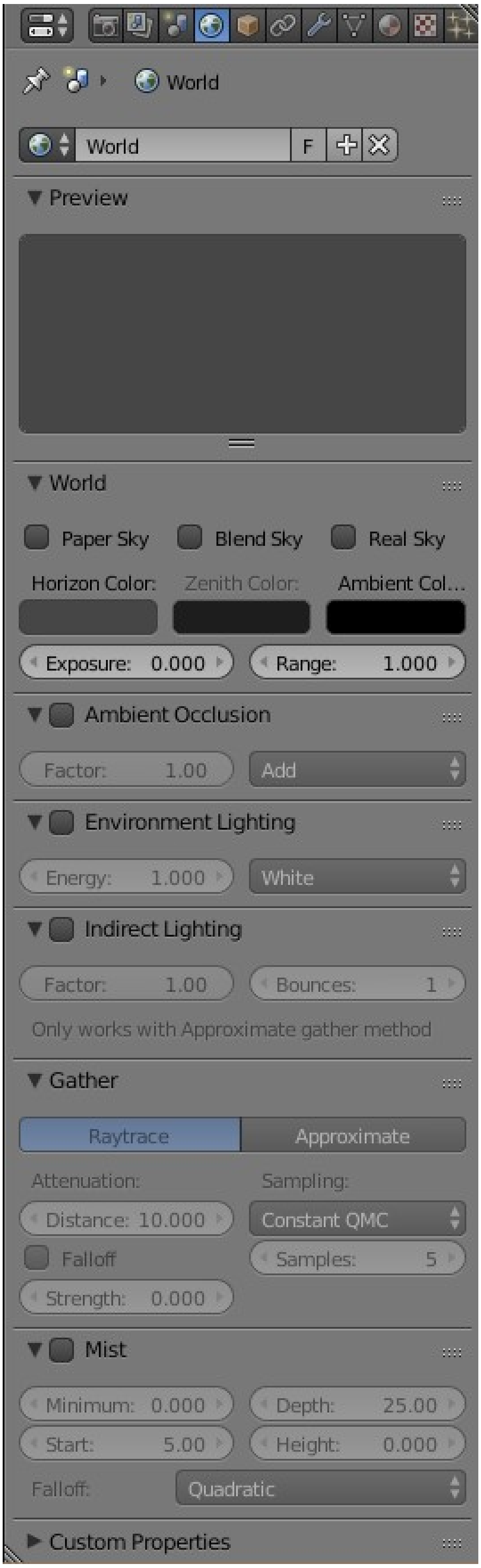
 An overexposed teapot.	 Range: 2.0.
 Range: 0.5.	 Range: 2.0, Exposure: 0.3.

Hints

Try to find the best *Range* value, so that overexposed parts are barely not too bright. Now turn up the *Exposure* value until the overall brightness of the image is satisfying. This is especially useful with area lamps.

10.2.4 Render - Blender Render Engine - World

Introduction



World Panel

Bforartists provides a number of very interesting settings to complete your renderings by adding a nice background, and some interesting ‘depth’ effects. These are accessible via the *World* context. By default a very plain uniform world is present. You can edit it or add a new World.

You have:

Background
The color and texture of the world background, with special settings for mapping coordinates.

Mist
Add a mist to your scene to enhance the feeling of depth.

While these world settings offers a simple way of adding effects to a scene, *compositing nodes* are often preferred, though more complex to master, for the additional control and options they offer. For example, filtering the Z value (distance from camera) or normals (direction of surfaces) through compositing nodes can further increase the depth and spacial clarity of a scene.

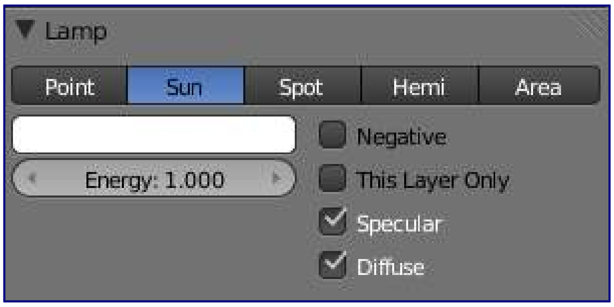
Note

Some of the settings under the World panel in Bforartists affect lighting so you find them under the *Lighting* chapter (see *Ambient Light*, *Exposure* and *Ambient Occlusion*). When using a *Sun Lamp* options for *Sky & Atmosphere* are available in the *Lamp* menu.

World

A *Sun* lamp provides light of constant intensity emitted in a single direction. A *Sun* lamp can be very handy for a uniform clear daylight open-space illumination. In the 3D view, the *Sun* light is represented by an encircled black dot with rays emitting from it, plus a dashed line indicating the direction of the light.

This direction can be changed by rotating the *Sun* lamp, like any other object, but because the light is emitted in a constant direction, the location of a *Sun* lamp does not affect the rendered result (unless you use the *"sky & atmosphere" option*).



Sun lamp panel

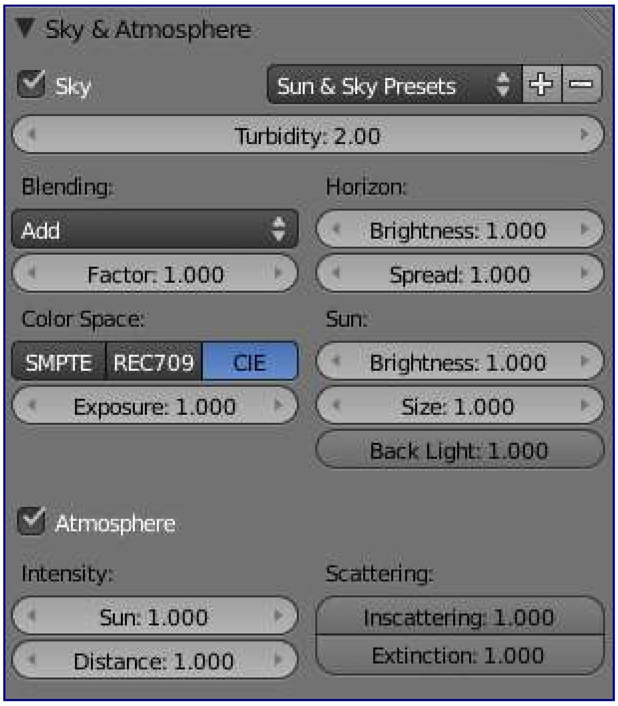
Lamp options

Energy and Color
These settings are common to most types of lamps, and are described in *Light Properties*.

Negative, This Layer Only, Specular, and Diffuse
These settings control what the lamp affects, as described in *What Light Affects*.

The *Sun* lamp has no light falloff settings: it always uses a constant attenuation (i.e. no attenuation!).

Sky & Atmosphere



Sky & Atmosphere panel

Various settings for the appearance of the sun in the sky, and the atmosphere through which it shines, are available. For details, see *Sky and Atmosphere*.

Shadow

Shadow panel

The *Sun* light source can only cast ray-traced shadows. It shares with other lamp types the same common shadowing options, described in *Shadows Properties*.

The ray-traced shadows settings of this lamp are shared with other lamps, and are described in *Raytraced Properties*.

World Background

Description

The world buttons let you set up the shading of your scene in general. It can provide ambient color, and special effects such as mist, but a very common use of a *World* is to shade a background color.

Note
Background Image in Render To use an image as your render background, see *BackBuf images specified in the Output Panel*

Note
Background Image in 3D To use an image as a background image in your 3D view, for example as a reference when doing a model, see *using a Background Image*

Options

World panel

Horizon Color
: The RGB color at the horizon

Zenith Color
: The RGB color at the zenith (overhead)

How these colors are interpreted depends on which kind of *Sky* is chosen.

None Enabled
: If none of these three buttons is checked, your background will just be plain flat color (using the horizon one).

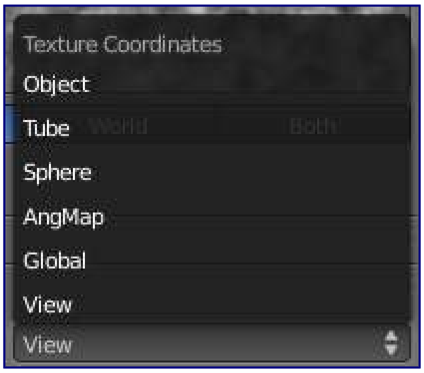
Paper Sky
: If this option is added, the gradient keeps its characteristics, but it is clipped in the image (it stays on a horizontal plane (parallel to x-y plane): what ever the angle of the camera may be, the horizon is always at the middle of the image).

Blend Sky
: The background color is blended from horizon to zenith. If only this button is pressed, the gradient runs from the bottom to the top of the rendered image regardless of the camera orientation.

Real Sky
: If this option is added, the gradient produced has two transitions, from nadir (same color as zenith) to horizon to zenith; the blending is also dependent on the camera orientation, which makes it more realistic. The horizon color is exactly at the horizon (on the x-y plane), and the zenith color is used for points vertically above and below the camera.

Textures

Instead of a color, or blend of two colors, Bforartists can use an 2D image which it maps to a very large Box or sphere which encompasses the entire scene, or which it maps to a virtual space around the scene.



Texture Coordinates pop-up menu

The World textures are accessible in the texture menu (just select *World* first, then *Texture*. They are used much like the Materials textures, except for a couple of differences. The textures can be mapped according to:

View
: The default orientation, aligned with the co-ordinates of the final render

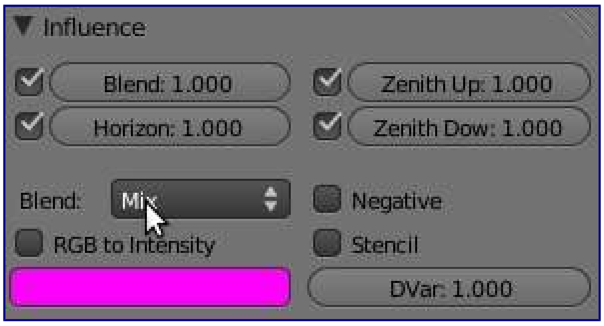
Global
: Uses global coordinates

AngMap
: Used to wrap a standard hemisphere angular map around the scene in a dome. This can be used for image based lighting with *Ambient Occlusion* set to sky color. You’ll generally need a high dynamic range image (HDRI) angular map. (It will look like a weird spherical image).

Sphere
: Sphere mapping, similar to that of materials

Tube
: Wrap the rectangular texture around in a cylinder, similar to that of materials

Object
: Position the texture relative to a specified object’s local texture space



Texture Influence panel

The texture affects color only, but in four different ways:

Blend
: Makes the Horizon color appear where the texture is non-zero

Horizon
: Affect the color of the horizon

Zenith Up

Affect the zenith color overhead

Zenith Down

Affect the zenith color underneath

If you are disappointed that your camera appears to carry the texture with it rather than rotate through the texture, you should check the Real Sky checkbox in the World tab of the Properties view.

Mist

Description

Mist can greatly enhance the illusion of depth in your rendering. To create mist, Bforartists makes objects farther away more transparent (decreasing their Alpha value) so that they mix more of the background color with the object color. With Mist enabled, the further the object is away from the camera the less it’s alpha value will be.

Option

Mist panel

Mist check box

Toggles mist on and off

Minimum

An overall minimum intensity, or strength, of the mist.

Start

The distance from the camera at which the mist starts to fade in

Depth

The distance from *Start* of the mist, that it fades in over. Objects further from the camera than *Start+Depth* are completely hidden by the mist.

Height

Makes the mist intensity decrease with height, for a more realistic effect. If greater than 0, it sets, in Bforartists units, an interval around z=0 in which the mist goes from maximum intensity (below) to zero (above).

Falloff

The decay rate of the mist (*Quadratic* / *Linear* / *Inverse Quadratic*). These settings control the rate of change of the mist’s strength further and further into the distance.

Note

Mist distances

To visualize the mist distances in the 3D View, select your camera, go to the camera menu, and enable *Show*

Mist.

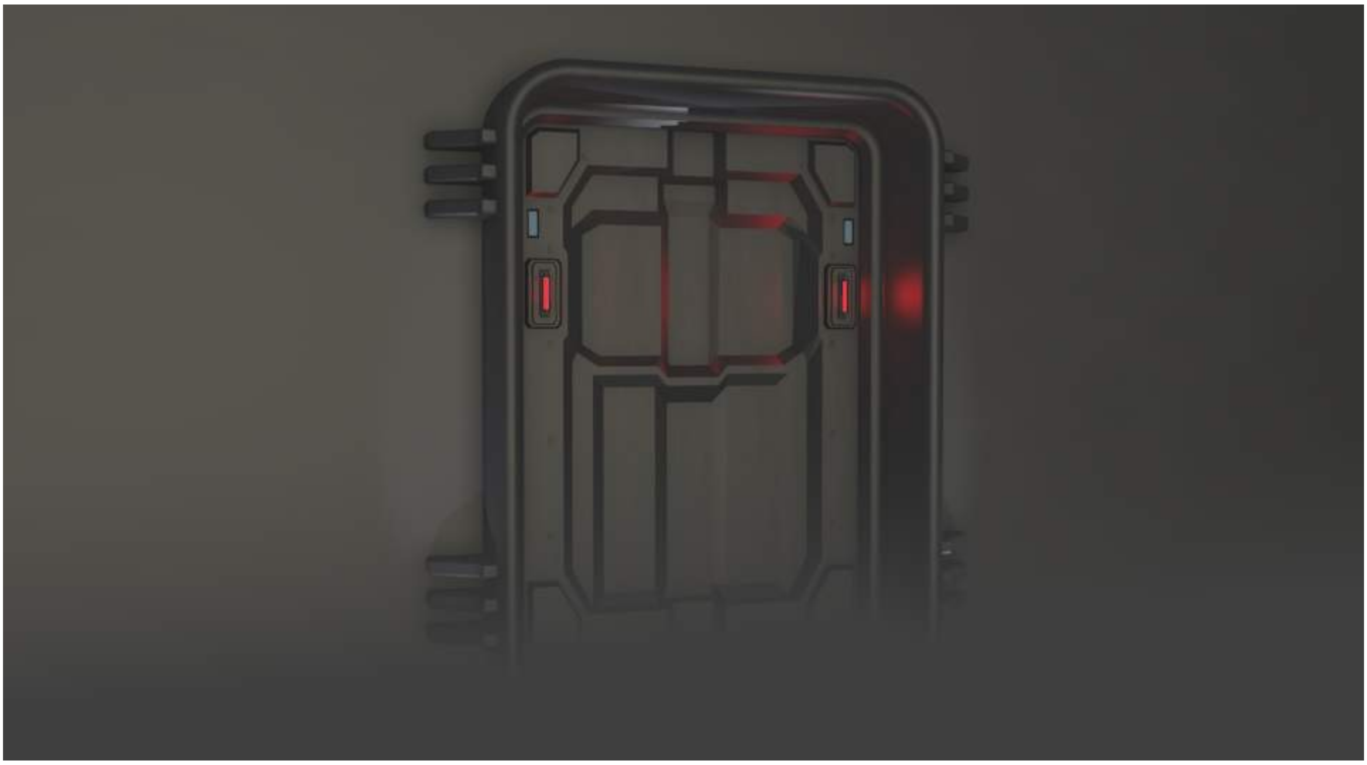
The camera will show mist limits as a line projecting from the camera starting from *Start* and of distance *Depth*.

To get a better view to evaluate the *Mist* visualization, `Shift-Numpad1` with the camera selected (`Numpad5` to toggle perspective view on and off). This will place the 3D view right over the camera looking down.

Transparency

Because *Mist* works by adjusting transparency, this can sometimes cause objects to be partially transparent when they shouldn't be. One workaround is to set the Mist settings as desired, but turn Mist off. The Mist data is still available for compositing even though it is off. Use *Do Composite* and the *Node Editor* to feed the Mist pass to an *AlphaOver* to blend the background color (or a render layer with just the sky) with the rendered image. This produces the mist effect but since Mist is off the object transparency (or lack of) is preserved.

Examples



Mist example

In this example the *Mist Height* options has been limited to create smoke covering the floor.

This simple scene was inspired by Stefan Morell's Arc Sci-Fi Corridor.

10.2.5 Render - Blender Render Engine - Render Layers

Render Layers

This section covers only the Render Layer settings appropriate for the Bforartists Render engine. For the engine-independent settings, see *this section*.

Light Override

Enter the name of a light group, and the scene will be lit with only those lights.

Examples of where this might be used:

- Using multiple Render Layers with different light group overrides can allow you to tweak light intensity and color in the compositor (avoiding re-renders).
- Speed up a draft render by using only a few lights instead of all of them.

Include Options

Each render layer has its own set of features which can be enabled/disabled to save time and give you control when working with passes:

Zmask

Only render what’s in front of the solid Z values.

Negate
Only render what’s Behind the solid Z values.

All Z
Z-values are computed for everything in view, not just those things that are rendered. When disabled, objects not included in the render have no (“infinite”) z value.

Solid
Solid faces are rendered. All normal meshes are solid faced.

Halo
Halo materials are rendered.

ZTransp
Transparency may be Z-based or Ray-traced. If Z-based, enabling *Ztra* renders transparent areas with the z-value of what is behind the transparent area.

Sky
Turning on Sky renders the sky, as defined in your material world settings. Otherwise, a black alpha transparent background is rendered.

Edge
If Edge is enable in the Output panel, objects in this Render Layer are given an outline edge. Turning on Edge pulls in the Edge settings from the Output tab, and adds an outline to the objects. Edges also have to be enabled on the Output tab.

Strand
Strands are strings of static particles that are colored as part of the material settings; they look like strands

of hair or grass.

Freestyle

Render the Freestyle strokes on this layer.

10.2.6 Render - Blender Render Engine - Render Passes

Render Passes

Render Passes are necessary because of the different things the Bforartists Render Engine must calculate to give you the final image. In each ‘pass’ the engine calculates different interactions between objects.

Render Passes In Detail

Everything you see in a render must be calculated for the final image. All interactions between objects in your scene, lighting, cameras, background images, world settings, etc., must all be separately calculated in different passes for different reasons, such as calculating shadows.

In a render, every pixel has been calculated several times to make sure it will show the right color for the right part of the image. Various things that are calculated in a standard render include:

- *Where are* **shadows** *cast?*
- *How is* **ambient** *light in the environment blocked (* **occluded** *) by objects in the scene?*
- *How is light* **reflected** *off mirrored surfaces?* Like shadows, lines are calculated, except this time they come from the camera and bounce off mirrored surfaces, so that when these lines hit an object, the engine calculates that this is what the camera should see.
- ***How is light bent (*** **refracted** ***) as is passes through transparent objects?***

  Does it go straight through? Does it bend? If so, at what depth in the object?
- *What designated* **objects** *are in the scene, and what is their outline?* Should the object appear blurred, or should it appear in sharp focus?
- ***How fast is something moving (*** **velocity** ***)?***

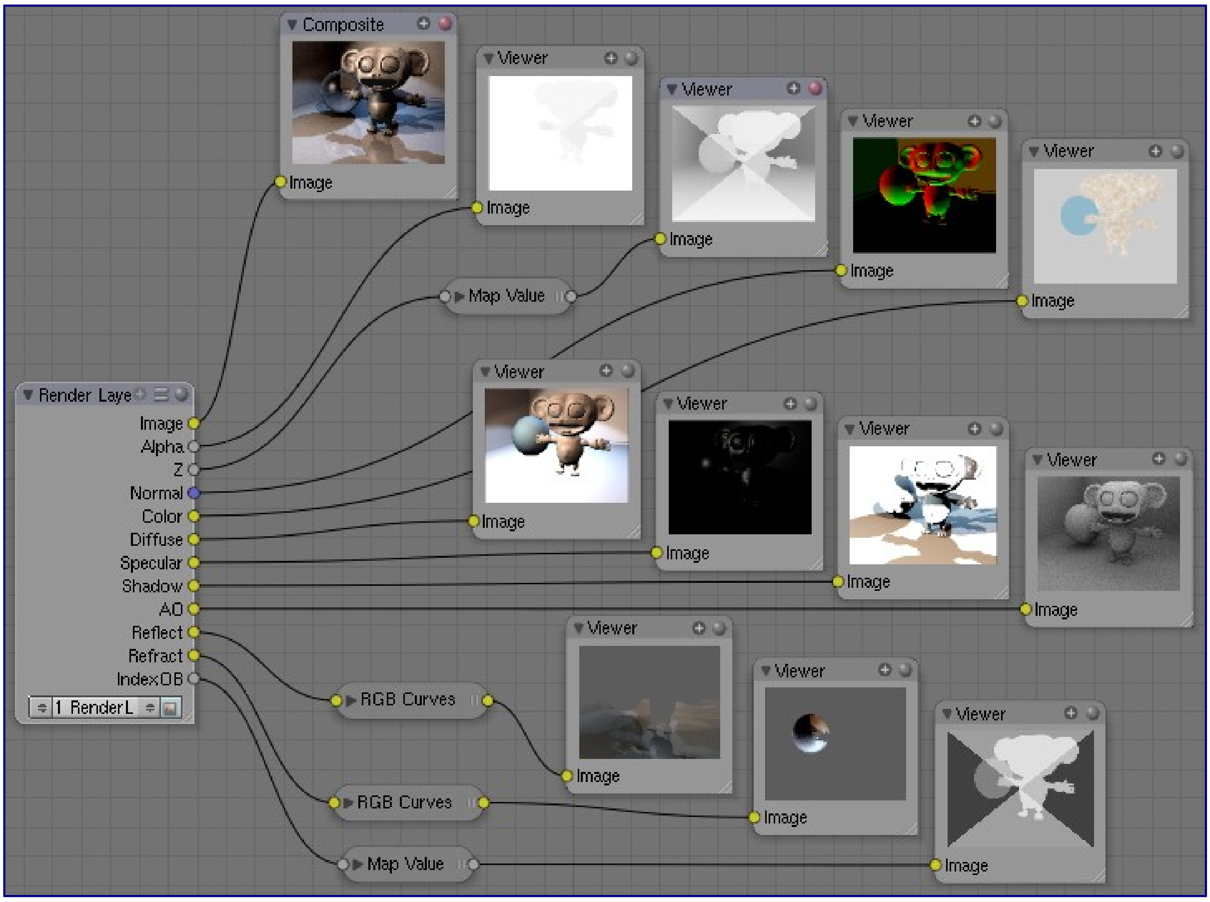
  Should it appear blurred given our frame rate or is it slow enough to still be focused on properly?
- ***How far away from the camera are objects’ surfaces (*** **Z-depth** ***)?***

  Can the object’s surfaces be seen at all, or are they being blocked by another object’s geometry?
- ***Does an object have a*** **normal** ***vector (bumpmap)?***

Do shadows and apparent geometry need to be calculated for any objects?

- *Is there any* **specularity** *?* Are objects with textures such as metal shiny at all?

The answer to each of the above questions is an image or map, as shown below:

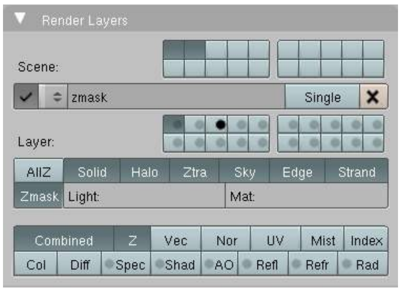


Each Render Pass puts out an image or a map. For the purposes of this example, a Render Layer was defined to produce all possible outputs. When a Render Layer input-node was added to the node diagram and the Render Layer input-node was subsequently associated with the Render Layer, all of the layer’s outputs appeared as connection points on the right-hand (output) side of the node.

Render Passes that produce Images can be directly viewed in a viewer, or, if they are the only pass that is rendered, saved as the render image. If the pass is enabled, it can be saved in a multilayer OpenEXR format.

If the Render Pass output is not an image but is a map, it needs to be translated into something that we can see. For example, the Z-depth map is an array of values that specifies how far away from the camera each pixel is; values range between +/-3,000,000 Bforartists Units or so. The intermediate node you see above, between the Render Layer output socket and the Viewer node input socket (such as Map Value) does this translation or scaling. You must use that specific kind of translation node to get good results if you intend on operating on that map as an image. You must then, after making any adjustments, run the map back through that node to re-scale it back to the original before saving.

Selecting Render Passes



Render Passes are the various distinct outputs that the renderer is able to generate. All of the following render outputs are normally combined into a single output known, appropriately enough, as the **Combined** output. But you can also select any of them to be output as a separate pass. (If you do so, in most cases you can choose whether to *also* continue to include it in the Combined output.)

Some of these outputs must be enabled and used within your scene (and not just selected in the Render Layer panel) in order to show anything. For example, if you do not have any lights in your scene, or those lights have been set to not cast shadows, or objects in the limelight do not have materials which have been set to receive shadows, the **Shadow** pass will be blank; there's simply nothing to show you. If you have not enabled *Ambient Occlusion* in your World environment settings, the **AO** pass will be blank, even if you select it here.

To save time and disk space, you have to tell Bforartists each of the passes to render in the Render Layers panel (which we first introduced on *the previous page*):

Combined

This renders everything in the image, even if it's not necessary. ("The whole enchilada," so to speak.) This is all the options below, blended into a single output, *except* those options which you've indicated should be omitted from this pass, as indicated with the camera button.

Z

The Z-depth map; how far away each pixel is from the camera. Used for Depth-Of-Field (DOF). The depth map is inverse linear *(1/distance)* from the camera clip start.

Vector

The direction and speed things are moving. Used with Vector Blur.

Normal

Calculates lighting and apparent geometry for a bumpmap (an image which is used to fake detail on an object) or for changing the apparent direction of light falling on an object.

UV

Allows texturing after rendering. See UV node.

Mist

Deliver Mist factor pass.

Object Index

Masks selected objects. See MaskObj node.

Color

The color of materials without shading.

Diffuse

The diffuse shading of materials.

Specular

Specular highlights.

Shadow

Shadows cast. Make sure shadows are cast by your lights (positive or negative), and received by materials. To use this pass, mix multiply it with the Diffuse pass.

Emit
Emission pass.

AO
Ambient Occlusion. Make sure it's turned on in your environment and that RayTracing is enabled.

Environment
Environment lighting.

Indirect
Indirect lighting pass.

Reflection
Reflection off mirrors and other reflective surfaces (highly waxed white floors, for example). Mix Add this pass to Diffuse to use it.

Refraction
Refraction of colors through transparent meshes. Mix Add this pass to the Diffuse pass to use it.

When you enable a pass, the appropriate socket on the Render Layers node shows up like magic, and can be used as shown in the example above.

Excluding Render Passes

As we said, the **Combined** output is an amalgam of several outputs which are *also* available separately. When you select one of these outputs, they will be provided separately *and also* included in the Combined pass.

When you enable the Camera icon that is beside several of the pass options, the particular pass will be excluded from the combined pass. They will be made available separately *but not* included in the combined pass.

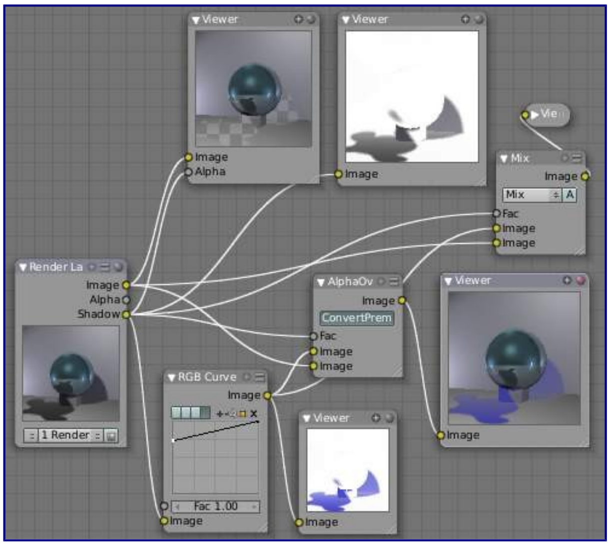
Using Render Passes

The primary purpose of Render Passes is to enable you to process the various outputs in different ways, by constructing networks of render nodes. You can achieve many special effects, and economize considerably on the render times of complicated scenes, by creative and effective use of this facility. We'll show you a few examples of this in just a moment.

Quite a bit of information about the typical uses for some of the passes is discussed elsewhere:

- Image: Since this is the main product, all of Bforartists uses it.
- Alpha: See the *AlphaOver* node and all of the *Matte* nodes.
- Z: See the *Defocus* node.
- Vec: See the *Vector Blur* node.
- Normal: See the *Normal* node.

Recoloring Shadows



Let’s run the Shadow buffer through a colorization noodle, then recombine it; all your shadows will be artificially colored. Lots of threads in this noodle are shown to the right, so let’s walk through it. On the left is the Render Layer input node: it refers to one of the Render Layers that we have defined for our scene. In the scene, we have a reflective ball on a pedestal standing in front of a backdrop. Everything (except the ball) is gray. We use a standard four-light rig: backfill placed high, two sidefills at ground level, and a key light above and to the left of camera. Suzanne, a monkey-shaped geometry, is standing in front of the key light, so her shadow is cast into the scene on the floor. The ball casts shadows onto the backdrop and floor.

The output channels of the Render Layer node are determined by which buttons we selected when defining our Render Layer. The top two viewers show you the image output using the Shadow as the Alpha channel, and the node next to it just the Shadow channel. Where the Shadow is dark, the image in the left viewer is transparent. We have used the Shadow to cut out parts of the image.

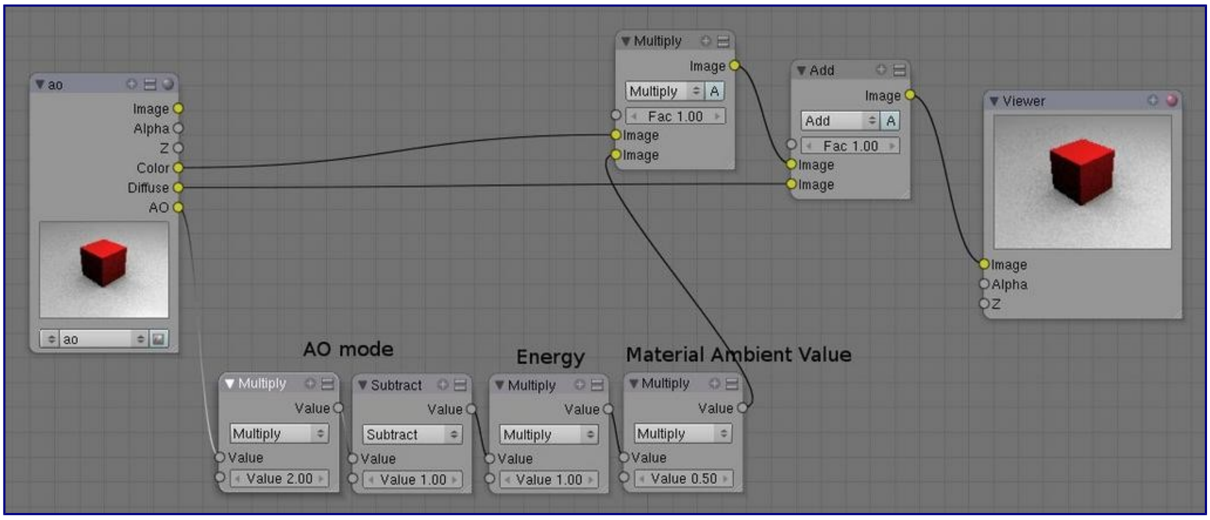
We then take the shadow through an RGB Curve, which is set to magnify just the Blue by 75%; so a gray shadow of (R:40, G:40, B:40) becomes (R:40, G:40, B:40x1.75=70). That blue-tinged shadow is shown in the bottom viewer. Now we have two options: AlphaOver and Mix. For either option:

- Use the Shadow map as a Factor.
- Feed the Blue Shadow to the Top Socket.
- Feed the core or base image to the Bottom Socket.

The resulting image is the same in either case; a blue shadow. Note that Suzanne’s reflection is not blue; there’s a different Render Pass for that.

You could just as easily swap in another image entirely; for example, the shadow map from another render layer. You can even take an image from another project entirely and use that instead (using the Image Input node), to get a different effect. (For example, an effect similar to a *Star Wars Episode One* movie poster, where Anakin Skywalker already casts the shadow of Darth Vader.)

Compositing Ambient Occlusion



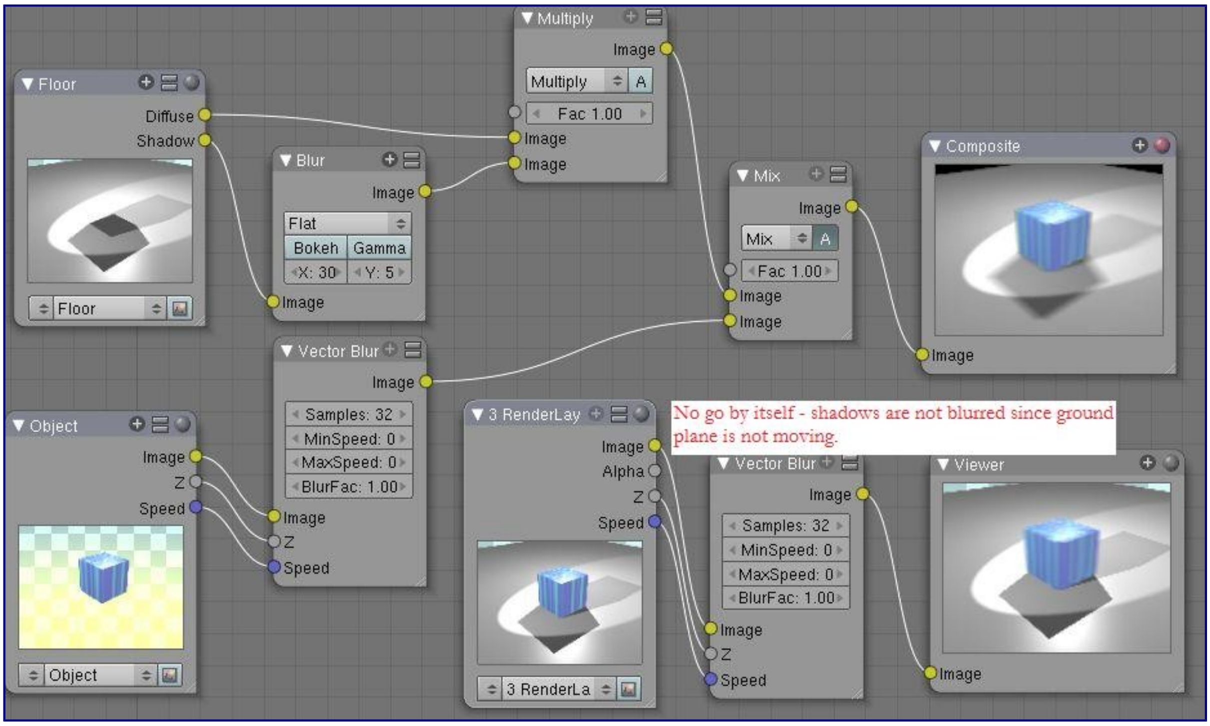
AO is a geometry-based dirt shader, making corners darker. It is separately enabled in the World settings and computed as a separate pass. When enabled, it has one of three Modes (*Add*, *Subtract*, *Both*), and variable *Energy* level (which changes the intensity of the shading). The third variable is the amount of Ambient light that the material receives. If it does not receive any, then ambient occlusion does not affect it. Based on these variables, Bforartists computes an AO pass. If you call it out as a separate pass and wish to composite it back into your image, you will need to enable the Color and Diffuse pass as well.

To configure your noodle, consider the example image above.

- First, depending on the AO mode do one of the following: If AO mode is Add: directly use the AO pass. If AO mode is Sub: Calculate AO - 1, or if AO mode is Both: Calculate 2*AO - 1.
- Multiply the output of Step 1 with the AO energy level.
- Multiply the output of Step 2 with the material's ambience value. If you have materials which receive different ambience light levels (0.5 is the default), one would have to create an ambience map based on Object ID.
- Multiply the output of Step 3 with the color pass.
- Add the output of Step 4 to the diffuse pass.

If shadows, colored ambient light, specularity, reflections, and/or refractions are involved they have to be added to the diffuse pass before adding the converted AO pass.

Vector Blurring Shadows



When using Vector Blur instead of Motion Blur, objects in motion are blurred, but objects at rest (with respect to the camera) are not blurred. The crossover is the shadow of the object in motion. Above, we have a cube in motion across a ground plane. If we just ran the combined pass through Vector Blur, you can see the result in the lower right-hand corner; the box is blurred, but its shadow is sharply in focus, and thus the image does not look realistic.

Therefore, we need to separate out the diffuse and shadow passes from the floor by creating a “Floor” render layer. That render layer has Diffuse and Shadow passes enabled, and only renders the floor object (layer 2). Another render layer (“Cube”) renders the Z and Vector passes, and only renders the cube (on layer 1). Using the Blur node, we blur the shadow pass, and then combine the diffuse and blurred shadow by multiplying them together in a Mix Multiply node; we then have a blurred shadow on a crisp ground plane. We can then mix the vector-blurred object to provide a realistic-looking image.

Conclusion

Render Passes can be manipulated to give you almost complete control over your final image. Causing objects to cast shadows that aren’t really their shadows, making objects appear out of focus or sharply in focus like a real camera, manipulating colors just for final post-processing or just reconfiguring your render passes to save render time, are all things which you might wish to manipulate the render engine for.

10.2.7 Render - Blender Render Engine - Motion Blur

Motion Blur

Bforartists's animations are by default rendered as a sequence of *perfectly still* images. While great for stop-motion and time-lapses, this is unrealistic, since fast-moving objects do appear to be blurred in the direction of motion, both in a movie frame and in a photograph from a real-world camera.

Bforartists has two ways to achieve motion blur:

Sampled Motion Blur

Bforartists can be made to render the current frame and some more ‘virtual’ frames in between it and the next frame, then merge them all together to obtain an image where moving objects are ‘blurred’.

This method is slow, but produces good results. It can be activated in the *Sampled Motion Blur* panel of the render settings. This kind of motion blur is done during the render.

Motion Samples
: Set the number of samples to take for each frame. The higher the samples, the smoother the blur effect, but the longer the render, as each virtual intermediate frame has to be rendered.

Shutter
: Time (in frames) the shutter is open. If you are rendering at 24 fps, and the Shutter is set to 0.5, the time in between frames is 41.67 ms, so the shutter is open for half that, 20.83 ms.

Note

Samples are taken only from the *next* frame, not the previous one. Therefore the blurred object will appear to be slightly ahead of how it would look without motion blur.

Vector Blur

Vector Blur is faster but sometimes has unwanted side-effects which are sometimes difficult to avoid.

Vector blur is a process done in compositing (post-render time), by rendering the scene without any blur, plus a pass that has movement information for each pixel. This information is a vector map which describes a 2d or 3d direction and magnitude. The compositor uses that data to blur each pixel in the given direction.

Examples

To better grasp the concept, let’s assume that we have a cube 2 units wide, uniformly moving 1 unit to the right at each frame.

Image 1 shows a render of frame 1 without Motion Blur; *Image 2* shows a render of frame 2. The scale beneath the cube helps in appreciating the movement of 1 Bforartists unit.

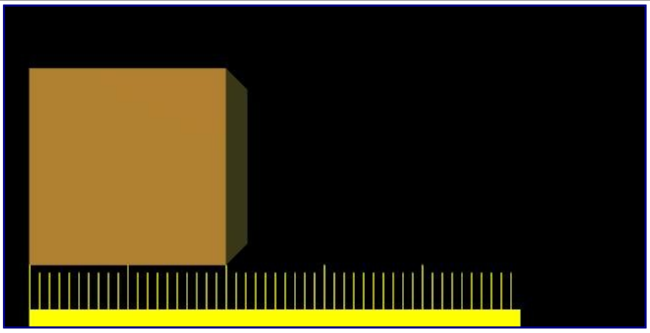


Image 1. Frame 1 of moving cube without Motion Blur.

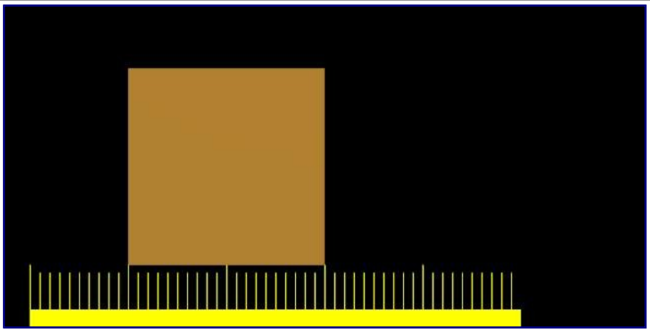


Image 2. Frame 2 of moving cube without Motion Blur.

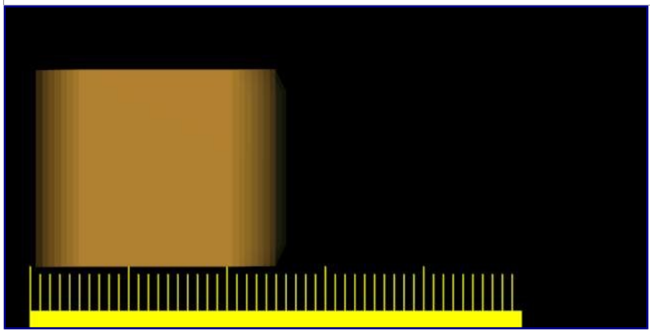
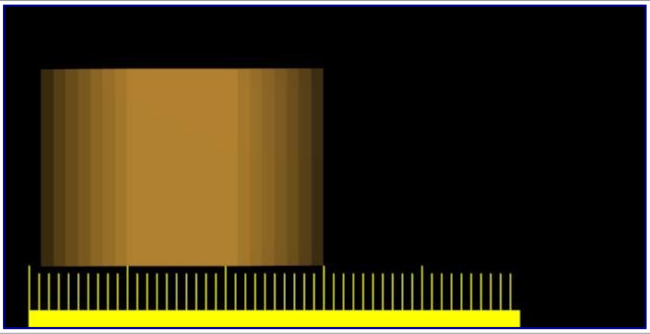
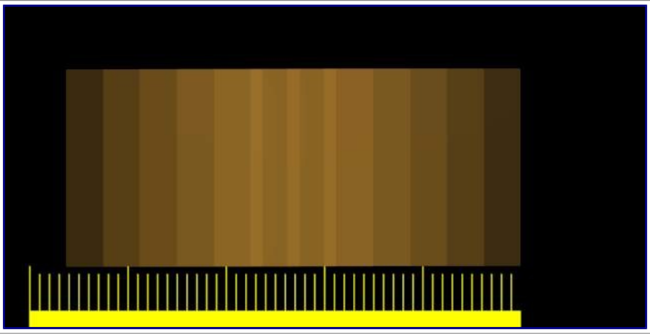


Image 3 shows the rendering of frame 1 when Sampled Motion Blur is enabled and 8 ‘intermediate’ frames are computed. *Shutter* is set to 0.5 - thus the image 8 samples are rendered between frame 1 and halfway to frame 2.

Image 4 and *Image 5* show the effect of increasing shutter values. A value greater than 1 is physically impossible in a real-world camera, but can be used to exaggerate the effect.





Better results than those shown can be obtained by using higher samples than 8, but, of course, since as many *separate* renders as samples are needed, a Motion Blur render takes that many times more time than a non-Motion Blur one.

Hints

Sampled Motion Blur can be used as an additional form of *Anti-Aliasing*, since aliasing artifacts are computed differently for each sample and averaged together at the end.

10.2.8 Render - Blender Render Engine - Anti-Aliasing

Anti-Aliasing

A computer generated image is made up of pixels; each pixel can of course only be a single color. In the rendering process the rendering engine must therefore assign a single color to each pixel on the basis of what object is shown in that pixel. This often leads to poor results, especially at sharp boundaries, or where thin lines are present, and it is particularly evident for oblique lines.

To overcome this problem, which is known as *Aliasing*, it is possible to resort to an Anti-Aliasing technique. Basically, each pixel is ‘oversampled’, by rendering it as if it were 5 pixels or more, and assigning an ‘average’ color to the rendered pixel.

The buttons to control Anti-Aliasing, or OverSampling (OSA), are below the rendering button in the *Render* Panel (*Render Panel.*).

Options

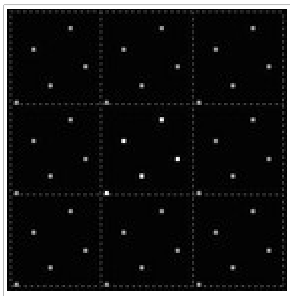
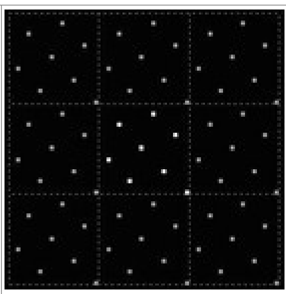
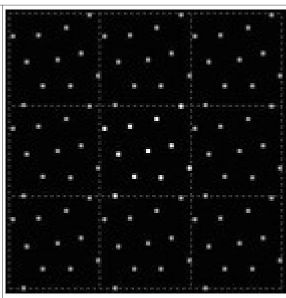
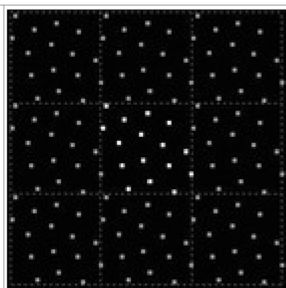
Anti-Aliasing (check box)
Enables oversampling

5 / 8 / 11 / 16
The number of samples to use. The values 5, 8, 11, 16 are preset numbers in specific sample patterns; a higher value produces better edges, but slows down the rendering.

By default, we use in Bforartists a fixed “Distributed Jitter” table. The samples within a pixel are distributed and jittered in a way that guarantees two characteristics:

- Each sample has equal distances to its neighbor samples
- The samples cover all sub-pixel positions equally, both horizontally and vertically

The images below show Bforartists sample patterns for 5, 8, 11 and 16 samples. To show that the distribution is equalized over multiple pixels, the neighbor pixel patterns were drawn as well. Note that each pixel has an identical pattern.

5 samples	8 samples	11 samples	16 samples

Full Sample
: For every anti-aliasing sample, save the entire Render Layer results. This solves anti-aliasing issues with compositing.

Filtering

When the samples have been rendered, we’ve got color and alpha information available per sample. It then is important to define how much each sample contributes to a pixel.

The simplest method is to average all samples and make that the pixel color. This is called using a “Box Filter”. The disadvantage of this method is that it doesn’t take into account that some samples are very close to the edge of a pixel, and therefore could influence the color of the neighbor pixel(s) as well.

Filter menu: Set The filter type to use to ‘average’ the samples:

Box

A low-quality box-shaped curve

> **Note**
>
> This filter is relatively low quality. you can see that only the samples within the pixel itself are added to the pixel’s color. For the other filters, the formula ensures that a certain amount of the sample color gets distributed over the other pixels as well.

Tent
: A simplistic filter that gives sharp results

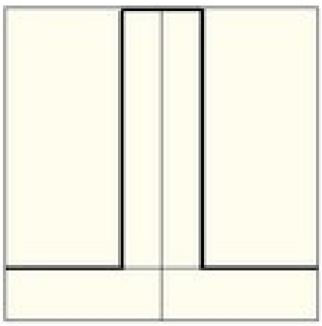
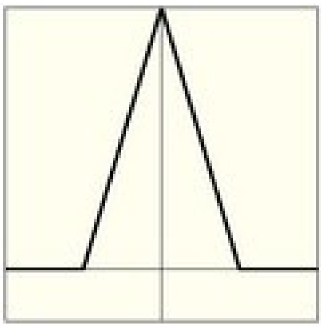
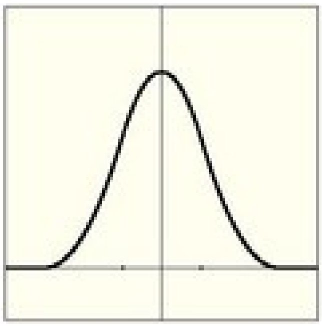
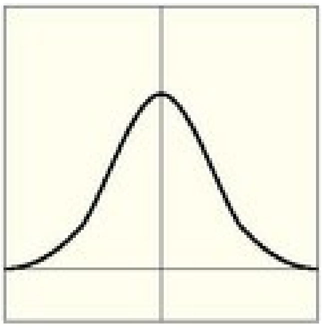
Quadratic
: A Quadratic curve

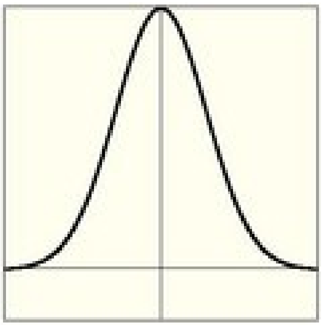
Cubic
: A Cubic curve

Gauss
: Gaussian distribution, the most blurry

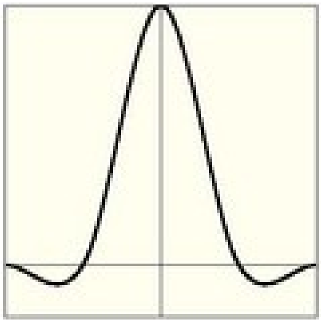
Catmull-Rom
: Catmull-Rom filter, gives the most sharpening

Mitchell-Netravali
: a good all-around filter that gives reasonable sharpness

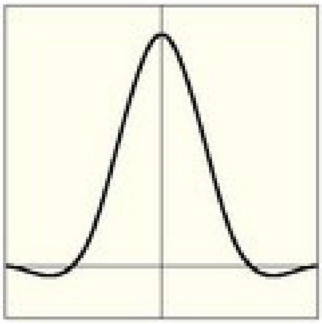
			
Box	Tent	Quadratic	Cubic



Gaussian



Catmull-Rom

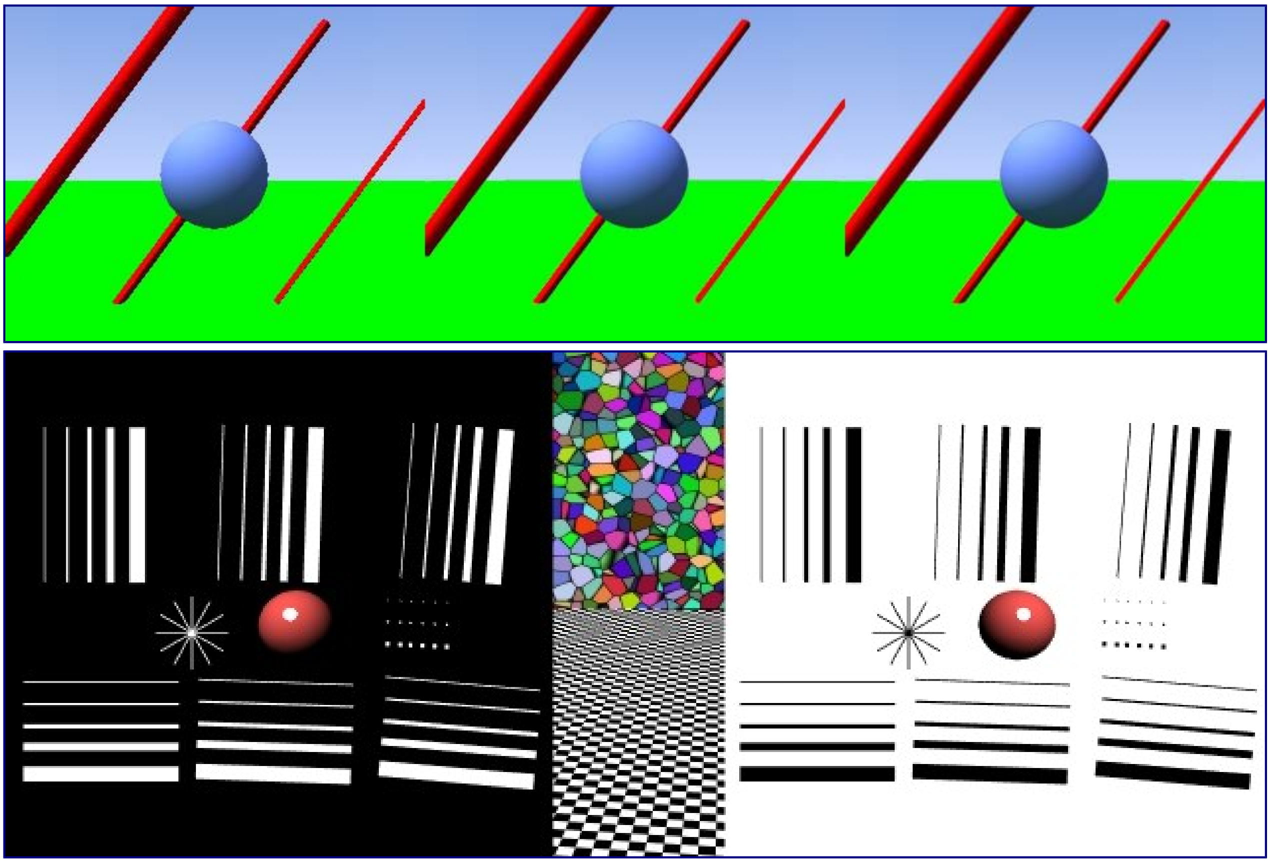


Mitchell-Netravali

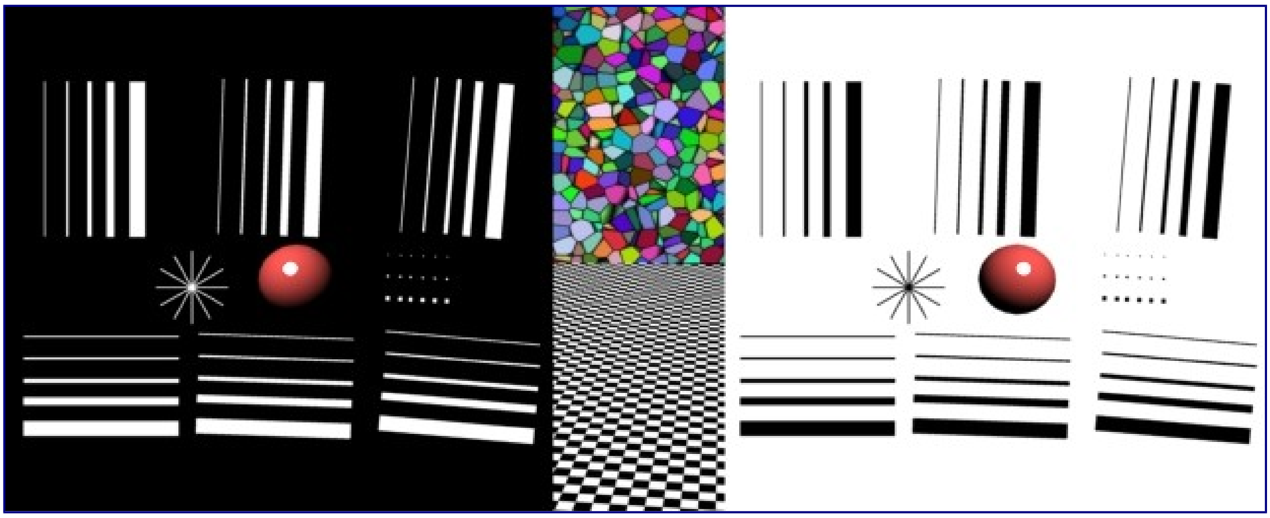
Filter Size

Making the filter size value smaller will squeeze the samples more into the center, and blur the image more. A larger filter size makes the result sharper. Notice that the last two filters also have a negative part; this will give an extra sharpening result.

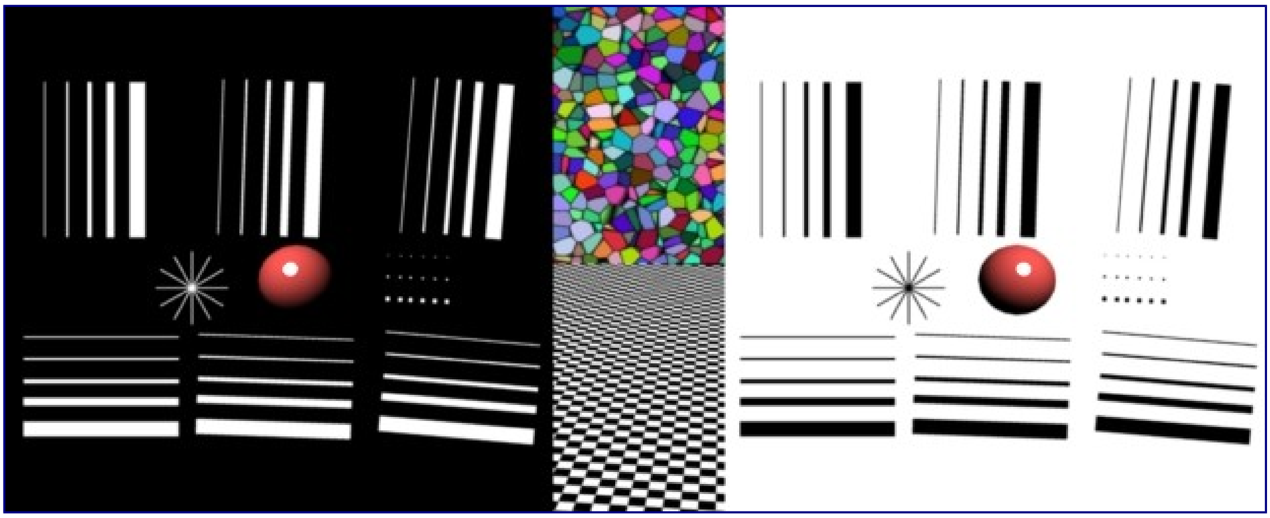
Examples



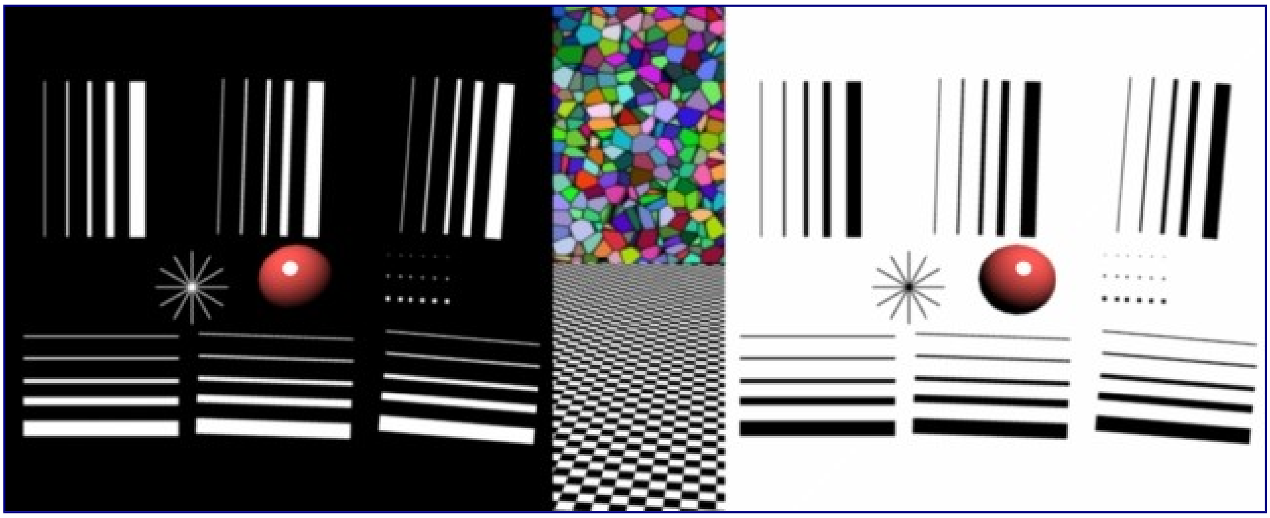
AA 8, Box filter



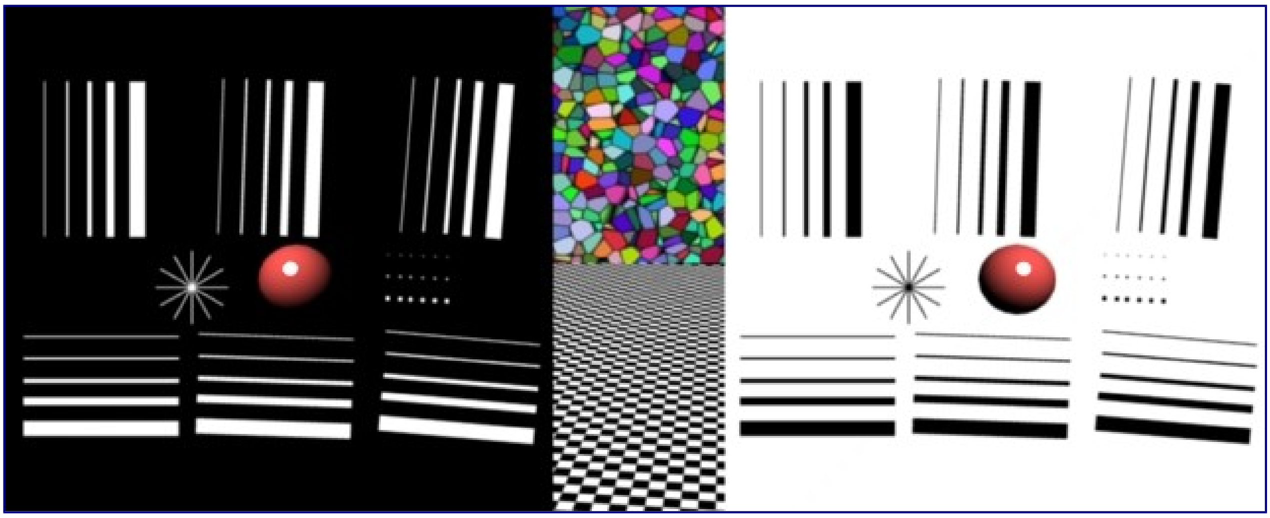
AA 8, Tent filter



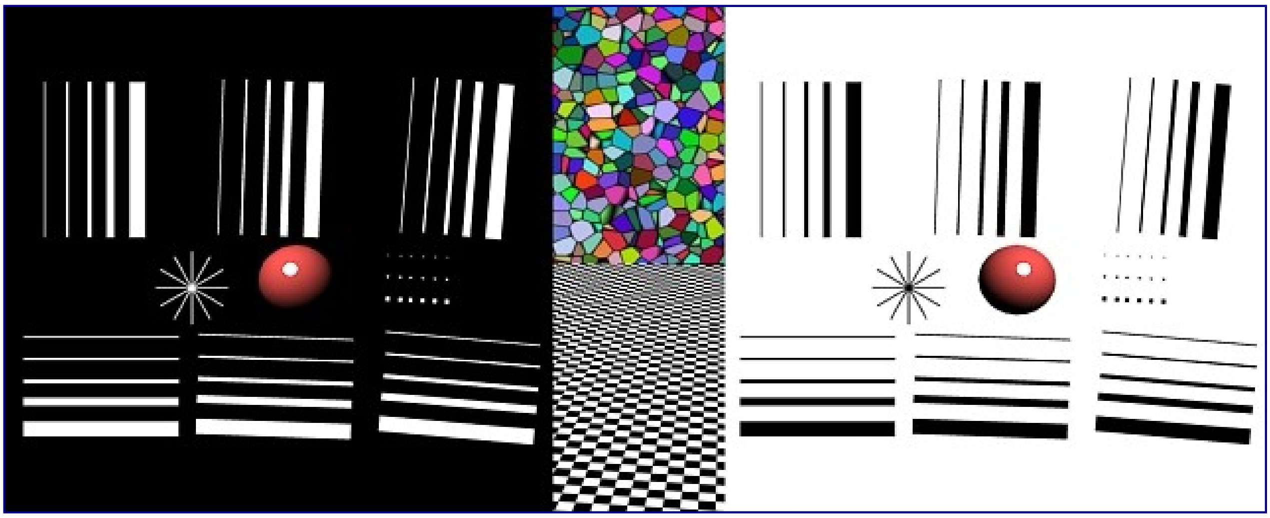
AA 8, Quadratic filter



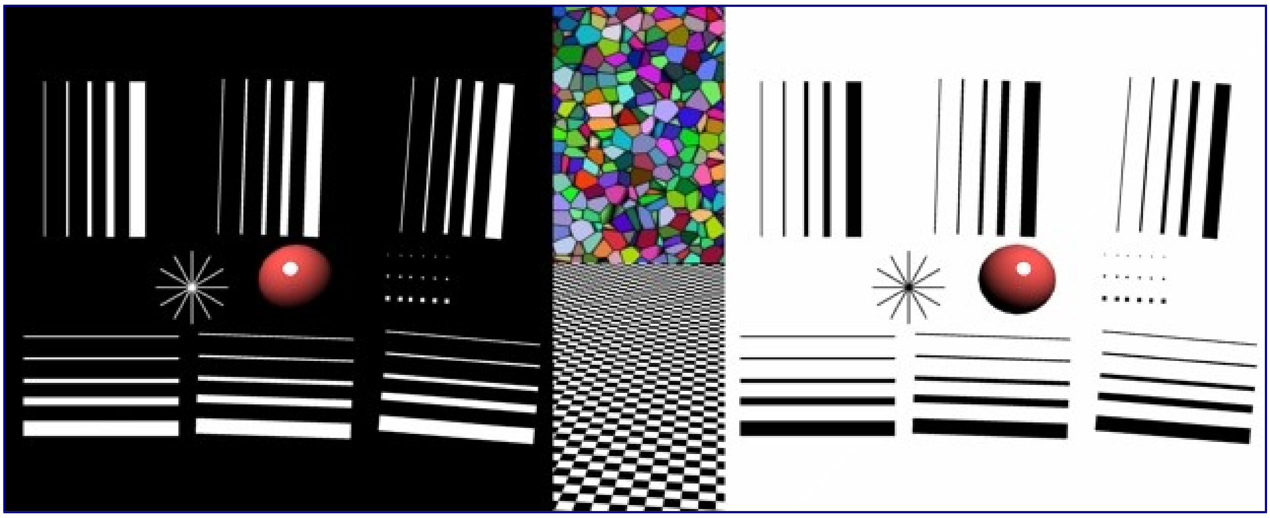
AA 8, Cubic filter



AA 8, Gaussian filter



AA 8, Catmull-Rom filter



AA 8, Mitchell-Netravali filter

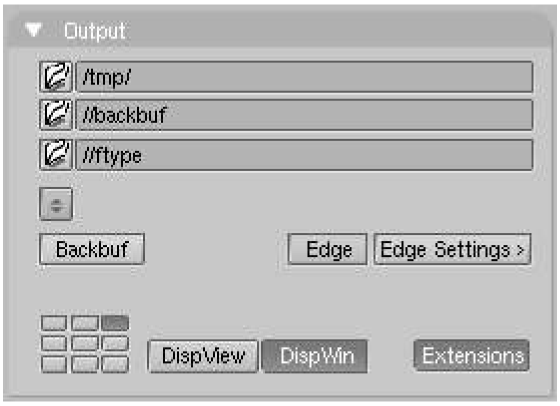
10.2.9 Render - Blender Render Engine - Edge (Toon) Rendering

Edge (Toon) Rendering

A scene with Toon materials.

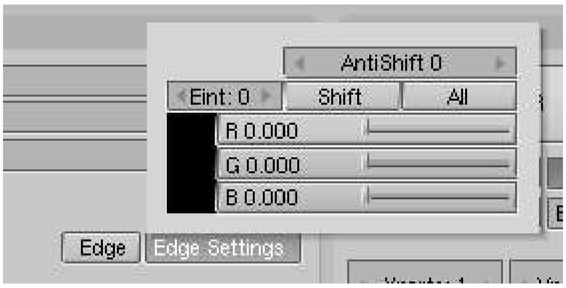
Bforartists’s toon shaders can give your rendering a comic-book-like or manga-like appearance, affecting the shades of colors. The effect is not perfect since real comics and manga also usually have china ink outlines. Bforartists can add this feature as a post-processing operation.

Options



Toon edge buttons.

Edge
: This makes Bforartists search for edges in your rendering and add an ‘outline’ to them.



Toon edge settings.

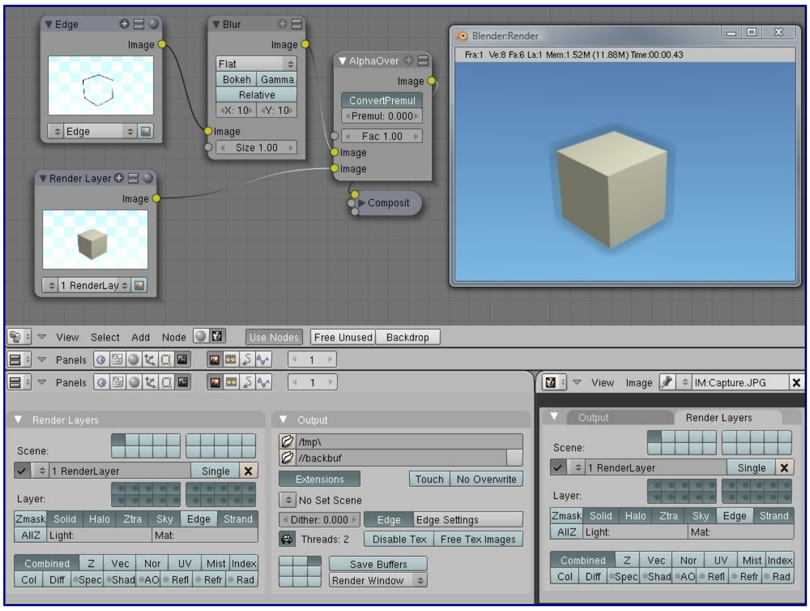
Before repeating the rendering it is necessary to set some parameters:

Threshold
: The threshold of the angle between faces for drawing edges, from 0 to 255. A value of 10 would just give outline of object against the background, whereas higher settings start to add outlines on surface edges, starting with sharper angles. At maximum intensity, Edge will even faintly display geometry subsurf edge lines in areas of imperfect smoothing.

Color / R/G/B
: The color of the rendered edges (black by default). Click on the swatch to see the color picker

Examples

Scene re-rendered with toon edge set.



Post-processing Edge and Renderlayers

It is possible to separate out the edge layer using a render layer dedicated to that purpose. The alpha channel is 0 where there is no edge, and 1 where the edge is. By separating out the edge layer, you can blur it, change its color, mask it, etc. The image to the right shows how to do this. I created an Edge render layer that only has the Sky and Edge layers (I included sky so that we get the world color later on in the composite output). The other render layer omits the Edge layer, so it returns just the normal image. On the output panel I enabled Edge with a width of 10 in black. I run that layer through a blur node. Using the Alphaover node, I then composite the cube on top of the blurred edge. The result gives a soft-shadow kind of effect. Note that Premultiply is set because the Edge image already has an alpha of 1.0 set.

10.2.10 Render - Blender Render Engine - Render Quality

Render Quality

Many factors go into the quality of the rendered image. Rendering a scene without changing any of the render settings is probably going to produce a rather unpleasant image. In previous chapters, you have learned how to model, shade, texture, and light scenes. Optimizing settings with respect to those areas will help to produce quality images, but there are some important settings that come into play before pressing the render button. These can directly affect the look of the rendered image.

The next section covers render layers and render passes, both of which allow you to compose an image from several elements of a scene. In some cases it is necessary to render effects straight out of the renderer, rather than creating them in "post."

Color Management and Exposure

One important aspect of 3D rendering that is often overlooked is color management. Without color management, or more commonly, linear rendering, render engines interpret scene lighting correctly, but display them incorrectly on your monitor. Bforartists simplifies this workflow, but it is important to know how the color space of a rendered image factors into your pipeline.

Anti-Aliasing

Anti-Aliasing removes jagged edges that appear in contrasting areas of color. This is a very important aspect of render quality. Without this render setting, images usually appear particularly CG and amateur.

Exposure (Lighting)

Exposure is, in physical terms, the length of time a camera's film or sensor is exposed to light. Longer exposure times create a brighter image. In CG, the recorded light values are offset to simulate longer or shorter exposures. This can be achieved through lighting settings, or better, through *Color Management settings*

Motion Blur

Cameras have a certain shutter speed, or the length of time the film is exposed to the image. Things that are in motion while the picture is taken will have some degree of blurring. Faster-moving objects will appear more blurred than slower objects. This is an important effect in CG because it is an artifact that we expect to see, and when it is missing, an image may not be believable.

10.2.11 Render - Blender Render Engine - Performance Consideration

Performance Considerations

Optimizing Render Performance

“A watched pot never boils” is the old saying, but you may wonder why your render takes so long to create, or worse, crashes mid-way through! Well, there is lots going on and lots you can do to speed up rendering or enable a complicated render to complete. Also, it is possible to render a very complicated scene on a mediocre PC by being “render-smart”. Here’s a “top ten” list of things to do or not do in order to speed up rendering or even avoid crashes during scene render. Some options may decrease the quality of your render, but for draft renders you may not care.

If you get the message “Malloc returns nil”, in plain English that means the memory allocator tried to get more physical memory for Bforartists but came back empty-handed. This means that you do not have enough memory available to render the scene, and Bforartists cannot continue. You will need to do one or more of the following tasks on this page in order to render.

Hardware Improvements

- Install more system memory.
- Upgrade your CPU to a multi-core/multiprocessor
- Upgrade your OpenGL video drivers
- Get faster memory, up to your PC’s motherboard limit.
- Use or set up a render farm using all available PCs in your house, or use a render farm.

Operating System Configuration

- Increase Bforartists’s processing priority through your OS.
- Increase your swap file space used by the OS for memory swapping. Also called virtual memory pagefile size, up to the size of your physical memory.
- Use a system-monitor to check if any other processes are using significant CPU or RAM, which can be closed.
- Render in *background mode* (from the command line), saves extra memory.

Bforartists Settings

- Increase the MEM Cache Limit in the User Preferences System & OpenGL tab.
- Switch to an Orthographic camera, and render your own “parts” of the scene as separate images, and then paste those parts together in GIMP. An old trick in making your own panorama with a real camera is to take three or so pictures of a very wide (beach sunset) scene, where you take one picture, rotate to the right, snap another, then another, and when you get the pictures developed, you overlap them to make a very wide landscape image. Do the same in Bforartists: render out one shot to a file, then move the camera to look at a different area of the scene, and render that shot. Each shot will be of a smaller area and thus take in fewer polygons/faces. Be sure that when you position your camera that you snap overlapping shots, so that you can then match them up. If you don’t want to use GIMP, you can use compositing nodes and the Translate node to match them up in Bforartists.
- Minimize the render window (and Bforartists if rendering to an internal window). ATI users report dramatic speedup on a per frame basis, which adds up over the frame range.
- Use the Big Render script to render sub-sections of the overall image, and then paste them together.

Scene and Specific Objects

- Remove lamps, or move them to unrendered layers, or tie them to layers.
- Turn off some lamp’s shadows, using only one or two main sun lamps to cast shadows. A few “shadows only” lights will render faster than every light having shadows on.
- Use Buffer Shadows rather than ray-traced Shadows
- Bake your shadows using Render Baking Full Render bake on surfaces that do not move. Use that texture for that mesh, then disable shadows for that material.
- Simplify meshes (remove polygons). The more vertices you have in camera, the more time it takes to render.
- Remove Doubles, or use the Decimator mesh edit feature.
- Remove Subsurf and Multires modifiers.
- Delete backsides of meshes (removing unseen geometry).
- Render just a few objects at a time; in the beginning of your project, render the background objects and sets that will not change and will always be in the background.
- Put the buildings on another layer, and through render layers, don’t render them. Then composite them back in later.
- Make the camera static so that you can better accomplish the above two ideas.
- Avoid use of Area lights.
- Make materials Shadeless.
- Render Bake AO and textures, and then make those materials Shadeless.
- Decrease the Clip distance for spot lights.
- Decrease the Clip distance for the camera.
- Turn off world AO.
- Turn off Material SSS.
- Use smaller image textures. A 256x256 image takes only 1% of the memory that a 2k image does, often with no loss of quality in the ultimate render.
- Reduce Subsurf. Each level quadruples (4x) the number of faces from the previous level.
- Reduce Multires.

- Make a matte render of background objects, like buildings, and put the image of them on a billboard in the scene instead of the object themselves. This will reduce vertex/face count.
- if you have lots of linked instances of an object, use DupliFaces, as these are instanced. If you have 100 of them, Bforartists will only store the geometry for 1 (Instances themselves take a small amount of memory).

Render Settings

- *Output Panel* - Disable *Edge* rendering. - *Save Buffers*.
    - Render to an Image Editor window, not a pop-up. *Render Window.*
    - Use multiple *Threads* on a multi-core CPU (with multiple *Parts*).
- *Render Layers Panel* - Render only the Layers of interest. - Render with all lights set to one simple spot (enter its name in the *Light:* field). - Render with one material override (enter its name in the Mat: field).
    - Disable unnecessary Render Passes, such as *Z*, or only render the pass of interest, such as *Diffuse*.
- *Render Panel* - Turn off *Shadows*. - Turn off *Environment Mapping*. - Turn off *Panoramic Rendering*. - Turn off *Raytracing*. - Turn off SSS Subsurface Scattering. - Turn off or lower oversampling/aliasing *OSA*. - Turn off or lower *Motion Blur.*
    - Render in Parts. This will also allow you to render HUGE images on a weak PC. On a multi-core PC, it will assign a thread to each part as well.
    - Increase the octree resolution.
    - Render at a percentage size of your final resolution (like 25%).
    - Turn off *Fields* rendering.
    - Use *Border* rendering to render a subset of the full image.
- *Anim Panel*
    - Decrease the frame count of the animation (and use a lower framerate for the same duration of animation). For example, render 30 frames at 10 frames per second for a 3-second animation, instead of 75 frames at 25 frames per second.
- *Bake Panel*
    - Bake Full Render - create a UV Texture that colors the objects based on materials, and then use that UV Texture shadeless instead of the material.
    - Bake Ambient Occlusion only.
    - Bake textures for objects.
    - Baking Normals or Displacement does not speed up render time, and are used for other things.
- *Format Panel* - Render at a lower resolution. Smaller pictures take less time to render. - Choose a faster CODEC or CODEC settings. - Render in black and white (*BW* button). - If using FFMPEG, do not activate *Multiplex audio*. - If using FFMPEG, *Autosplit Output* (*Video* panel button).
    - Render only RGB if you just need color; the A channel (*RGBA* button) takes more memory and is unused when saving a movie file.

Multi-Pass Compositing

Another strategy that can be used to address the problem of long (re-)render times is to structure your workflow from the ground up so that you make aggressive use of *compositing*, as described in the “Post-Production” section. In this approach, you break down each shot into components that can be rendered separately, then you combine those separately-rendered elements to achieve the finished clip. For instance:

- If the camera isn't moving, then neither is the background: only a single frame is needed. (The same is true of any non-moving object within the frame.) These individual elements, having been generated *once*, can be re-used as many times as necessary over as many frames as necessary.
- Both shadows and highlights can be captured separately from the objects that are being illuminated or shadowed, such that the intensity, color, and depth of the effect can be adjusted later without re-rendering.
- Start by using lights that do not cast shadows. (Shadow calculations are big time-killers.) Then, use "shadow-only" lights (which cast shadows, but do not cast light) to create shadows *only* where you judge that they are actually necessary. (It is very often the case that only a few of the shadows which could exist in the scene actually matter, and that the rest of them simply won't be noticed.)
- Tricky lighting situations can be avoided by handling the objects separately, then combining the individually-rendered clips and "tweaking" the result.

This is a very familiar idea. Modern sound recordings, for example, always use a "multi-track" approach. Individual components of the song are captured separately and in isolation, then the components are "mixed" together. The "final mix" then goes through additional processing stages, called *mastering*, to produce the finished product(s). (In fact, the features and design of modern sound-processing software are directly comparable to that of Bforartists's node-based compositor.)

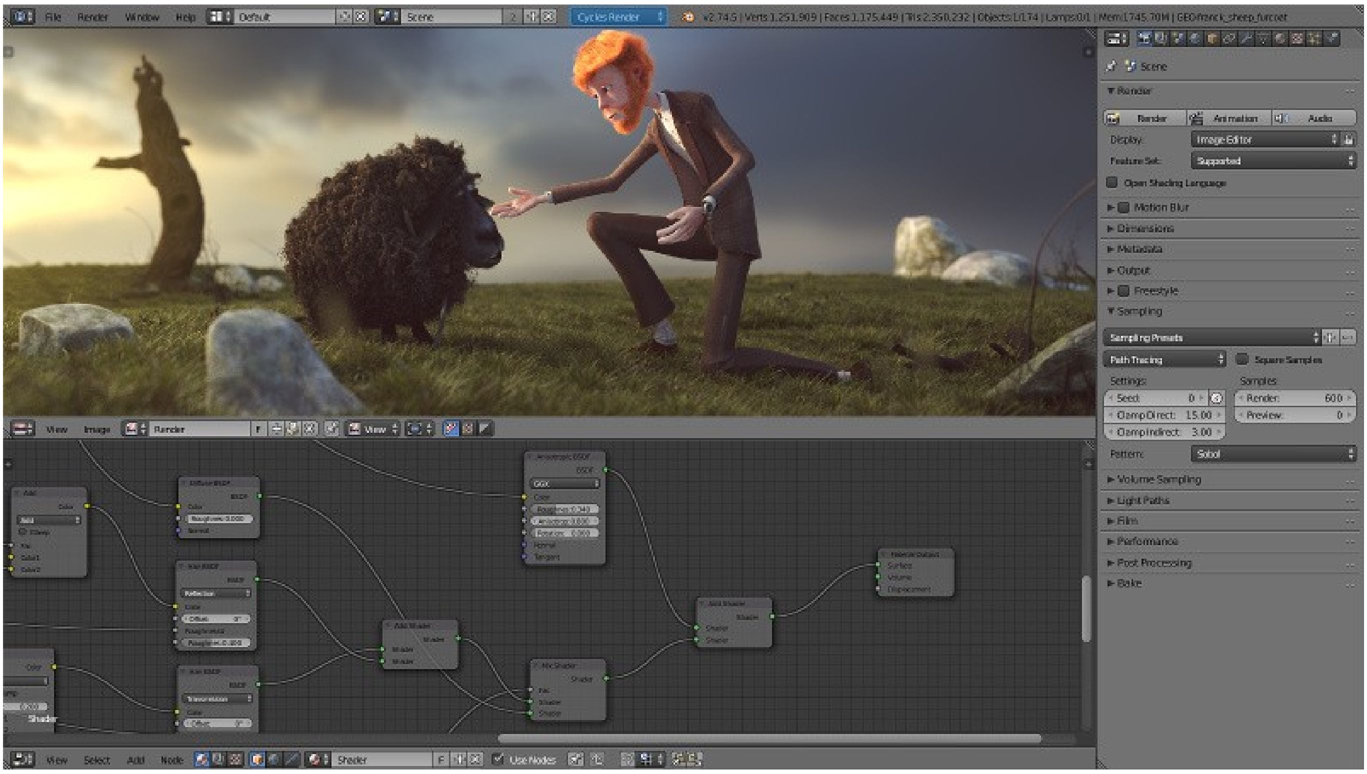
There are compelling advantages to this approach:

- You have options. If something is "not quite right," you don't necessarily have to start over from scratch.
- In practice, the deadline-killer is *re*- rendering, which ordinarily must be done (in its entirety) just because "'one little thing' about the shot is wrong." Compositing helps to avoid this, because (ideally...) only the specific parts that are found to be in error must be repeated. (Or, maybe, the error can be blocked out with a "garbage matte" and a corrected version can be inserted in its place. No one will ever know!)
- It's also possible that you find yourself saying, "okay, that's *almost* what I wanted, but now I'd like to *add* this and maybe *take away* that." A compositing-based approach enables you to do just that, and furthermore, to do so *non-destructively.* In other words, having generated the "addition" (or the "mask") as a separate channel of information, you can now fine-tune its influence in the overall "mix, " or even change your mind and remove it altogether, all without permanently altering anything.
- By and large, these stages work *two*- dimensionally, manipulating what is by that time "a raster bitmap with R, G, B, Alpha *(transparency...)* and Z-Depth information," so they're consistently fast.
- Since each discrete rendering task has been simplified, the computer can carry them out using much fewer resources.
- The tasks can be distributed among several different computers ... even less-powerful ones
- "After all, the scene doesn't actually have to be *physically perfect,* to be *convincing.* " A compositing-based approach lets you take full advantage of this. You can focus your attention (and Bforartists's) upon those specific aspects of the scene which will actually make a noticeable difference. It is possible to save a considerable amount of time by consciously choosing to exclude less-important aspects which (although "technically correct") probably won't be noticed.

Of course, this approach is not without its own set of trade-offs. You must devise a workable asset-management system for keeping track of exactly what material you have, where it is, whether it is up-to-date, and exactly how to re-create it. You must understand and use the “library linking” features of Bforartists to allow you to refer to objects, nodes, materials, textures and scenes in a carefully-organized collection of other files. You need to have a very clear notion, *in advance*, of exactly what the finished shot must consist of and what the task breakdown must be. You must be a scrupulous note-taker and record-keeper. But sometimes this is the best way, if not the *only* way, to accomplish a substantial production.

10.3.1 Render - Cycles Render Engine - Introduction

Introduction



Cycles is a unbiased* ray tracing renderer focused on interactivity and ease of use, while still supporting many production features.

*A unbiased renderer fires rays wildly from the light source until you tell him to stop. It will not stop automatically. But continue to fire rays until you tell him to stop. A biased renderer follows some special algorithms when fiering the rays. And it stops at one point as done. Cycles is a special beast here. It's a unbiased renderer with some bias algorithms to speed things up. This would normally qualify it as a biased renderer. But it still mainly shows the behaviour of a unbiased renderer.

Cycles is bundled as an add-on that is enabled by default. To use Cycles, it must be set as the active render engine. Bforartists comes with Cycles set as the default renderer. Once that is done, interactive rendering can be started by setting a 3D view editor to draw mode Rendered using the render command from the file menu. The render will keep updating as modifications are done, such as changing a material color, changing a lamp’s intensity or moving objects around.

Cycles may be able to use your GPU to render. To see if and how you can use your GPU for rendering, see the documentation on *GPU Rendering*.

See also

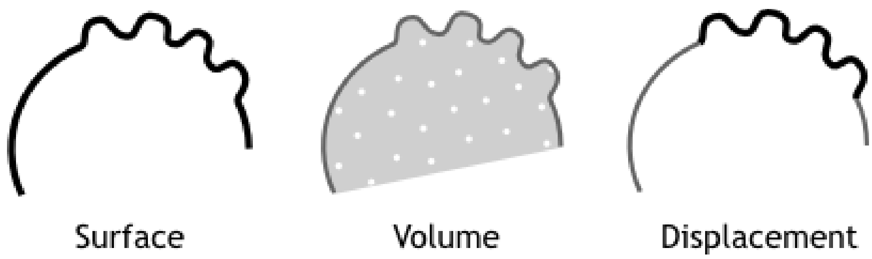
Developer documentation is also available.

http://wiki.Bforartists.org/index.php/Dev:2.6/Source/Render/Cycles

10.3.2 Render - Cycles Render Engine - Materials

Materials

Materials define the appearance of meshes, curves and other objects. They consist of three shaders, defining the appearance of the surface of the mesh, the volume inside the mesh, and displacement of the surface of the mesh.



Surface Shader

The surface shader defines the light interaction at the surface of the mesh. One or more BSDF s specify if incoming light is reflected back, refracted into the mesh, or absorbed.

Emission defines how light is emitted from the surface, allowing any surface to become a light source.

Volume Shader

When the surface shader does not reflect or absorb light, it enters into the volume. If no volume shader is specified, it will pass straight through to the other side of the mesh.

If it is defined, a volume shader describes the light interaction as it passes through the volume of the mesh. Light may be scattered, absorbed, or emitted at any point in the volume.

A material may have both a surface and a volume shader, or only one of either. Using both may be useful for materials such as glass, water or ice, where you want some of the light to be absorbed as it passes through the surface, combined with e.g. a glass or glossy shader at the surface.

Displacement

The shape of the surface and the volume inside it may be altered by displacement shaders. This way, textures can then be used to make the mesh surface more detailed.

Depending on the settings, the displacement may be virtual, only modifying the surface normals to give the impression of displacement, which is known as bump mapping, or a combination of real and virtual displacement.

Energy Conservation

The material system is built with physics-based rendering in mind, cleanly separating how a material looks and which rendering algorithm is used to render it. This makes it easier to achieve realistic results and balanced lighting, though there are a few things to keep in mind.

In order for materials to work well with global illumination, they should be, speaking in terms of physics, energy conserving. That means they cannot reflect more light than comes in. This property is not strictly enforced, but if colors are in the range 0.0 to 1.0, and BSDF s are only mixed together with the Mix Shader node, this will automatically be true.

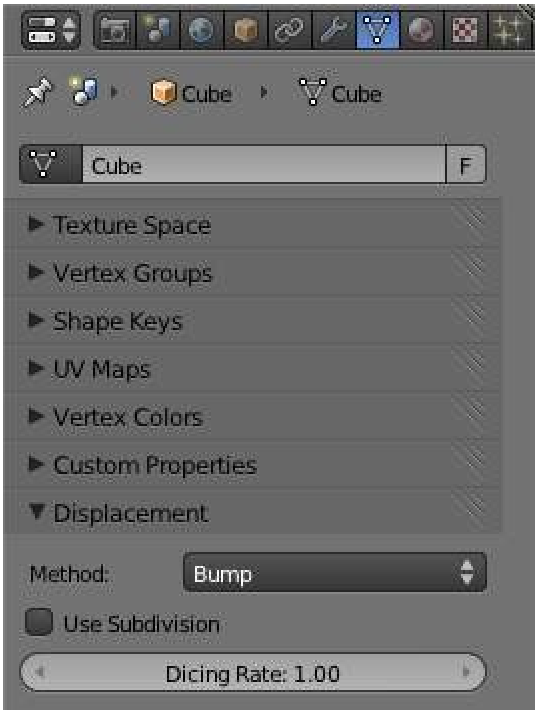
It is however possible to break this, with color values higher than 1.0 or using the Add Shader node, but one must be careful when doing this to keep materials behaving predictably under various lighting conditions. It can result in a reflection adding light into the system at each bounce, turning a BSDF into a kind of emitter.

Displacement

Implementation not finished yet, marked as an experimental feature.

The shape of the surface and the volume inside its mesh may be altered by the displacement shaders. This way, textures can then be used to make the mesh surface more detailed.

Type



Depending on the settings, the displacement may be virtual, only modifying the surface normals to give the impression of displacement, known as bump mapping, or a combination of real and virtual displacement. The displacement type options are:

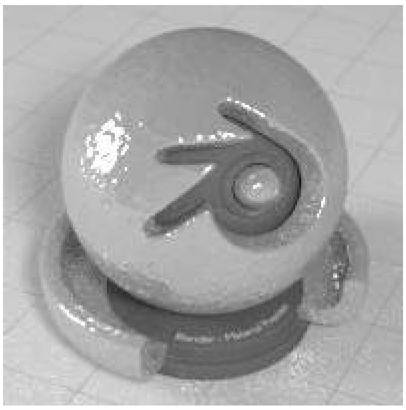
True Displacement
: Mesh vertices will be displaced before rendering, modifying the actual mesh. This gives the best quality results, if the mesh is finely subdivided. As a result this method is also the most memory intensive.

Bump Mapping
: When executing the surface shader, a modified surface normal is used instead of the true normal. This is a quick alternative to true displacement, but only an approximation. Surface silhouettes will not be accurate and there will be no self-shadowing of the displacement.

Displacement + Bump
: Both methods can be combined, to do displacement on a coarser mesh, and use bump mapping for the final details.

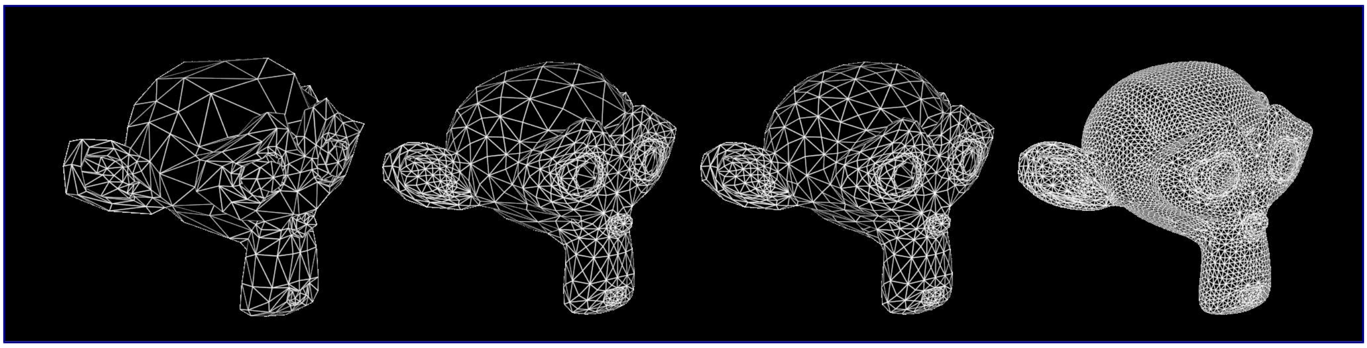
Subdivision

Implementation not finished yet, marked as an experimental feature.



Bump Mapped Displacement

When using *True Displacement* or *Displacement + Bump* and enabling *Use Subdivision* you can reduce the **Dicing Rate** to subdivide the mesh. This only affects the render and does not show in the viewport (but does show in *Rendered Shading Mode*). Displacement can also be done manually by use of the Displacement Modifier.



Subdivision Off - On, Dicing Rate 1.0 - 0.3 - 0.05 (Monkeys look identical in viewport, no modifiers)

Surface

The surface shader defines the light interaction at the surface of the mesh. One or more BSDF s specify if incoming light is reflected back, refracted into the mesh, or absorbed.

Emission defines how light is emitted from the surface, allowing any surface to become a light source.

Terminology

BSDF stands for bidirectional scattering distribution function.
: It defines how light is reflected and refracted at a surface.

Reflection BSDF s
: Reflect an incoming ray on the same side of the surface.

Transmission BSDF s
: Transmit an incoming ray through the surface, leaving on the other side.

Refraction BSDF s are a type of Transmission,
: Transmitting an incoming ray and changing its direction as it exits on the other side of the surface.

BSDF Parameters

A major difference from non-physically based renderers is that direct light reflection from lamps and indirect light reflection of other surfaces are not decoupled, but rather handled using a single BSDF. This limits the possibilities a bit, but we believe overall it is helpful in creating consistent-looking renders with fewer parameters to tune.

For glossy BSDF s, **roughness** parameters control the sharpness of the reflection, from 0.0 (perfectly sharp) to 1.0 (very soft). Compared to **hardness** or **exponent** parameters, it has the advantage of being in the range 0.0..1.0, and as a result gives more linear control and is more easily textureable. The relation is roughly:
roughness = 1 - 1/hardness

Volume

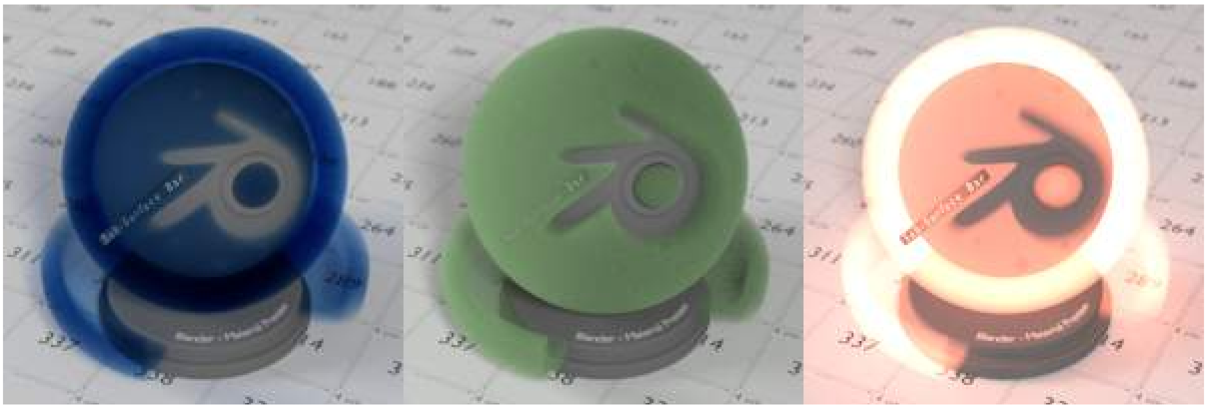
Volume rendering can be used to render effects like fire, smoke, mist, absorption in glass, and many other effects that can't be represented by surface meshes alone.

To set up a volume, you create a mesh that defines the bounds within which the volume exists. In the material you typically remove the surface nodes and instead connect volume nodes to define the shading inside the volume. For effects such as absorption in glass you can use both a surface and volume shader. The world can also use a volume shader to create effects such as mist.

Volume Shaders

We support three volume shader nodes, that model particular effects as light passes through the volume and interacts with it.

- Volume Absorption will absorb part of the light as it passes through the volume. This can be used to shade for example black smoke or colored glass objects, or mixed with the volume scatter node. This node is somewhat similar to the transparent BSDF node, it blocks part of the light and lets other light pass straight through.
- Volume Scatter lets light scatter in other directions as it hits particles in the volume. The anisotropy defines in which direction the light is more likely to scatter. A value of 0 will let light scatter evenly in all directions (somewhat similar to the diffuse BSDF node), negative values let light scatter mostly backwards, and positive values let light scatter mostly forward. This can be used to shade white smoke or clouds for example.
- Emission will emit light from the volume. This can be used to shade fire for example.



Volume Shader: Absorption / Absorption + Scatter / Emission

Density

All volume shaders have a density input. The density defines how much of the light will interact with the volume, getting absorbed or scattered, and how much will pass straight through. For effects such as smoke you would specify a density field to indicate where in the volume there is smoke and how much (density bigger than 0), and where there is no smoke (density equals 0).

Volumes in real life consist of particles, a higher density means there are more particles per unit volume. More particles means there is a higher chance for light to collide with a particle and get absorbed or scattered, rather than passing straight through.

Volume Material

Interaction with the Surface Shader

A material may have both a surface and a volume shader, or only one of either. Using both may be useful for materials such as glass, water or ice, where you want some of the light to be absorbed as it passes through the surface, combined with e.g. a glass or glossy shader at the surface.

When the surface shader does not reflect or absorb light, it enters into the volume. If no volume shader is specified, it will pass straight through to the other side of the mesh. If it is defined, a volume shader describes the light interaction as it passes through the volume of the mesh. Light may be scattered, absorbed, or emitted at any point in the volume.

Mesh Topology

Meshes used for volume render should be closed and manifold. That means that there should be no holes in the mesh. Each edge must be connected to exactly 2 faces such that there are no holes or T-shaped faces where 3 or more faces are connected to an edge.

Normals must point outside for correct results. The normals are used to determine if a ray enters or exits a volume, and if they point in a wrong direction, or there is a hole in the mesh, then the renderer is unable to decide what is the inside or outside of the volume.

These rules are the same as for rendering glass refraction correctly.

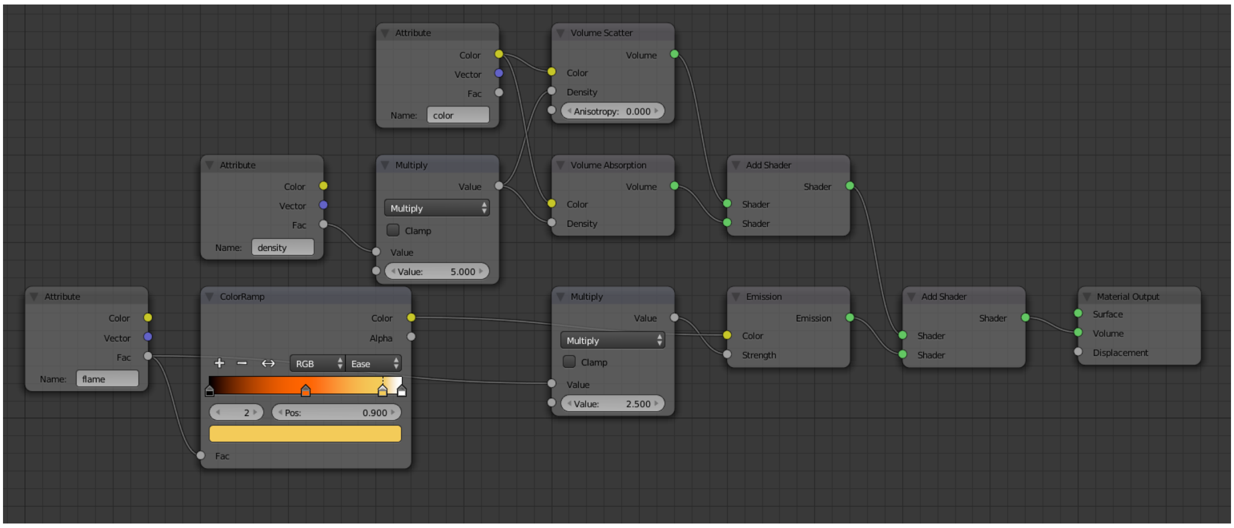
Volume World

A volume shader can also be applied to the entirely world, filling the entire space.

Currently this is most useful for night time or other dark scenes, as the world surface shader or sun lamps will have no effect if a volume shader is used. This is because the world background is assumed to be infinitely far away, which is accurate enough for the sun for example. However for modeling effects such as fog or atmospheric scattering, it is not a good assumption that the volume fills the entire space, as most of the distance between the sun and the earth is empty space. For such effects it is be better to create a volume object surrounding the scene. The size of this object will determine how much light is scattered or absorbed.

Smoke

Creating a smoke material for cycles can be difficult however the image below shows a good setup on how to do this.



Smoke and Fire Material

Scattering Bounces

Real world effects such as scattering in clouds or subsurface scattering require many scattering bounces. However unbiased rendering of such effects is slow and noisy. In typical movie production scenes only 0 or 1 bounces might be used to keep render times under control. The effect you get when rendering with 0 volume bounces is what is known as “single scattering”, the effect from more bounces is “multiple scattering”.

For rendering materials like skin or milk, the subsurface scattering shader is an approximation of such multiple scattering effects that is significantly more efficient but not as accurate.

For materials such as clouds or smoke that do not have a well defined surface, volume rendering is required. These look best with many scattering bounces, but in practice one might have to limit the number of bounces to keep render times acceptable.

Limitations

Currently we do not support:

- Correct ray visibility for volume meshes

Not available on GPU:

- Smoke/Fire rendering
- Equi Angular / MIS Volume Sampling
- Volume Multi Light sampling

Texture Editing

3D viewport draw types, UV mapping, and texture painting work somewhat differently when Cycles is enabled. UV Maps no longer get image textures assigned themselves; rather they must always be assigned by adding an image texture node to a material.

3D Viewport Draw Types

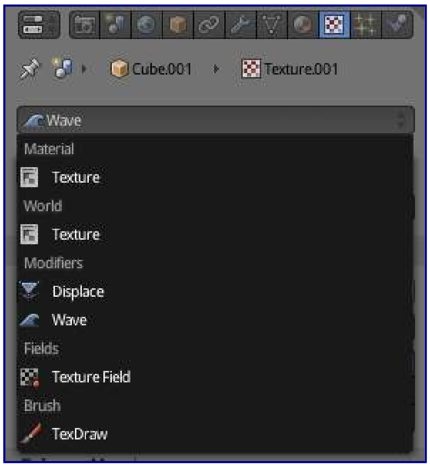
The Texture draw types used for Bforartists Internal have been replaced by three others in Cycles:

Texture
: This draw mode is used for editing, painting and mapping individual textures. Lighting is the same as in solid mode, so this is similar to the existing textured solid for Bforartists Internal. The texture drawn is the active image texture node for the material.

Material
: A simplified version of the entire material is drawn using GLSL shaders. This uses solid lighting, and also is mostly useful for editing, painting and mapping textures, but while seeing how they integrate with the material.

Rendered
: In this draw mode the render engine does the drawing, interactively refining the full rendered image by taking more samples. Unlike offline rendering, objects still use the viewport rather than render resolution and visibility.

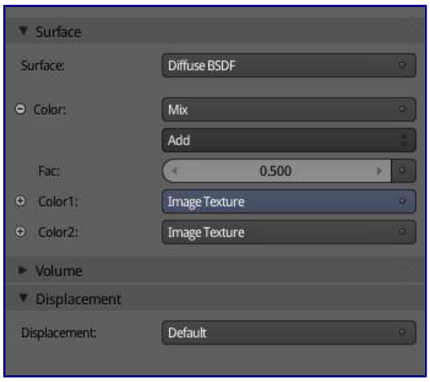
Texture Properties



In the texture properties, the texture can now be selected from a list that contains all texture nodes from the world, lamps and materials, but also from e.g. modifiers, brushes and physics fields.

For shading nodes, the available textures are Cycles textures. For others, Bforartists textures are still used, but this will change in the future.

Painting & UV Editing



For texture paint mode, the image that is painted on is taken from the active image texture node. This can be selected in the node editor or the texture properties, and it is indicated as blue in the material properties.

For UV mapping, the active UV map as specified in the mesh properties is used. Assigning images in the image editor also affects the active image texture node.

10.3.3 Render - Cycles Render Engine - Lamp

Lamps

Next to lighting from the background and any object with an emission shader, lamps are another way to add light into the scene. The difference is that they are not directly visible in the rendered image, and can be more easily managed as objects of their own type.

Type
: Currently *Point*, *Spot*, *Area* and *Sun* lamps are supported. *Hemi* lamps are not supported, and will be rendered as point and sun lamps respectively, but they may start working in the future, so it's best not to enable them to preserve compatibility.

Size
: Size of the lamp in Bforartists Units; increasing this will result in softer shadows and shading.

Max Bounces
: Maximum number of times light from the lamp is allowed to bounce. Limited by scene-wide bounce settings

Cast Shadow
: By disabling this option, light from lamps will not be blocked by objects in-between. This can speed up rendering by not having to trace rays to the light source.

Point Lamp

Point lamps emit light equally in all directions. By setting the *Size* larger than zero, they become spherical lamps, which give softer shadows and shading. The strength of point lamps is specified in Watts.

Spot Lamp

Spot lamps emit light in a particular direction, inside a cone. By setting the *Size* larger than zero, they can cast softer shadows and shading. The size parameter defines the size of the cone, while the blend parameter can soften the edges of the cone.

Area Lamp

Area lamps emit light from a square or rectangular area with a Lambertian distribution.

Light Portals

Area lamps can also function as light portals to help sample the environment light, and significantly reduce noise in interior scenes. Note that rendering with portals is usually slower, but as it converges more quickly, less samples are required.

Light portals work by enabling the Portal option, and placing areas lamps in windows, door openings, and any place where light will enter the interior.

Sun Lamp

Sun lamps emit light in a given direction. Their position is not taken into account; they are always located outside of the scene, infinitely far away, and will not result in any distance falloff.

Because they are not located inside the scene, their strength uses different units, and should typically be set to lower values than other lights.

10.3.4 Render - Cycles Render Engine - Nodes

Introduction

Materials, lights and backgrounds are all defined using a network of shading nodes. These nodes output values, vectors, colors and shaders.

Shaders

An important concept to understand when building node setups is that of the **shader socket**. The output of all surface and volume shaders is a shader, describing lighting interaction at the surface or of the volume, rather than the color of the surface.

There are a few types of shaders available as nodes:

- BSDF shader describing light reflection, refraction and absorption at an object surface.
- **Emission** shader describing light emission at an object surface or in a volume.
- **Volume** shader describing light scattering inside a volume.
- **Background** shader describing light emission from the environment.

Each shader node has a color input, and outputs a shader. These can then be mixed and added together using Mix and Add Shader nodes. No other operations are permitted. The resulting output can then be used by the render engine to compute all light interactions, for direct lighting or global illumination.

Textures

Each texture type in Cycles corresponds to a node, with a texture coordinate and various parameters as input, and a color or value as output. No texture data-blocks are needed; instead node groups can be used for reusing texture setups.

For UV mapping and texture painting in the viewport, the Image texture node must be used. When setting such a node as active, it will be drawn in Textured draw mode, and can be painted on in texture paint mode.

The default texture coordinates for all nodes are Generated coordinates, with the exception of Image textures that use UV coordinates by default. Each node includes some options to modify the texture mapping and resulting color, and these can be edited in the texture properties.

More

Nodes for geometric data, texture coordinates, layering shaders and non-physically based tricks.

Open Shading Language

Custom nodes can be written using the Open Shading Language.

Input Nodes

Camera Data

View Vector
: A Camera space vector from the camera to the shading point.

View Z Depth
: TODO

View Distance
: Distance from the camera to the shading point.

Value

Input a scalar value.

Value
: Value output.

RGB

Input an RGB color.

Color

RGB color output.

Attribute

Retrieve attribute attached to the object or mesh. Currently UV maps and vertex color layers can be retrieved this way by their names, with layers and attributes planned to be added. Also internal attributes like *P* (position), *N* (normal), *Ng* (geometric normal) may be accessed this way, although there are more convenient nodes for this.

Name
Name of the attribute.
Color output
RGB color interpolated from the attribute.
Vector output
XYZ vector interpolated from the attribute.
Fac output
Scalar value interpolated from the attribute.

Wireframe

Retrieve the edges of an object as it appears to cycles. As meshes are triangulated before being processed by cycles, topology will always appear triangulated when viewed with the *Wireframe node*.

Pixel Size
When enabled, set the size of edge lines in screen space.
Size
Thickness of edge lines.
Fac output
Black and white mask showing white lines representing edges according to the object's topology.

Geometry

Geometric information about the current shading point. All vector coordinates are in *World Space*. For volume shaders, only the position and incoming vector are available.

Position
Position of the shading point.
Normal
Shading normal at the surface (includes smooth normals and bump mapping).
Tangent
Tangent at the surface.
True Normal
Geometry or flat normal of the surface.
Incoming
Vector pointing towards the point the shading point is being viewed from.
Parametric
Parametric coordinates of the shading point on the surface.
Backfacing
1.0 if the face is being viewed from the back side, 0.0 for the front side.
Pointiness
An approximation of the curvature of the mesh per-vertex. Lighter values indicate convex angles, darker

values indicate concave angles.

Light Path

Node to find out for which kind of incoming ray the shader is being executed; particularly useful for non-physically based tricks. More information about the meaning of each type is in the *Light Paths* documentation.

Is Camera Ray output
: 1.0 if shading is executed for a camera ray, 0.0 otherwise.

Is Shadow Ray output
: 1.0 if shading is executed for a shadow ray, 0.0 otherwise.

Is Diffuse Ray output
: 1.0 if shading is executed for a diffuse ray, 0.0 otherwise.

Is Glossy Ray output
: 1.0 if shading is executed for a glossy ray, 0.0 otherwise.

Is Singular Ray output
: 1.0 if shading is executed for a singular ray, 0.0 otherwise.

Is Reflection Ray output
: 1.0 if shading is executed for a reflection ray, 0.0 otherwise.

Is Transmission Ray output
: 1.0 if shading is executed for a transmission ray, 0.0 otherwise.

Ray Length output
: Distance traveled by the light ray from the last bounce or camera.

Ray Depth

Number of times the ray has “bounced”, i.e. been reflected or transmitted on interaction with a surface.

> **Note**
>
> Passing through a transparent shader does not count as a normal “bounce”.

Transparent Depth
: Number of times the ray has passed through a transparent shader.

Object Info

Information about the object instance. This can be useful to give some variation to a single material assigned to multiple instances, either manually controlled through the object index, based on the object location, or randomized for each instance. For example a Noise texture can give random colors or a Color ramp can give a range of colors to be randomly picked from.

Location
: Location of the object in world space.

Object Index
: Object pass index, same as in the Object Index pass.transformed.

Material Index
: Material pass index, same as in the Material Index pass.

Random
: Random number unique to a single object instance.

Fresnel

Dielectric fresnel, computing how much light is refracted through and how much is reflected off a layer. The resulting weight can be used for layering shaders with the *Mix Shader* node. It is dependent on the angle between the surface normal and the viewing direction.

IOR input
: Index of refraction of the material being entered.

Fresnel output
: Fresnel weight, indicating the probability with which light will reflect off the layer rather than passing through.

Layer Weight

Output weights typically used for layering shaders with the *Mix Shader* node.

Blend input
: Blend between the first and second shader.

Fresnel output
: Dielectric fresnel weight, useful for example for layering diffuse and glossy shaders to create a plastic material. This is like the Fresnel node, except that the input of this node is in the often more-convenient 0.0 to 1.0 range.

Facing output
: Weight that blends from the first to the second shader as the surface goes from facing the viewer to viewing it at a grazing angle.

Texture Coordinate

Commonly used texture coordinates, typically used as inputs for the *Vector* input for texture nodes.

Generated output
: Automatically-generated texture coordinates from the vertex positions of the mesh without deformation, keeping them sticking to the surface under animation. Range from 0.0 to 1. 0 over the bounding box of the undeformed mesh.

Normal output
: Object space normal, for texturing objects with the texture staying fixed on the object as it transformed.

UV output
: UV texture coordinates from the active render UV map.

Object output
: Position coordinate in object space.

Camera output
: Position coordinate in camera space.

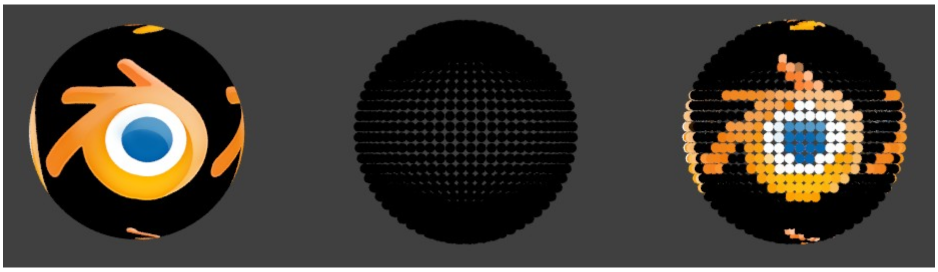
Window output
: Location of shading point on the screen, ranging from 0.0 to 1. 0 from the left to right side and bottom to top of the render.

Reflection output
: Vector in the direction of a sharp reflection, typically used for environment maps.

Object
: Specific object to use for object space coordinates. This only affects the *Object* output.

From Dupli

If the material is applied to a dupli object, use texture coordinates from the parent object. This only affects the *Generated* and *UV* outputs.



From left to right: Sphere with UV mapped texture. Small spheres duplicated to the faces of the textured sphere using *duplifaces*. Small spheres with *From Dupli* enabled, using the UV map of the large sphere.

Note

From Dupli only works with the UV output when the dupli object is instanced from faces, either with *particles* or *duplifaces*.

UV Map

Retrieve specific UV maps. Unlike the Texture Coordinate node which only provides the active UV map, this node can retrieve any UV map belonging to the object using the material.

From Dupli
: See the From Dupli option of the *Texture Coordinate node*.

UV Map
: UV map to use.

UV output
: UV mapping coordinates from the specified UV layer.

Particle Info

For objects instanced from a particle system, this node give access to the data of the particle that spawned the instance.

Index
: Index number of the particle (from 0 to number of particles).

Age
: Age of the particle in frames.

Lifetime
: Total lifespan of the particle in frames.

Location
: Location of the particle.

Size
: Size of the particle.

Velocity
: Velocity of the particle.

Angular Velocity
: Angular velocity of the particle.

Hair Info

This node gives access to strand information.

Is strand
Returns 1 when the shader is acting on a strand, otherwise 0.

Intercept
The point along the strand where the ray hits the strand (1 at the tip and 0 at the root).

Thickness
The thickness of the strand at the point where the ray hits the strand.

Tangent Normal
Tangent normal of the strand.

Tangent

Generates a tangent direction for the Anisotropic BSDF.

Direction Type
The tangent direction can be derived from a cylindrical projection around the X, Y or Z axis (Radial), or from a manually created UV Map for full control.

Tangent Output
The tangent direction vector.

Output Nodes

Output nodes are the final node in every node tree. Although you can add more than one, only one will be used (indicated by a colored or darkened header). Output nodes are always preceded by *Shaders* except in the case of the *Displacement* of a Material Output.

Material Output

Surface
The surface output of the material

Volume
Currently under independent development, does nothing

Displacement
Used to create bump mapping or actual subdivided *Displacement*

Lamp Output

Surface
Not an actual surface, but the final output of a *Lamp* Object

World Output

Surface
The appearance of the environment, usually preceded by a Background shader

Volume
Currently under independent development, does nothing

Shader Nodes

Diffuse

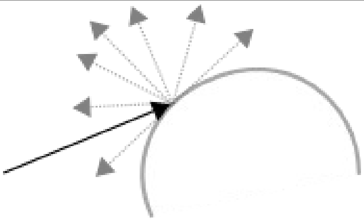
Lambertian and Oren-Nayar diffuse reflection.

Color input
: Color of the surface, or physically speaking, the probability that light is reflected or transmitted for each wavelength.

Roughness input
: Surface roughness; 0.0 gives standard Lambertian reflection, higher values activate the Oren-Nayar BSDF.

Normal input
: Normal used for shading; if nothing is connected the default shading normal is used.

BSDF output
: Diffuse BSDF shader.



Diffuse behavior

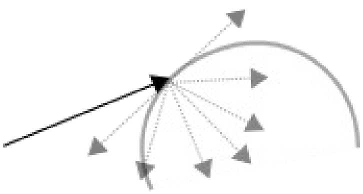
Translucent

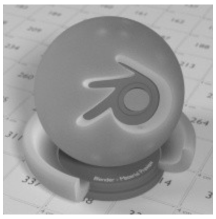
Lambertian diffuse transmission.

Color input
: Color of the surface, or physically speaking, the probability that light is transmitted for each wavelength.

Normal input
: Normal used for shading; if nothing is connected the default shading normal is used.

BSDF output
: Translucent BSDF shader.





Translucent Shader

Glossy

Glossy reflection with microfacet distribution, used for materials such as metal or mirrors.

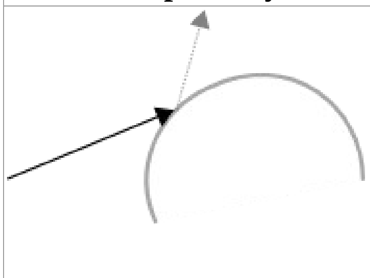
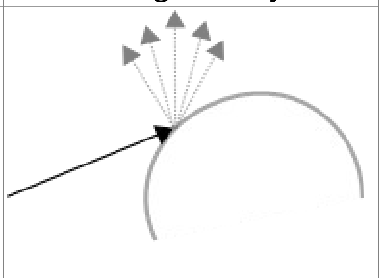
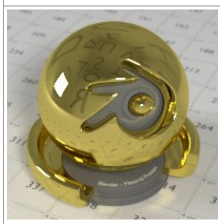
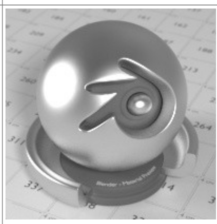
Distribution
: Microfacet distribution to use. *Sharp* results in perfectly sharp reflections like a mirror, while *Beckmann*, *GGX* and *Ashikhmin-Shirley* can use the *Roughness* input for blurry reflections.

Color input
: Color of the surface, or physically speaking, the probability that light is reflected for each wavelength.

Roughness input
: Influences sharpness of the reflection; perfectly sharp at 0.0 and smoother with higher values.

Normal input
: Normal used for shading; if nothing is connected the default shading normal is used.

BSDF output
: Glossy BSDF shader.

Sharp Glossy	Rough Glossy
	
	

Anisotropic

Anisotropic glossy reflection, with separate control over U and V direction roughness. The tangents used for shading are derived from the active UV map. If no UV map is available, they are automatically generated using a sphere mapping based on the mesh bounding box.

Distribution
: Microfacet distribution to use. *Sharp* results in perfectly sharp reflections like a mirror, while *Beckmann*, *GGX* and *Ashikhmin-Shirley* can use the *Roughness* input for blurry reflections.

Color input
: Color of the surface, or physically speaking, the probability that light is reflected for each wavelength.

Roughness input
: Sharpness of the reflection; perfectly sharp at 0.0 and smoother with higher values.

Anisotropy input
Amount of anisotropy in the reflection; 0.0 gives a round highlight. Higher values give elongated highlights orthogonal to the tangent direction; negative values give highlights shaped along the tangent direction.
Rotation input
Rotation of the anisotropic tangent direction. Value 0.0 equals 0- rotation, 0.25 equals 90- and 1.0 equals 360- = 0- . This can be used to texture the tangent direction.
Normal input
Normal used for shading; if nothing is connected the default shading normal is used.
Tangent input
Tangent used for shading; if nothing is connected the default shading tangent is used.
BSDF output
Anisotropic glossy BSDF shader.

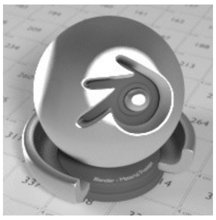

Anisotropic rotation on 0


Anisotropic rotation on 0.25 (90-)

Toon

Diffuse and Glossy Toon BSDF for creating cartoon light effects.

Color input
Color of the surface, or physically speaking, the probability that light is reflected for each wavelength.
Size input
Parameter between 0.0 and 1.0 that gives a angle of reflection between 0- and 90- .
Smooth input
This value specifies an angle over which a smooth transition from full to no reflection happens.
Normal input
Normal used for shading; if nothing is connected the default shading normal is used.
BSDF output
Toon BSDF shader.

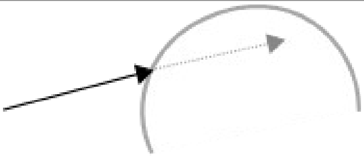
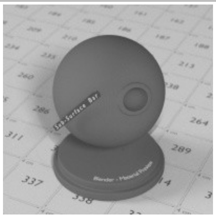
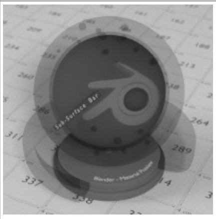

Toon Shader

Transparent

Transparent BSDF without refraction, passing straight through the surface, as if there were no geometry there. Useful with alpha maps, for example. This shader affects light paths somewhat differently than other BSDF s. Note that only pure white transparent shaders are completely transparent.

Color input
: Color of the surface, or physically speaking, the probability for each wavelength that light is blocked or passes straight through the surface.

BSDF output
: Transparent BSDF shader.

 Transparent behaviour	
 Transparent Shader (pure white)	 Transparent Shader (gray)

Glass

Glass-like shader mixing refraction and reflection at grazing angles. Like the transparent shader, only pure white will make it transparent. The glass shader tends to cause noise due to caustics. Since the Cycles path tracing integrator is not very good at rendering caustics, it helps to combine this with a transparent shader for shadows; for more details see here

Distribution
: Microfacet distribution to use. *Sharp* results in perfectly sharp refractions like clear glass, while *Beckmann* and *GGX* can use the *Roughness* input for rough glass.

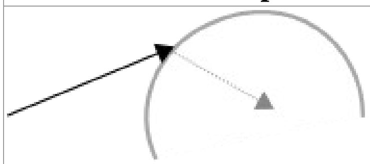
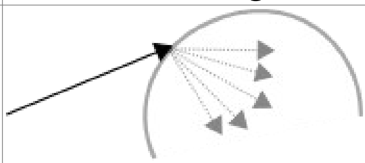
Color input
: Color of the surface, or physically speaking, the probability that light is transmitted for each wavelength.

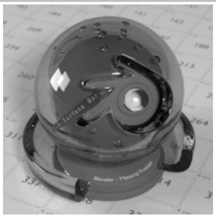
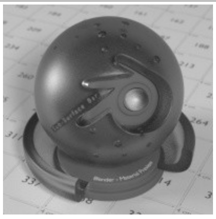
Roughness input
: Influences sharpness of the refraction; perfectly sharp at 0.0 and smoother with higher values.

IOR input
: Index of refraction defining how much the ray changes direction. At 1. 0 rays pass straight through like transparent; higher values give more refraction.

Normal input
: Normal used for shading; if nothing is connected the default shading normal is used.

BSDF output
: Glass BSDF shader.

Sharp Glass	Rough Glass
	

Sharp Glass	Rough Glass
	

Refraction

Glossy refraction with sharp or microfacet distribution, used for materials that transmit light. For best results this node should be considered as a building block and not be used on its own, but rather mixed with a glossy node using a fresnel factor. Otherwise it will give quite dark results at the edges for glossy refraction.

Distribution
: Microfacet distribution to use. *Sharp* results in perfectly sharp refractions, while *Beckmann* and *GGX* can use the *Roughness* input for blurry refractions.

Color input
: Color of the surface, or physically speaking, the probability that light is refracted for each wavelength.

Roughness input
: Influences sharpness of the refraction; perfectly sharp at 0.0 and smoother with higher values.

Normal input
: Normal used for shading; if nothing is connected the default shading normal is used.

BSDF output
: Glossy BSDF shader.

Refraction Shader.

Velvet

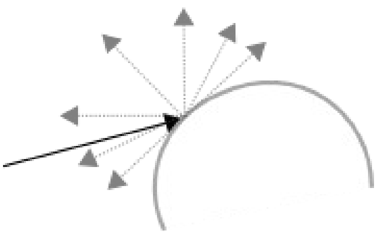
Velvet reflection shader for materials such as cloth. It is meant to be used together with other shaders (such as a *Diffuse Shader*) and isn’t particularly useful on it’s own.

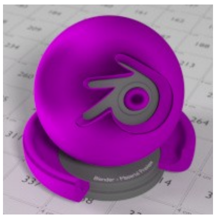
Color input
: Color of the surface, or physically speaking, the probability that light is reflected for each wavelength.

Sigma input
: Variance of the normal distribution, controlling the sharpness of the peak - can be thought of as a kind of *roughness*.

Normal input
: Normal used for shading; if nothing is connected the default shading normal is used.

BSDF output
: Velvet BSDF shader.





The Velvet Shader

Subsurface Scattering

Simple subsurface multiple scattering, for materials such as skin, wax, marble, milk and others. For these materials, rather than light being reflect directly off the surface, it will penetrate the surface and bounce around internally before getting absorbed or leaving the surface at a nearby point.

How far the color scatters on average can be configured per RGB color channel. For example, for skin, red colors scatter further, which gives distinctive red-colored shadows, and a soft appearance.

Falloff
: Lighting distance falloff function. **Cubic** is a sharp falloff useful for many simple materials. The function is $(radius - x)^3$ **Gaussian** gives a smoother falloff following a normal distribution, which is particularly useful for more advanced materials that use measured data that was fitted to one or more such Gaussian functions. The function is $e^{-8x2/radius2}$, such that the radius roughly matches the maximum falloff distance. To match a given measured variance v, set radius = sqrt(16*v).

Color input
: Color of the surface, or physically speaking, the probability that light is reflected for each wavelength.

Scale input
: Global scale factor for the scattering radius.

Radius input
: Scattering radius for each RGB color channel, the maximum distance that light can scatter.

Sharpness input
: Used only with **Cubic** falloff. Values increasing from 0 to 1 prevents softening of sharp edges and reduces unwanted darkening.

Normal input
: Normal used for shading; if nothing is connected the default shading normal is used.

Texture Blur input
: How much of the texture will be blurred along with the lighting, mixing the texture at the incoming and outgoing points on the surface. Note that the right choice depends on the texture. Consider for example a texture created from a photograph of skin, in this cases the colors will already be pre-blurred and texture blur could be set to 0. Even for hand painted textures no or minimal blurring might be appropriate, as a texture artist would likely paint in softening already, one would usually not even know what an unblurred skin texture looks like, we always see it blurred. For a procedural texture on the other hand this option would likely have a higher value.

BSSRDF output
: BSSRDF shader.

A skin-toned SSS shader with color radius: 1.0, 0.8, 0.5.

Emission

Lambertian emission, to be used for material and lamp surface outputs.

Color input
: Color of the emitted light.

Strength input
: Strength of the emitted light. For point and area lamps, the unit is Watts. For materials, a value of 1.0 will ensure that the object in the image has the exact same color as the Color input, i.e. make it ‘shadeless’.

Emission output
: Emission shader.

 Emission shader, with strength at 1.0	 Emission shader, with strength at 3.0

Cycles uses a physically correct light falloff by default, whereas Bforartists Internal uses a smoothed falloff with a Distance parameter. A similar effect can be found by using the Light Falloff node with the Smooth parameter.

Lamp strength for point, spot and area lamps is specified in Watts. This means you typically need higher values than Bforartists Internal, as you couldn’t use a 1W lamp to light a room; you need something stronger like a 100W lamp.

Sun lamps are specified in Watts/m^2, which require much smaller values like 1 W/m^2. This can be confusing, but specifying strength in Watts wouldn’t have been convenient; the real sun for example has strength 384600000000000000000000000W. Emission shaders on meshes are also in Watts/m^2.

Background

Background light emission. This node should only be used for the world surface output; it is ignored in other cases.

Color input
: Color of the emitted light.

Strength input
: Strength of the emitted light.

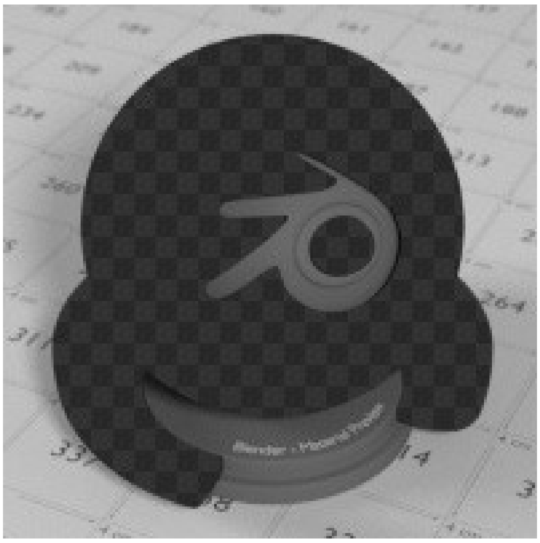
Background output
: Background shader.

Holdout

The holdout shader creates a “hole” in the image with zero alpha transparency, which is useful for compositing (see alpha channel).

Note that the holdout shader can only create alpha when Properties ‣ Render ‣ Film ‣ Transparent is enabled. If it’s disabled, the holdout shader will be black.

Holdout output
    Holdout shader.



The checkered area is a region with zero alpha.

Ambient Occlusion

The ambient occlusion node gives per-material control for the amount of AO. When AO is enabled in the world, it affects all diffuse BSDFs in the scene. With this option it’s possible to let only some materials be affected by AO, or to let it influence some materials more or less than others.

Color input
    surface reflection color.

AO output
    Ambient Occlusion shader.

White AO shader.

Mix and Add

Mix or add shaders together. Mixing can be used for material layering, where the *Fac* input may, for example, be connected to a Blend Weight node.

Shader inputs
Shaders to mix, such that incoming rays hit either with the specified probability in the *Fac* socket.
Fac input
Blend weight to use for mixing two shaders; at zero it uses the first shader entirely and at one the second shader.
Shader output
Mixed shader.

A mix of a glossy and a diffuse shader makes a nice ceramic material.

Texture Nodes

Image Texture

Image texture from GoodTextures.com

Use an image file as a texture.

Image Data-Block
Image data-block used as the image source. Currently not all images supported by Bforartists can be used by Cycles. In particular, generated, packed images or animations are not supported currently.
Projection

Projection to use for mapping the textures.

- *Flat* will use the XY coordinates for mapping.
- *Box* will map the image to the 6 sides of a virtual box, based on the normal, using XY, YZ and XYZ coordinates depending on the side.
- *Sphere* will map the image to the sphere using Z axis as central.
- *Tube* will map the tube to the sphere using Z axis as central.

Projection Blend
For Box mapping, the amount to blend between sides of the box, to get rid of sharp transitions between

the different sides. Blending is useful to map a procedural-like image texture pattern seamlessly on a model. 0.0 gives no blending; higher values give a smoother transition.

Color Space

Type of data that the image contains, either Color or Non-Color Data. For most color textures the default of Color should be used, but in case of e.g. a bump or alpha map, the pixel values should be interpreted as Non-Color Data, to avoid doing any unwanted color space conversions.

Extension Type

Extension type defines how the image is extrapolated past the original bounds:

- *Repeat* will repeat the image horizontally and vertically giving tiled-looking result.
- *Extend* will extend the image by repeating pixels on it’s edges.
- *Clip* will set all the extended pixels values to transparent black.

Vector input

Texture coordinate for texture lookup. If this socket is left unconnected, UV coordinates from the active UV render layer are used.

Color output

RGB color from image. If the image has alpha, the color is premultiplied with alpha if the Alpha output is used, and unpremultiplied or straight if the Alpha output is not used.

Alpha output

Alpha channel from image.

Environment Texture

HDR image from OpenFootage.net

Use an environment map image file as a texture. The environment map is expected to be in Latitude/Longitude or ‘latlong’ format.

Image Data-Block

Image data-block used as the image source. Currently not all images supported by Bforartists can be used by Cycles. In particular, generated, packed images or animations are not supported currently.

Color Space

Type of data that the image contains, either Color or Non-Color Data. For most color textures the default of Color should be used, but in case of e.g. a bump or alpha map, the pixel values should be interpreted as Non-Color Data, to avoid doing any unwanted color space conversions.

Vector input

Texture coordinate for texture lookup. If this socket is left unconnected, the image is mapped as environment with the Z axis as up.

Color output

RGB color from the image. If the image has alpha, the color is premultiplied with alpha if the Alpha output is used, and unpremultiplied if the Alpha output is not used.

Alpha output
Alpha channel from image.

Sky Texture

Sky Texture

Procedural Sky texture.

Sky Type
Sky model to use (Preetham or Hosek / Wilkie).

Sun Direction
Sun direction vector.

Turbidity
Atmospheric turbidity. (2: Arctic like, 3: clear sky, 6: warm/moist day, 10: hazy day)

Ground Albedo
Amount of light reflected from the planet surface back into the atmosphere. (RGB 0,0,0 is black, 1,1,1 is white).

Vector
Texture coordinate to sample texture at; defaults to Generated texture coordinates if the socket is left unconnected.

Color output
Texture color output.

Noise Texture

Noise Texture with high detail

Procedural Perlin noise texture, similar to the Clouds texture in Bforartists Internal.

Vector input
: Texture coordinate to sample texture at; defaults to Generated texture coordinates if the socket is left unconnected.

Scale input
: Overall texture scale.

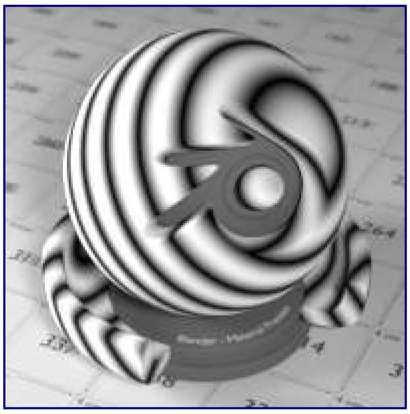
Detail input
: Amount of noise detail.

Distortion input
: Amount of distortion.

Color output
: Texture color output.

Fac output
: Texture intensity output.

Wave Texture



Default wave texture

Procedural bands or rings texture with noise distortion.

Type
: *Bands* or *Rings* shaped waves.

Vector input
: Texture coordinate to sample texture at; defaults to Generated texture coordinates if the socket is left unconnected.

Scale input
: Overall texture scale.

Distortion input
: Amount of distortion of the wave (similar to the Marble texture in Bforartists Internal).

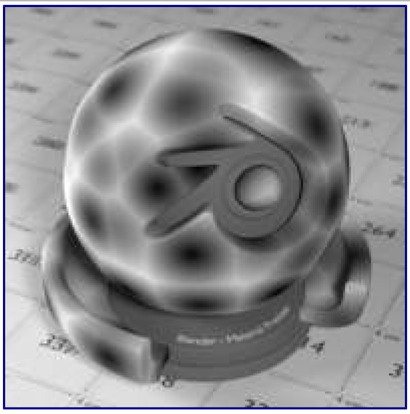
Detail input
: Amount of distortion noise detail.

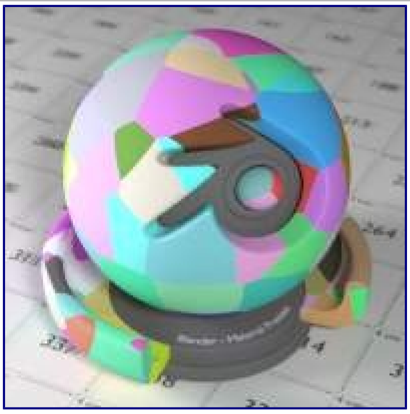
Detail Scale input
: Scale of distortion noise.

Color output
: Texture color output.

Fac output
: Texture intensity output.

Voronoi Texture


Voronoi texture, type: Intensity


Voronoi texture, type: Cells

Procedural texture producing Voronoi cells.

Type
: *Intensity* or *Cells* output.

Vector input
: Texture coordinate to sample texture at; defaults to Generated texture coordinates if the socket is left unconnected.

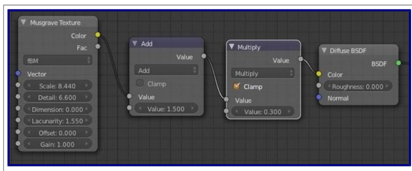
Scale input
: Overall texture scale.

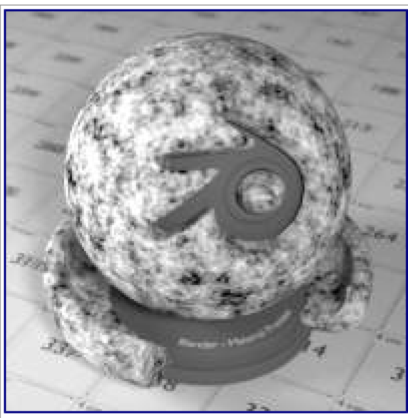
Color output
: Texture color output.

Fac output
: Texture intensity output.

Musgrave Texture

Advanced procedural noise texture. Note that it often needs some adjustments (multiplication and addition) in order to see more detail.


Nodes for the image to the right


Remapped Musgrave texture such that most values are visible

Type
: Multifractal, Ridged Multifractal, Hybrid Multifractal, fBM, Hetero Terrain.

Vector input
: Texture coordinate to sample texture at; defaults to Generated texture coordinates if the socket is left unconnected.

Scale input
: Overall texture scale.

Detail input
: Amount of noise detail.

Dimension input
: The highest fractal dimension, specified as the highest scale for the steps of the intensity.

Lacunarity input
: The space of the lacunarity, specified as a frequency factor.

Offset input
: The offset of the fractal, specified between black and white values (Intensity)

Gain input
: A multiplier for the gain input

Color output
: Texture color output.

Fac output
: Texture intensity output.

Gradient Texture

Gradient texture using object coordinates

A gradient texture.

Type
: The gradient can be *Linear*, *Quadratic*, *Easing*, *Diagonal*, *Spherical*, *Quadratic Sphere* or *Radial*.

Vector input
: Texture coordinate to sample texture at; defaults to Generated texture coordinates if the socket is left unconnected.

Color output
: Texture color output.

Fac output
: Texture intensity output.

Magic Texture

Magic texture: Depth 10, Distortion 2.0

Psychedelic color texture.

Depth
: Number of iterations.

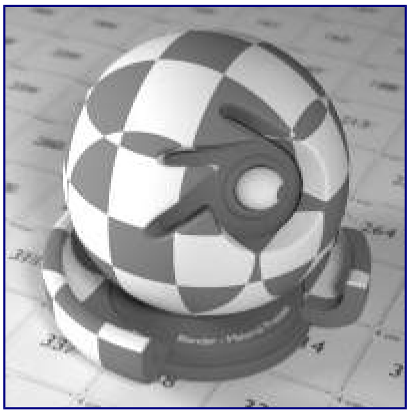
Vector input
: Texture coordinate to sample texture at; defaults to Generated texture coordinates if the socket is left unconnected.

Distortion input
: Amount of distortion.

Color output
: Texture color output.

Fac output
: Texture intensity output.

Checker Texture



Default Checker texture

Checkerboard texture.

Vector input
: Texture coordinate to sample texture at; defaults to Generated texture coordinates if the socket is left unconnected.

Color1/2 input
: Color of the checkers.

Scale input

Overall texture scale. The scale is a factor of the bounding box of the face divided by the scale. For example, a scale of 15 will result in 15 alternate patterns over the overall UV bounding box. Different patterns could be achieved using other nodes to give different input patterns to this socket. For example, using the Math Node.

Color output

Texture color output.

Fac output

Checker 1 mask (1 = Checker 1).

Brick Texture

Brick texture: Colors changed, Squash 0.62, Squash Frequency 3.

Procedural texture producing Bricks.

Options

Offset

Determines the brick offset of the various rows.

Frequency

Determines the offset frequency. A value of 2 gives a even/uneven pattern of rows.

Squash

Amount of brick squashing.

Frequency

Brick squashing frequency.

Sockets

Color 1/2 and Mortar

Color of the bricks and mortar.

Scale

Overall texture scale.

Mortar Size

The Mortar size; 0 means no Mortar.

Bias

The color variation between Brick color 1 / 2. Values of -1 and 1 only use one of the two colors; values in between mix the colors.

Brick Width

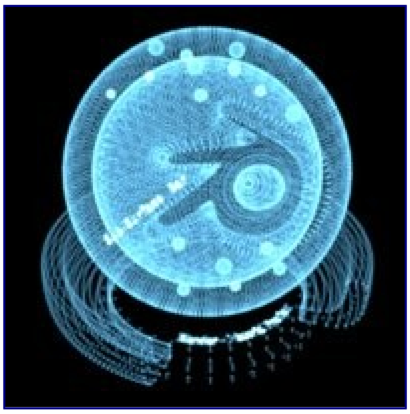
The width of the bricks.

Row Height

The height of the brick rows.

Color output
Texture color output.
Fac output
Mortar mask (1 = mortar).

Point Density



Domain object with Point Density texture using vertices from ball as points.

Used to add volumetric points for each particle or vertex of another object.

Options

Point Data

Where to get points from.

Particle System
Use each particle position from the specified particle system.
Object Vertices
Use each vertex position from the specified object.

Object
Which object’s vertices or particle system will be used.
Particle System
Particle positions from this system will be used.
Space

The coordinate system for mapping points.

World Space
Map each point exactly where the source particle/vertex is.
Object Space
Fit the points from the source particles/vertices inside the bounding box of the object with the point density texture. .. TODO As far as I can tell this is how it works, but should be checked with a developer.

Radius
Radius from the shaded sample to look for points within. .. TODO Same as tooltip, this does not make much sense to me.
Interpolation

Texel filtering type.

Closest
No interpolation, use nearest texel. Produces blocky looking points.
Linear
Interpolate linearly between texels, producing soft, round points.
Cubic
Use cubic falloff, producing very soft points. Useful when points are very densely packed.

Resolution
The dimensions of the texture holding the point data.

Color Source
Which attribute of the particle system is used to color the output.

Sockets

Vector
Texture coordinate to sample texture at; defaults to global position (Position output of Geometry node) if the socket is left unconnected.

Color output
Texture color output.

Density output
Density of volume.

More Nodes

Value

Input a scalar value.

Value
Value output.

RGB

Input an RGB color.

Color
RGB color output.

Geometry

Geometric information about the current shading point. All vector coordinates are in *World Space*. For volume shaders, only the position and incoming vector are available.

Position
Position of the shading point.

Normal
Shading normal at the surface (includes smooth normals and bump mapping).

Tangent
Tangent at the surface.

True Normal

Geometry or flat normal of the surface.

Incoming

Vector pointing towards the point the shading point is being viewed from.

Parametric

Parametric coordinates of the shading point on the surface.

Backfacing

1.0 if the face is being viewed from the backside, 0.0 for the frontside.

Wireframe

Node for a wireframe shader (Triangles only for now).

Pixel Size

Use screen pixel size instead of world units.

Size

Controls the thickness of the wireframe.

Fac output

1.0 if shading is executed on an edge, 0.0 otherwise.

Wavelength

A wavelength to rgb converter.

Wavelength

The color wavelength from 380 to 780 nanometers.

Color

RGB color output.

Blackbody

A blackbody temperature to RGB converter.

Temperature

The temperature in Kelvin.

Color

RGB color output.

Texture Coordinates

Commonly used texture coordinates, typically used as inputs for the *Vector* input for texture nodes.

Generated

Automatically-generated texture coordinates from the vertex positions of the mesh without deformation, keeping them sticking to the surface under animation. Range from 0.0 to 1. 0 over the bounding box of the undeformed mesh.

Normal

Object space normal, for texturing objects with the texture staying fixed on the object as it transformed.

UV

UV texture coordinates from the active render UV layer.

Object

Position coordinate in object space.

Camera

Position coordinate in camera space.

Window

Location of shading point on the screen, ranging from 0.0 to 1. 0 from the left to right side and bottom to top of the render.

Reflection

Vector in the direction of a sharp reflection, typically used for environment maps.

Bump

Generate a perturbed normal from a height texture, for bump mapping. The height value will be sampled at the shading point and two nearby points on the surface to determine the local direction of the normal.

Invert

Invert the bump mapping, to displace into the surface instead of out.

Strength Input

Strength of the bump mapping effect, interpolating between no bump mapping and full bump mapping.

Distance Input

Multiplier for the height value to control the overall distance for bump mapping.

Height Input

Scalar value giving the height offset from the surface at the shading point; this is where you plug in textures.

Vector Transform

Allows converting a Vector, Point or Normal between World <=> Camera <=> Object coordinate space.

Type

Specifies the input/output type: Vector, Point or Normal.

Convert From

Coordinate Space to convert from: World, Object or Camera.

Convert To

Coordinate Space to convert to: World, Object or Camera.

Vector Input

The input vector.

Vector Output

The transformed output vector.

Tangent

Generate a tangent direction for the Anisotropic BSDF.

Direction Type

The tangent direction can be derived from a cylindrical projection around the X, Y or Z axis (Radial), or from a manually created UV Map for full control.

Tangent Output

The tangent direction vector.

Normal Map

Generate a perturbed normal from an RGB normal map image. This is usually chained with an Image Texture node in the color input, to specify the normal map image. For tangent space normal maps, the UV coordinates for the image must match, and the image texture should be set to Non-Color mode to give correct results.

Space
The input RGB color can be in one of 3 spaces: Tangent, Object and World space. Tangent space normal maps are the most common, as they support object transformation and mesh deformations. Object space normal maps keep sticking to the surface under object transformations, while World normal maps do not.

UV Map
Name of the UV map to derive normal mapping tangents from. When chained with an Image Texture node, this UV map should be the same as the UV map used to map the texture.

Strength
Strength of the normal mapping effect.

Color Input
RGB color that encodes the normal in the specified space.

Normal Output
Normal that can be used as an input to BSDF nodes.

Object Info

Information about the object instance. This can be useful to give some variation to a single material assigned to multiple instances, either manually controlled through the object index, based on the object location, or randomized for each instance. For example a Noise texture can give random colors or a Color ramp can give a range of colors to be randomly picked from.

Note that this node only works for material shading nodes; it does nothing for lamp and world shading nodes.

Location
Location of the object in world space.

Object Index
Object pass index, same as in the Object Index pass.transformed.

Material Index
Material pass index, same as in the Material Index pass.

Random
Random number between 0 and 1 unique to a single object instance.

Particle Info

For objects instanced from a particle system, this node give access to the data of the particle that spawned the instance. This node currently only supports parent particles, info from child particles is not available.

Index
Index number of the particle (from 0 to number of particles).

Age
Age of the particle in frames.

Lifetime
Total lifespan of the particle in frames.

Location
Location of the particle.

Size
Size of the particle.

Velocity
Velocity of the particle.

Angular Velocity

Angular velocity of the particle.

Hair Info

This node gives access to strand information.

Is strand
Returns 1 when the shader is acting on a strand, otherwise 0.
Intersect
The point along the strand where the ray hits the strand (1 at the tip and 0 at the root).
Thickness
The thickness of the strand at the point where the ray hits the strand.
Tangent Normal
Tangent normal of the strand.

Attribute

Retrieve attribute attached to the object or mesh. Currently UV maps and vertex color layers can be retrieved this way by their names, with layers and attributes planned to be added. Also internal attributes like *P* (position), *N* (normal), *Ng* (geometric normal) may be accessed this way, although there are more convenient nodes for this.

Name
Name of the attribute.
Color output
RGB color interpolated from the attribute.
Vector output
XYZ vector interpolated from the attribute.
Fac output
Scalar value interpolated from the attribute.

Mapping

Transform a coordinate; typically used for modifying texture coordinates.

Location
Vector translation.
Rotation
Rotation of the vector along XYZ axes.
Scale
Scale of the vector.
Vector input
Vector to be transformed.
Vector output
Transformed vector.

Layer Weight

Output weights typically used for layering shaders with the *Mix Shader* node.

Blend input

Blend between the first and second shader.

Fresnel output

Dielectric fresnel weight, useful for example to layer diffuse and glossy shaders to create a plastic material. This is like the *Fresnel* node, except that the input of this node is in the often more-convenient 0.0 to 1.0 range.

Facing output

Weight that blends from the first to the second shader as the surface goes from facing the viewer to viewing it at a grazing angle.

Fresnel

Dielectric fresnel, computing how much light is reflected off a layer, where the rest will be refracted through the layer. The resulting weight can be used for layering shaders with the *Mix Shader* node. It is dependent on the angle between the surface normal and the viewing direction.

The most common use is to mix between two BSDFs using it as a blending factor in a mix shader node. For a simple glass material you would mix between a glossy refraction and glossy reflection. At grazing angles more light will be reflected than refracted as happens in reality.

For a two-layered material with a diffuse base and a glossy coating, you can use the same setup, mixing between a diffuse and glossy BSDF. By using the fresnel as the blending factor you’re specifying that any light which is refracted through the glossy coating layer would hit the diffuse base and be reflected off that.

IOR input

Index of refraction of the material being entered.

Fresnel output

Fresnel weight, indicating the probability with which light will reflect off the layer rather than passing through.

Light Path

Node to find out for which kind of incoming ray the shader is being executed; particularly useful for non-physically based tricks. More information about the meaning of each type is in the *Light Paths* documentation.

Is Camera Ray output

1.0 if shading is executed for a camera ray, 0.0 otherwise.

Is Shadow Ray output

1.0 if shading is executed for a shadow ray, 0.0 otherwise.

Is Diffuse Ray output

1.0 if shading is executed for a diffuse ray, 0.0 otherwise.

Is Glossy Ray output

1.0 if shading is executed for a glossy ray, 0.0 otherwise.

Is Singular Ray output

1.0 if shading is executed for a singular ray, 0.0 otherwise.

Is Reflection Ray output

1.0 if shading is executed for a reflection ray, 0.0 otherwise.

Is Transmission Ray output

1.0 if shading is executed for a transmission ray, 0.0 otherwise.

Ray Length output

Distance travelled by the light ray from the last bounce or camera.

Ray Depth output

Returns the current light bounce.

Transparent Depth output

Returns the number of transparent surfaces passed through.

Light Falloff

Manipulate how light intensity decreases over distance. In reality light will always fall off quadratically; however it can be useful to manipulate as a non-physically based lighting trick. Note that using Linear or Constant falloff may cause more light to be introduced with every global illumination bounce, making the resulting image extremely bright if many bounces are used.

Strength input

Light strength before applying falloff modification.

Smooth input

Smooth intensity of light near light sources. This can avoid harsh highlights, and reduce global illumination noise. 0.0 corresponds to no smoothing; higher values smooth more. The maximum light strength will be strength/smooth.

Quadratic output

Quadratic light falloff; this will leave strength unmodified if smooth is 0.0 and corresponds to reality.

Linear output

Linear light falloff, giving a slower decrease in intensity over distance.

Constant output

Constant light falloff, where the distance to the light has no influence on its intensity.

Nodes shared with the Compositor

Some nodes are common with Composite nodes, their documentation can be found at their relevant pages rather than repeated here.

- *Brightness Contrast*
- *Separate RGB*
- *Combine RGB*
- *Separate HSV*
- *Combine HSV*
- *Gamma*
- *Hue Saturation Value*
- *Invert*
- *Math*
- *Mix RGB*
- *RGB Curves*
- *RGB to BW*
- *Vector Curve*

10.3.5 Render - Cycles Render Engine - World

World

Lighting with an HDR image

The world environment can emit light, ranging from a single solid color, physical sky model, to arbitrary textures.

Surface Shader

The surface shader defines the light emission from the environment into the scene. The world surface is rendered as if it is very distant from the scene, and as such there is no two-way interacting between objects in the scene and the environment, only light coming in. The only shader accepted is the Background node with a color input and strength factor for the intensity of the light.

Image Based Lighting

For image based lighting, use the Environment Texture node rather than the Image Texture node for correct mapping. This supports Equirectangular (also known as Lat/Long) for environment maps, and Mirror Ball mapping for converting photos of mirror balls to environment maps.

Volume Shader

A volume shader can be applied to the entirely world, filling the entire space.

Currently this is most useful for night time or other dark scenes, as the world surface shader or sun lamps will have no effect if a volume shader is used. This is because the world background is assumed to be infinitely far away, which is accurate enough for the sun for example. However for modeling effects such as fog or atmospheric scattering, it is not a good assumption that the volume fills the entire space, as most of the distance between the sun and the earth is empty space. For such effects it is be better to create a volume object surrounding the scene. The size of this object will determine how much light is scattered or absorbed.

Ambient Occlusion

Ambient occlusion is a lighting method based on how much a point on a surface is occluded by nearby surfaces. This is a trick that is not physically accurate, but it is useful to emphasize shapes of surfaces, or as a cheap way to get an effect that looks a bit like indirect lighting.

Factor
: The strength of the ambient occlusion; value 1.0 is like a white world shader.

Distance
: Distance from shading point to trace rays. A shorter distance emphasizes nearby features, while longer distances make it also take objects further away into account.

Lighting from ambient occlusion is only applied to diffuse reflection BSDFs; glossy or transmission BSDFs are not affected. Transparency of surfaces will be taken into account, i.e. a half-transparent surface will only half occlude.

An alternative method of using Ambient Occlusion on a per-shader basis is to use the Ambient Occlusion shader.

Sampling

Multiple Importance Sample
: Enabling this will sample the background texture such that lighter parts are favored, producing less noise in the render. It is almost always a good idea to enable this when using an image texture to light the scene, otherwise noise can take a very long time to converge.

Map Resolution
: Sets the resolution of the ‘Multiple Importance Sample’ map. Higher values may produce less noise when using high-res images, but will take up more memory and render slightly slower.

Below is a comparison between Multiple Importance Sample Off and On - both images rendered for 25 seconds (Off: 1500 samples, On: 1000 samples)

Multiple Importance Sample Off

Multiple Importance Sample On

For interior scenes, noise can be significantly reduce by setting up area lamps as *light portals*.

Without Light Portals

With Light Portals

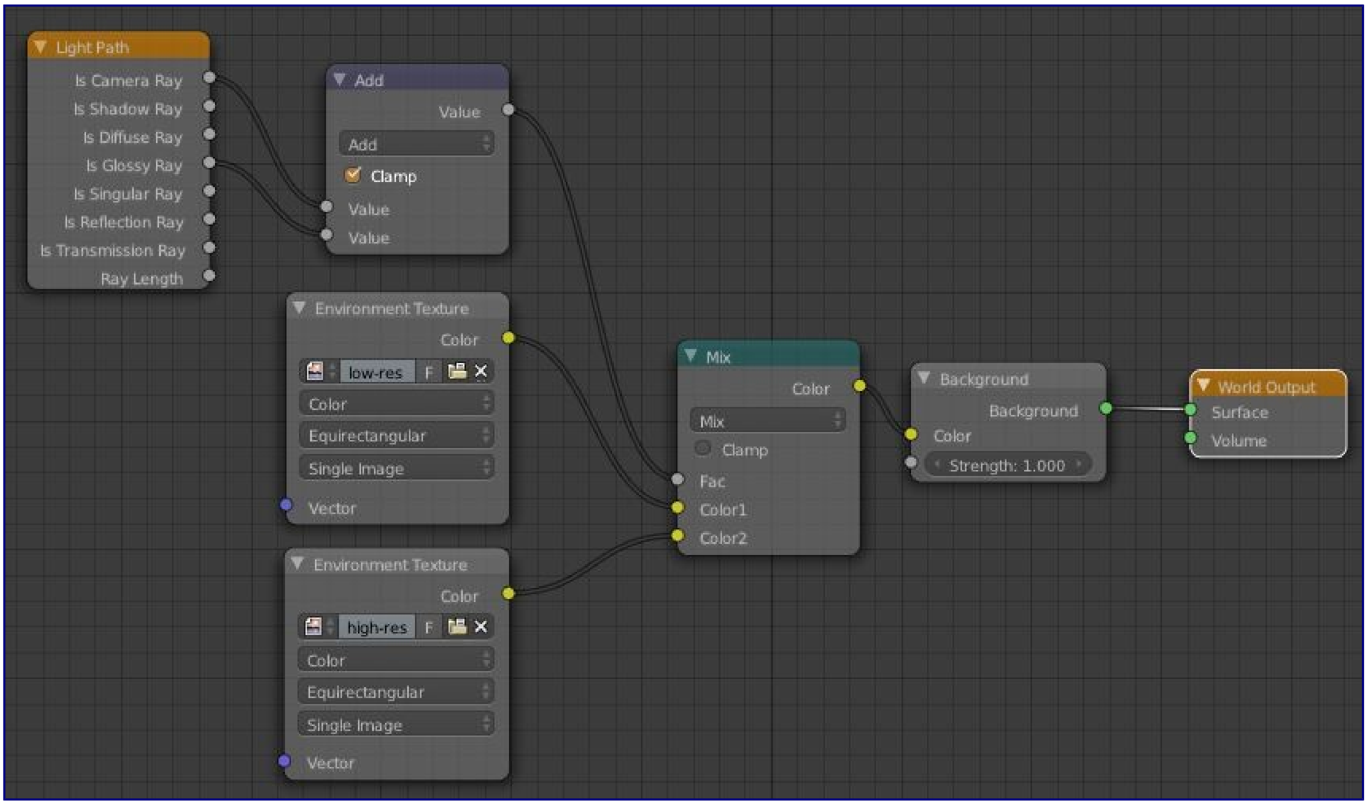
Ray Visibility

As with other objects, *Ray Visibility* allows you to control which other shaders can "see" the environment.

Tricks

Sometimes it may be useful to have a different background that is directly visible versus one that is indirectly lighting the objects. A simple solution to this is to add a Mix node, with the Blend Factor set to Is Camera Ray. The first input color is then the indirect color, and the second the directly visible color. This is useful when using a high-res image for the background and a low-res image for the actual lighting.

Similarly, adding the *Is Camera* and *Is Glossy* rays will mean that the high-res image will also be visible in reflections.



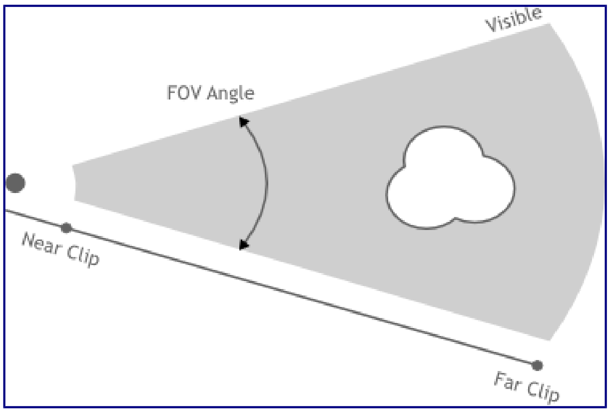
Nodes for the trick above

10.3.6 Render - Cycles Render Engine - Camera

Camera

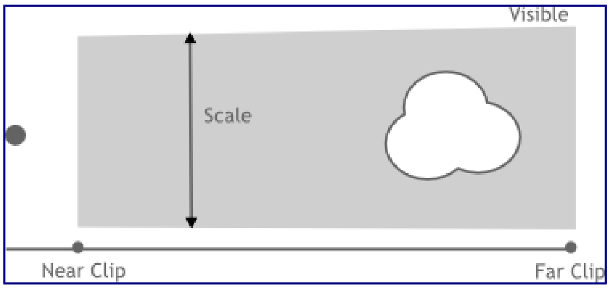
Perspective

Lens Size and Angle
Control the field of view angle.



Orthographic

Scale
Controls the size of objects projected on the image.



Panoramic

Cycles supports Equirectangular and Fisheye panoramic cameras. Note that these can’t be displayed with OpenGL rendering in the view-port; they will only work for rendering.

Equirectangular

Render a panoramic view of the scenes from the camera location and use an equirectangular projection, always rendering the full 360- over the X-axis and 180- over the Y-axis.

This projection is compatible with the environment texture as used for world shaders, so it can be used to render an environment map. To match the default mapping, set the camera object rotation to (90, 0, -90) or pointing along the positive X-axis. This corresponds to looking at the center of the image using the default environment texture mapping.

Fisheye

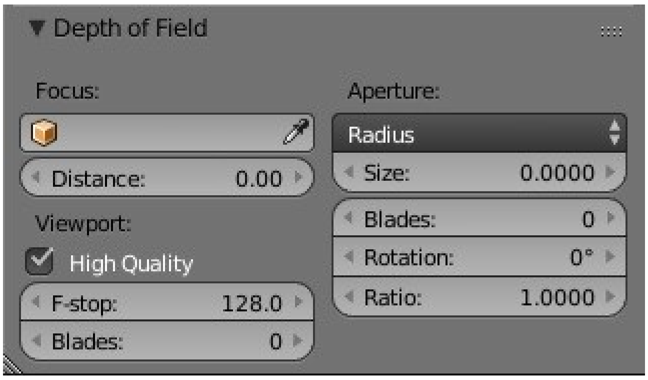
Fisheye lenses are typically wide angle lenses with strong distortion, useful for creating panoramic images for e.g. dome projection, or as an artistic effect. The *Fisheye Equisolid* lens will best match real cameras. It provides a lens focal length and field of view angle, and will also take the sensor dimensions into account.

The *Fisheye Equidistant* lens does not correspond to any real lens model; it will give a circular fish-eye that doesn’t take any sensor information into account but rather uses the whole sensor. This is a good lens for full dome projection.

Lens
: Lens focal length in millimeter.

Field of View
: Field of view angle, going to 360 and more to capture the whole environment.

Depth of Field



Focus
: Set an object to be used as a focal point by the camera, causing the camera to focus on the selected object.

Distance
: When an object is not used, the camera can be set to focus on an area in 3D space set by the distance from the camera. Using the *Limit* Display option, you are able to view the distance in the 3D space.

High Quality
: Enables the High Quality *view-port* depth of field, giving a more accurate representation of *depth of field*. This allows the view-port depth of field to be closely represented to that of the render and render preview depth of field.

F-Stop
: Viewport depth of field aperture measured in F-Stops. Smaller numbers will cause more blur in the view-port, OpenGL renders, and sequencer.

Blades
: The number of polygonal sides to give blurred objects in the view-port. The minimum number of blades

needed to enable the bokeh effect is 3 (triangle). *Only available with High Quality*

Aperture

Use F-Stop or Radius to set the aperture for the render, and render preview. F-Stop is the focal ratio, where Radius is the the raidus of the focal point.

Size/Number

Aperture radius *size*, or F-Stop *number* used for the render, and render preview. Using the F-Stop with a low number, or Radius with a large size will result in a strong blur, also allowing the use of the *bokeh effect*.

Blades

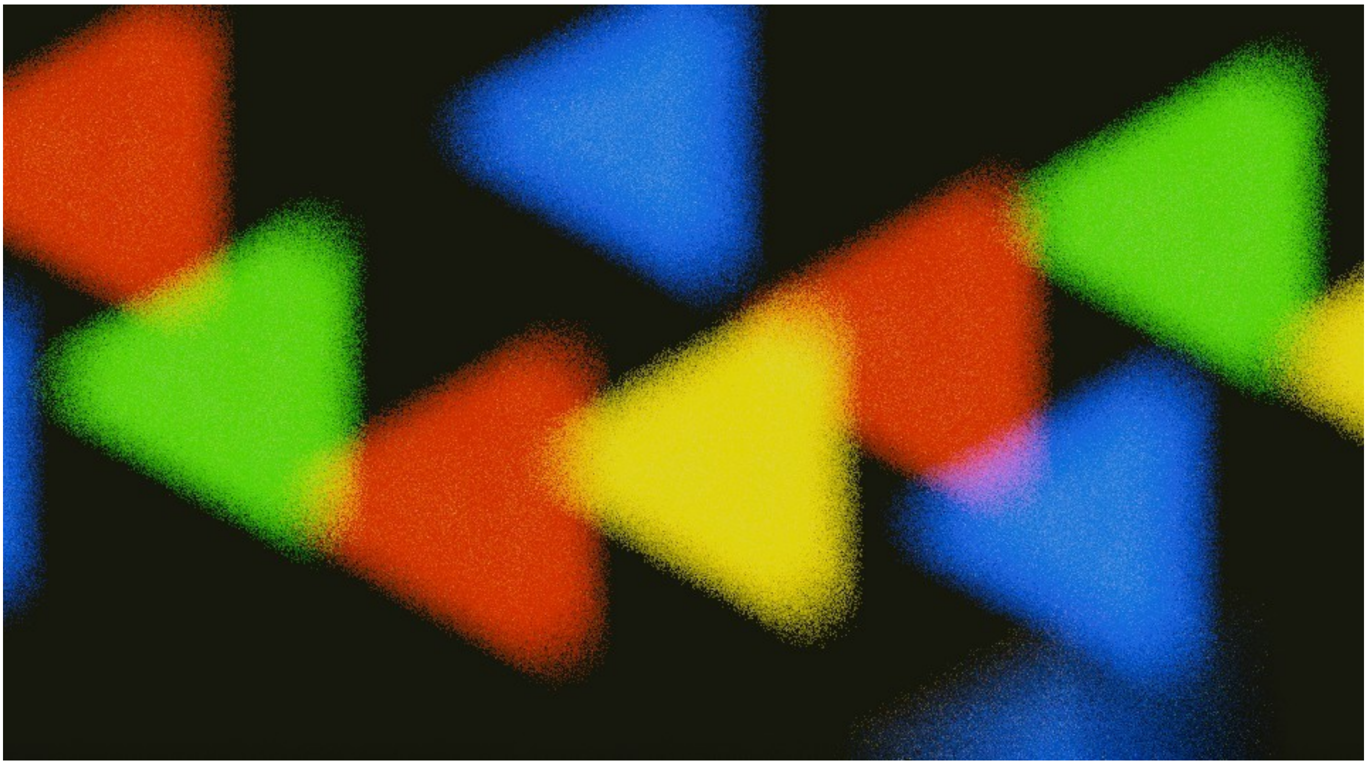
Total number of polygonal blades used to alter the shape of the blurred objects in the render, and render preview. As with the view-port, the minimum amount of blades to enable the bokeh effect is 3, resulting in a triangle shaped blur.

Rotation

Rotate the polygonal blades along the facing axis, and will rotate in a clockwise, and counter-clockwise fashion.

Ratio

Change the amount of distortion to simulate the anamorphic bokeh effect. A setting of 1.0 shows no distortion, where a number below 1.0 will cause a horizontal distortion, and a higher number will cause a vertical distortion.



Clipping

Clip Start and End

The interval in which objects are directly visible, Any objects outside this range still influence the image indirectly, as further light bounces are not clipped.

See also
Camera Clipping.

10.3.7 Render - Cycles Render Engine - Render Features

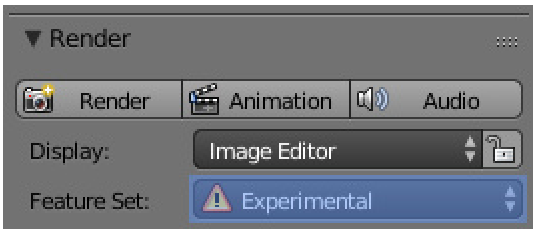
Features

This page offers a comparison of available features on CPU, CUDA and OpenCL.

Feature	CPU	CUDA (NVIDIA GPU)	OpenCL (AMD GPU)
Basic Shading	✔	✔	✔
Transparent Shadows	✔	✔	✗
Motion Blur	✔	✔	✔
Hair	✔	✔	✔
Volume	✔	✔	✗
Smoke / Fire	✔	✗	✗
Subsurface Scattering	✔	✔	✗
Open Shading Language	✔	✗	✗
CMJ sampling	✔	✔	✗
Branched Path integrator	✔	✔	✗
Displacement / Subdivision	✔ (experimental)	✔ (experimental)	✔ (experimental)

Experimental Features

Experimental features are disabled / hidden by default, but can be enabled by setting *Feature Set* to *Experimental* in the Render properties. They may not work properly, crash Bforartists or change their behaviour in later versions.

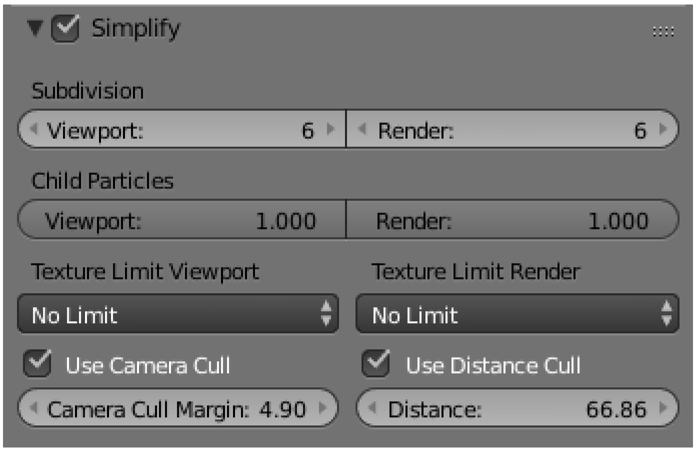


10.3.8 Render - Cycles Render Engine - Cycles Settings

Introduction

Simplify

Reference
Menu: Properties editor ‣ Scene ‣ Simplify



Texture Limit
: Automatically scales textures down textures so they are no larger than the values chosen. This can help large scenes that use huge textures to still fit into the computer's memory resources.

Use Camera Cull
: Automatically culls objects based on the camera frustum defined by the *Margin*.

Use Distance Cull
: Automatically culls objects based on their distance from the active camera. This is set via the *Distance* property.

Integrator

The integrator is the rendering algorithm used to compute the lighting. Cycles currently supports a path tracing integrator with direct light sampling. It works well for various lighting setups, but is not as suitable for caustics and some other complex lighting situations.

Rays are traced from the camera into the scene, bouncing around until they find a light source such as a lamp, an object emitting light, or the world background. To find lamps and surfaces emitting light, both indirect light sampling (letting the ray follow the surface BSDF) and direct light sampling (picking a light source and tracing a ray towards it) are used.

Sampling

Reference
Panel: Properties editor ‣ Render ‣ Sampling

Sample Method

There are two integrator modes that can be used: *Path Tracing* and *Branched Path Tracing*.

Square Samples

Square the amount samples.

Seed

Seed value for integrator to get different noise patterns.

Animate Seed (clock icon)

This button which can be found on the right side of the *Seed* value can be used to give different seed values. It is a good idea to enable this when making animation because in the real world each frame has a different noise pattern.

Clamp Direct

This option limits the maximum intensity a sample from rays which have not yet bounced can contribute to a pixel. It reduces noise at the cost of accuracy. Setting this option to 0.0 disables clamping altogether. Lower have a greater affect (dimmer samples) on the resulting image than higher values.

> **Note**
>
> A common issue encountered with *Path Tracing* is the occurrence of "fireflies": improbable samples that contribute very high values to pixels. This option provides a way to limit that. However, note that as you clamp out such values, other bright lights/reflections will be dimmed as well.
>
> Care must be taken when using this setting to find a balance between mitigating fireflies and losing intentionally bright parts. It is often useful to clamp indirect bounces separately, as they tend to cause more fireflies than direct bounces. See the *Clamp Indirect* setting.

Clamp Indirect

The same as *Clamp Direct*, but for rays which have bounced multiple times.

Light Sampling Threshold

Probabilistically terminates light samples when the light contribution is below this threshold (more noise but faster rendering). Zero disables the test and never ignores lights. This is useful because in large scenes with many light sources, some might only contribute a small amount to the final image, and increase render times. Using this setting can decease the render times needed to calculate the rays which in the end have very little affect on the image.

Pattern

Random sampling pattern used by the integrator.

Sobol

Uses a Sobol pattern to decide the random sapling pattern used by the integrator. See Sobol sequence on Wikipedia for more information.

Correlated Multi-Jitter

Uses a Correlated Multi-Jitter pattern to decide the random sapling pattern used by the integrator. See this Pixar paper for more information.

Layer Samples

When render layers have per layer number of samples set, this option specifies how to use them.

Use
: ToDo

Bounded
: Bound render layer samples by scene samples.

Ignore
: Ignore render layer sample settings.

Path Tracing

The *Path Tracing* integrator is a pure path tracer; at each hit it will bounce light in one direction and pick one light to receive lighting from. This makes each individual sample faster to compute, but will typically require more samples to clean up the noise.

Render Samples
: Number of paths to trace for each pixel in the final render. As more samples are taken, the solution becomes less noisy and more accurate.

Preview Samples
: Number of samples for viewport rendering.

Branched Path Tracing

The non-progressive Branched Path Tracing integrator offers finer control over sampling. It is similar to *Path Tracing*, but at the first hit it will split the path for different surface components and will take all lights into account for shading instead of just one.

This makes each sample slower, but will reduce noise, especially in scenes dominated by direct or one-bounce lighting. To get the same number of diffuse samples as in the path tracing integrator, note that e.g. 250 path tracing samples = 10 AA samples x 25 diffuse samples. The Sampling panel shows this total number of samples.

AA Render Samples
: Number of samples to take for each pixel in the final render. More samples will improve antialiasing.

AA Preview Samples
: Number of samples for viewport rendering.

Diffuse Samples
: Number of diffuse bounce samples to take for each AA sample.

Glossy Samples
: Number of glossy bounce samples to take for each AA sample.

Transmission Samples
: Number of transmission bounce samples to take for each AA sample.

AO Samples
: Number of ambient occlusion samples to take for each AA sample.

Mesh Light Samples
: Number of mesh light samples to take for each AA sample.

Subsurface Samples
: Number of subsurface scattering samples to take for each AA sample.

Volume Samples
: Number of volume scattering samples to take for each AA sample.

Sample All Direct Lights
: When enabled, Cycles will samples all lights in the scene for direct bounces, instead of randomly picking one. Disabling this can improve performance, when using a lot of AA Samples anyway, to clear up the render.

Sample All Indirect Lights
Similar to direct light, but for indirects lights. This can reduce noise in scenes with many lights.

Light Paths

Reference
Panel: Properties editor ‣ Render ‣ Light Paths

Bounces

Max Bounces
Maximum number of light bounces. For best quality, this should be set to the maximum. However, in practice, it may be good to set it to lower values for faster rendering. Setting it to maximum 0 bounces results in direct lighting only.

Min Bounces
Minimum number of light bounces for each path, after which the integrator uses Russian Roulette to terminate paths that contribute less to the image. Setting this higher gives less noise, but may also increase render time considerably. For a low number of bounces, it is strongly recommended to set this equal to the maximum number of bounces.

Diffuse Bounces
Maximum number of diffuse bounces.

Glossy Bounces
Maximum number of glossy bounces.

Transmission Bounces
Maximum number of transmission bounces.

Volume Bounces
Maximum number of volume scattering bounces.

Transparency

Transparency Max
Maximum number of transparency bounces.

Transparency Min
Minimum number of transparency bounces, after which Russian Roulette termination is used.

Transparent Shadows
For direct light sampling, use transparency of surfaces in between to produce shadows affected by transparency of those surfaces.

Caustics & Filter Glossy

Reflective Caustics
While in principle path tracing supports rendering of caustics with a sufficient number of samples, in practice it may be inefficient to the point that there is just too much noise. This option can be unchecked, to disable reflective caustics.

Refractive Caustics
The same as above, but for refractive caustics.

Filter Glossy

When using a value higher than 0.0, this will blur glossy reflections after blurry bounces, to reduce noise at the cost of accuracy. 1.0 is a good starting value to tweak.

Some light paths have a low probability of being found while contributing much light to the pixel. As a result these light paths will be found in some pixels and not in others, causing fireflies. An example of such a difficult path might be a small light that is causing a small specular highlight on a sharp glossy material, which we are seeing through a rough glossy material. In fact in such a case we practically have a caustic.

With path tracing it is difficult to find the specular highlight, but if we increase the roughness on the material, the highlight gets bigger and softer, and so easier to find. Often this blurring will hardly be noticeable, because we are seeing it through a blurry material anyway, but there are also cases where this will lead to a loss of detail in lighting.

Geometry

Reference
Panel: Properties editor ‣ Render ‣ Geometry

Volume Sampling

Step Size
Distance between volume shader samples when rendering the volume. Lower values give more accurate and detailed results but also increased render time.

Max Steps
Maximum number of steps through the volume before giving up, to protect from extremely long render times with big objects or small step sizes.

Subdivision Rate

These settings are used to control the True Displacement.

Note
These Options are only available if Experimental Feature Set is turned on.

Render
Size of micropolygons in pixels.

Preview
Size of micropolygons in pixels while preview rendering.

Max Subdivisions
Stop subdividing when this level is reached even if the dice rate would produce finer tessellation.

Hair

These are global settings that apply to all instances of hair systems. The resolution of the strands is controlled by the step values in particle settings. Each hair system uses the material identified in the particle settings in the same way as Blender Internal.

Use Hair

Enables rendering of hair particle systems.

Primitive

Triangles

Uses a triangle mesh.

Resolution

ToDo.

Line Segments

Uses a straight curve primitive.

Curve Segments

Uses a smooth Cardinal curve primitive. These interpolate a path through the curve keys. However, it renders slower than line segments.

Curve Subdivisions

The interpolated path is subdivided to give points to connect. The parameter subdivisions sets the number of divisions used.

Shape

Thick

Cylindrical segments between two points.

Cull back-faces

Excludes strands emitted from the mesh back facing the camera.

Ribbons

Are flat planes following the strand direction facing the camera.

Min Pixels

Strands that are further away will be made wider, which is compensated with transparency to keep the look similar. This effect is only applied for camera rays. It works best with ribbon primitives.

Light Paths

Ray Types

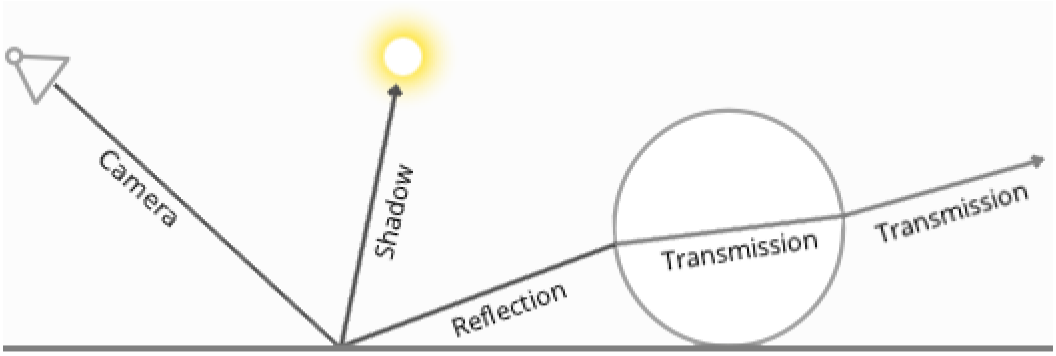
Ray types can be divided into four categories:

- Camera: the ray comes straight from the camera.
- Reflection: the ray is generated by a reflection off a surface.
- Transmission: the ray is generated by a transmission through a surface.
- Shadow: the ray is used for (transparent) shadows.

Reflection and transmission rays can further have these properties:

- Diffuse: the ray is generated by a diffuse reflection or transmission (translucency).
- Glossy: the ray is generated by a glossy specular reflection or transmission.
- Singular: the ray is generated by a perfectly sharp reflection or transmission.

The Light Path node can be used to find out the type of ray the shading is being computed for.



Bounce Control

The maximum number of light bounces can be controlled manually. While ideally this should be infinite, in practice a smaller number of bounces may be sufficient, or some light interactions may be intentionally left out for faster convergence. The number of diffuse reflection, glossy reflection and transmission bounces can also be controlled individually.

Light paths are terminated probabilistically when specifying a minimum number of light bounces lower than the maximum. In that case paths longer than minimum will be randomly stopped when they are expected to contribute less light to the image. This will still converge to the same image, but renders faster while possibly being noisier.

A common source of noise is caustics, which are diffuse bounces followed by a glossy bounce (assuming we start from the camera). An option is available to disable these entirely.

Transparency

The transparent BSDF shader is given special treatment. When a ray passes through it, light passes straight on, as if there was no geometry there. The ray type does not change when passing through a transparent BSDF.

Alpha pass output is also different for the transparent BSDF. Other transmission BSDFs are considered opaque, because they change the light direction. As such they cannot be used for alpha-over compositing, while this is possible with the transparent BSDF.

The maximum number of transparent bounces is controlled separately from other bounces. It is also possible to use probabilistic termination of transparent bounces, which might help rendering many layers of transparency.

Note that while semantically the ray passes through as if no geometry was hit, rendering performance is affected as each transparency step requires executing the shader and tracing a ray.

Ray Visibility

Objects can be set to be invisible to particular ray types:

- Camera
- Diffuse reflection
- Glossy reflection
- Transmission
- Shadow

Properties Editor Object ‣ Cycles Settings ‣ Ray visibility.

This can be used, for example, to make an emitting mesh invisible to camera rays. For duplicators, visibility is inherited; if the parent object is hidden for some ray types, the children will be hidden for these too.

In terms of performance, using these options is more efficient that using a shader node setup that achieves the same effect. Objects invisible to a certain ray will be skipped in ray traversal already, leading to fewer rays cast and shaders executed.

Motion Blur & Film

Motion Blur

Reference
Panel: Properties editor ‣ Render ‣ Motion Blur

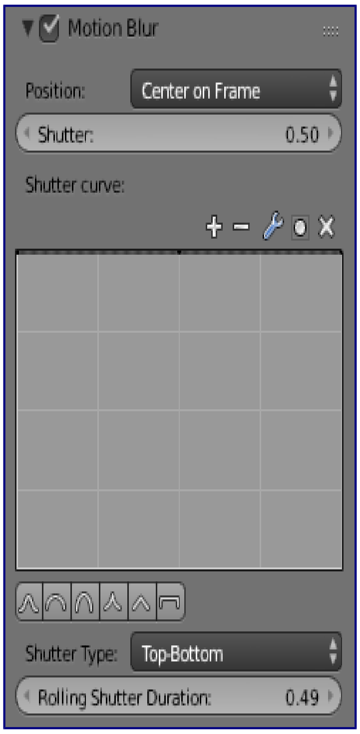
Blender’s animations are by default rendered as a sequence of *perfectly still* images. While great for stop-motion and time-lapses, this is unrealistic, since fast-moving objects do appear to be blurred in the direction of motion, both in a movie frame and in a photograph from a real-world camera.

Cycles Motion Blur Example.

Note

If there are particles or other physics system in a scene, be sure to bake them before rendering, otherwise you might not get correct or consistent motion.

Options



Cycles Motion Blur Settings.

Position

Controls at what point the shutter opens in relation to the frame.

- End on frame
- Center on frame
- Start on frame

Shutter Speed
: Time between frames over which motion blur is computed. Shutter time 1.0 blurs over the length of 1 frame, 2.0 over the length of two frames, from the previous to the next.

Shutter Curve
: Curve defining how the shutter opens and closes.

Shutter Type

Replicates CMOS cameras by rendering a rolling shutter effect using scanlines.

- Top Bottom: Renders rolling shutter from the top of the image to the bottom.

Rolling Shutter Duration
: Controls balance between pure rolling shutter effect and pure motion blur effect. With zero being no rolling shutter and one being all rolling shutter.

Warning

An object modifier setup that changes mesh topology over time will cause severe problems.

Common examples of this are animated Booleans, Deformation before Edge Split, Remesh, Skin or Decimate modifiers.

Each object has its own settings to control motion blur. These options can be found in the Object tab of the Properties editor.

Film

Reference
Panel: Properties editor ‣ Render ‣ Film

Exposure
This can be used to change the brightness of an image. Different then the *Exposure* option found in the Color management panel this exposure option works is *on the data* while the Color management exposure is *on the view*.

Transparent
ToDo

Pixel Filter

Blackman-Harris, Box, Gaussian

Width
ToDo.

Performance

Threads

Mode

Auto-detect
Automatically chooses the amount threads to match the number of logical processors on your computer.

Fixed
Manually choose the amount threads to use for rendering. This can be useful for example, if you want to use your computer while rendering you can set the property to a thread count lower the amount of logical processors on your computer.

Tiles

Tile Order
Order of rendering tiles. This does not significantly affect performance.

Tile size X/Y

The size of the tiles for rendering.

Depending on what device you are using for rendering, different tile sizes can give faster renders. For CPU rendering smaller tiles sizes (like 32 x 32) tend to be faster, while for GPU rendering larger tile sizes give better performance (like 256 x 256).

Progressive Refine

Instead of rendering each tile until it has finished every sample, refine the whole image progressively. Note that progressive rendering is slightly slower than tiled rendering, but time can be saved by manually stopping the render when the noise level is low enough.

For rendering animations it is best to disable this feature, as stopping a frame early is not possible.

Save Buffers
Saves all render layers and passes to the temp directory on a drive, and read them back after rendering has finished. This saves memory usage during rendering, particularly when using many render layers and passes.

Viewport

Viewport BVH Type
Dynamic BVH
Objects can be transformed, added and deleted interactively, at the cost of slower renders.
Static BVH
Object modifications require a complete BVH rebuild which reduces interactivity but renders faster.
Start Resolution
Resolution to start rendering preview at, progressively increase it to the full viewport size.

Final Render

Persistent Images
Keep image data in memory after rendering, for faster re-renders at the cost of extra memory usage when performing other tasks in Blender.

Acceleration Structure

Use Spatial Splits
Spatial splits improve rendering performance in scenes with a mix of large and small polygons. The downsides are longer BVH build times and slightly increased memory usage.
Use Hair BVH
Use a special type of BVH for rendering hair. The bounding boxes are not axis aligned allowing a spatially closer fit to the hair geometry. Disabling this option will reduce memory, at the cost of increasing hair render time.

Layers

Reference

Panel: Properties editor ‣ Render Layers ‣ Layer

This section covers only the Render Layer settings appropriate for the Blender Render engine. For the engine-independent settings, see this section.

Exclude
: Scene layers are shared between all render layers; however, sometimes it is useful to leave out some object influence for a particular render layer. That is what this option allows you to do.

Material
: Overrides all materials in the render layer.

Samples
: Render layer samples to override the scene samples. Controlled by the layer samples in the sampling panel.

Use Environment
: Disables rendering the *Environment* render pass in the final render.

Use AO
: Disables rendering the *Ambient Occlusion* render pass in the final render.

Use Surfaces
: Disables rendering object materials in the final render.

Use Hair
: Disables rendering hair strands in the final render.

Passes

Reference
Panel: Properties editor ‣ Render Layers ‣ Passes

Passes can be used to split rendered images into colors, direct and indirect light to edit them individually, and also to extract data such as depth or normals.

Lighting Passes

Diffuse Direct
: Direct lighting from diffuse BSDFs. We define direct lighting as coming from lamps, emitting surfaces, the background, or ambient occlusion after a single reflection or transmission off a surface. BSDF color is not included in this pass.

Diffuse Indirect
: Indirect lighting from diffuse BSDFs. We define indirect lighting as coming from lamps, emitting surfaces or the background after more than one reflection or transmission off a surface. BSDF color is not included in this pass.

Diffuse Color
: Color weights of diffuse BSDFs. These weights are the color input socket for BSDF nodes, modified by any Mix and Add Shader nodes.

Glossy Direct, Indirect, Color
: Same as above, but for glossy BSDFs.

Transmission Direct, Indirect, Color
: Same as above, but for transmission BSDFs.

Subsurface Direct, Indirect, Color
Same as above, but for subsurface BSDFs.

Emission
Emission from directly visible surfaces.

Environment
Emission from the directly visible background. When the film is set to transparent, this can be used to get the environment color and composite it back in.

Shadow
Shadows from lamp objects. Mostly useful for compositing objects with shadow into existing footage.

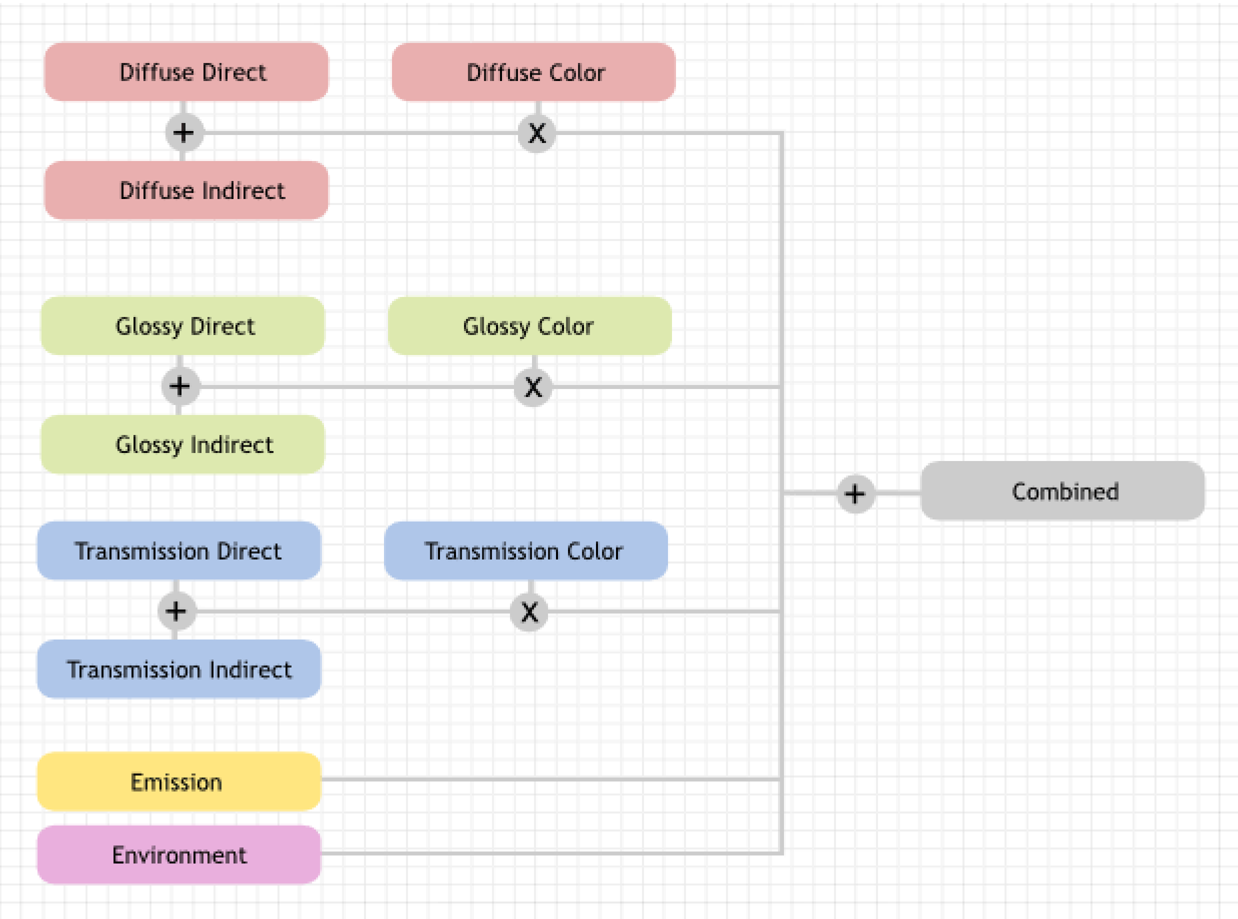
Ambient Occlusion
Ambient occlusion from directly visible surfaces. BSDF color or AO factor is not included; i.e. it gives a ‘normalized’ value between 0 and 1.

Note

Transparent BSDFs are given special treatment. A fully transparent surface is treated as if there is no surface there at all; a partially transparent surface is treated as if only part of the light rays can pass through. This means it is not included in the Transmission passes; for that a glass BSDF with index of refraction 1.0 can be used.

Combining

All these lighting passes can be combined to produce the final image as follows:



Data Passes

Combined
The final combination of render passes with everything included.

Z

Distance in BU to any visible surfaces.

Note

The Z pass only uses one sample. When depth values need to be blended in case of motion blur or DOF, use the mist pass.

Mist
Distance to visible surfaces, mapped to the 0.0-1.0 range. When enabled, settings are in World tab. This pass can be used in compositing to add fade out object that are further away.

Normal
Surface normal used for shading.

Vector
Motion vectors for the vector blur node. The four components consist of 2D vectors giving the motion towards the next and previous frame position in pixel space.

UV
Default render UV coordinates.

Object Index
Creates a mask of the object that can be later read by the ID Mask Node in the compositor.

Material Index
Creates a mask of the material that can be later read by the ID Mask Node in the compositor.

Note

The Z, Object Index and Material Index passes are not anti-aliased.

Alpha Threshold
Z, Index, normal, UV and vector passes are only affected by surfaces with alpha transparency equal to or higher than this threshold. With value 0.0 the first surface hit will always write to these passes, regardless of transparency. With higher values surfaces that are mostly transparent can be skipped until an opaque surface is encountered.

Denoising

Reference

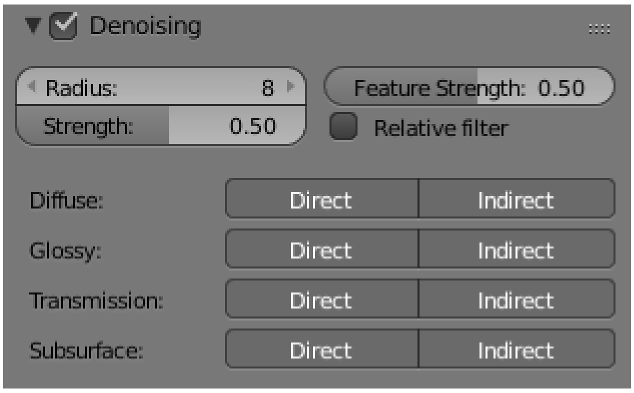
Panel: Properties editor ‣ Render Layers ‣ Denoising

Denoising filters the resulting image using information (known as feature passes) gathered during rendering to get rid of noise while preserving visual detail as well as possible.

To use the option, enable it in the render layers tab of the properties editor. On rendering, it will denoise tile by tile once all the surrounding tiles are finished rendering. The default settings fit a wide range of scenes, but the user can tweak individual settings to control the tradeoff between a noise-free image, image details, and calculation time.

See also
See the other ways to reduce noise on the general Noise Optimization page.

Options



Denoising panel.

Radius
: Size of the image area that's used to denoise a pixel. Higher values are smoother, but might lose detail and are slower.

Strength
: Controls how different the area around a neighbor pixel can look compared to the center pixel before it's no longer used for denoising. Lower values preserve more detail, but aren't as smooth.

Feature Strength
: Controls removal of noisy and redundant image feature passes before the actual denoising. This is required in some cases like DoF or Motion Blur to avoid splotchy results, but might cause fine texture/geometrical detail to be lost. Lower values preserve more detail, but aren't as smooth.

Relative Filter
: When removing features that don't carry information, decide which to keep based on the total amount of information in the features. This can help to reduce artifacts, but might cause detail loss around edges.

Passes
: You can choose to selectively choose which Render Passes you want to denoise.

Notes and issues

The denoiser will change in the future and some features are not implemented yet. If denoising fails to produce good results, more samples or clamping will often resolve the issue.

- Setting the radius too high is generally not advisable. It increases denoising time a lot and, while the result might be smoother, it is not more accurate since there isn't any additional info coming out of the renderer. Beyond a radius of ~15, the additional rendering time is probably better spent on increasing the amount of samples.

- Denoising cannot be used for baking yet.
- For animation denoising can be used, however it still requires high sample counts for good results. With low sample counts low frequency (blurry) noise can be visible in animation, even if it is not immediately apparent in still images.
- When using GPU rendering, the denoising process may use a significant amount of vRAM. If the GPU runs out of memory but renders fine without denoising, try reducing the tile size.

Examples

Below is an example render by The Pixelary.

	
Example render before denoising.	Example render after denoising.

Object Data

Motion Blur

Reference
Panel: Properties editor ‣ Object ‣ Motion Blur

Each object has its own motion blur settings along with the Scene Level Motion Blur These settings can be found in the Object Properties tab of the Properties editor.

Deformation
: Enables motion blur for deformed meshes such as animated characters, including hair.

Steps
: Controls accuracy of deformation motion blur, more steps gives more memory usage. The actual number of time steps is 2steps−1

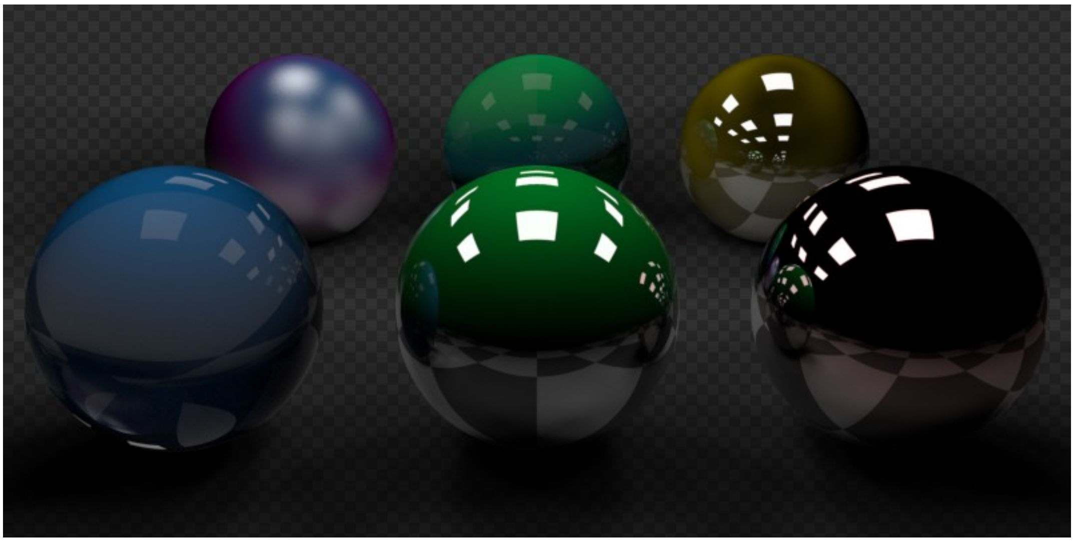
.

Cycles Settings

Ray Visibility

Camera
Makes the object visible in camera rays.
Diffuse
Makes the object visible in diffuse rays.
Glossy
Makes the object visible in glossy rays.
Transmission
Makes the object visible in transmission rays.
Volume Scatter
Makes the object visible in transmission rays.
Shadow
Enables the object to cast shadows.
Shadow Catcher

Enables the object to only receive shadow rays. It is to be noted that shadow catcher objects will interact with other CG objects via indirect light interaction. This feature makes it really easy to combine CGI elements into a real-life footage.



Example of the shadow catcher. Note how the material of the plane can still be viewed in the spheres.

Performance

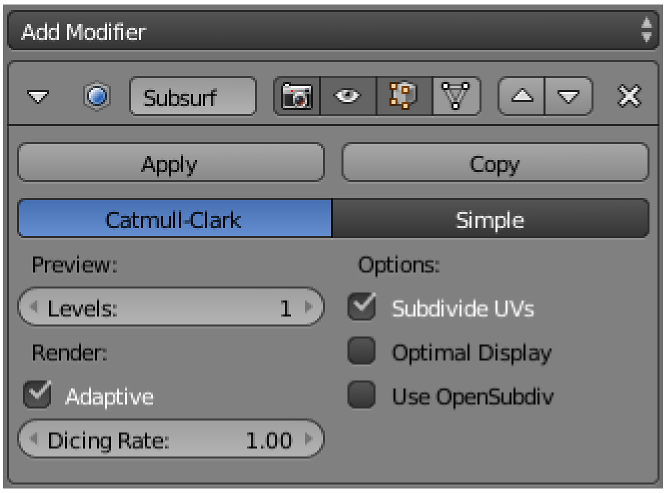
Use Camera Cull
TODO.
Use Distance Cull
TODO.

Adaptive Subdivision

Note

Implementation not finished yet, marked as an Experimental Feature Set

When using the *Experimental Feature Set* the Subdivision Surface Modifier gets changed to control the subdivision of a mesh at the time of rendering. For this, all the other settings are the same except the *View* and *Render* settings. These previously mentioned settings get removed/renamed and the following settings are added:



Subdivision Surface Modifier.

Preview

Levels

The levels of subdivision to see in the 3D View, this works the same as the *View* setting on the original *Subdivision Modifier*.

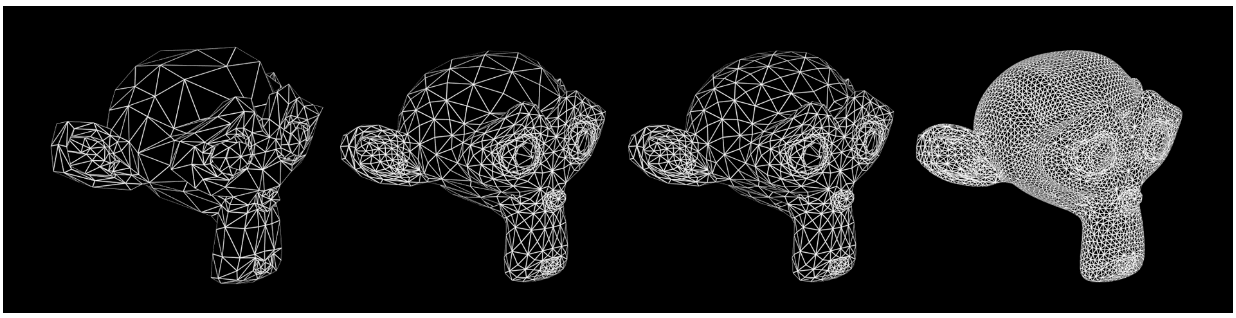
Render

Adaptive

Use OpenSubdiv to give different subdivision levels to near and far objects automatically. This allows nearer object to get more subdivisions and far objects to get less.

Dicing Rate

When using *Adaptive* the *Render Levels* property gets changed to *Dicing Rate*, this property is used to multiply the scene dicing rate.



Subdivision Off/On, Dicing Rate: 1.0 - 0.3 - 0.05 (Monkeys look identical in viewport, no modifiers).

Levels

The levels of subdivision to see in the final render, this works the same as the *Render* setting on the original *Subdivision Modifier*.

Known limitations

- Missing support for UV subdivision.
- Creases do not match Blender creases currently.
- Multi-user object data are currently made single users, leading to increased memory usage. For those it is better to use non-adaptive subdivision still.
- Multi-view renders can have some inconsistencies between views.
- Editing displacement shaders while using True Displacement does not update the viewport.

Warning

Particle instances, Group instances, Dupliverts and Dupligroups are not tessellated individually. Instead, the original object is tessellated and then duplicated on all instances. To take advantage of both adaptive subdivision and instancing you should place the original object at the position of the instance that is closest from the camera.

Hair Particles

These are extra settings for Hair Particles used by Cycles.

There are also scene level hair settings which can be found with the Geometry settings.

Hair Settings

The Cycles Hair Settings, under the particle tab, are used to control each hair particle system's strand properties.

Shape

A shape parameter that controls the transition in thickness between the root and tip. Negative values make the primitive rounded more towards the top, the value of zero gives makes the primitive linear, and positive values makes the primitive rounded more towards the bottom.

Thickness

Root

Multiplier of the hair width at the root.

Tip

Multiplier of the hair width at the tip.

Scaling

Multiplier for the *Root* and *Tip* values. This can be used to change the thickness of the hair.

Close tip

Sets the thickness at the tip to zero, even when using a non-zero tip multiplier.

Texture

ToDo

10.3.9 Render - Cycles Render Engine - GPU Rendering

GPU Rendering

Introduction

GPU rendering makes it possible to use your graphics card for rendering, instead of the CPU. This can speed up rendering, because modern GPUs are designed to do quite a lot of number crunching. On the other hand, they also have some limitations in rendering complex scenes, due to more limited memory, and issues with interactivity when using the same graphics card for display and rendering.

Cycles has two GPU rendering modes: **CUDA**, which is the preferred method for NVIDIA graphics cards; and **OpenCL**, which supports rendering on AMD graphics cards.

Configuration

To enable GPU rendering, go into the User Preferences, and under the System tab, select the Compute Device(s) to use. Next, for each scene, you can configure to use CPU or GPU rendering in the Render properties.

CUDA

NVIDIA CUDA is supported for GPU rendering with **NVIDIA graphics cards**. We support graphics cards starting from GTX 4xx (computing capability 2.0).

Cycles requires recent NVIDIA drivers to be installed, on all operating systems.

List of CUDA cards with shader model

OpenCL

OpenCL is supported for GPU rendering with **AMD graphics cards**. We only support graphics cards with GCN architecture (HD 7xxx and above). Not all HD 7xxx cards are GCN cards though, you can check if your card is here.

Cycles requires recent AMD drivers to be installed, on all operating systems.

Supported Features and Limitations

For an overview of supported features, check the comparison in the *Features*.

CUDA:
: The maximum amount of individual textures is limited to 95 byte-image textures (PNG, JPEG, ..) and 5 float-image textures (OpenEXR, 16 bit TIFF, ..) on GTX 4xx/5xx cards, and 145 byte-image textures and 5 float-image textures on GTX6xx cards and above.

OpenCL:
: No support for HDR (float) textures at the moment.

Frequently Asked Questions

Why is Bforartists unresponsive during rendering?

While a graphics card is rendering, it can not redraw the user interface, which makes Bforartists unresponsive. We attempt to avoid this problem by giving back control over the GPU as often as possible, but a completely smooth interaction can’t be guaranteed, especially on heavy scenes. This is a limitation of graphics cards for which no true solution exists, though we might be able to improve this somewhat in the future.

If possible, it is best to install more than one GPU, using one for display and the other(s) for rendering.

Why does a scene that renders on the CPU not render on the GPU?

There maybe be multiple causes, but the most common is that there is not enough memory on your graphics card. We can currently only render scenes that fit in graphics card memory, and this is usually smaller than that of the CPU. Note that, for example, 8k, 4k, 2k and 1k image textures take up respectively 256MB, 64MB, 16MB and 4MB of memory.

We do intend to add a system to support scenes bigger than GPU memory, but this will not be added soon.

Can I use multiple GPUs for rendering?

Yes, go to User Preferences > System > Compute Device Panel, and configure it as you desire.

Would multiple GPUs increase available memory?

No, each GPU can only access its own memory.

What renders faster, NVIDIA or AMD, CUDA or OpenCL?

Currently NVIDIA with CUDA is rendering faster. There is no fundamental reason why this should be so - we don’t use any CUDA - specific features - but the compiler appears to be more mature, and can better support big kernels. OpenCL support is still in an early stage and has not been optimized as much.

Error Messages

Unsupported GNU version! gcc 4.7 and up are not supported!

On Linux, depending on your GCC version you might get this error.

If so, delete the following line in `/usr/local/cuda/include/host_config.h`

```
#error -- unsupported GNU version! gcc 4.7 and up are not supported!
```

CUDA Error: Invalid kernel image

If you get this error on MS-Windows 64-bit, be sure to use the 64-bit build of Bforartists, not the 32-bit version.

CUDA Error: Out of memory

This usually means there is not enough memory to store the scene on the GPU. We can currently only render scenes that fit in graphics card memory, and this is usually smaller than that of the CPU. See above for more details.

The NVIDIA OpenGL driver lost connection with the display driver

If a GPU is used for both display and rendering, MS-Windows has a limit on the time the GPU can do render computations. If you have a particularly heavy scene, Cycles can take up too much GPU time. Reducing Tile Size in the Performance panel may alleviate the issue, but the only real solution is to use separate graphics cards for display and rendering.

Another solution can be to increase the timeout, although this will make the user interface less responsive when rendering heavy scenes. Learn More Here.

CUDA error: Unknown error in cuCtxSynchronize()

An unknown error can have many causes, but one possibility is that it’s a timeout. See the above answer for solutions.

10.3.10 Render - Cycles Render Engine - Render Baking

Open Shading Language

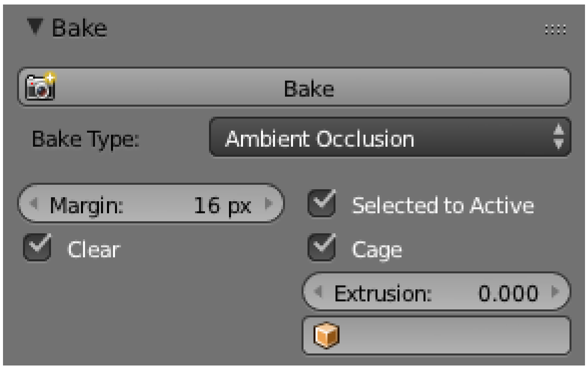
Render Baking

Refer to the Blender Render page for general baking guidelines

Cycles uses the render settings (samples, bounces, …) for baking. This way the quality of the baked textures should match the result you get from the rendered scene.

The baking happens into the respective active textures of the object materials. The active texture is the last selected Image Texture node of the material node tree. That means the active object (or the selected objects, when not baking ‘Selected to Active’) needs a material, and that material needs at least an Image Texture node, with the image to be used for the baking. Note, the node does not need to be connected to any other node. The active texture is what projection painting and the viewport use as a criteria to which image to use. This way after the baking is done you can automatically preview the baked result in the Texture mode.

Options

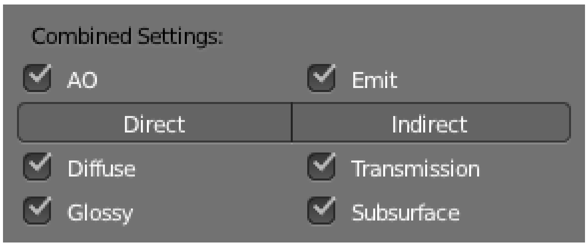


Ambient Occlusion Pass.

Bake Mode

Combined

Bakes all materials, textures, and lighting except specularity.



Combined Pass Options.

The passes that contribute to the combined pass can be toggled individually to form the final map.

Ambient Occlusion
Bakes ambient occlusion as specified in the World panels. Ignores all lights in the scene.

Shadow
Bakes shadows and lighting.

Normals

Bakes normals to an RGB image.

Normal Pass Options.

Normal Space

Normals can be baked in different spaces:

Object space
Normals in object coordinates, independent of object transformation, but dependent on deformation.

Tangent space
Normals in tangent space coordinates, independent of object transformation and deformation. This is the default, and the right choice in most cases, since then the normal map can be used for animated objects too.

Normal Swizzle
Axis to bake into the red, green and blue channel.

For materials the same spaces can be chosen in the image texture options next to the existing *Normal Map* setting. For correct results, the setting here should match the setting used for baking.

UV
Bakes colors of materials and textures only, without shading.

Emit
Bakes Emission, or the Glow color of a material.

Environment
Bakes the environment as seen from the center of the object.

Diffuse, Glossy, Transmission, Subsurface

Bakes the diffuse, glossiness, transmission of subsurface pass of a material.

Diffuse Pass Options.

- If only color is selected you get the pass color, which is a property of the surface and independent of sampling refinement.
- If color is not selected, you get the direct and/or indirect contributions in grayscale.
- If color and either direct or indirect are selected, you get the direct and/or indirect contributions colored.

Additional Options

Margin
Baked result is extended this many pixels beyond the border of each UV “island,” to soften seams in the texture.

Clear
If selected, clears the image before baking render.

Select to Active
Bake shading on the surface of selected objects to the active object. The rays are cast from the lowpoly object inwards towards the highpoly object. If the highpoly object is not entirely involved by the lowpoly object, you can tweak the rays start point with *Ray Distance* or *Cage Extrusion* (depending on whether or not you are using cage). For even more control you can use a *Cage Object*.

Note

Memory Usage

There is a CPU fixed memory footprint for every object used to bake from. In order to avoid crashes due to lack of memory, the highpoly objects can be joined before the baking process. The render tiles parameter also influence the memory usage, so the bigger the tile the less overhead you have, but the more memory it will take during baking (either in GPU or CPU).

Cage
Cast rays to active object from a cage. A cage is a ballooned-out version of the lowpoly mesh created either automatically (by adjusting the ray distance) or manually (by specifying an object to use). When not using a cage the rays will conform to the mesh normals. This produces glitches on the edges, but it is a preferable method when baking into planes to avoid the need of adding extra loops around the edges.

Ray Distance
Distance to use for the inward ray cast when using selected to active. Ray distance is only available when not using *Cage*.

Cage Extrusion
Distance to use for the inward ray cast when using *Selected to Active* and *Cage*. The inward rays are casted from a version of the active object with disabled Edge Split Modifiers. Hard splits (e.g., when the Edge Split Modifier is applied) should be avoided because they will lead to non-smooth normals around the edges.

Cage

Object to use as cage instead of calculating the cage from the active object with the *Cage Extrusion*.

Note

When the base mesh extruded does not give good results, you can create a copy of the base mesh and modify it to use as a *Cage*. Both meshes need to have the same topology (number of faces and face order).

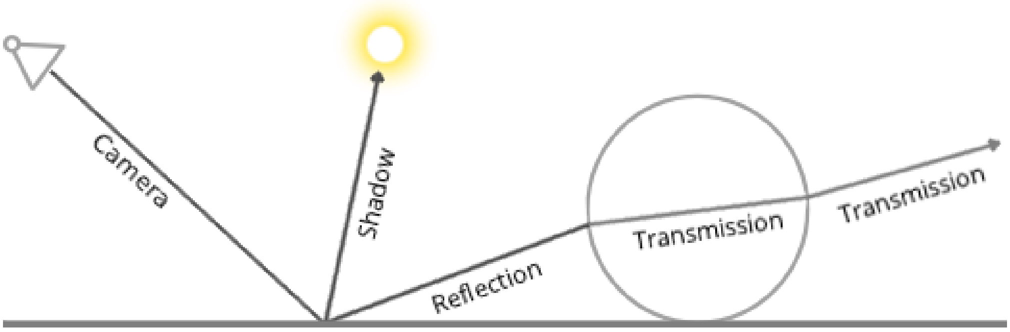
10.3.11 Render - Cycles Render Engine - Optimizing Rendering

Reducing Noise

When performing a final render, it is important to reduce noise as much as possible. Here we'll discuss a number of tricks that, while breaking the laws of physics, are particularly important when rendering animations within a reasonable time. Click to enlarge the example images to see the noise differences well.

Path Tracing

Cycles uses path tracing with next event estimation, which is not good at rendering all types of light effects, like caustics, but has the advantage of being able to render more detailed and larger scenes compared to some other rendering algorithms. This is because we do not need to store, for example, a photon map in memory, and because we can keep rays relatively coherent to use an on-demand image cache, compared to e.g. bidirectional path tracing.

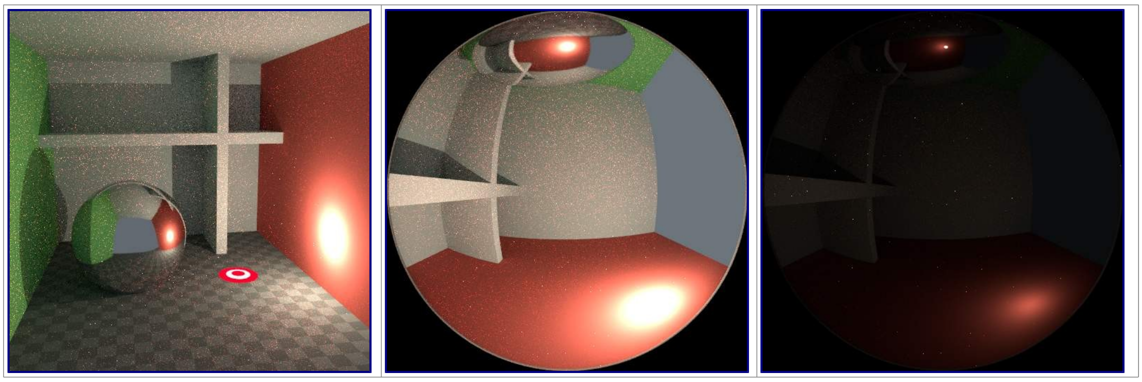


We do the inverse of what reality does, tracing light rays from the camera into the scene and onto lights, rather than from the light sources into the scene and then into the camera. This has the advantage that we do not waste light rays that will not end up in the camera, but also means that it is difficult to find some light paths that may contribute a lot. Light rays will be sent either according to the surface BRDF, or in the direction of known light sources (lamps, emitting meshes with Sample as Lamp).

For more details, see the *Light Paths* and *Integrator* documentation.

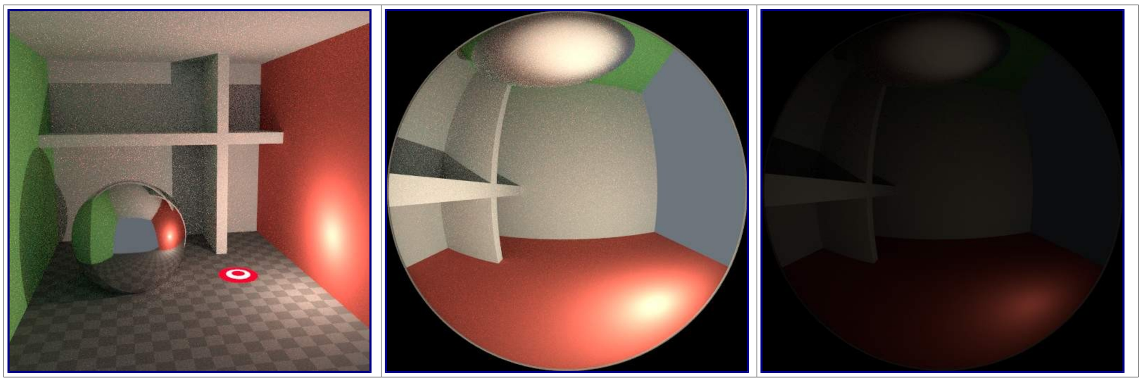
Where Noise Comes From

To understand where noise can come from, take for example this scene. When we trace a light ray into the specified location, this is what the diffuse shader “sees”. To find the light that is reflected from this surface, we need to find the average color from all these pixels. Note the glossy highlight on the sphere, and the bright spot the lamp casts on the nearby wall. These hotspots are 100x brighter than other parts of the image and will contribute significantly to the lighting of this pixel.



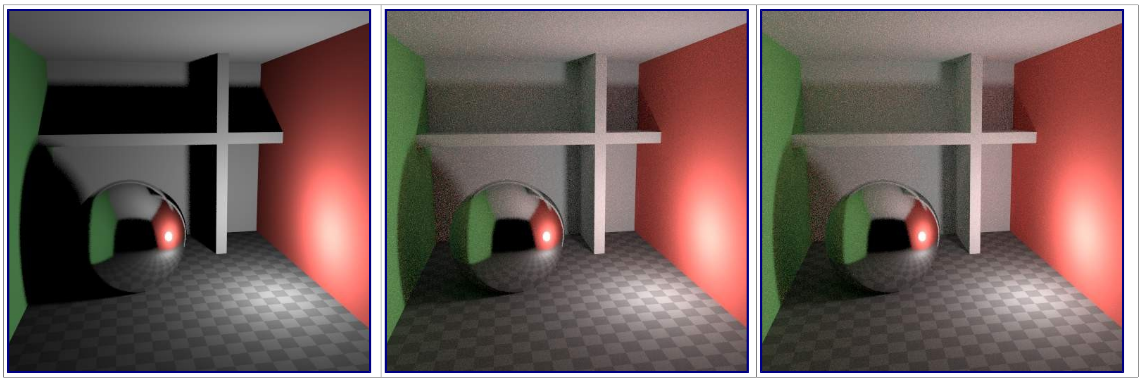
The lamp is a known light source, so it will not be too hard to find, but the glossy highlight (s) that it causes are a different matter. The best we can do with path tracing is to distribute light rays randomly over the hemisphere, hoping to find all the important bright spots. If for some pixels we miss some bright spot, but we do find it for another, that results in noise. The more samples we take, the higher the probability that we cover all the important sources of light.

With some tricks we can reduce this noise. If we blur the bright spots, they become bigger and less intense, making them easier to find and less noisy. This will not give the same exact result, but often it’s close enough when viewed through a diffuse or soft glossy reflection. Below is an example of using Filter Glossy and Smooth Light Falloff.



Bounces

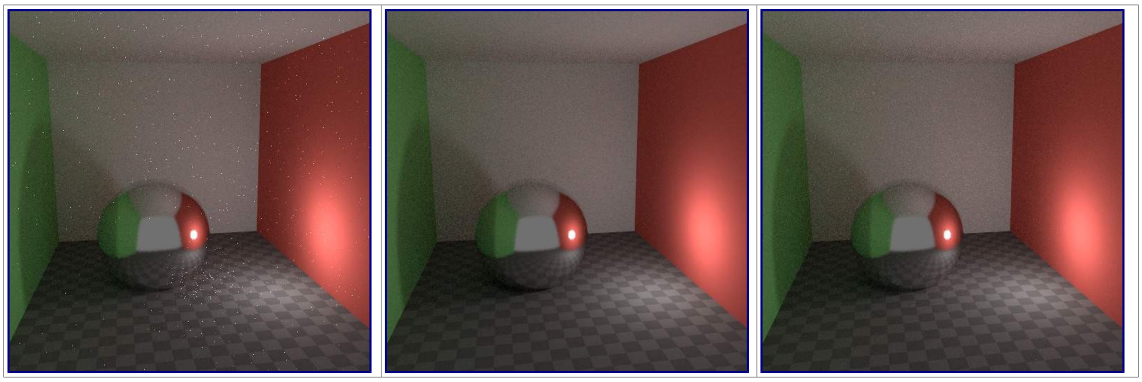
In reality light will bounce a huge number of times due to the speed of light being very high. In practice more bounces will introduce more noise, and it might be good to use something like the Limited Global Illumination preset that uses **fewer bounces for different shader types**. Diffuse surfaces typically can get away with fewer bounces, while glossy surfaces need a few more, and transmission shaders such as glass usually need the most.



Also important is to **use shader colors that do not have components of value 1.0** or values near that; try to keep the maximum value to 0.8 or less and make your lights brighter. In reality, surfaces are rarely perfectly reflecting all light, but there are of course exceptions; usually glass will let most light through, which is why we need more bounces there. High values for the color components tend to introduce noise because light intensity then does not decrease much as it bounces off each surface.

Caustics and Filter Glossy

Caustics are a well-known source of noise, causing fireflies. They happen because the renderer has difficulty finding specular highlights viewed through a soft glossy or diffuse reflection. There is a No Caustics option to disable glossy behind a diffuse reflection entirely. Many render engines will typically disable caustics by default.

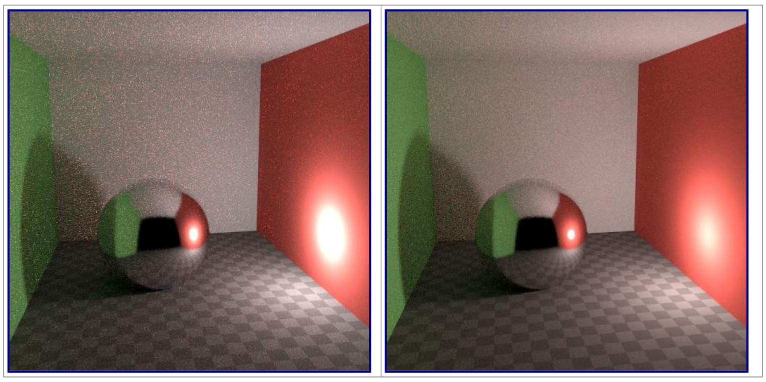


However using No Caustics will result in missing light, and it still does not cover the case where a sharp glossy reflection is viewed through a soft glossy reflection. There is a Filter Glossy option to reduce the noise from such cases at the cost of accuracy. This will blur the sharp glossy reflection to make it easier to find, by increasing the shader Roughness.

The above images show default settings, no caustics, and filter glossy set to 1.0.

Light Falloff

In reality light in a vacuum will always fall off at a rate of 1/(distance^2). However as distance goes to zero, this value goes to infinity and we can get very bright spots in the image. These are mostly a problem for indirect lighting, where the probability of hitting such a small but extremely bright spot is low and so happens only rarely. This is a typical recipe for fireflies.

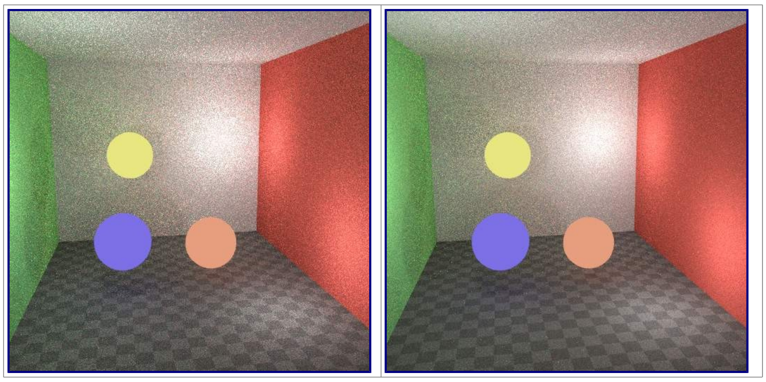


To reduce this problem, the Light Falloff node has a **Smooth factor, that can be used to reduce the maximum intensity** a light can contribute to nearby surfaces. The images above show default falloff and smooth value 1.0.

Sample as Lamp

Materials with emission shaders can be configured to be **sampled as lamp** (Material Settings). This means that they will get rays sent directly towards them, rather than ending up there based on rays randomly bouncing around. For very bright mesh light sources, this can reduce noise significantly. However when the emission is not particularly bright, this will take samples away from other brighter light sources for which it is important to find them this way.

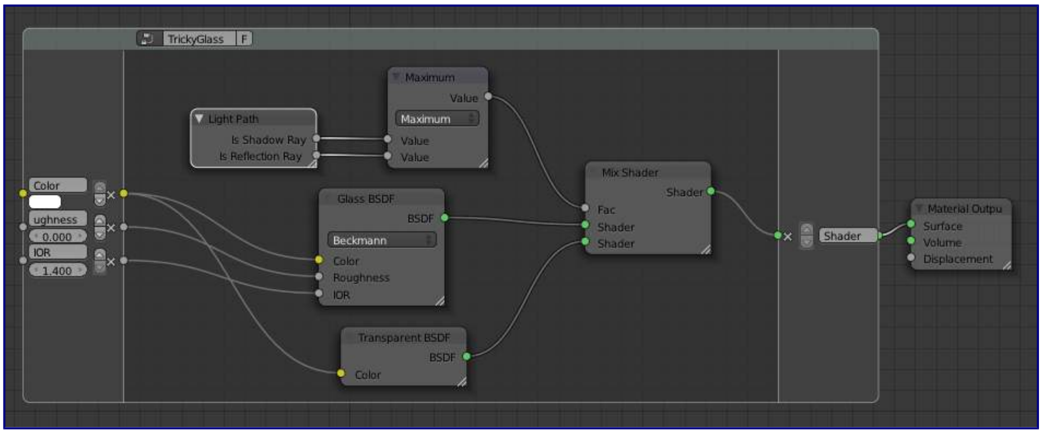
The optimal setting here is difficult to guess; it may be a matter of trial and error, but often it is clear that a somewhat glowing object may be only contributing light locally, while a mesh light used as a lamp would need this option enabled. Here is an example where the emissive spheres contribute little to the lighting, and the image renders with slightly less noise by disabling Sample as Lamp on them.

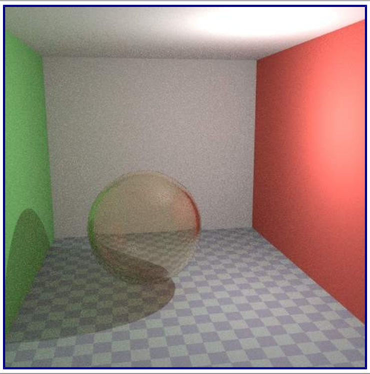


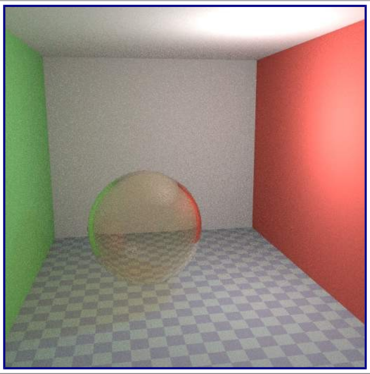
The world background also has a *Sample as Lamp* (World Settings) option. This is mostly useful for environment maps that have small bright spots in them, rather than being smooth. This option will then, in a preprocess, determine the bright spots, and send light rays directly towards them. Again, enabling this option may take samples away from more important light sources if it is not needed.

Glass and Transparent Shadows

With caustics disabled, glass will miss shadows, and with filter glossy they might be too soft. We can make a glass shader that will **use a Glass BSDF when viewed directly, and a Transparent BSDF when viewed indirectly**. The Transparent BSDF can be used for transparent shadows to find light sources straight through surfaces, and will give properly-colored shadows, but without the caustics. The Light Path node is used to determine when to use which of the two shaders.





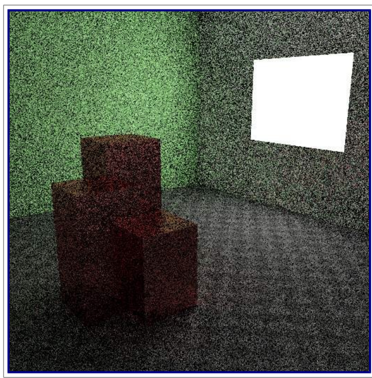


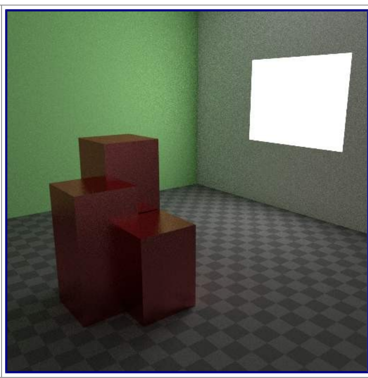
Above we can see the node setup used for the glass transparency trick; on the left the render has too much shadow due to missing caustics, and on the right the render with the trick.

Window Lights

When rendering a daylight indoor scene where most of the light is coming in through a window or door opening, it is difficult for the integrator to find its way to them. We can replace the opening with a plane with an emission shader, so that the integrator knows in which direction to fire rays. For camera rays we can make this mesh light invisible, so that we can still look into the outside scene. This is done either by disabling camera ray visibility on the object, or by switching between glass and emission shaders in the material.

The two renders below have the same render time, with the second render using a mesh light positioned in the window.



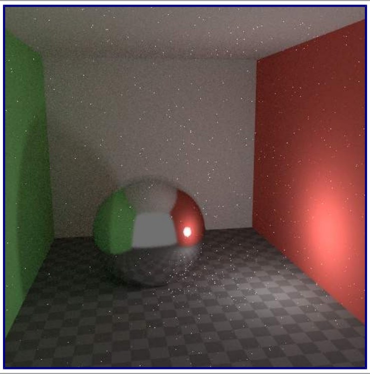


In newer versions, *light portals* provide a better solution.

Clamp Fireflies

Ideally with all the previous tricks, fireflies would be eliminated, but they could still happen. For that, **the**

intensity that any individual light ray sample will contribute to a pixel can be clamped to a maximum value with the integrator Clamp setting. If set too low this can cause missing highlights in the image, which might be useful to preserve for camera effects such as bloom or glare.

10.4 Render - Render Output

Render Panel

Render panel.

Render `F12`
: Starts rendering a still image of the current frame.

Animation `Ctrl-F12`
: Starts rendering an animation. See Rendering Animations for more detail.

Audio
: Mixes all the audio found in a scene and saves into one file. See Introduction.

By default the biggest area is replaced with the UV/Image Editor and the render appears.

To cancel the rendering process click the cancel button X besides the progressbar in the Info Editor, or press `Esc`.

Display

Renders are displayed in the UV/Image Editor. You can set the way this is displayed to several different options in the Display menu:

Display

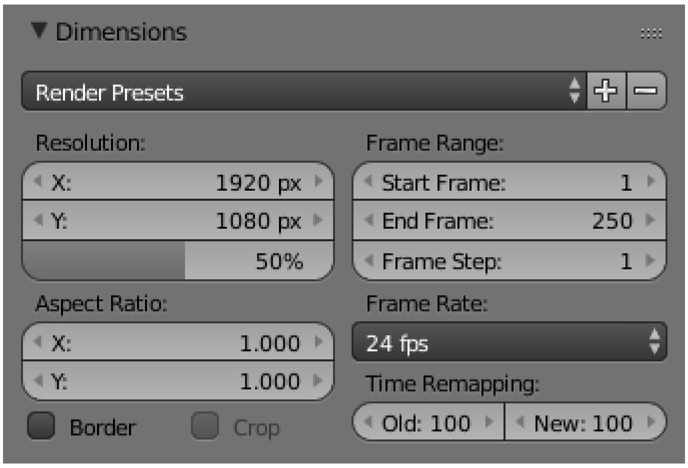
Keep UI
The image is rendered to the UV/Image Editor, but the UI remains the same. You will need to open the UV/Image Editor manually to see the render result.
New Window
A new floating window opens up, displaying the render.
Image Editor
One of the existing editors is replaced with the UV/Image Editor, showing the render.
Full Screen
The UV/Image Editor replaces the UI, showing the render.

Lock Interface
Lock interface during rendering in favor of giving more memory to the renderer.

Output Options

The first step in the rendering process is to determine and set the output options. This includes render size, frame rate, pixel aspect ratio, output location, and file type.

Dimensions panel



Dimensions Panel.

Render Presets
Common format presets for TVs and screens.

Resolution
X/Y
The number of pixels horizontally and vertically in the image.
Percentage
Slider to reduce or increase the size of the rendered image relative to the X/Y values above. This is useful for small test renders that are the same proportions as the final image.

Aspect Ratio

Older televisions may have non-square pixels, so this can be used to control the shape of the pixels along the respective axis. This will *pre-distorted* the images which will look stretched on a computer screen, but which will display correctly on a TV set. It is important that you use the correct pixel aspect ratio when rendering to prevent re-scaling, resulting in lowered image quality.

See Video Output for details on pixel aspect ratio.

Border

You can render just a portion of the view instead of the entire frame. While in Camera View, press `Ctrl-B` and drag a rectangle to define the area you want to render. `Ctrl-Alt-B` is the shortcut to disable the border.

Note

This disables the *Save Buffers* option in *Performance* and *Full Sample* option in *Anti-Aliasing*.

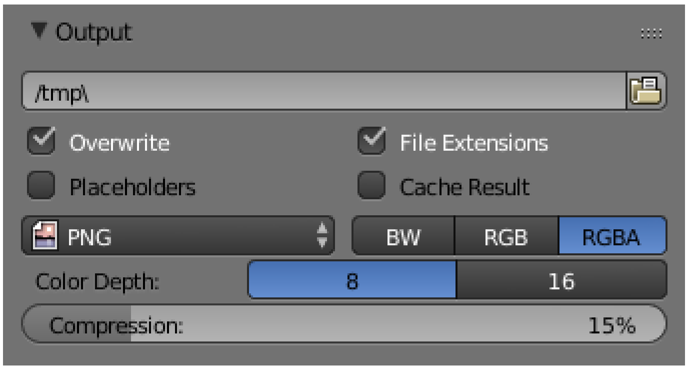
Enabling *Crop* will crop the rendered image to the *Border* size, instead of rendering a black region around it.

Frame Range
Set the *Start* and *End* frames for Rendering Animations. *Step* controls the number of frames to advance by for each frame in the timeline.

Frame Rate
For an Animation the frame rate is how many frames will be displayed per second.

Time Remapping
Use to remap the length of an animation.

Output Panel



Output panel.

This panel provides options for setting the location of rendered frames for animations, and the quality of the saved images.

File Path

Choose the location to save rendered frames.

When rendering an animation, the frame number is appended at the end of the file name with four padded zeros (e.g. `image0001.png`). You can set a custom padding size by adding the appropriate number of # anywhere in the file name (e.g. `image_##_test.png` translates to `image_01_test.png`).

This setting expands relative paths where a `//` prefix represents the directory of the current blend-file.

Overwrite
Overwrite existing files when rendering.

Placeholders
Create empty placeholder frames while rendering.

File Extensions

Adds the correct file extensions per file type to the output files.

Cache Result

Saves the rendered image and passes to a Multilayer EXR-file in temporary location on your hard drive. This allows the compositor to read these to improve performance, especially for heavy compositing.

Output Format

Choose the file format to save to. Based on which format is used, other options such as channels, bit-depth and compression level are available.

For rendering out to images see: saving images for rendering to videos see rendering to videos

Color Mode

Choose the color format to save the image to. Note that *RGBA* will not be avaible for all image formats.

BW, RGB, RGBA

Hint

Primitive Render-Farm

An easy way to get multiple machines to share the rendering workload is to:

- Set up a shared directory over a network file-system.
- Disable *Overwrite*, enable *Placeholders* in the Render *Output* panel.
- Start as many machines as you wish rendering to that directory

Video Output

Preparing your work for video

Once you master the art of 3D animation, you will probably want to share your work with others; either on the internet (YouTube, Vimeo, etc) or with family and friends (DVD/Bluray) or even possibly for television broadcast.

To spare you some disappointment, here are some tips specifically targeted at video preparation.

Safe Areas and Overscan

For anyone creating motion graphics or simple text overlays, overscan is an important consideration. Although its origins are rooted in historic analog TV systems, unfortunately even in 2017, for various reasons it can still be an issue with modern digital flatscreen TVs.

Note

Due to various limitations in analog TV equipment, the displayed image could sometimes end up shifted horizontally or vary in size, which could lead to the area beyond the intended visible picture being shown. This hidden area sometimes contained junk noise, timing signals or closed-caption/subtitle data. To avoid this being visible to the viewer, the standard approach for TV manufacturers was to ‘overscan’ (zoom in) the displayed picture by a small amount (between 5-10% edge crop) to ensure that at no time would the hidden areas be visible.

Although modern digital electronics have eliminated the issue of shifting image position, unfortunately, some TV manufacturers have included overscan on their flatscreen TVs. Why? Because for many years it was given that the edge of the visible image would rarely be seen, so broadcasters would sometimes overlay ‘hidden’ data to the very edge of the image (e.g. some types of closed captions). Also, legacy analog recordings might still contain unwanted noise around the edge. To avoid consumer complaints, overscan is quite often enabled by default. For some flatscreen TVs, it is not possible to disable it.

Enabling Safe Areas

Blender has configurable safe-area markings which can be made visible by selecting the scene camera, then in the camera settings by enabling Safe Areas. Several presets are available. If you are producing work for a television network or indeed any client, they may have their own rules and requirements on safe area dimensions – so consult with them.

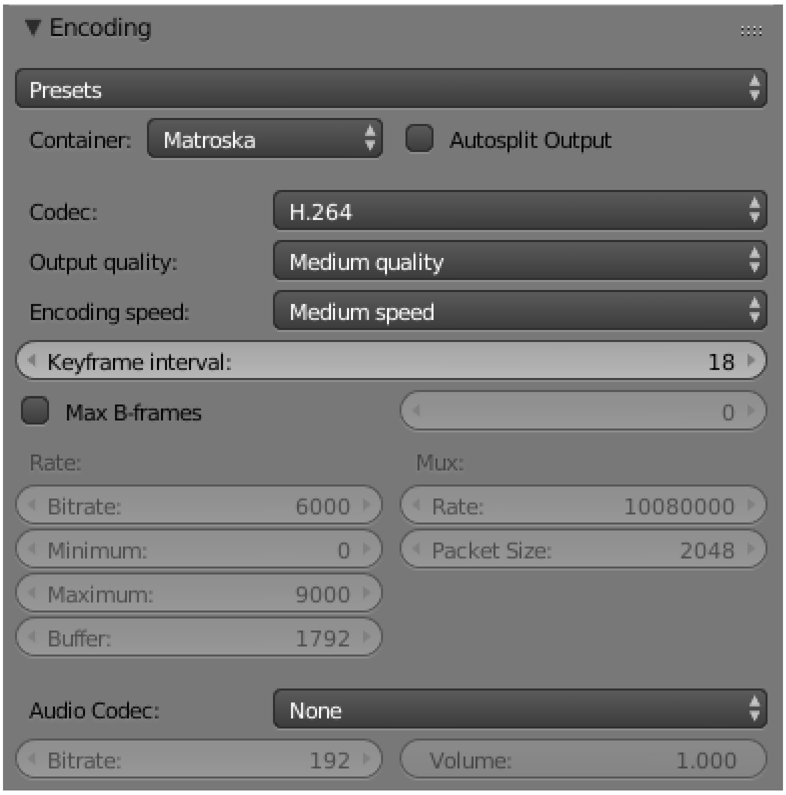
Color Reproduction

When exporting to many of the common video formats, the rendered RGB(A) images go through a conversion process whereby they are translated to the YCbCr color model. Y corresponds to a grayscale representation of the image, Cb and Cr contain data for the blue and red channels respectively. Green is encoded into the Y and Cb, Cr channels with some clever math.

Importantly, the color components are often stored at a lower resolution to the Y (grayscale) channel. This can cause blurring/smearing which can be a problem with small text and some saturated color combinations – so it is well worth doing test encodes to make sure that text remains legible. As with safe areas, a TV network or client might have their own rules on minimum text size and positioning, so always seek clarification when unsure.

Encoding Panel

Reference
Panel: Properties editor ‣ Render ‣ Encoding



Encoding panel.

Here you choose which video container, codec, and compression settings you want to use. With all of these compression choices, there is a tradeoff between file size, compatibility across platforms, and playback quality.

> **Tip**
>
> When you view the System Console, you can see some of the output of the encoding process. You will see even more output if you execute Blender as `blender -d`.

Presets
: You can use the presets, which choose optimum settings for you for that type of output.

Container
: Video container or file type. For a list of all available options, see video formats.

Autosplit Output
: If your video is huge and exceeds 2GiB, enable Autosplit Output. This will automatically split the output into multiple files after the first file is 2Gig.

Codec
: Chooses the method of compression and encoding. For a list of all available options see video formats.

> **Note**
>
> Standards
>
> Some containers and codecs are not compatible with each other, so if you are getting errors check that your container and codec are compatible. Like containers and codecs are sometimes not compatible with each other, some codecs do not work with arbitrary dimensions. So, try to stick with common dimensions or research the

limitations of the codec you are trying to use.

Output Quality
These are preset Rates

Encoding Speed
Presets to change between a fast encode (bigger file size) and more compression (smaller file size)

Key Frame Interval
The number of pictures per Group of Pictures. Set to 0 for “intra_only”, which disables inter-frame video. A higher number generally leads to a smaller file but needs a higher-powered device to replay it.

Max B-frames

Enables the use of B-frames.

Interval
The maximum number of B-frames between non-B-frames.

Rate

Bitrate
Sets the average bitrate (quality), which is the count of binary digits per frame. See also: FFmpeg -b:v.

Rate
Video files can use what is called variable bitrate (VBR). This is used to give some segments of the video less compressing to frames that need more data and less to frames with less data. This can be controlled by the *Minimum* and a *Maximum* values.

Buffer
The decoder bitstream buffer size.

Mux

Multiplexing <http://www.afterdawn.com/glossary/term.cfm/multiplexing>`__ is the process of combining separate video and audio streams into a single file, similar to packing a video file and .mp3 audio file in a zip-file.

Rate
Maximum bit rate of the multiplexed stream.

Packet Size
Reduces data fragmentation or muxer overhead depending on the source.

Audio

Audio Codec
Audio format to use. For a list of all available options, see video formats.

Bitrate
For each codec, you can control the bitrate (quality) of the sound in the movie. Higher bitrates are bigger files that stream worse but sound better. Use powers of 2 for compatibility.

Volume
Sets the output volume of the audio.

Tips

The choice of video format depends on what you are planning to do.

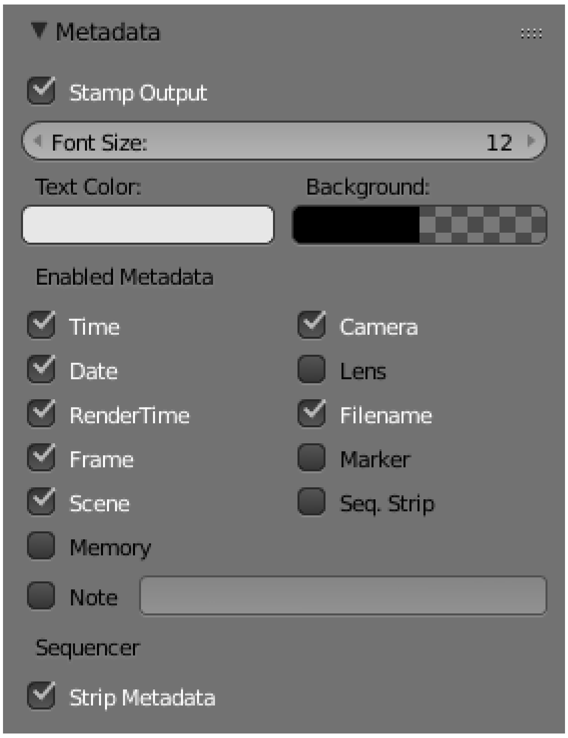
It's not recommended to render directly to a video format in the first instance. If a problem occurs while rendering, the file might become unplayable and you will have to re-render all frames from the beginning. If you first render out a set of static images such as the default PNG format or the higher-quality OpenEXR (which can retain HDR pixel data), you can combine them as an Image Strip in the Video Sequence Editor (VSE). This way, you can easily:

- Restart the rendering from the place (the frame) where any problem occurred.
- Try out different video encoding options in seconds, rather than minutes or hours as encoding is usually much faster than rendering the 3d scene.
- Enjoy the rest of the features of the VSE, such as adding Image Strips from previous renders, audio, video clips, etc.

You shouldn't post-process a lossy-compressed file as the compression artifacts may become visible. Lossy compression should be reserved as a final 'delivery format'.

If you are planning on doing significant post-processing and color correction, it is best to output a frameset rendered in OpenEXR format. If you plan to do only minimal changes after rendering and would prefer a single file, choose lossless H.264 for high quality, or regular H.264 for lower quality.

Metadata



Metadata panel.

The *Metadata* panel includes options for writing meta-data into render output.

Note
Only some image formats support metadata: See image formats.

Stamp Output

Add metadata as text to the render.

Stamp Text Color
Set the color and alpha of the stamp text.
Stamp Background
Set the color and alpha of the color behind the text.
Font Size
Set the size of the text.
Draw Labels
Draws the labels before the metadata text. For example, “Camera” infront of camera name etc.

Enabled Metadata

Stamping can include the following data.

Time
Includes the current scene time and render frame at `HH:MM:SS.FF`
Date
Includes the current date and time.
Render Time
Includes the render time.
Frame
Includes the frame number.
Scene
Includes the name of the active scene.
Memory
Includes the peak memory usage.
Note

Includes a custom note.

Hint

It can be useful to use the *Note* field if you are setting up a render-farm.

Since you can script any information you like into it, such as an identifier for the render-node or the job-number.

For details on stamping arbitrary values, see: this page.

Camera
Includes the name of the active camera.
Lens
Includes the name of the active camera’s lens value.
Filename
Includes the filename of the blend-file.
Marker

Includes the name of the last marker.

Seq. Strip

Includes the name of the foreground sequence strip.

Sequencer

Strip Metadata

Use metadata from the strips in the sequencer.

Animation Player

The Info Editor ‣ Render ‣ Play Rendered Animation menu will play back the rendered animation in a new window.

You can also drop images or movie files in a running animation player. It will then restart the player with the new data.

An external player can also be used instead of the one included in Blender. To do this, select it in the User Preferences.

Shortcuts

The following table shows the available hotkeys for the animation player.

Playback

Action	Hotkey
Start/Pause:	`Spacebar`
Start playback (when paused):	`Enter`
Quit:	`Esc`

Timeline

Action	Hotkey
Scrub in time:	`LMB`
Step back one frame:	`Left`
Step forward one frame:	`Right`
Step back 10 frames:	`Down`

Action	Hotkey
Step forward 10 frames:	`Up`
Manual frame stepping:	`NumpadPeriod`

Playback Options

Action	Hotkey
Backward playback:	`Shift-Down`
Forward playback	`Shift-Up`
Slow down playback:	`Minus`
Speed up playback:	`Plus`
Toggle looping:	`Numpad0`
Toggle frame skipping:	`A`
Toggle ping-pong:	`P`

Display

Action	Hotkey
Toggle Time Cursor (Indicator):	`I`
Flip drawing on the X axis:	`F`
Flip drawing on the Y axis:	`Shift-F`
Hold to show frame numbers:	`Shift`

Action	Hotkey
Zoom in:	`Ctrl-Plus`
Zoom out:	`Ctrl-Minus`

Frame rate

- 60 fps `Numpad1`
- 50 fps `Numpad2`
- 30 fps `Numpad3`
- 25 fps `Numpad4`
- 24 fps `Shift-Numpad4`
- 20 fps `Numpad5`
- 15 fps `Numpad6`
- 12 fps `Numpad7`
- 10 fps `Numpad8`
- 6 fps `Numpad9`
- 5 fps `NumpadSlash`

10.5 Render - Post Processing

Render Layers

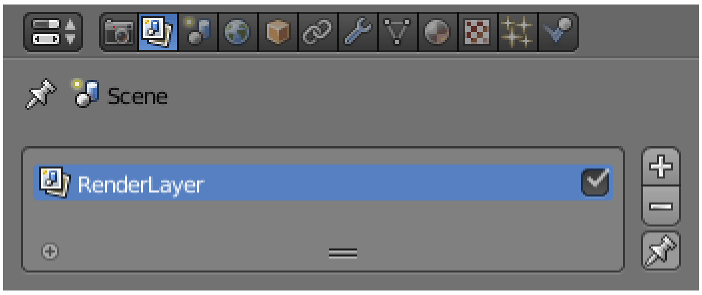
Render layers allow you to render your scene in separate layers, usually with the intension of compositing them back together afterwards.

This can be useful for several purposes, such as color correcting certain elements differently, blurring the foreground as a fast manual method of creating DoF, or reducing the render quality for unimportant objects.

Using Render Layers can also save you from having to re-render your entire image each time you change something, allowing you to instead re-render only the layer(s) that you need.

Layer List

Reference
Panel: Properties editor ‣ Scene ‣ Scene



Layer list.

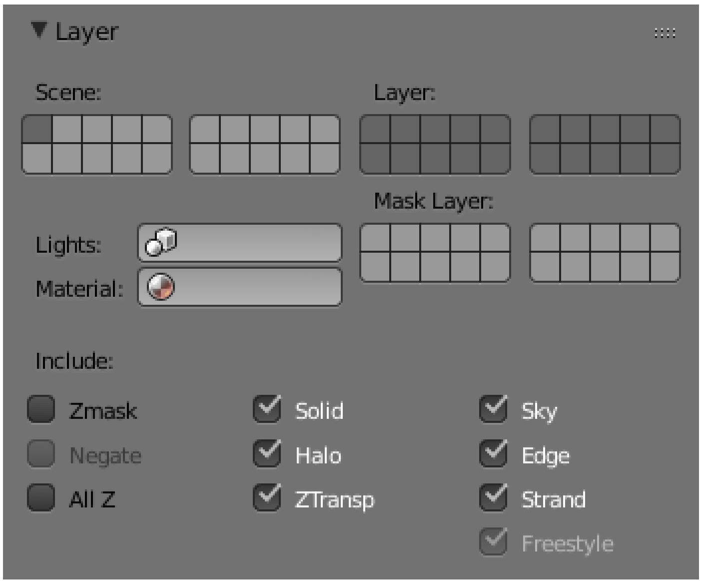
This is a list of all the Render Layers in the current scene.

Only layers which are enabled (checkbox on right is ticked) will be rendered. If the *Pin* icon at the bottom right of the list is enabled, only the active (highlighted) layer will be rendered.

Render Layers can be added and removed using the + and - buttons on the right, and existing layers can be renamed by double clicking on their name.

Layer Panel

Reference
Panel: Properties editor ‣ Scene ‣ Layer



Layer panel.

The Layer Panel shows the settings of the active Render Layer from the list above.

You can select multiple layers using `Shift-LMB`.

Scene
The Scene Layers, showing which are currently visible and will be rendered.

Layer
The Scene Layers which are associated with the active Render Layer. Objects in those Scene Layers will be rendered in that Render Layer. When an object is in the Scene Layers but not the Render Layer, it will still cast shadows and be visible in reflections, so it is still indirectly visible.

Mask Layer
Objects on these will mask out other objects appearing behind them. This can be used for compositing objects into footage, to take into account objects in front of the virtual objects blocking the view from the camera.

Material Override

Overrides all material settings to use the Material chosen here.

Examples of where this might be used:

- To check lighting by using a plain diffuse material on all objects
- Render a wireframe of the scene

- Create a custom render pass such as an anti-aliased matte or global coordinates.

See also

Additional options shown in this panel are different for each render engine. See these options for:

- Blender Render
- Cycles

Usage

Each Render Layer has an associated set of Scene Layers. Objects which are on one of the associated Scene Layers are shown in that Render Layer, as long as that Scene Layer is also visible.

Warning
Only the objects in visible Scene Layers will be rendered. So, if only Scene Layer 1 is visible and your Render Layer set specifies to render only Layers 2 and 3, nothing will be rendered.

Post Processing Panel

Reference
Panel: Properties editor ‣ Render ‣ Post Processing

The Post Processing panel is used to control different options used to process your image after rendering.

Post Processing Panel.

Sequencer
: Renders the output of the sequence editor, instead of the view from the 3D scene’s active camera. If the sequence contains scene strips, these will also be rendered as part of the pipeline. If *Compositing* is also enabled, the Scene strip will be the output of the Compositor.

Compositing
: Renders the output from the compositing node setup, and then pumps all images through the Composite node map, displaying the image fed to the Composite Output node.

Dithering

Dithering is a technique for blurring pixels to prevent banding that is seen in areas of gradients, where stair-stepping appears between colors. Banding artifacts are more noticeable when gradients are longer, or less steep. Dithering was developed for graphics with low bit depths, meaning they had a limited range of possible colors.

Dithering works by taking pixel values and comparing them with a threshold and neighboring pixels then does calculations to generate the appropriate color. Dithering creates the perceived effect of a larger color palette by creating a sort of visual color mixing. For example, if you take a grid and distribute red and yellow pixels evenly across it, the image would appear to be orange.

The *Dither* value ranges from 0 to 2.

Note

When using *Blender Internal* Render you get a few more options and these are discussed here.

Color Management

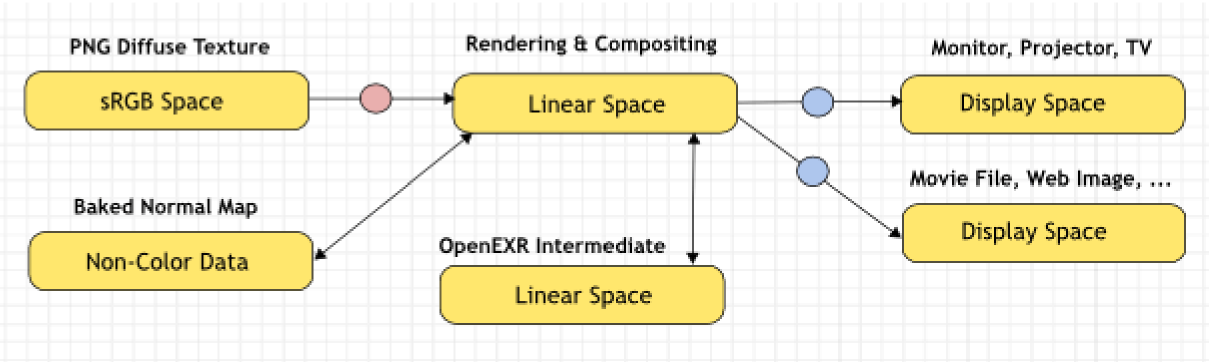
Color management is one of the most important tools that an artist can use. It allows an artist to make sure that an image stays the same from rendering, to saving, to post processing. Color management also allows an artist to tweak things like exposure, gamma, or the overall color grade.

Different views and exposures of the same render.

To achieve color management in Blender, the OpenColorIO (OCIO) library has been integrated into Blender. This library offers fine control over different LUT along with integrating your own set of color profiles to keep your work linearized with other software.

Scene Linear Color Space

For correct results, different color spaces are needed for rendering display and storage of images. Rendering and compositing is best done in scene *linear* color space, which corresponds more closely to nature, and makes computations more physically accurate.



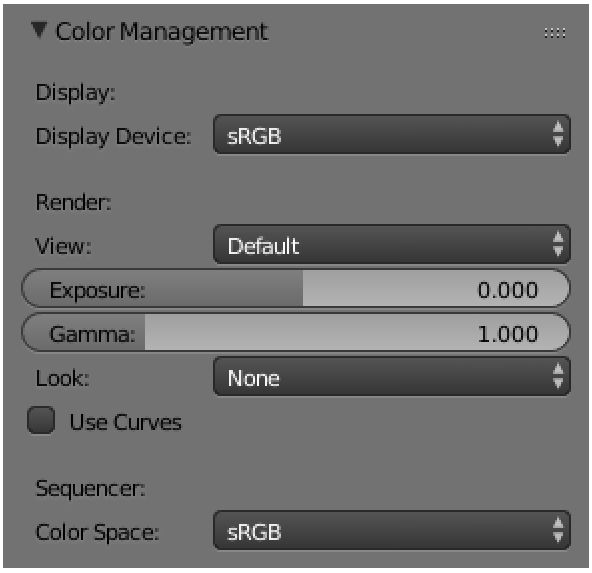
An example of a linear workflow.

If the colors are linear, it means that if in reality, we double the number of photons, the color values are also doubled. Put another way, if we have two photos/renders each with one of two lights on, and add those images together, the result would be the same as a render/photo with both lights on. It follows that such a radiometrically linear space is best for photo-realistic rendering and compositing.

However, these values do not directly correspond to human perception or the way display devices work and image files are often stored in different color spaces, so we have to take care to do the right conversion into and out of this linear color space.

Settings

Reference
Panel: Properties editor ‣ Scene ‣ Color Management



Scene settings for color management.

Display

Correct display of renders requires a conversion to the display device color space, which can be configured here. A computer monitor works differently from a digital cinema projector HDTV. The scene properties have these settings:

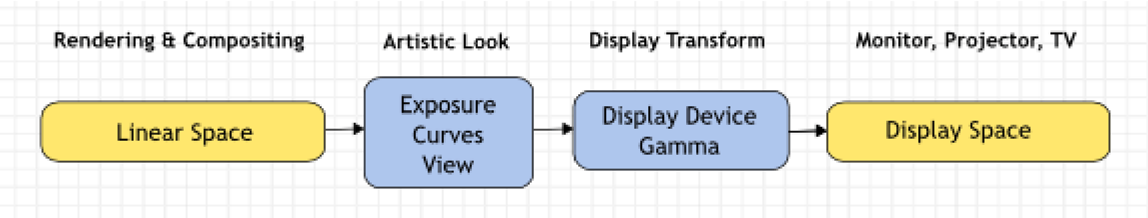
Display Device

The device that the image is being viewed on.

Most computer monitors are configured for the sRGB color space, and so when working on a computer usually this option should just be left to the default. It would typically be changed when viewing the image on another display device connected to the computer, or when writing out image files intended to be displayed on another device.

Rec709 is commonly used for HDTVs, while XYZ and DCI-P3 are common for digital projectors.

Color management can be disabled by setting the device to None.



Conversion from linear to display device space.

Render

There is also an artistic choice to be made for renders. Partially that is because display devices cannot display the full spectrum of colors and only have limited brightness, so we can squeeze the colors to fit in the gamut of the device. Besides that, it can also be useful to give the renders a particular look, e.g. as if they have been printed on real film.

Another common use case is when you want to inspect renders, to see details in dark shadows or bright highlights, or identify render errors. Such settings would be only used temporarily and not get used for final renders.

View

These are different ways to view the image on the same display device.

Default
Does no extra conversion besides the conversion for the display device.

RRT
Uses the ACES Reference Rendering Transform, to simulate a film-like look.

Film
Uses a technique known as film emulation to give renders a look similar to what might be expected from a film based camera. This is usually done by crushing the blacks and decreasing the contrast of the image.

Raw
Intended for inspecting the image but not for final export. Raw gives the image without any color space conversion.

Log
Intended for inspecting the image but not for final export. Log works similar to Raw but gives a more “flat” view of the image without very dark or light areas.

Exposure
Used to control the image brightness (in stops) applied before color space conversion. 2(stops)×value

Gamma
: Extra gamma correction applied after color space conversion. Note that the default sRGB or Rec709 color space conversions already include a gamma correction of approximately 2.2 (except the *Raw* and *Log* views), so this would be applied in addition to that.

Look
: Choose an artistic effect from a set of measured film response data which roughly emulates the look of certain film types. Applied before color space conversion.

Use Curves
: Adjust RGB Curves to control image colors before color space conversion. Read more about using the Curve Widget.

Sequencer

Color Space
: The color space that the sequencer operates in. By default, the sequencer operates in sRGB space, but it can also be set to work in Linear space like the Compositing nodes, or another color space. Different color spaces will give different results for color correction, crossfades, and other operations.

Image Files

When loading and saving media formats it is important to have color management in mind. File formats such as PNG or JPEG will typically store colors in a color space ready for display, not in a linear space. When they are, for example, used as textures in renders, they need to be converted to linear first, and when saving renders for display on the web, they also need to be converted to a display space. Other file formats like OpenEXR store linear color spaces and as such are useful as intermediate files in production.

When working with image files, the default color space is usually the right one. If this is not the case, the color space of the image file can be configured in the image settings. A common situation where manual changes are needed is when working with or baking normal maps or displacement maps, for example. Such maps do not actually store colors, just data encoded as colors. In such cases, they should be marked as *Non-Color Data*.

Image data-blocks will always store float buffers in memory in the scene linear color space, while a byte buffer in memory and files in a drive are stored in the color space specified with this setting:

Color Space
: The color space of the image file on a drive. This depends on the file format, for example, PNG or JPEG images are often stored in sRGB, while OpenEXR images are stored in a linear color space. Some images such as normal, bump or stencil maps do not strictly contain ‘colors’, and on such values, no color space conversion should ever be applied. For such images, the color space should be set to *None*.

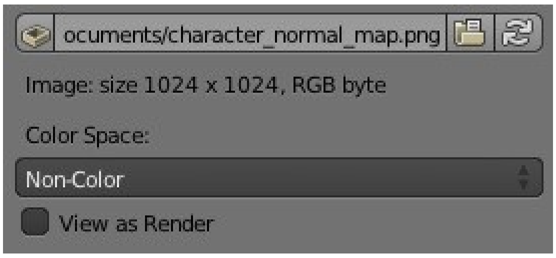


Image settings for color management.

By default only renders are displayed and saved with the render view transformations applied. These are the Render Result and Viewer image data-blocks, and the files saved directly to a drive with the Render Animation operator. However, when loading a render saved to an intermediate OpenEXR file, Blender cannot detect automatically that this is a render (it could be e.g. an image texture or displacement map). We need to specify that this is a render and that we want the transformations applied, with these two settings:

View as Render
: Display the image data-block (not only renders) with view transform, exposure, gamma, RGB curves applied. Useful for viewing rendered frames in linear OpenEXR files the same as when rendering them directly.

Save as Render
: Option in the image save operator to apply the view transform, exposure, gamma, RGB curves. This is useful for saving linear OpenEXR to e.g. PNG or JPEG files in display space.

OpenColorIO Configuration

Blender comes with a standard OpenColorIO configuration that contains a number of useful display devices and view transforms. The reference linear color space used is the linear color space with Rec. 709 chromaticities and D65 white point.

However, OpenColorIO was also designed to give a consistent user experience across multiple applications, and for this, a single shared configuration file can be used. Blender will use the standard OCIO environment variable to read an OpenColorIO configuration other than the default Blender one. More information about how to set up such a workflow can be found on the OpenColorIO website.

We currently use the following color space rules:

scene_linear
: Color space used for rendering, compositing, and storing all float precision images in memory.

default_sequencer
: Default color space for sequencer, *scene_linear* if not specified

default_byte
: Default color space for byte precision images and files, *texture_paint* if not specified.

default_float
: Default color space for float precision images and files, *scene_linear* if not specified.

The standard Blender configuration also includes some support for ACES (code and documentation), even though we have a different linear color space. It is possible to load and save EXR files with the Linear ACES color space, and the RRT view transform can be used to view images with their standard display transform. However, the ACES gamut is larger than the Rec. 709 gamut, so for best results, an ACES specific configuration file should be used. OpenColorIO provides an ACES configuration file, though it may need a few more tweaks to be usable in production.

10.6 Render - Freestyle

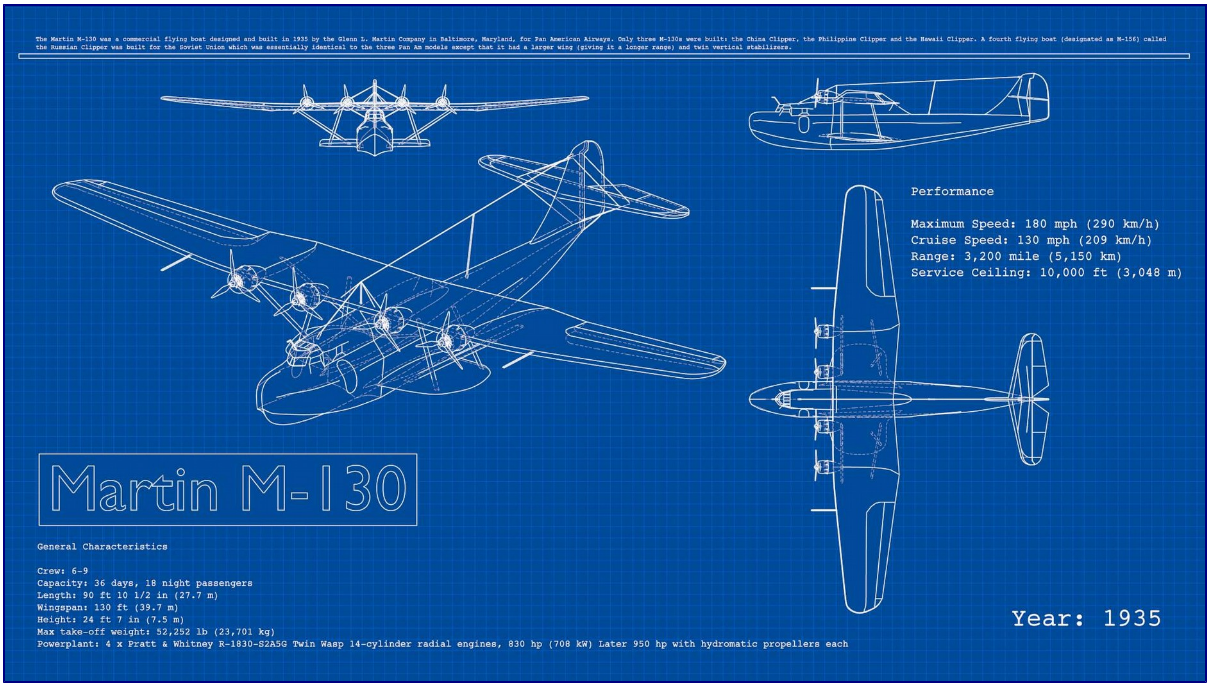
Freestyle

What is FreeStyle?

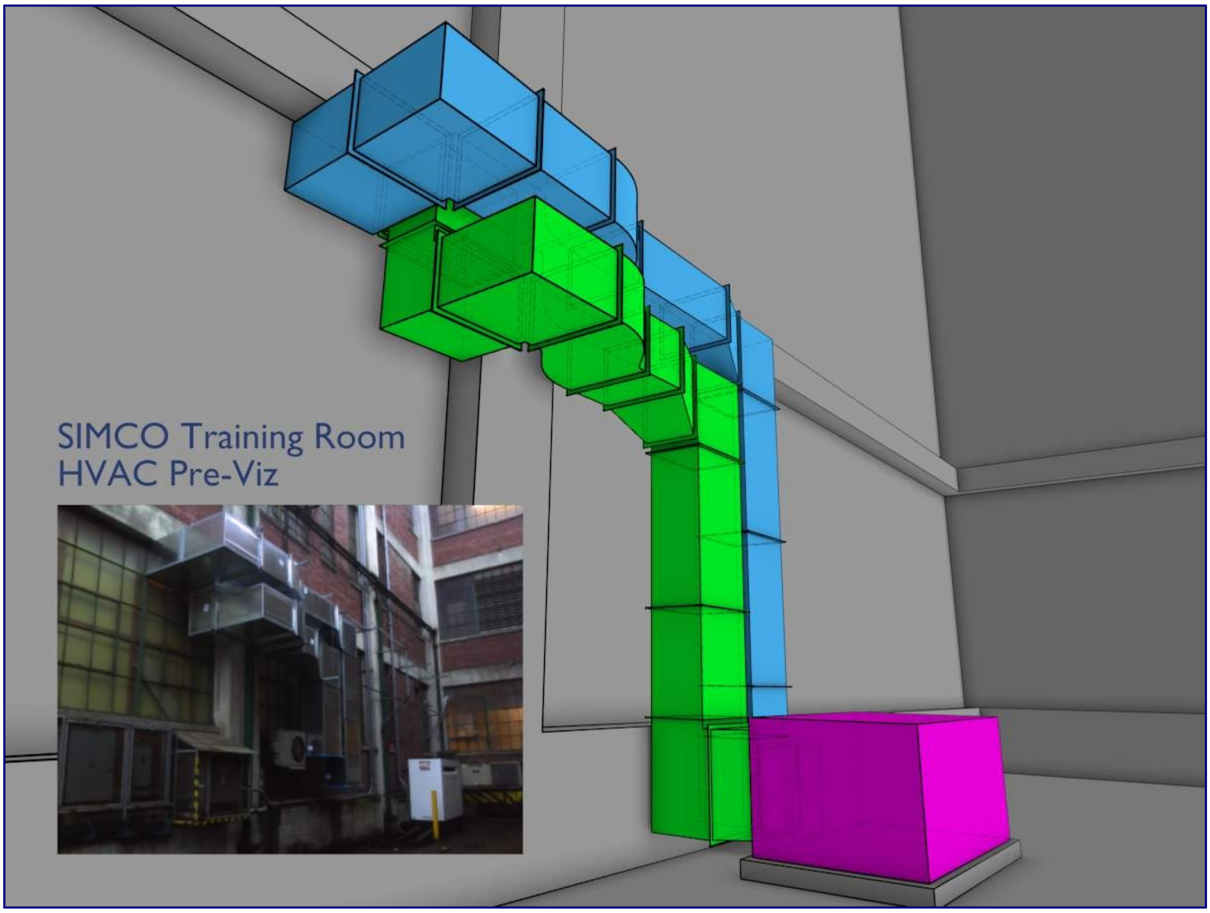
Freestyle is an edge- and line-based non-photorealistic (NPR) rendering engine. It relies on mesh data and z-depth information to draw lines on selected edge types. Various line styles can be added to produce artistic ("hand drawn", "painted", etc.) or technical (hard line) looks.

The two operating modes - *Python Scripting* and *Parameter Editor* - allow a powerful diversity of line styles and results. Line styles such as Japanese big brush, cartoon, blueprint, thickness-with-depth are already pre-scripted in Python. The Parameter Editor mode allows intuitive editing of features such as dotted lines and easy setup of multiple line types and edge definitions. On top of all of that, with the introduction of line style modifiers, the sky is the limit!

A cartoon scene from OHA Studio (the .blend file). © Mechanimotion Entertainment.



Blueprint render of Martin M-130 from 1935 by LightBWK. CC0. WARNING: HEAVY FILE! DESIGNED FOR STRESS TEST Bforartists TO THE LIMITS & MAY CRASH Bforartists. (File:M-130Blueprint.zip)



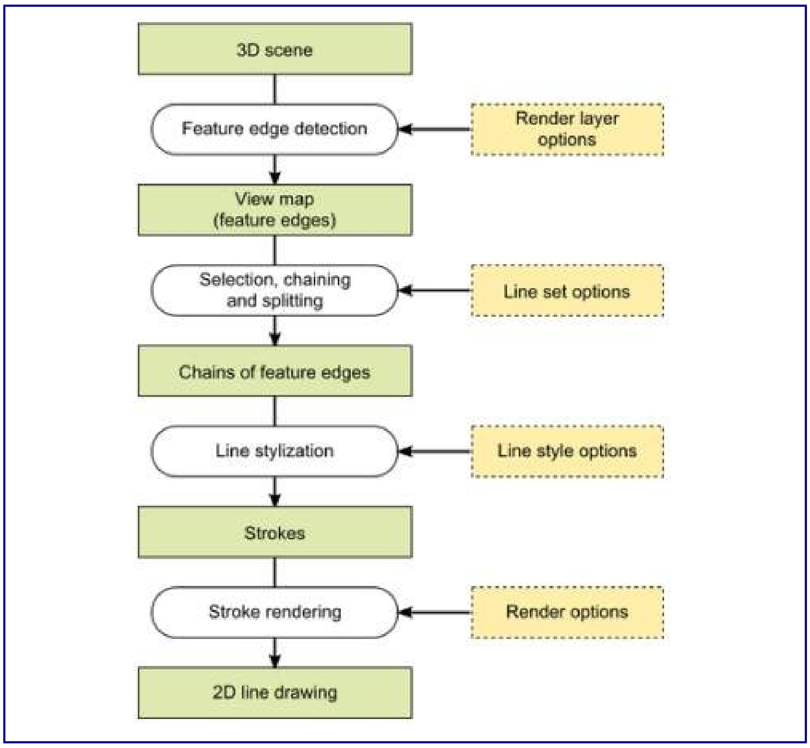
HVAC Pre-Viz by Lee Posey. CC0 (File:HVACPreViz.zip)

Kitchen by Vicente Carro. © AnigoAnimation

More artwork can be found at http://wiki.Bforartists.org/index.php/Dev:Ref/Release_Notes/2.67/FreeStyle#Freestyle_Artwork_Showcase

The Big Picture

- Activate FreeStyle by *Properties* window –> *Render* tab –> *FreeStyle* panel, tick check box. Please note that FreeStyle is only available for the Bforartists Internal renderer.
- Freestyle settings are located in the new *Render Layers* context.
- One render layer can only have one viewmap. A viewmap holds the edge detection settings (Crease Angle, Culling toggle, Face Smoothness toggle, Material Boundaries toggle, Sphere Radius and Kr Derivative Epsilon advanced options).
- A viewmap can have multiple line sets.
- A line set controls which line types and selections will be rendered, from lines based on your scene.
- Each line set uses one line style (which can be shared between multiple line sets).
- A line style tells Freestyle how to render the linked line sets in terms of color, alpha, thickness and other aspects.

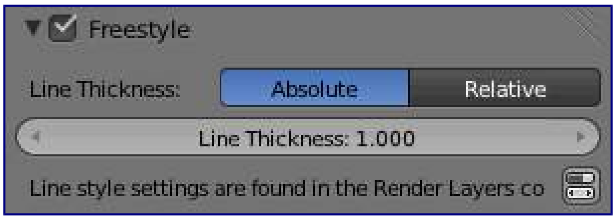


block diagram of Freestyle view map and processes

Known Limitations

- Highly memory demanding: All mesh objects in a render layer are loaded at once.
- Only faced mesh objects are supported. The following kinds of meshes are ignored:
    - Mesh faces with wire materials.
    - Mesh faces with completely transparent materials.
    - Mesh faces with the *Cast Only* material option enabled.
- Transparent faces are treated as opaque faces.
- No edges at face intersections are detected yet.
- Layer masks do not work with Freestyle.
- Freestyle rendering results do not have any Z depth information.
- Panoramic cameras are not supported.

Core Options



Freestyle core options.

Activating Freestyle in the *Render* context of the *Buttons* window will give you the following options:

Line Thickness

There are two different modes for defining the base line thickness:

Absolute
The line thickness is given by a user-specified number of pixels. The default value is **1.0**.

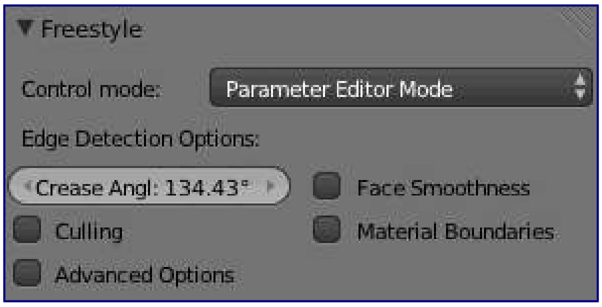
Relative
The unit line thickness is scaled by the proportion of the present vertical image resolution to **480** pixels. For instance, the unit line thickness is **1.0** with the image height set to **480**, **1.5** with **720**, and **2.0** with **960**.

Line Thickness
Only for *Absolute* line thickness: base line thickness in pixels, **1.0** by default.

Viewmaps

There is only one viewmap per render layer. It controls the edge detection parameters. Which detected edges are actually rendered, and how, can be controlled either through the user-friendly *parameter editor*, or powerful but complex *Python scripting*.

Face Smoothness
When enabled, Face Smoothness will be taken into account for edges calculation.



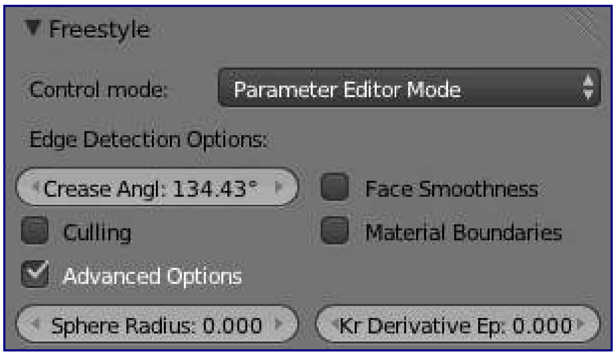
Parameter Editor Mode UI

Crease Angle
If two adjacent faces form an angle less than the defined *Crease Angle*, the edge between them will be rendered when using *Crease* edge type selection in a line set. The value also affects *Silhouette* edge type selection.

Culling

Ignore the edges that are out of view (saves some processing time and memory, but may reduce the quality of the result in some cases).

Advanced Options



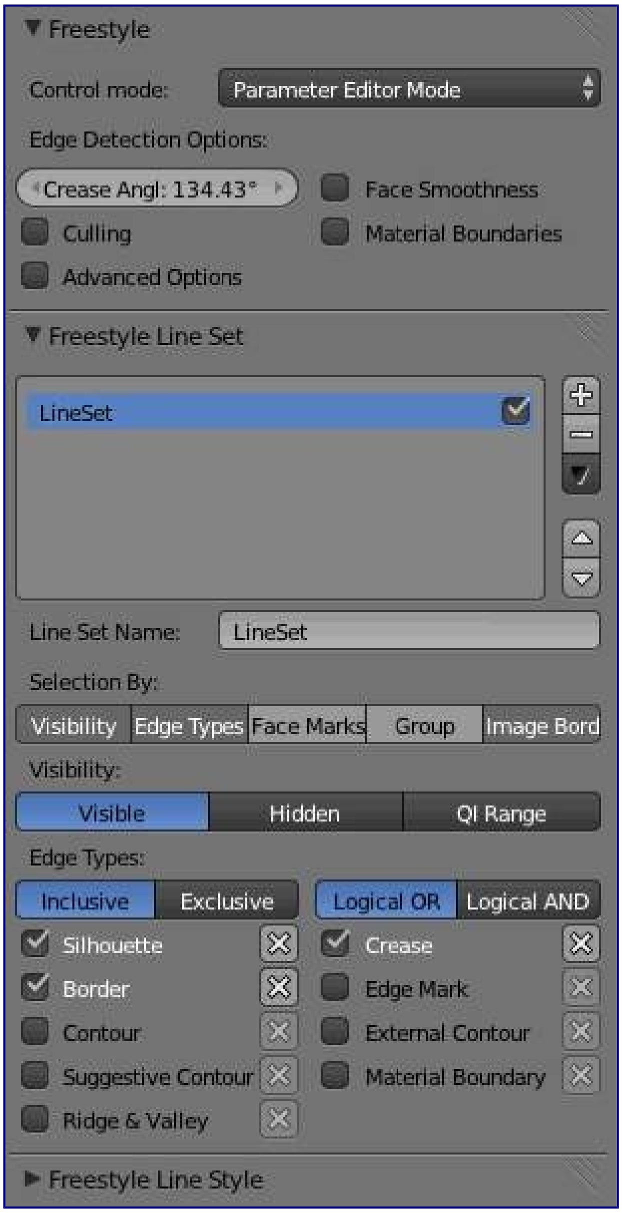
Advanced Options

Sphere Radius It affects the calculation of curvatures for *Ridge*, *Valley* and *Suggestive Contour* edge type selection in a line set.

Kr Derivative Epsilon

It provides you with control over the output of *Suggestive Contour* and *Silhouette* edge type selection (further information in this pdf).

Parameter Editor



Parameter Editor

The Freestyle *Parameter Editor* is a user-friendly interface to define and control line sets and line styles.

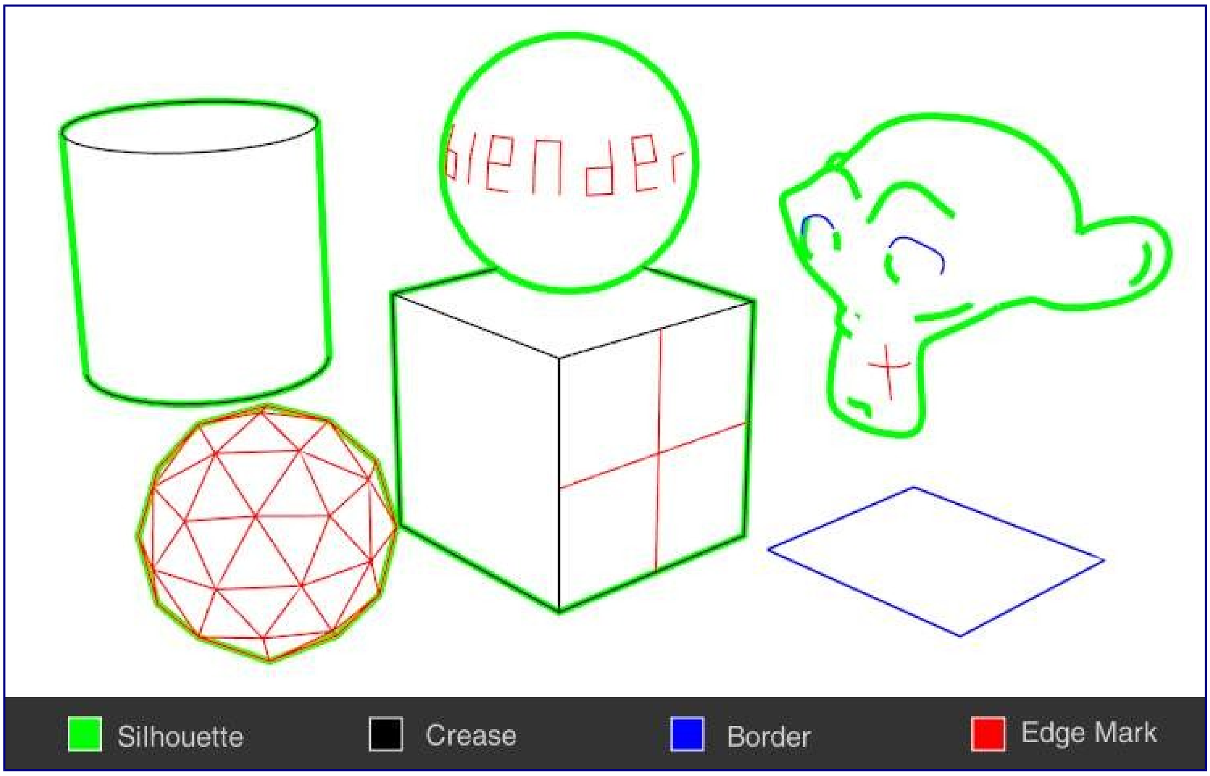
Line Sets
: control which of the edges detected by Freestyle will actually be used (rendered).

Line Styles
: control how the selected edges are rendered.

A view map (hence a render layer) can have multiple line sets, and each line set is linked to one line style.

Line Set

A line set selects, among the lines (edges) detected by Freestyle, which ones will be rendered using its attached *line style*, through various methods.



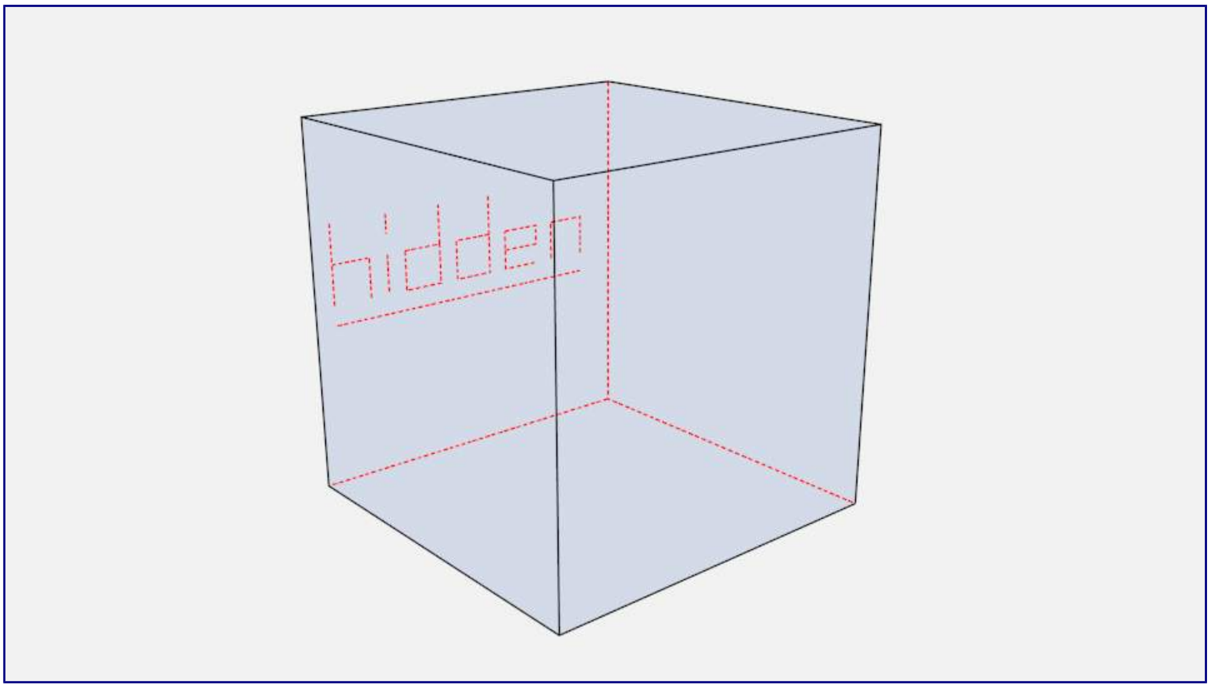
Examples of some basic edge types by LightBWK (File:EdgeType.zip)

Selection by Visibility

There are three choices for selecting edges by visibility.

Visible
: Only lines occluded by no surfaces are rendered.

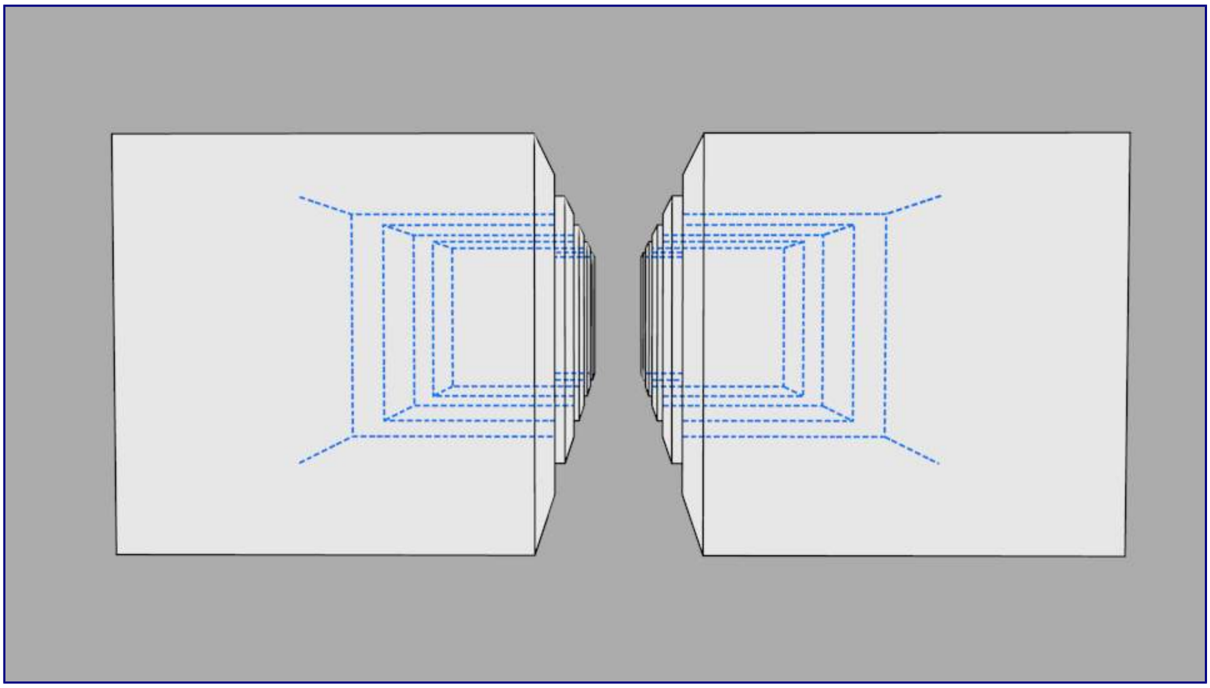
Hidden
: Lines occluded by at least one surface are rendered.



Proof of concept of visible and hidden edges by LightBWK (Sample .blend)

QI Range
: QI stands for *Quantitative Invisibility*. Lines occluded by a number of surfaces in the given range are rendered.

Start and End
: Only with *QI Range*, min/max number of occluding surfaces for a line to be rendered.



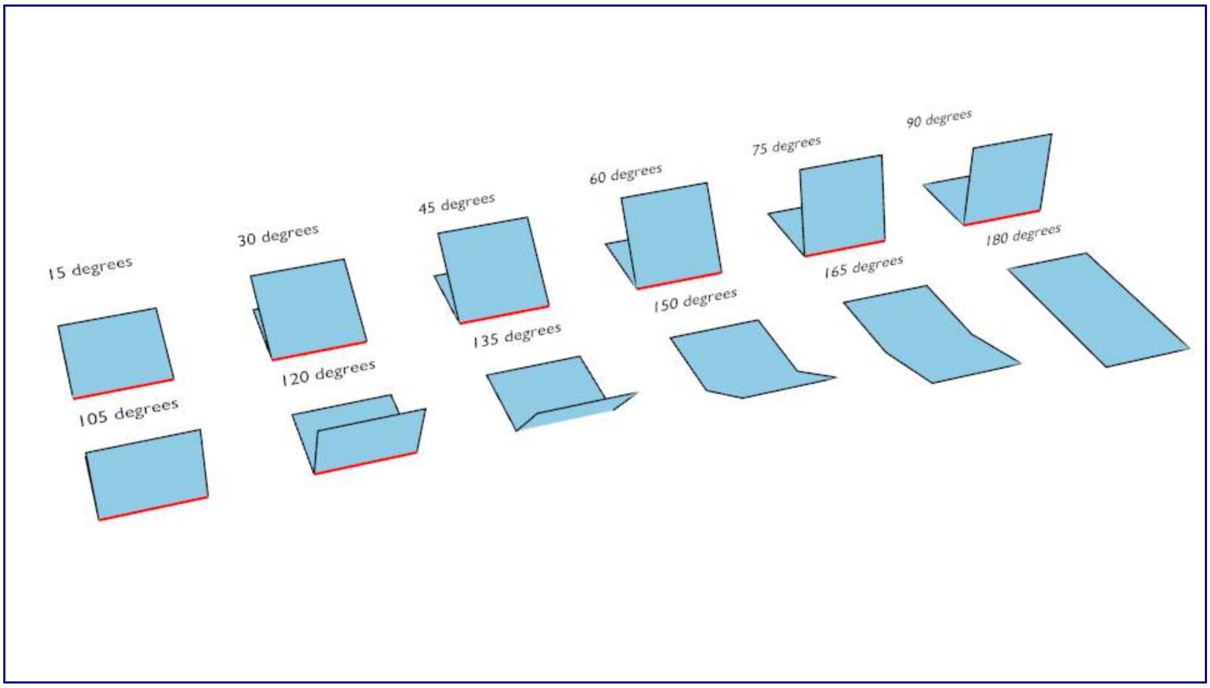
QI Range proof of concept demo, Start: 3, End: 7, by LightBWK (Sample .blend)

Selection by Edge Types

Edge types are basic algorithms for the selection of lines from geometry. When using the parameter editor you have to choose at least one edge type in order to get a render output, but several edge types can be combined in one line set. Edge types can also be excluded from calculation by pressing the *X* next to them.

Silhouette
: Draws silhouettes around your closed objects; it is often good for organic objects (like Suzanne & Sphere), and bad for sharp edges, like a box. It can't render open mesh objects like open cylinders and flat planes. The output is affected by the *Kr Derivative Epsilon* viewmap setting.

Crease
: Shows only edges whose adjacent faces form an angle greater than the defined viewmap's *Crease Angle*.



Crease Angle proof of concept for 121° by LightBWK (the .blend file)

Border

Border is for open/unclosed edge meshes; an open cylinder has an open edge at the top and bottom, and a plane is open all around. Suzanne’s eye socket is an open edge. All open edges will have lines rendered. This depends on the mesh structure.

Edge Marks

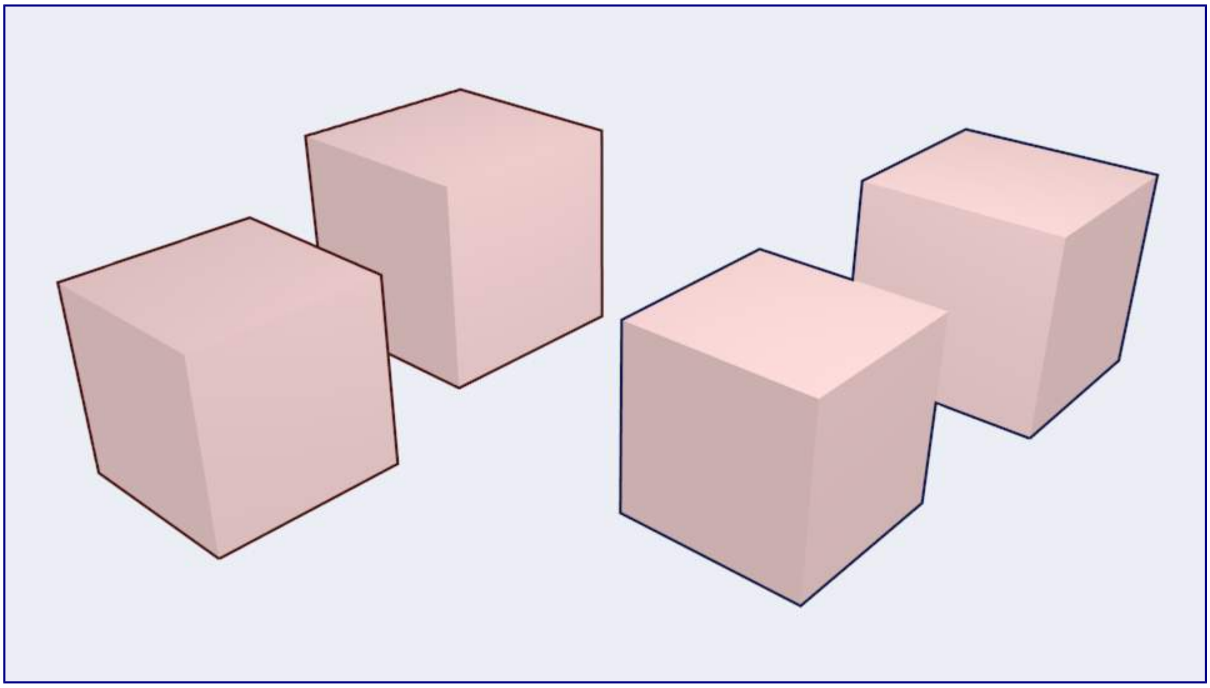
Renders marked edges. See Edge Marks for details.

Contour

Draws the outer edges and inner open border.

External Contour

Draws the contour lines, but only on the outer edges.



Left pair: Contour; Right pair: External Contour

Suggestive Contour

Draws some lines which would form the contour of the mesh if the viewport was shifted. Depends on your viewmap settings for *Kr Derivative Epsilon* and *Sphere Radius* (further information: File:Manual-2.6-Render-Freestyle-PrincetownLinestyle.pdf).

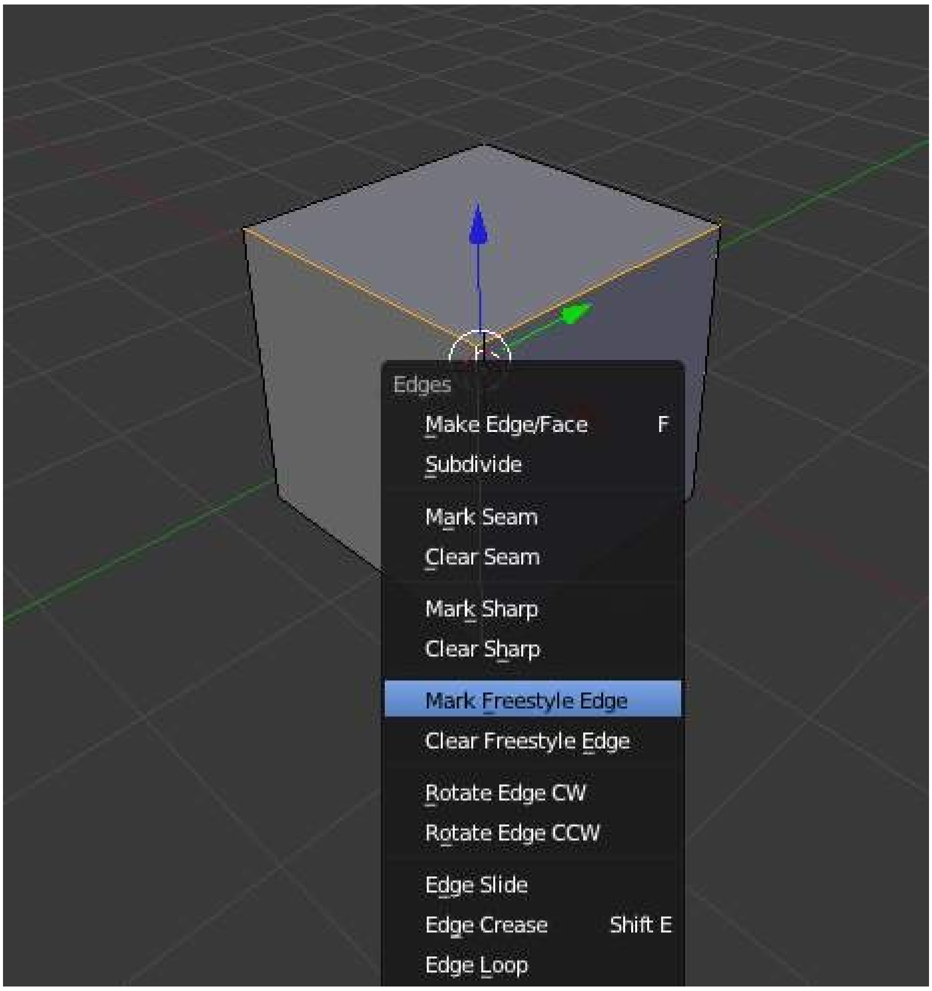
Material Boundary

Draws lines where two materials meet on the same object. Must be activated in the viewmap settings.

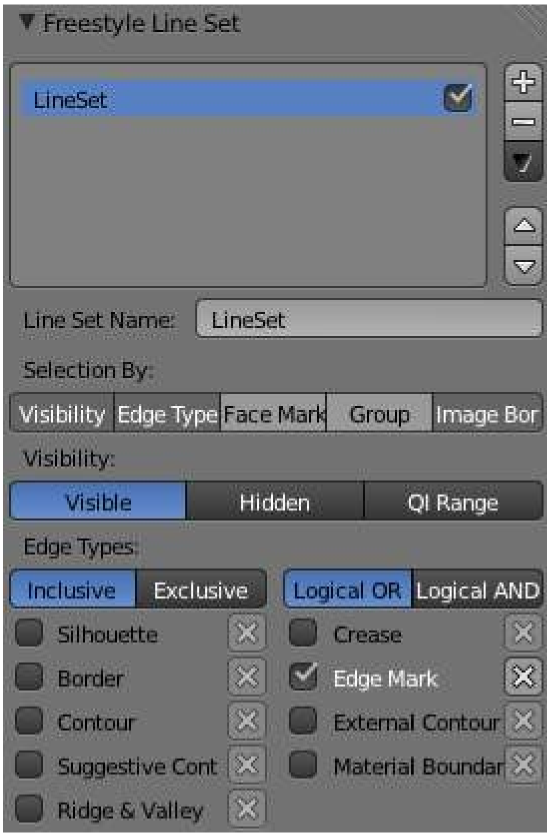
Ridge & Valley

Draws ridges and valleys. Depends on your *Sphere Radius* viewmap settings.

Edge Marks



Select and mark Freestyle edges.



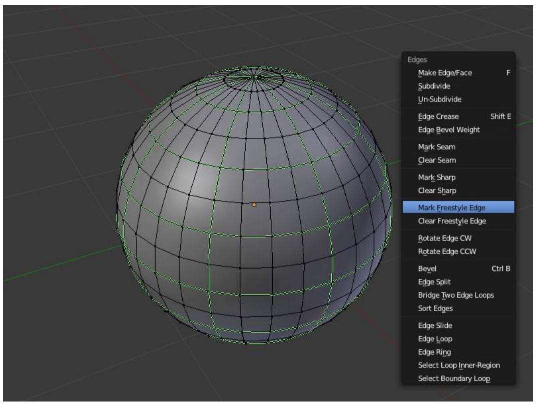
Edge Mark setting in the Line Sets tab.

In edit mode you can mark “Freestyle Edges” in the same manner you can mark “Seams” for UV unwrapping or “Sharp” for edge split. These marked edges are available to render when you select *Edge Mark.*

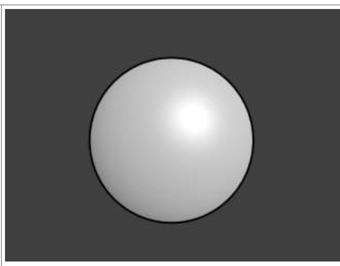
This is done as follows:

- Select your mesh and tab into *Edit* mode.
- Select the edges you want to be marked.
- Press `Ctrl-E` and select *Mark Freestyle Edge*.

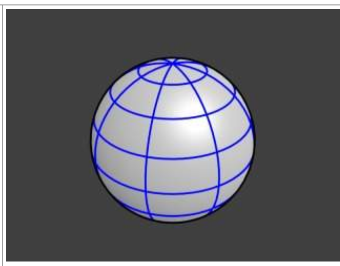
Edge marks are useful when you want to draw lines along particular mesh edges. The examples below explain the use of edge marks.



Marking Freestyle Edges in edit mode.



Render without Edge Marks.



Render with Edge Marks enabled.

The image on the left shows a sphere in *Edit* mode. The green lines are the edge marks. On the right you see a render without edge marks enabled.

With edge marks enabled, the previously-marked lines are always rendered. You can see the black contour lines and the blue lines that are made with edge marks.

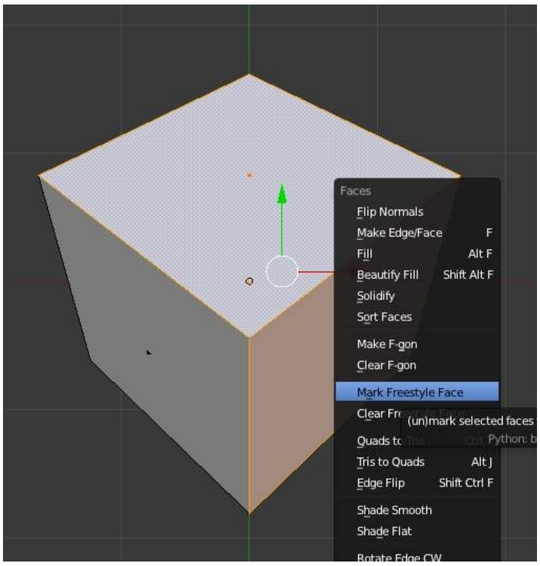
What are edge marks good for?

- When you need to render marks on an almost-flat plane, when other edge types can't detect any line.
- When you want full control of edge rendering. Often used for edges of squarish shapes.
- Mark the whole base mesh to be rendered for base mesh preview.

What are edge marks not good for?

- Round outer edges (use instead *Contour* / *External Contour* / *Silhouette*).

Selection by Face Marks



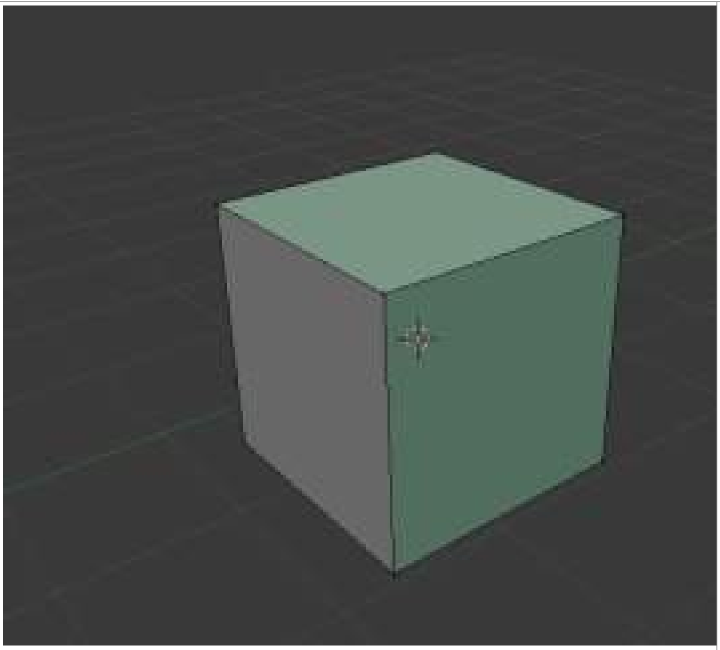
Mark Freestyle Faces.

To set a face mark:

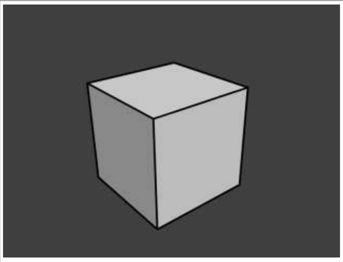
- Select a mesh and tab into *Edit* mode.
- Select the faces you want to be marked.
- Press `Ctrl-F` and select *Mark Freestyle Face*.

Face marks are useful for removing lines from certain areas of a mesh.

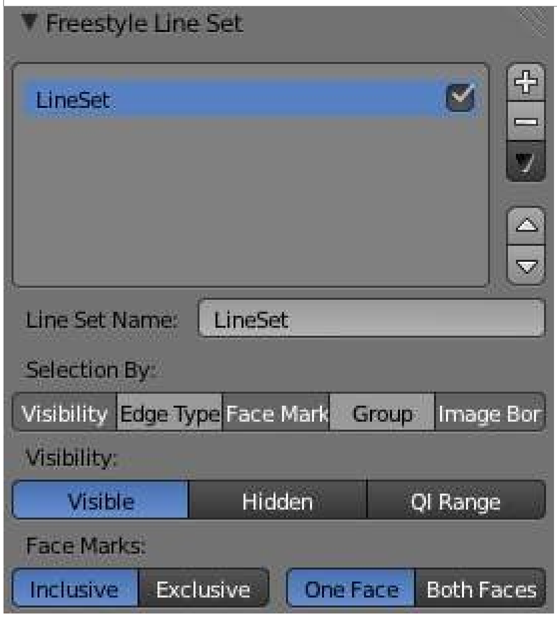
In this example, two faces of the default cube are marked like the image on the left. On the right is a render without face marks activated.



Marked Faces.



Render Output.



Face mark options.

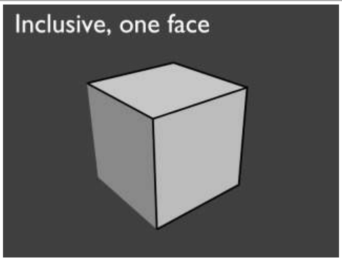
The line selection can be controlled via inclusion and faces options:

Inclusive / Exclusive
Whether to include or exclude edges matching defined face mark conditions from the line set.

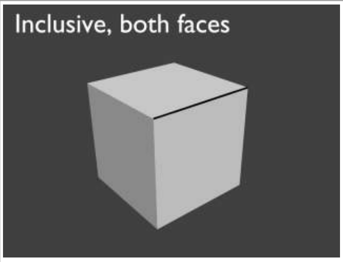
One Face
(De)select all edges which have one or both neighbor faces marked.

Both Faces
(De)select all edges which have both of their neighbor faces marked.

The image below shows the resulting combinations.

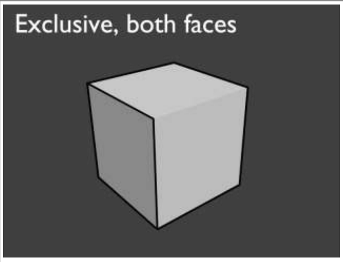


Inclusive, One Face.



Inclusive, Both Faces.

Exclusive, One Face.



Exclusive, Both Faces.

Selection by Group

You can include or exclude objects for line calculation, based on their belonging to a group.

Group
: The name of the object group to use.

Inclusive / Exclusive
: Whether to include or exclude lines from those objects in this line set.

Selection by Image Border

If enabled, Freestyle only takes geometry within the image border into consideration for line calculation. This reduces render times but increases continuity problems when geometry is moved out of and into camera view.

Line Style & Modifiers

Line Style UI

In Freestyle, the line style settings define the appearance of a line set using five main aspects:

- *stroke*
- *color*
- *alpha*
- *thickness*
- *geometry*

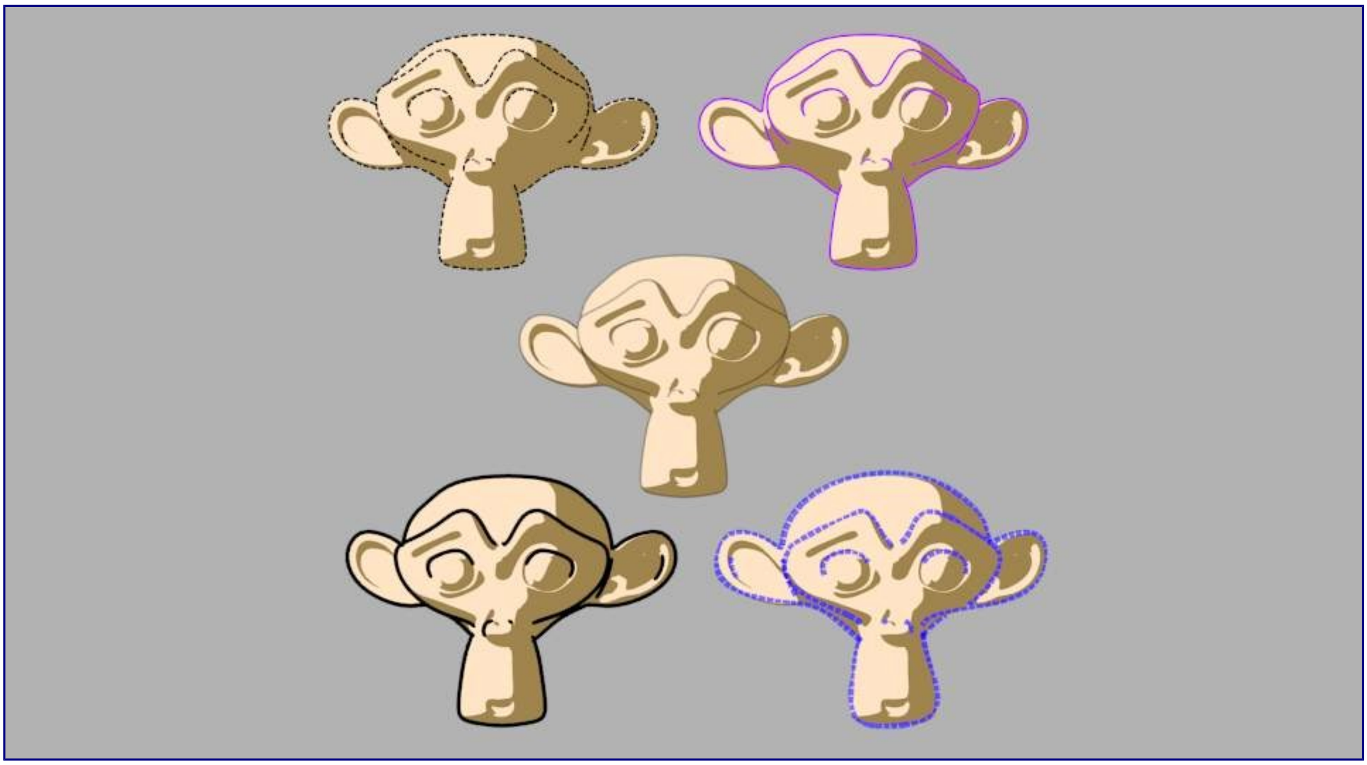
These allow you to get many different styles of renders (technical draw, rough sketch, cartoon, oriental calligraphy, etc.).

You can create as many line styles as you wish, and reuse a given line style for several line sets by selecting it from the dropdown menu next to its name.

Note

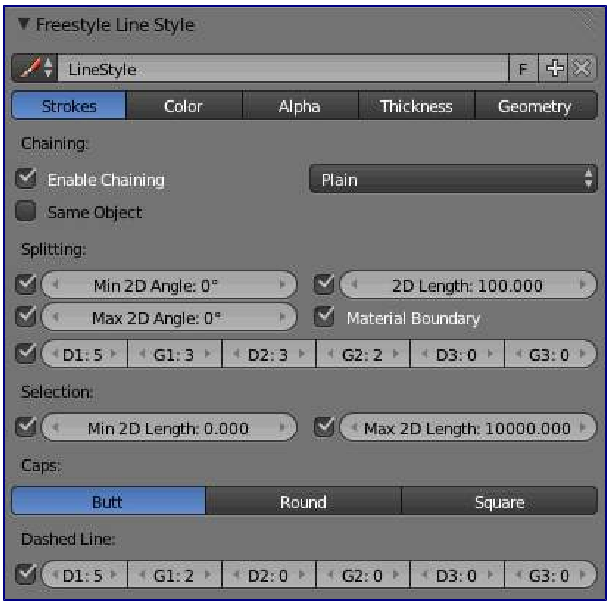
Length Unit

Unless otherwise specified, all lengths in line style settings are in pixels (either relative or absolute, as specified in the *core options*).



Line Style demo

Stroke



Stroke Line Style

Strokes are the final rendered lines. Yet you can tweaks them, for example, by removing the ones longer/shorter than some threshold, chaining lines into a single stroke or breaking a stroke into several ones based on angles, dashed pattern, etc.

Chaining

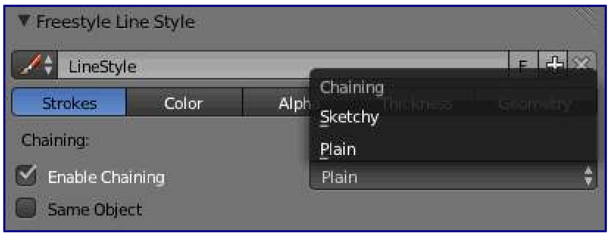
By default all retrieved lines from the line set are chained together. There are two basic chaining methods:

Plain
: The default chaining method; it creates simple chains.

Sketchy
: This chaining option allows for generating chains of feature edges with sketchy multiple strokes. Basically, it generates *Round* strokes instead of a single one. It is only really useful if you use some random-driven modifiers in the line style!

Rounds
: It specifies the number of rounds in sketchy strokes.

Chaining can also be turned off to render each line separately, which can be useful for line styles which depend on accurate representation of the line set.



Chaining

Splitting

You can split up chains of Freestyle lines by checking one of the following:

Material Boundary

Splits chains of feature edges if they cross from one material to another.

Min 2D Angle and Max 2D Angle

Splits chains of feature edges when they make a 2D angle above (or below) a minimum (or maximum) threshold.

Splitting

2D Length

Splits chains when they are longer than the given value.

D1 / G1 / D2 / G2 / D3 / G3

Splits the chains using the given dashed pattern (“D” stands for “dash”, “G” stands for “gap”; see also Dashed Line).

Sorting

You can sort the order of your strokes, allowing the lines to stack in the order given.

Sort key

Choose which way you would like to sort your strokes.

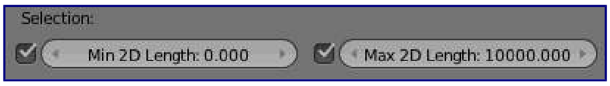
Integration Type

Use in tandem with the Sort Key to determine the range for sorting

Sort Order

With the given result you can choose to “Reverse” the sort order

Selection



Selection

You can also choose to only select (i.e. render) chains longer than *Min 2D Length* and/or shorter than *Max 2D Length*.

Caps

You can choose between three types of line caps:

Butt

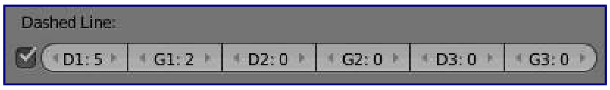
Flat cap, exactly at the point the line ends.

Line tip caps

Round
: A half circle centered on the end point of the line.

Square
: A square centered on the end point of the line (hence, like the circle, the drawn end of the line is slightly extended compared to its computed value).

Dashed Line



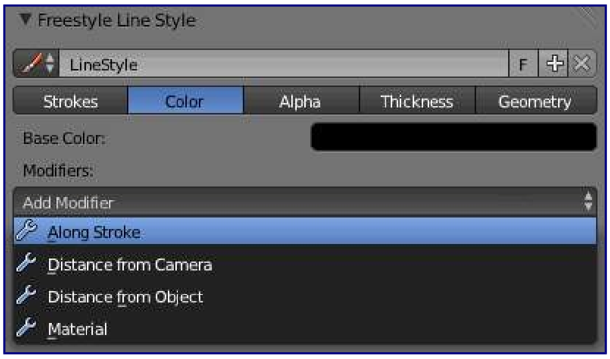
Dashes Line UI

By enabling the *Dashed Line* check box, you can specify three pairs of dash and gap lengths. Dash values define the lengths of dash strokes, while gap values specify intervals between two dashes.

If a zero gap is specified, then the corresponding dash is ignored even if it has a non-zero value.

Dashes are treated as separate strokes, meaning that you can apply line caps, as well as color, alpha and thickness modifiers.

Color



Line Style Color UI

In this tab you control the color of your strokes.

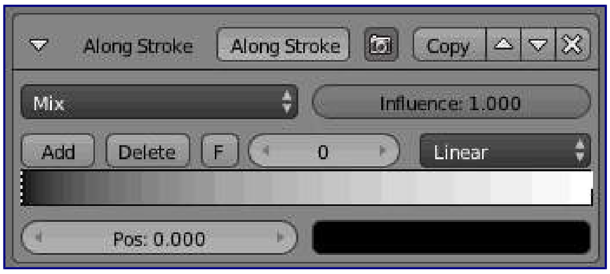
Base Color
: The base color for this line style.

Modifiers

There are four color modifiers available, which can be mixed with the base color using the usual methods (see for example the *Mix compositing node* for further discussion of this topic). As with other modifier stacks in Bforartists, they are applied from top to bottom.

Influence
: How much the result of this modifier affects the current color.

Along Stroke



The *Along Stroke* modifier alters the base color with a new one from a given color ramp mapped along each stroke’s length. In other words, it applies a color ramp along each stroke.

Color Ramp
: A standard Bforartists color ramp.

Distance from Camera

The *Distance from Camera* color modifier alters the base color with a new one from a given color ramp, using the distance to the active camera as the parameter.

Range Min and Range Max
: The limits of the mapping from “distance to camera” to “color in ramp”. If the current point of the stroke is at *Range Min* or less from the active camera, it will take the start color of the ramp, and conversely, if it is at *Range Max* or more from the camera, it will take the end color of the ramp. These values are in the current scene’s units, not in pixels!

Fill Range by Selection
: Set the min/max range values from the distances between the current selected objects and the camera.

The other settings are those of the standard Bforartists color ramp!

Distance from Object

The *Distance from Object* color modifier alters the base color with a new one from a given color ramp, using the distance to a given object as the parameter.

Target
: The object to measure distance from.

Range Min and Range Max
: The limits of the mapping from “distance to object” to “color in ramp”. If the current point of the stroke is at *Range Min* or less from the target, it will take the start color of the ramp, and conversely, if it is at *Range Max* or more from the target, it will take the end color of the ramp. These values are in the current scene’s units, not in pixels!

Fill Range by Selection
: Set the min/max range values from the distances between the current selected objects and the target.

The other settings are those of the standard Bforartists color ramp!

Material

The *Material* color modifier alters the base color with a new one taken from the current material under the stroke.

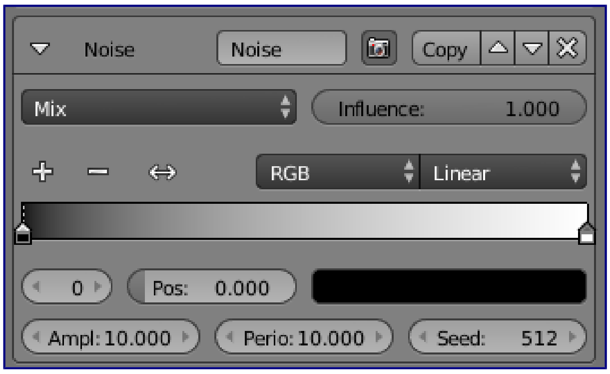
You can use various properties of the materials, among which many are mono-component (i.e. give B&W results). In this case, an optional color ramp can be used to map these grayscale values to colored ones.

If used with the *Split by Material* option in the *Stroke* tab, the result will not be blurred between materials along the strokes.

Material modifiers demo by T.K. File:Lilies_Color_Material.zip

Noise

The *Noise* modifier uses a pseudo-random number generator to variably distribute color along the stroke.



Amplitude

The maximum value of the noise. A higher amplitude means a less transparent (more solid) stroke.

Period

The period of the noise. This means how quickly the color value can change. A higher value means a more smoothly changing color along the stroke.

Seed

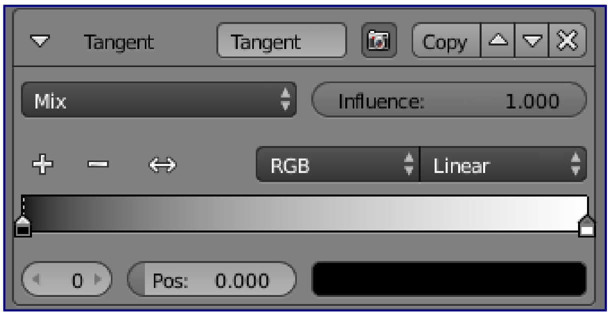
Seed used by the pseudo-random numer generator.

Color Ramp

A standard Bforartists color ramp that maps noise values to a stroke color.

Tangent

This modifier bases its effect on the traveling direction of the stroke evaluated at the stroke's vertices.



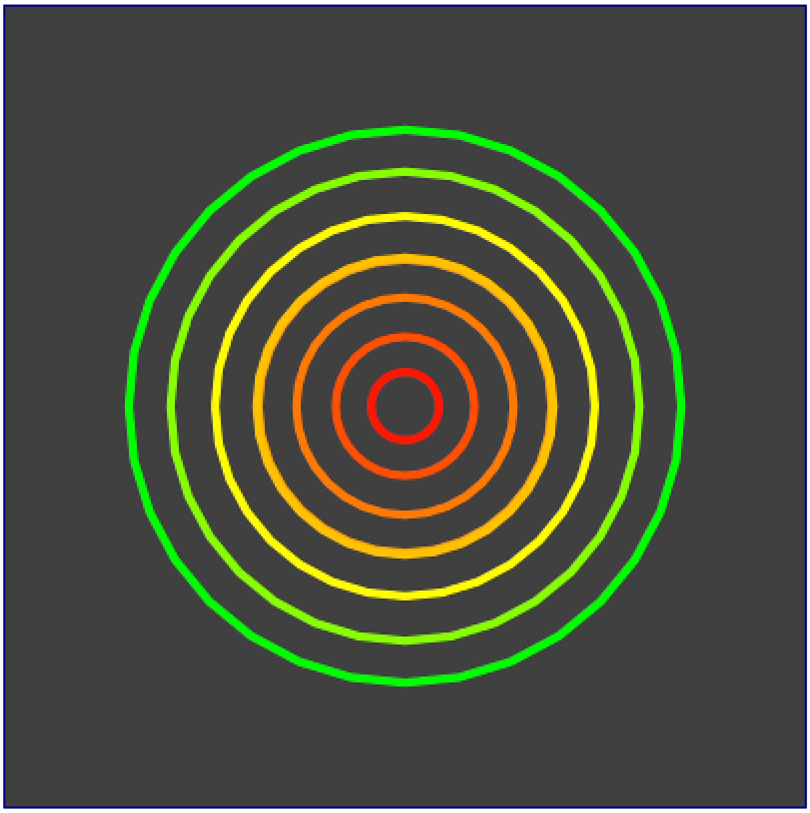
Color Ramp

A standard Bforartists color ramp that maps the traveling directio to a stroke color.

Min Angle and Max Angle

The range of input values to the mapping. Out-of-range input values will be clamped by the Min and Max angles and their corresponding color values.

3D Curvature



3D Curvature modifier demo by T.K. File:Render_freestyle_modifier_curvature_3d.blend

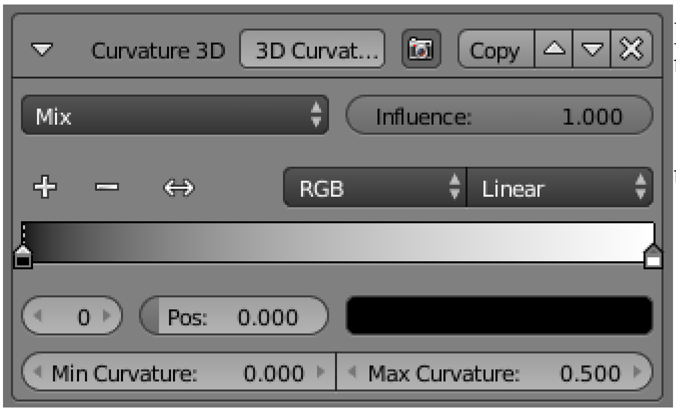
A modifier based on radial curvatures of the underlying 3D surface. The curvature of a 2D curve at a point is a measure of how quickly the curve turns at the point. The quicker the turn is, the larger the curvature is at the point. The curvature is zero if the curve is a straight line. Radial curvatures are those computed for a 2D curve that appears at the cross-section between the 3D surface and a plane defined by the view point (camera location) and the normal direction of the surface at the point.

For radial curvatures to be calculated (and therefore for this modifier to have any effect), the *Face Smoothness* option has to be turned on and the object needs to have *Smooth Shading*.

Color Ramp

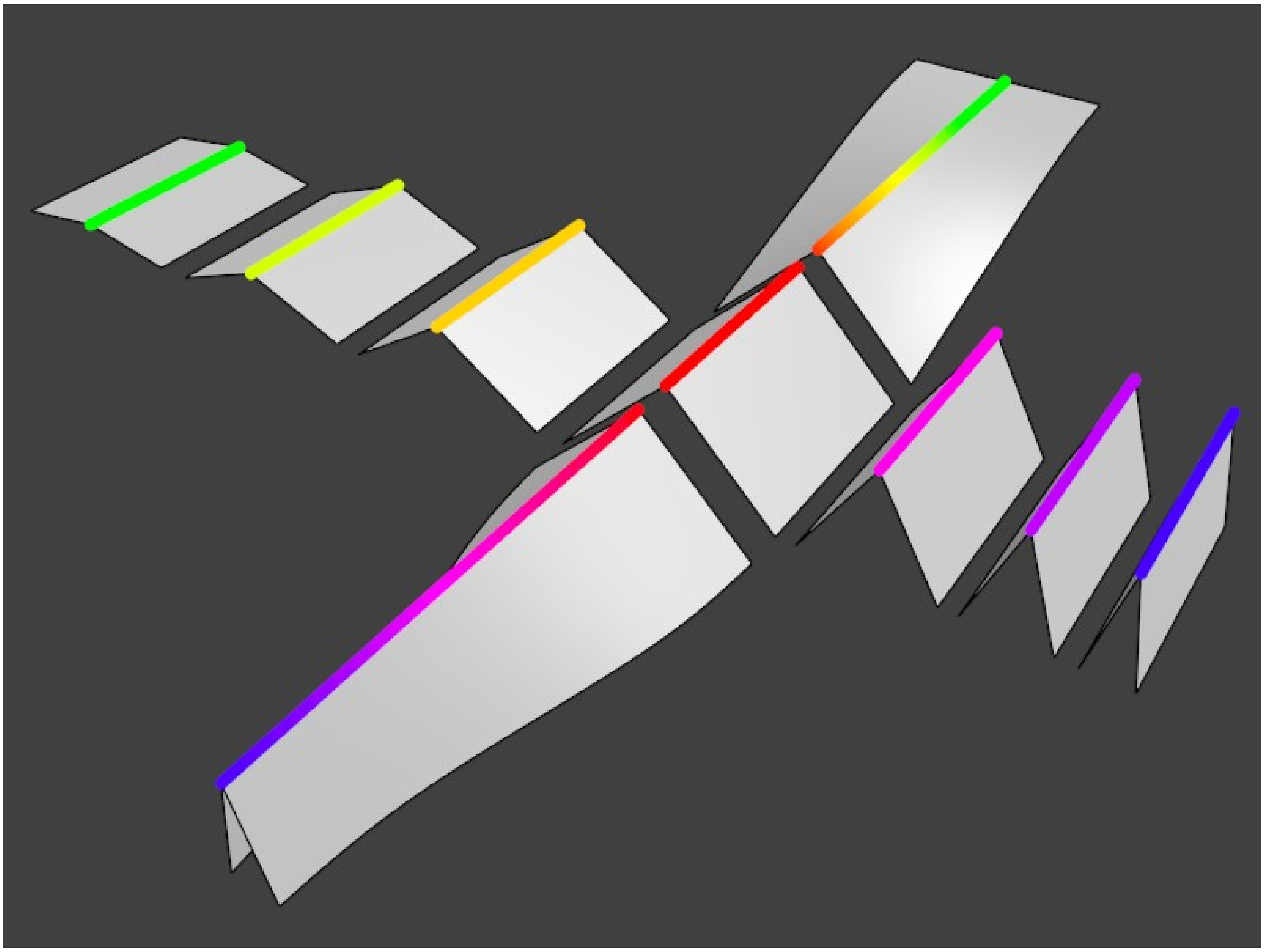
A standard Bforartists color ramp that maps the radial curvature to a stroke color.

Min Curvature and Max Curvature



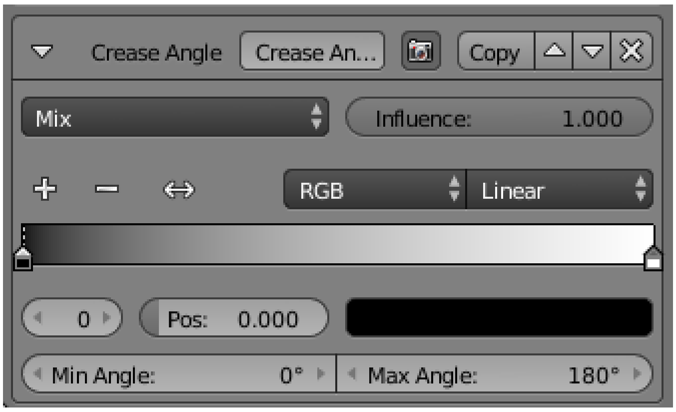
The limits of the color ramp. If the current point of the stroke is at *Min Curvature* or less from the target, it will take the start color of the mapping, and conversely, if it is at *Max Curvature* or more from the target, it will take the end color of the mapping.

Crease Angle



Crease Angle modifier demo by T.K. File:Render_freestyle_modifier_crease_angle.blend

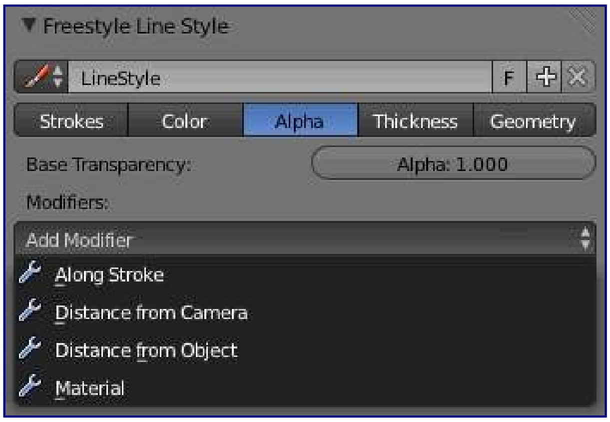
A modifier based on the Crease Angle (angle between two adjacent faces). If a stroke segment doesn't lie on a crease (i.e., the edge doesn't have the Crease Angle nature), its color values are not touched by the modifier.



Color Ramp
: A standard Bforartists color ramp that maps the crease angle to a stroke color.

Min Angle and Max Angle
: The range of input values to the mapping. Out-of-range crease angle values will be clamped by the Min and Max angles and their corresponding color values.

Alpha



Line Style Alpha UI

In this tab you control the alpha (transparency) of your strokes.

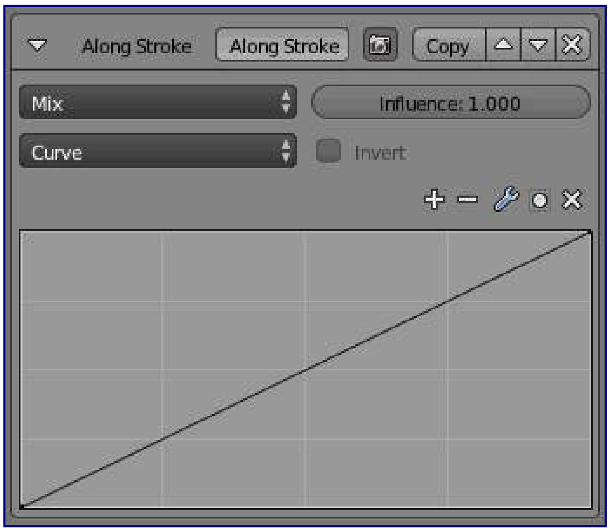
Base Transparency
The base alpha for this line style.

Modifiers

There are four alpha modifiers available, which can be mixed with the base alpha using a subset of the usual methods (see for example the *Mix compositing node* for further discussion of this topic). As with other modifier stacks in Bforartists, they are applied from top to bottom.

Influence
How much the result of this modifier affects the current transparency.

Along Stroke

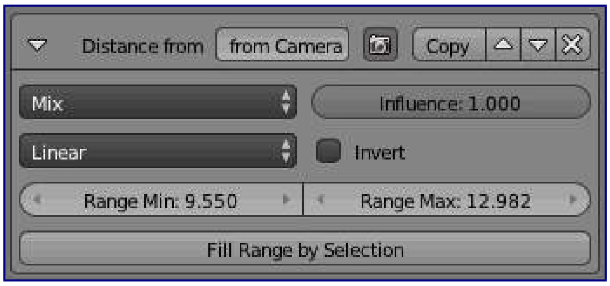


The *Along Stroke* modifier alters the base alpha with a new one from either a linear progression or a custom curve, mapped along each stroke’s length. In other words, it applies the selected progression along each stroke.

Mapping
Either a linear progression (from `0.0` to `1.0`, which may be inverted with the *Invert* option), or a custom mapping curve.

Distance from Camera

The *Distance from Camera* modifier alters the base alpha with a new one from either a linear progression or a custom curve, using the distance to the active camera as parameter.



Mapping

Either a linear progression (from `0.0` to `1.0`, which may be inverted with the *Invert* option), or a custom mapping curve.

Range Min and Range Max

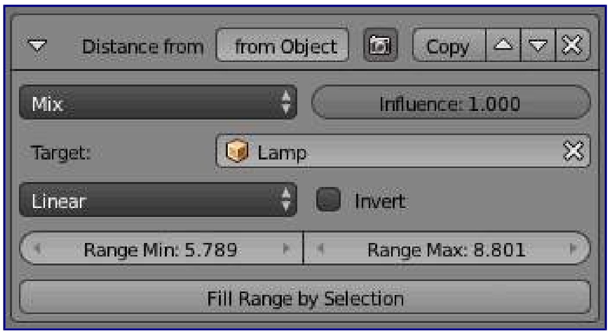
The limits of the mapping from “distance to camera” to “alpha in mapping”. If the current point of the stroke is at *Range Min* or less from the active camera, it will take the start alpha of the mapping, and conversely, if it is at *Range Max* or more from the camera, it will take the end alpha of the mapping. These values are in the current scene’s units, not in pixels!

Fill Range by Selection

Set the min/max range values from the distances between the current selected objects and the camera.

Distance from Object

The *Distance from Object* modifier alters the base alpha with a new one from either a linear progression or a custom curve, using the distance to a given object as parameter.



Target

The object to measure distance from.

Mapping

Either a linear progression (from `0.0` to `1.0`, which may be inverted with the *Invert* option), or a custom mapping curve.

Range Min and Range Max

The limits of the mapping from “distance to object” to “alpha in mapping”. If the current point of the stroke is at *Range Min* or less from the target, it will take the start alpha of the mapping, and conversely, if it is at *Range Max* or more from the target, it will take the end alpha of the mapping. These values are in the current scene’s units, not in pixels!

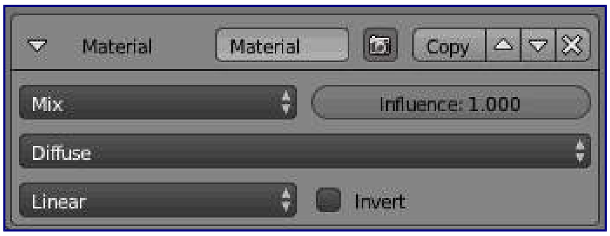
Fill Range by Selection

Set the min/max range values from the distances between the current selected objects and the target.

Material

The *Material* modifier alters the base alpha with a new one taken from the current material under the stroke.

You can use various properties of the materials, among which some are multi-components (i.e. give RGB results). In that case, the mean value will be used.



Mapping
Either a linear progression (from `0.0` to `1.0`, which may be inverted with the *Invert* option), or a custom mapping curve. Note the linear non-inverted option is equivalent to “do nothing”, as original values from materials are already in the `[0.0, 1.0]` range.

If used with the *Split by Material* option in the *Stroke* tab, the result will not be blurred between materials along the strokes.

Noise

The *Noise* modifier uses a pseudo-random number generator to variably distribute transparency along the stroke.

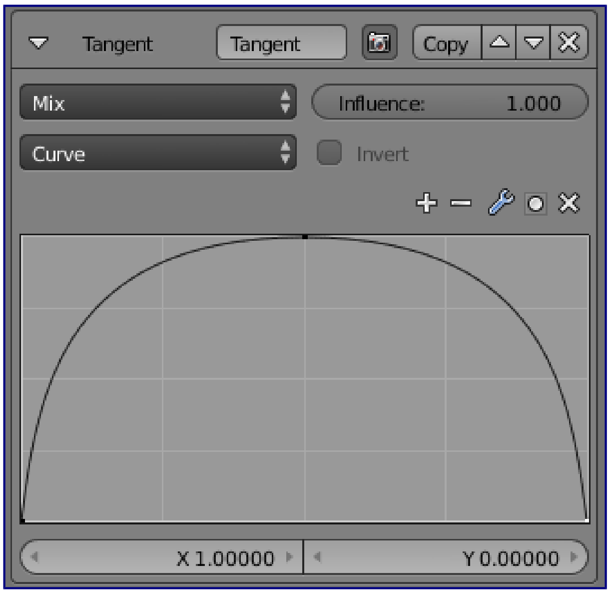
Amplitude
The maximum value of the noise. A higher amplitude means a less transparent (more solid) stroke.

Period
The period of the noise. This means how quickly the alpha value can change. A higher value means a more smoothly changing transparency along the stroke.

Seed
Seed used by the pseudo-random numer generator.

Mapping
Either a linear progression (from `0.0` to `1.0`, which may be inverted with the *Invert* option), or a custom mapping curve. Note the linear non-inverted option is equivalent to “do nothing”, as original values from materials are already in the `[0.0, 1.0]` range.

Tangent



This modifier bases its effect on the traveling direction of the stroke evaluated at the stroke's vertices.

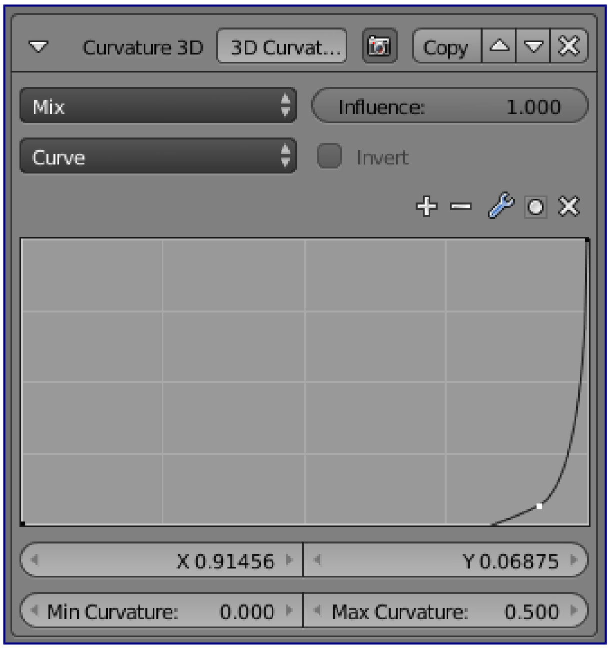
Mapping
: Either a linear progression (from `0.0` to `1.0`, which may be inverted with the *Invert* option), or a custom mapping curve. Note the linear non-inverted option is equivalent to "do nothing", as original values from materials are already in the `[0.0, 1.0]` range.

Min Angle and Max Angle
: The range of input values to the mapping. Out-of-range input values will be clamped by the Min and Max angles and their corresponding alpha values.

3D Curvature

A modifier based on radial curvatures of the underlying 3D surface. The curvature of a 2D curve at a point is a measure of how quickly the curve turns at the point. The quicker the turn is, the larger the curvature is at the point. The curvature is zero if the curve is a straight line. Radial curvatures are those computed for a 2D curve that appears at the cross-section between the 3D surface and a plane defined by the view point (camera location) and the normal direction of the surface at the point.

For radial curvatures to be calculated (and therefore for this modifier to have any effect), the *Face Smoothness* option has to be turned on and the object needs to have *Smooth Shading*.



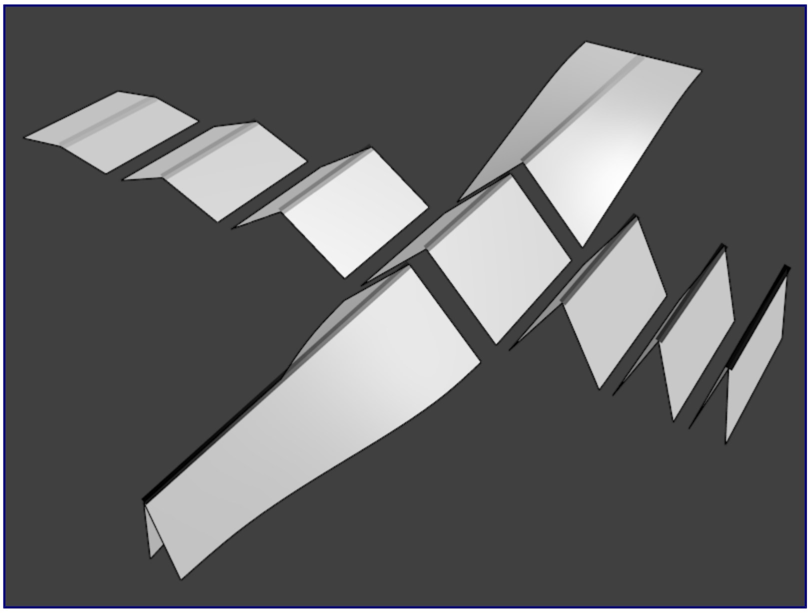
Mapping

Either a linear progression (from `0.0` to `1.0`, which may be inverted with the *Invert* option), or a custom mapping curve. Note the linear non-inverted option is equivalent to "do nothing", as original values from materials are already in the `[0.0, 1.0]` range.

Min Curvature and Max Curvature

The limits of the mapping. If the current point of the stroke is at *Min Curvature* or less from the target, it will take the start alpha of the mapping, and conversely, if it is at *Max Curvature* or more from the target, it will take the end alpha of the mapping.

Crease Angle



Crease Angle modifier demo by T.K. File:Render_freestyle_modifier_crease_angle.blend

A modifier based on the Crease Angle (angle between two adjacent faces). If a stroke segment doesn't lie on a crease (i.e., the edge doesn't have the Crease Angle nature), its alpha value is not touched by this modifier.

Mapping

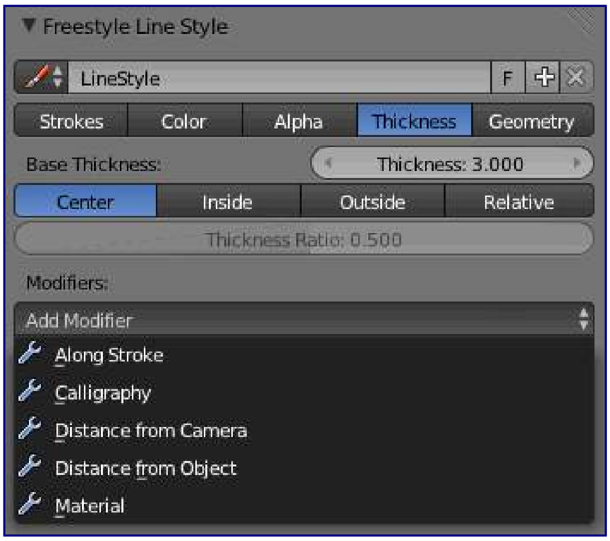
Either a linear progression (from `0.0` to `1.0`, which may be inverted with the *Invert* option), or a custom mapping curve. Note the linear non-inverted option is equivalent to “do nothing”, as original values from materials are already in the `[0.0, 1.0]` range.

Min Angle and Max Angle

The range of input values to the mapping. Out-of-range input values will be clamped by the Min and Max angles and their corresponding alpha values.

Thickness

In this tab you control the thickness of your strokes.



Base Thickness

The base thickness for this line style.

Thickness Position

Control the position of stroke thickness from the original (backbone) stroke geometry. There are four choices:

Center

The thickness is evenly split to the left and right side of the stroke geometry.

Inside

The strokes are drawn within object boundary.

Outside

The strokes are drawn outside the object boundary.

Relative

This allows you to specify the relative position by a number between `0.0` (inside) and `1.0` (outside), in the *Thickness Ratio* numeric field just below.

The thickness position options are applied only to strokes of edge types *Silhouette* and *Border*, since these are the only edge types defined in terms of the object boundary. Strokes of other edge types are always drawn using the *Center* option.

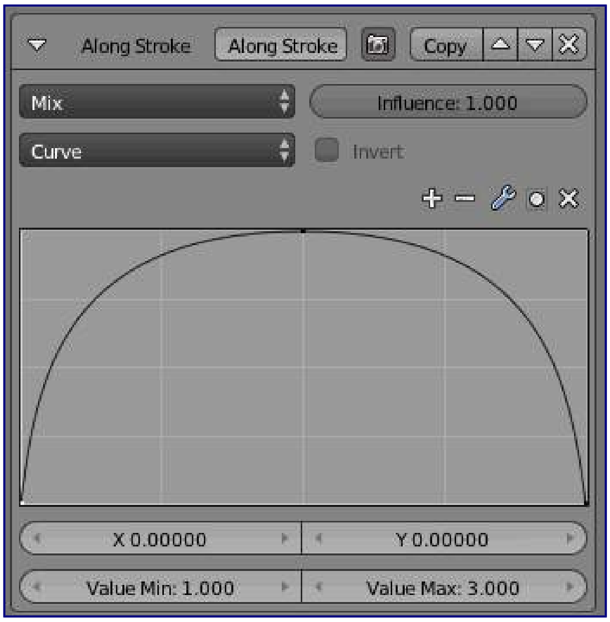
Modifiers

There are five thickness modifiers available, which can be mixed with the base thickness using a subset of the usual methods (see for example the *Mix compositing node* for further discussion of this topic). As with other modifier stacks in Bforartists, they are applied from top to bottom.

Influence
How much the result of this modifier affects the current thickness.

Along Stroke

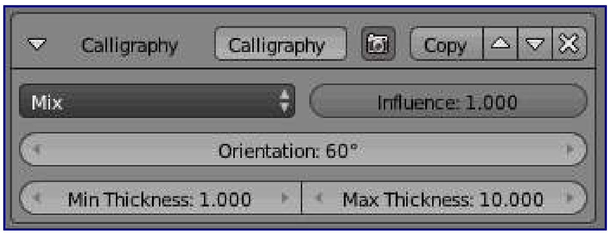
The *Along Stroke* modifier alters the base thickness with a new one from either a linear progression or a custom curve, mapped along each stroke's length. In other words, it applies the selected progression along each stroke.



Mapping
Either a linear progression (from `0.0` to `1.0` which may be inverted with the *Invert* option), or a custom mapping curve.

Calligraphy

The *Calligraphy* modifier mimics some broad and flat pens for calligraphy. It generates different thickness based on the orientation of the stroke.



Orientation

The angle (orientation) of the virtual drawing tool, from the vertical axis of the picture. For example, an angle of `0.0` mimics a pen aligned with the vertical axis, hence the thickest strokes will be the vertical ones, and the thinnest, the horizontal ones.

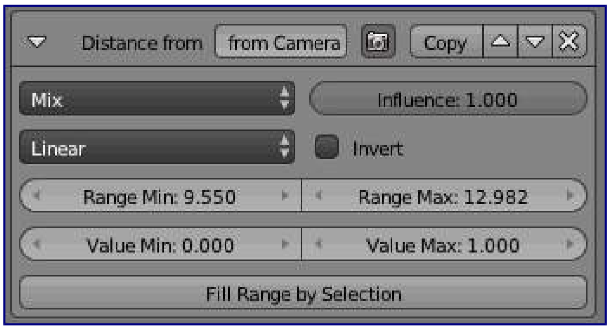
Min Thickness and Max Thickness

The minimum and maximum generated thickness (as explained above, minimum is used when the stroke's direction is perpendicular to the main *Orientation*, and maximum, when aligned with it).

Calligraphy modifier demo by T.K. File:Toycar_Calligraphy.zip

Distance from Camera

The *Distance from Camera* modifier alters the base thickness with a new one from either a linear progression or a custom curve, using the distance to the active camera as the parameter.



Mapping

Either a linear progression (from `0.0` to `1.0` which may be inverted with the *Invert* option), or a custom mapping curve.

Range Min and Range Max

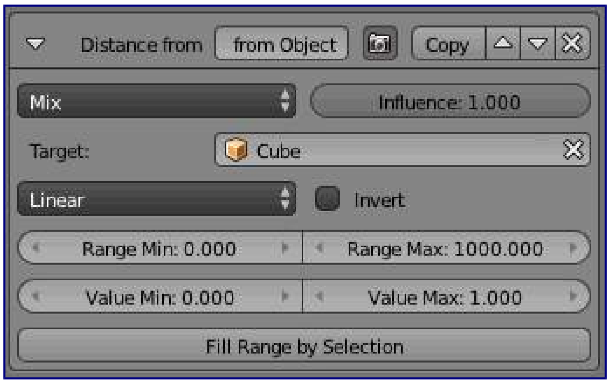
The limits of the mapping from "distance to camera" to "thickness in mapping". If the current point of the stroke is at *Range Min* or less from the active camera, it will take the start thickness of the mapping, and conversely, if it is at *Range Max* or more from the camera, it will take the end thickness of the mapping. These values are in the current scene's units, not in pixels!

Fill Range by Selection

Set the min/max range values from the distances between the current selected objects and the camera.

Distance from Object

The *Distance from Object* modifier alters the base thickness with a new one from either a linear progression or a custom curve, using the distance to a given object as parameter.



Target
: The object to measure distance from.

Mapping
: Either a linear progression (from `0.0` to `1.0` which may be inverted with the *Invert* option), or a custom mapping curve.

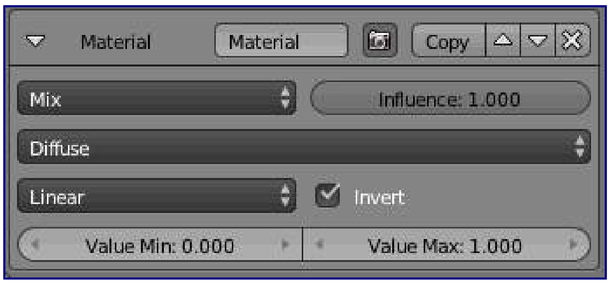
Range Min and Range Max
: The limits of the mapping from “distance to object” to “alpha in mapping”. If the current point of the stroke is at *Range Min* or less from the target, it will take the start thickness of the mapping, and conversely, if it is at *Range Max* or more from the target, it will take the end thickness of the mapping. These values are in the current scene’s units, not in pixels!

Fill Range by Selection
: Set the min/max range values from the distances between the current selected objects and the target.

Material

The *Material* modifier alters the base thickness with a new one taken from the current material under the stroke.

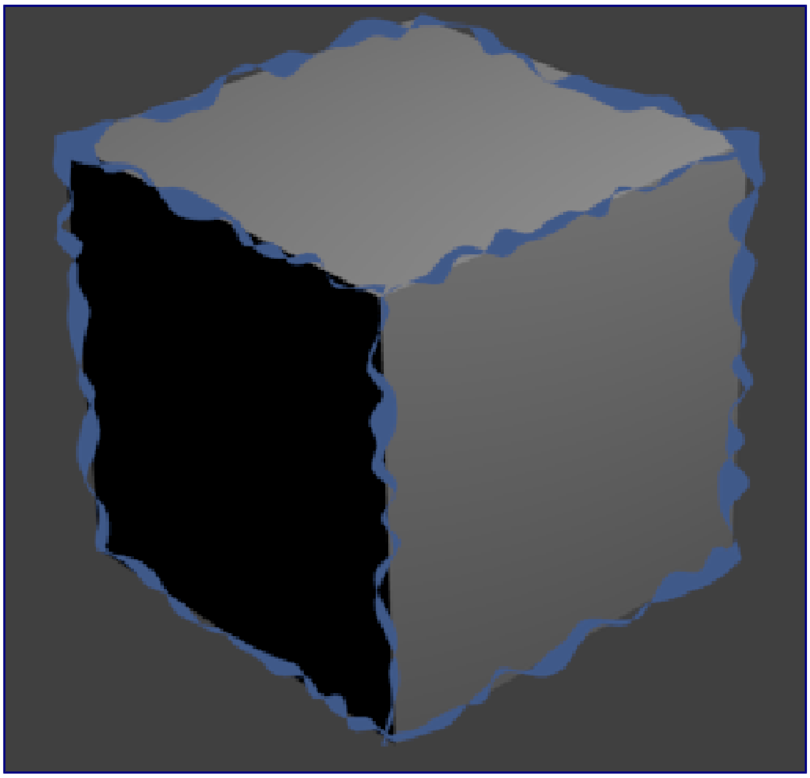
You can use various properties of the materials, among which some are multi-components (i.e. give RGB results). In that case, the mean value will be used.



Mapping
: Either a linear progression (from `0.0` to `1.0` which may be inverted with the *Invert* option), or a custom mapping curve. Note the linear non-inverted option is equivalent to “do nothing”, as original values from materials are already in the [0.0, 1.0] range...

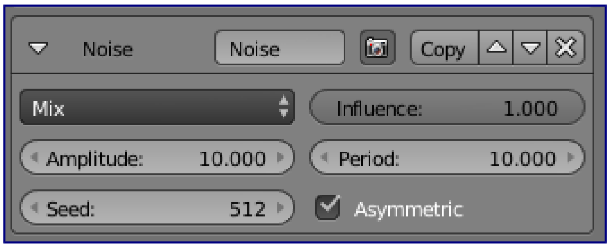
If used with the *Split by Material* option in the *Stroke* tab, the result will not be blurred between materials along the strokes.

Noise



Effect generated with a noise thickness modifier using asymmetric thickness.

The *Noise* modifier uses a pseudo-random number generator to variably distribute thickness along the stroke.



Min Thickness and Max Thickness

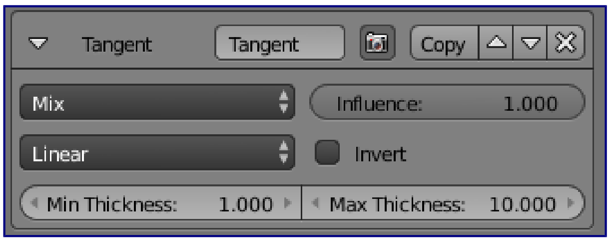
The minimum and maximum assigned thickness.

Asymmetric

Allows the thickness to be distributed unevenly at every point. Internally, the stroke is represented as a backbone with a thickness to the right and left side. All other thickness shaders make sure that the left and right thickness values are equal. For the Noise shader however, a meaningful (and good-looking) result can be created by assigning different values to either side of the backbone.

Tangent

This modifier bases its effect on the traveling direction of the stroke evaluated at the stroke's vertices.



Min Thickness and Max Thickness
: The minimum and maximum assigned thickness.

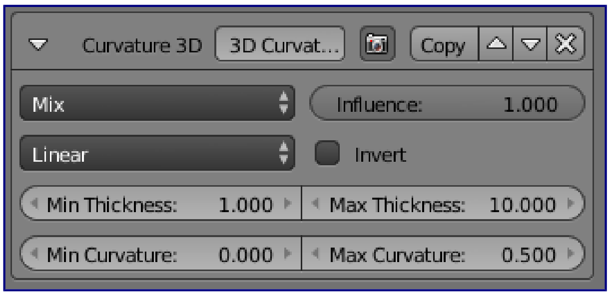
Mapping
: Either a linear progression (from *Min Thickness* to *Max Thickness*, which may be inverted with the *Invert* option), or a custom mapping curve (on the same range).

Min Angle and Max Angle
: The range of input values to the mapping. Out-of-range input values will be clamped by the Min and Max angles and their corresponding thickness values.

3D Curvature

A modifier based on radial curvatures of the underlying 3D surface. The curvature of a 2D curve at a point is a measure of how quickly the curve turns at the point. The quicker the turn is, the larger the curvature is at the point. The curvature is zero if the curve is a straight line. Radial curvatures are those computed for a 2D curve that appears at the cross-section between the 3D surface and a plane defined by the view point (camera location) and the normal direction of the surface at the point.

For radial curvatures to be calculated (and therefore for this modifier to have any effect), the *Face Smoothness* option has to be turned on and the object needs to have *Smooth Shading*.

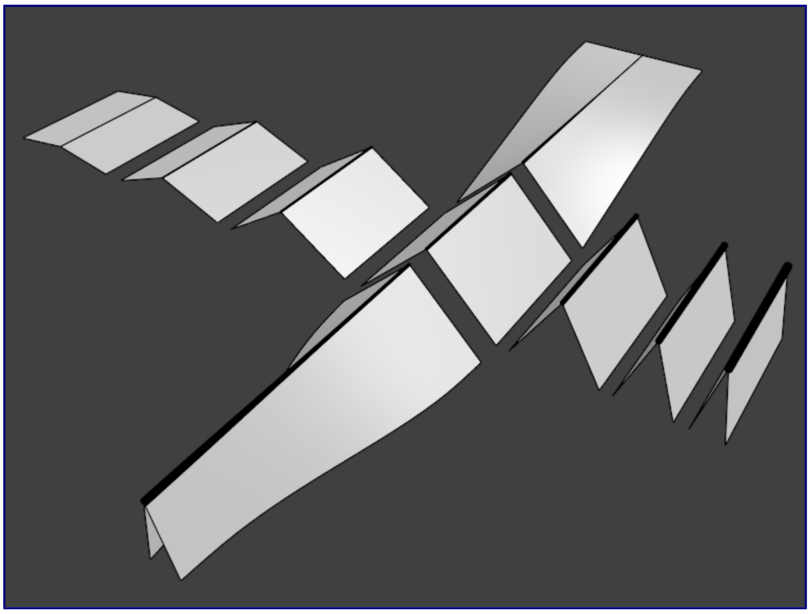


Min Thickness and Max Thickness
: The minimum and maximum assigned thickness.

Mapping
: Either a linear progression (from *Min Thickness* to *Max Thickness*, which may be inverted with the *Invert* option), or a custom mapping curve (on the same range).

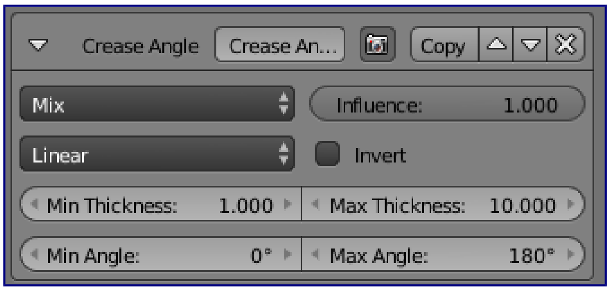
Min Curvature and Max Curvature
: The limits of the mapping of the Min and Max Thickness. If the current point of the stroke is at *Min Curvature* or less from the target, it will take the start thickness of the mapping, and conversely, if it is at *Max Curvature* or more from the target, it will take the end thickness of the mapping.

Crease Angle



Crease Angle modifier demo by T.K. File:Render_freestyle_modifier_crease_angle.blend

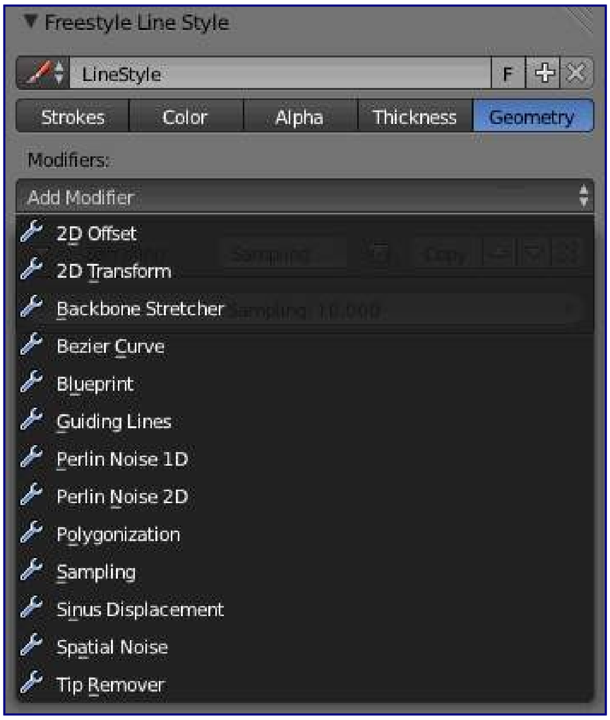
A modifier based on the Crease Angle (angle between two adjacent faces). If a stroke segment doesn’t lie on a crease (i.e., the edge doesn’t have the Crease Angle nature), its thickness value is not touched by this modifier.



Min Thickness and Max Thickness
: The minimum and maximum assigned thickness.

Mapping
: Either a linear progression (from *Min Thickness* to *Max Thickness*, which may be inverted with the *Invert* option), or a custom mapping curve (on the same range).

Geometry



Line Style Geometry Overall UI

In this tab you control the geometry of your strokes.

Modifiers

There are thirteen geometry modifiers available. These modifiers have no mix nor influence settings, as they always completely apply to the strokes' geometry (like object modifiers do). They take the resulting two-dimensional strokes from the Freestyle line set and displace or deform them in various ways.

As with other modifier stacks in Bforartists, they are applied from top to bottom.

2D Offset

The *2D Offset* modifier adds some two-dimensional offsets to the stroke backbone geometry. It has two sets of independent options/effects:

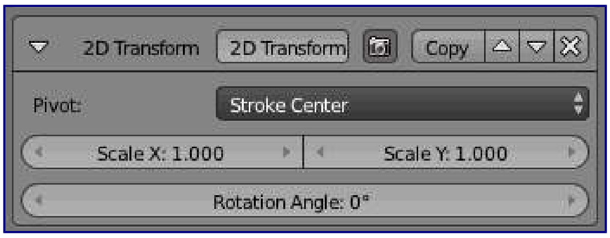
Start and End
: These two options add the given amount of offset to the start (or end) point of the stroke, along the (2D) normal at those points. The effect is blended over the whole stroke, so if you, for example, set only *Start* to **50**, the start of the stroke is offset 50 pixels along its normal, the middle of the stroke, 25 pixels along its own normal, and the end point isn't moved.

X and Y
: These two options simply add a constant horizontal and/or vertical offset to the whole stroke.

2D Transform

The *2D Transform* modifier applies two-dimensional scaling and/or rotation to the stroke backbone geometry. Scale is applied before rotation.

The center (pivot point) of these 2D transformations can be:



Stroke Center
: The median point of the stroke.

Stroke Start
: The beginning point of the stroke.

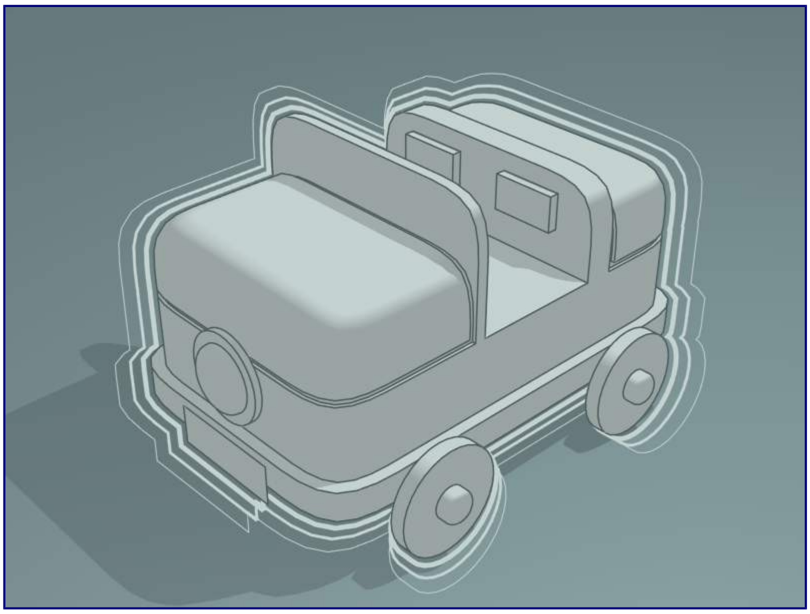
Stroke End
: The end point of the stroke.

Stroke Point Parameter
: The *Stroke Point Parameter* factor controls where along the stroke the pivot point is (`0.0` means start point; `1.0` end point).

Absolute 2D Point
: The *Pivot X* and *Pivot Y* allows you to define the position of the pivot point in the final render (from the bottom left corner). **WARNING** : Currently, you have to take into account the *real* render size, i.e. resolution **and** resolution percentage!

Scale X and Scale Y
: The scaling factors, in their respective axes.

Rotation Angle
: The rotation angle.



2D Transform modifier File:Toycar_Three_Contours.zip

Backbone Stretcher

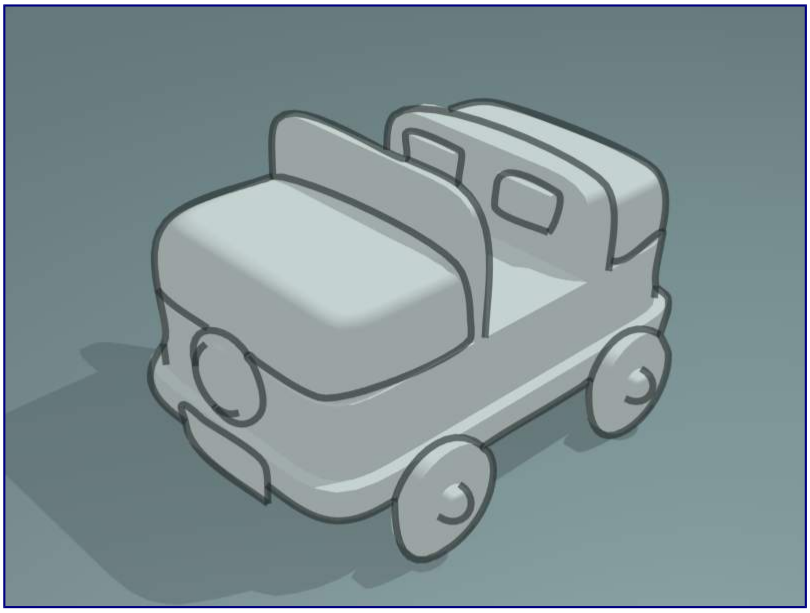
The *Backbone Stretcher* modifier stretches (adds some length to) the beginning and end of the stroke.

Backbone Length
Length to add to the strokes' ends.

Bezier Curve

The *Bezier Curve* modifier replaces the stroke by a Bezier approximation of it.

Error
The maximum distance allowed between the new Bezier curve and the original stroke.



Bezier Curve modifier demo by T.K. File:toycar_bezier.zip

Blueprint

The *Blueprint* modifier produces blueprint-like strokes using either circular, elliptical, or square contours. A blueprint here refers to those lines drawn at the beginning of free-hand drawing to capture the silhouette of objects with a simple shape such as circles, ellipses and squares.

Shape
: Which base shapes to use for this blueprint: *Circles*, *Ellipses* or *Squares*.

Rounds
: How many rounds are generated, as if the pen draws the same stroke several times (i.e. how many times the process is repeated).

Random Radius and Random Center
: For the *Circles* and *Ellipses* shapes. Adds some randomness to each round in the relevant aspect. Using more than one round with no randomness would be meaningless, as they would draw over each other exactly.

Backbone Length and Random Backbone
: For the *Squares* shapes. The first adds some extra length to each edge of the generated squares (also affected by the second parameter). The second adds some randomness to the squares.

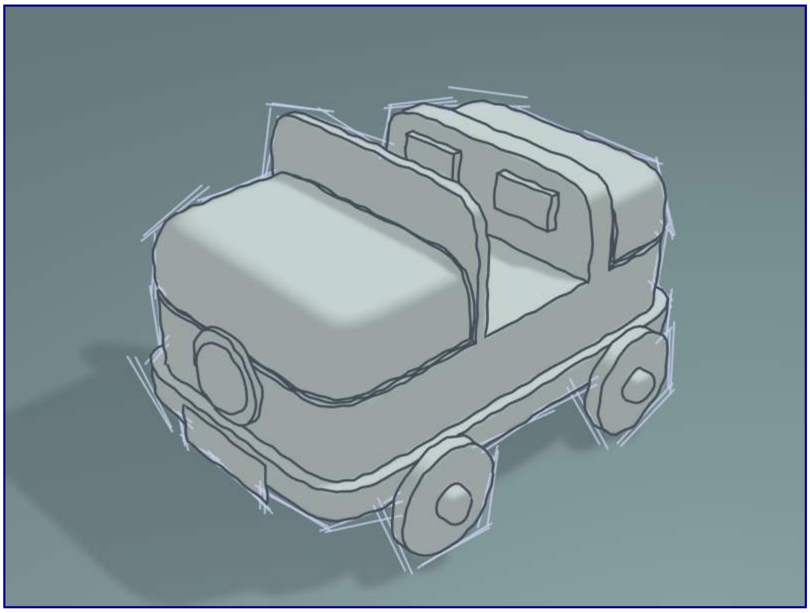
Note that the *Min 2D Length* feature from the *Strokes* settings is quite handy here, to avoid the noise generated by small strokes...

Guiding Lines

The *Guiding Lines* modifier replaces a stroke by a straight line connecting both of its ends.

Offset
: Offset the start and end points along the original stroke, before generating the new straight one.

This modifier will produce reasonable results when strokes are short enough, because shorter strokes are more likely to be well approximated by straight lines. Therefore, it is recommended to use this modifier together with one of the splitting options (by 2D angle or by 2D length) from the *Strokes* panel.



Guiding Lines modifier Demo by T.K. File:Toycar_Guiding_Line.zip

Perlin Noise 1D

The *Perlin Noise 1D* modifier adds one-dimensional Perlin noise to the stroke. The curvilinear abscissa (value between 0 and 1 determined by a point’s position relative to the first and last point of a stroke) is used as the input to the noise function to generate noisy displacements.

This means that this modifier will give an identical result for two strokes with the same length and sampling interval.

Frequency
: How dense the noise is (kind of a scale factor along the stroke).

Amplitude
: How much the noise distorts the stroke in the *Angle* direction.

Seed
: The seed of the random generator (the same seed over a stroke will always give the same result).

Octaves
: The “level of detail” of the noise.

Angle
: In which direction the noise is applied (`0.0` is fully horizontal).

Perlin Noise 2D

The *Perlin Noise 2D* modifier adds one-dimensional Perlin noise to the stroke. The modifier generates noisy displacements using 2D coordinates of stroke vertices as the input of the noise generator.

Its settings are exactly the same as the *Perlin Noise 1D* modifier.

Polygonization

The *Polygonization* modifier simplifies strokes as much as possible (in other words, it transforms smooth strokes into jagged polylines).

Error
: The maximum distance allowed between the new simplified stroke and the original one (the larger this value is, the more jagged/approximated the resulting polylines are).

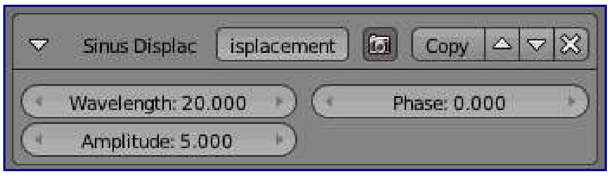
Sampling

The *Sampling* modifier changes the definition, precision of the stroke, for the following modifiers.

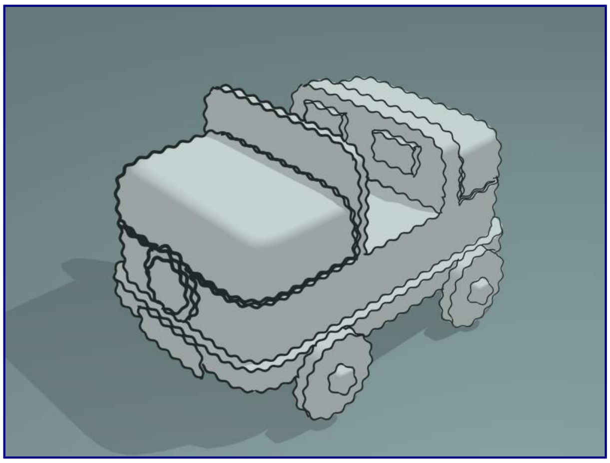
Sampling
The smaller this value, the more precise are the strokes. Be careful; too small values will require a huge amount of time and memory during render!

Sinus Displacement

The *Sinus Displacement* modifier adds a sinusoidal displacement to the stroke.



Wavelength
How wide the undulations are along the stroke.
Amplitude
How high the undulations are across the stroke.
Phase
Allows “offsetting” (“moving”) the undulations along the stroke.



Sinus Displacement modifier demo by T.K. File:Toycar_Sinus.zip

Spatial Noise

The *Spatial Noise* modifier adds some spatial noise to the stroke. Spatial noise displacements are added in the normal direction (i.e., the direction perpendicular to the tangent line) evaluated at each stroke vertex.

Amplitude
How much the noise distorts the stroke.

Scale
How wide the noise is along the stroke.

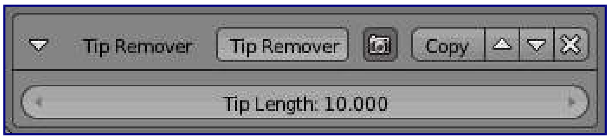
Octaves
The level of detail of the noise.

Smooth
When enabled, apply some smoothing over the generated noise.

Pure Random
When disabled, the next generated random value depends on the previous one; otherwise they are completely independent. Disabling this setting gives a more “consistent” noise along a stroke.

Tip Remover

The *Tip Remover* modifier removes a piece of the stroke at its beginning and end.



Tip Length
Length of stroke to remove at both of its tips.

Simplification

The *Simplification* modifier merges stroke vertices that lie close to one another, like the *Decimate* modifier for meshes.

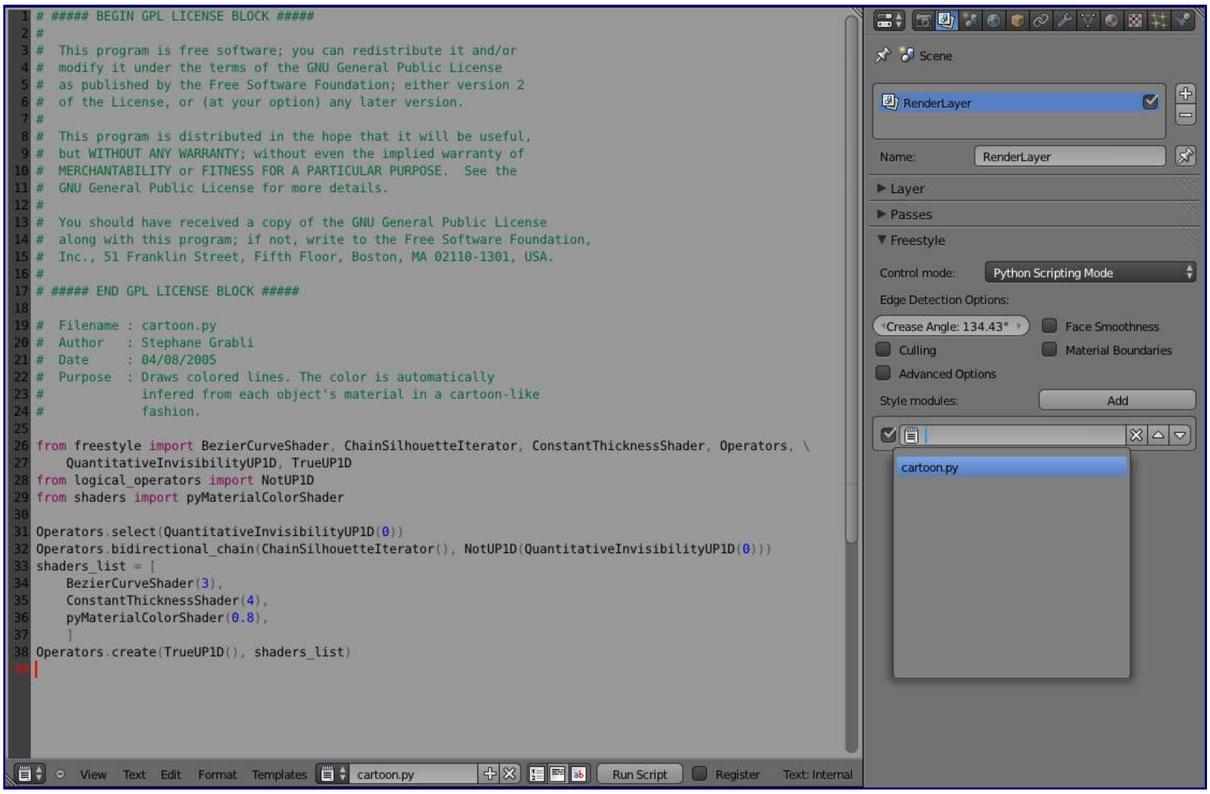
Tolerance
Measure for how close points have to be to each other to be merged. A higher tolerance means more vertices are merged.

Python Scripting Mode

The Python Scripting mode offers full programmability for line stylization. In this control mode, all stylization operations are written as Python scripts referred to as style modules in the Freestyle terminology. The input to a style module is a view map (i.e., a set of detected feature edges), and the output is a set of stylized strokes.

A style module is composed of successive calls of five basic operators: selection, chaining, splitting, sorting and stroke creation. The selection operator identifies a subset of input feature edges based on one or more user-defined selection conditions (predicates). The selected edges are processed with the chaining, splitting and sorting operators to build chains of feature edges. These operators are also controlled by user-supplied predicates and functions in order to determine how to transform the feature edges into chains. Finally, the chains are transformed into stylized strokes by the stroke creation operator, which takes a list of user-defined stroke shaders.

Python style modules are stored within .blend files as text data-blocks. External style module files first need to be loaded in the Text Editor window. Then the pull-down menu within an entry of the style module stack allows you to select a module from the list of loaded style modules.



A screen capture of a style module (cartoon.py) loaded in the Text Editor window (left), as well as Freestyle options in the Python Scripting mode in the Render Layers buttons (right)

Freestyle for Bforartists comes with a number of Python style modules that can serve as a starting point of your own style module writing. See also the section of the Freestyle Python API in the Bforartists Python API reference manual for the full detail of style module constructs.

By T.K. using the Python Scripting mode

(File:Turning_Pages.zip, CC0)

By T.K. using the Python Scripting mode

(File:Lily_Broken_Topology.zip, CC0)

Writing Style Modules

A style module is a piece of code responsible for the stylization of Freestyle line drawing. The input of a style module is a set of feature edges called view map (ViewMap). The output is a set of stylized lines also referred to as strokes. A style module is structured as a pipeline of operations that allow for building strokes from the input edges within the view map.

There are five kinds of operations (listed with corresponding operator functions):

- Selection `Operators.select()`
- Chaining `Operators.chain(), Operators.bidirectional_chain()`
- Splitting `Operators.sequential_split(), Operators.recursive_split()`
- Sorting `Operators.sort()`
- Stroke creation `Operators.create()`

The input view map is populated with a set of ViewEdge objects. The selection operation is used to pick up ViewEdges of interest to artists based on user-defined selection conditions (predicates). Chaining operations take the subset of ViewEdges and build Chains by concatenating ViewEdges according to user-defined predicates and functions. The Chains can be further refined by splitting them into smaller pieces (e.g., at points where edges make an acute turn) and selecting a fraction of them (e.g., to keep only those longer than a length threshold). The sorting operation is used to arrange the stacking order of chains to draw one line on top of another. The chains are finally transformed into stylized strokes by the stroke creation operation applying a series of stroke shaders to individual chains.

ViewEdges, Chains and Strokes are generically referred to as one-dimensional (1D) elements. A 1D element is a polyline that is a series of connected straight lines. Vertices of 1D elements are called 0D elements in general.

All the operators act on a set of active 1D elements. The initial active set is the set of ViewEdges in the input view map. The active set is updated by the operators.

Selection

The selection operator goes through every element of the active set and keeps only the ones satisfying a certain predicate. The `Operators.select()` method takes as the argument a unary predicate that works on any

`Interface1D` that represents a 1D element. For example:

```
Operators.select(QuantitativeInvisibilityUP1D(0))
```

This selection operation uses the `QuantitativeInvisibilityUP1D` predicate to select only the visible `ViewEdge` (more precisely, those whose quantitative invisibility is equal to 0). The selection operator is intended to selectively apply the style to a fraction of the active 1D elements.

It is noted that `QuantitativeInvisibilityUP1D` is a class implementing the predicate that tests line visibility, and the `Operators.select()` method takes an instance of the predicate class as argument. The testing of the predicate for a given 1D element is actually done by calling the predicate instance, that is, by invoking the `__call__` method of the predicate class. In other words, the `Operators.select()` method takes as argument a functor which in turn takes an `Interface0D` object as argument. The Freestyle Python API employs functors extensively to implement predicates, as well as functions.

Chaining

The chaining operators act on the set of active `ViewEdge` objects and determine the topology of the future strokes. The idea is to implement an iterator to traverse the ViewMap graph by marching along ViewEdges. The iterator defines a chaining rule that determines the next `ViewEdge` to follow at a given vertex (see `ViewEdgeIterator`). Several such iterators are provided as part of the Freestyle Python API (see `ChainPredicateIterator` and `ChainSilhouetteIterator`). Custom iterators can be defined by inheriting the `ViewEdgeIterator` class. The chaining operator also takes as argument a UnaryPredicate working on `Interface1D` as a stopping criterion. The chaining stops when the iterator has reached a `ViewEdge` satisfying this predicate during the march along the graph.

Chaining can be either unidirectional `Operators.chain()` or bidirectional `Operators.bidirectional_chain()`. In the latter case, the chaining will propagate in the two directions from the starting edge.

The following is a code example of bidirectional chaining:

```
Operators.bidirectional_chain(
        ChainSilhouetteIterator(),
        NotUP1D(QuantitativeInvisibilityUP1D(0)),
        )
```

The chaining operator uses the `ChainSilhouetteIterator` as the chaining rule and stops chaining as soon as the iterator has come to an invisible `ViewEdge`.

The chaining operators process the set of active `ViewEdge` objects in order. The active ViewEdges can be previously sorted using the `Operators.sort()` method (see below). It starts a chain with the first `ViewEdge` of the active set. All ViewEdges that have already been involved in the chaining process are marked (in the case of the example above, the time stamp of each `ViewEdge` is modified by default), in order not to process the same `ViewEdge` twice. Once the chaining reaches a `ViewEdge` that satisfies the stopping predicate, the chain is terminated. Then a new chain is started from the first unmarked `ViewEdge` in the active set. This operation is repeated until the last unmarked `ViewEdge` of the active set was processed. At the end of the chaining operation, the active set is set to the Chains that have just been constructed.

Splitting

The splitting operation is used to refine the topology of each Chain. Splitting is performed either sequentially or recursively. Sequential splitting `Operators.sequentialSplit()` in its basic form, parses the Chain at a given arbitrary resolution and evaluates a unary predicate (working on 0D elements) at each point along the Chain. Every time the predicate is satisfied, the chain is split into two chains. At the end of the sequential split operation, the active set of chains is set to the new chains.

```
Operators.sequentialSplit(TrueUP0D(), 2)
```

In this example, the chain is split every 2 units. A more elaborated version uses two predicates instead of one: One to determine the starting point of the new chain and the other to determine its ending point. This second version can lead to a set of Chains that are disjoint or that overlap if the two predicates are different. (see `Operators.sequentialSplit()` for more details).

Recursive splitting `Operators.recursiveSplit()` evaluates a function on the 0D elements along the Chain at a given resolution and find the point that gives the maximum value for the function. The Chain is then split into two at that point. This process is recursively repeated on each of the two new Chains, until the input Chain satisfies a user-specified stopping condition.

```
func = Curvature2DAngleF0D()
Operators.recursive_split(func, NotUP1D(HigherLengthUP1D(5)), 5)
```

In the code example above, the Chains are recursively split at points of the highest 2D curvature. The curvature is evaluated at points along the Chain at a resolution of 5 units. Chains shorter than 5 units won’t be split anymore.

Sorting

The sorting operator `Operators.sort()` arranges the stacking order of active 1D elements. It takes as argument a binary predicate used as a “smaller than” operator to order two 1D elements.

```
Operators.sort(Length2DBP1D())
```

In this code example, the sorting uses the `Length2DBP1D` binary predicate to sort the `Interface1D` objects in the ascending order in terms of 2D length.

The sorting is particularly useful when combined with causal density. Indeed, the causal density evaluates the density of the resulting image as it is modified. If we wish to use such a tool to decide to remove strokes whenever the local density is too high, it is important to control the order in which the strokes are drawn. In this case, we would use the sorting operator to insure that the most “important” lines are drawn first.

Stroke creation

Finally, the stroke creation operator `Operators.create()` takes the active set of Chains as input and build Strokes. The operator takes two arguments. The first is a unary predicate that works on `Interface1D` that is designed to make a last selection on the set of chains. A Chain that doesn’t satisfy the condition won’t lead to a Stroke. The second input is a list of shaders that will be responsible for the shading of each built stroke.

```
shaders_list = [
    SamplingShader(5.0),
    ConstantThicknessShader(2),
```

```
    ConstantColorShader(0.2,0.2,0.2,1),
    ]
Operators.create(DensityUP1D(8,0.1, IntegrationType.MEAN), shaders_list)
```

In this example, the `DensityUP1D` predicate is used to remove all Chains whose mean density is higher than 0.1. Each chain is transformed into a stroke by resampling it so as to have a point every 5 units and assigning to it a constant thickness of 2 units and a dark gray constant color.

User control on the pipeline definition

Style module writing offers different types of user control, even though individual style modules have a fixed pipeline structure. One is the sequencing of different pipeline control structures, and another is through the definition of functor objects that are passed as argument all along the pipeline.

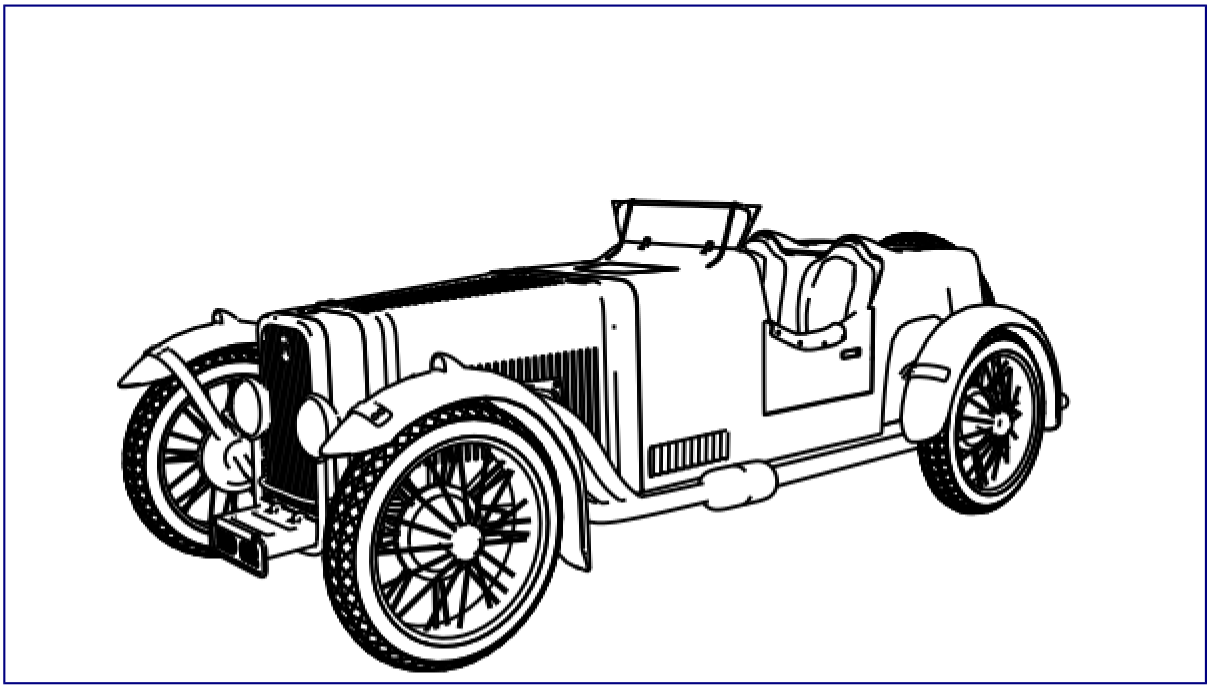
Different pipeline control structures can be defined by sequencing the selection, chaining, splitting, and sorting operations. The stroke creation is always the last operation that concludes a style module.

Predicates, functions, chaining iterators, and stroke shaders can be defined by inheriting base classes and overriding appropriate methods. See the reference manual entries of the following base classes for more information on the user-scriptable constructs.

- UnaryPredicate0D
- UnaryPredicate1D
- BinaryPredicate0D
- BinaryPredicate1D
- UnaryFunction0DDouble
- UnaryFunction0DEdgeNature
- UnaryFunction0DFloat
- UnaryFunction0DId
- UnaryFunction0DMaterial
- UnaryFunction0DUnsigned
- UnaryFunction0DVec2f
- UnaryFunction0DVec3f
- UnaryFunction0DVectorViewShape
- UnaryFunction0DViewShape
- UnaryFunction1DDouble
- UnaryFunction1DEdgeNature
- UnaryFunction1DFloat
- UnaryFunction1DUnsigned
- UnaryFunction1DVec2f
- UnaryFunction1DVec3f
- UnaryFunction1DVectorViewShape
- UnaryFunction1DVoid
- ViewEdgeIterator
- StrokeShader

Freestyle SVG Exporter

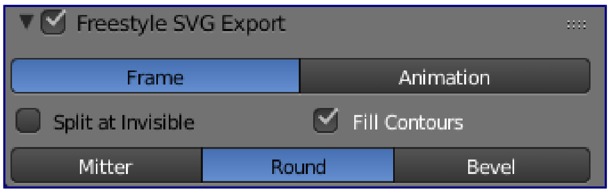
SVG exporting for Freestyle is available through an addon.



An example of a .svg result produced by the Freestyle SVG Exporter. Model by Bforartistsgoodies

This addon can be enabled via *User Preferences > Addons > Render:Freestyle SVG Exporter*. The GUI for the exporter should now be visible in the render tab of the properties window. The exported .svg file is written to the default output path (*Properties > Render > Output*).

Options



Mode
: Option between Frame and Animation. Frame will render a single frame, Animation will bundle all rendered frames into a single .svg file.

Split at Invisible
: By default the exporter won't take invisible vertices into account and export them like they are visible. Some stroke modifiers, like Blueprint, mark vertices as invisible to achieve a certain effect. Enabling this option will make the paths split when encountering an invisible vertex, which leads to a better result.

Fill Contours
: The contour of objects is filled with their material color. Note that this features is somewhat unstable - especially with animations.

Stroke Cap Style
: Defines the style the stroke caps will have in the SVG output.

Exportable Properties

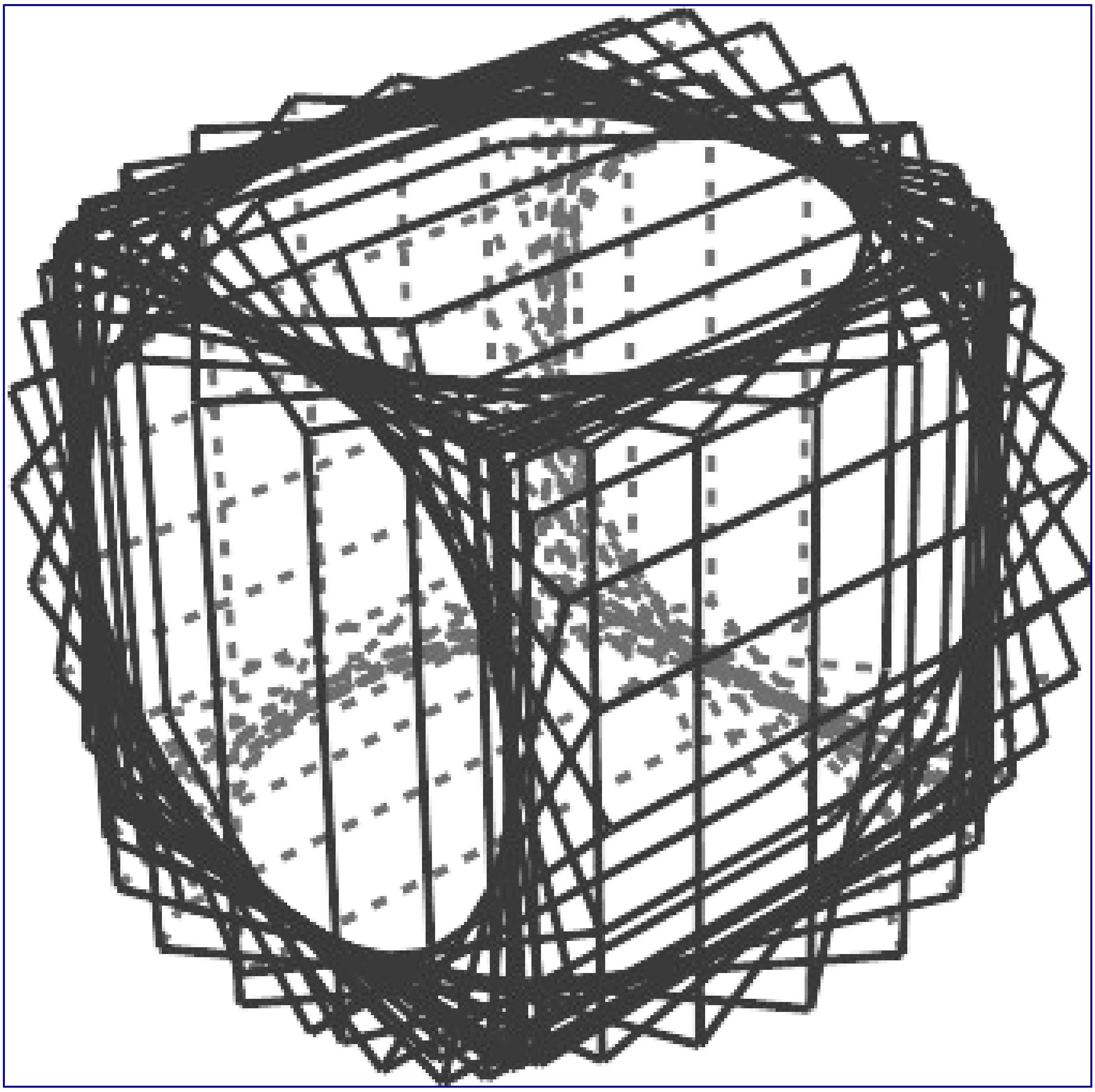
Because the representation of Freestyle strokes and SVG path objects is fundamentally different, a one on one translation between Freestyle and SVG is not possible. The main shortcoming of SVG compared to Freestyle is that Freestyle defines style per-point, where SVG defines it per-path. This means that Freestyle can produce much more complex results that are impossible to achieve in SVG.

The properties that can be exported are:

- Base color
- Base alpha
- Base thickness
- Dashes

Animations

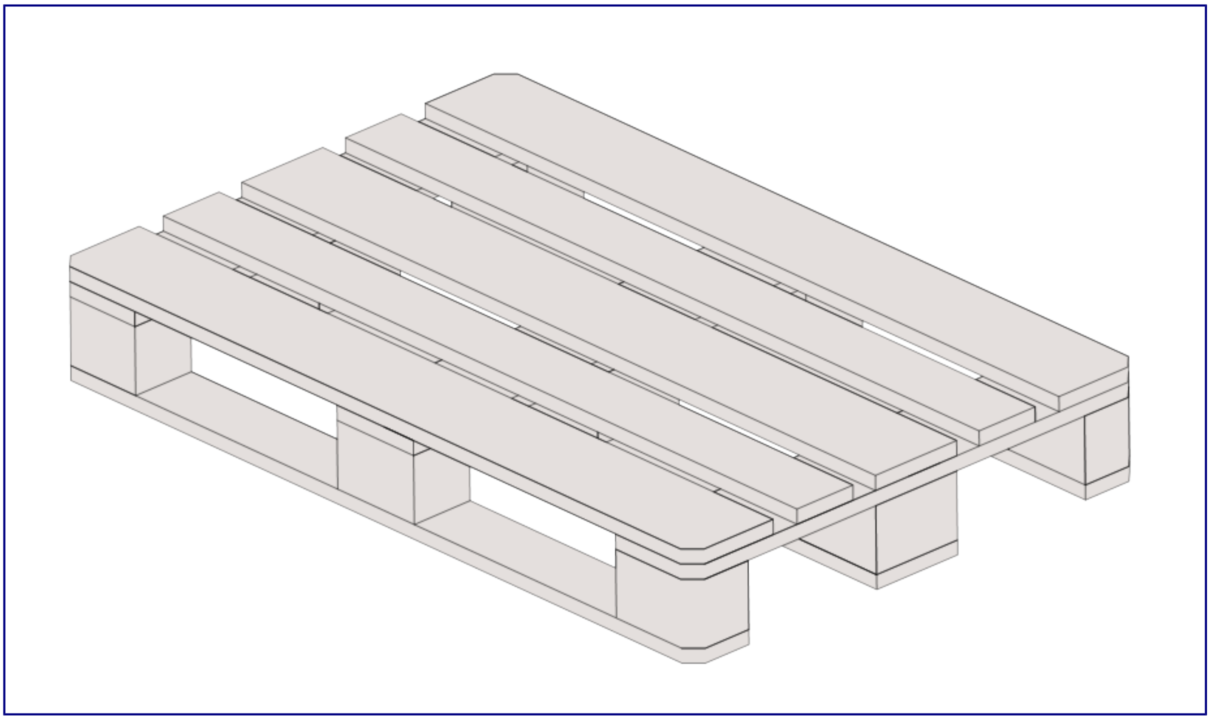
The exporter supports the creation of SVG animations. When the Mode is set to Animation, all frames from a render - one when rendering a frame (f12) or all when rendering an animation (shift f12) - into a single file. Most modern browsers support the rendering of SVG animations.



An SVG animation rendered with the exporter.

Exporting Fills

Fills are colored areas extracted from a Freestyle render result. Specifically, they are defined by a combination of the Contour and External Contour edge type, combined with some predicates. The fill result can be unexpected, when the SVG renderer cannot correctly draw the path that the exporter has generated. This problem is extra apparent in animations.



An example of a .svg result produced by the Freestyle SVG Exporter. Model by Julien Deswaef

Fills support holes and layering. When using layers, the exporter tries to render objects with the same material as the patch. The exporting of fills and especially the order in which they are layered is by no means perfect. In most cases, these problems can be easily solved in Inkscape or a text editor.

Link

Here are some links to external data regarding Freestyle.

Video

https://www.youtube.com/watch?v=IY1L76WwOHg

The Light At The End.

https://www.youtube.com/watch?v=4pOsmLV0-BA

mmd_tools test2 with Bforartists+Freestyle (未来時計 AM4:30)

Video Tutorial

https://www.youtube.com/watch?v=1T_impeCV-0

Using freestyle in Bforartists

https://www.youtube.com/watch?v=Uq1-KoZ7Uv4

Tutorial: Bforartists 3D - Freestyle and Composite

https://www.youtube.com/watch?v=J3LI_MTnY7U

Bforartists Tutorial: Freestyle

Tutorial

Freestyle basics
: http://studiollb.wordpress.com/2012/02/29/freestyle-introductory-tutorial/ http://jikz.net/archives/364 http://jikz.net/archives/329

Edge types
: https://studiollb.wordpress.com/2012/09/08/freestyle-101-edge-types/

Line style basic
: http://studiollb.wordpress.com/2012/09/08/freestyle-101-line-style-basic/

Line style modifiers
: http://studiollb.wordpress.com/2012/09/08/freestyle-101-line-style-modifier-part-1/
http://studiollb.wordpress.com/2012/09/08/freestyle-101-line-style-modifier-part-2/
http://studiollb.wordpress.com/2012/09/15/freestyle-101-planning-and-along-stroke-line-style-modifier/

Tips and tricks
: http://studiollb.wordpress.com/2012/02/03/freestyle-tips/ (Old)

Misc

- FreeStyle Users’ improvement suggestions.
- FreeStyle integration into Bforartists blog

Early documentation of FreeStyle

10.7 Render - Workflows

Rendering Animations

While rendering stills will allow you to view and save the image from the render buffer when it is complete, animations are a series of images, or frames, and are automatically saved directly out to a drive after being rendered.

After rendering the frames, you may need to edit the clips, or first use the Compositor to do green-screen masking, matting, color correction, DOF, and so on to the images. That result is then fed to the Sequencer where the strips are cut and mixed and a final overlay is done.

Finally you can render out from the Sequencer and compress the frames into a playable movie clip.

Workflow

Generally, you do a lot of intermediate renders of different frames in your animation to check for timing, lighting, placement, materials, and so on. At some point, you are ready to make a final render of the complete animation for publication.

There are two approaches you can use when making a movie, or animation, with or without sound. The approach you should use depends on the amount of CPU time you will need to render the movie. You can render a “typical” frame at the desired resolution, and then multiply by the number of frames that will ultimately go into the movie, to arrive at a total render time.

If the total render time is an hour or more, you want to use the “Frame Sequence” approach. For example, if you are rendering a one-minute video clip for film, there will be (60 seconds per minute) X (24 frames per second) or 1440 frames per minute. If each frame takes 30 seconds to render, then you will be able to render two frames per minute, or need 720 minutes (12 hours) of render time.

Rendering takes all available CPU time; you should render overnight, when the computer is not needed, or set Blender to a low priority while rendering, and work on other things (be careful with the RAM space!).

Direct Approach

The Direct Approach, which is highly **not** recommended and not a standard practice, is where you set your output format to an AVI or MOV format, and click *Animation* to render your scene directly out to a movie file. Blender creates one file that holds all the frames of your animation. You can then use Blender’s VSE to add an audio track to the animation and render out to an MPEG format to complete your movie.

Frame Sequence

The Frame Sequence is a much more stable approach, where you set your output format to a still format (such as JPG, PNG or MultiLayer), and click *Animation* to render your scene out to a set of images, where each image is a frame in the sequence.

Blender creates a file for each frame of the animation. You can then use Blender’s compositor to perform any frame manipulation (post processing). You can then use Blender’s VSE to load that final image sequence, add an audio track to the animation, and render out to an MPEG format to complete your movie. The Frame Sequence approach is a little more complicated and takes more drive space, but gives you more flexibility.

Here are some guidelines to help you choose an approach.

Direct Approach

- short segments with total render time < 1 hour
- stable power supply
- computer not needed for other uses

Frame Sequence Approach

- total render time > 1 hour
- **post-production work needed**
    - Color/lighting adjustment
    - Green screen/matte replacement
    - Layering/compositing
    - Multiple formats and sizes of ultimate product
- intermediate frames/adjustments needed for compression/codec
- precise timing (e.g. lip-sync to audio track) needed in parts

- may need to interrupt rendering to use the computer, and want to be able to resume rendering where you left off.

Frame Sequence Workflow

1. First prepare your animation.
2. In the *Dimensions* panel, choose the render size, Pixel Aspect Ratio, and the Range of Frames to use, as well as the frame rate, which should already be set.
3. In the Output panel set up your animation to be rendered out as images, generally using a format that does not compromise any quality.
4. Choose the output path and file type in the Output panel as well, for example `//render/my-anim-`.
5. Confirm the range of your animation frame Start and End.
6. Save your blend-file.
7. Press the big *Animation* button. Do a long task [like sleeping, playing a video game, or cleaning your driveway] while you wait for your computer to finish rendering the frames.
8. Once the animation is finished, use your OS file explorer to navigate into the output folder (“`render` in this example). You will see lots of images (.png or .exr, etc… depending on the format you chose to render) that have a sequence number attached to them ranging from 0000 to a max of 9999. These are your single frames.
9. In Blender, now go into the video sequence editor.
10. Choose *Add Image* from the add menu. Select all the frames from your output folder that you want to include in your animation (Press A to Select All easily). They will be added as a strip to the sequence editor.
11. Now you can edit the strip and add effects or simply leave it like it is. You can add other strips, like an audio strip.
12. Scrub through the animation, checking that you have included all the frames.
13. In the Scene Render buttons, in the Post Processing panel, activate *Sequencer*.
14. In the Output panel, choose the container and codec you want (e.g. `MPEG H.264`) and configure them. The video codecs are described on the previous page: Output Options.
15. Click the *Animation* render button and Blender will render out the sequence editor output into your movie.

Why go through all this hassle? Well, first of all, if you render out single frames you can stop the render at any time by pressing `Esc` in the render window or UV/image editor. You will not lose the frames you have already rendered, since they have been written out to individual files. You can always adjust the range you want to continue from where you left off.

You can edit the frames afterwards and post-process them. You can add neat effects in the sequence editor. You can render the same sequence into different resolutions (640×480, 320×240, etc) and use different codecs (to get different file sizes and quality) with almost no effort whatsoever.

Hints

Your computer accidentally turns off in the middle of rendering your movie!

Unless your animation renders in a few minutes, it is best to render the animation as separate image files.

Instead of rendering directly to a compressed movie file, use a loss-less format (e.g. `PNG`).

This allows you an easy recovery if there is a problem and you have to re-start the rendering, since the frames you have already rendered will still be in the output directory.

Just disable the *Overwrite* option to start rendering where you left off.

You can then make a movie out of the separate frames with Blender's sequence editor or use 3rd party encoding software.

Animation Preview

It can be useful to render a subset of the animated sequence, since only part of an animation may have an error.

Using an image format for output, you can use the *Frame Step* option to render every *N'th* frame. Then disable *Overwrite* and re-render with *Frame Step* set to 1.

Command Line

In some situations we want to increase the render speed, access Blender remotely to render something or build scripts that use the command line.

One advantage of using the command line is that we do not need a graphical display (no need for X server on Linux for example) and consequently we can render via a remote shell (typically SSH).

See Command Line Arguments for a full list of arguments (for example to specify which scene to render, the end frame number, etc…), or simply run:

```
blender --help
```

Note

Arguments are executed in the order they are given!

The following command will not work, since the output and extension are set after Blender is told to render:

```
blender -b file.blend -a -x 1 -o //render
```

The following command will behave as expected:

```
blender -b file.blend -x 1 -o //render -a
```

Always position `-f` or `-a` as the last arguments.

Platforms

How to actually execute Blender from the command line depends on the platform and where you have installed Blender. Here are basic instructions for the different platforms.

Linux

Open a terminal, then go to the directory where Blender is installed, and run Blender like this:

```
cd <blender installation directory>
```

```
./blender
```

If you have Blender installed in your `PATH` (usually when Blender is installed through a distribution package), you can simply run:

```
blender
```

macOS

Open the terminal application, go to the directory where Blender is installed, and run the executable within the app bundle, with commands like this:

```
cd /Applications/Blender
./blender.app/Contents/MacOS/blender
```

If you need to do this often, you can make an alias so that typing just `blender` in the terminal works. For that you can run a command like this in the terminal (with the appropriate path).

```
echo "alias blender=/Applications/Blender/blender.app/Contents/MacOS/blender" >>
~/.profile
```

If you then open a new terminal, the following command will work:

```
blender
```

MS-Windows

Open the Command Prompt, go to the directory where Blender is installed, and then run Blender:

```
cd c:\<blender installation directory>
blender
```

You can also add the Blender folder to your system `PATH` so that do you do not have to `cd` to it each time.

Examples

Single Image

```
blender -b file.blend -f 10
```

-b
: Render in the background (without UI).

file.blend
: Path to the blend-file to render.

-f 10
: Render only the 10th frame.

```
blender -b file.blend -o /project/renders/frame_##### -F EXR -f -2
```

-o /project/renders/frame_#####
: Path of where to save the rendered image, using five padded zeros for the frame number.

-F EXR
: Override the image format specified in the blend-file and save to an OpenEXR image.

-f -2

Render only the second last frame.

Warning

Arguments are case sensitive! `-F` and `-f` are not the same.

Animation

```
blender -b file.blend -a
```

-a
Render the whole animation using all the settings saved in the blend-file.

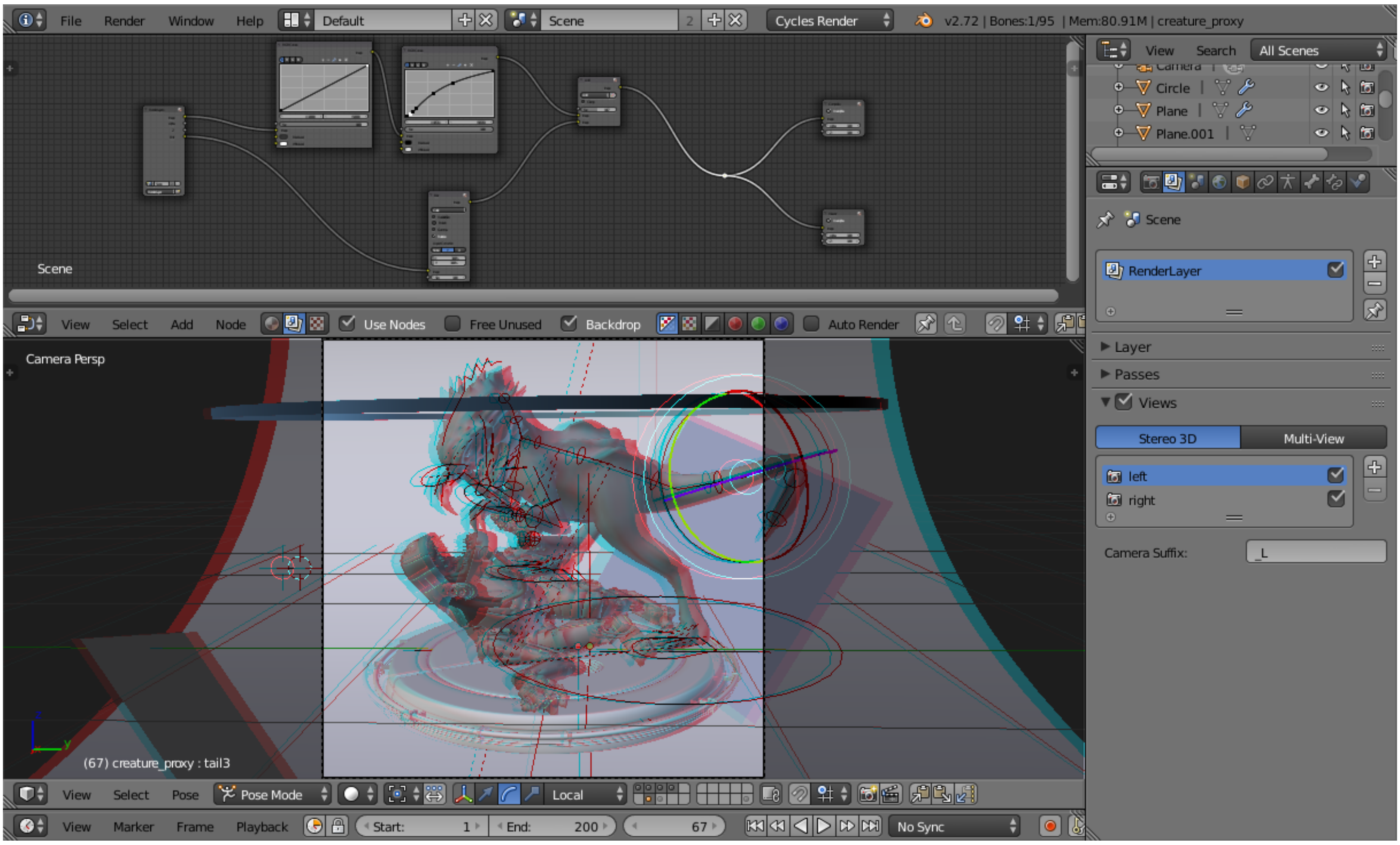
```
blender -b file.blend -E BLENDER_RENDER -s 10 -e 500 -t 2 -a
```

-E BLENDER_RENDER
Use the “Blender Render” engine. For a list of available render engines, run `blender -E help`.

-s 10 -e 500
Set the start frame to `10` and the end frame to `500`.

-t 2
Use only two threads.

Multiview Introduction



Since version 2.75, Blender has come with a new feature called Multiview. Multiview is a complete toolset for working with stereoscopic rendering in Blender. It works with both the Blender Internal and Cycles rendering engines and it also supports many different stereo 3D visualization types.

Note

If you have a real 3D display at some point you can change the 3D display mode in the Window menu, by calling the Stereo 3D operator. Be aware that some modes require a fullscreen editor to work, and this can be taxing on your CPU.

Usage

For example, we will take an existing blend file that was made for monoscopic rendering and transform it to be stereo 3D ready.

Creature Factory 2 by Andy Goralczyk Rendered in Stereo 3D (anaglyph).

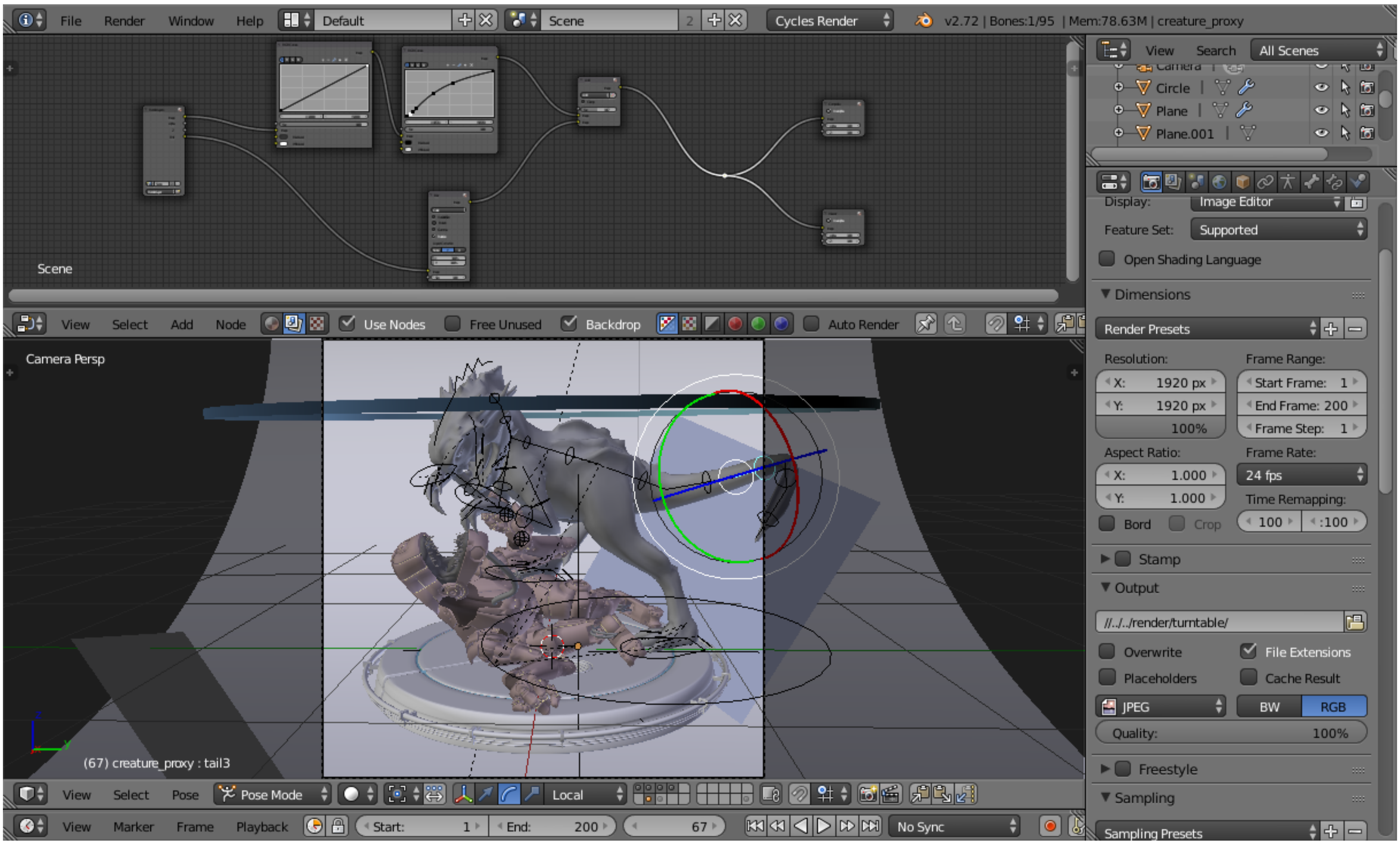
Note

Multi-View drawing requires capable graphics card and drivers with *Triple Buffer* support. If the *Automatic* mode does not work, set the *Window Draw Method* in the System User Preferences.

Introduction

Start opening up your project file, in this case `turntable.blend` from the *Creature Factory 2* Open Movie

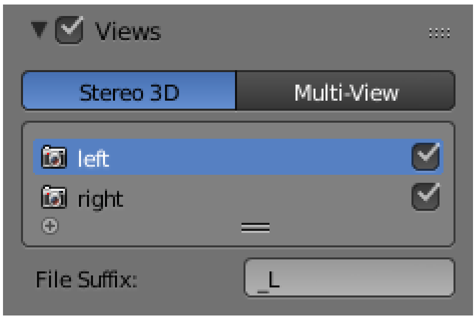
Workshop series from the Blender Institute by Andy Goralczyk.



Turn Table Creature Factory 2.

Views Setup

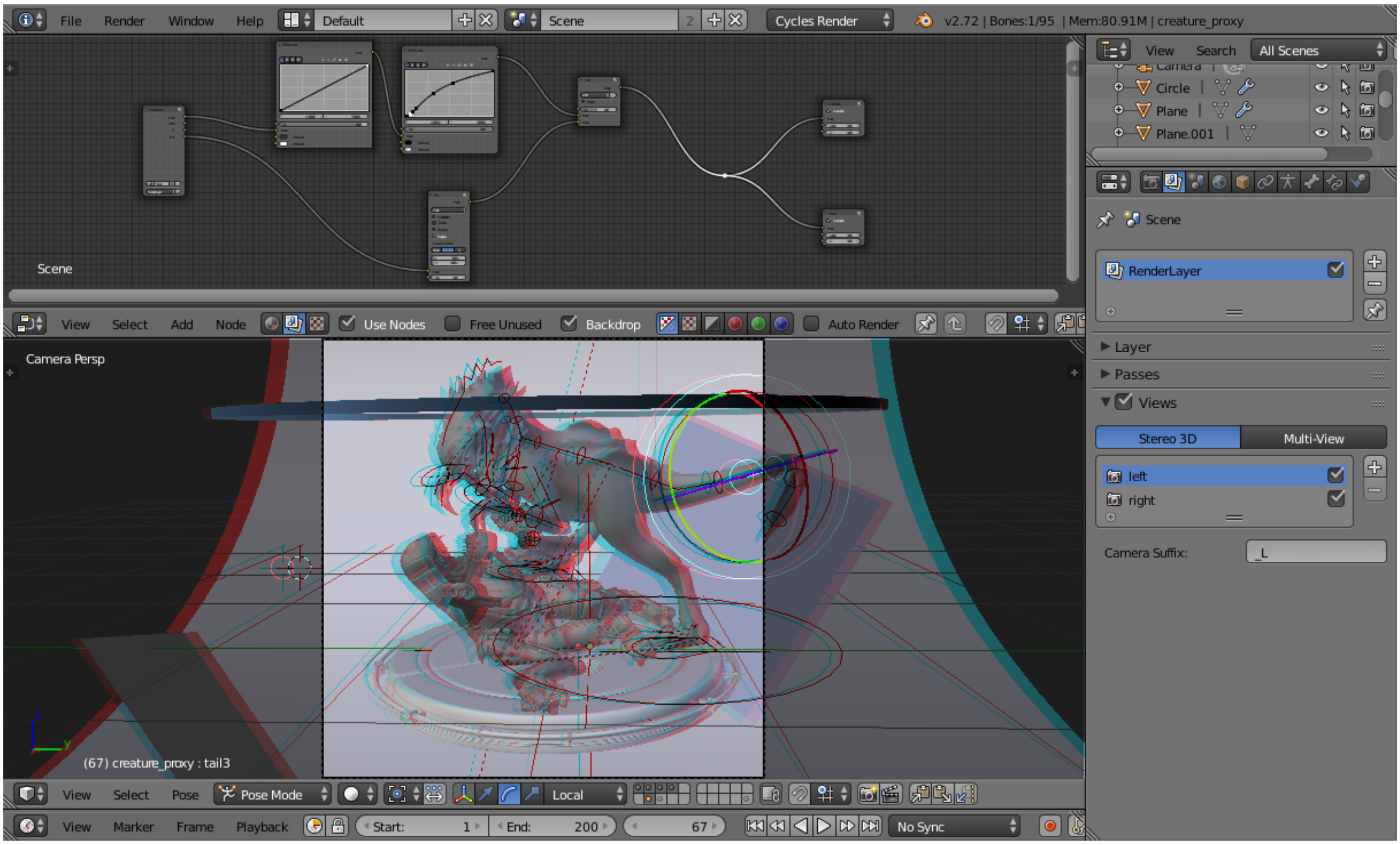
Go to the Render Layers panel and enable *Views* for this scene.



Scene Render Views.

Note

When you turn on *Views* in the scene, you get 3D preview in the viewport, as well as multiple panels that are now accessible all over the user interface.

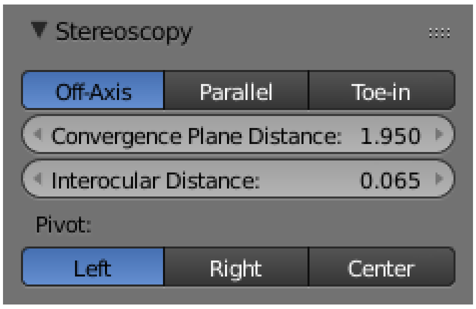


Viewport with 3D visualization.

Camera

To tweak the stereo 3D parameters, select the camera in the Outliner. In the Camera panel go to the Stereoscopy tab and change the *Convergence Distance*.

The viewport will respond in real-time to those changes allowing you to preview the current depth value of the scene.

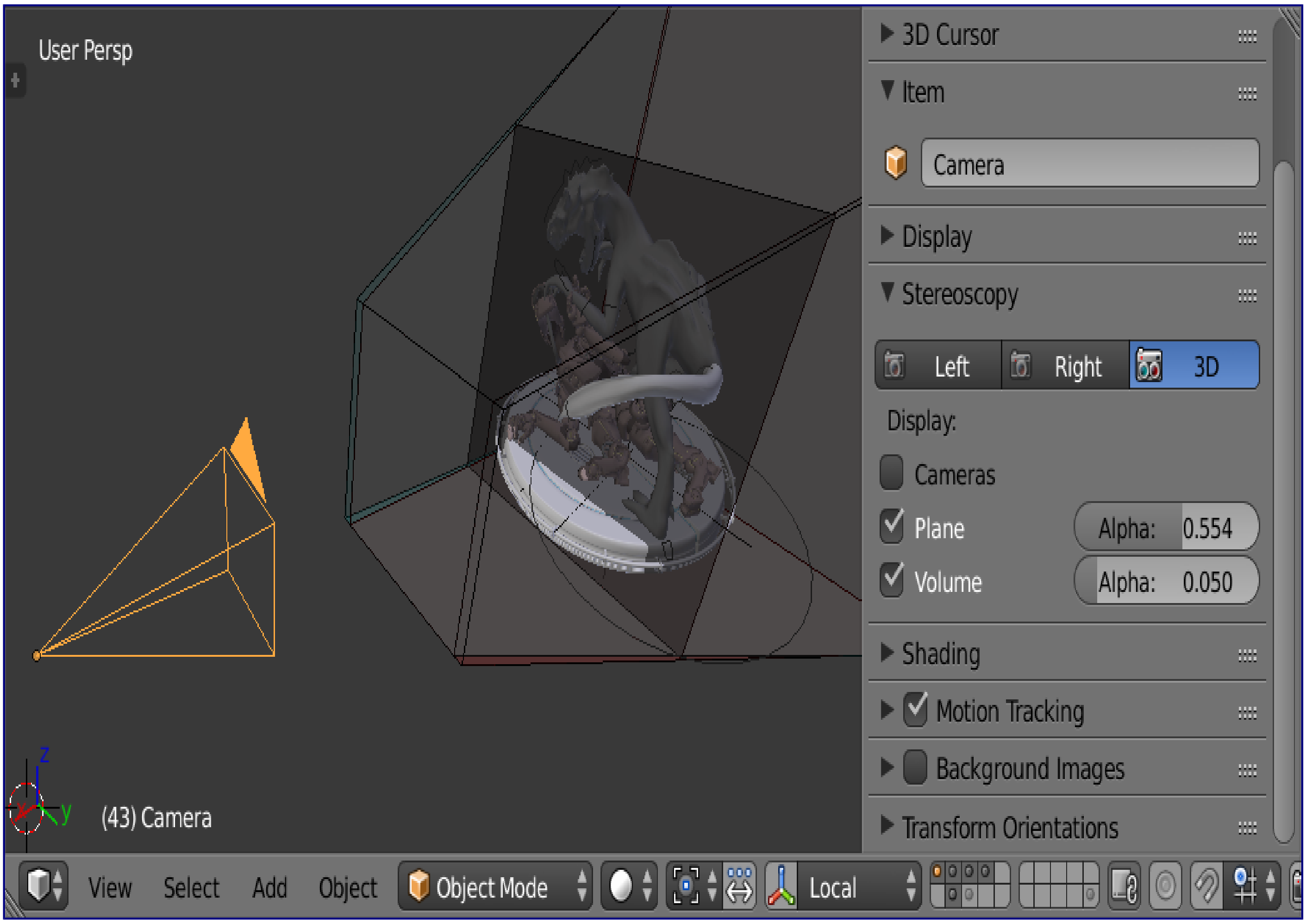


Stereo Convergence Distance.

Viewport

Before fine-tuning the camera parameters, you can set the convergence plane in the viewport based in your scene depth layout. Go outside the camera view and you will instantly see the convergence plane in front of the camera.

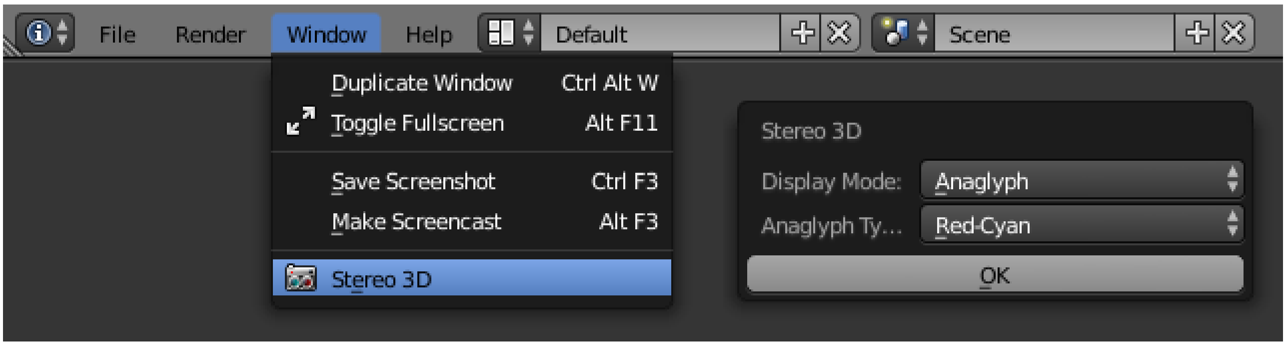
You can toggle this and other display settings in the Stereoscopy panel of the 3D Views properties region. In the following image, the camera's frustum volumes are also visible.



Viewport Plane and Volume Stereo Preview.

Stereo 3D Display

If you have a real 3D display at some point, you can change the 3D display mode in the Window menu, by calling the Stereo 3D operator. Be aware that some modes require a fullscreen editor to work.

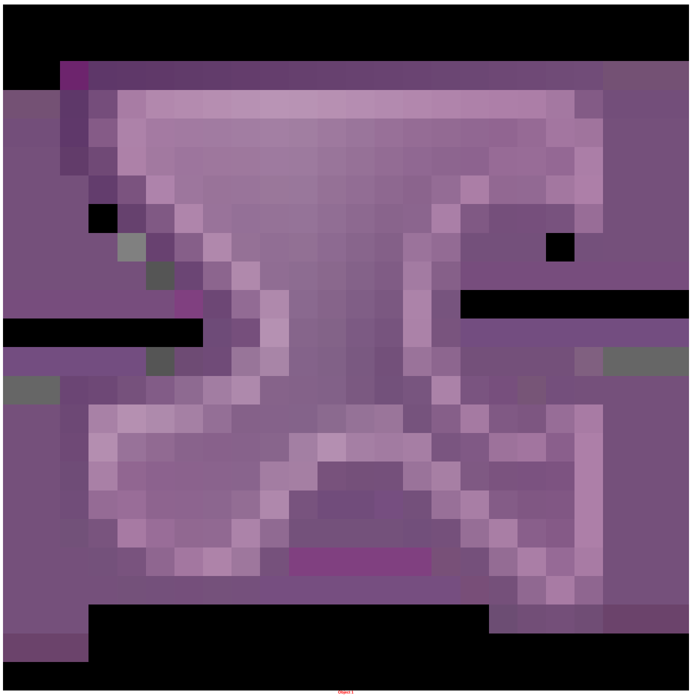


Window Menu, Stereo 3D Operator.

OpenGL Preview

Before rendering your scene, you can save an OpenGL preview of the animation for testing in the final display. In the Render Output panel you can choose the output *Views Format*.

The options include individual files per view, top-bottom, anaglyph among others. Pick the one that fits your display requirements.



Rendering and UV/Image Editor

Once you are happy with the results, you can render out the final animation. In the UV/Image Editor you can inspect the individual views and the stereo result.

Image Formats

Your final animation can be saved in more robust formats than the ones used by the OpenGL render preview. In this example we saved as cross-eyed side-by-side stereo 3D.

Side by Side Cross-Eye Format.

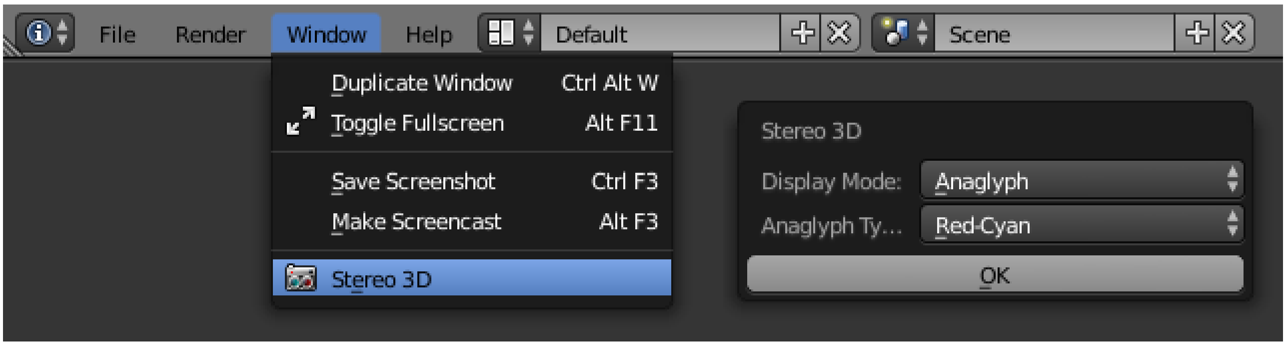
Final Considerations

As this guide showed, there is more to stereo 3D rendering than just generate two images. The earlier the stereo pipeline is considered the smoother it will get. The following sections are a more in-depth view of the individual components we visited in the workflow.

Window Stereo 3D Display

An essential component of the Stereoscopy pipeline is the ability to display the stereo image in a proper display. Blender supports from high-end 3D displays to simple red-cyan glasses. On top of that, you can set a different display mode for each window.

The display mode can be changed via the Window menu or if you create your own shortcuts for the `wm.set_stereo_3d` operator.



Window Menu, Stereo 3D Operator.

Display Mode

Anaglyph
: Render two differently filtered colored images for each eye. Anaglyph glasses are required. We support Red-Cyan, Green-Magenta and Yellow-Blue glasses.

Interlace
: Render two images for each eye into one interlaced image. A 3D-ready monitor is required. We support Row, Column and Checkerboard Interleaved. An option to Swap Left/Right helps to adjust the image for the screen. This method works better in fullscreen.

Time Sequential
: Render alternate eyes. This method is also known as Page Flip. This requires the graphic card to support Quad Buffer and it only works in fullscreen.

Side-by-Side
: Render images for left and right eye side-by-side. There is an option to support Cross-Eye glasses. It works only in fullscreen, and it should be used with the Full Editor operator.

Top-Bottom
: Render images for left and right eye one above another. It works only in fullscreen, and it should be used with the Full Editor operator.

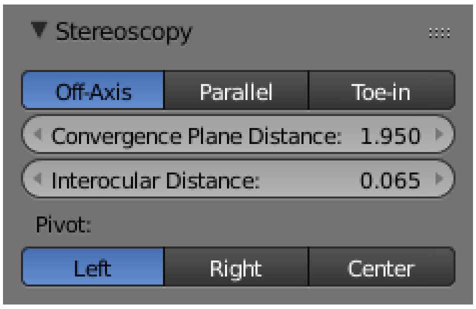
Note

Full Screen Stereo 3D Modes

If you have a 3D display most of the time, you will use it to see in stereo 3D, you will have to go to the fullscreen mode. In fact some modes will only work in the full window mode that hides most of the user interface from the work area. In this case it is recommended to work with two monitors, using the 3D screen for visualizing the stereo result while the other screen can be used for the regular Blender work.

Stereo 3D Camera

When using the Stereo 3D scene view setup, a stereo pair is created on-the-fly and used for rendering and previsualization. For all the purposes this works as two cameras that share most parameters (focal length, clipping, …). The stereo pair, however, is offsetted, and can have unique rotation and shift between itself.



Stereo 3D Camera Settings.

Interocular Distance
Set the distance between the camera pair. Although the convergence of a stereo pair can be changed in post-production, different interocular distances will produce different results due to the parts of the scene being occluded from each point of view.

Convergence Plane Distance
The converge point for the stereo cameras. This is often the distance between a projector and the projection screen. You can visualize this in the 3D View.

Convergence Mode

Off-Axis
The stereo camera pair is separated by the interocular distance, and shifted inwards so it converges in the convergence plane. This is the ideal format since it is the one closest to how the human vision works.

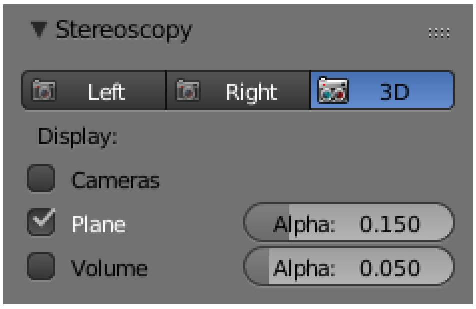
Parallel
This method produces two parallel cameras that do not converge. Since this method needs to be manually converged it cannot be used for viewing. This method is common when combining real footage with rendered elements.

Toe-in
A less common approach is to rotate the cameras instead of shifting their frustum. The Toe-in method is rarely used in modern 3D productions.

Pivot
The stereo pair can be constructed around the active camera with a new camera built for each eye (Center Pivot) or using the existing camera and creating (Left or Right). The latter is what is used when only one eye needs to be rendered for an existing mono 2D project.

Viewport Stereo 3D

When you enable 'Views' in the Render Layer panel, a new area is available in the 3D View properties region. In this panel you can pick whether to see the stereo 3D in the viewport, or which camera to see. It also allow you to see the Cameras, the Plane and the Volume of the stereo cameras.



Viewport Stereo 3D Settings.

Cameras

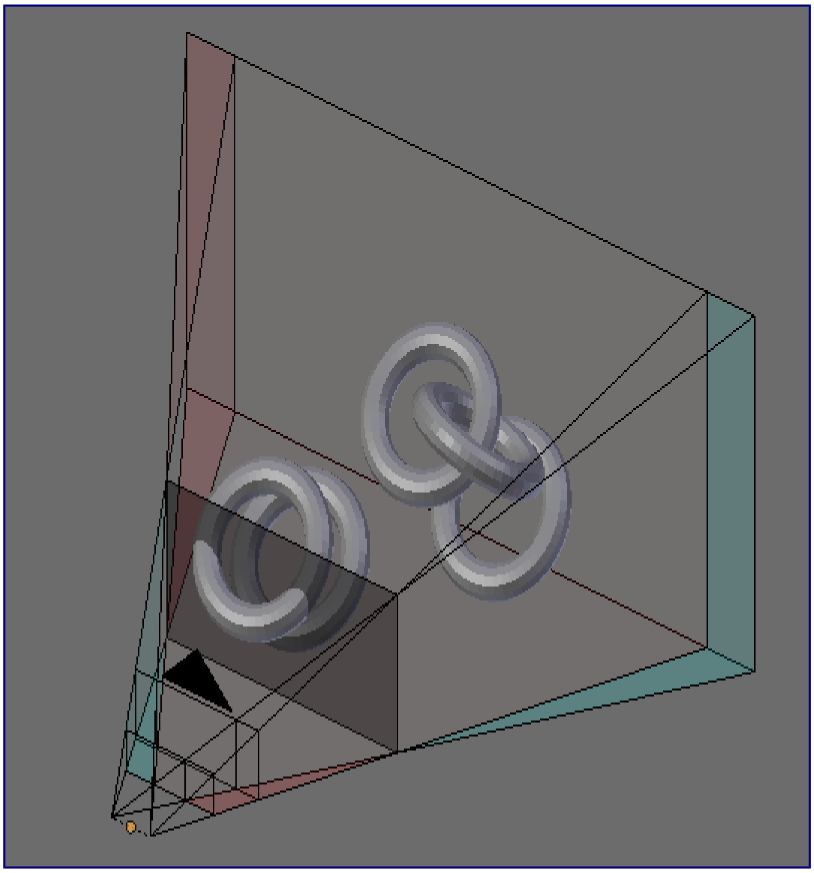
When working with the Stereo 3D Views setup, you can inspect what each individual generated camera is looking or the combined result of them. In the Multi-View mode you can see the combined result of the left and right cameras (when available) or the current selected camera.

Plane

The convergence plane represents the screen as it is perceived by the audience. Visualizing it in the 3D View allows you to layout your scene based on your depth script outside the camera view.

Volume

The intersection of the stereo cameras frustums helps planning the show by avoiding elements being visible by only one camera. The volume is defined by the camera's start and end clipping distances. The areas that are in the frustum of one camera only are known as *retinal rivalry areas*. They are tolerated in the negative space (the region from the convergence plane into the image) but are to be avoided at all costs in the positive space (the area from the convergence plane to the camera).



Viewport 3D: Convergence Plane and Volume Display.

Multi-View and Stereo 3D Image I/O

Multi-View and Stereo 3D

Multi-View images can be saved in special formats according to the production requirements. By default the system saves each view as an individual file, thus generating as many files as views to be rendered. In stereo 3D productions, for the final deployment or even intermediary previews it is convenient to save stereo 3D images, that are ready to use with 3D displays or simple anaglyph glasses. The formats supported match the display modes available for the window.

Lossy-Formats

Some stereo 3D formats represent a considerable loss of data. For example, the Anaglyph format will cap out entire color channels from the original image. The Top-Bottom compressed will discard half of your vertical resolution data. The Interlace will mash your data considerably. Once you export in those formats, you can still import the image back in Blender, for it to be treated as Stereo 3D. You will need to match the window stereo 3D display mode to the image stereo 3D format though.

Lossless Formats

Some formats will preserve the original data, leading to no problems on exporting and importing the files back in Blender. The Individual option will produce separate images that (if saved in a lossless encoding such as `PNG` or `OpenEXR`) can be loaded back in production with no loss of data. For the Stereo 3D formats the only lossless options are *Top-Bottom* and *Side-by-Side* without the Squeezed Frame option.

Multi-View OpenEXR

Another option is to use Multi-View OpenEXR files. This format can save multiple views in a single file and is backward compatible with old OpenEXR viewers (you see only one view though). Multi-View native support is only available to OpenEXR.

Image Editor

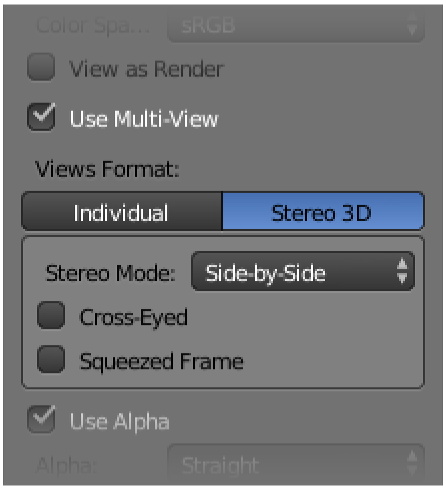
View Menu

After you render your scene with Stereo 3D you will be able to see the rendered result in the combined stereo 3D or to inspect the individual views. This works for Viewer nodes, render results or opened images.

Stereo 3D and View menu.

Views Format

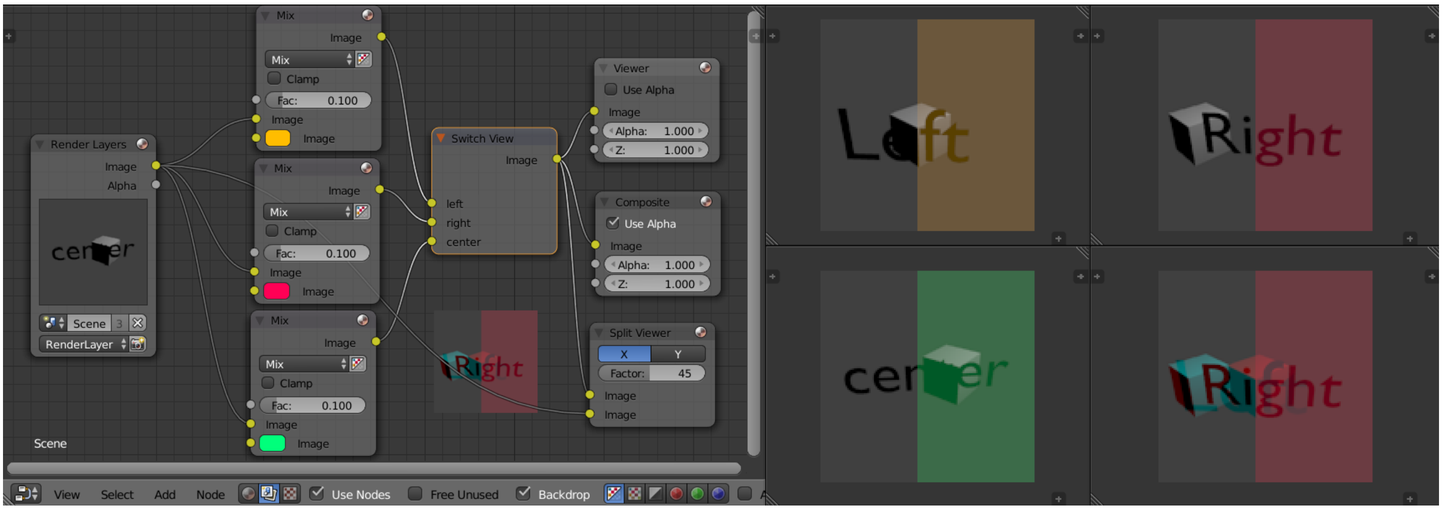
When you drag and drop an image into the UV/Image Editor, Blender will open it as an individual images at first. If your image was saved with one of the Stereo 3D formats, you can change how Blender should interpret the image by switching the mode to Stereo 3D, turning on Use Multi-View and picking the corresponding stereo method.



Views Formats and Stereo 3D.

Compositor

The compositor works smoothly with Multi-View. The compositing of a view is completed before the remaining views start to be composited. The pipeline is the same as the single-view workflow, with the difference that you can use Images, Movies or Image Sequences in any of the supported Multi-View formats.



Compositor, Backdrop and Split Viewer Node.

The views to render are defined in the current scene views, in a similar way as you define the composite output resolution in the current scene render panel, regardless of the Image nodes resolutions or Render Layers from different scenes.

Note

Single-View Images

If the image from an Image Node does not have the view you are trying to render, the image will be treated as a single-view image.

Switch View Node

If you need to treat the views separately, you can use the Switch View node to combine the views before an output node.

Performance Tip

By default, when compositing and rendering from the user interface all views are rendered and then composited. During test iterations you can disable all but one view from the Scene Views panel, and re-enable it after you get the final look.

10.8 Render - OpenGL Render

OpenGL Render

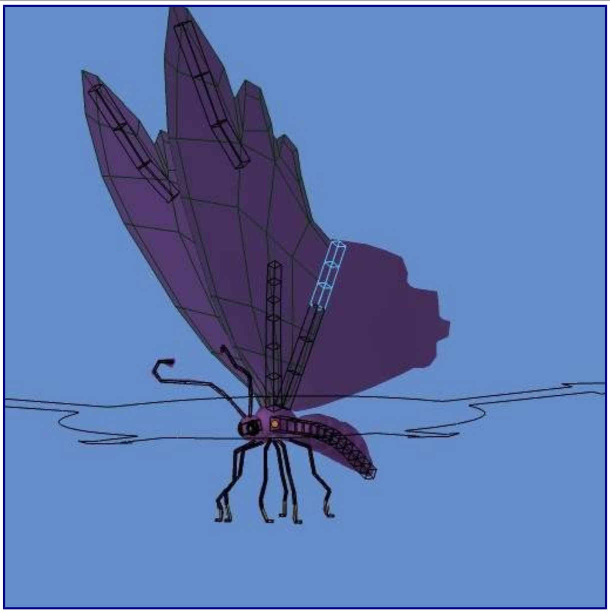
OpenGL rendering uses the 3d-views drawing for quick *preview* renders.

This allows you to inspect your animatic (for object movements, alternate angles, etc.).

This can also be used to preview your animations - in the event your scene is too complex for your system to play back in real-time in the 3d-view.

You can use OpenGL to render both images and animations.

Below is a comparison between the OpenGL render and a final render using the Bforartists Internal engine.



OpenGL Render

Full Render

Tip

Showing Only Rendered Objects

To access this option, enable the *Only Render* in the *Display Panel*.

While this option is not specific to OpenGL rendering, its often useful to enable, since it removes data such as rigs and empties that can be a distraction.

Settings

For the most part, *OpenGL Render* uses view-port, however some render settings are used too.

- Render Dimensions
- Render Aspect
- Anti-Aliasing, Samples & Full Sample (for slower, higher quality output).
- Alpha (*Sky* background is only used when the 3D view has *World Background* enabled).
- File Format & Output (file-path, format, compression settings... etc).

Rendering

Activating OpenGL render from the menu will render from the active camera.

You can also render any view-port, from the header of the *3D View*, using the small button showing a *Camera* (together with a small image showing a *slate*)

As with a normal render, you can abort it with `Esc`.

Render a Still Image

> Click on the small button showing a *camera* in the header of the 3D View.
>
> Or from the menu: Render ‣ OpenGL Render Image from the header of the *Info Window*

Render an Animation

> Click on the small button showing a *slate* in the header of the 3D View.
>
> Or from the menu: Render ‣ OpenGL Render Animation from the header of the *Info Window*

Render from the Sequencer

> Click on the small button showing a *slate* in the header of *Sequencer* preview window.
>
> Using scene strips in the sequencer you can edit together scenes to quickly render an entire sequence of shots.
>
> This can be activated using the render icons in the sequencer's playback window header.

Known Limitations

OpenGL Anti-Aliasing Support

Some graphics cards don't support this feature (known as the frame-buffer multi-sample OpenGL extensions).

In this case rendering works but no anti-aliasing is performed.

Enabling *Full Sample*, can be used to workaround this limit, because it doesn't rely on hardware multi-sample support.

Hint

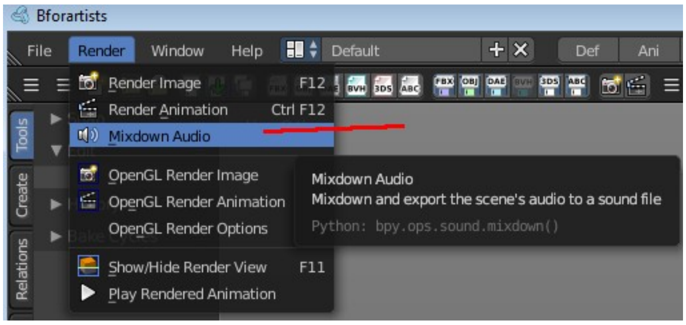
Exact extensions needed, as listed in output from Save System Info (OpenGL section).

- `GL_ARB_texture_multisample`
- `GL_EXT_framebuffer_blit`
- `GL_EXT_framebuffer_multisample_blit_scaled`
- `GL_EXT_framebuffer_multisample`

10.9 Render - Audio Rendering

Introduction

Audio can be rendered from the Render menu in the Info Editor.



Options

The options can be found downleft in the Save dialog.

Relative Path
Select the file relative to the blend-file.
Accuracy
Sample accuracy, important for animation data (the lower the value, the more accurate).
Audio Containers
See here.
Codec
Some *Audio Containers* also have option to choose a codec. For more information see here.
Split Channels
Each audio channel will be rendered into a separate file.

Speaker

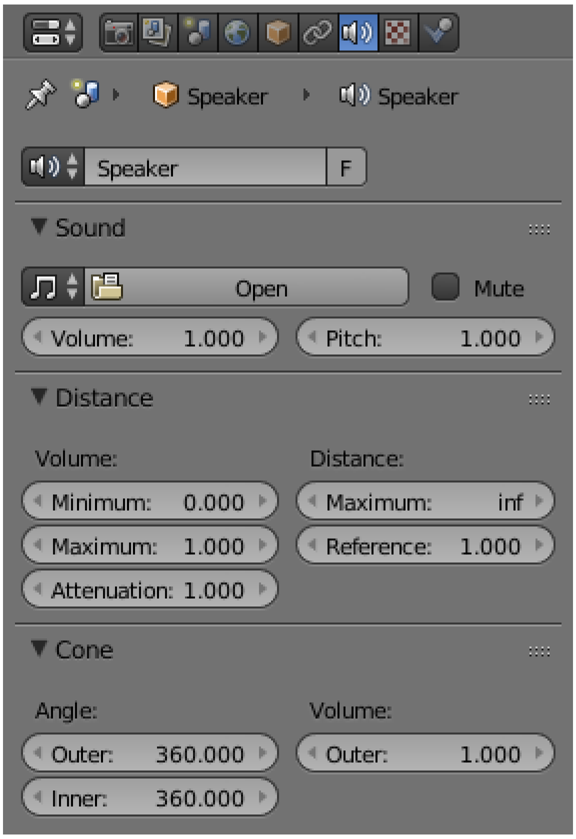
The speaker object is used to give sound in the 3D View. After adding the object the various settings can be changed in the properties editor.

Options

Sound

Mute
Toggles whether or not the sound can be heard.
Volume
Adjust the loudness of the sound.
Pitch
Can be used to bend the pitch of the sound to be either deeper or higher.

Distance



Volume

Minimum
Minimum volume, no matter how far the object is.
Maximum
Maximum volume, no matter how far the object is.
Attenuation
How strong the distance affects the volume.

Distance

Maximum
Maximum distance for volume calculation.
Reference
Reference distance at which volume is 100%.

Cone

Angle

Outer
: Angle of the outer cone in degrees. Outside this cone the volume is the outer cone volume (see below). Between the inner and outer cone the volume is interpolated.

Inner
: Angle of the inner cone in degrees. Inside the cone the volume is 100%.

Volume

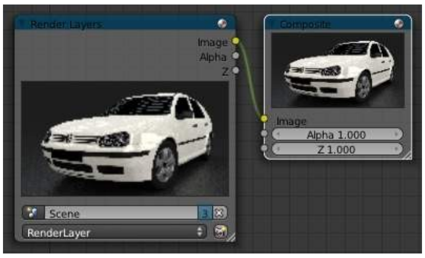
Outer
: Volume outside the outer cone.

11 Compositing

Compositing

Compositing Nodes allow you to assemble and enhance an image (or movie). Using composition nodes, you can glue two pieces of footage together and colorize the whole sequence all at once. You can enhance the colors of a single image or an entire movie clip in a static manner or in a dynamic way that changes over time (as the clip progresses). In this way, you use composition nodes to both assemble video clips together, and enhance them.

> **Note**
>
> Term: Image
>
> The term *Image* may refer to a single picture, a picture in a numbered sequence of images, or a frame of a movie clip. A node layout processes one image at a time, no matter what kind of input you provide.



Default Composition Noodle

To process your image, you use nodes to import the image into Bforartists, change it, optionally merge it with other images, and finally save it.

The example to the right shows the simplest node setup; an input node links the camera view to an output node so it can be saved.

Getting Started

Access the *Node Editor* and enable *Composite Nodes* by clicking on the *Image* icon.

Node Editor Header with Composite Nodes enabled

To activate nodes for compositing, click the *Use Nodes* checkbox. Bforartists creates a default node setup, consisting out of two nodes linked together.

> **Note**
>
> After clicking *Use Nodes* the Compositor is enabled however, it can also be disabled in the *Post Processing Panel*.

You now have your first node setup, a RenderLayer input node linked to a Composite output node. From here, you can add and connect many *types of compositing nodes*, in a sort of map layout, to your heart's content (or physical memory constraints, whichever comes first).

> **Note**
>
> Nodes and node concepts are explained in more detail in the *Node Editor*

Options

Free Unused Button

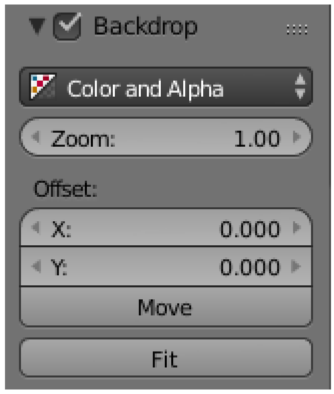
This button frees up memory space when you have a very complex node map.

Backdrop

Use the active viewer node output as a backdrop. When enabled, additional settings appear in the Header and the Properties Panel:

Backdrop Channels.

Backdrop Channels
: Set the image to be displayed with *Color*, *Color and Alpha*, or just *Alpha*.



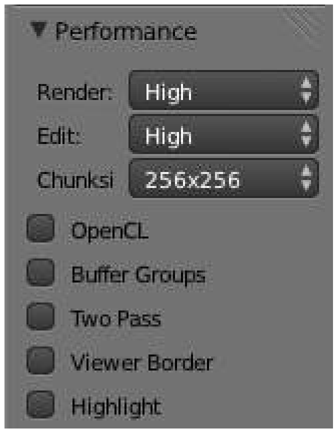
Backdrop Options

Zoom
: Sets how big the backdrop image is.

Offset
: Change the screen space position of the backdrop, or click the *Move* button, or shortcut `Alt-MMB` to manually move it.

Auto Render
: Re-render and composite changed layer when edits to the 3d scene are made.

Performance Settings



Performance Settings

Render
: Set quality when rendering in Node Editor.

Edit
: Set quality when editing in Node Editor

Chunk Size
: Max size of a title (smaller values give better distribution of multiple threads, but more overhead).

OpenCL
: Enable GPU calculations when working in Node Editor.

Buffer Groups
: Enable buffering of group nodes.

Two Pass
: Use two pass execution during editing: first calculate fast nodes, second pass calculate all nodes.

Viewer Border
: Use boundaries for viewer nodes and composite backdrop.

Highlight
: Highlight nodes that are being calculated.

Examples

You can do just about anything with images using nodes.

Raw footage from a foreground actor in front of a blue screen, or a rendered object doing something, can be layered on top of a background. Composite both together, and you have composited footage.

You can change the mood of an image:

- To make an image ‘feel’ colder, a blue tinge is added.

- To convey a flashback or memory, the image may be softened.
- To convey hatred and frustration, add a red tinge or enhance the red. The film ‘Sin City’ is the most extreme example of this I have ever seen.
- A startling event may be sharpened and contrast-enhanced.
- A happy feeling - you guessed it - add yellow (equal parts red and green, no blue) for bright and sunny.
- Dust and airborne dirt is often added as a cloud texture over the image to give a little more realism.

Types of Nodes

This section is organized by type of nodes, which are grouped based on similar functions:

- Input Nodes
- Output Nodes
- Color Nodes
- Converter Nodes
- Filter Nodes
- Vector Nodes
- Matte Nodes
- Distort Nodes
- Layout Nodes

Input Nodes

Input nodes produce information from some source. For instance, an input could be:

- Taken directly from the active camera in a selected scene,
- from a JPG, PNG, etc. file as a static picture,
- a movie clip (such as an image sequence or video), or
- just a color or value.

These nodes generate the information that feed other nodes. As such, they have no input-connectors; only outputs.

- Render Layers Node
- Image Node
- Movie Clip
- Mask
- RGB Node
- Value Node
- Texture Node
- Bokeh Image
- Time Node
- Track Position

Render Layers Node

Render Layers Node

This node is the starting place to getting a picture of your scene into the compositing node map.

This node inputs an image from a scene within your blend file. Select the scene and the active render layer from the yellow selection list at the bottom of the node. Bforartists uses the active camera for that scene to create an image of the objects specified in the *RenderLayer*.

The *Image* is input into the map, along with the following data:

- *Alpha* (transparency) mask

Depending on the Renderlayer passes that are enabled, other sockets are available. By default the Z is enabled:

- *Z* depth map (how far away each pixel is from the camera)

The example shows that two other passes are enabled:

- *Normal* vector set (how light bounces off the surface)
- *Speed* vector set (how fast an object is moving from one frame to the next)

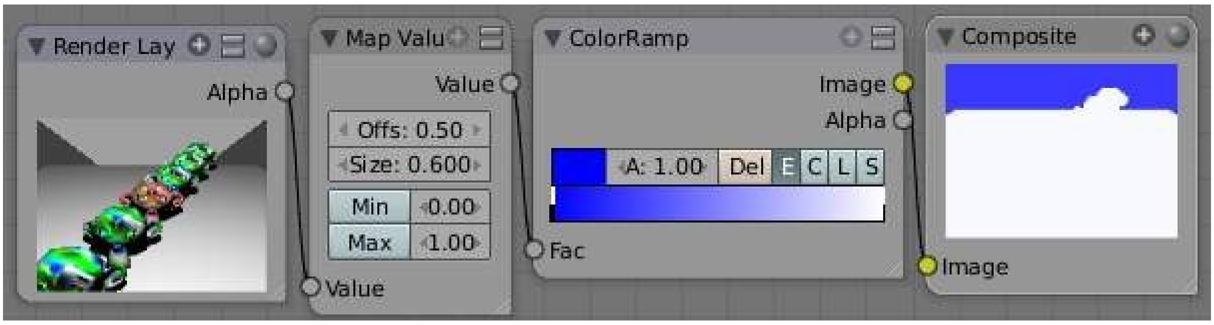
Use the re-render button (Small landscape icon - to the right of the Renderlayer name) to re-render the scene and refresh the image and map.

You may recall that a .blend file may contain many scenes. The Renderlayer node can pick up the scene info from any available scene by selecting the scene from the left-hand selector. If that *other* scene also uses the compositor and/or sequencer, you should note that the scene information taken is the raw information (pre-compositing and pre-sequencing). If you wish to use composited information from another scene, you will have to render that scene to a multilayer OpenEXR frameset as an intermediate file store, and then use the Image input node instead.

Using the Alpha Socket

Using the *Alpha* output socket is crucial in overlaying images on top of one another and letting a background image "show through" the image in front of it.

In a Bforartists scene, your objects are floating out there in virtual space. While some objects are in front of one another (Z depth), there is no ultimate background. Your world settings can give you the illusion of a horizon, but it's just that: an illusion. Further, some objects are semi-transparent; this is called having an Alpha value. A semi-transparent object allows light (and any background image) to pass through it to the camera. When you render an image, Bforartists puts out, in addition to a pretty image, a map of what solid objects actually are there, and where infinity is, and a map of the alpha values for semi-transparent objects. You can see this map by mapping it to a blue screen:



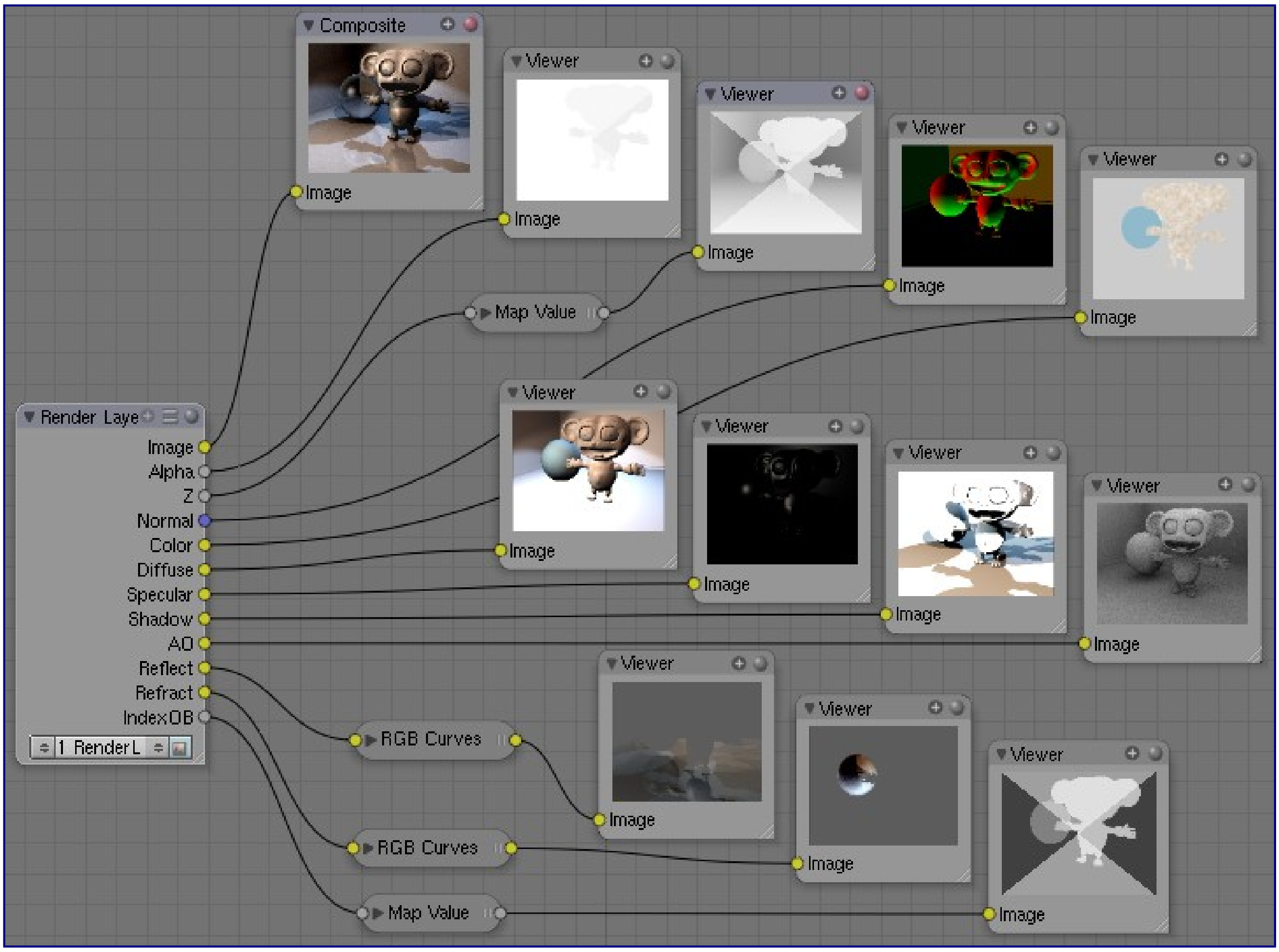
Viewing the Alpha values

In the little node map above, we have connected the Alpha output socket of the RenderLayer node to a Map Value node (explained later, but basically this node takes a set of values and maps them to something we can use). The Color Ramp node (also explained later in detail) takes each value and maps it to a color that we can see with our eyes. Finally, the output of the Color Ramp is output to a Composite viewer to show you, our dear reader, a picture of the Alpha values. Notice that we have set up the map so that things that are perfectly solid (opaque) are white, and things that are perfectly transparent (or where there is nothing) are blue.

Optional Sockets

For any of the optional sockets to appear on the node, you MUST have the corresponding pass enabled. In order for the output socket on the RenderLayer node to show, that pass must be enabled in the RenderLayer panel in the Buttons window. For example, in order to be able to have the Shadow socket show up on the RenderLayer input node, you must have the "Shad" button enabled in the Buttons window, Scene Render buttons, Renderlayer panel. See the RenderLayer tab (Buttons window, Output frame, Render Layers tab, Passes selector buttons) for Bforartists to put out the values corresponding to the socket.

For a simple scene, a monkey and her bouncy ball, the following picture expertly provides a great example of what each pass looks like:



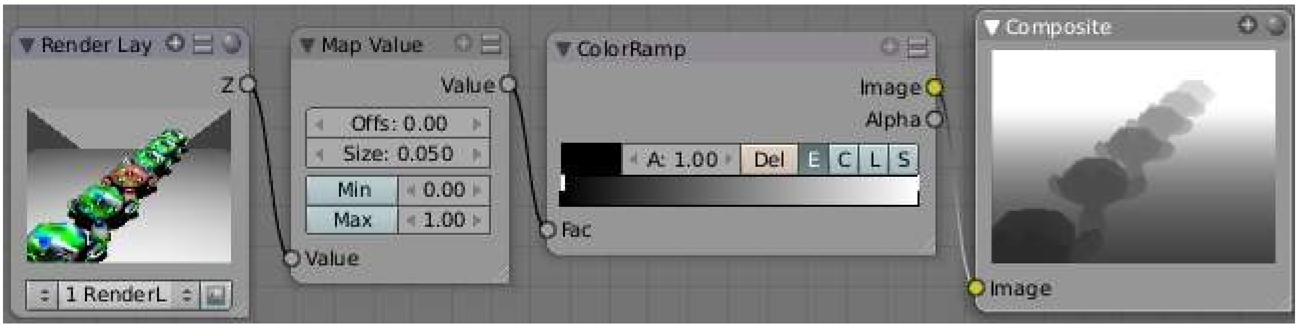
The available sockets are:

- Z: distance away from the camera, in Bforartists Units
- Normal (Nor): How the color is affected by light coming from the side
- UV: how the image is distorted by the UV mapping
- Speed (Vec): How fast the object is moving, and in what direction
- Color (Col): the RGB values that color the image that you see
- Diffuse: the softening of colors as they diffuse through the materials
- Specular: the degree of shininess added to colors as they shine in the light
- Shadow: shadows cast by objects onto other objects
- AO: how the colors are affected by Ambient Occlusion in the world
- Reflect (Ref): for mirror type objects, the colors they reflect and are thus not part of their basic material
- Refract: how colors are bent by passing through transparent objects
- Radio (Radiosity): colors that are emitted by other objects and cast onto the scene
- IndexOB: a numeric ordinal (index) of each object in the scene, as seen by the camera.

Using the Z value Socket

Using the *Z* output socket is crucial in producing realistic images, since items farther away are blurrier (but more on that later).

Imagine a camera hovering over an X-Y plane. When looking through the camera at the plane, Y is up/down and X is left/right, just like when you are looking at a graph. The camera is up in the air though, so it has a Z value from the X-Y plane, and, from the perspective of the camera, the plane, in fact all the objects that the camera can see, have a Z value as a distance that they are away from it. In addition to the pretty colors of an image, a RenderLayer input node also generates a Z value map. This map is a whole bunch of numbers that specify how far away each pixel in the image is away from the camera. You can see this map by translating it into colors, or shades of gray:



Viewing the Z values

In the little node map above, we have connected the Z output socket of the RenderLayer node to a Map Value node (explained later). This node takes a set of values and maps them to something we can use. The Color Ramp node (also explained later in detail) takes each value and maps it to a shade of gray that we can see with our eyes. Finally, the output of the colorramp is output to a Composite viewer to show you, our dear reader, a picture of the Z values. Notice that we have set up the Map Value node so that things closer to the camera appear blacker (think: black is 0, less Z means a smaller number) and pixels/items farther away have an increasing Z distance and therefore get whiter. We chose a Size value of 0.05 to see Z values ranging from 0 to 20 (20 is 1/0.05).

Using the Speed Socket

Even though things may be animated in our scene, a single image or frame from the animation does not portray any motion; the image from the frame is simply where things are at that particular time. However, from the *Render Layers* node, Bforartists puts out a vector set that says how particular pixels are moving, or will move, to the next frame. You use this socket to create a *blurring effect.*.

Image Node

Image Node

The *Image* node injects any image *format that is supported by Bforartists*. Besides inputting the actual image, this node can also input *Alpha* and depth (*Z*) values if the image has them. If the image is a MultiLayer format, all saved render passes are input. Use this node to input:

- A single image from a file (such as a JPG picture)
- Part or all of an animation sequence (such as the 30th to 60th frame)
- Part or all of a movie clip (such as an AVI file)
- the image that is currently in the UV/Image Editor (and possibly being painted)
- an image that was loaded in the UV/Image Editor

Animated image sequences or video files can also be used. See Animations below.

To select an image file or generated image from the UV/Image Editor, click on the small arrow selector button to the left of the name and pick an existing image (e.g. loaded in the UV editor or elsewhere) or click on *LOAD NEW* to select a file from your hard disk via a file-browser. These images can be e.g. previously rendered images, matte paintings, a picture of your cat, whatever. Bforartists really doesn't care.

If the image is part of a sequence, manually click the Image Type selector to the right of the name, and select *Sequence*. Additional controls will allow you to define how much of the sequence to pull in (see Animations below). If the file is a video file, these controls will automatically appear.

Image Channels

When the image is loaded, the available channels will be shown as sockets on the node. As a minimum, the Image, Alpha, and Z channels are made available. The picture may or may not have an alpha (transparency) and/or Z (depth) channel, depending on the format. If the image format does not support A and/or Z, default values are supplied (1.0 for A, 0.0 for Z).

Alpha/Transparency Channel

- If a transparency channel is detected, the *Alpha* output socket will supply it.
- If it does not have an Alpha channel (e.g. JPG images), Bforartists will supply one, setting the whole image to completely opaque (an Alpha of 1.00, which will show in a *Viewer* node as white - if connected to the *Image* input socket).

Z/depth Channel

- If a Z (depth) channel is detected, the *Z* output socket will supply it.
- If it does not have a Z channel (e.g. JPG or PNG images), Bforartists will supply one, setting the whole image to be at the camera (a depth of 0.00). To view the Z-depth channel, use the Map Value to ColorRamp noodle given above in the Render Layer input node (see Using the Z value Socket).

Note

Formats

Bforartists supports many image formats. Currently only the OpenEXR image format stores RGB (color), A (alpha), and Z (depth) buffer information in a single file, if enabled.

Saving/Retrieving Render Passes

Bforartists can save the individual Render Layers and specific passes in a MultiLayer file format, which is an extension of the OpenEXR format. In this example, we are reading in frames 50 to 100 of a RenderLayer that were generated some time ago. The passes that were saved were the Image, Alpha, Z, Specular and AO passes.

To create a MultiLayer image set when initially rendering, simply disable Do Composite, set your Format to MultiLayer, enable the Render Layer passes you wish to save over the desired frame range, and Animate. Then, in Bforartists, enable Compositing Nodes and Do Composite, and use the Image input node to read in the EXR file. When you do, you will see each of the saved passes available as sockets for you to use in your compositing noodle.

Image Size

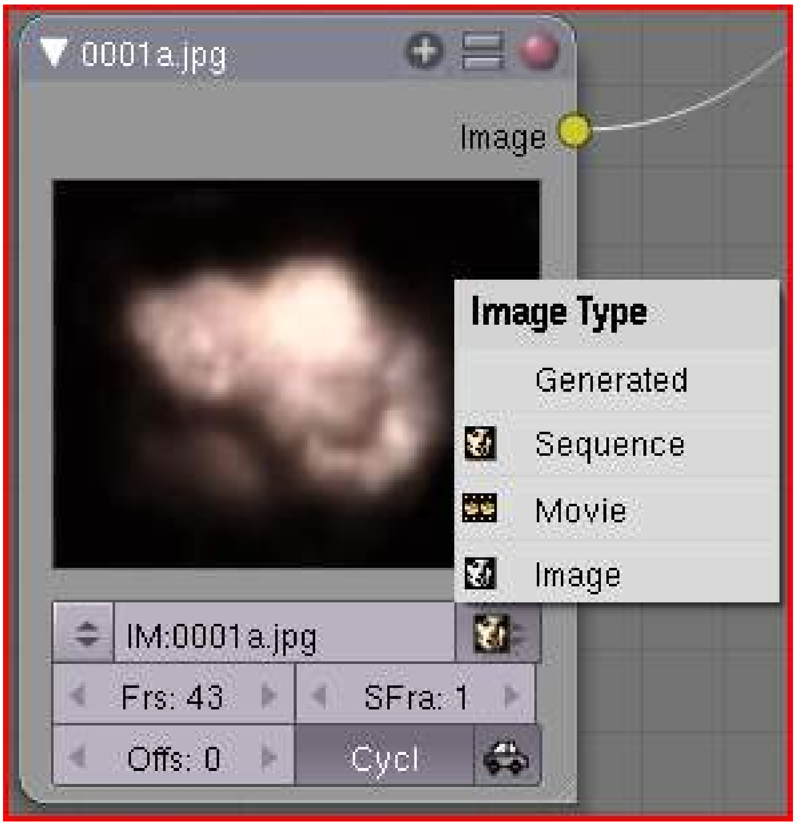
Size matters - Pay attention to image resolution and color depth when mixing and matching images. Aliasing (rough edges), color *flatness*, or distorted images can all be traced to mixing inappropriate resolutions and color depths.

The compositor can mix images with any size, and will only perform operations on pixels where images have an overlap. When nodes receive inputs with differently sized Images, these rules apply:

- The first/top Image input socket defines the output size.
- The composite is centered by default, unless a translation has been assigned to a buffer using a *Translate* node.

So each node in a composite can operate on different sized images, as defined by its inputs. Only the *Composite* output node has a fixed size, as defined by the *Scene buttons* (Format Panel). The *Viewer* node always shows the size from its input, but when not linked (or linked to a value) it shows a small 320x256 pixel image.

Animations



To use image sequences or movies within your composition, press the face or little film strip button located to the right of the selector. As you click, a pop-up will offer you four choices:

- Generated - a image generated from the *UV Editor*
- Sequence - a sequence of frames, each frame in a separate file.
- Movie - a sequence of frames packed into a single `.avi` or `.mov` file
- Image - a single frame or still image in a file

A Movie or Image can be named anything, but a Sequence must have a digit sequence somewhere in its filename, for example fire0001set.jpg, fire0002set.jpg, fire0003set.jpg and so on. The number indicates the frame.

If a Sequence or Movie is selected, an additional set of controls will appear that allows you to select part or all of the sequence. Use these controls to specify which frames, out of the original sequence, that you want to introduce into the animation you are about to render. You can start at the beginning and only use the beginning, or even pick out a set of frames from the middle of an existing animation.

The *Frs* number button is the number of frames in the sequence that you want to show. For example, if you want to show 2 seconds of the animation, and are running 30 fps, you would put 60 here.

The *SFra* number button sets the start frame of the animation; namely, at what point in the animation that you *are going to render* do you want this sequence to start playing. For example, if you want to introduce this clip ten seconds into the composite output, you would put 300 here (at 30 fps).

The *First* number button sets the first number in the animated sequence name. For example, if your images were called “credits-0001.png”, “credits-0002.png” through “credits-0300.png” and you wanted to start picking up with frame 20, you’d put 20 here.

To have the movie/sequence start over and repeat when it is done, press the *Cycl* ic button. For example, if you were compositing a fan into a room, and the fan animation lasted 30 frames, the animation would start over at frame 31, 61, 91, and so on, continuously looping. As you scrub from frame to frame, to see the actual video frame used for the current frame of animation, press the auto button to the right of the *Cycl* ic button.

Generated Images

Using the Nodes to modify a painting in progress in the UV/Image window Bforartists features Texture Paint which works in the UV/Image Editor, that allows you to paint on the fly, and the image is kept in memory or saved. If sync lock is enabled (the lock icon in the header), changes are broadcast throughout Bforartists as soon as you lift the mouse button. One of the places that the image can go is to the Image Input node. The example shows a painting session going on in the right-hand UV/Image Editor window for the painting “Untitled”. Create this image via Image?New in the UV/Image Editor. Refer to the texture paint section of the user maual for more info on using Texture Paint.

In the left-hand window, the Image input node was used to select that “Untitled” image. Notice that the Image type icon is blank, indicating that it is pulling in a Generated image. That image is colorized by the noodle, with the result used as a backdrop in the Node Editor Window.

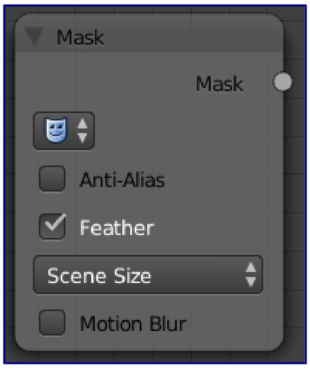
Using this setup and the Generated Image type is like painting and post-processing as you continue painting. Changes to either the painting or the post-pro noodle are dynamic and real-time.

Movie Clip

Mask Node

TODO - see: https://developer.Bforartists.org/T43469

Mask



Mask Node

TODO - see: https://developer.Bforartists.org/T43469

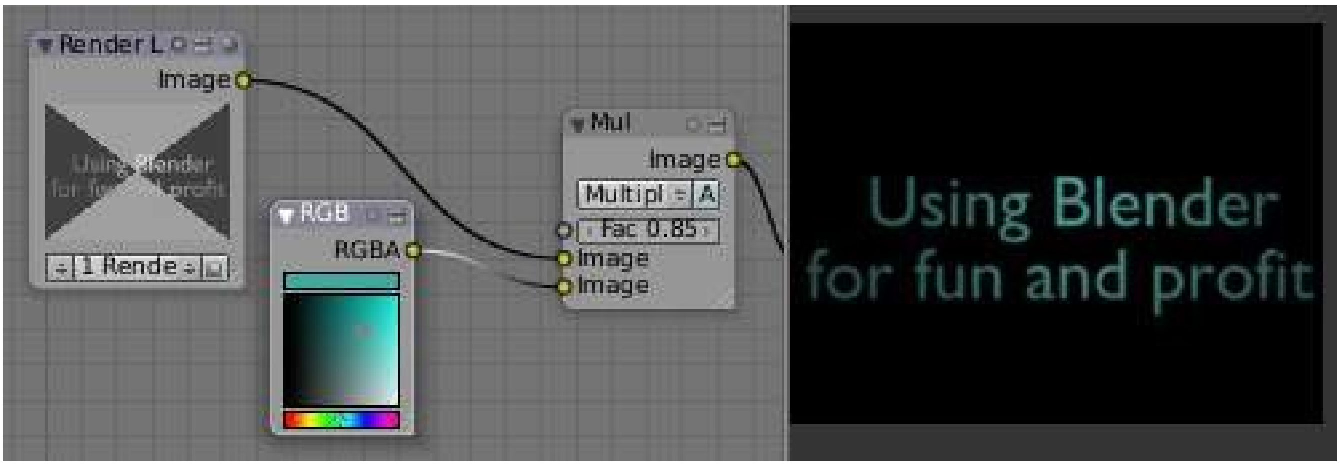
RGB Node

RGB Node

The RGB node has no inputs. It just outputs the Color currently selected in its controls section; a sample of it is shown in the top box. In the example to the right, a gray color with a tinge of red is slected.

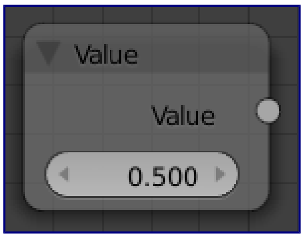
To change the brightness and saturation of the color, `LMB` click anywhere within the square gradient. The current saturation is shown as a little circle within the gradient. To change the color itself, click anywhere along the rainbow Color Ramp.

Example



In this example, our corporate color is teal, but the bozo who made the presentation forgot. So, we multiply his lame black and white image with our corporate color to save him from embarrassment in front of the boss when he gives his boring presentation.

Value Node

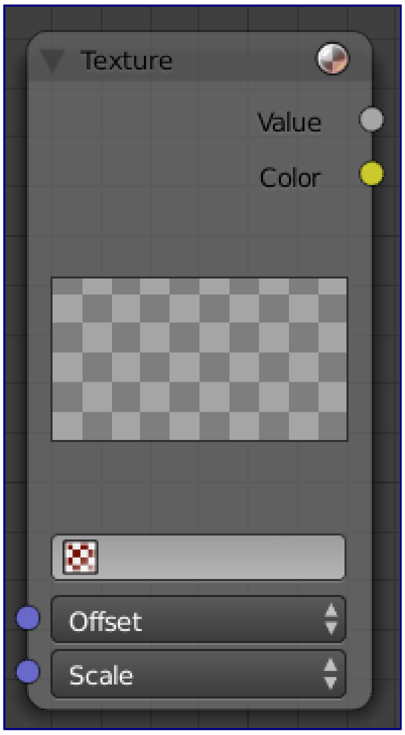


Value Node

The Value node has no inputs; it just outputs a numerical value (floating point spanning 0.00 to 1.00) currently entered in the NumButton displayed in its controls selection.

Use this node to supply a constant, fixed value to other nodes' value or factor input sockets.

Texture Node



Texture Node

The *Texture* node makes 3D textures available to the compositor.

The Texture node makes 3D textures available to the compositor. A texture, from the list of textures available in the current blend file, is selected and introduced through the value and/or color socket.

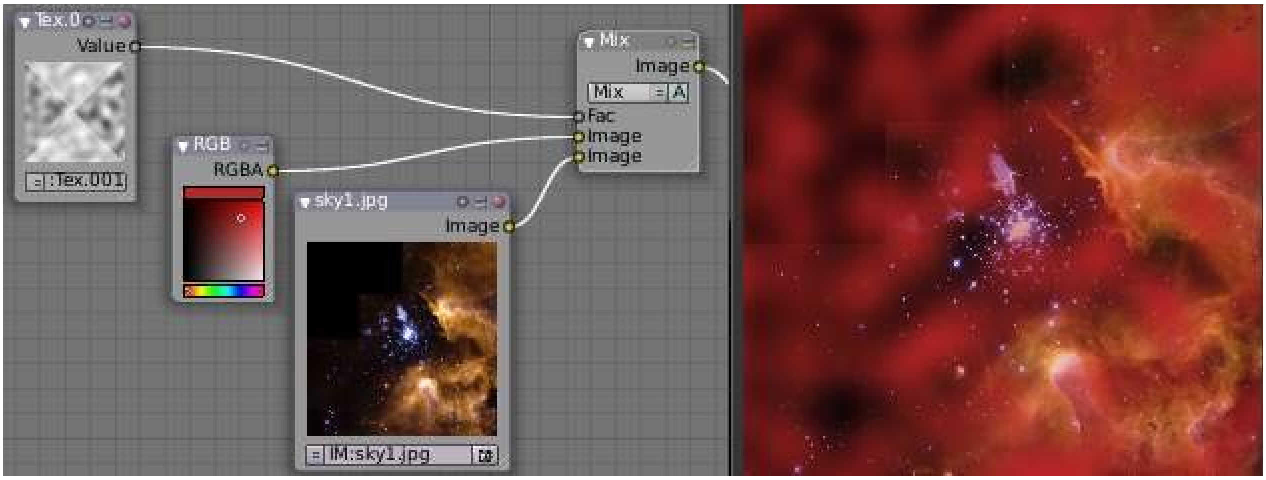
Note
Please read up on the Bforartists Library system for help on importing and linking to textures in other Bforartists files.

Note
You cannot edit the textures themselves in the node window. To use this node, create and edit the texture in the normal texture buttons, then select the texture from the menu button on the node.

You can change the *Offset* and a *Scale* (which is called Offs XYZ and Size XYZ in the Materials Texture Map Input panel) for the texture by clicking on the label and setting the sliders, thus affecting how the texture is applied to the image. For animation, note that this is a vector input socket, because the XYZ values are needed.

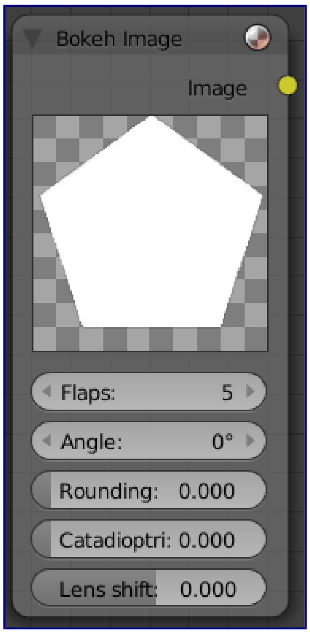
Texture nodes can output a straight black-and-white *Value* image (don't mistake this for alpha) and an image (*Color*).

Example



In the example above, we want to simulate some red plasma gas out there in space. So, we fog up an image taken from the Hubble telecscope of Orion and take the ever-so-useful Cloud texture and use it to mix in red with the image.

Bokeh Image



Bokeh Image Node

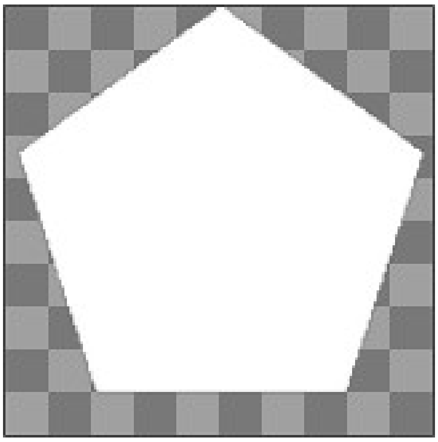
Bokeh Image generates a special input image for use with the *Bokeh Blur* filter node.

Bokeh Image is designed to create a reference image which simulates optical parameters such as aperture shape and lens distortions which have important impacts on bokeh in real cameras.

The first three settings simulate the aperture of the camera. Flaps sets an integer number of blades for the cameras iris diaphragm. Angle gives these blades an angular offset relative to the image plane and Rounding sets the curvature of the blades with a `0` being straight and `1` bringing them to a perfect circle.

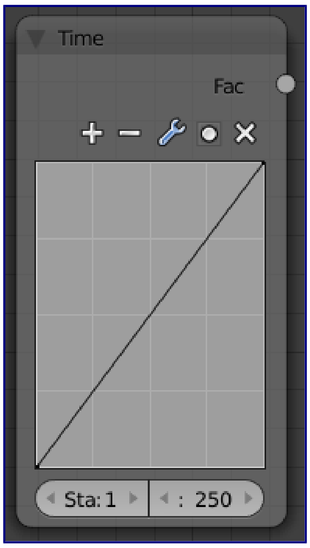
Catadioptric provides a type of distortion found in mirror lenses and some telescopes. This can be useful to produce a ‘busy’ bokeh.

Lens Shift introduces chromatic aberration into the blur such as would be caused by a tilt-shift lens.



Example of a bokeh image with 5 flaps.

Time Node



Time Node

The Time node generates a *fac* tor value (from 0.00 to 1.00) (that changes according to the curve drawn) as time progresses through your movie (frames).

The *Start* and *End* NumButtons specify the range of time the values should be output along, and this range becomes the X-axis of the graph. The curve defines the Y-value and hence the factor that is output. In the example to the right, since the timespan is 250 frames and the line is straight from corner to corner, 0.50 would be output at frame 125, and 0.75 will be output at frame 187.

Note
Note on output values The *Map Value* node can be used to map the output to a more appropriate value. With some time curves, it is possible that the Time node may output a number larger than one or less than zero. To be safe, use the

Min/Max clamping function of the Map Value node to limit output.

You can reverse time (unfortunately, only in Bforartists and not in the real world) by specifying a Start frame greater than the End frame. The net effect of doing so is to flip the curve around. Warning: doing so is easily overlooked in your node map and can be very confusing (like meeting your mother when she was/is your age in “Back to the Future”).

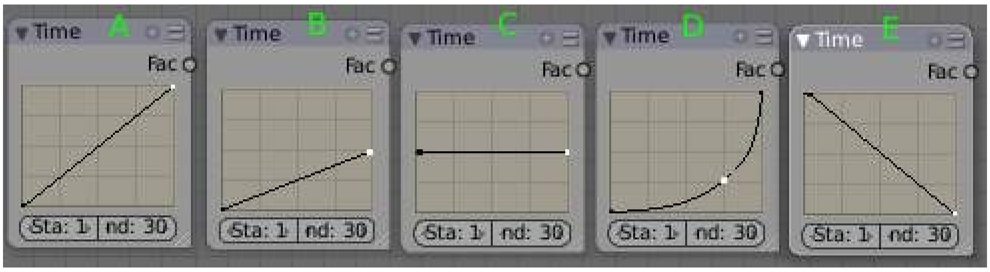
Note

Time is Relative

In Bforartists, time is measured in frames. The actual duration of a time span depends on how fast those frames whiz by (frame rate). You set the frame rate in your animation settings (Render Dimensions Panel). Common settings range from 5 seconds per frame for slideshows (0.2 fps), to 30 fps for US movies.

Time Node Examples

In the picture below, over the course of a second of time (30 frames), the following time controls are made:



See:

1. No Effect
2. Slow Down
3. Freeze
4. Accelerate
5. Reverse

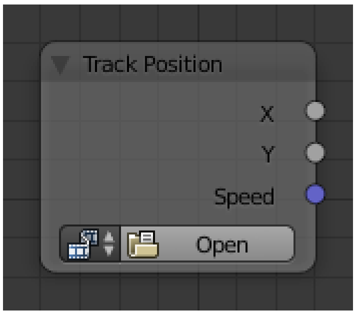
Common uses for this include a *“fade to black”*, wherein the accelerate time curve (typically exponentially-shaped) feeds a mix value that mixes a constant black color in, so that the blackness accelerates and eventually darkens the image to total black. Other good uses include an increasing soften (blur-out or -in) effect, or *fade-in* a background or foreground, instead of just jumping things into or out of the scene.

You can even imagine hooking up one blur to a background renderlayer, another inverted blur to a foreground renderlayer, and time-feeding both. This node group would simulate someone focusing the camera lens.

Usage

As your imagination runs wild, consider a few ideas that came to me just now on my couch: mixing a clouds texture with a time input to fog up a piece of glass or show spray paint building up on a wall. Consider mixing red and the soften with time (decreasing output) to show what someone sees when waking up from a hard hit on the head. Mix HSV input with a starfield image with time (decreasing output) to show what we might see someday as we accelerate our starship and experience red-shift.

Track Position Node



Track Position Node.

The *Track Position node* is used to return information about a tracking marker to the compositor.

Inputs

This node as no inputs.

Properties

Movie Clip

Used to select a Movie Clip data-block to use, for controls see Data-Block Menu.

Tracking Object
Camera object to get track information from.
Track Name
The name of the track to get track information from.

Position

Which marker position to use for output.

Absolute
Outputs a absolute position of a marker.
Relative Start
Outputs the positions of a marker relative to the first marker of a track.
Relative Frame
Outputs the positions of a marker relative to the markers of the given *Frame*.
Absolute Frame
Outputs the absolute positions of a marker at the given *Frame*.

Outputs

X/Y
The markers X and Y location.
Speed

The velocity of the marker, measured in pixels per frame. This could be used to fake effects like motion blur by connecting it to the Vector Blur Node.

Examples

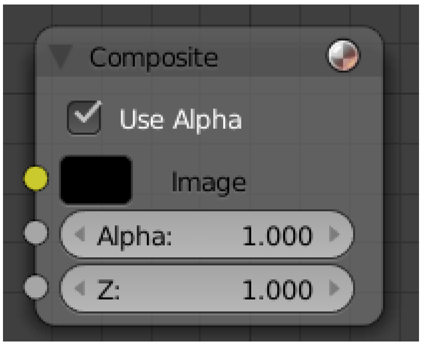
TODO.

Output Nodes

These nodes are used to output the composited result in some way.

- Composite Node
- Viewer Node
- Split Viewer Node
- File Output Node
- Levels Node

Composite Node



Composite Node

The Composite node is where the actual output from the compositor is connected to the renderer. Connecting a node to the *Composite* node will output the result of that node's full tree to the Renderer; leaving this node unconnected will result in a blank image. This node is updated after each render, but also if you change things in your node-tree (provided at least one finished input node is connected).

You can connect three channels: the actual RGBA image, the Alpha image, and the Z (depth) image. You should only have one Composite node in your map so that only one final image is rendered when the *Compositing* button is pressed on the Render Options Post-Processing panel. Otherwise, unpredictable results may occur.

Note

If multiple Composite nodes are added, only the active one (last selected, indicated with a slightly darker header) will be used.

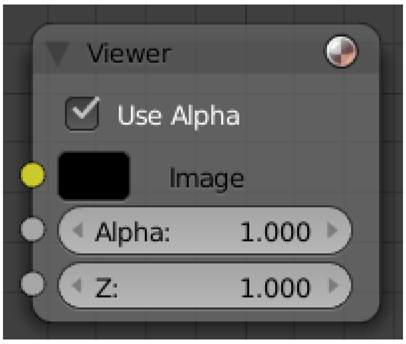
Saving your Composite Image

The RENDER button renders a single frame or image. Save your image using F3 or the *File → Save Image* menu. The image will be saved using the image format settings on the Render panel.

To save a sequence of images, for example, if you input a movie clip or used a Time node with each frame in its own file, use the *ANIM* button and its settings. If you might want to later overlay them, be sure to use an image format that supports an Alpha channel (such as PNG). If you might want to later arrange them front to back or create a depth of field effect, use a format that supports a Z-depth channel (such as EXR).

To save a composition as a movie clip (all frames in a single file), use an AVI or Quicktime format, and use the *ANIM* button and its settings.

Viewer Node



Viewer Node

The *Viewer* node is a temporary, in-process viewer. Plug it in wherever you would like to see an image or value-map in your node-tree.

LMB click on the image to update it, if it wasn't done automatically. You can use as many of these as you would like. It is possible to automatically plug a Viewer node to any other node by pressing Shift-Ctrl-LMB on it.

Note

It is possible to add multiple Viewer nodes, though only the active one (last selected, indicated with a slightly darker header) will be shown on the backdrop or in the UV/Image editor.

Border Compositing

A border for the viewer node can be defined using Ctrl-B and selecting a rectangular area.

This border is used to define the area of interest of the viewer node which restricts compositing to this area. Used for faster previews by skipping compositing outside of the defined area of interest. This is only a preview option, final compositing during a render ignores this border.

Use Ctrl-Alt-B to discard the defined border and see a full preview.

Tile order

The tile order can be defined for the backdrop image, using the *Tile order* field in the properties of the viewer node (*Properties* panel in *Properties* sidebar, with the viewer node selected):

Rule of thirds
: Calculates tiles around each of the 9 zones defined by the **rule of thirds** (see Rule of Thirds for more information).

Bottom up
: Tiles are calculated from the bottom up.

Random
: Calculates tiles in a non-specific order.

Center
: Calculates the tiles around a specific center, defined by *X* and *Y* fields.

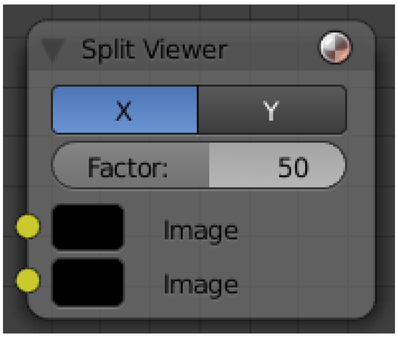
Using the UV/Image Editor Window

The viewer node allows results to be displayed in the UV/Image Editor. The image is facilitated by selecting *Viewer Node* on the window's header linked image selector. The UV/Image Editor will display the image from the currently selected viewer node.

To save the image being viewed, use Image ‣ Save As Image (F3) to save the image in a file.

The UV/Image Editor also has three additional options in its header to view Images with or without Alpha, or to view the Alpha or Z itself. Holding LMB in the Image display allows you to sample the values.

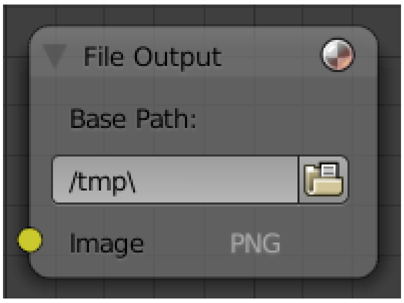
Split Viewer Node



Split Viewer Node

The *SplitViewer* node takes two images and displays one half of each on each side (top socket on the right half, bottom socket input on the left). Use this node for making side-by-side comparisons of two renderings/images, perhaps from different renderlayers or from different scenes. When transitioning between scenes, you want to be sure the stop action is seamless; use this node to compare the end of one scene with the beginning of another to ensure they align.

File Output Node



File Output Node

This node puts out an RGBA image, in the format selected, for each frame range specified, to the filename entered, as part of a frameset sequence. This means that the name of the file will be the name you enter plus a numeric frame number, plus the filename extension (based on format). Based on the format you choose, various quality/compression options may be shown.

To support subsequent arrangement and layering of images, the node can supply a Z-depth map. However, please note that only the OpenEXR image formats save the Z information.

The image is saved whenever Bforartists feels like it. Just kidding; whenever you press the Render button, the current frame image is saved. When you press the Anim button, the frameset sequence (specified in the Start and End frame) is saved.

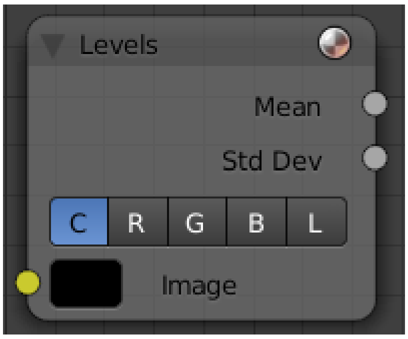
This node saves you from doing (or forgetting to do) the Save Image after a render; the image is saved automagically for you. In addition, since this node can be hooked in anywhere in the noodle, you can save intermediate images automatically. Neat, huh?

Note

Filespecs

As with all filename entries, use `//` at the beginning of the field to shorthand reference the current directory of the `.blend` file. You can also use the .. breadcrumb to go up a directory.

Levels Node



Levels Node

The Levels Node takes an image as an input, and can output a 1D value based on the levels of an image. It can read the input’s *Combined RGB*, *Red*, *Green*, *Blue*, or *Luminance* channels.

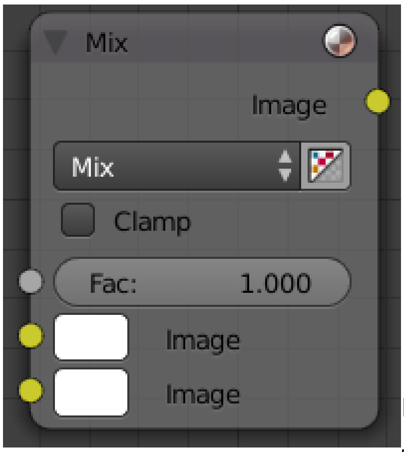
It can output a *Mean* value, or average of values, or a *Standard deviation*, which measures the diversity of values.

Color Nodes

These nodes adjust the image's colors, for example increasing the contrast, making it warmer, overlaying another image, etc.

- Mix Node
- Alpha Over Node
- Invert Node
- RGB Curves Node
- Hue Saturation Node
- Color Balance
- Hue Correct Node
- Bright/Contrast Node
- Gamma Node
- Color Correction Node
- Tone Map Node
- Z-Combine Node

Mix Node



Mix Node

This node mixes a base image (threaded to the top socket) together with a second image (bottom socket) by working on the individual and corresponding pixels in the two images or surfaces. The way the output image is produced is selected in the drop-down menu. The size (output resolution) of the image produced by the mix node is the size of the base image. The alpha and Z channels are mixed as well.

See also

Color Blend Modes for details on each blending mode.

Note
Color Channels There are two ways to express the channels that are combined to result in a color: RGB or HSV. RGB stands for the Red/Green/Blue pixel format, and HSV stands for the Hue/Saturation/Value pixel format.

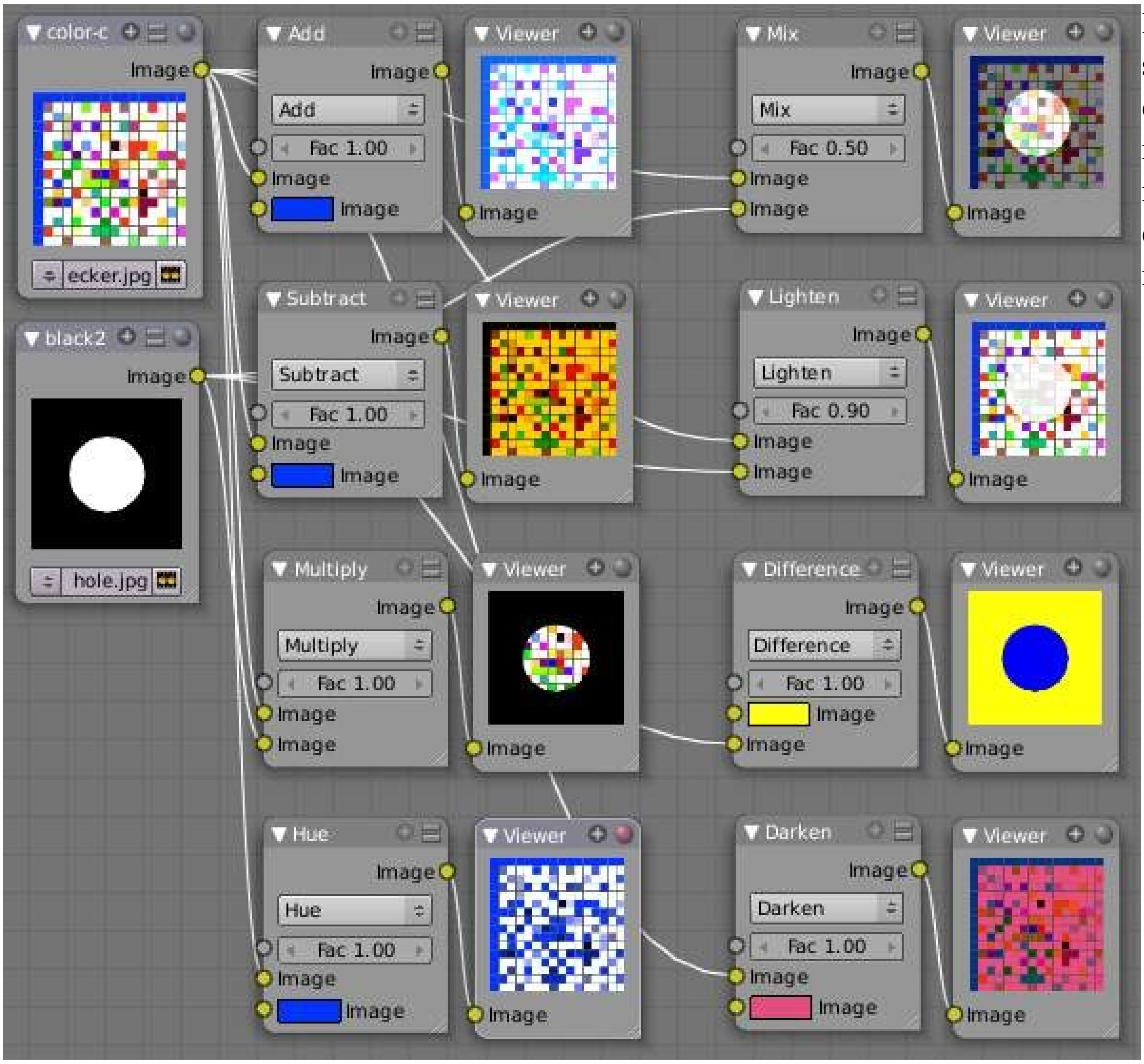
Alpha

Click the *Alpha* button to make the mix node use the Alpha (transparency) values of the second (bottom) node. If enabled, the resulting image will have an Alpha channel that reflects both images’ channels. Otherwise, (when not enabled, light green) the output image will mix the colors by considering what effect the Alpha channel has of the base (top input socket) image. The Alpha channel of the output image is not affected.

Fac

The amount of mixing of the bottom socket is selected by the Factor input field (*Fac:*). A factor of zero does not use the bottom socket, whereas a value of 1.0 makes full use. In Mix mode, `0.5` is an even mix between the two, but in Add mode, `0.5` means that only half of the second socket’s influence will be applied.

Examples



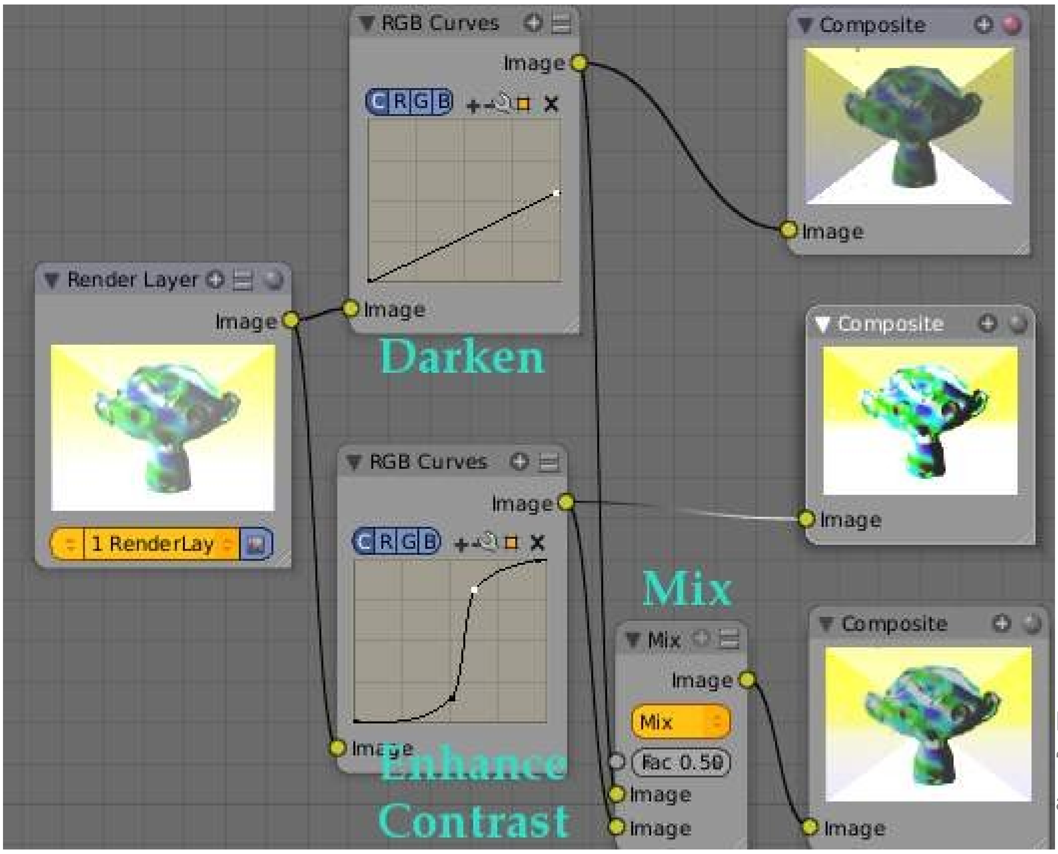
Below are samples of common mix modes and uses, mixing a color or checker with a mask.

Some explanation of the mixing methods above might help you use the Mix node effectively:

- *Add* - adding blue to blue keeps it blue, but adding blue to red makes purple. White already has a full amount of blue, so it stays white. Use this to shift a color of an image. Adding a blue tinge makes the image feel colder.
- *Subtract* : Taking Blue away from white leaves Red and Green, which combined make Yellow (and you never thought you'd need a color wheel again, eh?). Taking Blue away from Purple leaves Red. Use this to de-saturate an image. Taking away yellow makes an image bluer and more depressing.
- *Multiply* : Black (0.00) times anything leaves black. Anything times White (1.00) is itself. Use this to mask out garbage, or to colorize a black-and-white image.
- *Hue* : Shows you how much of a color is in an image, ignoring all colors except what is selected: makes a monochrome picture (style 'Black & Hue').
- *Mix* : Combines the two images, averaging the two.
- *Lighten* : Like bleach, makes your whites whiter. Use with a mask to lighten up a little.
- *Difference* : Kinda cute in that it takes out a color. The color needed to turn Yellow into White is Blue. Use this to compare two verrry similar images to see what had been done to one to make it the other; sorta like a change log for images. You can use this to see a watermark (see Using Mix to Watermark images) you have placed in an image for theft detection.
- *Darken*, with the colors set here, is like looking at the world through rose-colored glasses (sorry, I just couldn't resist).

Contrast Enhancement using Mix

Here is a small map showing the effects of two other common uses for the RGB Curve: **Darken** and **Contrast Enhancement**. You can see the effect each curve has independently, and the combined effect when they are **mixed** equally.



Example node setup showing "Darken", "Enhance Contrast" and "Mix" nodes for composition.

As you can hopefully see, our original magic monkey was overexposed by too much light. To cure an overexposure, you must both darken the image and enhance the contrast. Other paint programs usually provide a slider type of control, but Bforartists, ah the fantastic Bforartists, provides a user-definable curve to provide precise control.

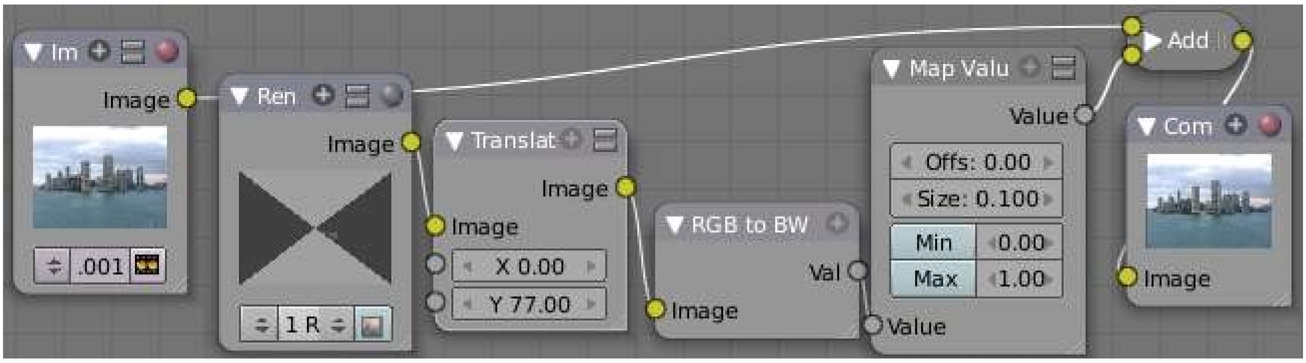
In the top RGB curve, *Darken*, only the right side of the curve was lowered; thus, any X input along the bottom results in a geometrically less Y output. The *Enhance Contrast* RGB 'S' curve scales the output such that middle values of X change dramatically; namely, the middle brightness scale is expanded, and thus whiter whites and blacker blacks are output. To make this curve, simply click on the curve and a new control point is added. Drag the point around to bend the curve as you wish. The Mix node combines these two effects equally, and Suzanne feels much better. And NOBODY wants a cranky monkey on their hands.

Using Mix to Watermark images

In the old days, a pattern was pressed into the paper mush as it dried, creating a mark that identified who made the paper and where it came from. The mark was barely perceptible except in just the right light. Probably the first form of subliminal advertising. Nowadays, people watermark their images to identify them as personal intellectual property, for subliminal advertising of the author or hosting service, or simply to track their image's proliferation throughout the web. Bforartists provides a complete set of tools for you to both encode your watermark and to tell if an image has your watermark.

Encoding Your Watermark in an Image

First, construct your own personal watermark. You can use your name, a word, or a shape or image not easily replicated. While neutral gray works best using the encoding method suggested, you are free to use other colors or patterns. It can be a single pixel or a whole gradient; it's up to you. In the example below, we are encoding the watermark in a specific location in the image using the Translate node; this helps later because we only have to look in a specific location for the mark. We then use the RGB to BW node to convert the image to numbers that the Map Value node can use to make the image subliminal. In this case, it reduces the mark to one-tenth of its original intensity. The Add node adds the corresponding pixels, make the ones containing the mark ever-so-slightly brighter.



Embedding your mark in an Image using a Mark and Specific Position

Of course, if you *want* people to notice your mark, don't scale it so much, or make it a contrasting color. There are also many other ways, using other mix settings and fancier rigs. Feel free to experiment!

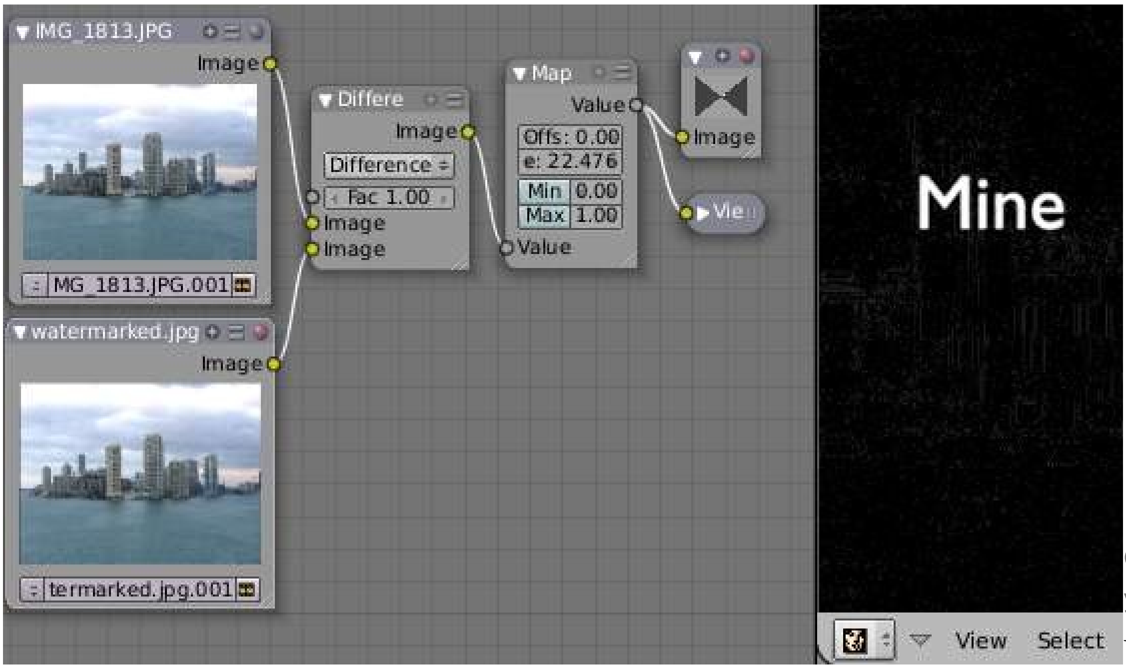
Note

Additional uses

You can also use this technique, using settings that result in visible effects, in title sequences to make the words appear to be cast on the water's surface, or as a special effect to make words appear on the possessed girl's forearm. yuk.

Decoding an Image for your Watermark

When you see an image that you think might be yours, use the node map below to compare it to your stock image (pre-watermarked original). In this map, the Mix node is set to Difference, and the Map Value node amplifies any difference. The result is routed to a viewer, and you can see how the original mark stands out, clear as a bell:



Checking an image for your watermark

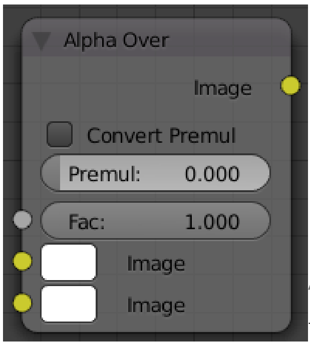
Various image compression algorithms lose some of the original; the difference shows as noise. Experiment with different compression settings and marks to see which works best for you by having the encoding map in one scene, and the decoding map in another. Use them while changing Bforartists's image format settings, reloading the watermarked image after saving, to get an acceptable result. In the example above, the mark was clearly visible all the way up to JPEG compression of 50%.

Using Dodge and Burn (History Lesson)

Use the dodge and burn mix methods in combination with a mask to affect only certain areas of the image. In the old darkroom days, when, yes, I actually spent hours in a small stinky room bathed in soft red light, I used a circle cutout taped to a straw to dodge areas of the photo as the exposure was made, casting a shadow on the plate and thus limiting the light to a certain area.

To do the opposite, I would burn in an image by holding a mask over the image. The mask had a hole in it, letting light through and thus 'burning' in the image onto the paper. The same equivalent can be used here by mixing an alpha mask image with your image using a dodge mixer to lighten an area of your photo. Remember that black is zero (no) effect, and white is one (full) effect. And by the way, ya grew to like the smell of the fixer, and with a little soft music in the background and the sound of the running water, it was very relaxing. I kinda miss those dayz.

Alpha Over Node

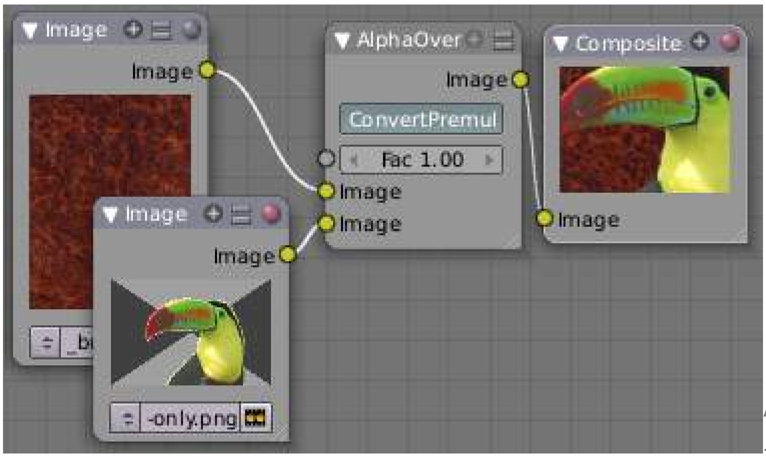


Alpha Over Node

Use this node to layer images on top of one another. This node takes two images as input, combines them by a factor, and outputs the image. Connect the Background image to the top input, and the foreground image to the lower input. Where the foreground image pixels have an alpha greater than 0 (namely, have some visibility), the background image will be overlaid.

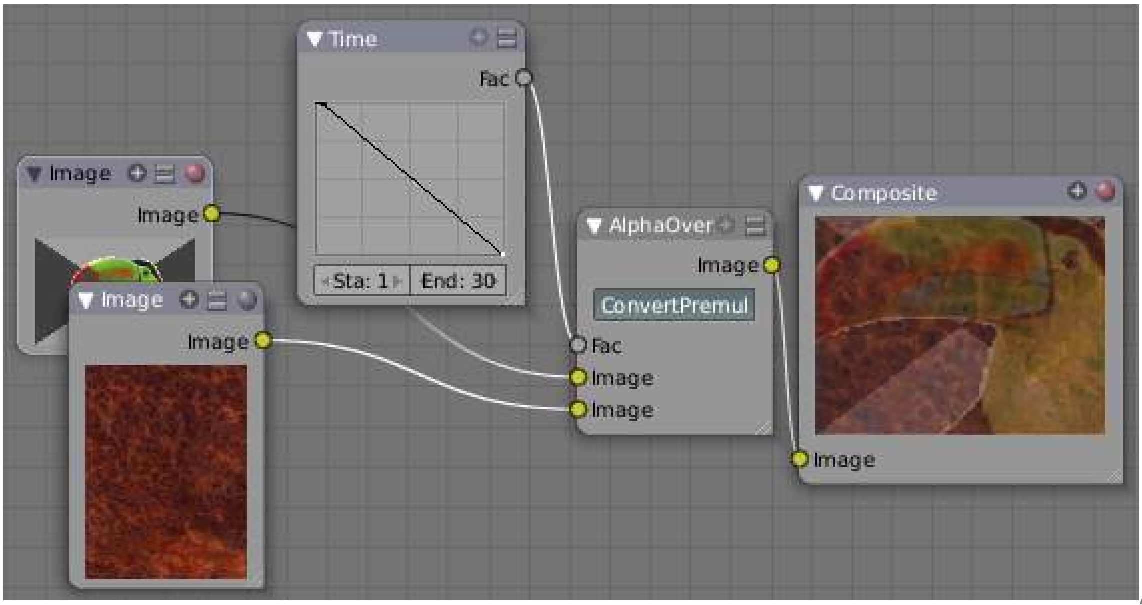
Use the *Factor* slider to ‘merge’ the two pictures. A factor less than 1.00 will make the foreground more transparent, allowing the background to bleed through.

Examples



Assembling a composite Image using AlphaOver

In this example, an image of a Toucan is superimposed over a wooden background. Use the PreMultiply button when the foreground image and background images have a combined Alpha that is greater than 1.00; otherwise you will see an unwanted halo effect. The resulting image is a composite of the two source images.



Animated See-

Through/Sheer SFX using AlphaOver - Frame 11

In this example, we use the Factor control to make a sheer cloth or onion-skin effect. You can animate this effect, allowing the observer to 'see-through' walls (or any foreground object) by hooking up a Time node to feed the Factor socket as shown below. In this example, over the course of 30 frames, the Time node makes the AlphaOver node produce a picture that starts with the background wood image, and slowly bleeds through the Toucan. This example shows frame 11 just as the Toucan starts to be revealed.

AlphaOver does not work on the colors of an image, and will not output any image when one of the sockets is unconnnected.

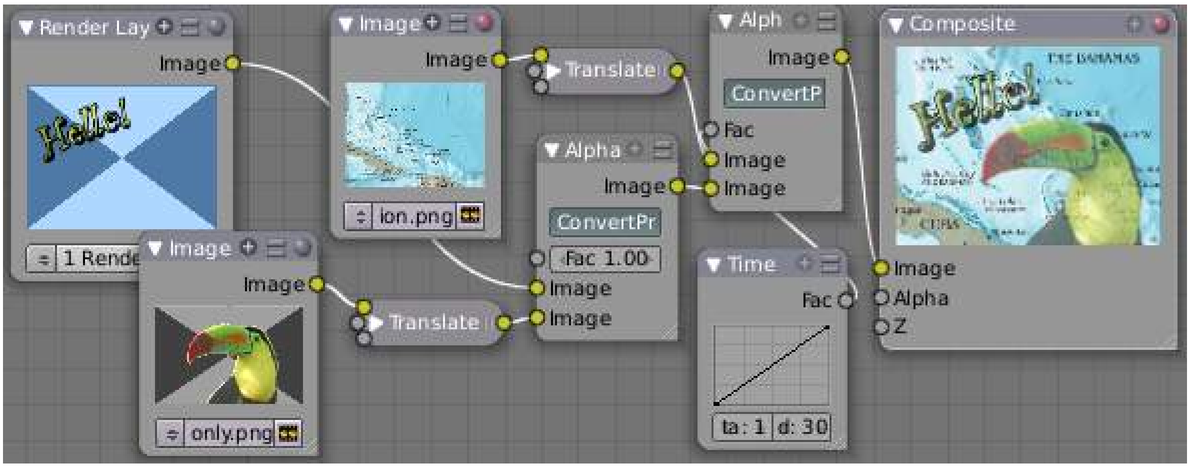
Strange Halos or Outlines

To clarify the premultiplied-alpha button: An alpha channel has a value of between 0 and 1. When you make an image transparent (to composite it over another one), you are really multiplying the RGB pixel values by the alpha values (making the image transparent (0) where the alpha is black (0), and opaque (1) where it is white (1)).

So, to composite image A over image B, you get the alpha of image A and multiply it by image A, thus making the image part of A opaque and the rest transparent. You then inverse the alphas of A and multiply image B by it, thus making image B transparent where A is opaque and vice versa. You then add the resultant images and get the final composite.

A pre-multiplied alpha is when the image (RGB) pixels are already multiplied by the alpha channel, therefore the above compositing op doesn't work too well, and you have to hit 'convert pre-mult'. This is only an issue in semi transparent area, and edges usually. The issue normally occurs in Nodes when you have combined, with alpha, two images, and then wish to combine that image with yet another image. The previously combined image was previously multiplied (pre-mult) and needs to be converted as such (hence, *Convert PreMul*).

If you don't pay attention and multiply twice, you will get a white or clear halo around your image where they meet, since your alpha value is being squared or cubed. It also depends on whether or not you have rendered your image as a pre-mult, or straight RGBA image.



Layering Images using AlphaOver Premul

Invert Node

Invert Node

This handy node inverts the colors in the input image, producing a negative.

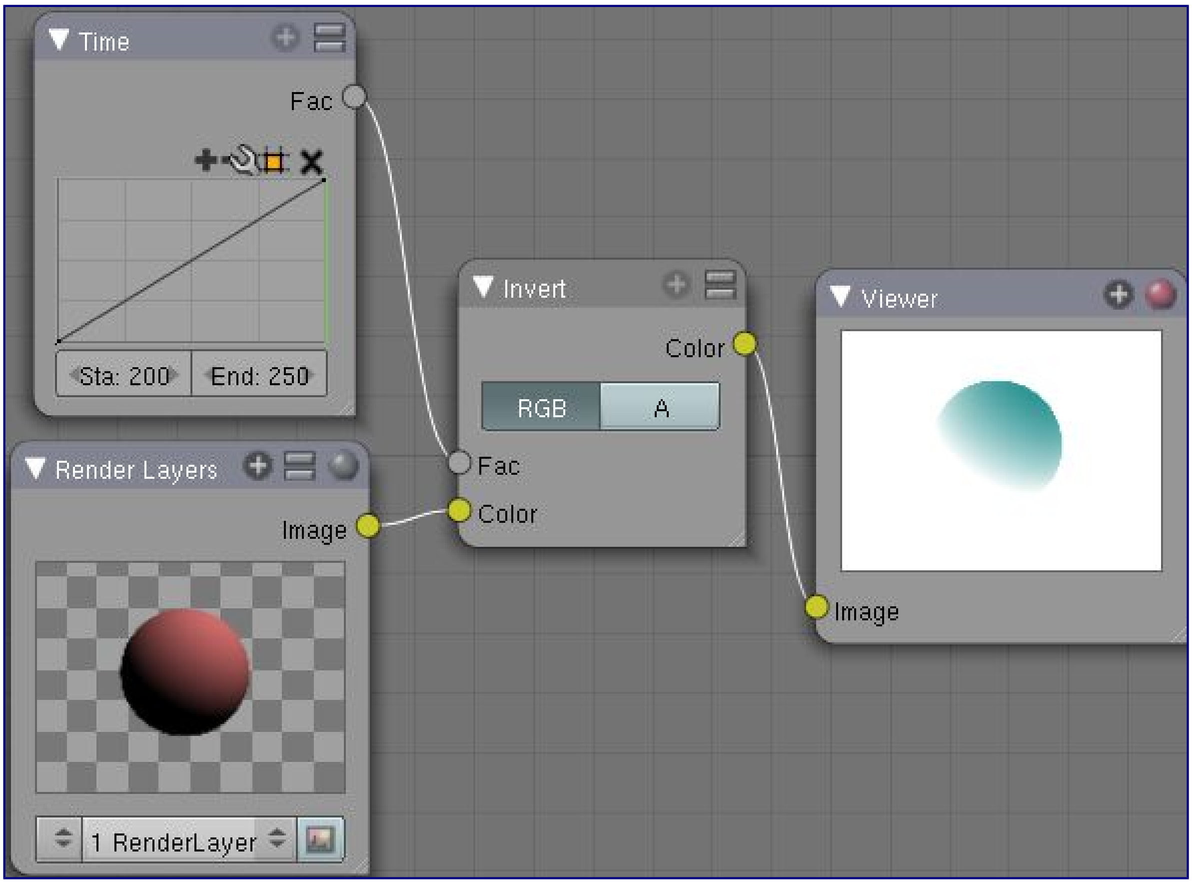
Options

Factor
: Controls the amount of influence the node exerts on the output image

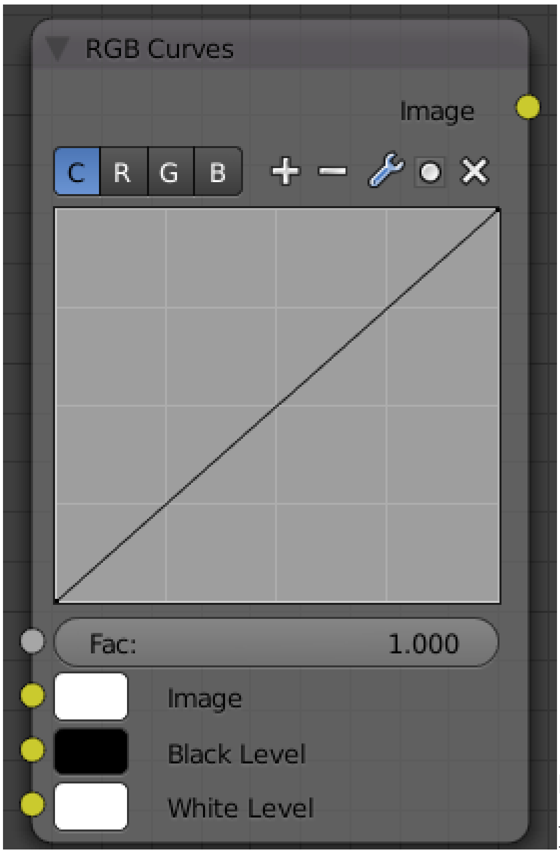
Color
: The input image. In this case, a red sphere on a black transparent background

RGB
: Invert the colors from white. In this example, red inverted is cyan (teal).

A
: Invert the alpha (transparency) channel as well. Handy for masking.



RGB Curves Node



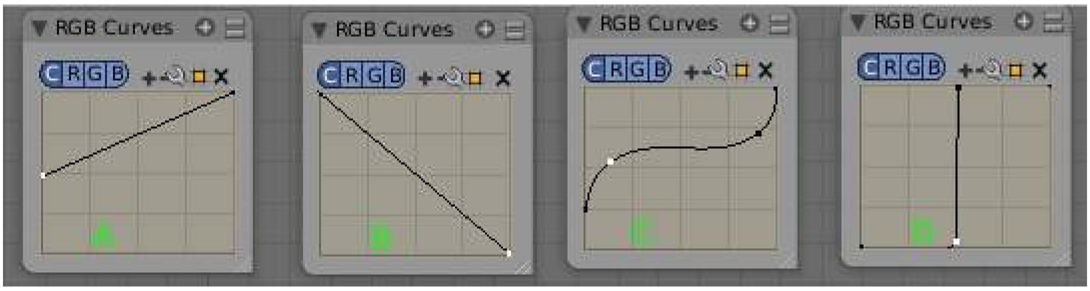
RGB Curves Node

For each color component channel (RGB) or the composite (C), this node allows you to define a bezier curve that varies the input (x-axis) to produce an output value (y-axis). Clicking on one of the *C R G B* components displays the curve for that channel.

See also

- Read more about using the Curve Widget.

Here are some common curves you can use to achieve desired effects:



Identifiers: A) Lighten B) Negative C) Decrease Contrast D) Posterize

Options

Fac

How much the node should factor in its settings and affect the output.

Black Level

Defines the input color that is mapped to black. Default is black, which does not change the image.

White Level

Defines the input color that is mapped to white. Default is white, which does not change the image.

The levels work exactly like the ones in the image viewer. Input colors are scaled linearly to match black/white levels.

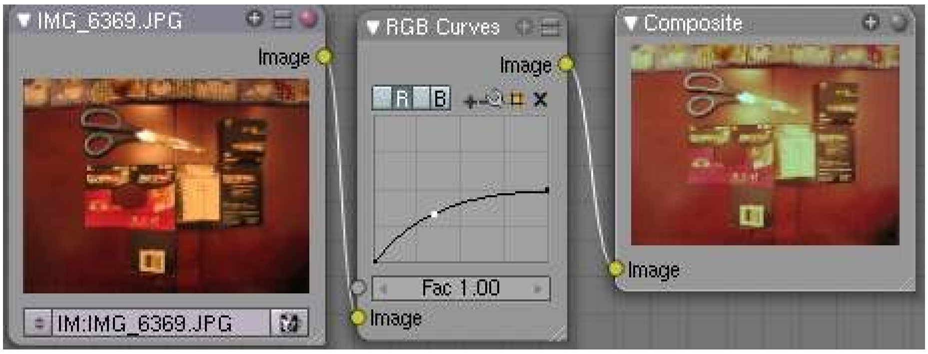
To define the levels, either use LMB on the color patch to bring up the color selection widget or connect some RGBA input to the sockets.

To only affect the value/contrast (not hue) of the output, set the levels to shades of gray. This is equivalent to setting a linear curve for C.

If you set any level to a color with a saturation greater than 0, the output colors will change accordingly, allowing for basic color correction or effects. This is equivalent to setting linear curves for R, G and B.

Examples

Color correction using Curves

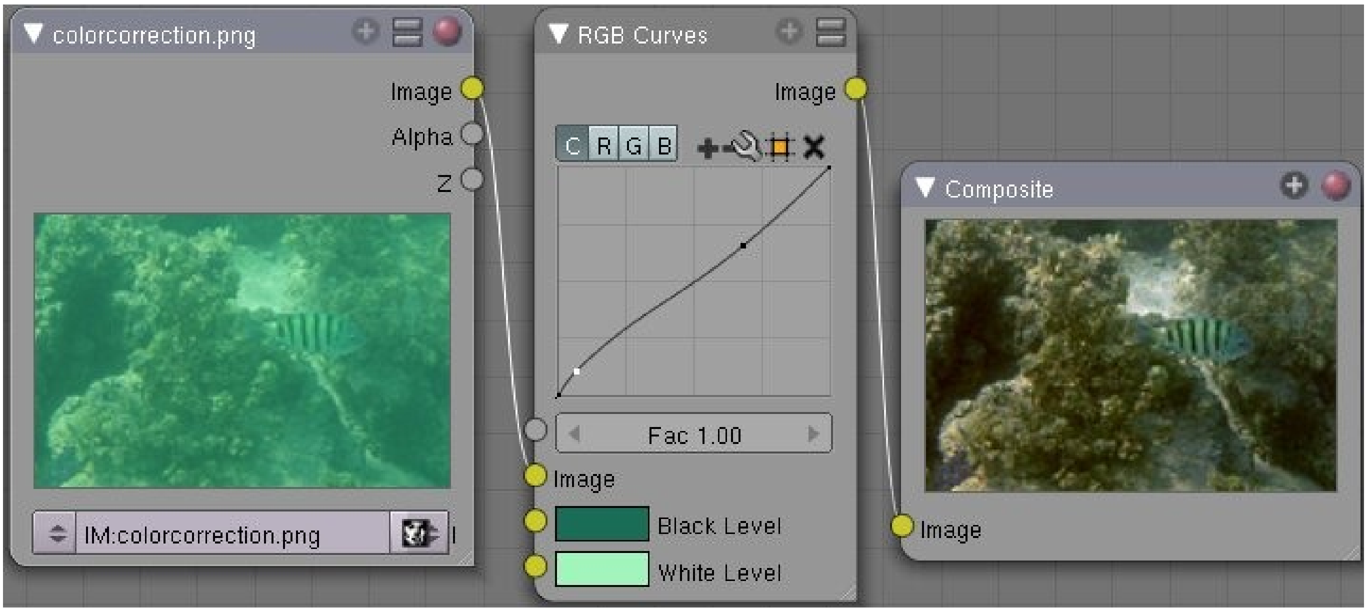


Color correction with curves

In this example, the image has way too much red in it, so we run it through an RGB node and reduce the Red channel by about half.

We added a middle dot so we could make the line into a sideways exponential curve. This kind of curve evens out the amount of a color in an image as it reaches saturation. Also, read on for examples of the Darken and Contrast Enhancement curves.

Color correction using Black/White Levels



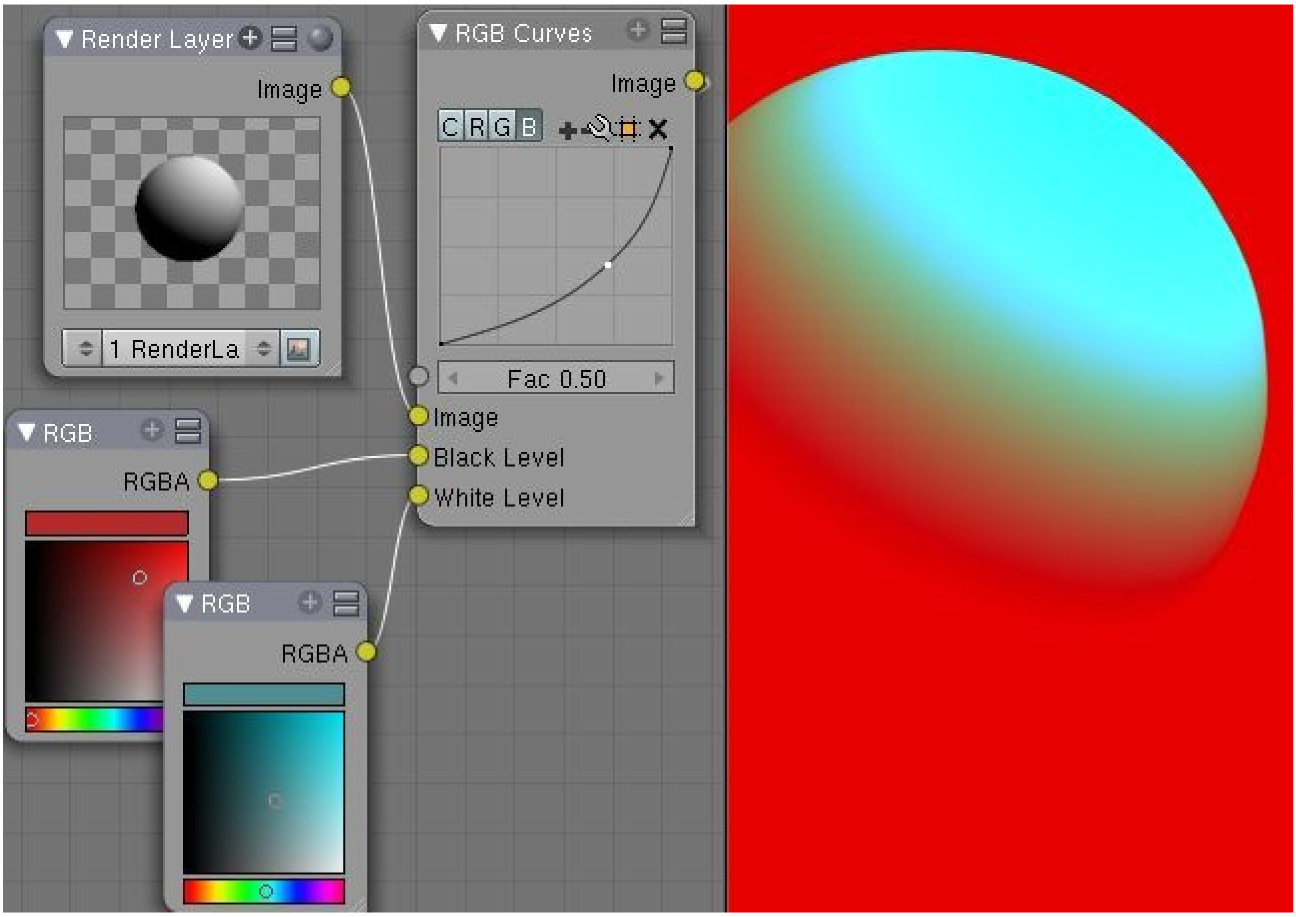
Color correction with Black/White Levels

Manually adjusting the RGB curves for color correction can be difficult. Another option for color correction is to use the Black and White Levels instead, which really might be their main purpose.

In this example, the White Level is set to the color of a bright spot of the sand in the background, and the Black Level to the color in the center of the fish's eye. To do this efficiently it's best to bring up an image viewer window showing the original input image. You can then use the levels' color picker to easily choose the appropriate colors from the input image, zooming in to pixel level if necessary. The result can be fine-tuned with the R,G, and B curves like in the previous example.

The curve for C is used to compensate for the increased contrast that is a side-effect of setting Black and White Levels.

Effects



Changing colors

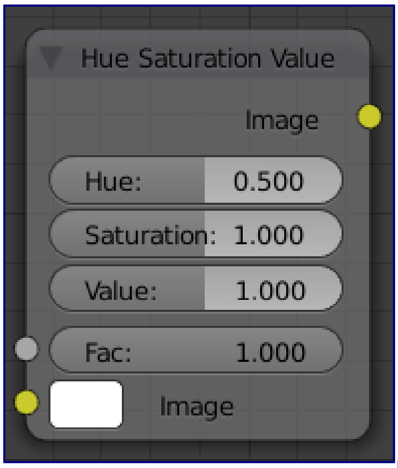
Curves and Black/White Levels can also be used to completely change the colors of an image.

Note that e.g. setting Black Level to red and White Level to blue does not simply substitute black with red and white with blue as the example image might suggest. Levels do color scaling, not substitution, but depending on the settings they can result in the described color substitution.

(What really happens when setting Black Level to pure red and White Level to pure blue is that the red channel gets inverted, green gets reduced to zero and blue remains unchanged.)

Because of this the results of setting arbitrary Black/White Levels or RGB curves is hard to predict, but can be fun to play with.

Hue Saturation Node



Hue Saturation Node

As an alternative to RGB editing, color can be thought of as a mix of Hues, namely a normalized value along the visible spectrum from infra-red to ultraviolet (the rainbow, remember “Roy G. Biv”). The amount of the color added depends on the saturation of that color; the higher the saturation, the more of that pigment is added. Use the saturation slider of this node to “bring out” the colors of a washed-out image.

This node takes an input image and runs the color of the image (and the light it reflects and radiates) ‘up’ through a factor (0.0-1.0) and applies a saturation of color effect of a hue to the image:

Hue:
: The **Hue** slider specifies how much to shift the hue of the image. Hue 0.5 (in the middle) does not shift the hue or affect the color of the image. As Hue shifts left, the colors shift as more cyan is added; a blue image goes bluer, then greener, then yellow. A red image goes violet, then purple, blue, and finally teal. Shifting right (increasing Hue from 0.5 to 1.0) introduces reds and greens. A blue image goes purple, plum, red, orange, and then yellow. A red image goes golden, olive, green, and cyan.

Sat:
: **Saturation** affect the amount of pigment in the image. A saturation of 0 actually *removes* hues from the color, resulting in a black-and-white grayscale image. A saturation of 1.0 blends in the hue, and 2.0 doubles the amount of pigment and brings out the colors.

Val:
: **Value** affects the overall amount of the color in the image. Increasing values make an image lighter; decreaing values shift an image darker.

Fac:
: **Factor** determines how much this node affects the image. A factor of 0 means that the input image is not affected by the Hue and Saturation settings. A factor of 1 means they rule, with .5 being a mix.

Hue/Saturation tips

Some things to keep in mind that might help you use this node better:

Hues are vice versa.
: A blue image, with a Hue setting at either end of the spectrum (0 or 1), is output as yellow (recall that white, minus blue, equals yellow). A yellow image, with a Hue setting at 0 or 1, is blue.

Hue and Saturation work together.
: So, a Hue of .5 keeps the blues the same shade of blue, but the saturation slider can deepen or lighten the intensity of that color.

Gray & White are neutral hues.
: A gray image, where the RGB values are equal, has no hue. Therefore, this node can only affect it with the *Val* slider. This applies for all shades of gray, from black to white; wherever the values are equal.

Changing the effect over time.

The Hue and Saturation values are set in the node by the slider, but you can feed a Time input into the Factor to bring up (or down) the effect change over time.

Note

Tinge

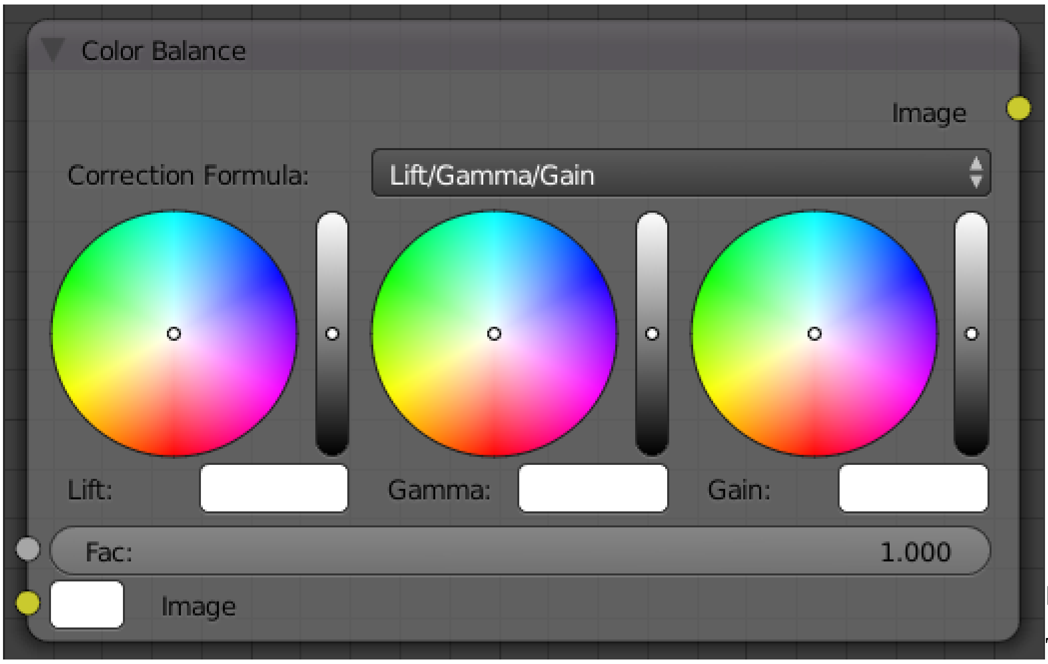
This HSV node simply shifts hues that are already there. To colorize a gray image, or to ADD color to an image, use a mix node to add in a static color from an RGB input node with your image.

HSV Example

Here, the image taken by a cheap digital camera in poor lighting at night using a flash (can we do it any worse, eh?) is adjusted by decreasing the Hue (decreasing reds and revealing more blues and greens), decreasing Saturation (common in digital cameras, and evens out contrast) and increasing Value (making it all lighter).

Color Balance

The Color Balance node can adjust the color and values of an image using two different correction formulas.



Bright/Contrast Node

The *Lift, Gammma, Gain* formula uses *Lift*, *Gamma*, and *Gain* calculations to adjust an image. *Lift* increases the value of dark colors, *Gamma* will adjust midtones, and *Gain* adjusts highlights.

The *Offset, Power, Slope* formula uses *Offset*, *Power*, and *Slope*: `out = (i * s + o) ^ p`

where:

`out`
: The color graded pixel code value.

`i`
: The input pixel code value (0=black, 1=white).

`s`
: Slope (any number 0 or greater, nominal value is 1.0).

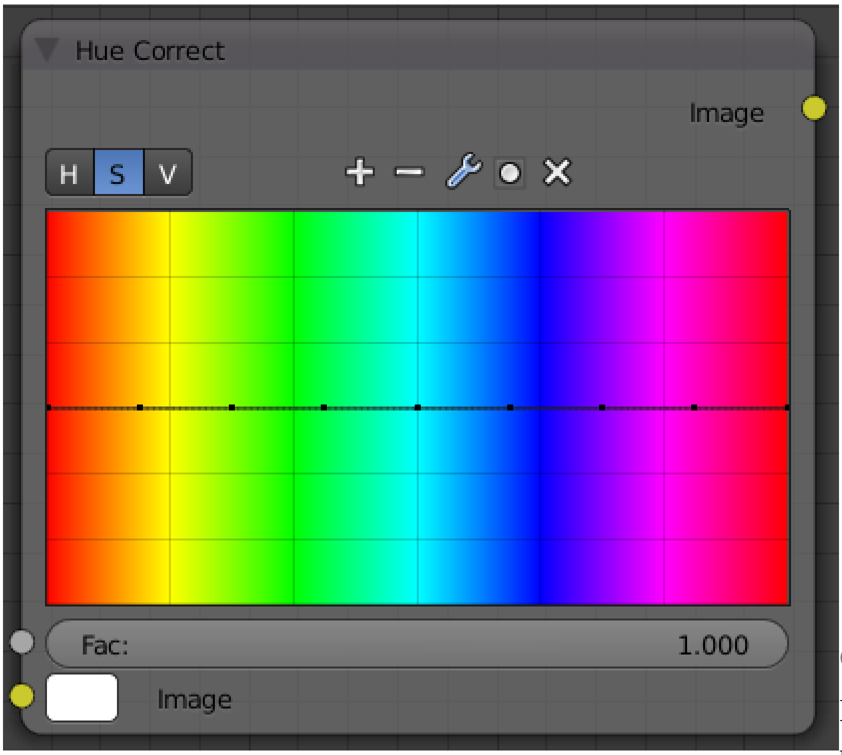
`o`
: Offset (any number, nominal value is 0).

`p`
: Power (any number greater than 0, nominal value is 1.0).

Factor
: Controls the amount of influence the node exerts on the output image

Hue Correct Node

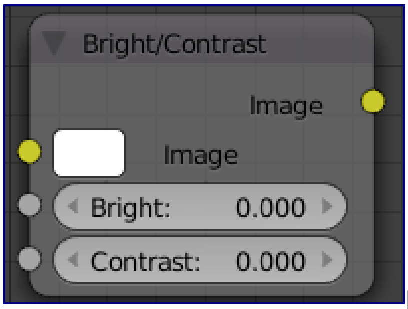
The Hue Correct node is able to adjust the Hue, Saturation, and Value of an image, with an input curve.



Color Balance Node

By default, the curve is a straight line, meaning there is no change. The spectrum allows you to raise or lower HSV levels for each range of pixel colors. To change a H, S, or V level, move the curve points up or down. Pixels with hue values each point in the horizontal position of the graph will be changed depending on the shape of the curve.

Bright/Contrast Node

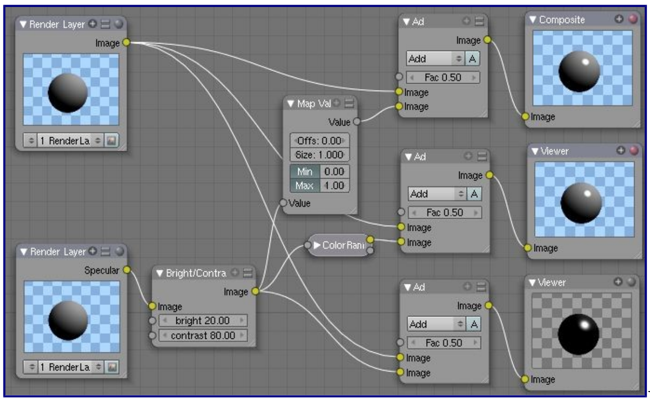


Bright/Contrast Node

Bright
: A multiplier-type factor by which to increase the overall brightness of the image. Use a negative number to darken an image.

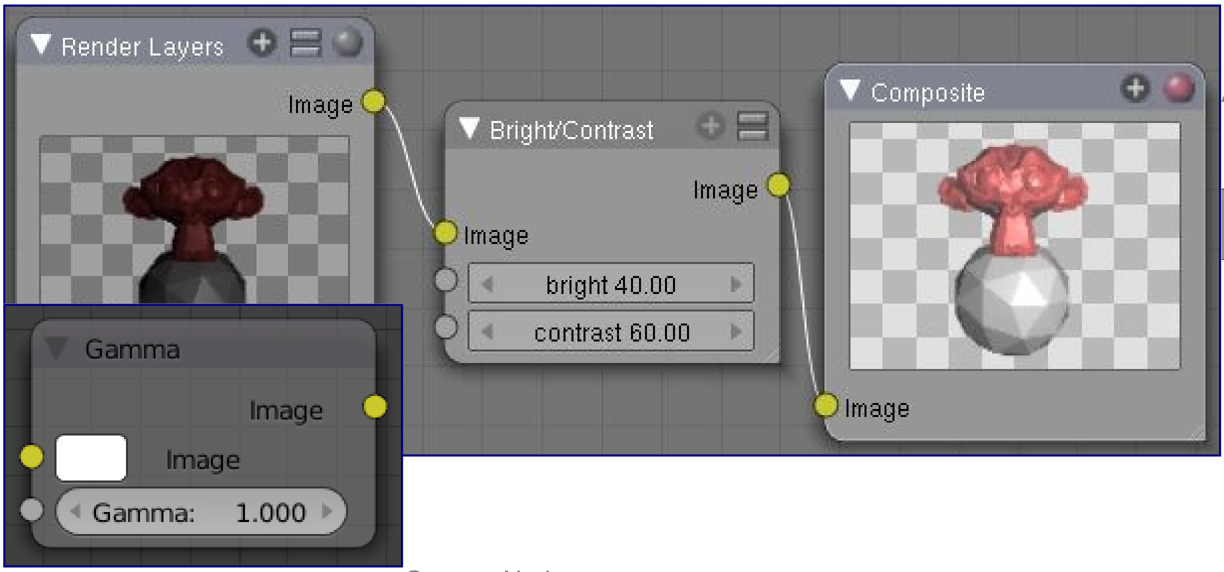
Contrast
: A scaling type factor by which to make brighter pixels brighter but keeping the darker pixels dark. Higher values make details stand out. Use a negative number to decrease the overall contrast in the image.

Notes



It is possible that this node will put out a value set that has values beyond normal range, i. e. values > 1 or < 0. If you will be using the output to mix with other images in the normal range, you should clamp the values using the Map Value node (with the Min and Max enabled), or put through a ColorRamp node (with all normal defaults).

Either of these nodes will scale the values back to normal range. In the example image, we want to amp up the specular pass. The bottom thread shows what happens if we do not clamp the values; the specular pass has valued much less than 1 in the dark areas; when added to the medium gray, it makes black. Passing the brightened image through either the Map Value or the ColorRamp produces the desired effect.



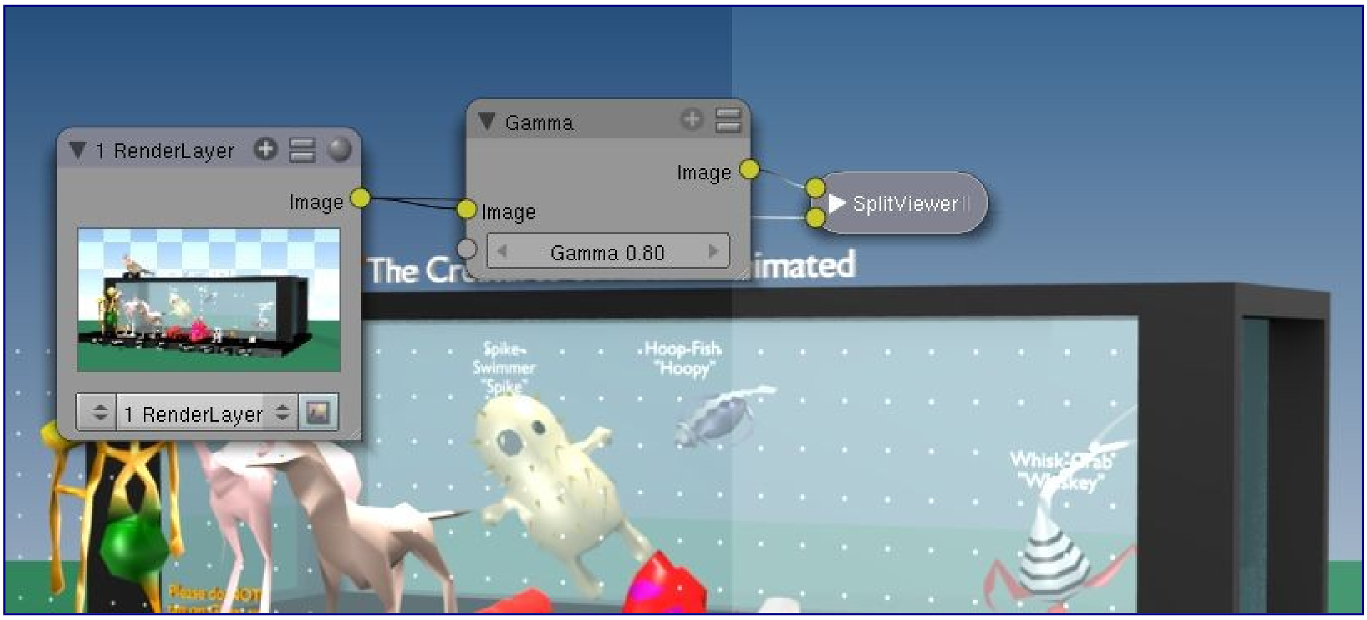
A basic example

Gamma Node

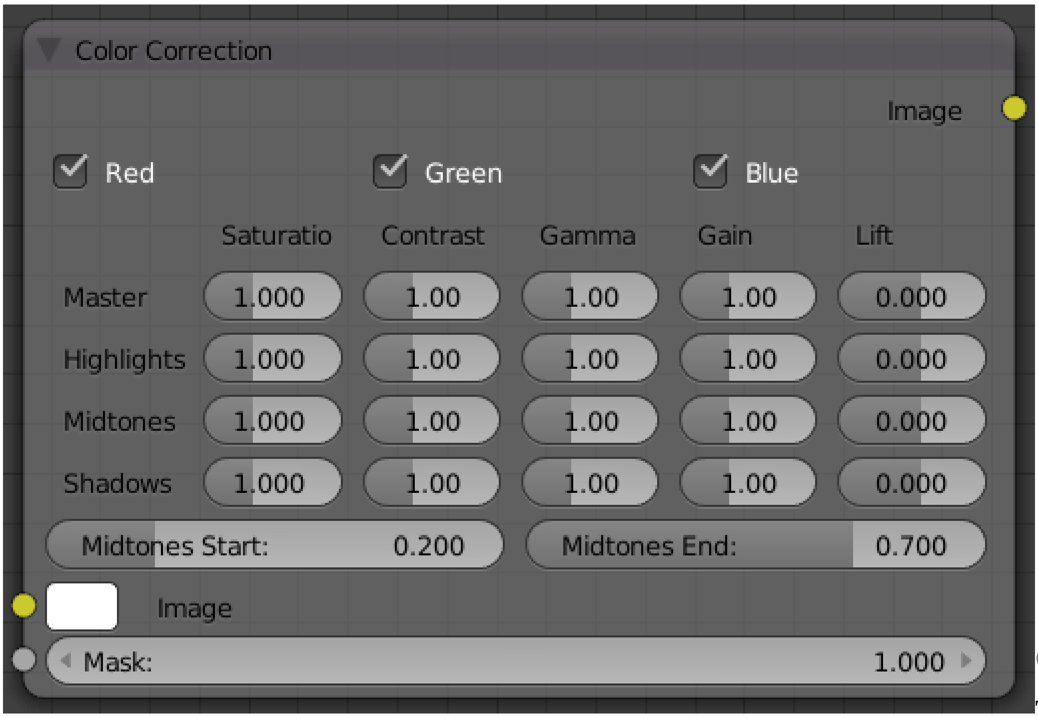
A reason for applying gamma correction to the final render is to correct lighting issues. Lighting issues that can be corrected by a gamma correction node are light attenuation with distance, light falloff at terminators, and light and shadow superpositions. Simply think about the renderer as a virtual camera. By applying a gamma correction to your render, you are just replicating what digital camera do with photos. Digital cameras gamma correct their photos, so you do the same thing. The gamma correction is, indeed, 0.45, not 2.2.

But reverse gamma correction on textures and colors have another very important consequence when you are using rendering techniques such as radiosity or GI. When doing the GI calculations, all textures and colors are taken to mean reflectance. If you do not reverse gamma correct your textures and colors, then the GI render will look way too bright because the reflected colors are all way too high and thus a lot more light is bouncing around than it should.

Gamma correction in Bforartists enters in a few places. The first is in this section with the nodes, both this node and the Tonemap node, and the second is in calculating Radiosity. In the noodle to the left, the split viewer shows the before and after effect of applying a gamma correction.



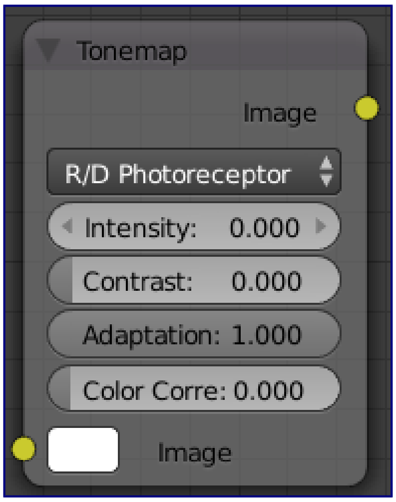
Color Correction Node



Color Balance Node

TODO - see: https://developer.Bforartists.org/T43469

Tone Map Node



Tone Map Node

Tone mapping is a technique used in image processing and computer graphics to map one set of colors to another in order to approximate the appearance of high dynamic range images in a medium that has a more limited dynamic range.

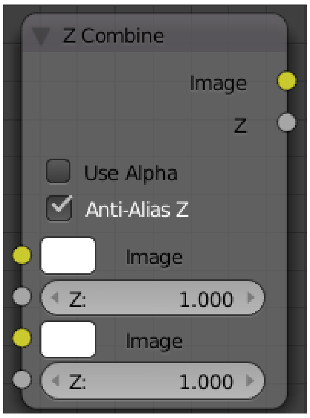
Essentially, tone mapping addresses the problem of strong contrast reduction from the scene values (radiance) to the displayable range while preserving the image details and color appearance important to appreciate the original scene content.

The Tone Map node has two methods of calculation:

Rh Simple
- **Key**
  - The value the average luminance is mapped to.
- **Offset**
  - Normally always 1, but can be used as an extra control to alter the brightness curve
- **Gamma**
  - If not used, set to 1

R/D Photoreceptor
- **Intensity**
  - If less than zero, darkens image; otherwise, makes it brighter
- **Contrast**
  - Set to 0 to use estimate from input image
- **Adaptation**
  - If 0, global; if 1, based on pixel intensity
- **Color Correction**
  - If 0, same for all channels; if 1, each independent

Z-Combine Node



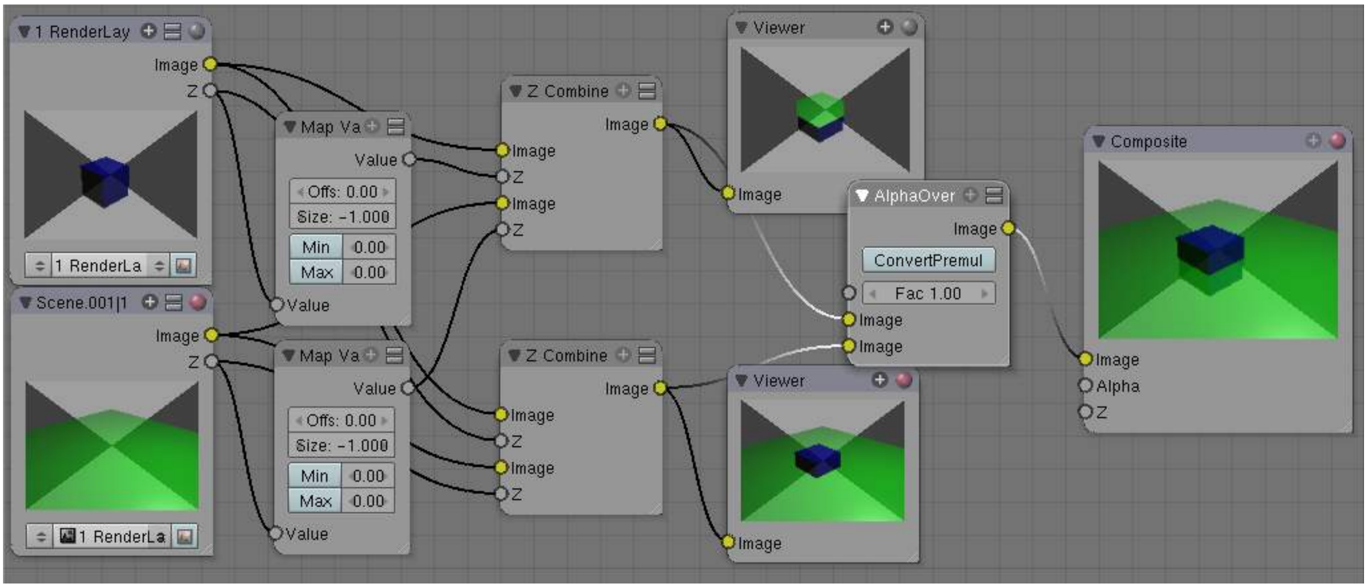
Z Combine Node

The Z-Combine node takes two images and two Z-value sets as input. It overlays the images using the provided Z values to detect which parts of one image are in front of the other. If both Z values are equal, it uses the top image. It puts out the combined image, with the combined Z-depth map, allowing you to thread multiple Z-combines together.

Z-Combine chooses whichever Z-value is less when deciding which image pixel to use. Normally, objects are in front of the camera and have a positive Z value. If one Z-value is negative, and the other positive, Z-Combine will use the image corresponding to the negative value. You can think of a negative Z value as being behind the camera. When choosing between two negative Z-values, Z-Combine will use whichever is more negative.

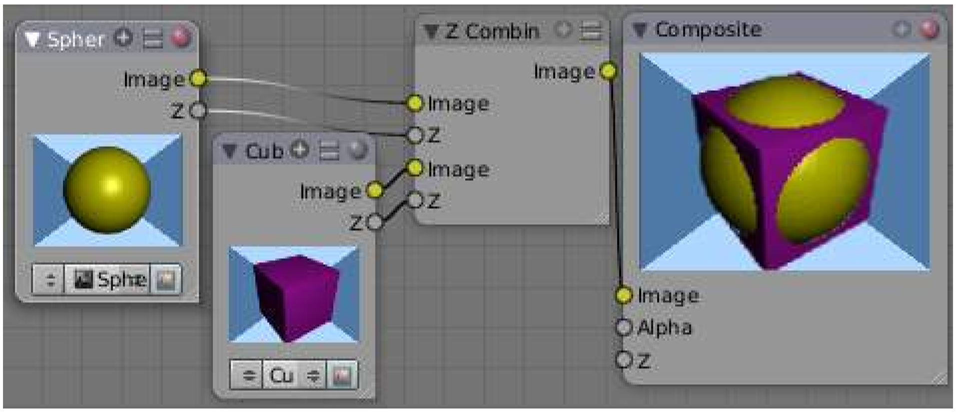
Alpha values carry over from the input images. Not only is the image pixel chosen, but also its alpha channel value. So, if a pixel is partially or totally transparent, the result of the Z-Combine will also be partially transparent; in which case the background image will show through the foreground (chosen) pixel. Where there are sharp edges or contrast, the alpha map will automatically be anti-aliased to smooth out any artifacts.

However, you can obtain this by making an AlphaOver of two Z-Combine, one normal, the other having inverted (reversed?) Z-values as inputs, obtained using for each of them a *MapValue* node with a *Size* field set to -1.0:



Alpha and Z-Combine node.

Examples

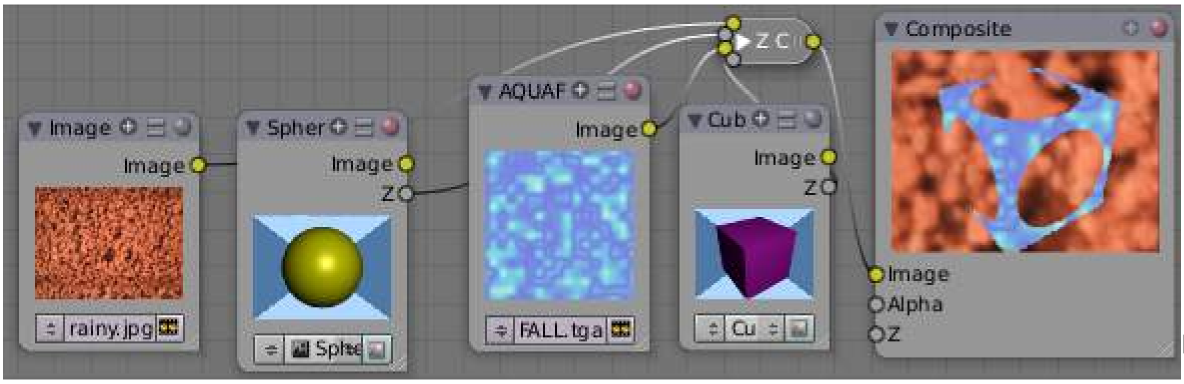


Choosing closest pixels

In the example to the right, render output from two scenes are mixed using the Z-Offset node, one from a sphere of size 1.30, and the other a cube of size 1.00. The sphere and square are located at the same place. The cube is tipped forward, so the corner in the center is closer to the camera than the sphere surface; so Z-Offset chooses to use the cube's pixels. But the sphere is slightly larger (a size of 1.30 versus 1.00), so it does not fit totally 'inside' the cube. At some point, as the cube's sides recede back away from the camera, the sphere's sides are closer. When this happens, Z-offset uses the sphere's pixels to form the resulting picture.

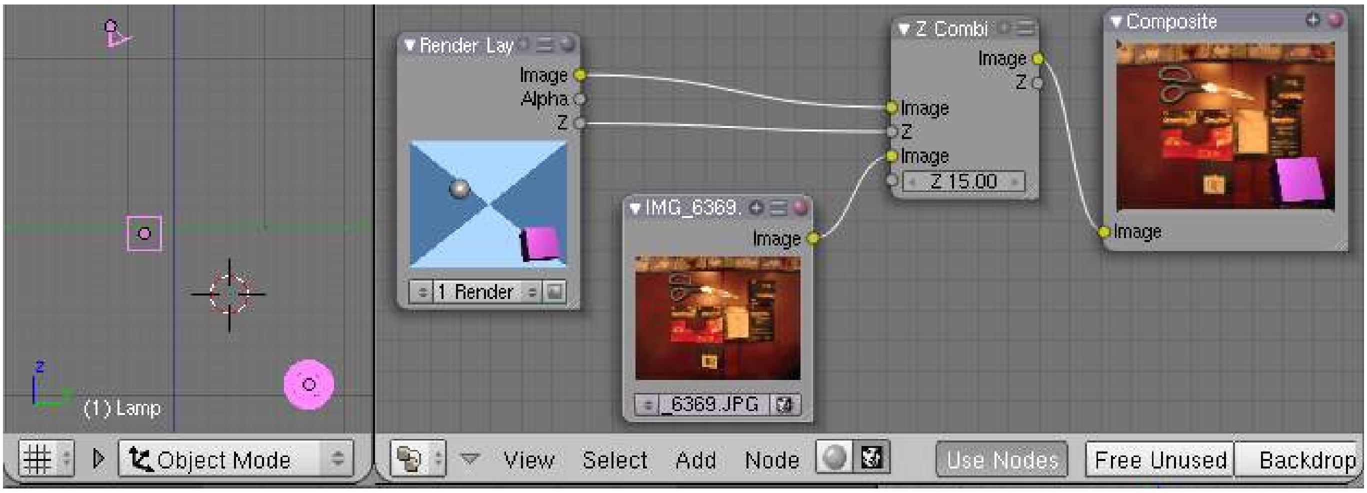
This node can be used to combine a foreground with a background matte painting. Walt Disney pioneered the use of multi-plane mattes, where three or four partial mattes were painted on glass and placed on the left and right at different Z positions; mininal camera moves to the right created the illusion of depth as Bambi moved through the forest.

Note
Valid Input Z Input Sockets do not accept fixed values; they must get a vector set (see Map Value node). Image Input Sockets will not accept a color, since it does not have UV coordinates.



Mix and Match Images

You can use Z-Combine to merge two images as well, using the Z-values put out by two renderlayers. Using the Z-values from the sphere and cube scenes above, but threading different images, yields the example to the right.



Z-Combine in action

In this noodle (you may click the little expand-o-matic icon in the bottom right to view it to full size), we mix a render scene with a flat image. In the side view of the scene, the purple cube is 10 units away from camera, and the gray ball is 20. The 3D cursor is about 15 units away from camera. We Z-in the image at a location of 15, thus inserting it in-between the cube and the ball. The resulting image appears to have the cube on the table.

Note
Invisible Man Effect

If you choose a foreground image which has a higher Alpha than the background, and then mix the Z-combine with a slightly magnified background, the outline of the transparent area will distort the background, enough to make it look like you are seeing part of the background through an invisible yet Fresnel-lens object.

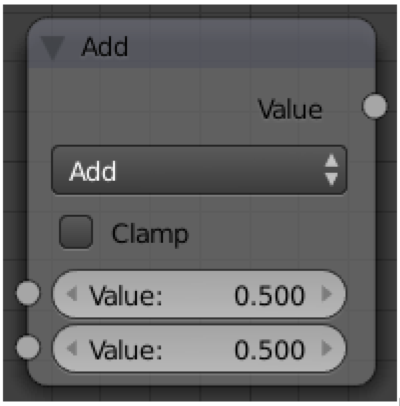
Converter Nodes

As the name implies, these nodes convert the colors or other properties of various data (e.g. transparency) in some way.

They also split out or re-combine the different color channels that make up an image, allowing you to work on each channel independently. Various color channel arrangements are supported, including traditional RGB, HSV and High Definition Media Interface (HDMI) formats.

- Math Node
- ColorRamp Node
- Set Alpha Node
- Alpha Convert Node
- ID Mask Node
- RGB to BW Node
- Combine/Separate Nodes
- Switch View Node

Math Node



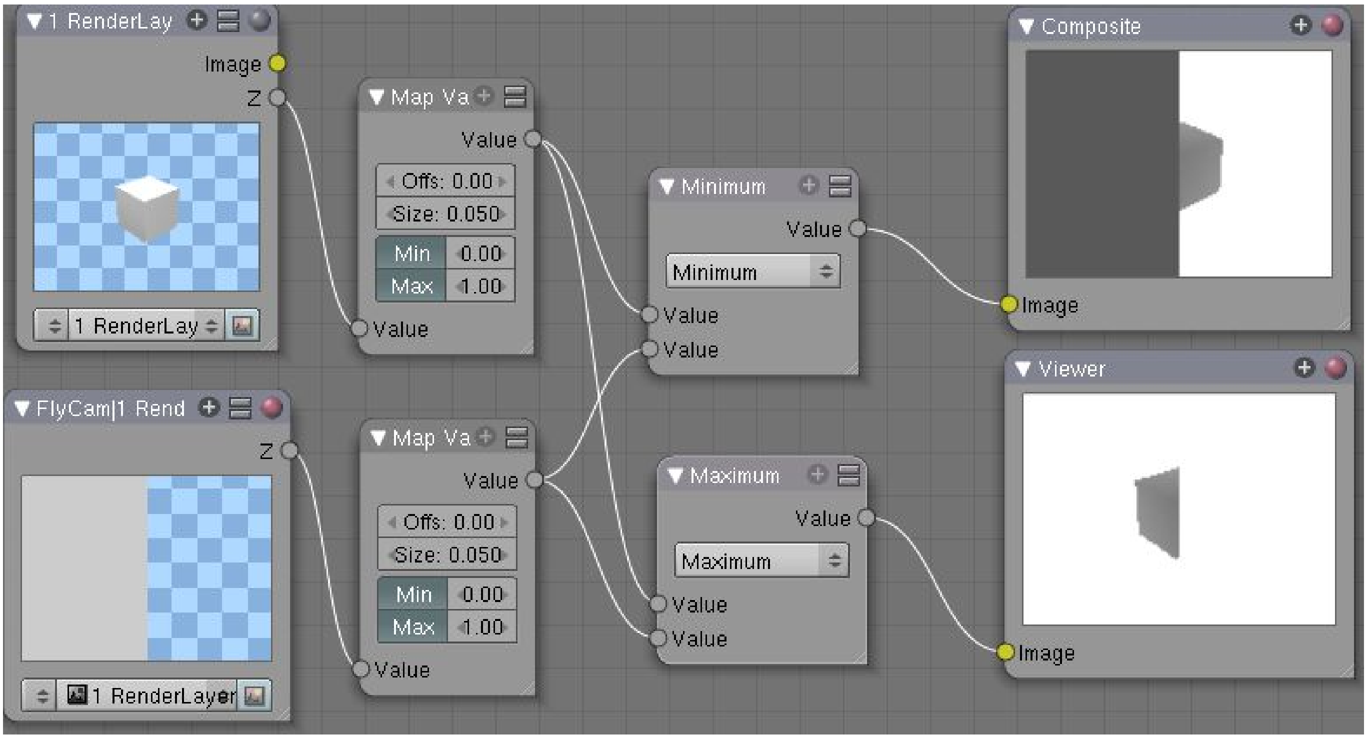
Math Node

This node performs the selected math operation on an image or buffer. All common math functions are supported. If only an image is fed to one Value socket, the math function will apply the other Value consistently to every pixel in producing the output Value. Select the math function by clicking the up-down selector where the “Add” selection is shown.

The trig functions of Sine, Cosine, Tangent use only the top socket and accept values in radians between 0 and 2*pi for one complete cycle.

Examples

Manual Z-Mask

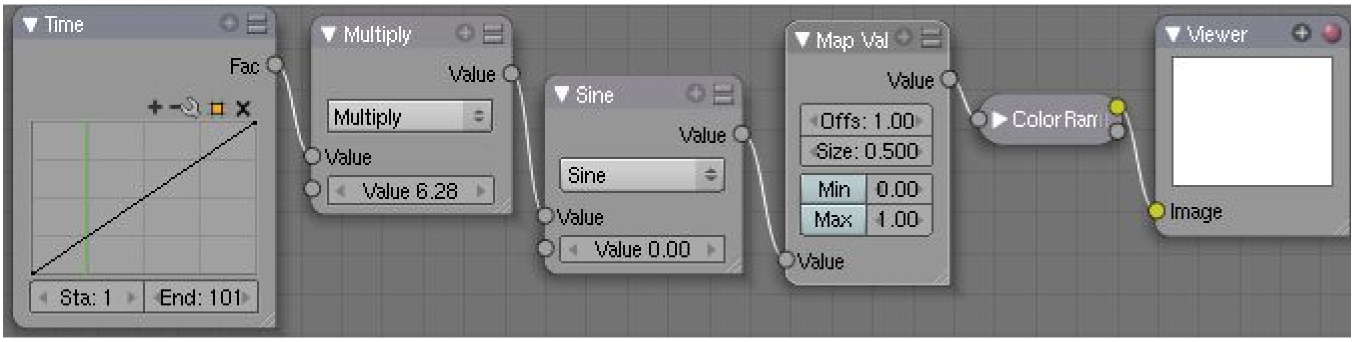


Example

This example has one scene input by the top RenderLayer node, which has a cube that is about 10 BU from the camera. The bottom RenderLayer node inputs a scene (FlyCam) with a plane that covers the left half of the view and is 7 BU from the camera. Both are fed through their respective Map Value nodes to divide the Z buffer by 20 (multiply by .05, as shown in the Size field) and clamped to be a Min/Max of 0.0/1.0 respectively.

For the Minimum function, the node selects those Z values where the corresponding pixel is closer to the camera; so it chooses the Z values for the plane and part of the cube. The background has an infinite Z value, so it is clamped to 1.0 (shown as white). In the maximum example, the Z values of the cube are greater than the plane, so they are chosen for the left side, but the plane (FlyCam) Renderlayer’s Z are infinite (mapped to 1.0) for the right side, so they are chosen.

Using Sine Function to Pulsate

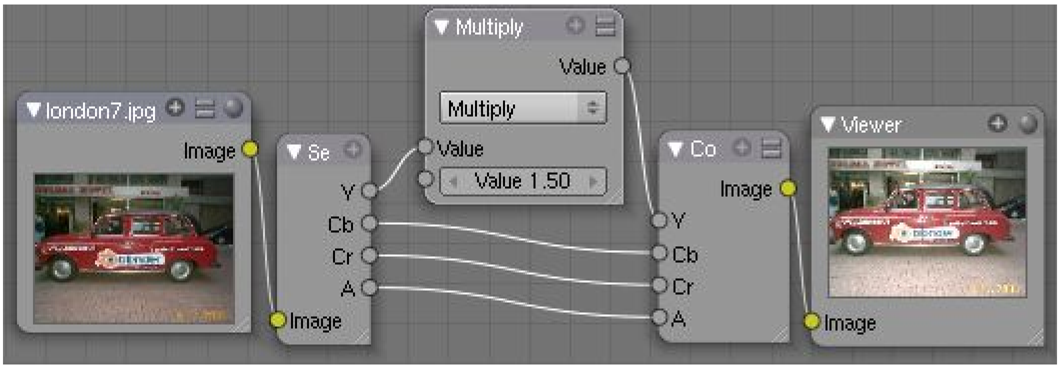


This example has a Time node putting out a linear sequence from 0 to 1 over the course of 101 frames. The green vertical line in the curve widget shows that frame 25 is being put out, or a value of .25. That value is multiplied by 2*pi and converted to 1.0 by the Sine function, since we all know that Sine(2*pi/4)=Sine(pi/2)=+1.0.

Since the Sine function can put out values between -1.0 and 1.0, the Map Value node scales that to 0.0 to 1.0 by taking the input (-1 to 1), adding 1 (making 0 to 2), and multiplying the result by one half (thus scaling the output between 0 and 1). The default ColorRamp converts those values to a grayscale. Thus, medium gray corresponds to a 0.0 output by the sine, black to -1.0, and white to 1.0. As you can see, Sine(pi/2)=1.0. Like having your own visual color calculator! Animating this noodle provides a smooth cyclic sequence through the range of grays.

Use this function to vary, for example, the alpha channel of an image to produce a fading in/out effect. Alter the Z channel to move an scene in/out of focus. Alter a color channel value to make a color “pulse”.

Brightening/Scaling a Channel



This example has a Multiply node increasing the luminance channel (Y) of the image to make it brighter. Note that you should use a Map Value node with Min() and Max () enabled to clamp the output to valid values. With this approach you could use a logarithmic function to make a high-dynamic range image. For this particular example, there is also a Brighten/Contrast node that might give simpler control over brightness.

Quantize/Restrict Color Selection

In this example, we want to restrict the color output to only 256 possible values. Possible use of this is to see what the image will look like on an 8-bit cell phone display. To do this, we want to restrict the R, G and B values of any pixel to be one of a certain value, such that when they are combined, will not result in more than 256 possible values. The number of possible values of an output is the number of channel values multiplied by each other, or Q = R * G * B.

Since there are 3 channels and 256 values, we have some flexibility how to quantize each channel, since there are a lot of combinations of R*G*B that would equal 256. For example, if {R,G,B} = {4,4,16}, then 4 * 4 * 16 = 256. Also, {6,6,7} would give 252 possible values. The difference in appearance between {4,4,16} and {6,6,7} is that the first set (4,4, 16} would have fewer shades of red and green, but lots of shades of blue. The set {6,6, 7} would have a more even distribution of colors. To get better image quality with fewer color values, give more possible values to the predominant colors in the image.

Theory

Two Approaches to Quantizing to 6 values

To accomplish this quantization of an image to 256 possible values, lets use the set {6,6,7}. To split up a continuous range of values between 0 and 1 (the full Red spectrum) into 6 values, we need to construct an algorithm or function that takes any input value but only puts out 6 possible values, as illustrated by the image to the right. We want to include 0 as true black, with five other colors in between. The approach shown produces {0,.2,.4,.6,.8,1}. Dividing 1.0 by 5 equals .2, which tells us how far apart each quantified value is from the other.

So, to get good even shading, we want to take values that are 0.16 or less and map them to 0.0; values between 0.16 and 0.33 get fixed to 0.2; colorband values between 0.33 and 0.5 get quantized to 0.4, and so on up to values between 0.83 and 1.0 get mapped to 1.0.

Note
Function f(x) An algebraic function is made up of primitive mathematical operations (add, subtract, multiply, sine, cosine, etc) that operate on an input value to provide a desired output value.

Spreadsheet showing a function

The theory behind this function is scaled truncation. Let us suppose we want a math function that takes in a range of values between 0 and 1, such as .552, but only outputs a value of 0.0, 0.2, 0.4, etc. We can imagine then that we need to get that range 0 to 1 powered up to something 0 to 6 so that we can chop off and make it a whole number. So, with six divisions, how can we do that? The answer is we multiply the range by 6. The output of that first math multiply node is a range of values between 0 and 6. To get even divisions, because we are using the rounding function (see documentation above), we want any number plus or minus around a whole number will get rounded to that number. So, we subtract a half, which shifts everything over. The Round() function then makes that range 0 to 5. We then divide by 5 to get back a range of numbers between 0 and 1 which can then be combined back with the other color channels. Thus, you get the function

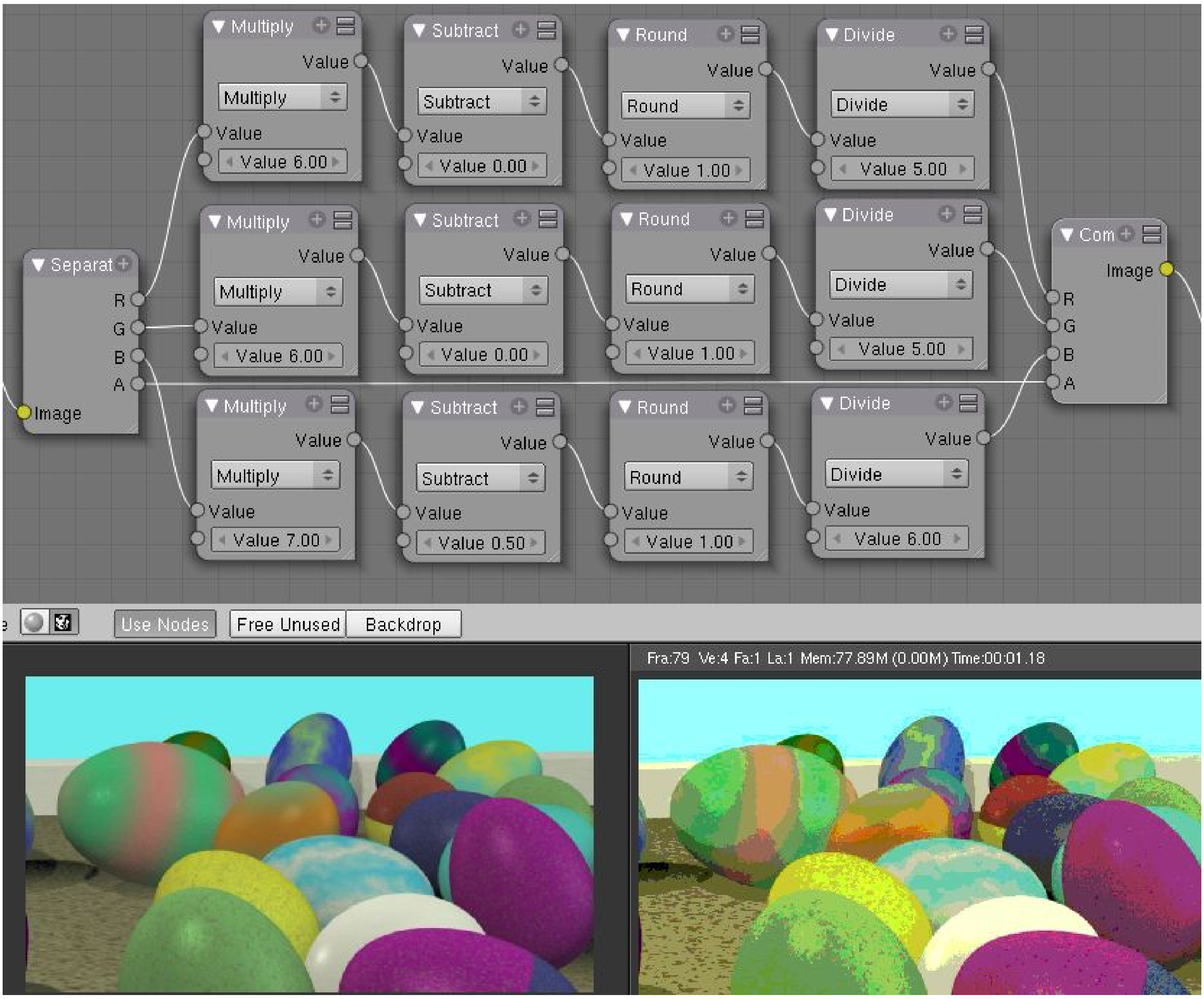
f(x,n)=round[x*n-1/2] /(n-1)

where n is the number of possible output values, and x is the input pixel color and f(x,n) is the output value. There’s only one slight problem, and that is for the value exactly equal to 1, the formula result is 1.2, which is an invalid value. This is because the round function is actually a roundup function, and exactly 5.5 is rounded up to 6. So, by subtracting .501, we compensate and thus 5. 499 is rounded to 5. At the other end of the spectrum, pure black, or 0, when .501 subtracted, rounds up to 0 since the Round() function does not return a negative number.

Sometimes using a spreadsheet can help you figure out how to put these nodes together to get the result that you want. Stepping you through the formula for n=6 and x=0.70, locate the line on the spreadsheet that has the 8-bit value 179 and R value 0.7. Multiplying by 6 gives 4.2. Subtracting 1/2 gives 3.7, which rounds up to 4. 4 divided by 5 = .8. Thus, f(0.7, 6) = 0.8 or an 8-bit value of 204. You can see that this same 8-bit value is output for a range of input values. Yeah! Geeks Rule! This is how you program Bforartists to do compositing based on

Algebra. Thank a Teacher if you understand this.

Reality



To implement this function in Bforartists, consider the noodle above. First, feed the image to the Separate RGB node. For the Red channel, we string the math nodes into a function that takes each red color, multiplies (scales) it up by the desired number of divisions (6), offsets it by 0.5, rounds the value to the nearest whole number, and then divides the image pixel color by 5. So, the transformation is {0..1} becomes {0..6}, subtracting centers the medians to {-0.5...5.5} and the rounding to the nearest whole number produces {0,1,2,3,4, 5} since the function rounds down, and then dividing by five results in six values {0.0,0.2,0.4,0.6,0.8,1.0}.

The result is that the output value can only be one of a certain set of values, stair-stepped because of the rounding function of the math node noodle. Copying this one channel to operate on Green and Blue gives the noodle below. To get the 6:6:7, we set the three multiply nodes to {6,6,7} and the divide nodes to {5,5,6}.

If you make this into a node group, you can easily re-use this setup from project to project. When you do, consider using a math node to drive the different values that you would have to otherwise set manually, just to error-proof your work.

Summary

Normally, an output render consists of 32- or 24-bit color depth, and each pixel can be one of millions of possible colors. This noodle example takes each of the Red, Green and Blue channels and normalizes them to one of a few values. When all three channels are combined back together, each color can only be one of 256 possible values.

While this example uses the Separate/Combine RGB to create distinct colors, other Separate/Combine nodes can be used as well. If using the YUV values, remember that U and V vary between -0.5 and +0.5, so you will have to first add on a half to bring the range between 0 and 1, and then after dividing, subtract a half to bring in back into standard range.

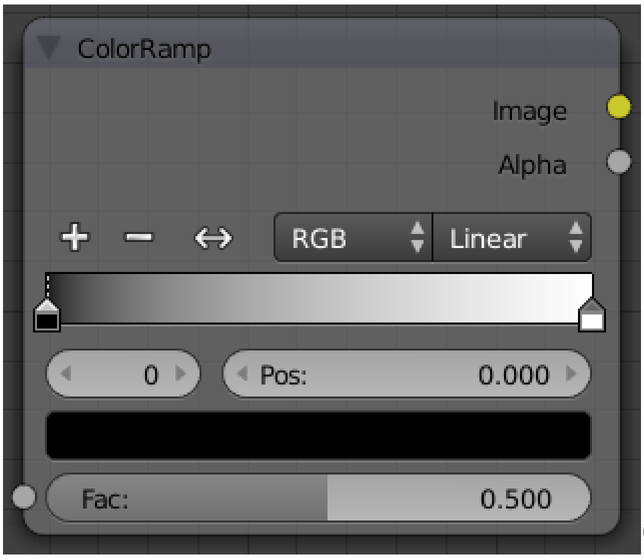
The JPG or PNG image format will store each of the colors according to their image standard for color depth (e.g. JPG is 24-bit), but the image will be very very small, since reducing color depth and quantizing colors is essentially what the JPEG compression algorithm accomplishes.

You do not have to reduce the color depth of each channel evenly. For example, if blue was the dominant color in an image, to preserve image quality, you could reduce Red to 2 values, Green to 4, and let the blue take on 256/(2*4) or 32 values. If using the HSV, you could reduce the Saturation and Value to 2 values (0 or 1.0) by Multiply by 2 and Divide by 2, and restrict the Hue to 64 possible values.

You can use this noodle to quantize any channel; alpha, speed (vector), z-values, and so forth.

ColorRamp Node

The ColorRamp Node is used for mapping values to colors with the use of a gradient. It works exactly the same way as a *Colorband for textures and materials*, using the Factor value as a slider or index to the color ramp shown, and outputting a color value and an alpha value from the output sockets.



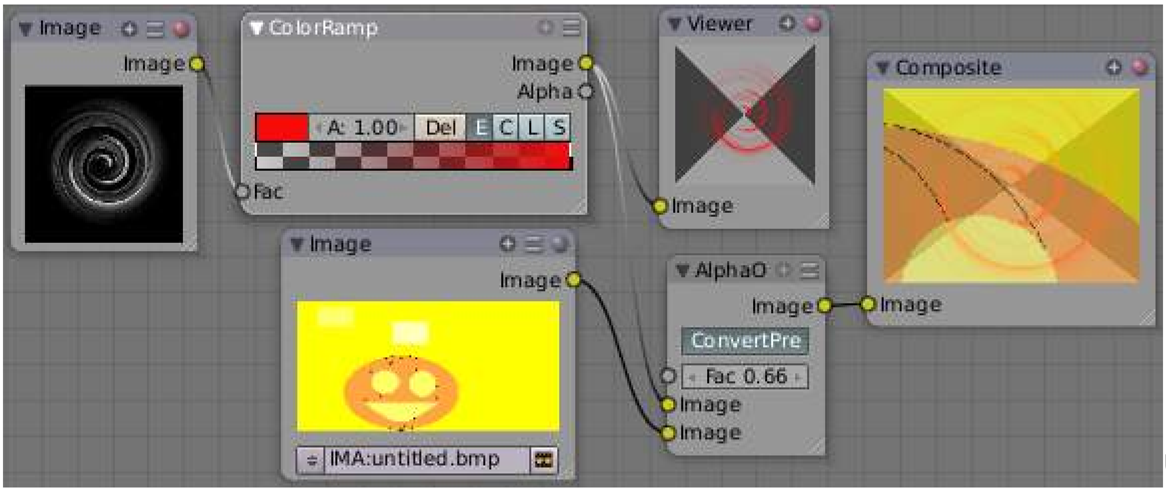
Color Ramp Node

By default, the ColorRamp is added to the node map with two colors at opposite ends of the spectrum. A completely black black is on the left (Black as shown in the swatch with an Alpha value of 1.00) and a whitewash white is on the right.

See Color Ramp Widget for editing info.

Using ColorRamp to create an Alpha Mask

A powerful but often overlooked feature of the ColorRamp is to create an Alpha Mask, or a mask that is overlaid on top of another image, and, like a mask, allows some of the background to show through. The example map below shows how to use the Color Ramp node to do this:



Using the ColorRamp node to create an alpha mask

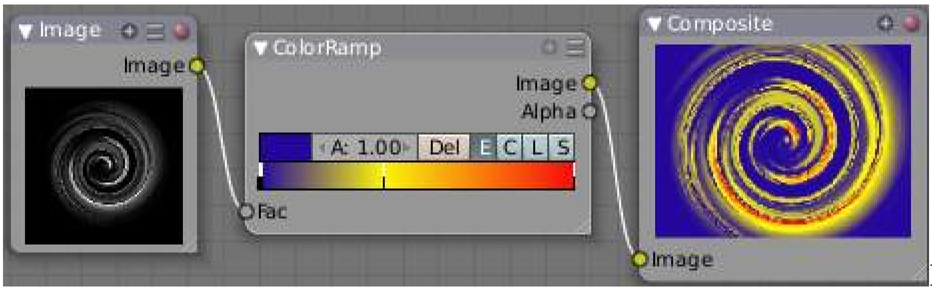
In the map above, a black and white swirl image, which is lacking an alpha channel, is fed into the ColorRamp node as a *Fac* tor. (Technically, we should have converted the image to a value using the RGB-to-BW node, buy hey, this works just as well since we are using a BW image as input.)

We have set the ColorRamp node to a purely transparent color on the left end of the spectrum, and a fully Red color on the right. As seen in the viewer, the ColorRamp node puts out a mask that is fully transparent where the image is black. Black is zero, so ColorRamp uses the 'color' at the left end of the spectrum, which we have set to transparent. The ColorRamp image is fully red and opaque where the image is white (1.00).

We verify that the output image mask is indeed transparent by overlaying it on top of a pumpkin image. For fun, we made that AlphaOver output image 0.66 transparent so that we can, in the future, overlay the image on a flashing white background to simulate a scary scene with lighting flashes.

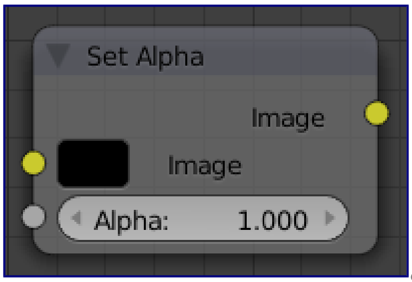
Using ColorRamp to Colorize an Image

The real power of ColorRamp is that multiple colors can be added to the color spectrum. This example compositing map takes a boring BW image and makes it a flaming swirl!



In this example, we have mapped the shades of gray in the input image to three colors, blue, yellow, and red, all fully opaque (Alpha of 1.00). Where the image is black, ColorRamp substitutes blue, the currently selected color. Where it is some shade of gray, ColorRamp chooses a corresponding color from the spectrum (bluish, yellow, to reddish). Where the image is fully white, ColorRamp chooses red.

Set Alpha Node



Set Alpha Node

This node adds an alpha channel to a picture. Some image formats, such as JPEG, do not support an alpha channel. In order to overlay a JPEG image on top of a background, you must add an alpha channel to it using this node.

The *Image* input socket is optional. If an input image is not supplied, the base color shown in the swatch will be used. To change the color, `LMB` click the swatch and use the color-picker control to choose or specify a color you want.

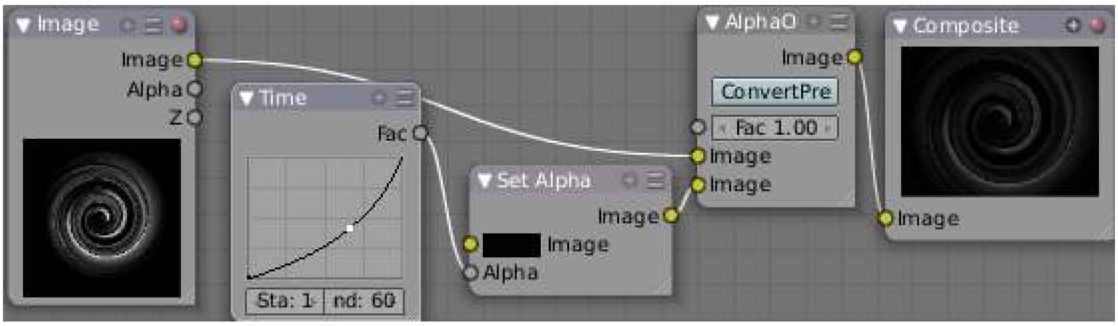
The amount of *Alpha* (1.00 being totally opaque and 0.00 being totally transparent) can be set for the whole picture using the input field. Additionally, the Alpha factor can be set by feeding its socket.

Note

This is not, and is not intended to be, a general-purpose solution to the problem of compositing an image that doesn't contain Alpha information. You might wish to use "Chroma Keying" or "Difference Keying" (as discussed elsewhere) if you can. This node is most often used (with a suitable input being provided by means of the socket) in those troublesome cases when you *can't,* for some reason, use those techniques directly.

Using SetAlpha to Fade to Black

To transition the audience from one scene or shot to another, a common technique is to "fade to black". As its name implies, the scene fades to a black screen. You can also "fade to white' or whatever color you wish, but black is a good neutral color that is easy on the eyes and intellectually "resets" the viewer's mind. The node map below shows how to do this using the Set Alpha node.



Fade To Black

In the example above, the alpha channel of the swirl image is ignored. Instead, a *time node* introduces a factor from 0.00 to 1.00 over 60 frames, or about 2 seconds, to the Set Alpha node. Note that the time curve is exponentially-shaped, so that the overall blackness will fade in slowly and then accelerate toward the end. The Set Alpha node does not need an input image; instead the flat (shadeless) black color is used. The Set Alpha Node uses the input factor and color to create a black image that has an alpha set which goes from 0.00 to 1.00 over 60 frames, or completely transparent to completely opaque. Think of alpha as a multiplier for how vivid you can see that pixel. These two images are combined by our trusty AlphaOver node completely (a *Fac* tor of 1.00) to produce the composite image. The SetAlpha node will thus, depending on the frame being rendered, produce a black image that has some degree of transparency. Set up and Animate, and you have an image sequence that fades to black over a 2-second period.

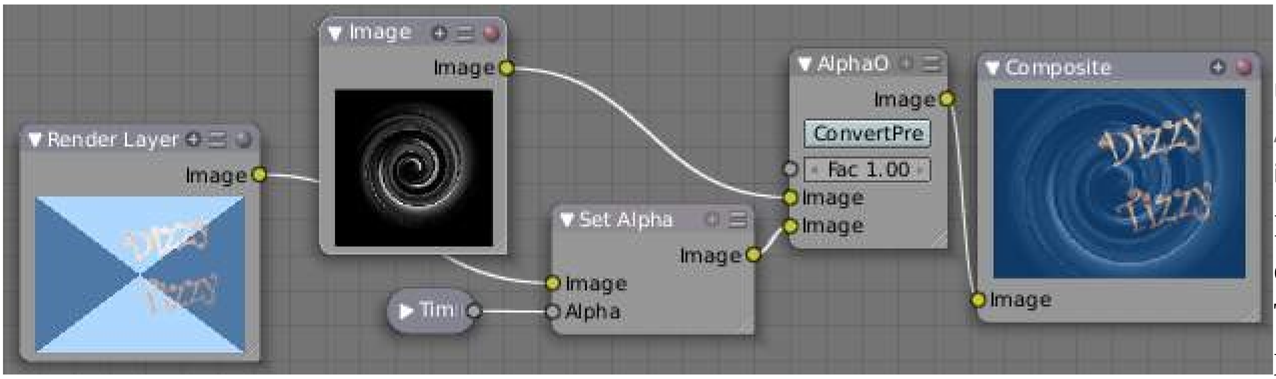
Note

No Scene information used

This example node map does not use the RenderLayer. To produce this 2 second animation, no Bforartists scene information was used. This is an example of using Bforartists's powerful compositing abilities separate from its modeling and animation capabilities. (A Render Layer could be substituted for the Image layer, and the "fade-network" effect will still produce the same effect)

Using SetAlpha to Fade In a Title

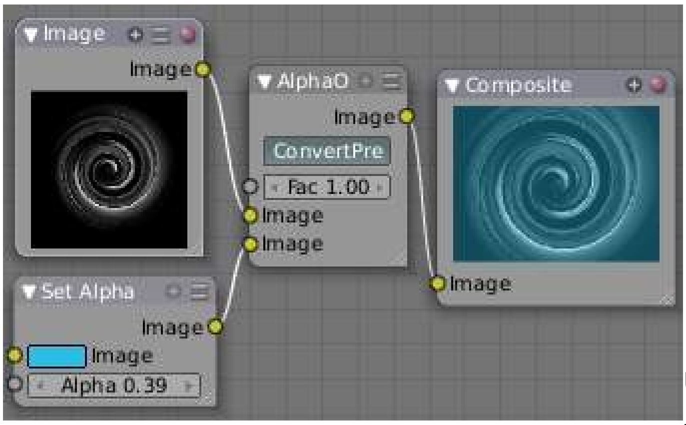
To introduce your animation, you will want to present the title of your animation over a background. You can have the title fly in, or fade it in. To fade it in, use the SetAlpha node with the Time node as shown below.



Using Set Alpha to Fade in a Title

In the above example, a Time curve provides the Alpha value to the input socket. The current RenderLayer, which has the title in view, provides the image. As before, the trusty AlphaOver node mixes (using the alpha values) the background swirl and the alphaed title to produce the composite image. Notice the *ConvertPre* -Multiply button is NOT enabled; this produces a composite where the title lets the background image show through where even the background image is transparent, allowing you to layer images on top of one another.

Using SetAlpha to Colorize a BW Image

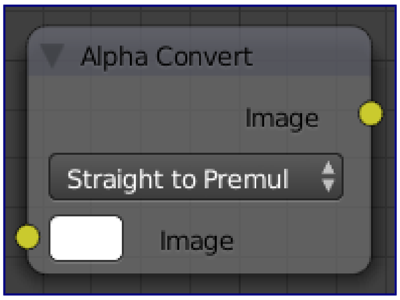


Using Set Alpha to Colorize an Image

In the example above, notice how the blue tinge of the render input colors the swirl. You can use the Set Alpha node’s color swatch with this kind of node map to add a consistent color to a BW image.

In the example map to the right, use the *Alpha* value of the SetAlpha node to give a desired degree of colorization. Thread the input image and the Set Alpha node into an AlphaOver node to colorize any black and white image in this manner. Note the *ConvertPre* -Multiply button is enabled, which tells the AlphaOver node not to multiply the alpha values of the two images together.

Alpha Convert Node

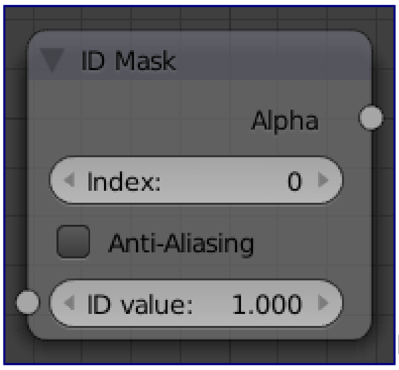


Alpha Convert Node

This node converts the alpha channel interpretation of an image from pre-multiplied to straight or the reverse.

For details on the difference between both kinds of alpha channels see Alpha Channel.

ID Mask Node



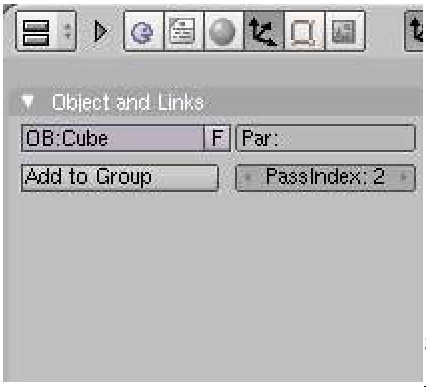
ID Mask Node

This node will use the Object Index pass (see RenderLayers) to produce an anti-aliased alpha mask for the object index specified. The mask is opaque where the object is, and transparent where the object isn't. If the object is partially transparent, the alpha mask matches the object's transparency. This post-process function fills in the jaggies with interpolated values.

Note

Object Index

Object indices are only output from a RenderLayers node or stored in a multilayer OpenEXR format image.

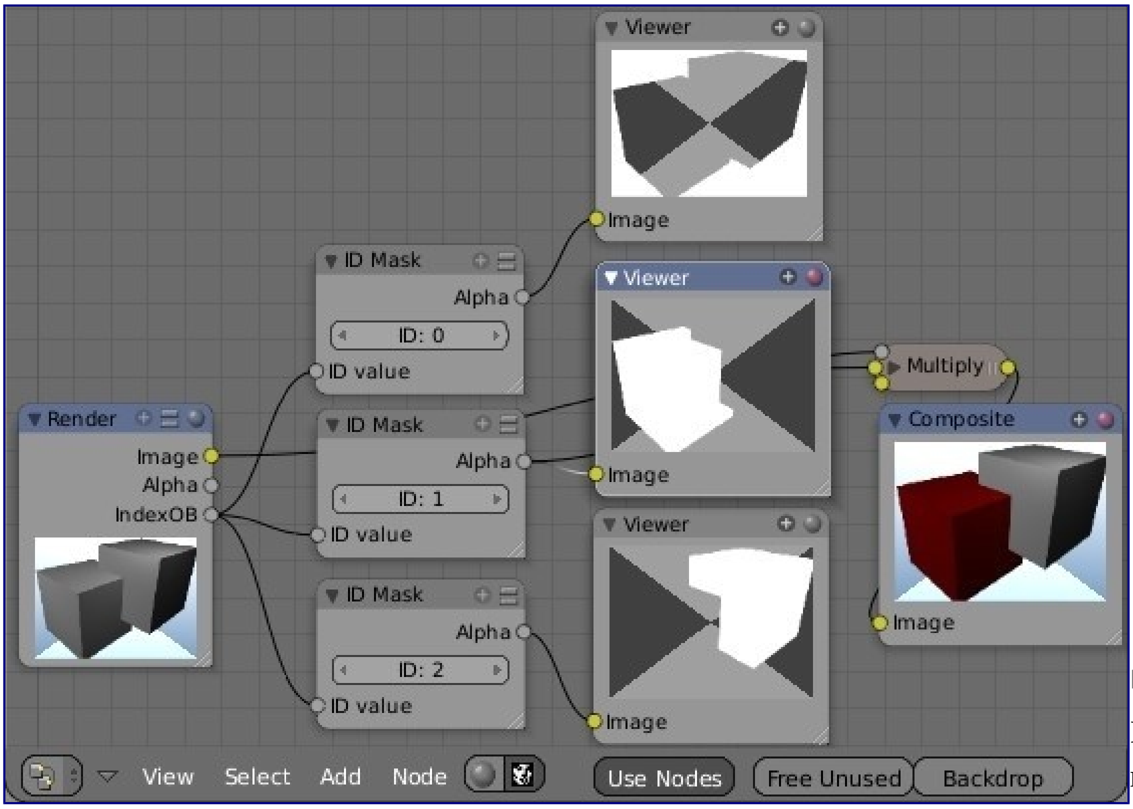


Setting an Object Index

You can specify, for any of the objects in your scene, an Object Index as shown the right (the currently select object has an index of 2). When rendered, if Object Index passes are enabled, its index will be 2, and setting the ID Mask node to 2 will show where that object is in the scene.

This node is extremely well suited to removing the aliases shown as output from the Defocus node or DOF noodles caused by some objects being close to camera against objects far away.

Example



Example

In this example, the left rear red cube is assigned PassIndex 1, and the right cube PassIndex 2. Where the two cubes intersect, there is going to be noticeable pixelation (jaggies) because they come together at a sharp angle and are different colors. Using the mask from object 1, which is smoothed (anti-aliased) at the edges, we use a Mix node set on Multiply to multiply the smoothed edges against the image, thus removing those nasty (Mick) Jaggies. Thus, being smoothed out, the Rolling Stones gather no moss. (I really hope you get that obscure reference :)

Note that the mask returns white where the object is fully visible to the camera (not behind anything else) and black for the part of the object that is partially or totally obscured by a fully or partially opaque object in front of it. If something else is in front of it, even if that thing is partially transparent and you can see the object in a render, the mask will not reflect that partially obscured part.

RGB to BW Node

RGB to BW Node

This node converts an RGB input and outputs a greyscale image.

Combine/Separate Nodes

All of these node do essentially the same thing: they split out an image into (or recombine an image from) its composite color channels. Each format supports the Alpha (transparency) channel. The standard way of representing color in an image is called a *color space*. There are several color spaces supported:

RGB
: Red-Green-Blue traditional primary colors, also broadcast directly to most computer monitors

HSV
: Three values, often considered as more intuitive than the RGB system (nearly only used on computers):

  Hue
  : the **Hue** of the color (in some way, choose a ‘color’ of the rainbow);

  Saturation
  : the **quantity** of hue in the color (from desaturate - shade of gray - to saturate - brighter colors)

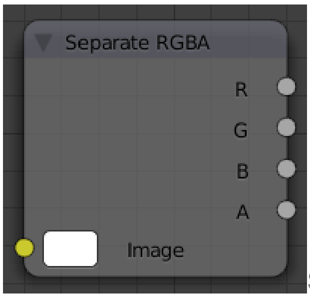
  Value: the luminosity of the color
  : (from ‘no light’ - black - to ‘full light’ - ‘full’ color, or white if Saturation is 0.0).

YUV
: Luminance-Chrominance standard used in broadcasting analog PAL (European) video.

YCbCr
: Luminance-ChannelBlue-ChannelRed Component video for digital broadcast use, whose standards have been updated for HDTV and commonly referred to as the HDMI format for component video.

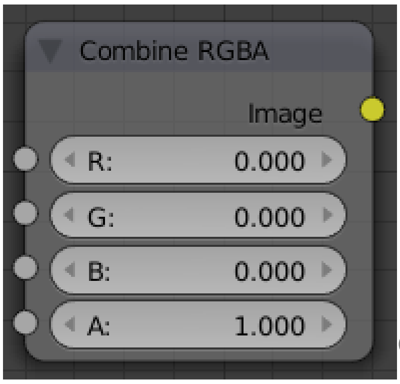
See also color space.

Separate/Combine RGBA Node



Separate RGBA Node

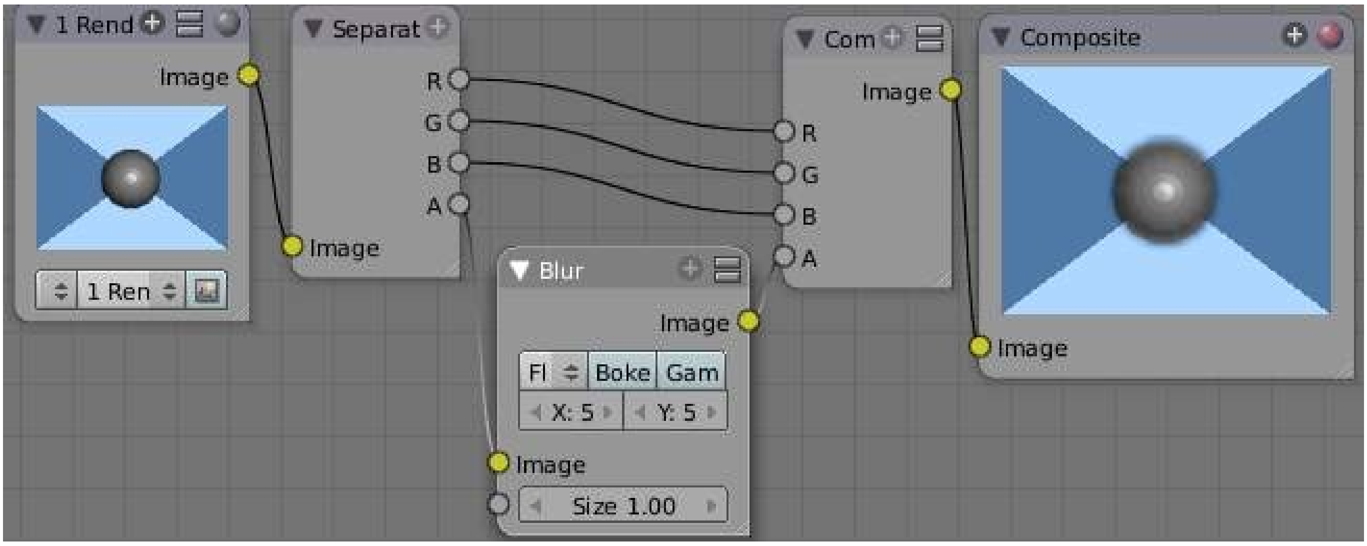
This node separates an image into its red, green, blue and alpha channels. There's a socket for each channel on the right.



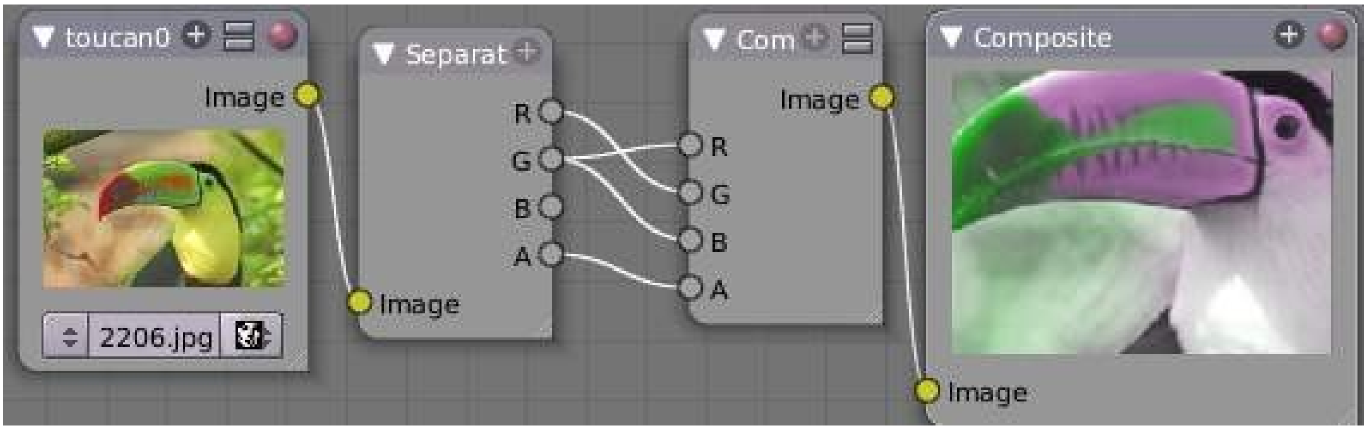
Combine RGBA Node

This node combines separate input images as each color and alpha channel, producing a composite image. You use this node combine the channels after working on each color channel separately.

Examples

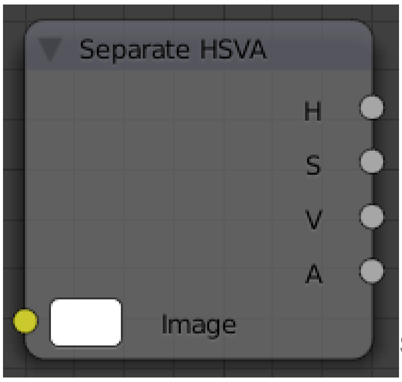


In this first example, we take the Alpha channel and blur it, and then combine it back with the colors. When placed in a scene, the edges of it will blend in, instead of having a hard edge. This is almost like anti-aliasing, but in a three-dimensional sense. Use this noodle when adding CG elements to live action to remove any hard edges. Animating this effect over a broader scale will make the object appear to "phase" in and out, as a "out-of-phase" time-traveling sync effect.



In this fun little noodle we make all the reds become green, and all the green both Red and Blue, and remove Blue from the image completely. Very cute. Very fun.

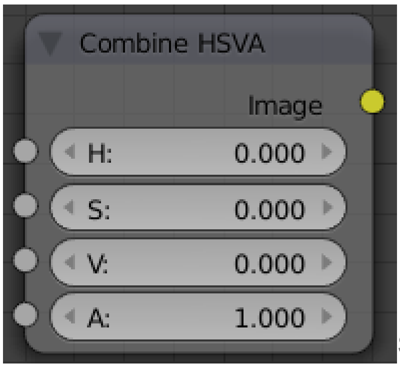
Separate/Combine HSVA Nodes



Separate HSVA Node

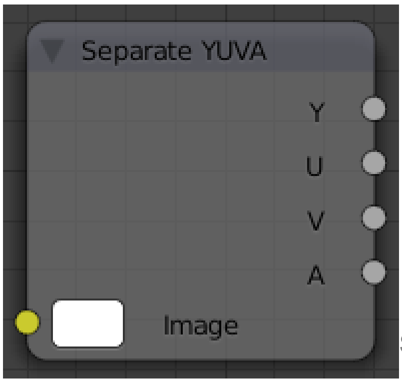
This node separates an image into image maps for the hue, saturation, value and alpha channels.

Use and manipulate the separated channels for different purposes; i.e. to achieve some compositing/color adjustment result. For example, you could expand the Value channel (by using the multiply node) to make all the colors brighter. You could make an image more relaxed by diminishing (via the divide or map value node) the Saturation channel. You could isolate a specific range of colors (by clipping the Hue channel via the Colorramp node) and change their color (by the Add/Subtract mix node).



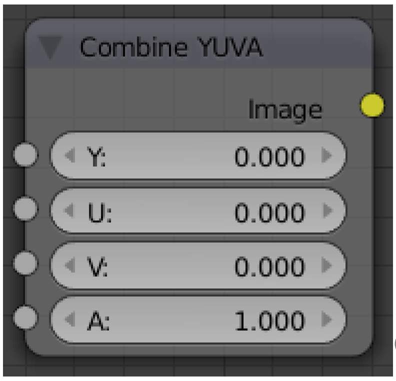
Separate HSVA Node

Separate/Combine YUVA Node



Separate YUVA Node

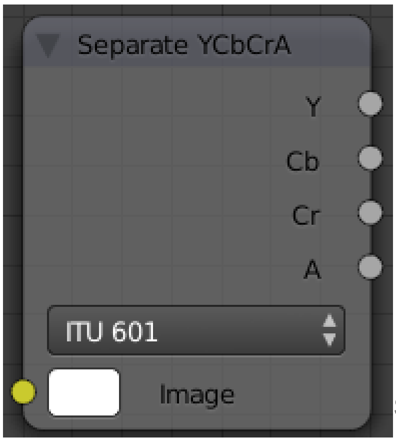
This node converts an RGBA image to YUVA color space, then splits each channel out to its own output so that they can be manipulated independently. Note that U and V values range from -0.5 to +0.5.



Combine YUVA Node

Combines the channels back into a composite image. If you do not connect any input socket, you can set a default value for the whole image for that channel using the numeric controls shown.

Separate/Combine YCbCrA Node



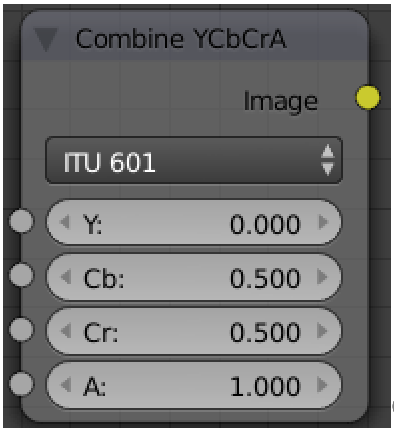
Separate YCbCrA Node

This node converts an RGBA image to YCbCrA color space, then splits each channel out to its own output so that they can be manipulated independently:

- Y: Luminance, 0=black, 1=white
- Cb: Chrominance Blue, 0=Blue, 1=Yellow
- Cr: Chrominance Red, 0=Red, 1=Yellow

Note

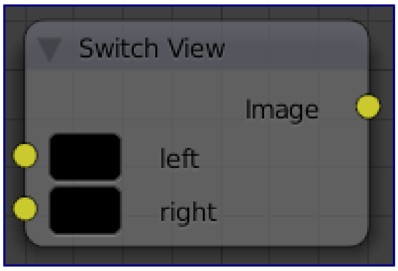
If running these channels through a ColorRamp to adjust value, use the Cardinal scale for accurate representation. Using the Exponential scale on the luminance channel gives high-contrast effect.



Combine YCbCrA Node

So, I kinda think you get the idea, and I was trying to think of some other creative way to write down the same thing, but I can’t. So, you’ll have to figure this node out on your own.

Switch View Node



Switch View Node

TODO - see: https://developer.Bforartists.org/T43469

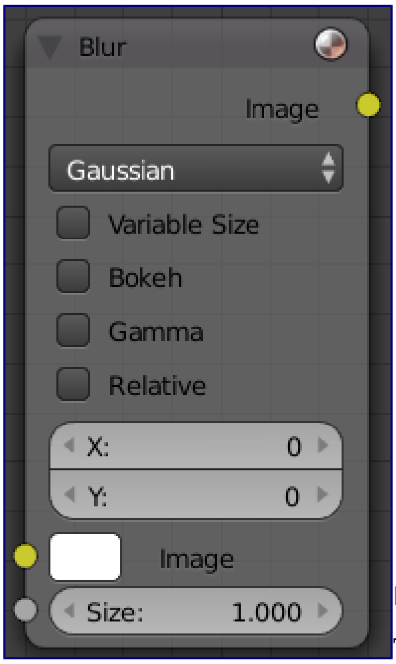
Filter Nodes

Filters process the pixels of an image to highlight additional details or perform some sort of post-processing effect on the image.

- Blur Node
- Bilateral Blur Node
- Dilate/Erode Node
- Despeckle Node
- Filter Node
- Bokeh Blur
- Vector (Motion) Blur Node
- Defocus Node
- Glare Node

- Inpaint Node
- Directional Blur Node
- Pixelate Node
- Sun Beams

Blur Node



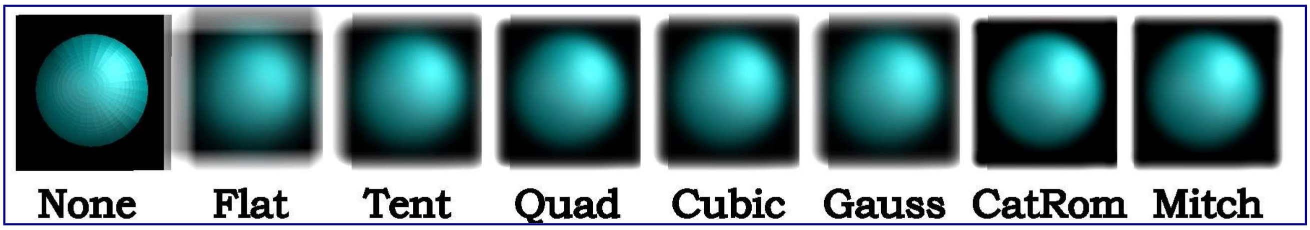
Blur Node

The Blur node blurs an image, using one of seven blur modes (set using the upper-left pop-up button), and a radius defined by the X and Y number buttons. By default these are set to zero, so to enable the node you must set one or both to a value greater than 0. You can optionally connect a value image to the Size input node, to control the blur radius with a mask. The values must be mapped between 0-1 for best effect, as they will be multiplied with the X and Y number button values.

Options

The X and Y values are the number of pixels over which to spread the blur effect.

The Bokeh button (only visible as Bok or Bo on some screen setups) will force the blur node to use a circular blur filter. This gives higher quality results, but is slower then using a normal filter. The Gam button (for "gamma") makes the Blur node gamma-correct the image before blurring it.



Blur node blur modes using 20% of image size as XY, no Bokeh/Gamma

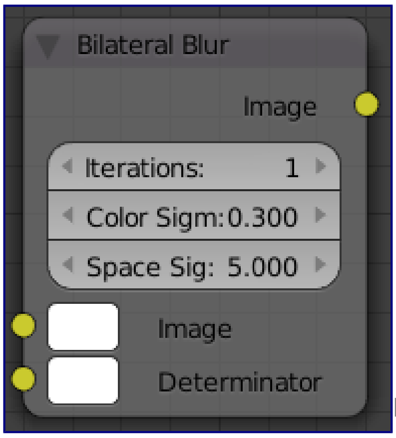
The difference between them is how they handle sharp edges and smooth gradients and preserve the highs and the lows. In particular (and you may have to closely examine the full-resolution picture to see this):

Flat
Simply blurs everything uniformly
Tent
Preserves the high and the lows better making a linear falloff
Quadratic
CatRom keeps sharp-contrast edges crisp.
Cubic, Mitch
Preserve the highs but give almost a out-of-focus blur while smoothing sharp edges

Example

An example blend file, in fact the one used to create the image above, is available here. The .blend file takes one image from the RenderLayer “Blurs” and blurs it while offsetting it (Translate) and then combining it (AlphaOver) to build up the progressive sequence of blurs. Play with the Value and Multiply nodes to change the amount of blurring that each algorithm does.

Bilateral Blur Node



Bilateral Blur Node

The Bilateral Blur node performs a high quality adaptive blur on the source image. It can be used for various purposes like: smoothing results from Bforartistss raytraced ambient occlusion smoothing results from various unbiased renderers, to fake some performance-heavy processes, like blurry refractions/reflections, soft shadows, to make non-photorealistic compositing effects.

Inputs

Bilateral blur has two inputs:
Image, for the image to be blurred. *Determinator*, which is non-obligatory, and is used only if connected.

if only 1st input is connected, the node blurs the image depending on the edges present in the source image. If the Determinator is connected, it serves as the source for defining edges/borders for the blur in the image. This has great advantage in case the source image is too noisy, but normals in combination with zbuffer can still define exact borders/edges of objects.

Options

Iterations

Defines how many times the filter should perform the operation on the image. It practically defines the radius of blur.

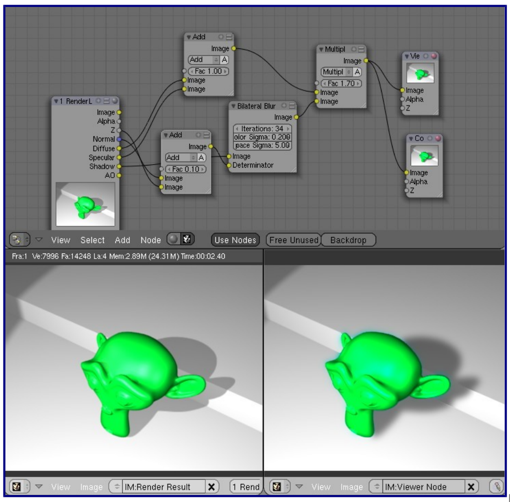
Color Sigma

Defines the threshold for which color differences in the image should be taken as edges.

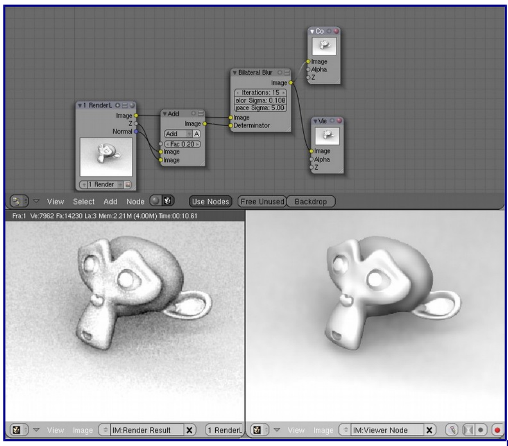
Space Sigma

A fine-tuning variable for blur radius.

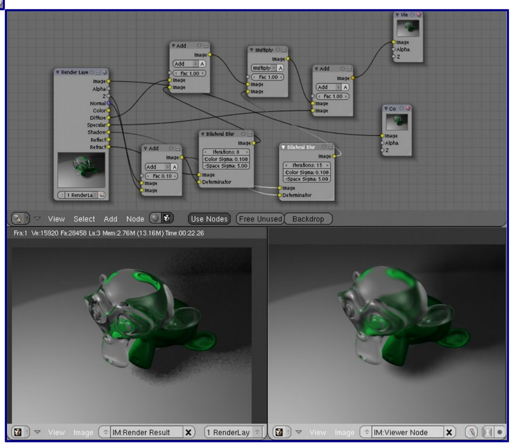
Examples



Bilateral smoothed buffered shadow

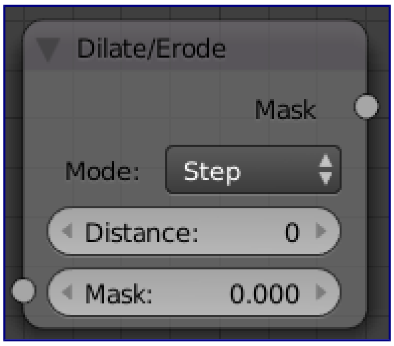


Bilateral smoothed AO



Bilateral faked blurry refraction+smoothed raytraced soft shadow

Dilate/Erode Node

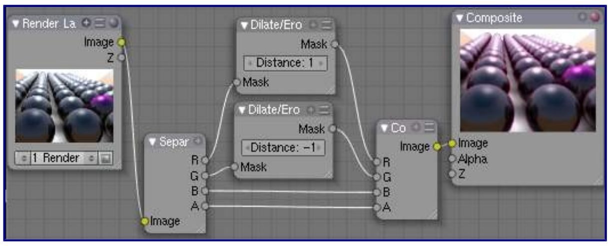


Dilate/Erode Node

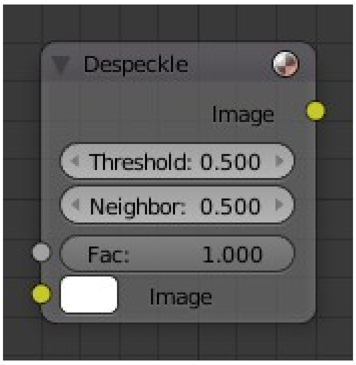
This node blurs individual color channels. The color channel (or a black and white image) is connected to the *Mask* input socket, and the *Distance* is set manually (by clicking on the arrows or the value) or automatically from a value node or a time-and-map-value noodle. A positive value of *Distance* expands the influence of a pixel on its surrounding pixels, thus blurring that color outward. A negative value erodes its influence, thus increases the constrast of that pixel relative to its surrounding pixels, thus sharpening it relative to surrounding pixels of the same color.

Example

In this example image, we wanted to take the rather boring array of ball bearings and spruce it up; make it hot, baby. So, we dilated the red and eroded the green, leaving the blue alone. If we had dilated both red and green... (hint: red and green make yellow). The amount of influence is increased by increasing the *Distance* values. Blend file available here.



Despeckle Node



Despeckle Node.

The *Despeckle node* is used to smooth areas of an image in which noise is noticeable, while leaving complex areas untouched.

This works by the standard deviation of each pixel and its neighbors is calculated to determine if the area is one of high complexity or low complexity. If the complexity is lower than the threshold then the area is smoothed using a simple mean filter.

Inputs

Factor
Controls the amount the filter effects the image.

Image
Standard image input.

Properties

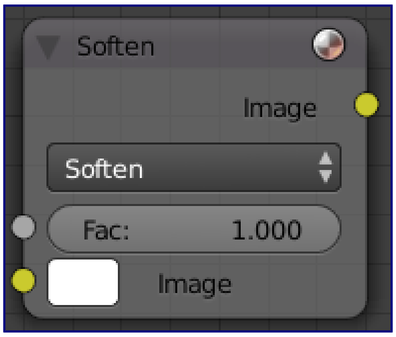
Threshold
The threshold to control high/low complexity.

Neighbor
The threshold to control the number of pixels that must match.

Outputs

Image
Standard image output.

Filter Node



Filter Node

The Filter node implements various common image enhancement filters. The supported filters are, if not obvious, named after the mathematical genius who came up with them:

Soften
: Slightly blurs the image.

Sharpen
: Increases the contrast, especially at edges

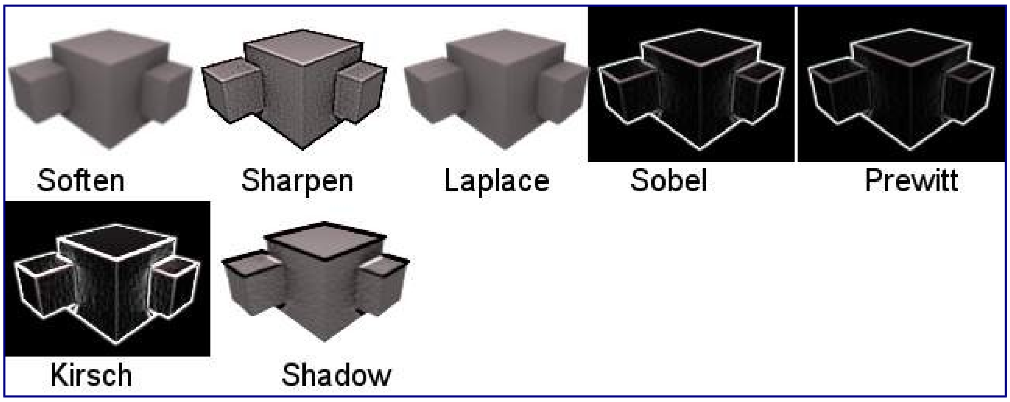
Laplace
: Softens around edges

Sobel
: Creates a negative image that highlights edges

Prewitt
: Tries to do Sobel one better.

Kirsch
: Improves on the work done by those other two flunkies, giving a better blending as you approach an edge.

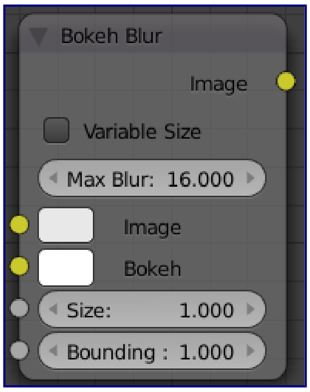
Shadow
: Performs a relief emboss/bumpmap effect, darkening outside edges.



The Filter node has seven modes, shown here.

The *Soften*, *Laplace*, *Sobel*, *Prewitt* and *Kirsch* all perform edge-detection (in slightly different ways) based on vector calculus and set theory equations that would fill six blackboards with gobbledy gook. Recommended reading for insomniacs.

Bokeh Blur



Bokeh Blur Node

The Bokeh Blur node generates a bokeh type blur similar to Defocus. Unlike defocus an in-focus region is defined in the compositor. There is also more flexibility in the type of blur applied through the *Bokeh Image* node.

Several performance optimizations are also available such as OpenCL support, calculation area restriction and masking.

Sockets

Max blur
: Max blur is intended to act as an optimization tool by limiting the number of pixels across which the blur is calculated.

Bokeh
: This is an input for the *Bokeh Image* node.

Size
: Size controls the amount of blur. Size can either be a single value across the entire image or a variable value controlled by an input image. In order to use the latter the Variable Size option must be selected. See the examples section below for more on how to use this.

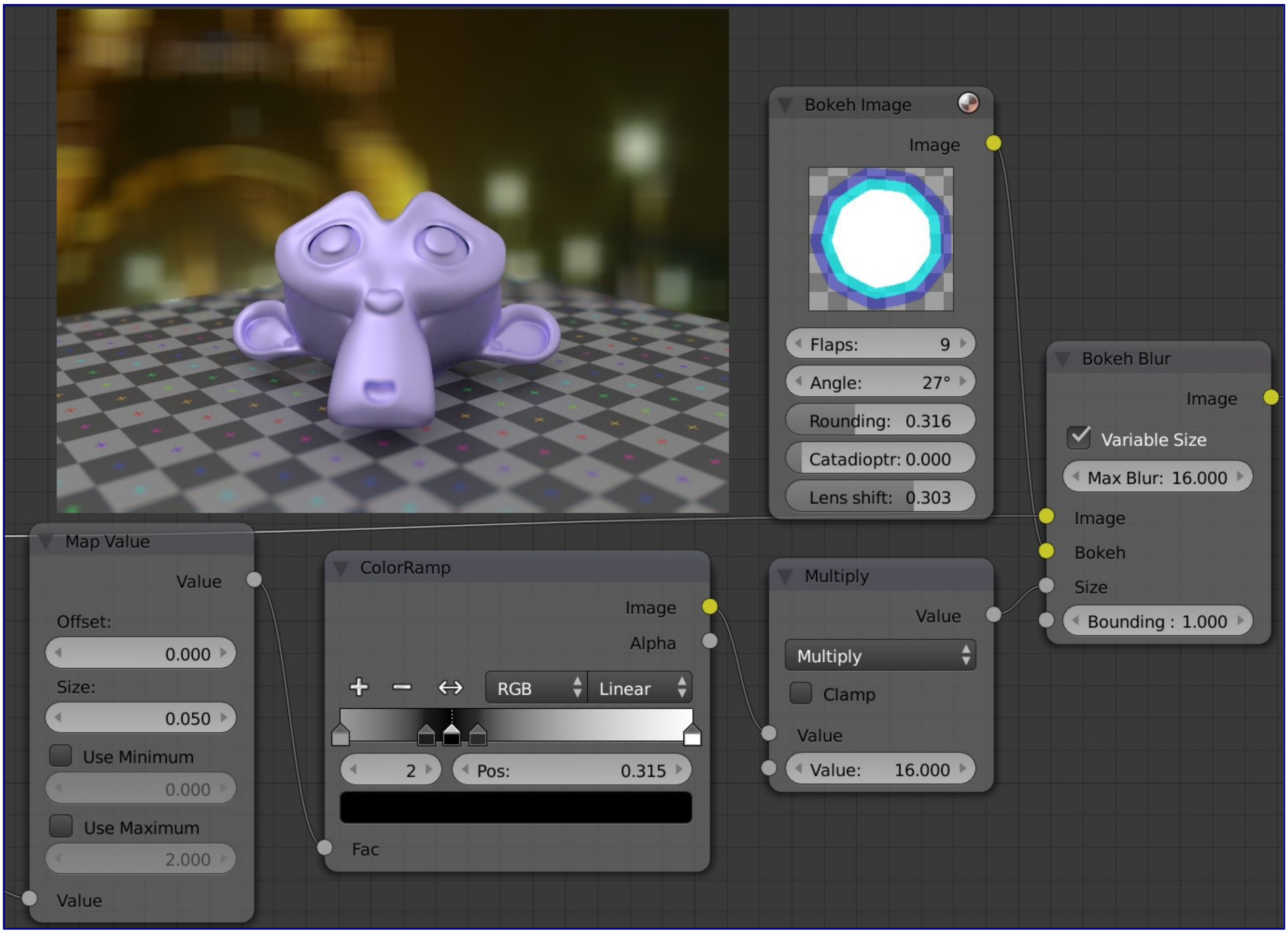
Bounding Box
: This can be used with a *Box Mask* matte node or with a *Mask* input node to restrict the area of the image the blur is applied to. This could be helpful, for example, when developing a node system by allowing only a small area of the image to be filtered thus saving composite time each time adjustments are made.

Examples

Three examples of how the size input may be used follow.

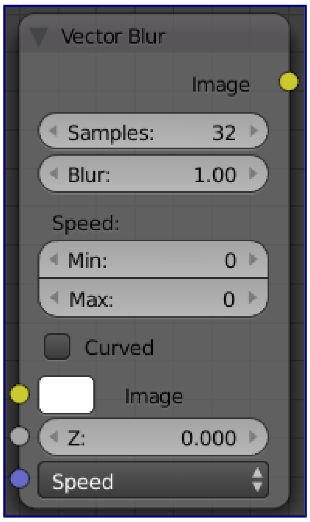
An *ID masked* alpha image can be used so that a background is blurred while foreground objects remain in focus. To prevent strange edges the *Dilate Node* should be used.

The Z pass can be visualized using a *Map Value* node and *ColorRamp* node as described in *Render Layers*. A *multiply Math* node can be used following the color-ramp so that a blur value greater than 1 is used for objects outside the focal range.



A manually created greyscale image can be used to define the sharp and blurry areas of a pre existing image. Again, a *multiply* node can be used so that a blur value greater than 1 is used.

Vector (Motion) Blur Node



Vector Blur Node

Motion blur is the effect of objects moving so fast they blur. Because CG animations work by rendering individual frames, they have no real knowledge of what was where in the last frame, and where it is now.

In Bforartists, there are two ways to produce motion blur. The first method (which produces the most correct results) works by rendering a single frame up to 16 times with slight time offsets, then accumulating these images together; this is called Motion Blur and is activated on the Render panel. The second (and much faster) method is the Compositor node Vector Blur.

To use, connect the appropriate passes from a Render Result node.

Note

Make sure to enable the Speed (called Vec) pass in the Render Layers panel for the render layer you wish to perform motion blur on.

Make sure to enable the Speed (called Vec) pass in the Render Layers panel for the render layer you wish to perform motion blur on.

Maximum Speed: Because of the way vector blur works, it can produce streaks, lines and other artifacts. These mostly come from pixels moving too fast; to combat these problems, the filter has minimum and maximum speed settings, which can be used to limit which pixels get blurred (e.g. if a pixel is moving really, really fast but you have maximum speed set to a moderate amount, it won't get blurred).

Minimum Speed: Especially when the camera itself moves, the mask created by the vectorblur node can become the entire image. A very simple solution is to introduce a small threshold for moving pixels, which can efficiently separate the hardly-moving pixels from the moving ones, and thus create nice looking masks. You can find this new option as 'min speed'. This minimum speed is in pixel units. A value of just 3 will already clearly separate the background from foreground.

Hint

You can make vector blur results a little smoother by passing the Speed pass through a blur node (but note that this can make strange results, so it's only really appropriate for still images with lots of motion blur).

Examples

An in-depth look at how to use the Vector Blur node *can be found here*.

As far as we know, this node represents a new approach to calculating motion blur. Use vector blur in compositing with confidence instead of motion blur. In face, when compositing images, it is necessary to use vector blur since there isn't "real" motion. In this example blend file, you will find a rigged hand reaching down to pick up a ball. Based on how the hand is moving (those vectors), the image is blurred in that direction. The fingers closest to the camera (the least Z value) are blurred more, and those farther away (the forearm) is blurred the least.

Note

Does not work when reading from a multilayer OpenEXR sequence set

Defocus Node

Defocus Node

This single node can be used to emulate depth of field using a postprocessing method. It can also be used to blur the image in other ways, not necessarily based on ‘depth’ by connecting something other than a Zbuffer. In essence, this node blurs areas of an image based on the input zbuffer map/mask.

Camera Settings

DofDist setting for the camera.

The *Defocus* node uses the actual camera data in your scene if supplied by a *RenderLayer* node.

To set the point of focus, the camera now has a *Distance* parameter, which is shorthand for Depth of Field Distance. Use this camera parameter to set the focal plane of the camera (objects Depth of Field Distance away from the camera are in focus). Set *Distance* in the main *Camera* edit panel; the button is right below the *Depth of Field*.

To make the focal point visible, enable the camera *Limits* option, the focal point is then visible as a yellow cross along the view direction of the camera.

Node Inputs

The node requires two inputs, an image and a zbuffer, the latter does not need to be an actual zbuffer, but can also be another (grayscale) image used as mask, or a single value input, for instance from a time node, to vary the effect over time.

Node Setting

The settings for this node are:

Bokeh Type menu
: Here you set the number of iris blades of the virtual camera's diaphragm. It can be set to emulate a perfect circle (*Disk*) or it can be set to have 3 (*Triangle*), 4 (*Square*), 5 (*Pentagon*), 6 (*Hexagon*), 7 (*Heptagon*) or 8 blades (*Octagon*). The reason it does not go any higher than 8 is that from that point on the result tends to be indistinguishable from a *Disk* shape anyway.

Rotate
: This button is not visible if the *Bokeh Type* is set to *Disk*. It can be used to add an additional rotation offset to the Bokeh shape. The value is the angle in degrees.

Gamma Correct
: Exactly the same as the *Gamma* option in Bforartists's general *Blur* node (see *Blur Node*). It can be useful to further brighten out of focus parts in the image, accentuating the Bokeh effect.

f-Stop
: This is the most important parameter to control the amount of focal blur: it simulates the aperture *f* of a real lens(' iris) - without modifying the luminosity of the picture, however! As in a real camera, the *smaller* this number is, the more-open the lens iris is, and the *shallower* the depth-of-field will be. The default value 128 is assumed to be infinity: everything is in perfect focus. Half the value will double the amount of blur. This button is not available if *No zbuffer* is enabled.

Maxblur
: Use this to limit the amount of blur of the most out of focus parts of the image. The value is the maximum blur radius allowed. This can be useful since the actual blur process can sometimes be very slow. (The more blur, the slower it gets.) So, setting this value can help bring down processing times, like for instance when the world background is visible, which in general tends to be the point of maximum blur (not always true, objects very close to the lens might be blurred even more). The default value of 0 means there is no limit to the maximum blur amount.

BThreshold
: The defocus node is not perfect: some artifacts may occur. One such example is in-focus objects against a blurred background, which have a tendency to bleed into the edges of the sharp object. The worst-case scenario is an object in-focus against the very distant world background: the differences in distance are very large and the result can look quite bad. The node tries to prevent this from occurring by testing that the blur difference between pixels is not too large, the value set here controls how large that blur difference may be to consider it 'safe.' This is all probably quite confusing, and fortunately, in general, there is no need to change the default setting of 1. Only try changing it if you experience problems around

any in-focus object.

Preview

As already mentioned, processing can take a long time. So to help make editing parameters somewhat 'interactive', there is a preview mode which you can enable with this button. Preview mode will render the result using a limited amount of (quasi)random samples, which is a *lot* faster than the 'perfect' mode used otherwise. The sampling mode also tends to produce grainy, noisy pictures (though the more samples you use, the less noisy the result). This option is on by default. Play around with the other parameters until you are happy with the results, and only then disable the preview mode for the final render.

Samples

Only visible when *Preview* is set. Sets the amount of samples to use to sample the image. The higher, the smoother the image, but also the longer the processing time. For preview, the default of 16 samples should be sufficient and is also the fastest.

No zbuffer

Sometimes you might want to have more control to blur the image. For instance, you may want to only blur one object while leaving everything else alone (or the other way around), or you want to blur the whole image uniformly all at once. The node therefore allows you to use something other than an actual zbuffer as the *Z* input. For instance, you could connect an image node and use a grayscale image where the color designates how much to blur the image at that point, where white is maximum blur and black is no blur. Or, you could use a Time node to uniformly blur the image, where the time value controls the maximum blur for that frame. It may also be used to obtain a possibly slightly-better DoF blur, by using a fake depth shaded image instead of a zbuffer. (A typical method to create the fake depth shaded image is by using a linear blend texture for all objects in the scene or by using the 'fog/mist' fake depth shading method.) This also has the advantage that the fake depth image can have anti-aliasing, which is not possible with a real zbuffer. *No zbuffer* will be enabled automatically whenever you connect a node that is not image based (e.g. time node/value node/etc).

Zscale

Only visible when *No zbuffer* enabled. When *No zbuffer* is used, the input is used directly to control the blur radius. And since usually the value of a texture is only in the numeric range 0.0 to 1.0, its range is too narrow to control the blur properly. This parameter can be used to expand the range of the input (or for that matter, narrow it as well, by setting it to a value less than one). So for *No zbuffer*, this parameter therefore then becomes the main blur control (similar to *f-Stop* when you *do* use a zbuffer).

Examples

In this blend file example, the ball array image is blurred as if it was taken by a camera with a f-stop of 2.8 resulting in a farily narrow depth of field centered on 7.5 Bforartists units from the camera. As the balls recede into the distance, they get blurrier.

Hints

Preview

In general, use preview mode, change parameters to your liking, only then disable preview mode for the final render. This node is compute intensive, so watch your console window, and it will give you status as it computes each render scan line.

Edge Artifacts

For minimum artifacts, try to setup your scene such that differences in distances between two objects that may visibly overlap at some point are not too large.

“Focus Pull”

Keep in mind that this is not ‘real’ DoF, only a post-processing simulation. Some things cannot be done which would be no problem for real DoF at all. A typical example is a scene with some object very close to the camera, and the camera focusing on some point far behind it. In the real world, using shallow depth of field, it is not impossible for nearby objects to become completely invisible, in effect allowing the camera to see ‘behind’ it. Hollywood cinematographers use this visual characteristic to good effect to achieve the popular “focus pull” effect, where the focus shifts from a nearby to a distant object, such that the “other” object all but disappears. Well, this is simply not possible to do with the current post-processing method in a single pass. If you really want to achieve this effect, quite satisfactorily, here’s how:

- Split up your scene into “nearby” and “far” objects, and render them in two passes.
- Now, combine the two the two results, each with their own “defocus” nodes driven by the same Time node, but with one of them inverted. (e.g. using a “Map Value” node with a Size of -1.) As the defocus of one increases, the defocus on the other decreases at the same rate, creating a smooth transition.

Aliasing at Low f-Stop Values

At very low values, less than 5, the node will start to remove any oversampling and bring the objects at DoFDist very sharply into focus. If the object is against a constrasting background, this may lead to visible stairstepping (aliasing) which OSA is designed to avoid. If you run into this problem:

- Do your own OSA by rendering at twice the intended size and then scaling down, so that adjacent pixels are blurred togther
- Use the blur node with a setting of 2 for x and y
- Set DoFDist off by a little, so that the object in focus is blurred by the tiniest bit.
- Use a higher f-Stop, which will start the blur, and then use the Z socket to a Map Value to a Blur node to enhance the blur effect.
- Rearrange the objects in your scene to use a lower-contrast background

No ZBuffer

A final word of warning, since there is no way to detect if an actual zbuffer is connected to the node, be VERY careful with the *No ZBuffer* switch. If the *Zscale* value happens to be large, and you forget to set it back to some low value, the values may suddenly be interpreted as huge blur-radius values that will cause processing times to explode.

Glare Node

Glare Node

Glare Node.

The *Glare node* is used add lens flares, fog, glows around exposed parts of an image an much more.

Inputs

Image
: Standard image input.

Properties

Glare Type

Ghosts
: Creates a haze over the image.

Streaks
: Creates bright streaks used to simulate lens flares.

  Streaks
  : Total number of streaks.

  Angle Offset
  : The rotation offset factor of the streaks.

  Fade
  : Fade out factor for the streaks.

Fog Glow
: Looks similar to *Ghost* however, it is much smaller in size and gives more of a atmospheric haze or "glow" around the image.

  Size

Scale of the glow relative to the size of the original bright pixels.

Simple Star

Works similar to *Streaks* but gives a simpler shape looking like a star.

Fade
Fade out factor for the streaks.

Rotate 45
Rotate the streaks by 45°.

Common Options

Quality
If not set to something other the *High*, then the glare effect will only be applied to a low resolution copy of the image. This can be helpful to save render times while only doing preview renders.

Iterations
The number of times to run through the filter algorithm. Higher values will give more accurate results but will take longer to compute. Note, that this is not available for *Fog Glow* as it does not use an iterative based algorithm.

Color Modulation

Used for *Streaks* and *Ghosts* to create a special dispersion effect.

Johannes Itten describes this effect, Color Modulation, as subtle variations in tones and chroma.

Mix
Value to control how much of the effect is added on to the image. A value of -1 would give just the original image, 0 gives a 50/50 mix, and 1 gives just the effect.

Threshold
Pixels brighter than this value will be affected by the glare filter.

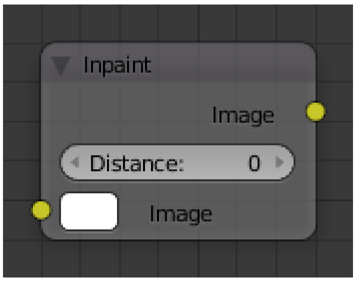
Outputs

Image
Standard image output.

Example

TODO.

Inpaint Node



Inpaint Node.

The *Inpaint node* is used to extend borders of an image into transparent or masked regions. This can be useful to solve problems like “wire removal” and holes created during chroma-keying.

Inputs

Image
    Standard image input.

Properties

Distance
    The number of times to extend the image.

Outputs

Image
    Standard image output.

Examples

In the left image shows the “wire” in place and after chroma-key has been applied you will see you’re left with a blank space – it’s shown as a black line here but it will be alpha in your Blender output.

Inpaint Node Example.

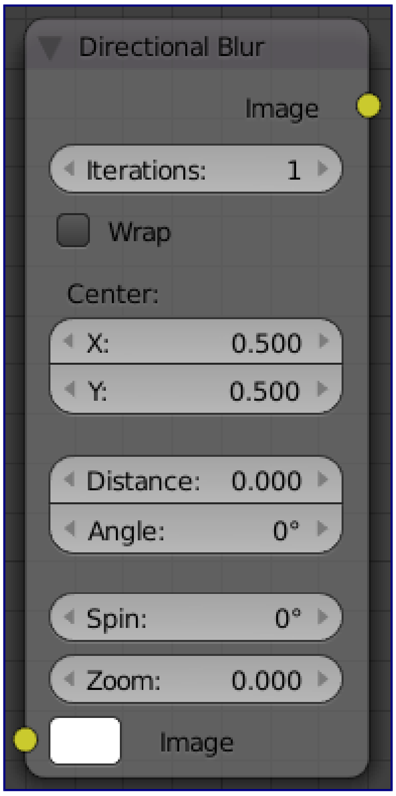
Inpainting fills in a couple of pixels using the surrounding image and voila... your wire is removed.

Note

The wider your "hole" is, the more noticeable this effect is! If you use more than a few pixels of infill, the effect is almost as irritating as the wire and your viewers won't be impressed.

Inpainting can also cover up a multitude of other minor sins such as control points for motion capture: use it sparingly and it will amaze.

Directional Blur Node



Dilate/Erode Node

Blurs an image in a specified direction and magnitude. Can be used to fake motion blur.

Options

Iterations
: Controls how may times the image is duplicated to create the blur effect. Higher values give smoother results.

Wrap
: Wraps the image on the X and Y axis to fill in areas that become transparent from the blur effect.

Center
: Sets the position where the blur center is. This makes a difference if the angle, spin, and/or zoom are used.

Distance
: How large the blur effect is.

Angle
: Image is blurred at this angle from the center

Spin
: Rotates the image each iteration to create a spin effect, from the center point.

Zoom
: Scales the image each iteration, creating the effect of a zoom.

Pixelate Node

Pixelate Node

Add this node in front of a *scale* node to get a pixelated (non smoothed) image from the resultant up scaled image.

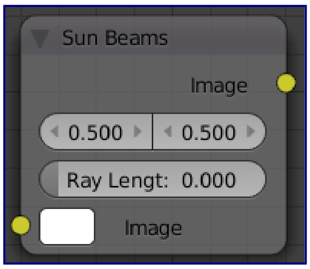
Example

In the node editor, set the node tree to compositing in the menu bar and check the ‘Use Nodes’ checkbox. Add an input Image node and an output Viewer node. Connect the Input node to the viewer node and check the ‘Backdrop’ checkbox in the menu bar. Open an image you would like to pixelate using the open button on the image node. This image should now appear in the backdrop. Now add two scale nodes between the input and output (Add>Distort>Scale). Change the values of X and Y to 0.2 in the first scale box and to 5 in the second. The background image will be unchanged.

Now add a Pixelate node between the two scale nodes.

(note: you can use alt-v and v to zoom the backdrop in and out respectively if needed)

Sun Beams



Sun Beams Node

Sun Beams is a 2D effect for simulating the effect of bright light getting scattered in a medium (Crepuscular Rays). This phenomenon can be created by renderers, but full volumetric lighting is a rather arduous approach and takes a lot of render time. Also when working with 2D images only the volumetric data may not be available. In these cases the “Sun Beams” node provides a computationally cheap way of creating a convincing effect based on image brightness alone.

Usage

Usually the first step is to define the area from which rays are cast. Any diffuse reflected light from surfaces is not going to contribute to such scattering in the real world, so should be excluded from the input data. Possible ways to achieve this are

- entirely separate image as a light source
- brightness/contrast tweaking to leave only the brightest areas
- muting shadow and midtone colors, which is a bit more flexible
- masking for ultimate control

After generating the sun beams from such a light source image they can then be overlayed on the original image. Usually a simple “Add” mix node is sufficient, and physically correct because the scattered light adds to the final result.

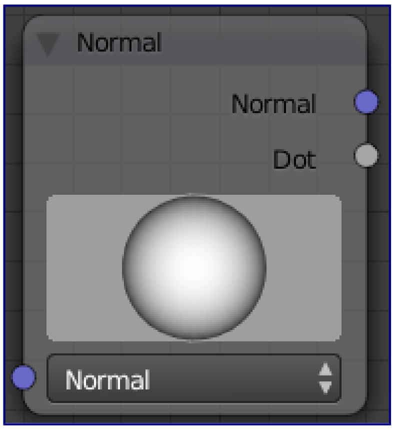
Vector Nodes

These nodes can be used to manipulate various types of vectors, such as surface normals and speed vectors.

- Normal Node
- Map Value Node
- Map Range Node
- Normalize

- Vector Curves Node

Normal Node

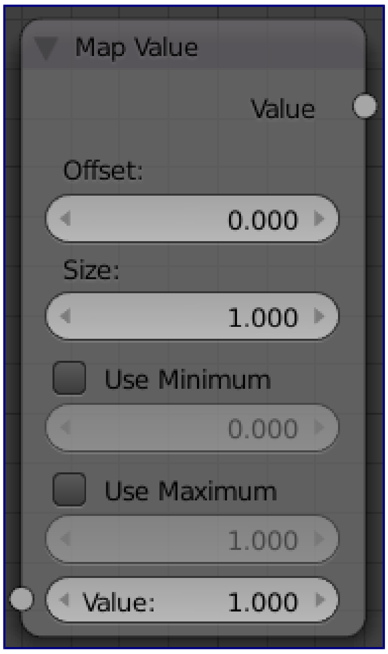


Normal Node

The Normal node generates a normal vector and a dot product. Click and Drag on the sphere to set the direction of the normal.

This node can be used to input a new normal vector into the mix. For example, use this node as an input to a Color Mix node. Use an Image input as the other input to the Mixer. The resulting colorized output can be easily varied by moving the light source (click and dragging the sphere).

Map Value Node



Map Value Node

Map Value node is used to scale, offset and clamp values (value refers to each vector in the set). The formula for how this node works is:

Offs
: will add a number to the input value

Size
: will scale (multiply) that value by a number

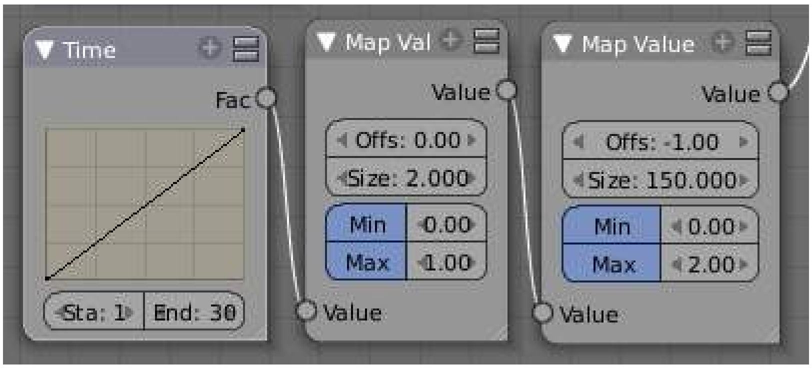
Min/Max
: you can set the minimum and maximum numbers to clamp (cut off) the value too. *Min* and *Max* must be individually enabled by `LMB` clicking on the label for them to clamp. `Shift-LMB` on the value to change it.

- If *Min* is enabled and the value is less than *Min*, set the output value to *Min*.
- If *Max* is enabled and the input value is greater than *Max*, set the output value to *Max*.

This is particularly useful in achieving a depth-of-field effect, where you can use the Map Value node to map a Z value (which can be 20 or 30 or even 500 depending on the scene) to to range between 0-1, suitable for connecting to a Blur node.

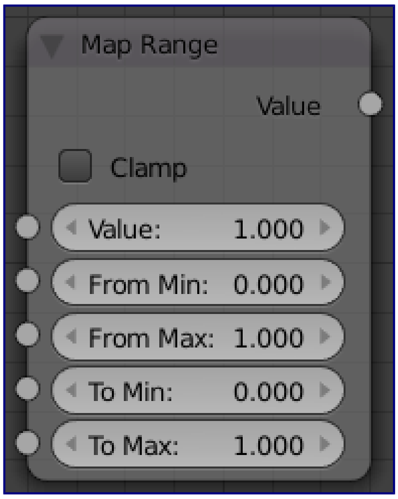
Using Map Value to Multiply values

You can also use the map value node to multiply values to achieve an output number that you desire. In the mini-map to the right, the Time node outputs a value between 0.0 and 1. 00 evenly scaled over 30 frames. The *first* Map Value node multiplies the input by 2, resulting in an output value that scales from 0.0 to 2.0 over 30 frames. The *second* Map Value node subtracts 1 from the input, giving working values between -1.00 and 1.0, and multiplies that by 150, resulting in an output value between -150 and 150 over a 30-frame sequence.



Using Map Value to multiply

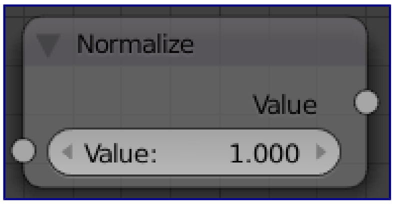
Map Range Node



Map Range Node

TODO - see: https://developer.Bforartists.org/T43469

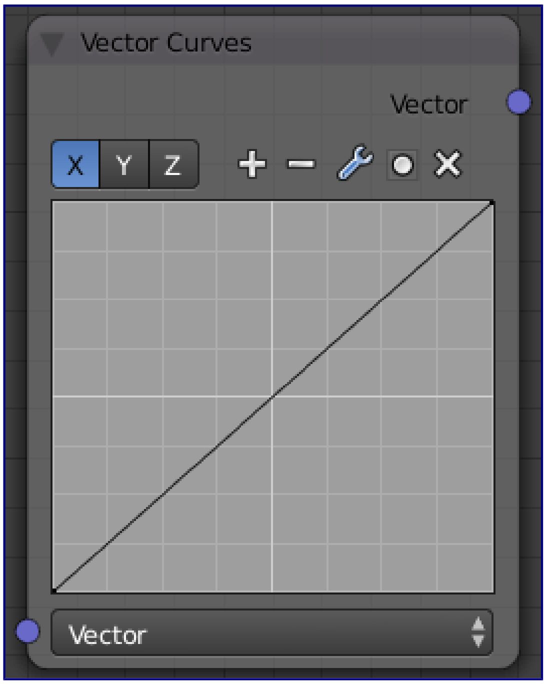
Normalize



Normalize Node

Normalizing a vector scales its magnitude, or length, to a value of 1, but keeps its direction intact.

Vector Curves Node



Vector Curves Node

The Vector Curves node maps an input vector image’s x, y, and z components to a diagonal curve. The three channels are accessed via the X, Y, and Z buttons at the top of the node. Add points to the curve by clicking on it.

Note that dragging a point across another will switch the order of the two points (e.g. if point A is dragged across point B, then point B will become point A and point A will become point B).

Use this curve to slow things down or speed them up from the original scene.

Matte Nodes

These nodes give you the essential tools for working with blue-screen or green-screen footage, where live action is shot in front of a blue or green backdrop for replacement by a matte painting or virtual background.

In general, hook up these nodes to a viewer, set your UV/Image Editor to show the viewer node, and play with the sliders in real-time using a sample image from the footage, to get the settings right. In some cases, small adjustments can eliminate artifacts or foreground image degredation. For example, taking out too much green can result in foreground actors looking ‘flat’ or blueish/purplish.

You can and should chain these nodes together, refining your color correction in successive refinements, using each node’s strengths to operate on the previous node’s output. There is no “one stop shopping” or one “does-it-all” node; they work best in combination.

Usually, green screen is shot in a stage with consistent lighting from shot to shot, so the same settings will work across multiple shots of raw footage. Footage shot outside under varying lighting conditions (and wind blowing the background) will complicate matters and mandate lower falloff values.

Note
Garbage Matte

Garbage matte is not a node, but a technique where the foreground is outlined using a closed curve (bezier or nurbs). Only the area within the curve is processed using these matte nodes; everything else is garbage and thus discarded.

- Keying Node
- Keying Screen Node
- Channel Key Node
- Color Spill Node
- Box Mask Node
- Ellipse Mask Node
- Luminance Key Node
- Difference Key Node
- Distance Key Node
- Chroma Key Node
- Color Key Node
- Double Edge Mask Node

Keying Node

Keying Node.

The *Keying* node is an one-stop-shop for “green screen” / “blue screen” removal. It performs both chroma keying to remove the backdrop and despill to correct color cast from the backdrop. Additionally, you can perform common operations used to tweak the resulting matte.

Inputs

Image
: Standard image input.

Key Color
: The color of content to be removed. This may be a single color using the, or a reference image such as generated by the Keying Screen Node.

Garbage Matte
: An optional mask of area(s) to always *exclude* from the output. This is removed from the chroma key generated matte.

Core Matte
: An optional mask of area(s) to always *include* in the output. This is merged with the chroma key generated matte.

Properties

Pre Blur

Reduce the effects of color noise in the image by blurring only color by the given amount, leaving luminocity intact. This will affect matte calculation only, not the result image.

Screen Balance

This is the balance between color channels compared with the key color. 0.5 will average the other channels (red and blue in the case of a green screen).

This may be tweaked in tandem with *Clip Black* and *Clip White* while checking the *Matte* output to create a mask with optimal separation.

Despill Factor

Controls how much color bleed from the key color is removed from the input image: 0 means no despilling, 1 means all possible spilling will be removed. The underlying implementation is the same as adjusting the *Unspill* amount of the Color Spill Node.

Despill Balance

This controls how the color chanels are compared when computing spill, affecting the hue and shade of the corrected colors. It is similar to setting the *Limiting Channel* in the Color Spill Node.

Edge Kernel Radius

Defines the radius in pixel used to detect an edge.

Edge Kernel Tolerance

Defines threshold used to check if pixels in radius are the same as current pixel: If the difference between pixel colors is higher than this threshold then the point will be considered an edge.

Clip Black

This sets the threshold for what becomes fully transparent in the output (black in the matte). It should be set as low as possible. Uneven backdrops will require this value to be increased. Use of the Keying Screen Node can help keep this value low. You may also use a *Garbage Matte* to exclude problematic areas.

This value does not impact areas detected as edges to ensure edge detail is preserved.

Clip White

This sets the threshold for what becomes fully opaque in the output (white in the matte). It should be set as high as possible. Colors close to green in the foreground may require lowing this and/or adjusting the *Screen Balance*. Particularly problematic parts can fixed with a *Core Matte* instead of a low *Clip White*.

This value does not impact areas detected as edges to ensure edge detail is preserved.

Dilate/Erode

Enlarge (positive numbers) or shrink (negative numbers) the matte by the specified number of pixels. This is similar to using the Dilate/Erode Node on the matte.

This a simple way to include more or less along the edges of the matte, particularly combined with *Post Blur*.

Feather Falloff

The rate of fall off at the edges of the matte when feathering, to manage edge detail.

Feather Distance

Controls how much the matte is feathered inwards (negative number) or outwards (positive number).

Post Blur

Make the matte less sharp, for smoother transitions to the background and noise reduction.

Outputs

Image
: Processed image with the *Matte* applied to the images's alpha channel.

Matte
: Output matte to use for checking the quality of the key, or to manually apply using a Set Alpha Node or Mix Node.

Edges
: Shows what edges were detected on the matte. Useful for adjusting the *Edge Kernel Radius* and *Edge Kernel Tolerance*.

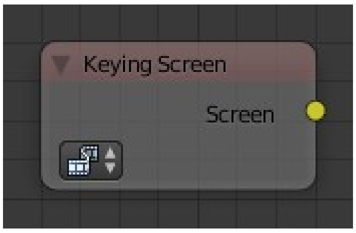
Tip

If there are problems with the edges of the matte, it may help to start with adjusting the *Edge Kernel* parameters before adjusting feathering. Detected edges are not subject to *Clip Black* / *Clip White* thresholds to preserve fine edge detail. You can check edge detection by connecting a Viewer Node to the *Edges* output.

Sharper detected edges (smaller *Edge Kernel Radius*, like 2 / larger *Edge Kernel Tolerance*, like 0.4) will create a sharper matte, but may loose some detail like stray hairs. A sharp matte is good, but disappearing or flickering hairs are distracting.

Fat edges (larger *Edge Kernel Radius*, like 8 / smaller *Edge Kernel Tolerance*, like 0.05) will capture more edge detail, but may also produce a halo around the subject. The halo can be adjusted with *Feather* controls along with *Dilate/Erode*.

Keying Screen Node

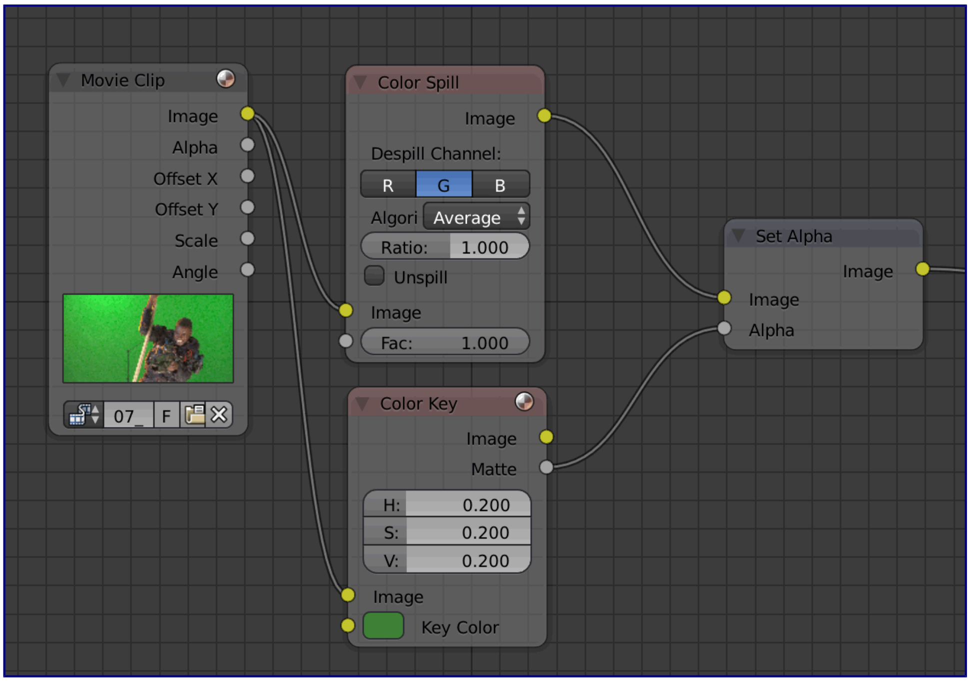


Keying Screen Node.

The *Keying Screen* node creates plates for use as a color reference for keying nodes. It generates gradients from sampled colors on motion tracking points on movie clips.

Example

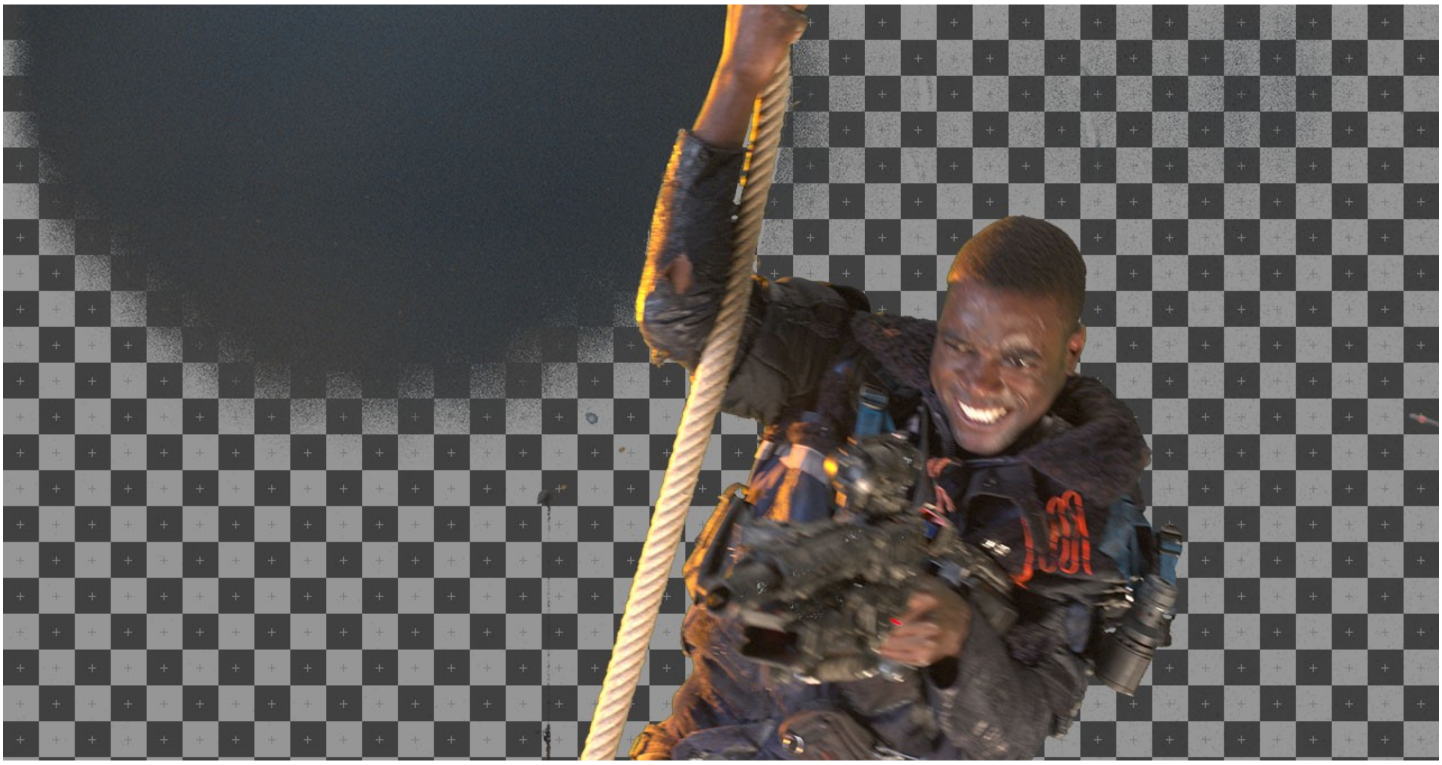
Consider a node setup for green screen removal, using a Color Key:



Often, lighting is uneven across the backdrop.

Example from the Mango Open Movie, Tears of Steel.

That can result in a bad matte.



Exanple of a poor mask: Some of the backdrop is opaque, and some parts of the gun in the foreground are transparent.

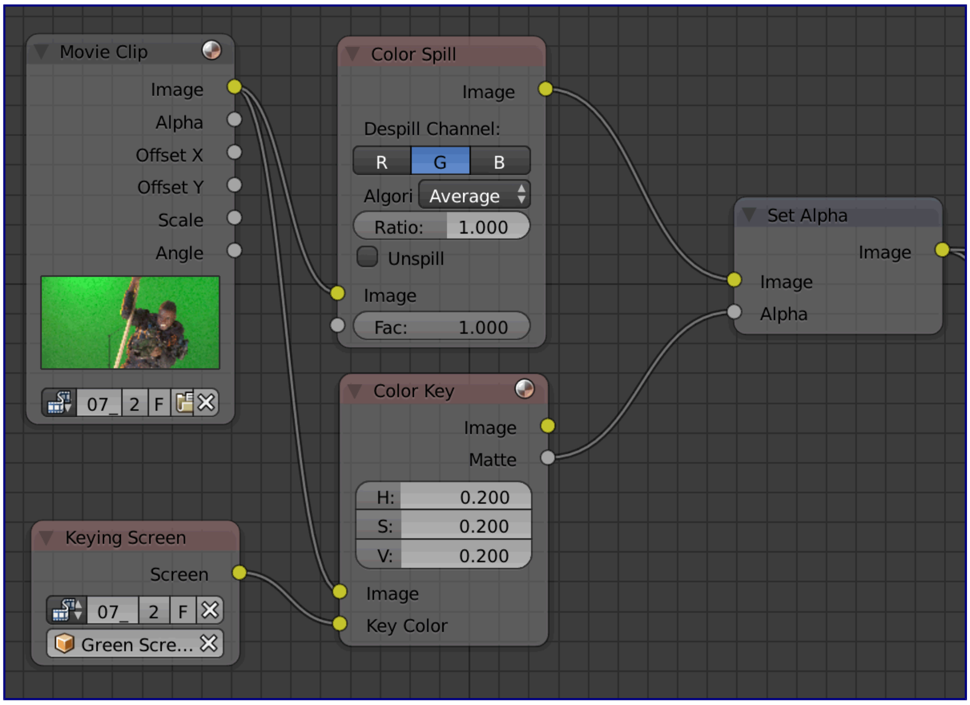
If you increase the tolerances on the keying node, it will accept mores shades of green to mask out. But it may also incorrectly mask out more of the foreground.

Instead of increasing the range of accepted shades to be masked out, the *Keying Screen* node lets you change what shade of green (or other color) to use for different parts of the image.

Start in the Movie Clip Editor. Open the Properties Region and Tool Shelf to show tracking configuration. Tracks used for gradients are not useful for camera solving, because they do not track well. So create a new object track in the *Objects* selector. Place tracking markers on the clip to sample different parts of the backdrop.

These tracks may be tracked or moved manually, so gradients can be updated over time. If the marker is not enabled for a frame, it will not be used creating the gradient. (Such as the red-colored marker on the arm in the screen shot above)

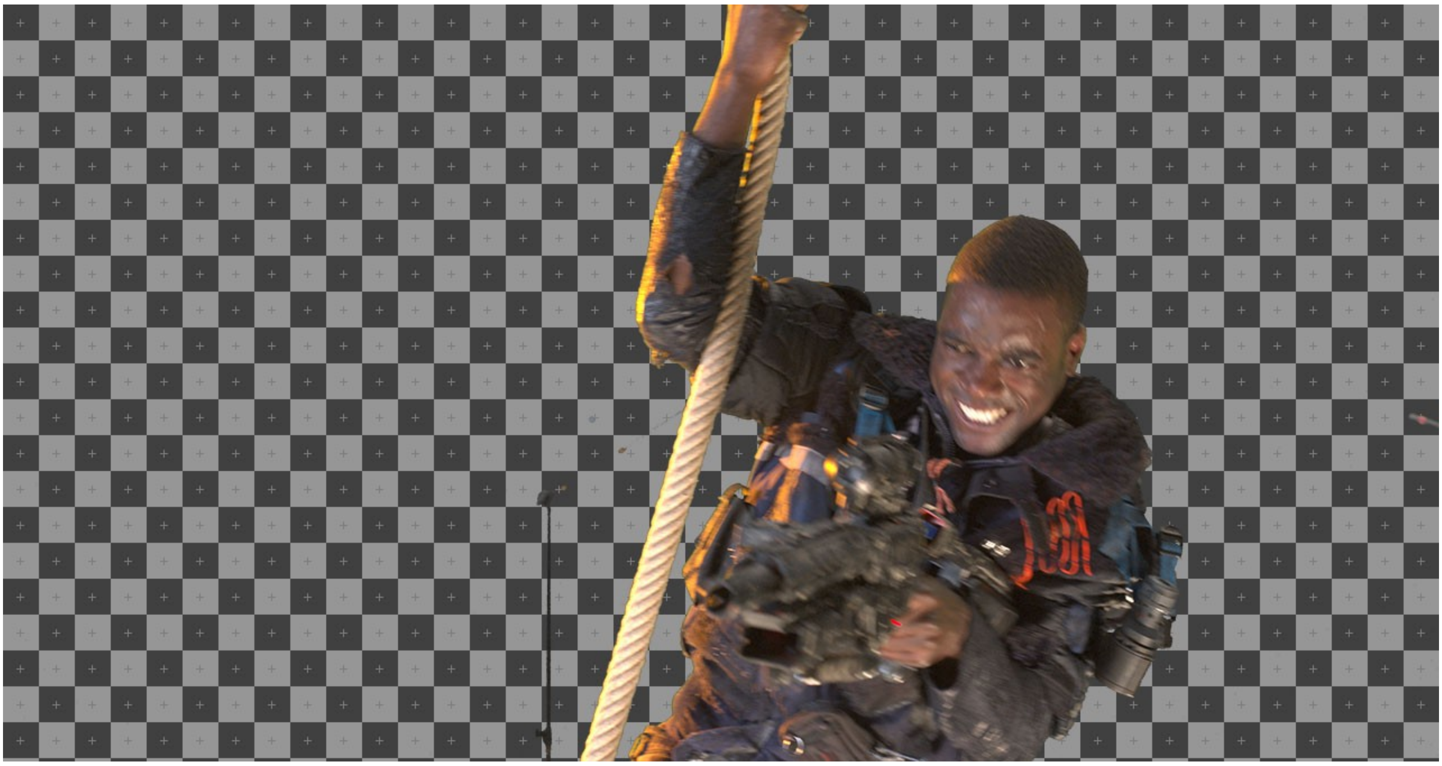
Once the tracks are created, add the node to your compositing setup, and select the tracking object used for the backdrop.



Node configuration with *Keying Screen*'s generated gradient plate connected to the Color input of the Keying node.

Gradient plate generated by *Keying Screen*.

The resulting image now has a better matte.



Channel Key Node

Channel Key Node

The *Channel Key* node determines background objects from foreground objects by the difference in the selected channel’s levels. For example in YUV color space, this is useful when compositing stock footage of explosions (very bright) which are normally shot against a solid, dark background.

There is one input to this node, the *Image* that is to be keyed.

Control this node using:

Color Space
: buttons selects what color space the channels will represent.

Channel
: buttons selects the channel to use to determine the matte.

High
: value selector determines the lowest values that are considered foreground. (which is supposed to be - relatively - height values: from this value to 1.0).

Low
: value selector determines the highest values that are considered to be background objects. (which is supposed to be - relatively - low values: from 0.0 to this value).

It is possible to have a separation between the two values to allow for a gradient of transparency between foreground and background objects.

The outputs of this node are the *Image* with an alpha channel adjusted for the keyed selection and a black and white *Matte* (i.e the alpha mask).

Color Spill Node

Color Spill Node

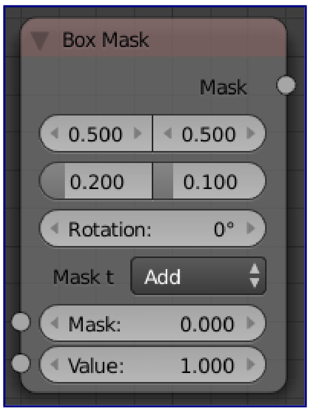
The *Color Spill* node reduces one of the RGB channels so that it is not greater than any of the others. This is common when compositing images that were shot in front of a green or blue screen. In some cases, if the foreground object is reflective, it will show the green or blue color; that color has “spilled” onto the foreground object. If there is light from the side or back, and the foreground actor is wearing white, it is possible to get “spill” green (or blue) light from the background onto the foreground objects, coloring them with a tinge of green or blue. To remove the green (or blue) light, you use this fancy node.

There is one input to this node, the *Image* to be processed.

The *Enhance* slider allows you to reduce the selected channel’s input to the image greater than the color spill algorithm normally allows. This is useful for exceptionally high amounts of color spill.

The outputs of this node are the image with the corrected channels.

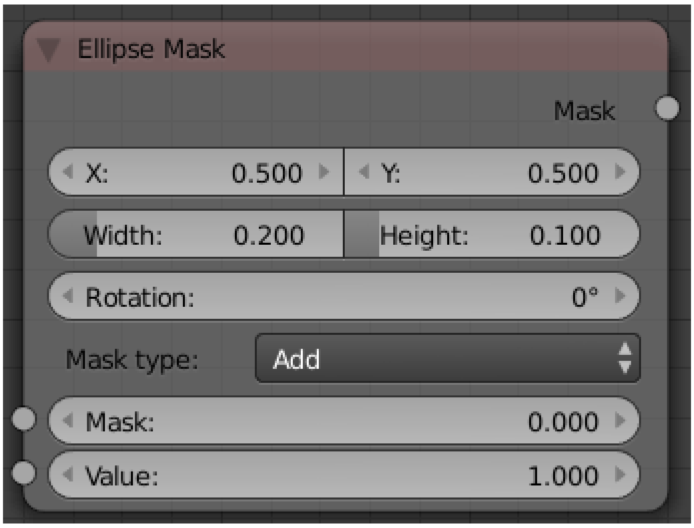
Box Mask Node



Box Mask Node

TODO - see: https://developer.Bforartists.org/T43469

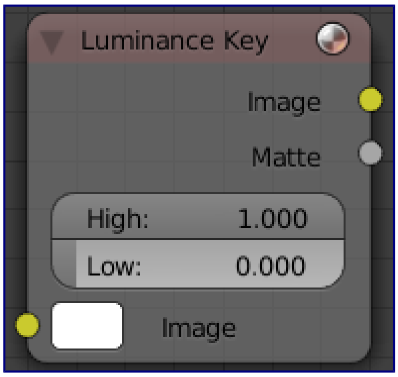
Ellipse Mask Node



Ellipse Mask Node

TODO - see: https://developer.Bforartists.org/T43469

Luminance Key Node



Luminance Key Node

The *Luminance Key* node determines background objects from foreground objects by the difference in the luminance (brightness) levels. For example, this is useful when compositing stock footage of explosions (very bright) which are normally shot against a solid, dark background.

There is one input to this node, the *Image* that is to be keyed.

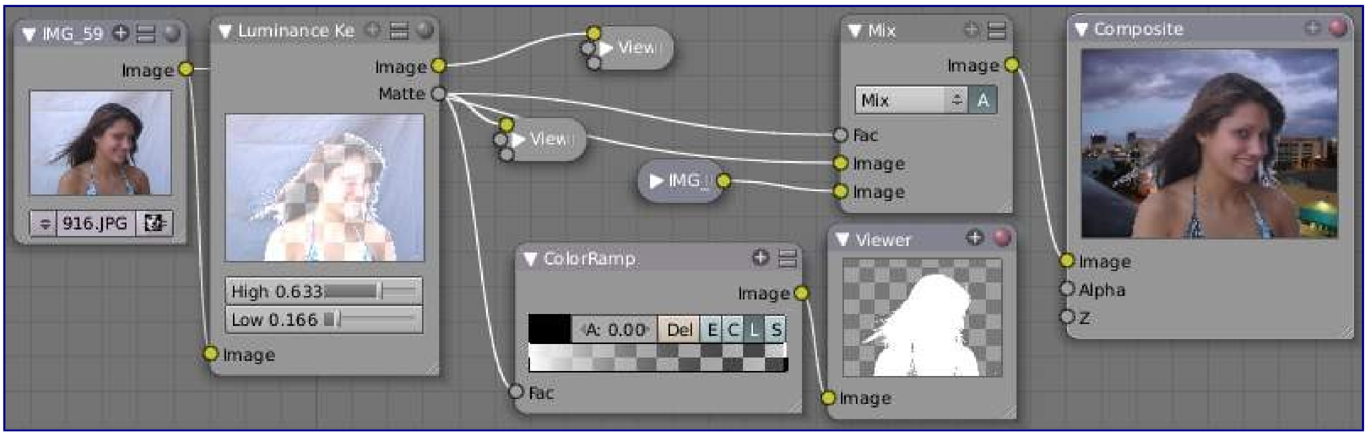
Control this node using:

- The *High* value selector determines the lowest values that are considered foreground. (which is supposed to be - relatively - light: from this value to 1.0).
- The *Low* value selector determines the hightes values that are considered to be background objects. (which is supposed to be - relatively - dark: from 0.0 to this value).

It is possible to have a separation between the two values to allow for a gradient of transparency between foreground and background objects.

The outputs of this node are the *Image* with an alpha channel adjusted for the keyed selection and a black and white *Matte* (i.e the alpha mask).

Example

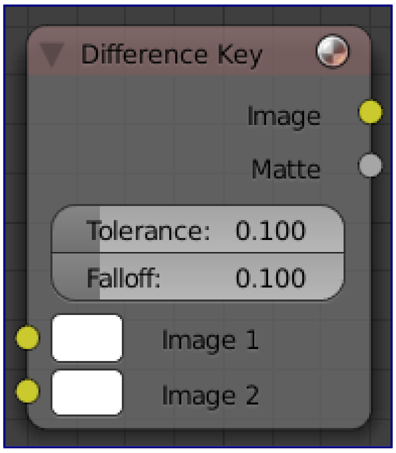


Using Luma Key...with a twist

For this example, let’s throw you a ringer. Here, the model was shot against a *white* background. Using the Luminance Key node, we get a matte out where the background is white, and the model is black; the opposite of what we want. If we wanted to use the matte, we have to switch the white and the black. How to do this? ColorRamp to the rescue - we set the left color White Alpha 1.0, and the right color to be Black Alpha 0.0. Thus, when the Colorramp gets in black, it spits out white, and vice versa. The reversed mask is shown; her white outline is useable as an alpha mask now.

Now to mix, we don’t really need the AlphaOver node; we can just use the mask as our Factor input. In this kinda weird case, we can use the matte directly; we just switch the input nodes. As you can see, since the matte is white (1.0) where we don’t want to use the model picture, we feed the background photo to the bottom socket (recall the mix node uses the top socket where the factor is 0.0, and the bottom socket where the factor is 1.0). Feeding our original photo into the top socket means it will be used where the Luminance Key node has spit out Black. Voila, our model is teleported from Atlanta to aboard a cruise ship docked in Miami.

Difference Key Node



Difference Key Node

This node produces a matte that isolates foreground content by comparing it with a reference background image.

There are two inputs:

Image 1
contains foreground content against the background that is to be removed
Image 2
is the reference background image

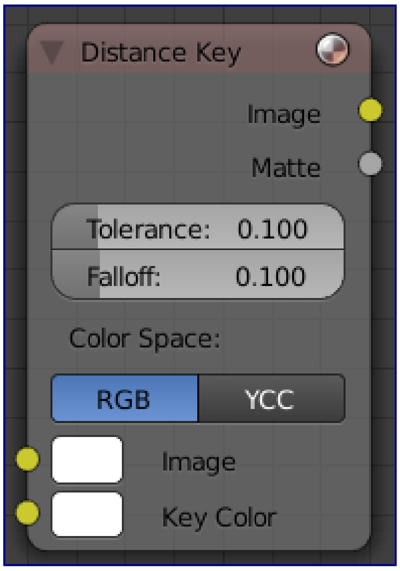
Where pixels match the reference background to within the specified **Tolerance**, the matte is made transparent.

Increase **Falloff** to make nearby pixels partially transparent producing a smoother blend along the edges.

Outputs are:

Image
with its alpha channel adjusted for the keyed selection
Matte
a monochrome representation of the mask

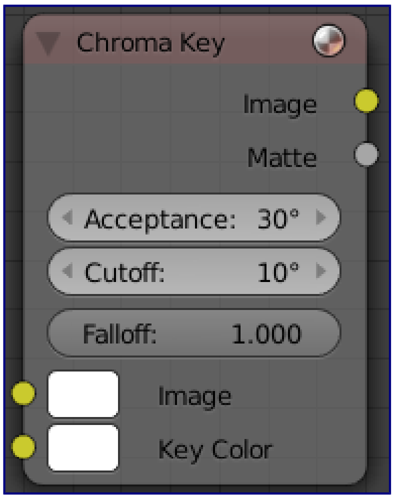
Distance Key Node



Distance Key Node

TODO - see: https://developer.Bforartists.org/T43469

Chroma Key Node



Chroma Key Node

The *Chroma Key* node determines if a pixel is foreground or background (and thereby should be transparent) based on its chroma values. Use this, for example, to composite images that have been shot in front of a green or blue screen.

Inputs:

Image
: that is to be keyed.

Key Color
: the background color usually selected using the color picker and the original image.

Control this node using:

Acceptance
: An angle on the color wheel that represents how tolerant the keying color is. Larger angles allow for larger variation in the keying color to be considered background pixels.

Cutoff
: controls the level that is considered pure background. Higher cutoff levels means more pixels will be 100% transparent if they are within the angle tolerance.

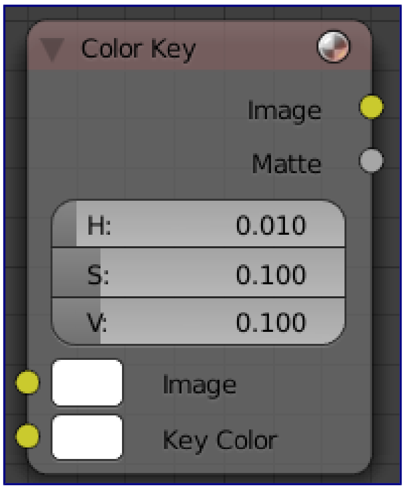
Falloff
: Increase to make nearby pixels partially transparent producing a smoother blend along the edges.

Outputs are:

Image
: with its alpha channel adjusted for the keyed selection

Matte
: a monochrome representation of the mask

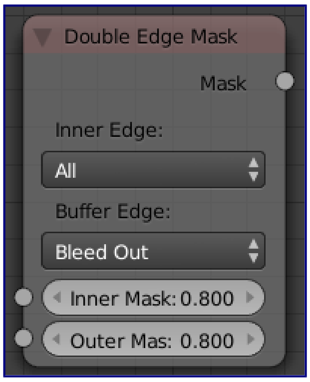
Color Key Node



Color Key Node

The color key node creates a matte based on a specified color of the input image. The sliders represent threshold values for *Hue*, *Saturation*, and *Value*. Higher values in this node’s context mean a wider range of colors from the specified will be added to the matte.

Double Edge Mask Node



Double Edge Mask Node

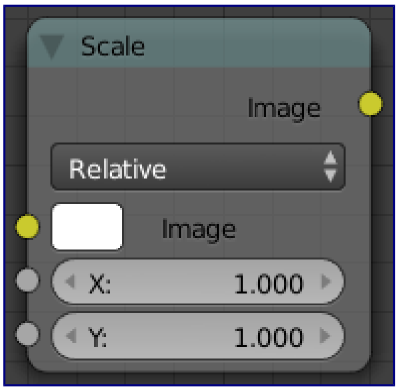
TODO - see: https://developer.Bforartists.org/T43469

Distort Nodes

These nodes distort the image in some fashion, operating either uniformly on the image, or by using a mask to vary the effect over the image.

- Scale Node
- Lens Distortion Node
- Movie Distortion Node
- Translate Node
- Rotate Node
- Flip Node
- Crop Node
- Displace Node
- Map UV Node
- Transform Node
- Stabilize 2D
- Plane Track Deform Node
- Corner Pin Node

Scale Node



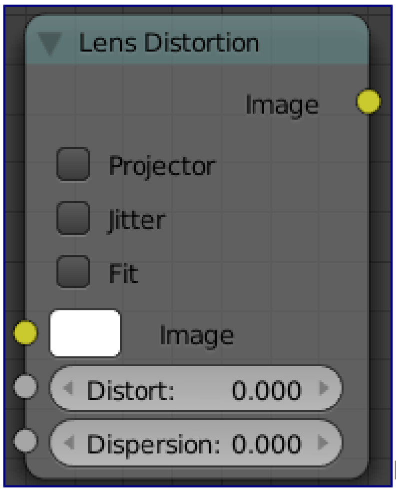
Scale Node

This node scales the size of an image. Scaling can be either absolute or relative. If Absolute toggle is on, you can define the size of an image by using real pixel values. In relative mode percents are used.

For instance X: `0.5` and Y: `0.5` would produce image which width and height would be half of what they used to be. When expanding an image greatly, you might want to blur it somewhat to remove the square corners that might result. Unless of course you want that effect; in which case, ignore what I just said.

Use this node to match image sizes. Most nodes produce an image that is the same size as the image input into their top image socket. So, if you want to uniformly combine two images of different size, you must scale the second to match the resolution of the first.

Lens Distortion Node



Lens Distortion Node

Use this node to simulate distortions that real camera lenses produce.

Distort
: This creates a bulging or pinching effect from the center of the image.

Dispersion
: This simulates chromatic aberration, where different wavelengths of light refract slightly differently, creating a rainbow colored fringe.

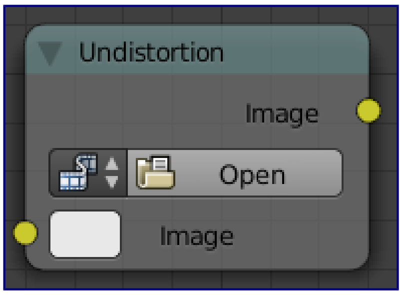
Projector
: Enable or disable slider projection mode. When on, distortion is only applied horizontally. Disables *Jitter* and *Fit*.

Jitter
: Adds jitter to the distortion. Faster, but noisier.

Fit

Scales image so black areas are not visible. Only works for positive distortion.

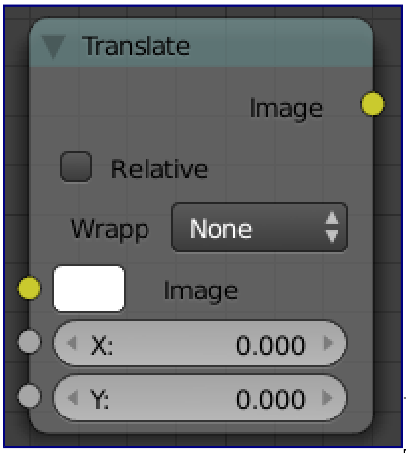
Movie Distortion Node



Movie Distortion Node

TODO - see: https://developer.Bforartists.org/T43469

Translate Node



Transform Node

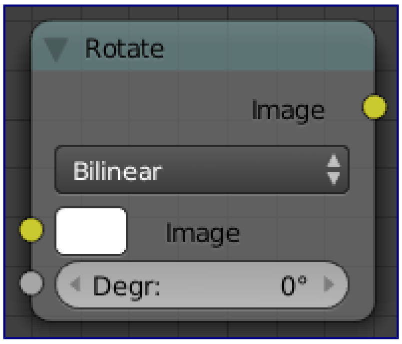
The translate node translates (moves) an image by the specified amounts in the X and Y directions. X and Y are in pixels, and can be positive or negative. To shift an image up and to the left, for example, you would specify a negative X offset and a positive Y.

Usage

This node can be used for:

- Movie credits.
- Moving a matte.
- Camera shake.

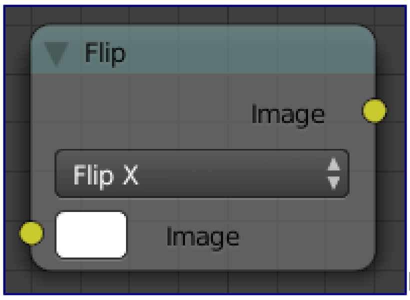
Rotate Node



Rotate Node

This node rotates an image. Positive values rotate clockwise and negative ones counterclockwise.

Flip Node

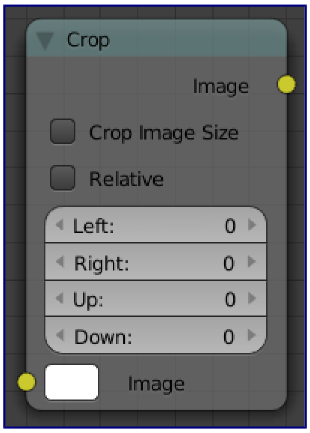


Flip Node

This node flips an image at defined axis that can be either X or Y. Also flipping can be done on both X and Y axis' simultaneously.

You can use this node to just flip or use it as a part of mirror setting. Mix half of the image to be mirrored with its flipped version to produce mirrored image.

Crop Node



Crop Node

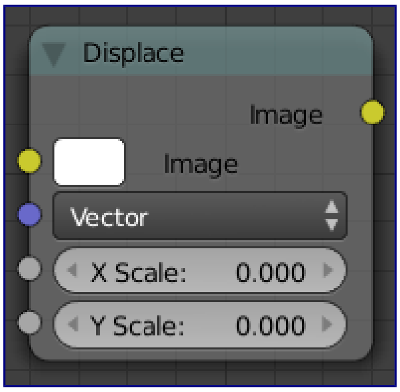
The Crop Node takes an input image and crops it to a selected region.

Crop Image Size
When enabled, the image size is cropped to the specified region. When disabled, image remains the same size, and uncropped areas become transparent pixels.

Relative
When enabled, crop dimensions are a percentage of the image’s width and height. When disabled, the range of the sliders are the width and height of the image in pixels.

Crop Region Values
These sliders define the lower, upper, left, and right borders if the crop region.

Displace Node



Displace Node

Ever look down the road on a hot summer day? See how the image is distorted by the hot air? That’s because the light is being bent by the air; the air itself is acting like a lens. This fancy little node does the same thing; it moves an input image’s pixels based on an input vector mask (the vector mask mimics the effect of the hot air).

This can be useful for a lot of things, like hot air distortion, quick-and-dirty refraction, compositing live footage behind refracting objects like looking through bent glass or glass blocks, and more! Remember what HAL saw in 2001:Space Odyssey; that distorted wide-angle lens? Yup, this node can take a flat image and apply a mask to produce that image.

The amount of displacement in the X and Y directions is determined by

- The value of the mask’s channels:
- The scaling of the mask’s channels

The (red) channel 1’s value determines displacement along the positive or negative X axis. The (green) channel 2’s value determines displacement along the positive or negative Y axis.

If both the channels’ values are equal (i.e. a greyscale image), the input image will be displaced equally in both X and Y directions, and also according to the X scale and Y scale buttons. These scale button act as multipliers to increase or decrease the strength of the displacement along their respective axes. They need to be set to non-zero values for the node to have any effect.

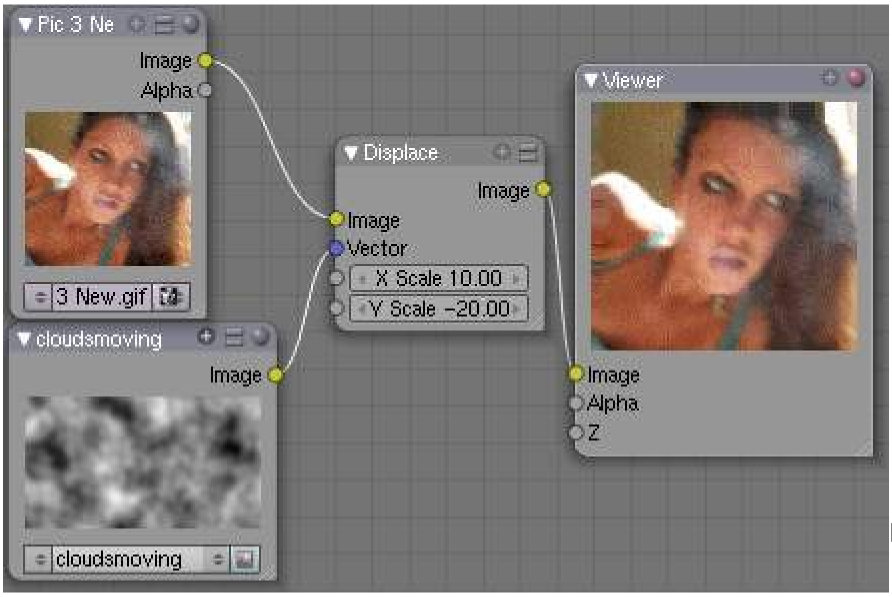
Because of this, you can use the displace node in two ways, with a greyscale mask (easy to paint, or take from a procedural texture), or with a vector channel or RGB image, such as a normal pass, which will displace the pixels based on the normal direction.

Example

In this example, she’s singing about dreams of the future. So, to represent this, we use a moving clouds texture (shot just by rendering the cloud texture on a moving plane) as the displacement map. Now, the colors in a black and white image go from zero (black) to one (white), which, if fed directly without scaling would only shift the pixels one position. So, we scale their effect in the X and Y direction.

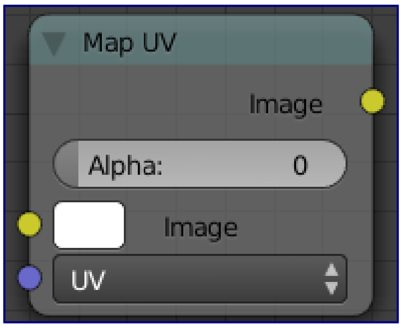
Upon reviewing it, sometimes stretching in both the X and Y direction made her face look fat, and we all can guess her reaction to looking fat on camera. SO, we scale it only half as much in the X so her face looks longer and thinner. Now, a single image does not do justice to the animation effect as the cloud moves, and this simple noodle does not reflect using blur and overlays to enhance (and complicate) the effect, but this is the core.

Photos courtesy of Becca, no rights reserved. See also some movies of this node in action, made by the wizard programmer himself, by following this external link



Music Video Distortion Example Using Displace

Map UV Node



Map UV Node

So, I think we all agree that the problem is...we just don’t know what we want. The same is true for directors. Despite our best job texturing our models, in post-production, inevitably the director changes their mind. “Man, I really wish he looked more ragged. Who did makeup, anyway?” comes the remark. While you can do quite a bit of coloring in post-production, there are limits. Well, now this little node comes along and you have the power to **re-texture your objects** *after* **they have been rendered**. Yes, you read that right; it’s not a typo and I’m not crazy. At least, not today.

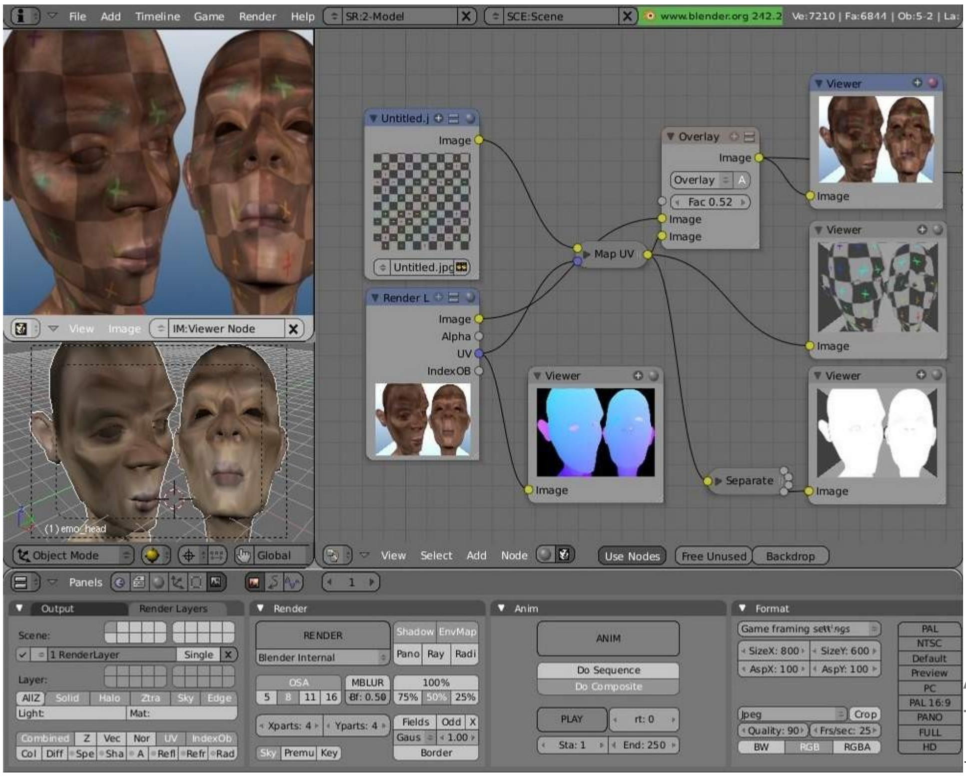
Using this node (and having saved the UV map in a multilayer OpenEXR format image sequence), you can apply new flat image textures to all objects (or individual objects if you used the very cool *ID Mask Node* to enumerate your objects) in the scene.

Thread the new UV Texture to the Image socket, and the UV Map from the rendered scene to the UV input socket. The resulting image is the input image texture distorted to match the UV coordinates. That image can then be overlay mixed with the original image to paint the texture on top of the original. Adjust alpha and the mix factor to control how much the new texture overlays the old.

Of course, when painting the new texture, it helps to have the UV maps for the original objects in the scene, so keep those UV texture outlines around even after all shooting is done.

Examples

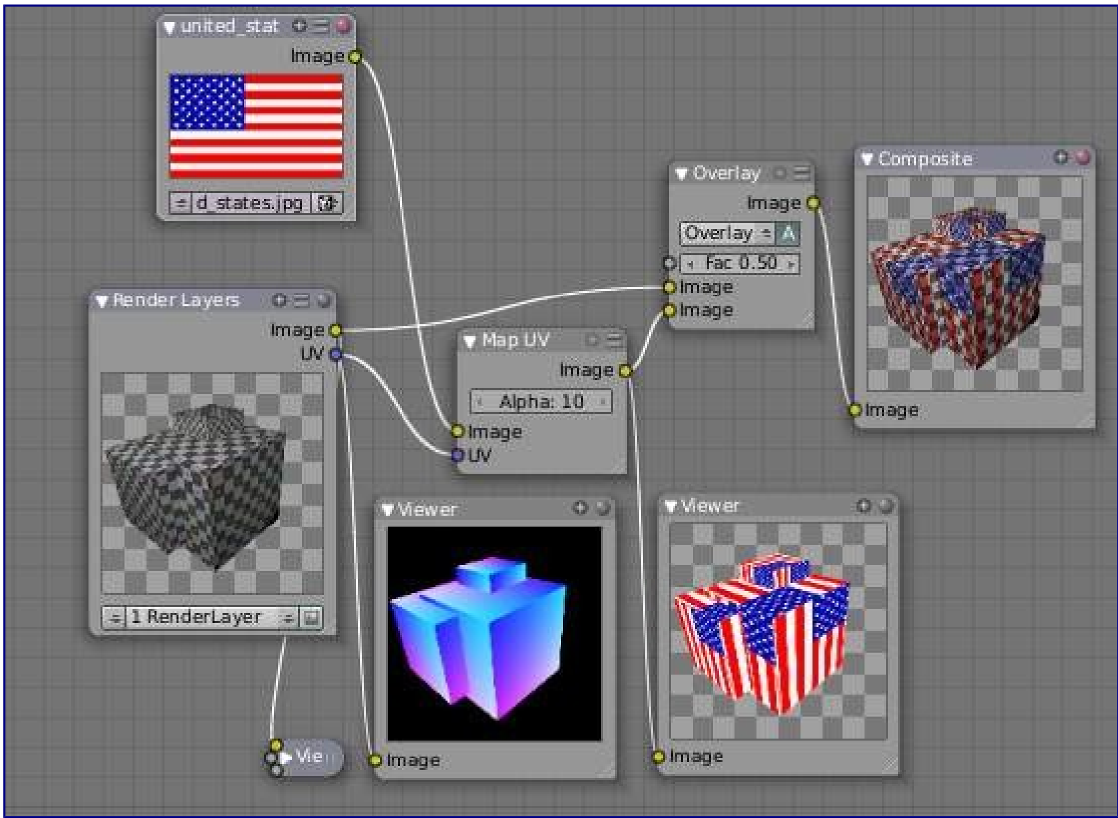
In the example below, we have overlaid a grid pattern on top of the two Emo heads after they have been rendered. During rendering, we enabled the UV layer in the RenderLayer tab (Buttons window, Render Context, RenderLayer tab). Using a mix node, we mix that new UV Texture over the original face. We can use this grid texture to help in any motion tracking that we need to do.



Adding a Grid UV Textures for Motion Tracking

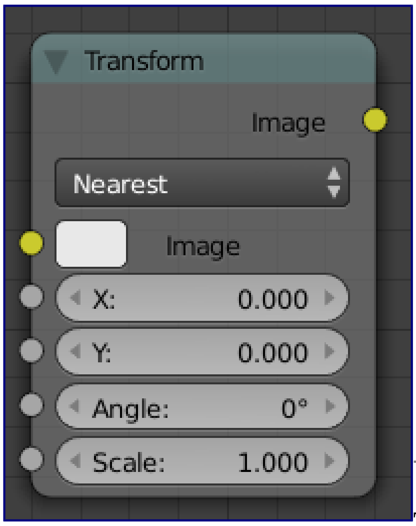
In the next example, we overlay a flag on top of a cubie-type thing, and we ensure that we Enable the Alpha pre-multiply button on the Mix node. The flag is used as additional UV Texture on top of the grid. Other examples include the possibility that we used an unauthorized product box during our initial animation, and we need to substitute in a different product sponsor after rendering.

Of course, this node does NOT give directors the power to rush pre-production rendering under the guise of “we’ll fix it later”, so maybe you don’t want to tell them about this node. Let’s keep it to ourselves for now.



Adding UV Textures in Post-Production

Transform Node



Transform Node

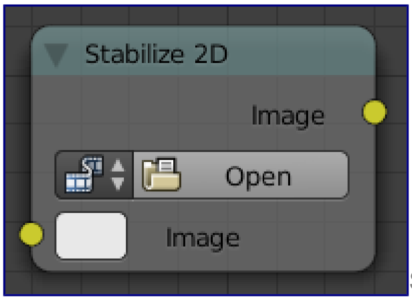
This node combines the functionality of three other nodes: *Scale*, *translate*, and *rotate* nodes.

X, Y
Used to move the input image horizontally and vertically.

Angle
Used to rotate an image around its center. Positive values rotate counter-clockwise and negative ones clockwise.

Scale
Used to resize the image. The scaling is relative, meaning a value of 0.5 gives half the size and a value of 2.0 gives twice the size of the original image.

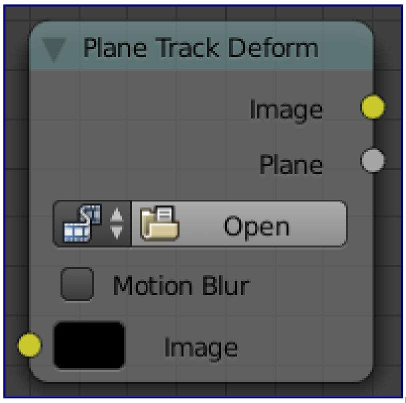
Stabilize 2D



Scale Node

TODO - see: https://developer.Bforartists.org/T43469

Plane Track Deform Node

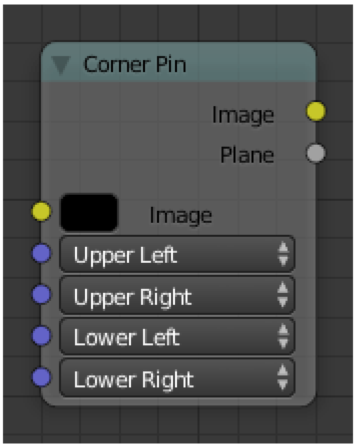


Plane Track Deform Node

TODO - see: https://developer.Bforartists.org/T43469

Corner Pin Node

Corner Pin Node



Corner Pin Node.

The Corner Pin node uses explicit corner values for a plane warp transformation. It works like the Plane Track Deform node, but without using "plane track" data from the Movie Clip Editor.

Inputs

Image
Standard image input.

Corners
Four vector inputs to define the plane warping. (Z-component of vector inputs is ignored.)

Properties

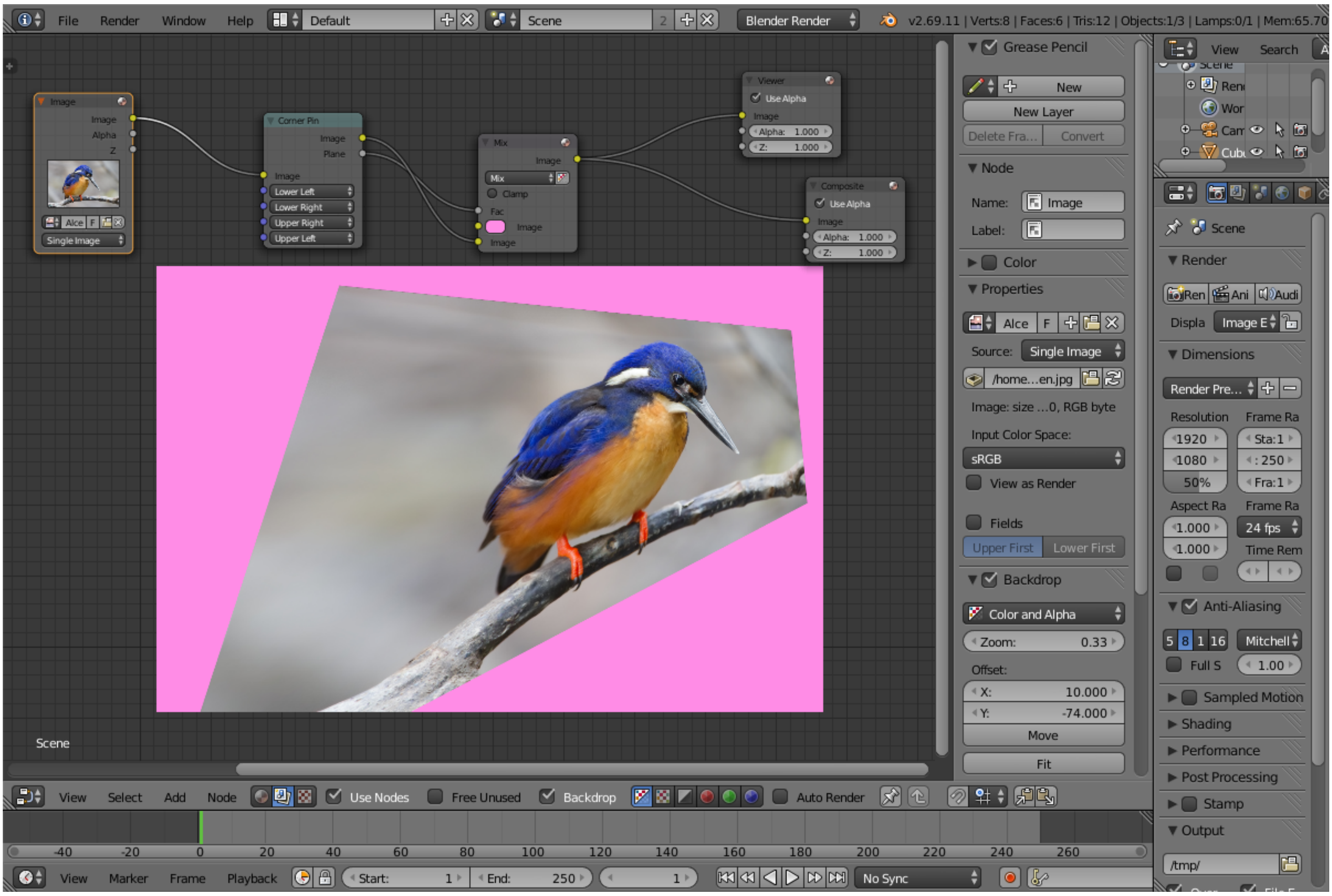
This node has no properties.

Outputs

Image
Standard image output. (The image after distorting.)

Plane
A black and white alpha mask of the plane.

Example



An example of the Conner Pin node.

In the example above, the image of the bird is distorted by the vectors specified by the Corner Pin node.

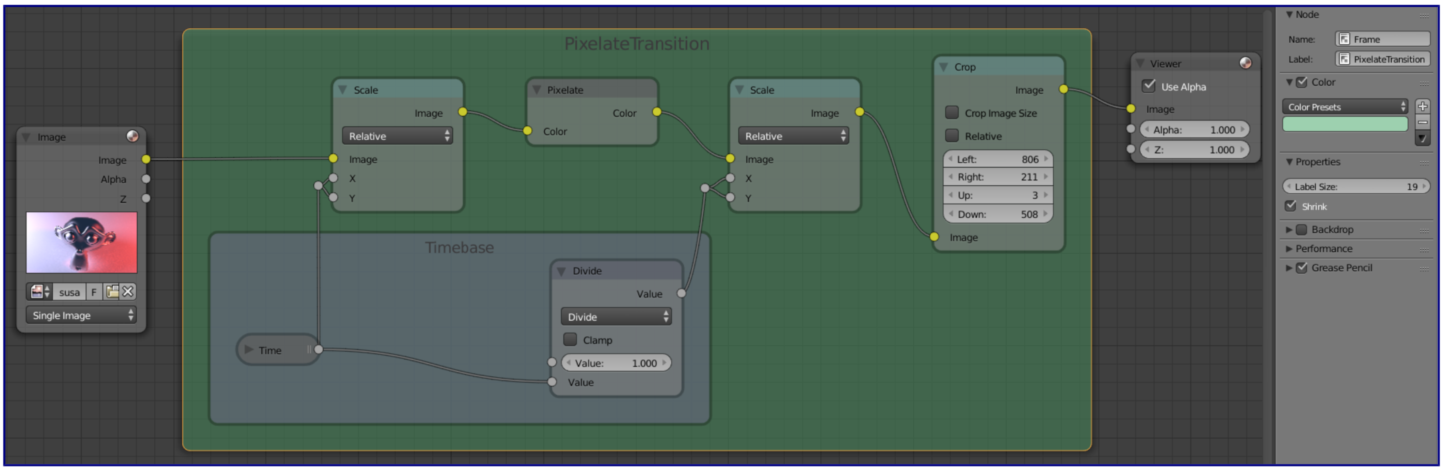
Layout Nodes

These are nodes which help you control the layout and connectivity of nodes within the Compositor.

- Frame Node
- Reroute Node
- Switch Node

Frame Node

The Frame node is a useful tool for organizing nodes by collecting related nodes together in a common area. Frames are useful when a node setup becomes large and confusing yet the re-usability of a Node Group is not required.



Adding and Removing Nodes

Once a Frame node is placed in the editor, nodes can be added by simply dropping them onto the frame or by selecting the node(s) then the frame and using `Ctrl-P`.

To remove them select the node(s) and use the `Alt-P` shortcut. This uses the same default keyboard bindings as Parenting and can be thought of as a similar concept.

Resizing Frame

When the Frame node is first placed in the node editor workspace it may be resized by dragging one of the edges.

Once a node is placed in the Frame, the Frame shrinks around it so as to remove wasted space. At this point it is no longer possible to grab the edge of the Frame to resize it, instead resizing occurs automatically when nodes within the Frame are rearranged.

This behavior can be changed by disabling the *Shrink* option in the Properties tab of the Properties region (N).

Label and Color

Frame Nodes can be given a title by modifying the Label field in the properties panel. Label size can be changed as well so that, for example, subordinate Frames have smaller titles.

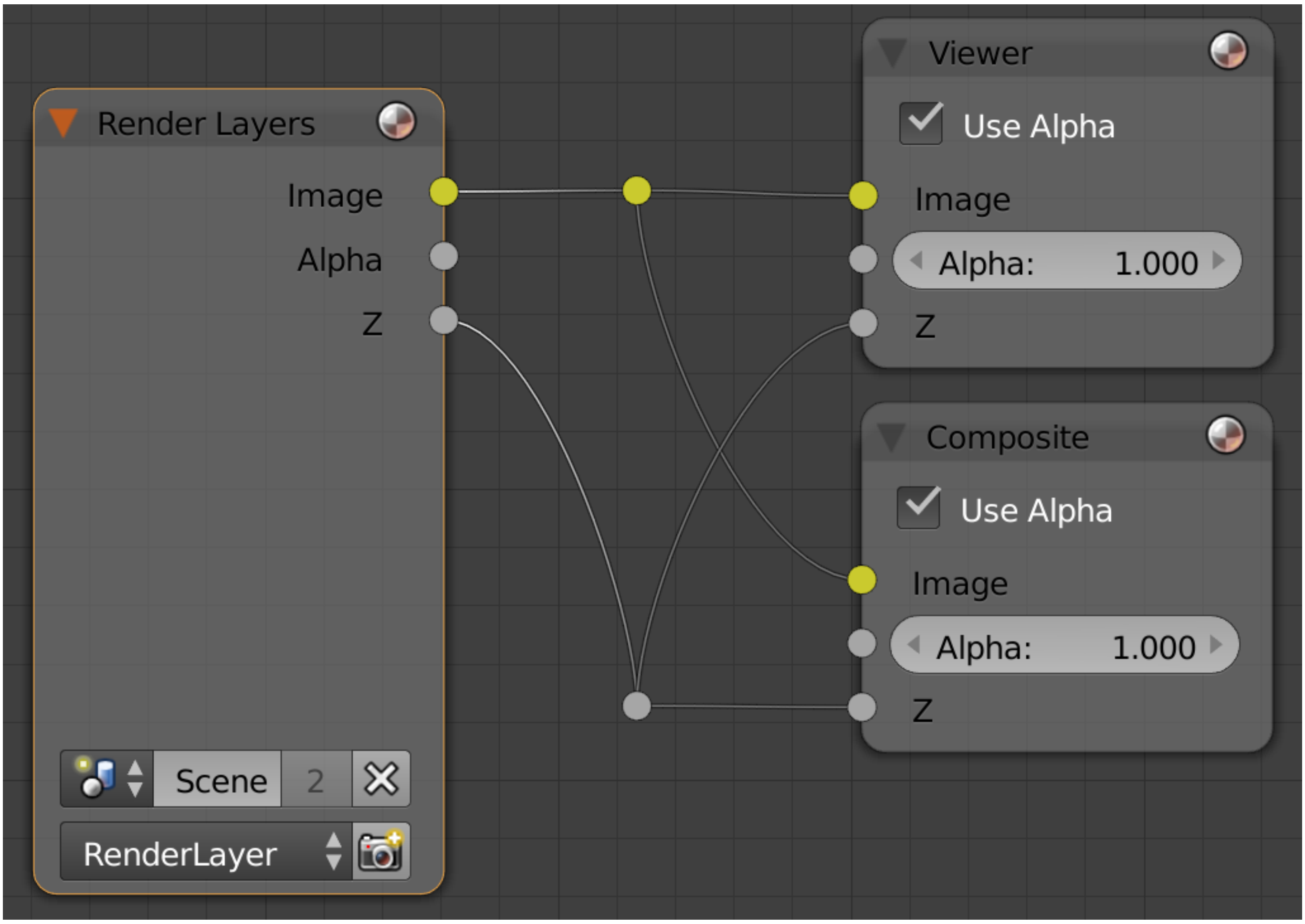
Frame Node colors can be applied from the properties panel which can be used to provide a powerful visual cue.

Once a satisfactory color is found it may be saved as a preset for re-use in other Frame nodes. To do this press the + button next to the Color Presets drop down in the properties panel and add a name for the preset. To delete a preset first choose that preset for the active Frame and press the - button in the properties panel.

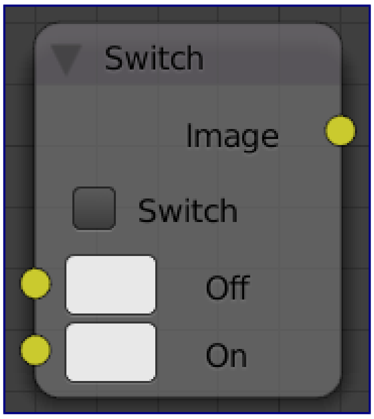
Reroute Node

A node used primarily for organization. Reroute looks and behaves much like a socket on other nodes in that it supports one input connection while allowing multiple output connections.

To quickly add a Reroute node into an existing connection, hold `Shift` and `LMB` while sweeping across the link to 'cut' in a new node.



Switch Node



Switch Node

Switch between two images using a checkbox. When the checkbox is checked, the ‘On’ input is output. When it is unchecked the ‘Off’ input is output instead. Switch state may be animated by adding a *keyframe* This makes the Switch node useful for bypassing nodes which are not wanted during part of a sequence.

12 User Preferences

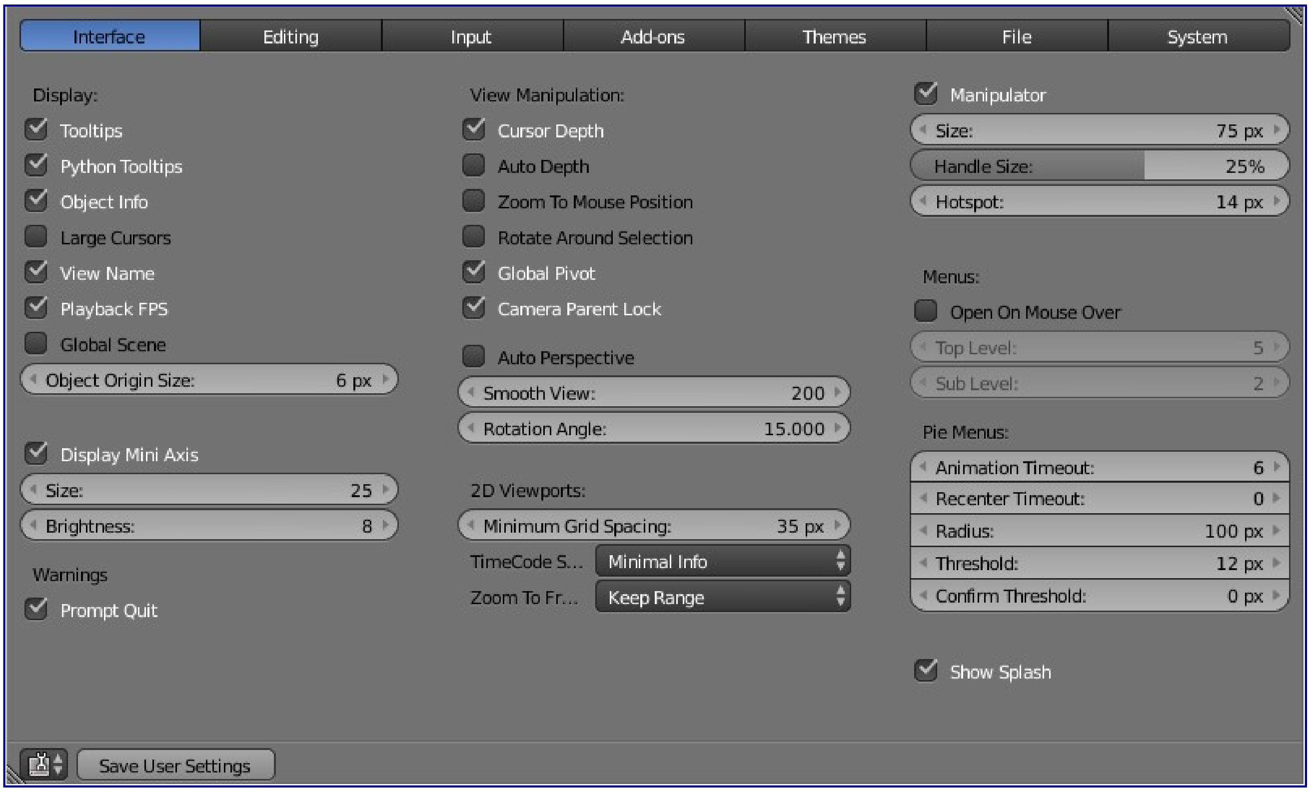
User Preferences

This chapter explains how to change Bforartists’s default configuration with the *User Preferences* editor.

The Bforartists *User Preferences* editor contains settings to to control how Bforartists behaves.

Open User Preferences

To open a Bforartists *User Preferences* editor go to File ‣ User Preferences.



Configure

Now that you have opened the User Preferences editor, you can configure Bforartists to your liking. At the top of the window, the available options are grouped into seven tabs:

Interface
Change how UI elements are displayed and how they react.

Editing
Control how several tools will interact with your input.

Input
Customize how Bforartists reacts to the mouse and keyboard as well as define your own keymap.

Add-ons
: Manage Bforartists's *Add-ons*, allowing you to access features not built-in as well as install new features.

Themes
: Customize interface appearance and colors.

File
: Configure auto-save preferences and set default file paths for .blend files, rendered images, and more.

System
: Set resolution, scripting console preferences, sound, graphics cards, and internationalization.

Save the new preferences

Once you have set your preferences, you will need to manually save them, otherwise the new configuration will be lost after a restart. Bforartists saves its preferences to *userpref.blend* in your user folder (see next section, "Load Factory Settings", for details).

In the *User Preferences* window, click on the *Save User Settings* button in the bottom left. This will save all of the new preferences.

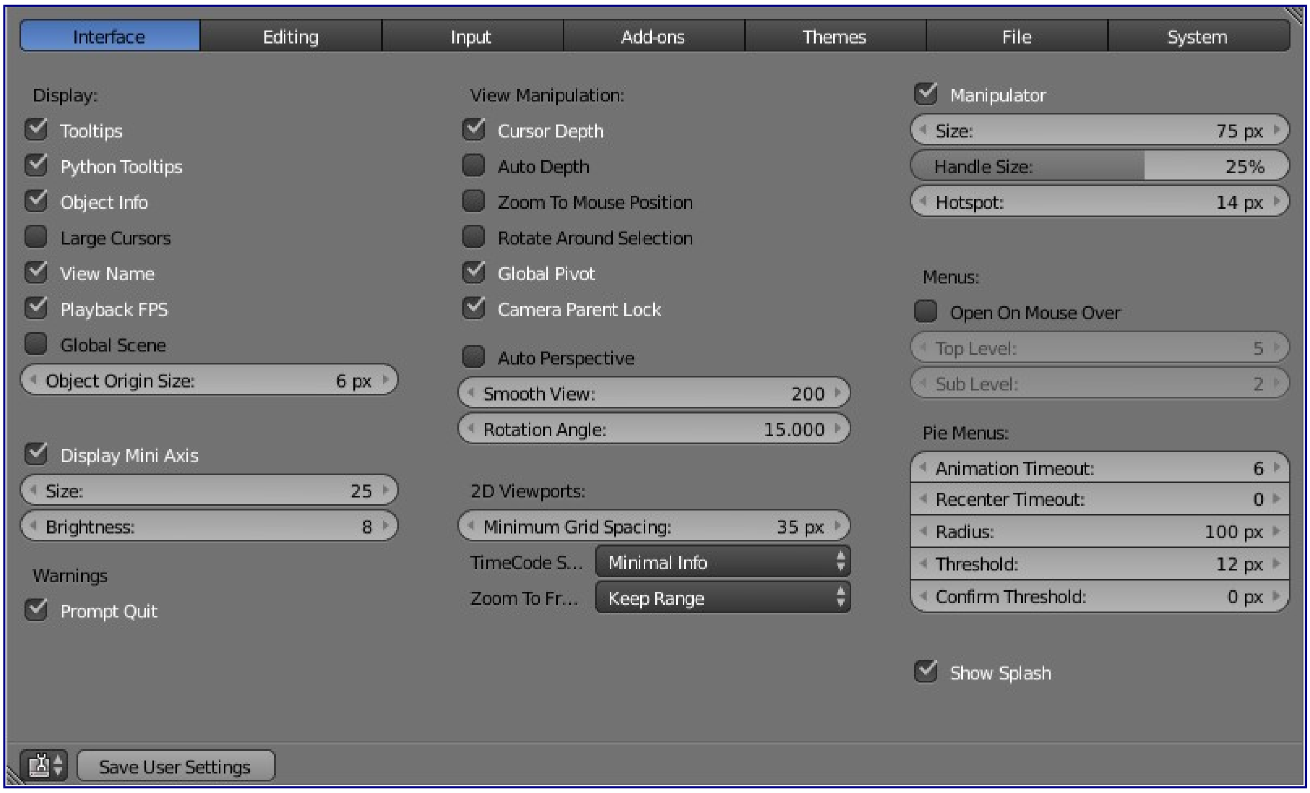
Load Factory Settings

Go to File ‣ Load Factory Settings then save the preferences via the *User Preferences* editor.

Hint
It can be valuable to make a backup of your preferences the event that you lose your configuration. See the *directory layout* section to see where your preferences are stored.

Interface

Interface configuration lets you change how UI elements are displayed and how they react.



Display

Tooltips

When enabled, a tooltip will appear when your mouse pointer is over a control. This tip explains the function of what's under the pointer, gives the associated hotkey (if any) and the Python function that refers to it.

Object Info

Display the active Object name and frame number at the bottom left of the 3D view.

Large Cursors

Use large mouse cursors when available.

View Name

Display the name and type of the current view in the top left corner of the 3D window. For example: *User Persp* or *Top Ortho*.

Playback FPS

Show the frames per second screen refresh rate while an animation is played back. It appears in the viewport corner, displaying red if the frame rate set can't be reached.

Global Scene

Forces the current scene to be displayed in all screens (a project can consist of more than one scene).

Object Origin Size

Diameter of 3D Object centers in the view port (value in pixels from 4 to 10).

Display Mini Axis

Show the mini axis at the bottom left of the viewport.

Size

Size of the mini axis.

Brightness

Adjust brightness of the mini axis.

View manipulation

Cursor Depth

Use the depth under the mouse when placing the cursor.

Auto Depth

Use the depth under the mouse to improve view pan/rotate/zoom functionality.

Zoom to Mouse Position

When enabled, the mouse pointer position becomes the focus point of zooming instead of the 2D window center. Helpful to avoid panning if you are frequently zooming in and out.

Rotate Around Selection

The selected object becomes the rotation center of the viewport. When there is no selection the last selection will be used.

Hint
This may seem ideal behavior, however it can become problematic with larger objects such as a terrain-mesh, where the center isn't necessarily your point of interest.

Global Pivot

Lock the same rotation/scaling pivot in all 3D views.

Auto Perspective

Automatically to perspective Top/Side/Front view after using User Orthographic. When disabled, Top/Side/Front views will retain Orthographic or Perspective view (whichever was active at the time of switching to that view).

Smooth View

Length of time the animation takes when changing the view with the numpad (Top/Side/Front/Camera...). Reduce to zero to remove the animation.

Rotation Angle

Rotation step size in degrees, when `Numpad4`, `Numpad6`, `Numpad8`, or `Numpad2` are used to rotate the 3D view.

2D Viewports

Minimum Grid Spacing

The minimum number of pixels between grid lines in a 2D (i.e. top orthographic) viewport.

TimeCode Style

Format of Time Codes displayed when not displaying timing in terms of frames. The format uses '+' as separator for sub-second frame numbers, with left and right truncation of the timecode as necessary.

Manipulator

Permits configuration of the 3D transform manipulator which is used to drag, rotate and resize objects (Size, Handle size).

Menus

Open on Mouse Over

Select this to have the menu open by placing the mouse pointer over the entry instead of clicking on it.

Menu Open Delay

Time for the menu to open.

Top Level

Time delay in 1/10 second before a menu opens (*Open on Mouse Over* needs to be enabled).

Sub Level

Same as above for sub menus (for example: File ‣ Open Recent).

Editing

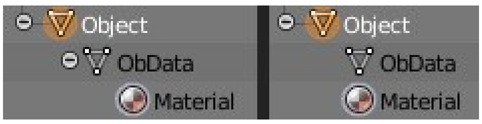
These preferences control how several tools will interact with your input.

Link Materials To

Example for a Mesh

To understand this option properly, you need to understand how Bforartists works with Objects. Almost everything in Bforartists is organized in a hierarchy of data-blocks. A data-block can be thought of as containers for certain pieces of information. For example, the Object data-block contains information about the Object's location while the Object Data (*ObData*) data-block contains information about the mesh.

A material may be linked in two different ways:



A material linked to ObData (left) and Object (right).

ObData

Any created material will be created as part of the ObData data-block.

Object

Any created material will be created as part of the Object data-block.

Read more about Bforartists's Data System

New objects

Enter Edit Mode

If selected, Edit Mode is automatically activated when you create a new object.

Align To

World

New objects align with world coordinates.

View

New object align with view coordinates.

Undo

Global Undo

This enables Bforartists to save actions done when you are **not** in *Edit Mode*. For example, duplicating Objects, changing panel settings or switching between modes.

Warning

While disabling this option does save memory, it stops the redo panel from functioning, also preventing tool options from being changed in some cases.

For typical usage, its best to keep this enabled.

Step

Number of Undo steps available.

Memory Limit

Maximum memory usage in Mb (0 is unlimited).

Read more about Undo and Redo options

Grease Pencil

Grease Pencil permits you to draw in the 3D viewport with a pencil-like tool.

Manhattan Distance

The minimum number of pixels the mouse has to move horizontally or vertically before the movement is recorded.

Euclidian Distance

The minimum distance that mouse has to travel before movement is recorded.

Eraser Radius

The size of the eraser used with the grease pencil.

Smooth Stroke

Smooths the pencil stroke after it's finished.

Playback

Allow Negative Frame
If set, negative framenumbers might be used.

Keyframing

In many situations, animation is controlled by keyframes. The state of a value (e.g. location) is recorded in a keyframe and the animation between two keyframes is interpolated by Bforartists.

Visual Keying
Use Visual keying automatically for constrained objects.
Only Insert Needed
When enabled, new keyframes will be created only when needed.
Auto Keyframing

Automatic keyframe insertion for Objects and Bones. Auto Keyframe is not enabled by default.

Only Insert Available
Automatic keyframe insertion in available curves.
New F-Curve Defaults
Interpolation
This controls how the state between two keyframes is computed. Default interpolation for new keyframes is Bezier which provides smooth acceleration and de-acceleration whereas Linear or Constant is more abrupt.
XYZ to RGB
Color for X, Y or Z animation curves (location, scale or rotation) are the same as the color for the X, Y and Z axis.

Transform

Release confirm
Dragging `LMB` on an object will move it. To confirm this (and other) transforms, a `LMB` is necessary by default. When this option is activated, the release of `LMB` acts as confirmation of the transform.

Sculpt Overlay Color

This color selector allows the user to define a color to be used in the inner part of the brushes circle when in sculpt mode, and it is placed as an overlay to the brush, representing the focal point of the brush influence. The overlay color is visible only when the overlay visibility is selected (clicking at the *eye* to set its visibility), and the transparency of the overlay is controled by the alpha slider located at the brush selector panel, located at the top of the tool shelf, when in sculpt mode.

Duplicate Data

The ‘Duplicate Data’ check-boxes define what data is copied with a duplicated Object and what data remains linked. Any boxes that are checked will have their data copied along with the duplication of the Object. Any boxes that are not checked will instead have their data linked from the source Object that was duplicated.

For example, if you have Mesh checked, then a full copy of the mesh data is created with the new Object, and each mesh will behave independently of the duplicate. If you leave the mesh box unchecked then when you change the mesh of one object, the change will be mirrored in the duplicate Object.

The same rules apply to each of the check-boxes in the ‘Duplicate Data’ list.

Input

In the Input preferences, you can customize how Bforartists reacts to the mouse and keyboard as well as define your own keymap.

Managing presets

Bforartists lets you define multiple *Preset* input configurations. Instead of deleting the default keymap to create yours, you can just add new *Presets* for both the mouse and keyboard. Mouse options can be found on the left hand side of the window and keyboard options to the right in the above picture.

Adding and deleting presets

Before changing anything in the default configuration, click on the “plus” symbol shown in the picture to add a new *Preset*. Bforartists will ask you to name your new preset after which you can select the *Preset* from the list to edit it. If you want to delete your *Preset*, select it from the list and then click the “minus” symbol.

Selecting presets

You can change the preset you are using by doing one of the following:

- Selecting the configuration from the *Interaction* menu of the splash screen at startup or by selecting Help ‣ Splash Screen.
- Selecting the configuration from the *User Preferences Input* window.

Note
Note that either of the above options will only change the preset for the current file. If you select File ‣ New or File ‣ Open, the default preset will be re-loaded.

Setting presets to default

Once you’ve configured your mouse and keyboard *Presets*, you can make this the default configuration by:

- Opening the *User Preferences Input* editor and select your presets from the preset list or,
- Selecting your preset configuration from the splash screen.
- Saving your configuration using the *Save As Default* option from a *User Preferences* window or by pressing `Ctrl-U`.

Export/Import key configuration

In some cases, you may need to save your configuration in an external file (e.g. if you need to install a new system or share your keymap configuration with the community). Simply `LMB` *Export Key Configuration* on the *Input* tab header and a file browser will open so that you can choose where to store the configuration. The *Import Key Configuration* button installs a keymap configuration that is on your computer but not in Bforartists.

Mouse

Emulate 3 Button Mouse

Bforartists can be configured to work with pointing devices which don’t have a middle-mouse button (such as a two-button mouse, Apple single-button mouse, or laptop touch-pad). The functionality of the 3 mouse buttons will then be be emulated with key/mouse-button combinations as shown in the table below.

Shortcuts for supported mouse hardware

3-button Mouse	2-button Mouse	Apple Mouse
`LMB`	`LMB`	`LMB` (mouse button)
`MMB`	`Alt-LMB`	`Alt-LMB` (Option/Alt key + mouse button)
`RMB`	`RMB`	`Cmd-LMB` (Command/Apple key + mouse button)

Mouse/Keyboard combinations refrenced in this manual can be expressed with the combinations shown in the table. For Example.

- `MMB` drag becomes `Alt-LMB` drag.
- `Shift-Alt-RMB` becomes `Shift-Alt-Cmd-LMB` on a single-button mouse.

Continuous Grab

This feature is used to prevent the problem where an action such as grabbing or panning a view, is limited by your screen bounds.

This is done by warping the mouse within the view.

Note
Cursor warping is only supported by *relative* input devices (mouse, trackball, trackpad). Graphics tablets however, typically use *absolute* positioning, this feature is disabled when a tablet is being used This is detected for each action, so the presence of a tablet wont disable continuous-grab for mouse cursor input.

Drag Threshold
The number of pixels that a User Interface element has to be moved before it is recognized by Bforartists.

Select with
You can choose which button is used for selection (the other one is used to place the 3D cursor).

Double Click
The time for a double click (in ms).

Note
The Mouse emulate option is only available if *Select With* is set to *Right*.

Graphic Tablets

Graphic tablets can be used to provide a more traditional method of controlling the mouse cursor using a pen. This can help to provide a more familiar experience for artists who are used to painting and drawing with similar tools, as well as provide additional controls such as pressure sensitivity.

Note
If you are using a graphic tablet instead of a mouse and pressure sensitivity doesn't work properly, try to place the mouse pointer in the Bforartists window and then unplug/replug your graphic tablet. This might help.

Numpad Emulation

The Numpad keys are used quite often in Bforartists and are not the same keys as the regular number keys. If you have a keyboard without a Numpad (e.g. on a laptop), you can tell Bforartists to treat the standard number keys as Numpad keys. Just check *Emulate Numpad*.

View Manipulation

Orbit Style

Select how Bforartists works when you rotate the 3D view by default when holding `MMB`.

Turntable

Rotates the view keeping the horizon horizontal.

This behaves like a potters wheel or record player where you have two axes of rotation available, and the world seems to have a better definition of what is “Up” and “Down” in it.

The drawback to using the *Turntable* style is that you lose some flexibility when working with your objects. However, you gain the sense of “Up” and “Down” which can help if you are feeling disoriented.

Orbit

Is less restrictive, allowing any orientation.

Zoom Style

Choose your preferred style of zooming in and out with `Ctrl-MMB`

Scale

Scale zooming depends on where you first click in the view. To zoom out, hold `Ctrl-MMB` while dragging from the edge of the screen towards the center. To zoom in, hold `Ctrl-MMB` while dragging from the center of the screen towards the edge.

Continue

The *Continue* zooming option allows you to control the speed (and not the value) of zooming by moving away from the initial click-point with `Ctrl-MMB`. Moving up from the initial click-point or to the right will zoom out, moving down or to the left will zoom in. The further away you move, the faster the zoom movement will be. The directions can be altered by the *Vertical* and *Horizontal* radio buttons and the *Invert Zoom Direction* option.

Dolly

Dolly zooming works similarly to *Continue* zooming except that zoom speed is constant.

Vertical

Moving up zooms out and moving down zooms in.

Horizontal

Moving left zooms in and moving right zooms out.

Invert Zoom Direction

Inverts the Zoom direction for *Dolly* and *Continue* zooming.

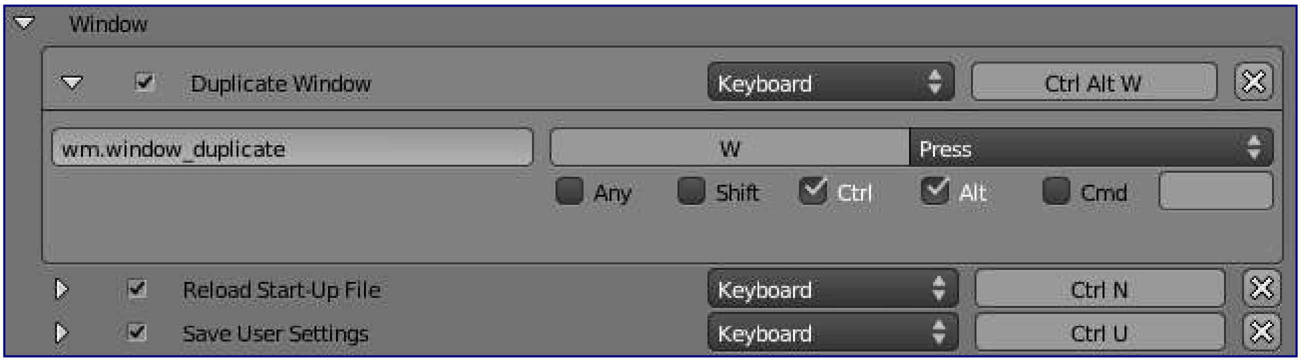
Invert Wheel Zoom Direction

Inverts the direction of the mouse wheel zoom.

NDOF device

Set the sensitivity of a 3D mouse.

Keymap editor



The Keymap editor lets you change the default Hotkeys. You can change keymaps for each window.

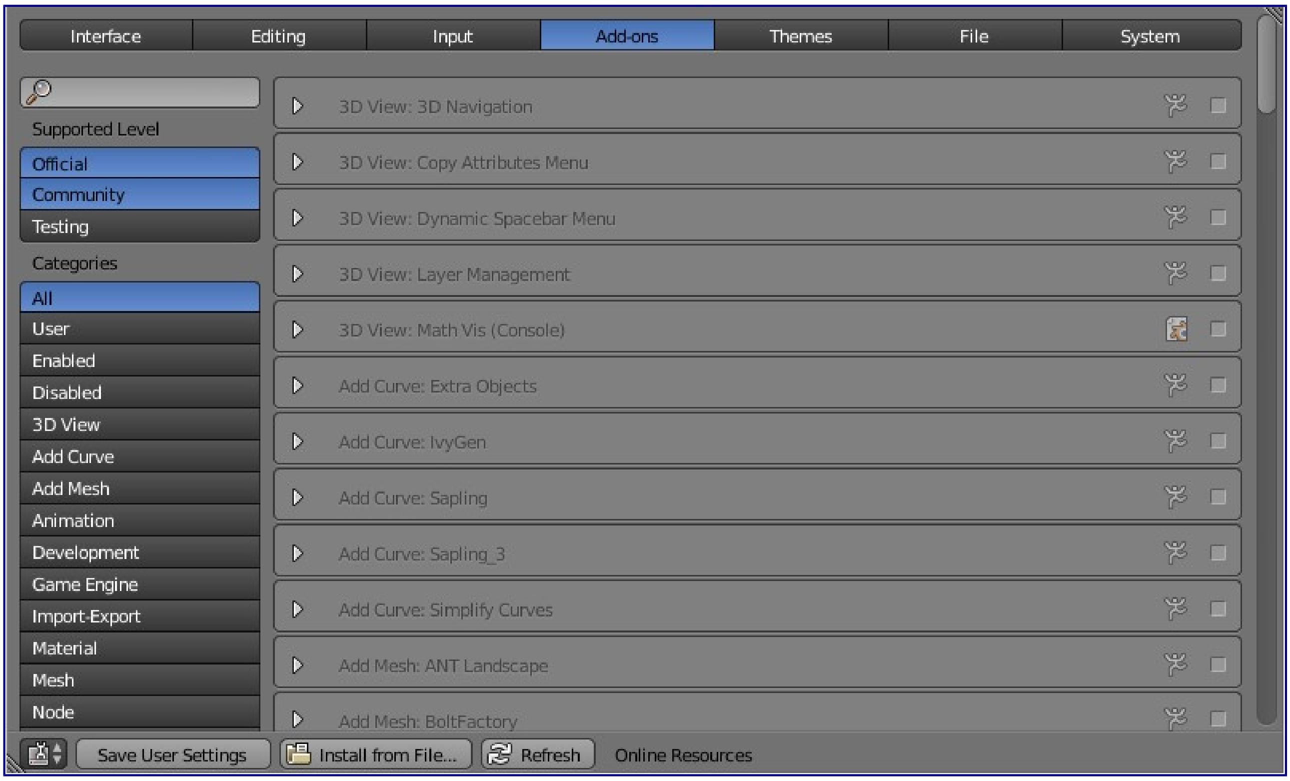
- Select the keymap you want to change and click on the white arrows to open up the keymap tree.
- Select which Input will control the function
    - Keyboard: Only hotkey or combo hotkey (`E` or `Shift-E`).
    - Mouse: Left/middle/right click. Can be combined with `Alt`, `Shift`, `Ctrl`, `Cmd`.
    - Tweak: Click and drag. Can also be combined with the 4 previous keys.
    - Text input: Use this function by entering a text
    - Timer: Used to control actions based on a time period. e.g. By default, Animation Step uses Timer 0, Smooth view uses Timer 1.
- Change hotkeys as you want. Just click on the shortcut input and enter the new shortcut.

If you want to restore the default settings for a keymap, just click on the *Restore* button at the top right of this keymap.

Add-ons

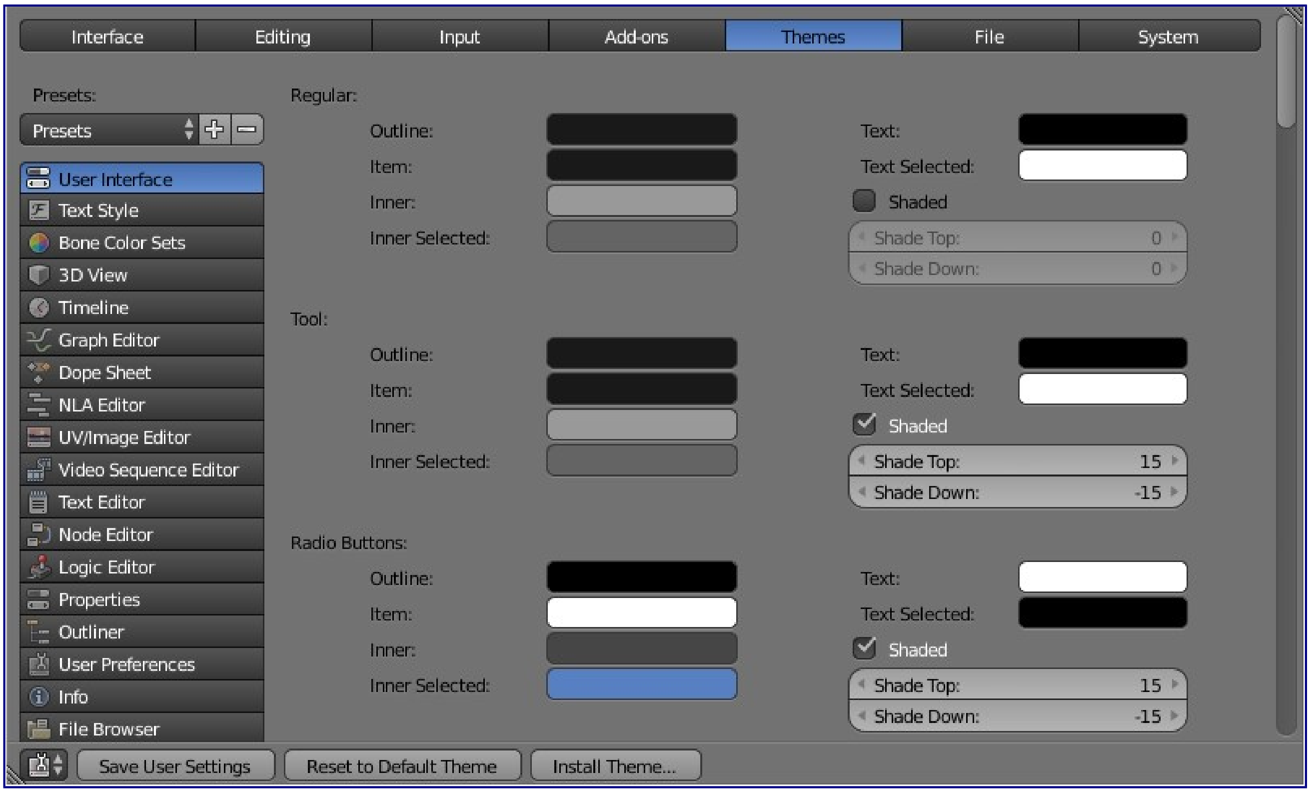
The Add-ons tab lets you manage secondary options which are not enabled in Bforartists by default. New features may be added with *Install Add-ons*. There will be a growing number of such Add-ons, generated by the Bforartists-community so look out for that one feature you were missing (or maybe simply create it yourself).

See the *Add-ons Page* for more on using Add-ons.



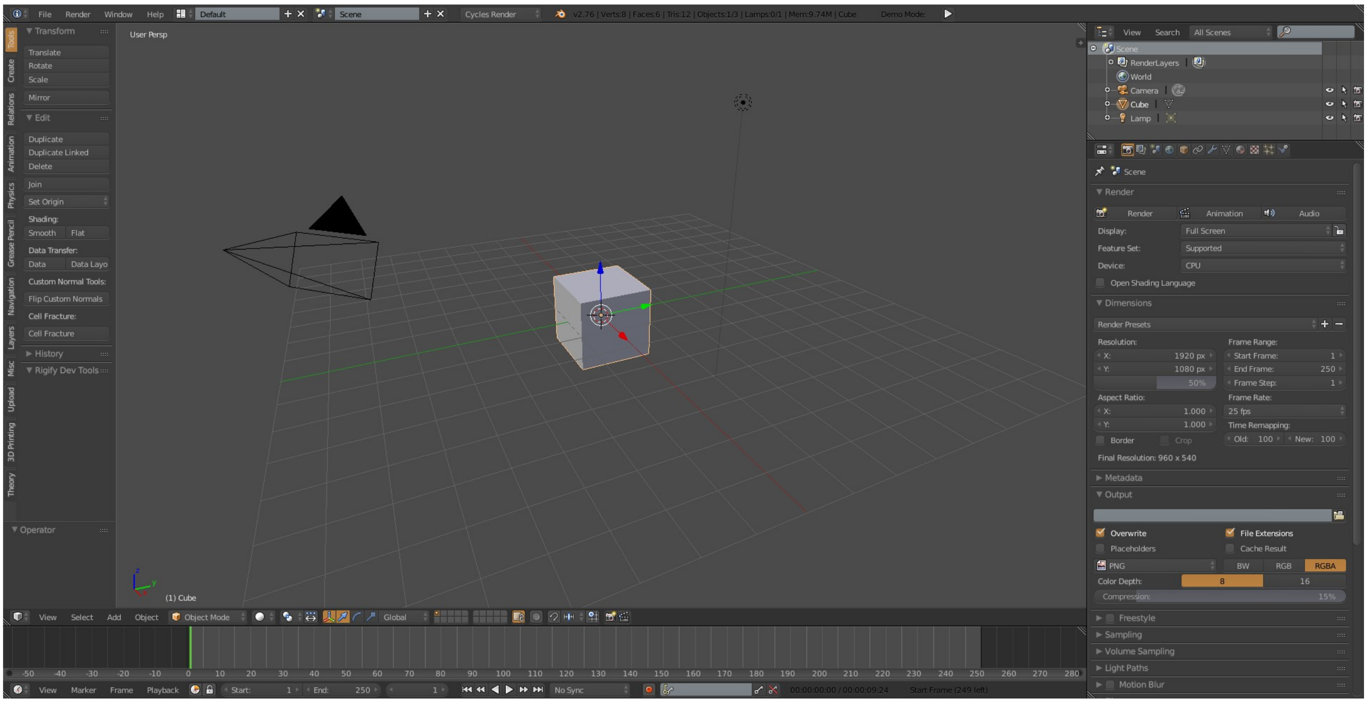
Themes

The *Themes* tab allows you to customize interface appearance and colors.



The colors for each editor can be set separately - simply select the editor you wish to change in the multi-choice list at the left, and adjust colors as required. Notice that changes appear in real-time on your screen. In addition, details such as the dot size in the *3D View* or the *Graph Editor* can also be changed.

Themes use Bforartists’s preset system. To save a theme, click the + button next to the preset selection drop-down and enter a name. This will save the theme to an XML file in the `./scripts/presets/interface_theme/` subdirectory of one of the *configuration directories*.

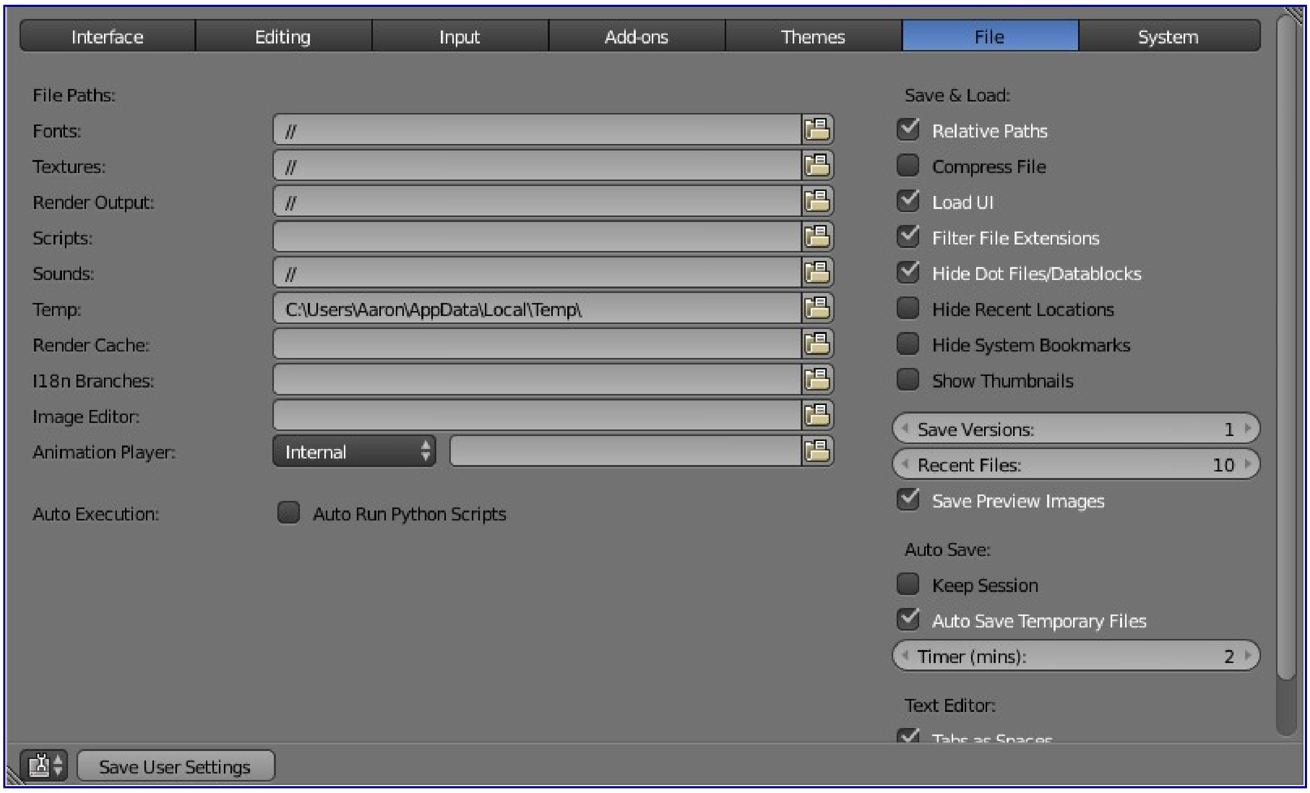


Bforartists comes bundled with a small selection of themes.

This is an example of the theme *Elsyiun*.

File Preferences

The *File Preferences* tab allows you to configure auto-save preferences and set default file paths for .blend files, rendered images, and more.



File Paths

Locations for various external files can be set for the following options:

Fonts
: Default location when searching for font files.

Textures
: Default location when searching for image textures.

Render Output
: Where rendered images/videos are saved.

Scripts
: An additional location to search for Python scripts. See Scripts Path below.

Sounds
: Default location when searching for sound files.

Temp
: The location where temporary files are stored.

Render Cache
: The location where cached render images are stored.

I18n Branches
: The path to the `/branches` directory of your local svn-translation copy, to allow translating from the UI.

Image Editor
: The path to an external program to use for image editing.

Animation Player
: The path to an external program to use for playback of rendered animations.

> **Note**
>
> If these folders do not exist, they will *not* be created automatically.

Scripts Path

By default Bforartists looks in several directories (OS dependant) for scripts. By setting a user script path in the preferences an additional directory is looked in. This can be used to store certain scripts/templates/presets independently of the currently used Bforartists Version.

Inside the specified folder specific folders have to be created to tell Bforartists what to look for where. This folder structure has to mirror the structure of the scripts folder found in the installation directory of Bforartists:

- scripts
- add-ons
- modules
- presets
- camera
- cloth
- interface_theme
- operator
- render
- ...
- startup
- templates Not all of the folders have to be present.

Auto Execution

Python scripts (including driver expressions) are not executed by default for security reasons.

Auto Run Python Scripts
: You may choose to ignore these security issues and allow scripts to be executed automatically.

Excluded Paths
: Blend files in these folders will *not* automatically run Python scripts. This can be used to define where blend files from untrusted sources are kept.

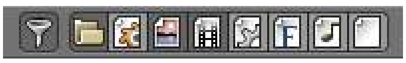
See also
Scripting & Security

Save & Load

Relative Paths
: By default, external files use a *relative path*.

Compress File
: Compress `.blend` file when saving.

Load UI
: Default setting is to load the Window layout (the *Screens*) of the saved file. This can be changed individually when loading a file from the *Open Bforartists File* panel of the *File Browser* window.



File extension filter

Filter File Extensions
By activating this, file dialog windows will only show appropriate files (i.e. `.blend` files when loading a complete *Bforartists* setting). The selection of file types may be changed in the file dialog window.

Hide Dot File/Data-blocks
Hide file which start with `.` on file browsers (in Linux and Apple systems, `.` files are hidden).

Hide Recent Locations
Hides the *Recent* panel of the *File Browser* window which displays recently accessed folders.

Show Thumbnails
Displays a thumbnail of images and movies when using the *File Browser.*

Auto Save

Save Versions
Number of versions created for the same file (for backup).

Recent Files
Number of files displayed in File ‣ Open Recent.

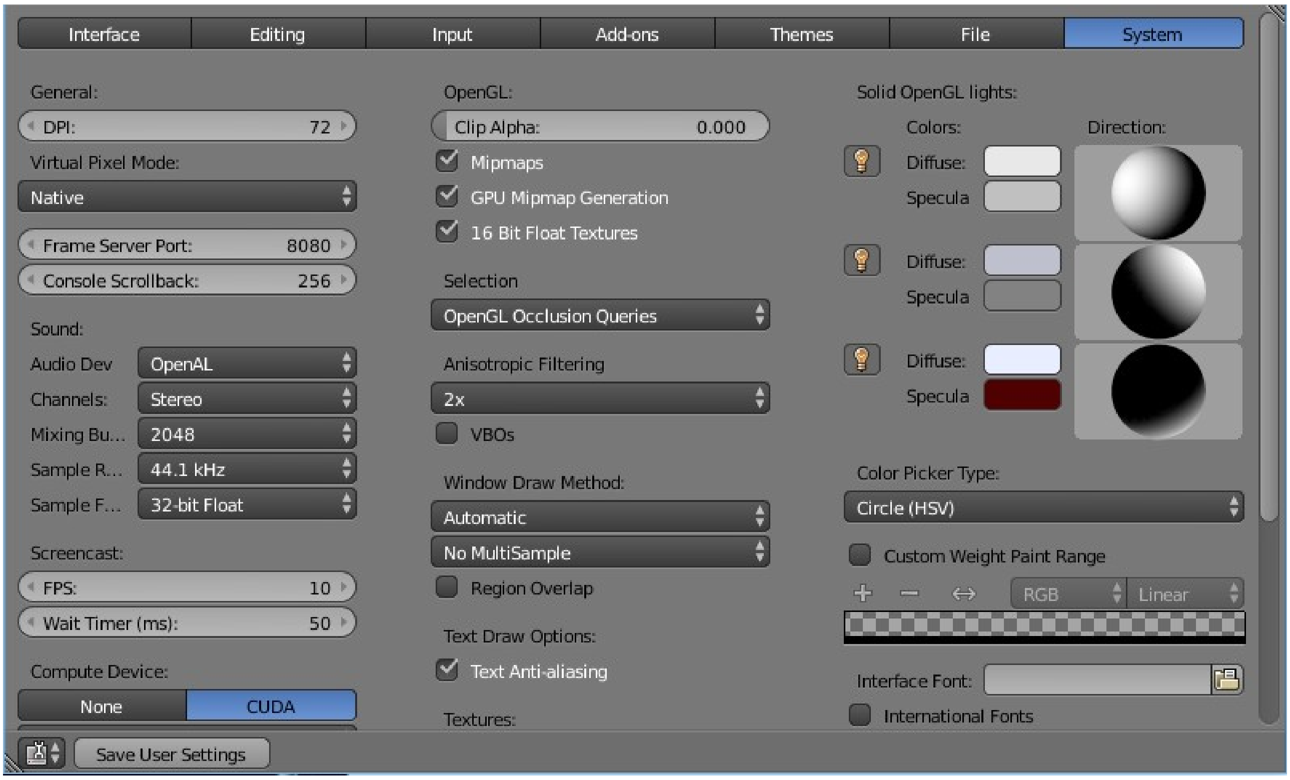
Save Preview Images
Previews of images and materials in the *File Browser* window are created on demand. To save these previews into your `.blend` file, enable this option (at the cost of increasing the size of your `.blend` file).

Auto Save Temporary File
Enable Auto Save (create a temporary file).

Timer
Time to wait between automatic saves.

System Preferences

The *System* tab allows you to set resolution, scripting console preferences, sound, graphics cards, and internationalization.



General

DPI

Value of the screen resolution which controls the size of Bforartists's interface fonts and internal icons shown. Useful for taking screen shots for book printing and use of high resolution monitors. During typical usage, you may prefer to use zoom which is a available in many parts of Bforartists interface.

Virtual Pixel Mode

Allows you to select global scaling. While the DPI only scales the interface, this will scale line width, vertex-size.

This is intended for hi-dpi monitors.

Note
This is auto-detected on OSX.

Frame Server Port

TCP/IP port used in conjunction with the IP Address of the machine for frameserver rendering. Used when working with distributed rendering. Avoid changing this port value unless it is conflicting with already existing service ports used by your Operating System and/or softwares. Always consult your operating system documentation and services or consult your system administrator before changing this value.

Console Scrollback

The number of lines, buffered in memory of the console window. Useful for debugging purposes and command line rendering.

Sound

Sound

Set the audio output device or no audio support:

None
No Audio support (no audio output, audio strips can be loaded normally)

SDL
Uses Simple Direct Media Layer API from libsdl.org to render sounds directly to the sound device output. Very useful for sequencer strips editing.

OpenAL

This API provides buffered sound rendering with 3D/spatial support.

Used for 3D source support by *Speaker Objects* and the *Game Engine*.

'Specific sound options' (With *SDL* or *OpenAL* enabled)

Channels

Set the audio channel count. Available options are: *Stereo* (Default) , *4 Channels* , *5.1 Surround* , *7.1 Surround*

Mixing Buffer

Set the number of samples used by the audio mixing buffer. Available options are:

512 , *1024* , *2048* (Default), *4096* , *8192*, *16384*, and *32768*

Sample Rate

Set the audio sample rate. Available options are: *44.1 Khz* (Default), *48 Khs* , *96 Khz* and *192Khz*

Sample Format

Set the audio sample format. Available options are: *32 bit float* (Default), *8 bit Unsigned* , *16 Bits Signed* , *24 Bits Signed* , *32 Bits Signed* , *32 Bits Float* and *64 Bits Float*

Screencast

TODO

Compute Device

The Options here will set the compute device used by the Cycles render engine.

None
When set to *None* or the only option is *None*: your CPU will be used as a computing device for Cycles Render Engine

CUDA
If the system has a compatible CUDA enabled graphics card and appropriate device drivers installed.

When one or both of the options are available, the user will be able to choose whether to use CPU or other computing device for Cycles Rendering.

OpenCL

Note that this currently has limited support unsupported, see: *Cycles* Render engine page

OpenSubdiv Compute

The Options here will set the compute device used by OpenSubdiv for the *Subdivision Surface Modifier.*

None

Disables any OpenSubdiv compute devices, makes sure legacy subsurf code from Bforartists is used. Use this option when OpenSubdiv causes any bugs or regressions.

CPU

Single threaded CPU implementation. It is mainly useful in cases when GPU compute is possible and threaded CPU option causes artifacts (it is unlikely to happen, but still possible).

OpenMP

Multi-threaded CPU implementation. It is similar to threading model of old subsurf code. Use it for maximum performance in cases when GPU compute is not available.

GLSL Transform Feedback

Uses GPU to perform calculations, has minimal requirements to video card and driver.

GLSL Compute

Uses GPU to perform calculations, supposed to be more efficient than Transform Feedback but also has higher requirements to video card and driver.

Open GL

Clip Alpha

Clip alpha below this threshold in the 3D viewport. Minimum: **0.000** (No Clip) , Maximum: **1.000** , Default **0.000** (No Clip)

Mipmaps

Scale textures for 3D view using mipmap filtering. This increases display quality, but uses more memory.

GPU MipMap Generation

Generate MipMaps on the GPU. Offloads the CPU Mimpap generation to the GPU.

16 Bit Float Textures

Enables the use of 16 Bit per component Texture Images (Floating point Images).

Anisotropic Filtering

Set the level of anisotropic filtering. Available Options are: *Off" (No Filtering)* , 2x (Default) *, 4x , 8x , 16x*

Window Draw Method

Window Draw Method

Specifies the Window Draw Method used to display Bforartists Window(s).

***Automatic* (Default)**

Automatically set based on graphics card and driver.

Triple Buffer

Use a third buffer for minimal redraws at the cost of more memory. If you have a capable GPU, this is the best and faster method of redraw.

Overlap

Redraw all overlapping regions. Minimal memory usage, but more redraws. Recommended for some graphics cards and drivers combinations.

Overlap Flip

Redraw all overlapping regions. Minimal memory usage, but more redraws (for graphics drivers that do flipping). Recommended for some graphic cards and drivers combinations.

Full

Do a full redraw each time. Only use for reference, or when all else fails. Useful for certain cards with bad to no OpenGL acceleration at all.

Multi-Sampling

This enables FSAA for smooth drawing, at the expense of some performance.

Note
This is known to cause selection issues on some configurations, see: Invalid Selection.

Region Overlap

This checkbox will enable Bforartists to draw regions overlapping the 3D Window. It means that the Object Tools and Transform Properties Tab, which are opened by using the shortcuts `T` and `N` will be drawn overlapping the 3D View Window.

If you have a capable graphics card and drivers with *Triple Buffer* support, clicking the checkbox will enable the overlapping regions to be drawn using the *Triple Buffer* method, which will also enable them to be drawn using Alpha, showing the 3D View contents trough the Object Tools and Transform Properties Tab.

Text Draw Options

Text Draw Options

Enable interface text anti-aliasing. When disabled, texts are drawn using text straight render (Filling only absolute Pixels). Default: Enabled.

Textures

Limit Size

Limit the maximum resolution for pictures used in textured display to save memory. The limit options are specified in a square of pixels, (e.g.: the option 256 means a texture of 256x256 pixels) This is useful for game engineers, whereas the texture limit matches paging blocks of the textures in the target graphic card memory. Available Options are: *Off* (No limit - Default) , *128*, *256*, *512*, *1024*, *2048*, *4096*, *8192*.

Time Out

Time since last access of a GL texture in seconds, after which it is freed. Set to 0 to keep textures allocated. Minimum: **0** , Maximum: **3600** , Default: **120**

Collection Rate

Number of seconds between each run of the GL texture garbage collector. Minimum: **0** , Maximum: **3600** , Default: **120**

Sequencer/Clip Editor

Memory Cache Limit

Upper limit of the sequencer's memory cache (megabytes). For optimum clip editor and sequencer performance, high values are recommended. Minimum: **0** (No cache) , Maximum: **1024** (1 Gigabyte), Default: **128**

Solid OpenGL lights

Solid OpenGL Lights are used to light the 3D Window, mostly during *Solid view*. Lighting is constant and position “world” based. There are three virtual light sources, also called OpenGL auxiliary lamps, used to illuminate 3D View scenes, which will not display in renders.

The Lamp Icons allows the user to enable or disable OpenGL Lamps. At least one of the three auxiliary OpenGL Lamps must remain enabled for the 3D View. The lamps are equal, their difference is their positioning and colors. You can control the direction of the lamps, as well as their diffuse and specular colors. Available Options are:

Direction

Clicking with `LMB` in the sphere and dragging the mouse cursor let's the user change the direction of the lamp by rotating the sphere. The direction of the lamp will be the same as shown at the sphere surface.

Diffuse

This is the constant color of the lamp. Clicking on the color widget, opens the color picker mini window and allows the user to change colors using the color picker.

Specular

This is the highlight color of the lamp Clicking on the color widget, opens the color picker mini window and allows the user to change colors using the color picker.

Color Picker Type

Choose which type of color dialog you prefer - it will show when clicking `LMB` on any color field.

See the different color picker types at the *Extended Controls* page.

Custom Weight Paint Range

Mesh skin weighting is used to control how much a bone deforms the mesh of a character. To visualize and paint these weights, Bforartists uses a color ramp (from blue to green, and from yellow to red). Enabling the checkbox will enable an alternate map using a ramp starting with an empty range. Now you can create your custom map using the common color ramp options. For detailed information about how to use color ramps, see: to the *Extended Controls* page.

Internationalization

Bforartists supports a wide range of languages, enabling this check box will enable Bforartists to support International Fonts. International fonts can be loaded for the User Interface and used instead of Bforartists default bundled font.

This will also enable options for translating the User Interface through a list of languages and Tips for Bforartists tools which appears whenever the user hovers a mouse over Bforartists tools.

Bforartists supports I18N for internationalization. For more Information on how to load International fonts, see: *Editing Texts* page.

Startup File

Reference
Mode: All modes Menu: File ‣ Save Startup File

When you start Bforartists or start a new project with the menu entry File ‣ New, a new scene is created from the default scene included with Bforartists.

This default scene can instead be your own customized setup.

To change the default scene, make all of the desired changes to the current scene or current file and File ‣ Save Startup File.

Restoring to Factory Settings

Reference
Mode: All modes Menu: File ‣ Load factory Settings

To restore the startup file to the factory settings, open File ‣ Load Factory Settings. This will restore the *Startup File* and *User Preferences* back to the original factory settings. After this you can save the startup file to overwrite any customizations permanently.

Note

User Preferences Window

For more information about the Editor Window for User Preferences or how to clean your preferences manually, see *User Preferences*

13.1 Advanced - Command Line Arguments

Command Line Arguments

Bforartists 2.76 Usage: Bforartists [args ...] [file] [args ...]

Render Options

-b, --background
: Run in background (often used for UI-less rendering)

-a, --render-anim
: Render frames from start to end (inclusive)

-S, --scene <name>
: Set the active scene <name> for rendering

-f, --render-frame <frame>
: Render frame <frame> and save it. +<frame> start frame relative, -<frame> end frame relative.

-s, --frame-start <frame>
: Set start to frame <frame>, supports +/- for relative frames too.

-e, --frame-end <frame>
: Set end to frame <frame>, supports +/- for relative frames too.

-j, --frame-jump <frames>
: Set number of frames to step forward after each rendered frame

-o, --render-output <path>

Set the render path and file name. Use // at the start of the path to render relative to the blend file.

The # characters are replaced by the frame number, and used to define zero padding.

- ani_##_test.png becomes ani_01_test.png
- test-######.png becomes test-000001.png

When the filename does not contain #, The suffix #### is added to the filename.

The frame number will be added at the end of the filename, eg:

```
Bforartists -b foobar.blend -o //render_ -F PNG -x 1 -a
```

//render_ becomes //render_####, writing frames as //render_0001.png

-E, --engine <engine>
Specify the render engine use -E help to list available engines
-t, --threads <threads>
Use amount of <threads> for rendering and other operations [1-64], 0 for systems processor count.

Format Options

-F, --render-format <format>
Set the render format, Valid options are...
TGA IRIS JPEG MOVIE IRIZ RAWTGA AVIRAW AVIJPEG PNG BMP FRAMESERVER
(formats that can be compiled into Bforartists, not available on all systems)
HDR TIFF EXR MULTILAYER MPEG AVICODEC QUICKTIME CINEON DPX DDS
-x, --use-extension <bool>
Set option to add the file extension to the end of the file

Animation Playback Options

-a <options> <file(s)>
Playback <file(s)>, only operates this way when not running in background.
-p <sx> <sy> Open with lower left corner at <sx>, <sy> -m Read from disk (Don't buffer) -f <fps> <fps-base> Specify FPS to start with -j <frame> Set frame step to <frame> -s <frame> Play from <frame> -e <frame> Play until <frame>

Window Options

-w, --window-border
Force opening with borders (default)
-W, --window-borderless
Force opening without borders
-p, --window-geometry <sx> <sy> <w> <h>
Open with lower left corner at <sx>, <sy> and width and height as <w>, <h>
-con, --start-console
Start with the console window open (ignored if -b is set), (Windows only)
--no-native-pixels
Do not use native pixel size, for high resolution displays (MacBook Retina)

Game Engine Specific Options

-g Game Engine specific options

-g *fixedtime*	Run on 50 hertz without dropping frames
-g *vertexarrays*	Use Vertex Arrays for rendering (usually faster)

`-g` *nomipmap* — No Texture Mipmapping

`-g` *linearmipmap*

Linear Texture Mipmapping instead of Nearest (default)

Python Options

`-y`, `--enable-autoexec`
Enable automatic Python script execution

`-Y`, `--disable-autoexec`
Disable automatic Python script execution (pydrivers & startup scripts), (default).

`-P`, `--python` `<filename>`
Run the given Python script file

`--python-text` `<name>`
Run the given Python script text block

`--python-expr` `<expression>`
Run the given expression as a Python script

`--python-console`
Run Bforartists with an interactive console

`--python-exit-code`
Set the exit-code in [0..255] to exit if a Python exception is raised (only for scripts executed from the command line), zero disables.

`--addons`
Comma separated list of addons (no spaces)

Debug Options

`-d`, `--debug`

Turn debugging on

- Enables memory error detection
- Disables mouse grab (to interact with a debugger in some cases)
- Keeps Python’s `sys.stdin` rather than setting it to None

`--debug-value` `<value>`
Set debug value of `<value>` on startup

`--debug-events`
Enable debug messages for the event system

`--debug-ffmpeg`
Enable debug messages from FFmpeg library

`--debug-handlers`
Enable debug messages for event handling

`--debug-libmv`
Enable debug messages from libmv library

`--debug-cycles`
Enable debug messages from Cycles

`--debug-memory`
Enable fully guarded memory allocation and debugging

`--debug-jobs`
    Enable time profiling for background jobs.

`--debug-python`
    Enable debug messages for Python

`--debug-depsgraph`
    Enable debug messages from dependency graph

`--debug-depsgraph-no-threads`
    Switch dependency graph to a single threaded evaluation

`--debug-gpumem`
    Enable GPU memory stats in status bar

`--debug-wm`
    Enable debug messages for the window manager, also prints every operator call

`--debug-all`
    Enable all debug messages (excludes libmv)

`--debug-fpe`
    Enable floating point exceptions

`--disable-crash-handler`
    Disable the crash handler

Misc Options

`--factory-startup`
    Skip reading the startup.blend in the users home directory

`--env-system-datafiles`
    Set the `Bforartists_SYSTEM_DATAFILES` environment variable

`--env-system-scripts`
    Set the `Bforartists_SYSTEM_SCRIPTS` environment variable

`--env-system-python`
    Set the `Bforartists_SYSTEM_PYTHON` environment variable

`-nojoystick`
    Disable joystick support

`-noglsl`
    Disable GLSL shading

`-noaudio`
    Force sound system to None

`-setaudio`
    Force sound system to a specific device NULL SDL OPENAL JACK

`-h`, `--help`
    Print this help text and exit

`-R`
    Register .blend extension, then exit (Windows only)

`-r`
    Silently register .blend extension, then exit (Windows only)

`-v`, `--version`
    Print Bforartists version and exit

`--`
    Ends option processing, following arguments passed unchanged. Access via Python's `sys.argv`

Other Options

`/?`
: Print this help text and exit (windows only)

`--debug-freestyle`
: Enable debug/profiling messages from Freestyle rendering

`--debug-gpu`
: Enable gpu debug context and information for OpenGL 4.3+.

`--disable-abort-handler`
: Disable the abort handler

`--enable-new-depsgraph`
: Use new dependency graph

`--verbose <verbose>`
: Set logging verbosity level.

Experimental features

`--enable-new-depsgraph`
: Use new dependency graph

Argument Parsing

Arguments must be separated by white space, eg:

```
Bforartists -ba test.blend
```

...will ignore the `a`

```
Bforartists -b test.blend -f8
```

...will ignore `8` because there is no space between the `-f` and the frame value

Argument Order

Arguments are executed in the order they are given. eg:

```
Bforartists --background test.blend --render-frame 1 --render-output '/tmp'
```

...will not render to `/tmp` because `--render-frame 1` renders before the output path is set

```
Bforartists --background --render-output /tmp test.blend --render-frame 1
```

...will not render to `/tmp` because loading the blend file overwrites the render output that was set

```
Bforartists --background test.blend --render-output /tmp --render-frame 1
```

...works as expected.

Environment Variables

Bforartists_USER_CONFIG:
Directory for user configuration files.

Bforartists_USER_SCRIPTS:
Directory for user scripts.

Bforartists_SYSTEM_SCRIPTS:
Directory for system wide scripts.

Bforartists_USER_DATAFILES:
Directory for user data files (icons, translations, ..).

Bforartists_SYSTEM_DATAFILES:
Directory for system wide data files.

Bforartists_SYSTEM_PYTHON:
Directory for system python libraries.

TEMP: Store temporary files here.

TMP: or $TMPDIR Store temporary files here.

SDL_AUDIODRIVER:
LibSDL audio driver - alsa, esd, dma.

PYTHONHOME: Path to the python directory, eg. /usr/lib/python.

13.2 Advanced - Scripting & Extending Bforartists

Scripting & Extending Bforartists

Note
Bforartists relies at the Blender Python API.

Python is an interpreted, interactive, object-oriented programming language. It incorporates modules, exceptions, dynamic typing, very high level dynamic data types, and classes. Python combines remarkable power with very clear syntax.

Python scripts are a powerful and versatile way to extend Bforartists functionality. Most areas of Bforartists can be scripted, including Animation, Rendering, Import and Export, Object Creation and the scripting of repetitive tasks.

To interact with Bforartists, scripts can make use of the tightly integrated API (Application Programming Interface).

General information

Links that are useful while writing scripts.

- http://www.python.org/ - Python.org - General information about Python.
- http://www.blender.org/documentation/250PythonDoc/ - Blender Python API - Official API

documentation. Use this for referencing while writing scripts.

- http://www.blender.org/documentation/blender_python_api_2_72_release/info_quickstart.html - API introduction - A short introduction to get you started with the API. Contains examples.
- http://wiki.blender.org/index.php/Dev:2.5/Py/Scripts/Cookbook - CookBook - A section of handy code snippets (yet to be written)

Links that deal with distributing your scripts.

- http://wiki.blender.org/index.php/Dev:Py/Sharing - Sharing scripts - Information on how to share your scripts and get them included in the official Blender distribution.
- http://wiki.blender.org/index.php/Dev:2.5/Py/Scripts/Guidelines/Addons - Creating Add-ons - Add-ons are used to encapsulate and distribute scripts.
- https://projects.blender.org/projects/bf-extensions/ - Extensions project - Project to maintain a central repository of extensions to Blender.

Getting Started - Manual links

The following links take you from the basics to the more advanced concepts of Python scripting for Bforartists.

- *Text Editor*
- *Python Console*

Getting Started - External links

Here are external links containing a lot of good information to start learning how to write scripts for Bforartists.

- http://sites.google.com/site/satishgoda/blender/learningblender25/introduction-to-blender-python-api - Introductory tutorial by Satish Goda - Takes you from the beginning and teaches how to do basic API manipulations.
- http://www.youtube.com/watch?v=vmhU_whC6zw - Ira Krakow's video tutorials - First video in a series of video tutorials.
- http://en.wikibooks.org/wiki/Blender_3D:_Blending_Into_Python/2.5_quickstart - Quickstart guide - A quickstart guide for people who already have some familiarity with Python and Blender.
- http://blenderartists.org/forum/showthread.php?t=164765 - Examples thread - A forum thread containing many short working script examples.
- http://cgcookie.com/blender/2011/08/26/introduction-to-scripting-with-python-in-blender/ - Introduction to Python - A one hour video tutorial introducing Python and the Blender API.

Extending Bforartists

Add-ons

Add-ons are scripts you can enable to gain extra functionality within Bforartists, they can be enabled from the user preferences.

Outside of the Bforartists executable, there are literally hundreds of add-ons written by many people:

- Officially supported add-ons are bundled with Bforartists.
- Other **Testing** add-ons are included in development builds but not official releases, many of them work

reliably and are very useful but are not ensured to be stable for release.

For an overview of all add-ons is available in, see Scripts Catalog and Extensions tracker.

http://wiki.blender.org/index.php/Extensions:2.6/Py/Scripts
https://projects.blender.org/projects/bf-extensions/

Scripts

Apart from add-ons there are also scripts you can use to extend Bforartists functionality:

- Modules: Utility libraries for import into other scripts.
- Presets: Settings for Bforartists tools and key configurations.
- Startup: These files are imported when starting Bforartists. They define most of Bforartists UI, as well as some additional core operators.
- Custom scripts: In contrast to add-ons they are typically intended for one-time execution via the *text editor*

Saving your own scripts

File location

All scripts are loaded from the `scripts` folder of the *local*, *system and user paths*.

You can setup an additional search path for scripts in File Paths (*User Preferences –> File Paths*).

Installation

Add-ons are conveniently installed through Bforartists in the *User Preferences –> Add-ons* window. Click the *Install from File...* button and select the `.py` or `.zip` file.

To manually install scripts or add-ons place them in the `add-ons`, `modules`, `presets` or `startup` directory according to their type. See the description above.

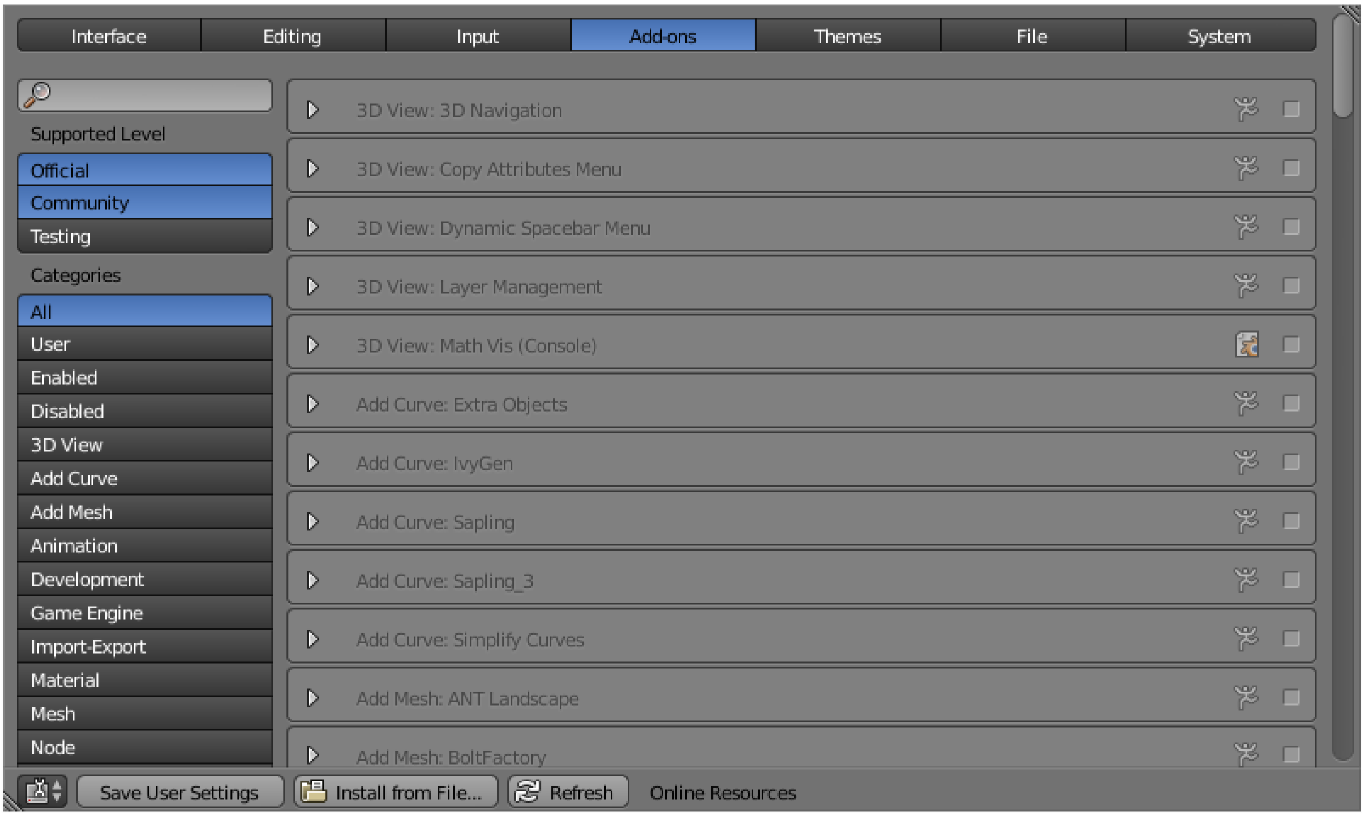
You can also run scripts by loading them in the *text editor* window.

Add-ons

Add-on is the general term for a script that extends Bforartists functionality. They are found in the *Add-ons* tab of the *User Preferences* window. This tab allows to search, install, enable and disable Add-ons.

Searching

Bforartists comes with some useful Add-ons already, ready to be enabled, but you can also add your own, or any interesting ones you find on the web.



Add-ons tab in the User Preferences

The Scripts Catalog provides an index of Add-ons that are included with Bforartists as well as listing a number of external Add-ons.

Enabling and Disabling

Enable and disable and add-on by checking or unchecking the box on the right of the add-on you chose, as shown on the figure.

Enabling an Add-on

The add-on functionality should be immediately available. If the Add-on does not activate when enabled, check the *Console window* for any errors that may have occurred.

You can click the arrow at the left of the add-on box to see more information, such as where it is located, a description and a link to the documentation. Here you can also find a button to report a bug specific of this add-on.

Tip
Saving Add-on Preferences If you want an Add-on to be enabled every time you start Bforartists, you will need to *Save User Settings*.

Installation of a 3rd party Add-on

For add-ons that you found on the web or your own to show on the list, you have to install them first by clicking *Install from File...* and providing a .zip or .py file.

Alternatively you can manually install an Add-on, which is useful when developing your own add-ons. Move or link the files to `../scripts/addons` folder (where .. is the path to your Bforartists configuration folder).

File locations

For information on the location of Bforartists directories see: *Configuration & Data Paths*

You can also create a personal folder containing new add-ons and configure your files' path in the *File* panel of the *User Preferences*. To create a personal script folder:

- Create an empty folder (i.e. 'script_addon_2-7x')
- Add one folder named 'addons'. It has to named like this for Bforartists to recognize it.
- Put your new add-ons in this 'addons' folder.
- open the *File* panel of the *User Preferences*.
- Fill the *Scripts* entry with the path to your script folder (i.e. 'script_addon_2-7x').

Development guidelines

If you are a script developer, you may be interested in the Add-ons development guidelines

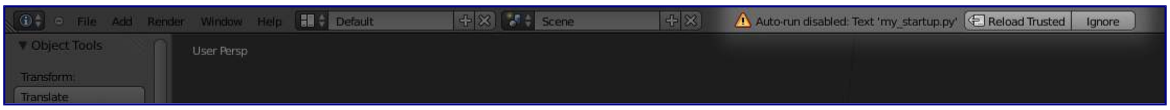
Scripting & Security

The ability to include Python scripts within blend files is valuable for advanced tasks such as rigging, automation and using the game-engine, however it poses a security risk since Python doesn't restrict what a script can do.

Therefore, you should only run scripts from sources you know and trust.

Automatic execution is disabled by default, however some blend files need this to function properly.

When a blend file tries to execute a script and is not allowed, a message will appear in the header with the option to **Reload Trusted** or **Ignore** the message.



Scripts in Blend Files

Auto Execution

Here are the different ways blend files may automatically run scripts.

Registered Text-Blocks
    A text block can have its *Register* option enabled which means it will load on start.
Animation Drivers

Python expressions can be used to *Drive* values and are often used in more advanced rigs and animations.

Game Engine Auto-Start

Scripts are often used for game logic, blend files can have *Auto Start* enabled with runs the game on load.

Manual Execution

There are other ways scripts in a `blend` file may execute that require user interaction (therefor will run even when auto-execution is off), but you should be aware that this is the case since it's not necessarily obvious.

- Running a script in the text editor *(ok, this is obvious!)*.
- Rendering with FreeStyle - *FreeStyle uses scripts to control line styles*
- Running the Game-Engine.

Controlling Script Execution

Bforartists provides a number of ways to control whether scripts from a blend file are allowed to automatically execute.

First of all, the file-selector has the option **Trusted Source** which you can use on a case-by-case basis to control auto-execution.

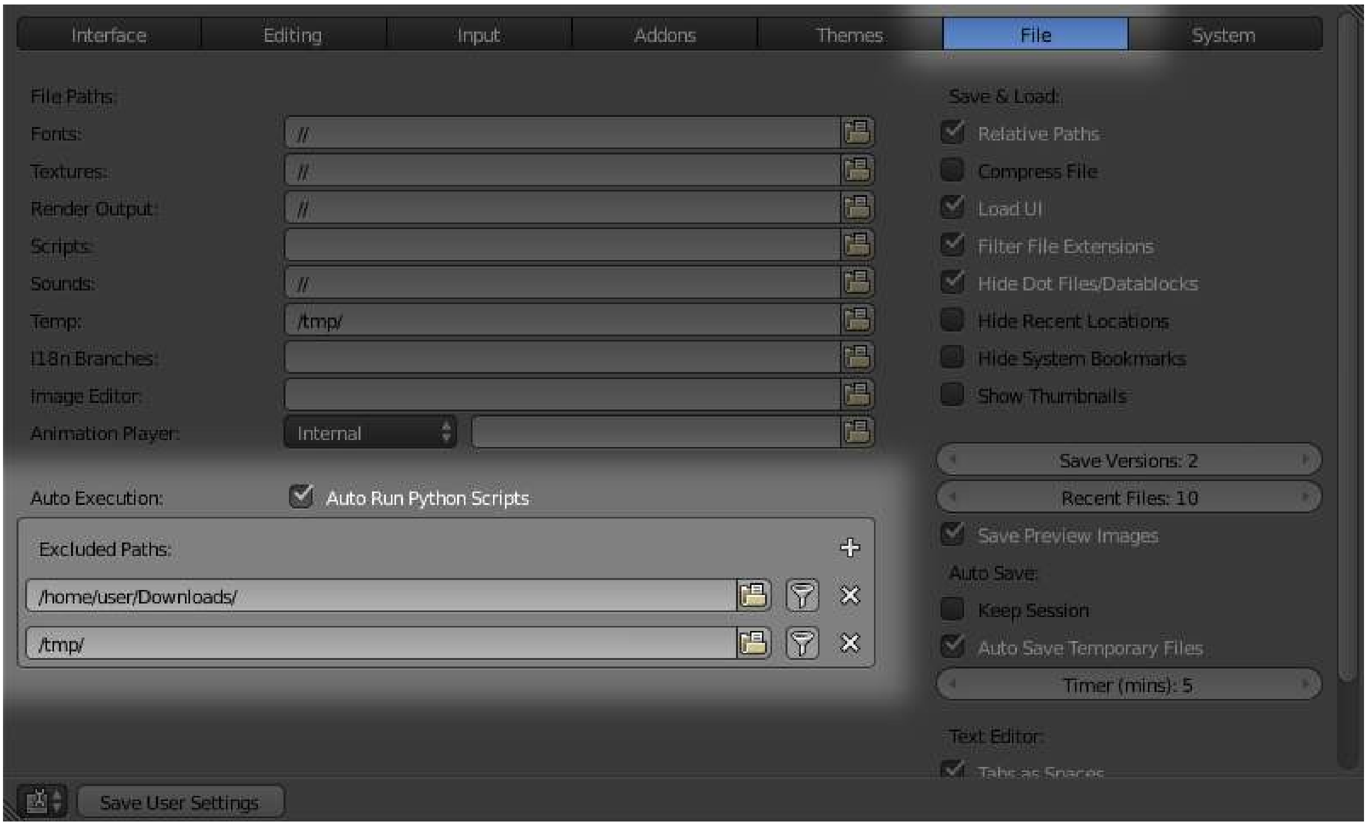
However you may forget to set this, or open a file without going through the file selector - so you can change the default (described next).

Setting Defaults

In the **File** section of the user-preferences there is the toggle **Auto-Run Python Scripts**.

This means the **Trusted Source** option in the file-selector will be enabled by default, and scripts can run when blend files are loaded without using the file selector.

Once enabled you have the option to exclude certain directories, a typical configuration would be to trust all paths except for the download directory.



Command Line

You may want to perform batch rendering or some other task from the command line - running Bforartists without an interface.

In this case the user-preferences are still used but you may want to override them.

- Enable with `-y` or `--enable-autoexec`
- Disable with `-Y` or `--disable-autoexec`

Example - rendering an animation in background mode, allowing drivers and other scripts to run:

```
Bforartists --background --enable-autoexec my_movie.blend --render-anim
```

Note

These command line arguments can be used to start a regular Bforartists instance and will still override the user-preferences.

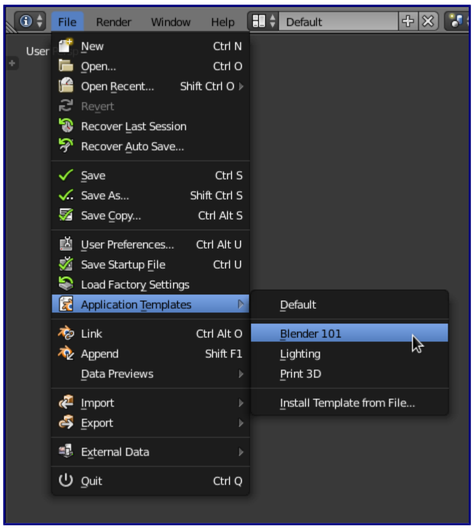
13.3 Advanced - Application Templates

Application Templates

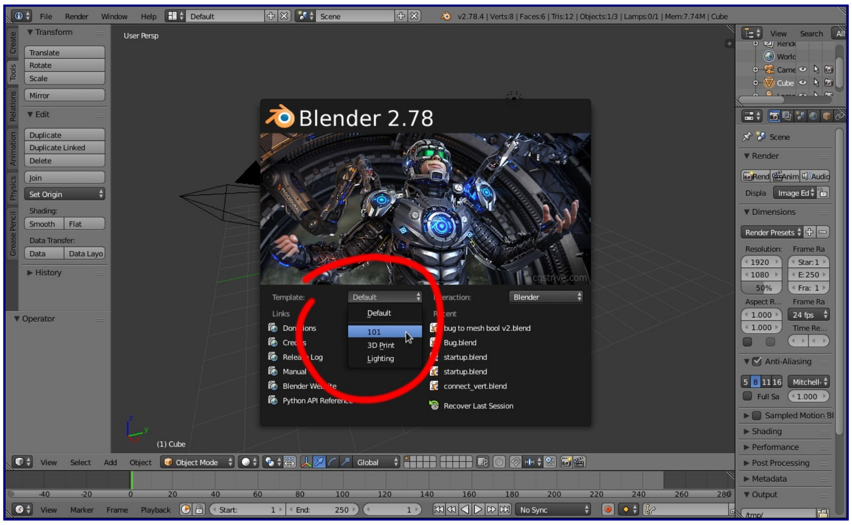
Application Templates

Usage

Application templates are a feature that allows you to define a re-usable configuration that can be selected to replace the default configuration, without requiring a separate Bforartists installation or overwriting your personal settings.



Using templates from the file menu



Selecting a template from the splash screen.

Application templates can be selected from the splash screen or the file menu *(as shown above)*.

When there are no templates found the menu will not be displayed on the splash screen.

New application-templates can be installed from the file menu.

If you would like to keep the current application-template active on restarting Blender, save your user-preferences.

Motivation

In some cases its not enough to write a single script or add-on, and expect someone to replace his user-preferences and startup file, install scripts and change his key-map.

The goal of application-templates is to support switching to a customized configuration without disrupting your existing settings & installation.

This means people can build their own *applications* on top of Bforartists that can be easily distributed.

Details

An application-template may define its own:

Startup File
: The default file to load with this template.

User Preferences
: Only certain user-preferences from a template are used:

- Themes.
- Add-ons.
- Keymaps.
- Viewport lighting.

Splash Screen
: Templates may provide their own splash screen image.

Python Scripts
: While templates have access to the same functionality as any other scripts, typical operations include:

- Modifying and replacing parts of the user-interface.
- Defining new menus, key-maps & tools.
- Defining a custom add-on path for template specific add-ons.

Templates also have their own user configuration so saving startup while using a template won’t overwrite your default startup file.

Directory Layout

Templates may be located in one of two locations within the `scripts` directory.

Template locations:
`{BLENDER_USER_SCRIPTS}/startup/bl_app_templates_user`
`{BLENDER_SYSTEM_SCRIPTS}/startup/bl_app_templates_system`

User configuration is stored in a sub directory,

Without a template:
`./config/startup.blend`
`./config/userpref.blend`
With a template:
`./config/{APP_TEMPLATE_ID}/startup.blend`
`./config/{APP_TEMPLATE_ID}/userpref.blend`

See Configuring Directories for details on script and configuration locations.

Template Contents

Each of the following files can be used for application templates but are optional.

`startup.blend`
Factory startup file to use for this template.
`userpref.blend`

Factory user-preferences file to use for this template.

(As noted previously, this is only used for a subset of preferences).

`splash.png`, `splash_2x.png`

Splash screen do override Blender’s default artwork (not including header text).

Must be `501x230` or `1002x460` (used for HiDPI monitors).

`__init__.py`
A Python script which must contain `register` and `unregister` functions.

Note

Bundled blend files `startup.blend` and `userpref.blend` are considered *Factory Settings* and are never overwritten.

The user may save his own startup/preferences while using this template which will override them.

The original template settings can be loaded using: *Load Template Factory Settings* from the file menu in much the same way *Load Factory Settings* works.

13.4 - Advanced - Working Limits

Working Limits

Working Limits

Space

While object positions, vertex locations are not clamped, larger values become increasingly imprecise.

To get an idea of the precision you can work with using different scales.

Here's a table of scales and their associated accuracy.

10:	1/1,048,576th
100:	1/131,072th
1,000:	1/16,384th
10,000:	1/1,024th
100,000:	1/128th
1,000,000:	1/16th

Hint

For a rough rule of thumb, values within -5,000/+5,000 are typically reliable (range of 10,000).

Internally *single precision* floating point calculations are used.

Time

The maximum number of frames for each scene is currently 500,000, and allows for continuous shots for durations of:

24 fps:	5 hours, 47 seconds.
25 fps:	5 hours, 33 seconds.
30 fps:	4 hours, 37 seconds.
60 fps:	2 hours, 18 seconds.

Note

In practice, a finished work is typically composted of output from many scenes. So this limit does not prevent you from creating longer works.

Text Fields

Fixed strings are used internally, and while it is not useful to list all limits, here are some common limits.

directory: 767

file-name: 255

file-path: 1023

identifier: 63

Used for data-block names, modifiers, vertex-groups, UV-layers…

Note

Multi-byte encoding means some unicode characters use more than a single ASCII character.

15 Troubleshooting

Troubleshooting

- Startup
- 3D Viewport
- Graphics Hardware
- Crashes
- Recovering Lost Work

Compatibility

Some applications which integrate themselves into your system can cause problem’s with Bforartists.

Here are some known compatibility issues listed by platform.

- Compatibility (Linux)
- Compatibility (OSX)
- Compatibility (Windows)

Troubleshooting Startup

There are some common causes for problems when using Bforartists. If you can not find a solution for your problem here, try asking the community for help.

If Bforartists crashes on startup there are a few things to check for:

- See if you computer meets the minimum requirements
- Confirm that your graphics card is supported and that the drivers support at least OpenGL 1.4
- Make sure you are using the correct Bforartists version (32 or 64 bit) for your architecture.

Known causes listed below.

Python Crashes on Startup

If you get an error on startup

```
Fatal Python error: Py_Initialize: unable to load the file system codec
```

you may have set your systems `PYTHONPATH` environment variable.

In this case Bforartists's bundled Python will attempt to use the `PYTHONPATH`. If the Python version is different from the version used by Bforartists, this will crash Bforartists on startup.

To solve the problem, either clear the `PYTHONPATH` before starting Bforartists *(can be done in a launcher script)*, or set it to a compatible Python version.

Troubleshooting the 3D View

TODO

See: https://developer.Bforartists.org/T43810

Drawing

Depth Buffer Glitches

TODO, see: http://Bforartists.stackexchange.com/questions/1385

Objects Invisible in Camera View

If you have a large scene, viewing it through Camera View may not display all of the Objects in the scene. One possibility may be that the clipping distance of the camera is too low. The camera will only show objects that fall within the clipping range.

Performance

Slow Drawing

TODO.

Slow Selection

Bforartists uses OpenGL drawing for selection, some graphics card drivers are slow at performing this operation.

This becomes especially problematic on dense geometry.

Possible Solutions:

OpenGL Occlusion Queries (User Preference)

See User Preferences ‣ System ‣ Selection

This option defaults *Automatic*, try setting this to *OpenGL Occlusion Queries*, since there is a significant performance difference under some configurations.

Upgrade OpenGL Driver
In some cases slow selection is resolved by using updated drivers. *It's generally good to use recent drivers when using 3D software.*

Select Centers (Workaround)
In *Object Mode*, holding `Ctrl` while selecting uses the object center point. While this can be useful on its own, its has the side-effect of not relying on OpenGL selection.

Change Draw Modes (Workaround)
Using *Wireframe* or even *Bounding Box* draw modes can used to more quickly select different objects.

Note

Obviously the workarounds listed here aren't long term solutions, but its handy to know if you're stuck using a system with poor OpenGL support.

Ultimately, if none of these options work out it may be worth upgrading your hardware.

Navigation

Lost in Space

When navigating your scene, you may accidentally navigate away from your scene and find yourself with a blank view-port

TODO.

Invisible Limit Zooming In

TODO, see: http://Bforartists.stackexchange.com/questions/644

Tools

Invalid Selection

There are times when selection fails under some configurations, often this is noticeable in mesh *Edit Mode*, selecting vertices/edges/faces where random elements are selected.

Internally Bforartists uses OpenGL for selection, so the graphics card driver is relied on giving correct results.

Possible Solutions:

Disable Anti-Aliasing (FSAA, Multi-Sampling)

> This is by far the most common cause of selection issues.
>
> There are known problems with some graphics cards when using FSAA/multi-sampling.
>
> You can disable this option by:
>
> - Turning FSAA/multi-sampling off in your graphics card driver options.
> - Turning *Multi-Sampling* off in the system preferences.

Change Anti-Aliasing Sample Settings

> Depending on your OpenGL configuration, some specific sample settings may work, while others fail.
>
> Unfortunately finding working configuration involves trial & error testing.

Upgrade OpenGL Driver

> As with any OpenGL related issues, using recent drivers can resolve problems.
>
> However it should be noted that this is a fairly common problem and remains unresolved with many drivers.

Troubleshooting Graphics Hardware

Bforartists makes use of OpenGL, which is typically hardware accelerated.

This means issues with the graphics card hardware and drivers can impact on Bforartists's behavior. This page lists some known issues using Bforartists on different graphics hardware and how to trouble-shoot them.

Performance

When the entire interface very slow and unresponsive *(even with the default startup scene)*. This is likely a problem with the OpenGL configuration.

Unfortunately in this situation you may have to do some of your own tests to find the cause, here are some common causes and possible solutions.

Upgrade your OpenGL Driver

> If you're experiencing any strange graphics problems with Bforartists, its always good to double check

you're using the latest drivers.

Disable Anti-Aliasing (FSAA, Multi-Sampling)

See Invalid Selection, Disable Anti-Aliasing.

Change the *Window Draw Method*

This is set in the system preferences. Its selected automatically, however when experiencing problems its worth checking if changing this resolves interface drawing problems.

Troubleshooting Crashes

The most common causes of Bforartists crashes.

- Running out of memory.
- Issues with graphics hardware/drivers.
- Bugs in Bforartists.

Firstly, you may be able to recover your work with File ‣ Recover Last Session.

To prevent the problem from happening again, you can check that the graphics drivers are up to date, upgrade your machine's hardware (the RAM or graphics card), and disable some options that are more memory intensive:

- Disable *Region Overlap* and *Triple buffering* at User Preferences ‣ System ‣ Window Draw Method.
- Using multisample, anti-aliasing also increase the memory usage and make display slower.
- On Linux, the Window Manager (KDE, Gnome, Unity) may be using hardware accelerated effects (eg. window shadows and transparency) that are using up the memory that Bforartists needs. Try disabling the desktop effects or switch to a light-weight Window Manager.

Recovering from mistakes or problems

Bforartists provides a number of ways for the user to recover from mistakes, and reduce the chance of losing their work in the event of operation errors, computer failures, or power outages. There are two ways for you to recover from mistakes or problems:

At the User Level (Relating to *Actions*)

- For your actions, there are options like *Undo*, *Redo* and an *Undo History*, used to roll back from mistakes under normal operation, or return back to a specific action.
- Bforartists also has new features like *Repeat* and *Repeat History*, and the new *Redo Last* which you can use in conjunction with the options listed.

At the System Level (Relating to *Files*)

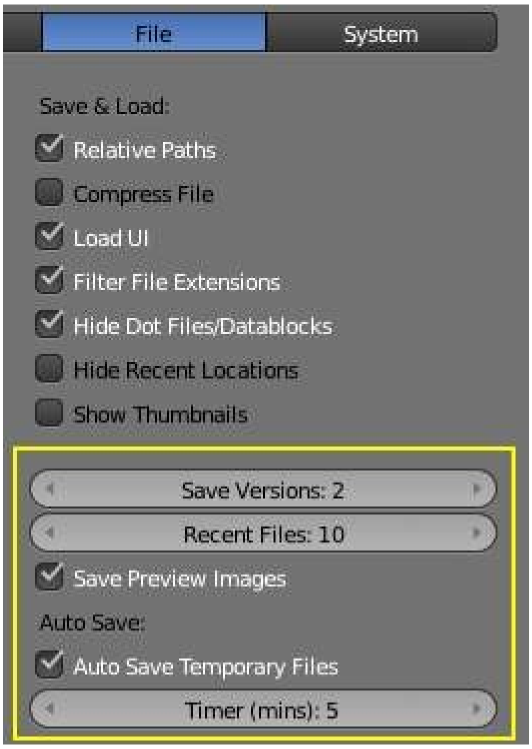
- There are options to save your files like *Auto Save* that saves your file automatically over time, and *Save on Quit*, which saves your Bforartists file automatically when you exit Bforartists.

Note

In addition to these functions being enabled by default, the *Save on Quit* functionality cannot be disabled.

Options for Files (System Level)

Save and Auto Save



Auto Save options

Computer crashes, power outages or simply forgetting to save can result in the loss or corruption of your work. To reduce the chance of losing files when those events occur, Bforartists can use an *Autosave* function. The *File* tab of the *User Preferences* window allows you to configure the two ways that Bforartists provides for you to regress to a previous version of your work.

Save on Quit
: The function *Save on Quit* is enabled by default in Bforartists. Bforartists will always save your files when you quit the application under normal operation.

Save Versions
: This option tells Bforartists to keep the indicated number of saved versions of your file in your current working directory when you manually save a file. These files will have the extension: `.blend1`, `.blend2`, etc., with the number increasing to the number of versions you specify. Older files will be named with a higher number. e.g. With the default setting of **2**, you will have three versions of your file: `*.blend` (your last save), `*.blend1` (your second last save) and `*.blend2` (your third last save).

Auto Save Temporary Files
: Checking this box tells Bforartists to *automatically* save a backup copy of your work-in-progress to the Temp directory (refer to the *File* panel in the *User Preferences* window for its location). This will also enable the *Timer (mins)* control which specifies the number of minutes between each Auto Save. The default value of the Bforartists installation is **5** (5 minutes). The minimum is **1**, and the Maximum is **60** (Save at every one hour).The Auto Saved files are named using a random number and have a `.blend` extension.

Tip

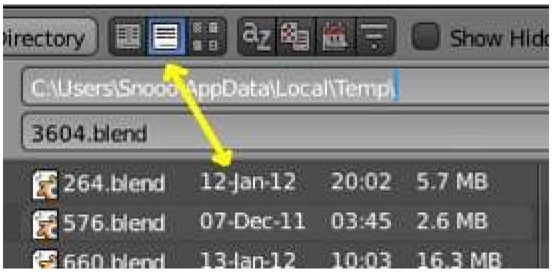
Compress Files

The option to Compress files will try to compact your files whenever Bforartists is saving them. Large Scenes, dense Meshes, big Textures or lots of elements in your Scene will result in a big `.blend` being created. This option could slow down Bforartists when you quit, or under normal operation when Bforartists is saving your backup files. In fact, using this option you will trade processor time for file space.

Recovering Auto Saves

Recover Last Session

File ‣ Recover Last Session will open the `quit.blend` that is saved into the *Temp* directory when you exit Bforartists. Note that files in your *Temp* directory are deleted when you reboot.



Bforartists File Browser

Tip

When recovering files, you will navigate to your temporary folder. It is important, when browsing, to enable the detailed list view. Otherwise, you will not be able to figure out the dates of the auto-saved .blends. (See Figure: Bforartists File Browser)

Recover Auto Save

File ‣ Recover Auto Save... allows you to open the Auto Saved file. After loading the Auto Saved version, you may save it over the current file in your working directory as a normal `.blend` file.

Important

When recovering an Auto Saved file, you will lose any changes made since the last *Auto Save* was performed.Only **one** Auto Saved file exists for each project (i.e. Bforartists does not keep older versions - hence you won't be able to go back more than a few minutes with this tool).

Other options

Recent Files

This setting controls how many recent files are listed in the File ‣ Open Recent sub-menu.

Save Preview Images

Previews of images and materials in the *File Browser* window are created on demand. To save these previews into your `.blend` file, enable this option (at the cost of increasing the size of your `.blend` file).

Compatibility (Linux)

Compatibility (OSX)

Mouse Motion Jitters (SmoothMouse)

Problem

When grabbing an object or orbiting the view, cursor motion is jittery.

See bug report

Solutions

- Uninstall **SmoothMouse**.
- Disable Continuous Grab

Compatibility (Windows)

Bforartists Hangs on Window Duplication (Nahimic for MSI)

Problem

Accessing Window ‣ Duplicate Window, hangs Bforartists, using 100% of one core.

See bug report https://developer.Bforartists.org/T47224

Solution

Uninstall **Nahimic·for·MSI**

16 Glossary

Glossary

This page lists definitions for terms used in Bforartists and this manual. Also see

- About this manual

For other common conventions used throughout the manual.

Active
: One of the three *selection states*. Only one object or item can be active at any given time.

Action Safe
: Area of the screen visible on most devices. Place content inside it to ensure it doesn't get cut off.

Actuator
: A logic brick that acts like a muscle of a lifeform. It can move the object, or also make a sound.

Aliasing
: Rendering artifacts in the form of jagged lines.

Alpha Channel

Additional channel in 2D image for transparency.

Straight Alpha
: Method where `RGBA` channels are stored as `(R, G, B, A)` channels, with the RGB channels unaffected by the alpha channel. This is the alpha type used by paint programs such as Photoshop or Gimp, and used in common file formats like PNG, BMP or Targa. So, image textures or output for the web are usually straight alpha.

Premultiplied Alpha

Method where `RGBA` channels are stored as `(R*A, G*A, B*A, A)`, with the alpha multiplied into the RGB channel.

This is the natural output of render engines, with the RGB channels representing the amount of light that comes toward the viewer, and alpha representing how much of the light from the background is blocked. The OpenEXR file format uses this alpha type. So, intermediate files for rendering and compositing are often stored as premultiplied alpha.

Conversion (Straight/Premultiplied) Alpha

Conversion between the two alpha types is not a simple operation and can involve data loss, as both alpha types can represent data that the other can not, though it is often subtle.

Straight alpha can be considered to be an RGB color image with a separate alpha mask. In areas where this mask is fully transparent, there can still be colors in the RGB channels. On conversion to premultiplied alpha this mask is *'applied'* and the colors in such areas become black and are lost.

Premultiplied alpha on the other hand can represent renders that are both emitting light and letting through light from the background. For example a transparent fire render might be emitting light, but also letting through all light from objects behind it. On converting to straight alpha this effect is lost.

Ambient Light
Light that comes from the surrounding environment as a whole.
Ambient Occlusion
A ratio of how much ambient light a surface point would be likely to receive. If a a surface point is under a foot or table, it will end up much darker than the top of someone’s head or the tabletop.
Animation
Simulation of motion.
Anti-aliasing
See oversampling.
Armature
An Object consisting of bones. Used to rig characters, props, etc.
Axis
A reference line which defines coordinates along one cardinal direction in n-D space.
Baking
The process of computing and storing the result of a potentially time-consuming calculation so as to avoid needing to calculate it again.
Bevel
Operation to chamfer or bevel edges of an object.
BU
Bforartists Units
Internal units used by Bforartists, equivalent to meters. Often abbreviated to “BU”.
Bone
The building block of an Armature. Made up of a Head, Tail and Roll Angle which define a set of local axes and a point of rotation at the Head.
Boolean

A type of logic dealing with binary true/false states.

See also *boolean modifier*

Bounce
Refers to the reflection or transmission of a light ray upon interaction with a material. See also *Light Paths*.
Bounding Box
Box that encloses the shape of an object. The box is aligned with the local space of the object.
Bump Mapping
Technique for simulating slight variations in surface height using a grayscale “height-map” texture.
Bézier
A computer graphics technique for generating and representing curves.
Caustics
Bright concentrations of light focused by specularly reflecting or refracting objects.
Child
An Object that is affected by its Parent.
Color Blend Modes

Methods for blending two colors together.

See also Blend Modes on Wikipedia.

Color Space

TODO.

See also Color Spaces on Wikipedia.

Concave face
: Face in which one vert is inside a triangle formed by other vertices of the face.

Constraint
: A way of controlling one object with data from another.

Controller
: A logic brick that acts like the brain of a lifeform. It makes decisions to activate muscles (actuators), either using simple logic or complex Python scripts.

Convex face
: Face where, if lines were drawn from each vertex to every other vertex, all lines would remain within the face. Opposite of a concave face.

Coplanar
: Refers to any set of elements that are all aligned to the same 2D plane in 3D space.

Crease
: Property of an edge. Used to define the sharpness of edges in subdivision surface meshes.

Curve
: A type of object defined in terms of a line interpolated between Control Vertices. Available types of curves include Bézier and NURBS.

DOF

Depth Of Field
: The distance in front of and behind the subject which appears to be in focus. For any given lens setting, there is only one distance at which a subject is precisely in focus, but focus falls off gradually on either side of that distance, so there is a region in which the blurring is tolerable. This region is greater behind the point of focus than it is in front, as the angle of the light rays change more rapidly; they approach being parallel with increasing distance.

Diffuse Light
: Even, directed light coming off a surface. For most things, diffuse light is the main lighting we see. Diffuse light comes from a specific direction or location, and creates shading. Surfaces facing towards the light source will be brighter, while surfaces facing away from the light source will be darker.

Directional Light
: Light that has a specific direction, but no location. It seems to come from an infinitely far away source, like the sun. Surfaces facing the light are illuminated more than surfaces facing away, but their location doesn't matter. A Directional Light illuminates all objects in the scene, no matter where they are.

Displacement Mapping
: Method for distorting vertices based on an image or texture. Similar to Bump Mapping, but instead operates on the mesh's actual geometry. This relies on the mesh having enough geometry to represent details in the image.

Double Buffer
: Technique for drawing and displaying content on screen. Bforartists uses two buffers (images) to draw the interface in. The content of one buffer is displayed, while drawing occurs on the other buffer. When drawing is complete, the buffers are switched.

Edge
: Straight segment (line) that connects two vertices, and can be part of a face.

Edge Loop
: Chain of edges belonging to consecutive quads. An edge loop ends at a pole or a boundary. Otherwise it is cyclic.

Edge Ring
: Path of all edges along a face loop that share two faces belonging to that loop.

Empty
An Object without any Vertices, Edges or Faces.

Environment Map
Method of calculating reflections. It involves rendering images at strategic positions and applying them as textures to the mirror. Now in most cases obsoleted by Raytracing, which though slower is easier to use and more accurate.

Euler Rotation
TODO.

Face
Mesh element that defines a piece of surface. It consists of 3 or more edges.

Face Loop
Chain of consecutive quads. A face loop stops at a triangle or Ngon (which don’t belong to the loop), or at a boundary. Otherwise it’s cyclic.

Face Normal
The normalized vector perpendicular to the plane that a face lies in. Each face has its own normal.

FCurve
Curve that holds the animation values of a specific property.

Field of View
The area in which objects are visible to the camera. Also see Focal Length

Focal Length
Distance required by a lens to focus collimated light. Defines the magnification power of a lens. Also see Field of View

FSAA
Full-Screen Anti-Aliasing

Method of Anti-aliasing on the graphics card, so the entire image is displayed smooth. Also known as *Multi-Sampling*.

This can be enabled in the user preferences. On many graphics cards this can also be enabled in the driver options.

Gamma

An operation used to adjust brightness of an image.

See also Gamma correction on Wikipedia.

Geometric Center
Mean average of the positions of all vertices making up the object.

Gimbal Lock

The limitation where axes of rotation can become aligned, loosing the ability to rotate on an axis (typically assosiated with euler rotation).

- See also Gimbal lock on Wikipedia.
- See also Gimbal lock on Stackexchange.

Global Illumination
A superset of radiosity and ray tracing. The goal is to compute all possible light interactions in a given scene, and thus obtain a truly photo realistic image. All combinations of diffuse and specular reflections and transmissions must be accounted for. Effects such as color bleeding and caustics must be included in a global illumination simulation.

Global Space
See World Space.

Gouraud Shading

Used to achieve smooth lighting on low-polygon surfaces without the heavy computational requirements of calculating lighting for each pixel. The technique was first presented by Henri Gouraud in 1971.

Head

A subcomponent of a Bone. The point of rotation for that Bone. Has X, Y and Z coordinates measured in the Local Space of the Armature Object. Used in conjunction with the Tail to define the local Y axis of the Bone in Pose Mode. The larger of the two ends when drawn as an Octahedron.

HDRI

High Dynamic Range Image

A set of techniques that allow a far greater dynamic range of exposures than normal digital imaging techniques. The intention is to accurately represent the wide range of intensity levels found in real scenes, ranging from direct sunlight to the deepest shadows.

See also HDRI on Wikipedia.

IOR

Index Of Refraction

A property of transparent materials. When a light ray travels through the same volume it follows a straight path. However if it passes from one transparent volume to another, it bends. The angle by which the ray is bent can be determined by the IOR of the materials of both volumes.

Interpolation

Method of calculating new data between points of known value, like keyframes.

Inverse Kinematics

The process of determining the movement of interconnected segments of a body or model. Using ordinary Kinematics on a hierarchically structured object you can for example move the shoulder of a puppet. The upper and lower arm and hand will automatically follow that movement. IK will allow you to move the hand and let the lower and upper arm go along with the movement. Without IK the hand would come off the model and would move independently in space.

Keyframe

A frame in an animated sequence drawn or otherwise constructed directly by the user. In classical animation, when all frames were drawn by animators, the senior artist would draw these frames, leaving the “in between” frames to an apprentice. Now, the animator creates only the first and last frames of a simple sequence (keyframes); the computer fills in the gap.

Keyframing

Inserting Keyframes to build an animated sequence.

Lattice

A type of object consisting of a non-renderable three-dimensional grid of vertices.

See also *Lattice Modifier.*

Layer

A device for organizing objects. See also *Layers*.

Local Space

A 3D coordinate system that originates (for Objects) at the Object Center or (for Bones) at the Head of the Bone.

Compare to World Space.

Logic brick

A graphical representation of a functional unit in Bforartists’s game logic. A Logic brick can be a Sensor, Controller or Actuator.

Manifold

Manifold meshes, also called *water tight* meshes, define a **closed non-self-intersecting volume** (see also non-manifold). A manifold mesh is a mesh in which the structure of the connected faces in a closed volume will always point the normals (and their surfaces) to the outside or to the inside of the mesh without any overlaps. If you recalculate those normals, they will always point at a predictable direction (To the outside or to the inside of the volume). When working with non-closed volumes, a manifold mesh is a mesh in which the normals will always define two different and non-consecutive surfaces. A manifold mesh will always define an even number of non overlapped surfaces.

Mesh

Type of object consisting of vertices, edges and faces.

Motion Blur

The phenomenon that occurs when we perceive a rapidly moving object. The object appears to be blurred because of our persistence of vision. Simulating motion blur makes computer animation appear more realistic.

Multi-sampling

See FSAA

Ngon

A face that contains more than four vertices.

Non-linear animation

Animation technique that allows the animator to edit motions as a whole, not just the individual keys. Nonlinear animation allows you to combine, mix, and blend different motions to create entirely new animations.

Non-manifold

Non-Manifold meshes essentially define geometry which cannot exist in the real world. This kind of geometry is not suitable for several types of operations, specially those where knowing the volume (inside/outside) of the object is important (refraction, fluids, booleans, or 3D printing, to name a few). A non-manifold mesh is a mesh in which the structure of a non-overlapped surface (based on it's connected faces) won't determine the inside or the outside of a volume based on it's normals, defining a single surface for both sides, but ended with flipped normals. When working with non-closed volumes, a non-manifold mesh will always determine at least one discontinuity at the normal directions, either by an inversion of a connected loop, or by an odd number of surfaces. A non manifold mesh will always define an odd number of surfaces.

There are several types of non-manifold geometry:

- Some borders and holes (edges with only a single connected face), as faces have no thickness.
- Edges and vertices not belonging to any face (wire).
- Edges connected to 3 or more faces (interior faces).
- Vertices belonging to faces that are not adjoining (e.g. 2 cones sharing the vertex at the apex).

See also: Select Non-Manifold tool.

Normal

The normalized vector perpendicular to a surface.

Normals can be assigned to vertices, faces and modulated across a surface using normal mapping.

Normal mapping

Is similar to Bump mapping, but instead of the image being a greyscale heightmap, the colors define in which direction the normal should be shifted, the 3 color channels being mapped to the 3 directions X, Y and Z. This allows more detail and control over the effect.

NURBS

A computer graphics technique for generating and representing **curves** and **surfaces**.

Object

Container for a type (Mesh, Curve, Surface, Metaball, Text, Armature, Lattice, Empty, Camera, Lamp) and basic 3D transform data(Object Center).

Object Center

Object Origin

A reference point used to position, rotate, and scale an Object and to define its Local Space coordinates.

Octahedron

An eight-sided figure commonly used to depict the Bones of an Armature.

OpenGL

The graphics system used by Bforartists (and many other graphics applications) for drawing 3D graphics, often taking advantage of hardware acceleration.

See also OpenGL on Wikipedia.

Oversampling

Is the technique of minimizing aliasing when representing a high-resolution signal at a lower resolution.

Also called **Anti-Aliasing**.

Overscan

The term used to describe the situation when not all of a televised image is present on a viewing screen

See also Overscan on Wikipedia.

Parent

An Object that affects its Child objects.

Parenting

Creating a Parent-Child relationship between two objects.

Particle system

Technique that simulate certain kinds of fuzzy phenomena, which are otherwise very hard to reproduce with conventional rendering techniques. Common examples include fire, explosions, smoke, sparks, falling leaves, clouds, fog, snow, dust, meteor tails, stars and galaxies, or abstract visual effects like glowing trails, magic spells. Also used for fur, grass or hair.

Phong

Local illumination model that can produce a certain degree of realism in three-dimensional objects by combining three elements: diffuse, specular and ambient for each considered point on a surface. It has several assumptions - all lights are points, only surface geometry is considered, only local modelling of diffuse and specular, specular color is the same as light color, ambient is a global constant.

Pivot Point

Reference point used by many mesh manipulation tools.

See also *Pivot Point*.

Pixel

The smallest unit of information in a 2D raster image, representing a single color made up of red, green, and blue channels. If the image has an alpha channel, the pixel will contain a corresponding fourth channel.

Pole

Vertex where three, five, or more edges meet. A vertex connected to one, two, or four edges is not a pole.

Pose Mode

Used for posing, keyframing, weight painting, constraining and parenting the bones of an armature.

Posing

Moving, Rotating and Scaling the bones of an armature to achieve an aesthetically pleasing pose for a character.

Premultiplied Alpha

See Alpha Channel

Primitive

A basic object that can be used as a basis for modeling more complicated objects.

Procedural Texture

Computer generated (generic) textures. Procedural textures can be configured via parameters.

Projection

In computer graphics there are two common camera projections used.

Perspective

A *perspective* view is geometrically constructed by taking a scene in 3D and placing an observer at point `O`. The 2D perspective scene is built by placing a plane (e.g. a sheet of paper) where the 2D scene is to be drawn in front of point `O`, perpendicular to the viewing direction. For each point `P` in the 3D scene a `PO` line is drawn, passing by `O` and `P`. The intersection point `S` between this `PO` line and the plane is the perspective projection of that point. By projecting all points `P` of the scene you get a perspective view.

Orthographic

In an *orthographic* projection, you have a viewing direction but not a viewing point `O`. The line is then drawn through point `P` so that it is parallel to the viewing direction. The intersection `S` between the line and the plane is the orthographic projection of the point `P`. By projecting all points `P` of the scene you get the orthographic view.

Quad

Quadrilateral

Quadrangle

Face that contains exactly four vertices.

Radiosity

A global lighting method that calculates patterns of light and shadow for rendering graphics images from three-dimensional models. One of the many different tools which can simulate diffuse lighting in Bforartists.

See also Radiosity (computer graphics) on Wikipedia.

Raytracing

Rendering technique that works by tracing the path taken by a ray of light through the scene, and calculating reflection, refraction, or absorption of the ray whenever it intersects an object in the world. More accurate than scanline, but much slower.

Refraction

The change in direction of a wave due to a change in velocity. It happens when waves travel from a medium with a given index of refraction to a medium with another. At the boundary between the media, the wave changes direction; its wavelength increases or decreases but frequency remains constant.

Render

The process of computationally generating a 2D image from 3D geometry.

Rig

A system of relationships that determine how something moves. The act of building of such a system.

Roll
Roll Angle

The orientation of the local X and Z axes of a Bone. Has no effect on the local Y axis as local Y is determined by the location of the Head and Tail.

Scanline

Rendering technique. Much faster than raytracing, but allows fewer effects, such as reflections, refractions, motion blur and focal blur.

Sensor

A logic brick that acts like a sense of a lifeform. It reacts to touch, vision, collision etc.

Shading

Process of altering the color of an object/surface in the 3D scene, based on its angle to lights and its distance from lights to create a photorealistic effect.

Smoothing

Defines how faces are shaded. Face can be either solid (faces are rendered flat) or smooth (faces are smoothed by interpolating the normal on every point of the face).

Specular light

Light which is reflected precisely, like a mirror. Also used to refer to highlights on reflective objects.

Straight Alpha

See Alpha Channel

Sub surface scattering

Mechanism of light transport in which light penetrates the surface of a translucent object, is scattered by interacting with the material, and exits the surface at a different point. All non-metallic materials are translucent to some degree. In particular, materials such as marble, skin, and milk are extremely difficult to simulate realistically without taking subsurface scattering into account.

Subdividing

Technique for adding more geometry to a mesh. It creates new vertices on subdivided edges, new edges between subdivisions and new faces based on new edges. If new edges cross a new vertex is created on their crossing point.

Subsurf
Subdivision surface

Method of creating smooth higher poly surfaces which can take a low polygon mesh as input.

Sometimes abbreviated to **Subsurf**.

See also Catmull-Clark subdivision surface on Wikipedia

Tail

A subcomponent of a Bone. Has X, Y and Z coordinates measured in the Local Space of the Armature Object. Used in conjunction with the Head to define the local Y axis of a Bone in Pose Mode. The smaller of the two ends when drawn as an Octahedron.

Texture

Specifies visual patterns on surfaces and simulates physical surface structure.

Timecode

A coded signal on videotape or film giving information about the frame number, time of recording, or exposure.

Title Safe

Area of the screen visible on all devices. Place text and graphics inside this area to make sure they don’t get cut off.

Topology

Arrangement of *Vertices*, *Edges*, and *Faces* which define the shape of a mesh. See vertex, edge, and face.

Transforms

The combined idea of location, rotation and scale.

Triangle
    Face with exactly 3 vertices.
UV map
    Defines a relation between the surface of a 3 dimensional mesh and a 2D texture. In detail, each face of the mesh is mapped to a corresponding face on the texture. It is possible and often common practice to map several faces of the mesh to the same or overlapping areas of the texture.
Vertex
Vertices
    A point in 3D space containing a location. It may also have a defined color. Vertices are the terminating points of edges.
Vertex Group
    Collection of vertices. Vertex groups are useful for limiting operations to specific areas of a mesh.
Voxel
    A cubicle 3D equivalent to the square 2D pixel. The name is a combination of the terms “Volumetric” and “Pixel”. Used to store smoke and fire data from physics simulations.
Weight Painting
    Assigning vertices to Vertex Groups with a weight of 0.0 - 1.0.
World Space
    A 3D coordinate system that originates at a point at the origin of the world. Compare to Local Space.

About this manual

In this manual aims to be a complete and concise source of information to help you to become familiar with the application.

You can find links to the particular areas of interest in the navigation bar on the left.

Conventions used

The mouse buttons are referred to as:

`LMB`
    Left Mouse Button
`RMB`
    Right Mouse Button

If your mouse has a wheel

`MMB`
    Middle Mouse Button
`Wheel`
    Scrolling the wheel.

Hotkey letters are shown in this manual like they appear on a keyboard; for example,

`G`
    refers to the lowercase `g`.
`Shift`, **`Ctrl`**, **`Alt`**
    are specified as modifier keys.
`Ctrl-W`, **`Shift-Alt-A`**, …

indicates that these keys should be pressed simultaneously

`Numpad0` to `Numpad9`, `NumpadPlus`

refer to the keys on the separate numeric keypad.

Other keys are referred to by their names, such as `Esc`, `Tab`, `F1` to `F12`. Of special note are the arrow keys, `Left`, `Right` and so on.

Get Involved

If you would like to contribute to this manual, see *About this Manual*, check for open tasks, or join the mailing list and #Bforartistswiki channel on IRC.

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About this Manual

Bforartists is a Blender fork. And so also the Bforartists Manual is based at the Blender manual. Most of the text and the images are still the images from the Blender manual.

This will change over time when Bforartists evolves more and more away from Blender. But it is very likely that some old Blender manual parts will remain parts of the Bforartists manual. Freestyle documentation for example.

Manipulating Bforartists Manual

The Bforartists Manual is a community driven effort to which anyone can contribute.

And this very easy, since the manual comes not only as pdf files, but also as editable *.odt files. That's the file format for Libre and Open Office. Both free and open source Office solutions. To manipulate or to fix a typoe, a word, a sentence or even a whole chapter is as easy as manipulating the text in Libre Office or Open Office, export to PDF, and tell the Bforartists developers to put it online.

License

The Bforartists's Manual is free and published under Public Domain*

This means that anyone is free to download, edit and share the manual. It also means that when contributing to the manual you don't hold exclusive copyright to your text. You are, of course, acknowledged and appreciated for your contribution. However others can change and improve your text in order to keep the manual consistent and up to date.

*** As of writing this part here the Blender manual for 2.77 and below was put under a Public Domain AS CC0 license. Which is simply invalid. You can have either Public domain. Or CC0. Those two licenses contradicts each other.**

It also seems that the Blender manual was put under CC0 without asking all involved persons if they wanted to do so. Another license breach.

So i choose the license type that seems to fit most here, especially when looking at the old licensing. Public Domain.

The Blender developers are currently at looking under what license the manual will be in the future since the current license doesn't fit. I will adjust the license when needed to the new license type then.

Pipeline

Pipeline

This section of the manual focuses on the integration of Blender into a production pipeline. This is a vast topic that covers many areas of the software, but here we will focus on file/asset management and data I/O.

Note

The tools and workflows documented here require familiarity with working with a command line interface and are mostly aimed at TDs and technical users.

BAM Asset Manager

Refactoring linked .blend files is a common practice in a production environment. While some basic operations can be accomplished within Blender, sometimes it is more practical to perform them on the command line or via a script. During the production of Cosmos Laundromat (Gooseberry Open Movie Project) the *BAM Asset Manager* (BAM) was developed. The original scope of BAM included client-server asset management tools going beyond Blender, but it was later refocused on core utilities to perform two operations:

- blendfile packing
- automatic dependencies remapping

The following section of the manual focuses on how to use BAM.

Installing BAM

BAM is a standalone Python package, that can be run on any system without any particular configuration. The only requirement is Python 3 (and pip, the Python package manager, to easily install BAM).

Windows, Linux and macOS provide different ways to install Python 3 and pip. Check out the online docs to learn more about a specific platform.

Once Python 3 and pip are available, BAM can be installed via command line by typing:

```
pip3 install blender-bam
```

After a successful installation, the *bam* command will be available. By typing it and pressing the Enter key, all the available subcommands will be displayed.

bam pack

This command is used for packing a `.blend` file and *all* its dependencies into a `.zip` file for redistribution.

```
usage: bam pack [-h] [-o FILE] [-m MODE] [-e PATTERNS] [-a] [-q] [-c LEVEL]
                paths [paths ...]
```

You can simply pack a blend file like this to create a zip-file of the same name.

```
bam pack /path/to/scene.blend
```

You may also want to give an explicit output directory. The example shows how to pack a blend with maximum compression for online downloads

```
bam pack /path/to/scene.blend --output my_scene.zip --compress=best
```

The command provides several options to adapt to different workflows (final distribution, partial extraction, rendering).

-o, --output <FILE>
: Output file or a directory when multiple inputs are passed

-m, --mode <MODE>
: Output file or a directory when multiple inputs are passed. Possible choices: `ZIP`, `FILE`

-e, --exclude <PATTERN(S)>
: Optionally exclude files from the pack.

  --exclude="*.png"
  : Using Unix shell-style wildcards *(case insensitive)*.

  --exclude="*.txt;*.avi;*.wav"
  : Multiple patterns can be passed using the `;` separator.

-a, --all-deps
: Follow all dependencies (unused indirect dependencies too)

-q, --quiet
: Suppress status output

-c, --compress <LEVEL>
: Compression level for resulting archive Possible choices: `default`, `fast`, `best`, `store`

--repo <DIR PATH>
: Specify a “root” path from where to pack the selected file. This allows for the creation of a sparse copy of the production tree, without any remapping.

--warn-external

Report external libraries errors (missing paths)

Examples

Consider the following directory layout, and in particular the file *01_01_A.lighting.blend* with its linked libraries.

```
~/agent327/
└─ lib/
   ├─ chars/
   |  ├─ agent.blend  ------------->|
   |  ├─ boris.blend  ------------->|
   |  └─ barber.blend               |
   └─ scenes/                       |
      ├─ 01-opening                 |
      ├─ 01_01_A.lighting.blend  <--|  < BAM pack this file
      └─ 01_01_A.anim.blend  ------>|
```

Once we run `bam pack /scenes/01-opening/01_01_A.lighting.blend` we obtain a *01_01_A.lighting.zip* inside of which we find the following structure.

```
~/01_01_A.lighting
   ├─ 01_01_A.lighting.blend
   └─ __/
      ├─ 01_01_A.anim.blend
      └─ __/
         └─ lib/
            └─ chars/
               ├─ agent.blend
               └─ boris.blend
```

Note how all paths have been remapped relative to the placement of *01_01_A.lighting.blend* in the root of the output. If we run `bam pack /scenes/01-opening/01_01_A.lighting.blend --repo ~/agent327`, the output will be different.

```
~/01_01_A.lighting
   ├─ lib/
   |  └─ chars/
   |     ├─ agent.blend
   |     └─ boris.blend
   └─ scenes
      └─ 01-opening/
         ├─ 01_01_A.lighting.blend  < The BAM packed file
         └─ 01_01_A.anim.blend
```

In this case no path is remapped, and we simply strip out any file that is not referenced as a direct or indirect dependency of *01_01_A.lighting.blend*. This is effectively a sparse copy of the original production tree.

bam remap

Remap blend file paths

```
usage: bam remap [-h] {start,finish,reset} ...
```

This command is a 3 step process:

- first run `bam remap start .` which stores the current state of your project (recursively).
- then re-arrange the files on the filesystem (rename, relocate).
- finally run `bam remap finish` to apply the changes, updating the `.blend` files internal paths.

```
cd /my/project

bam remap start .
mv photos textures
mv barbershop_v14_library.blend barberhop_libraray.blend
bam remap finish
```

Note

Remapping creates a file called `bam_remap.data` in the current directory. You can relocate the entire project to a new location but on executing `finish`, this file must be accessible from the current directory.

Note

This command depends on files unique contents, take care not to modify the files once remap is started.

Subcommands

remap start

Start remapping the blend files

```
usage: bam remap start [-h] [-j] [paths [paths ...]]
```

`-j`, `--json`
: Generate JSON output

remap finish

Finish remapping the blend files

```
usage: bam remap finish [-h] [-r] [-d] [-j] [paths [paths ...]]
```

`-r`, `--force-relative`
: Make all remapped paths relative (even if they were originally absolute)

`-d`, `--dry-run`
: Just print output as if the paths are being run

`-j`, `--json`
: Generate JSON output

remap reset

Cancel path remapping

```
usage: bam remap reset [-h] [-j]
```

Alembic

From the Alembic home page:

> Alembic is an open computer graphics interchange framework. Alembic distills complex, animated scenes into a non-procedural, application-independent set of baked geometric results. This ‘distillation’ of scenes into baked geometry is exactly analogous to the distillation of lighting and rendering scenes into rendered image data.
>
> Alembic is focused on efficiently storing the computed results of complex procedural geometric constructions. It is very specifically NOT concerned with storing the complex dependency graph of procedural tools used to create the computed results. For example, Alembic will efficiently store the animated vertex positions and animated transforms that result from an arbitrarily complex animation and simulation process which could involve enveloping, corrective shapes, volume-preserving simulations, cloth and flesh simulations, and so on. Alembic will not attempt to store a representation of the network of computations (rigs, basically) which are required to produce the final, animated vertex positions and animated transforms.

TL;DR: Alembic can be used to write an animated mesh to disk, and read it back quickly & efficiently. This means that a mesh can be animated with a very CPU-heavy rig, ‘baked’ to an Alembic file, and loaded into the shot file for shading and lighting with only moderate CPU usage.

Support for the Alembic file format was introduced in Blender 2.78.

Due to the Open Source nature of the Alembic standard, as well as the C++ library implementing that standard, **Blender can be used in a hybrid pipeline**. For example, other software, such as Houdini or Maya, can export files to Alembic, which can then be loaded, shaded, and rendered in Blender. It is also possible to animate characters (or other models) in Blender, export to Alembic, and load those files into other software for further processing.

Exporting to Alembic files

This section describes the effect of the different export options.

Alembic Export options.

Manual Transform

Scale

This sets the global scale of the Alembic file. Keep it at the default value of 1.0 to use Blender's units.

Scene Options

Start Frame and End Frame

Sets the frame range to export to Alembic. This defaults to the current scene frame range.

Sub-frame sampling: Transform & Geometry Samples, Shutter Open & Close

These options control the sub-frame sampling of animations. Transform Samples sets the number of times per frame at which animated transformations are sampled and written to Alembic. Geometry Samples sets the same, but then for animated geometry. Shutter Open & Close define the interval [open, close) over which those samples are taken. The valid range is -1 to 1, where -1 indicates the previous frame, 0 indicates the current frame, and 1 indicates the next frame. For example, if information for detailed mesh motion blur is desired, some subframes around the current frame can be written to Alembic by using a sample count of 5, Shutter Open at -0.25 and Shutter Close at 0.25. This mimicks a “180 degree” shutter, opening 90 degrees before the frame and closing 90 degrees after the frame.

Selected Objects Only

When enabled, exports only the selected objects. When disabled, all objects are exported.

Renderable Objects Only

This is useful to, for example, avoid exporting custom bone shapes.

Visible Layers Only

Limits the export to scene layers that are currently visible.

Flatten Hierarchy

When disabled, parent/child relations between objects are exported too. Any parent object that is not exported itself, but with children that *are* exported, is replaced by an Empty. When enabled, parent/child relations are not exported, and transformations are all written in world coordinates.

Object Options

UVs

When enabled, UV maps are exported. Although the Alembic standard only supports a single UV map, Blender exports all UV maps in a way that should be readable by other software.

Pack UV Islands

TODO: figure out & describe what this does

Normals

TODO: figure out & describe what this does

Vertex Colors

When enabled, exports vertex colours. At this moment, this only supports static vertex colors, and not dynamically animated vertex colors.

Face Sets

TODO: figure out & describe what this does

Use Subdivision Schema

When enabled, writes polygonal meshes using the “SubD” Alembic schema, rather than the “PolyMesh” schema.

Apply Subsurf

TODO: figure out & describe what this does

Triangulate

Triangulates the mesh before writing to Alembic.

Particle Systems

Alembic has no support for Particle Systems, in the same way that it does not support armatures. Hair is exported as animated zero-width curves. Particles are exported as animated points.

The Game Engine

Blender has its own built in Game Engine. Bforartists is a fork of Blender, and so the game engine exists also in Bforartists.

The Blender Game Engine is aged to say the least. And it is very limited. We recommend NOT to use it anymore. As with the video sequence editor, everything is better than the Blender solution. Use Unity, Unreal, Godot or anything else state of the art instead.

BFORARTISTS DOES NOT GIVE ANY SUPPORT FOR THE GAME ENGINE!

You have to use the Blender manual when you want to work with the game engine.

It can be found here: https://docs.blender.org/manual/en/dev/game_engine/introduction.html

Bforartists History

Bforartists History

Preface:

Welcome to Bforartists, the free and open source 3D modeling, rendering and animation suite.

Bforartists is a fork of the popluar open source 3d software Blender. And, similar to Blender, of course also open source and under the GPL license. The primary goal of the Bforartists fork is to deliver a better graphical UI and a better usability. This means a complete switch in the useage philosophy. Away from the hotkey and speed centered useage. Away from crazy decisions like RMB select. Towards a user friendly and intuitive graphical UI that can be used with a mouse and one hand when neccessary. And that is much closer to the common UI standards of many other software.

The idea to solve the UI dilemma of Blender and to fork it was long around since years. It was no easy decision to really start it. Blender is a code monster. And so the answer to the question shall i really start a fork was always no. But at one point it was simply enough how the user interface gots treaten by the Blender developers. The answer if Blender should be forked turned from *no* to *possible with some big caveats*. And then the decision was made to fork Blender.

The Bforartists project itself started officially at July the 2nd 2015. That's when the first real steps were done.

History:

2.6.2015 - Decision day. The first pages for the UI proposal were written. The work at the homepage started. Which was the official start of the whole project.

2.7.2015 - The domain bforartists was registered.

13.8.2015 - The Bforartists page was finished and went live.

22.8.2015 - Github account was created and went live.

21.9.2015 - The first Bforartists version 0.1 was released. It was based at Blender 2.75. And containted not this much more than the changed branding.

14.10.2015 - Version 0.2 brought the changes for Blender 2.76. And that was the moment when Bforartists started to walk alone.

19.12.2015 - Version 0.2.1 introduced a new keymap and a new navigation scheme. And already quite a few changes at the UI layout. Blender has a ton of missing UI entries and a ton of double and even triple menu entries. It also brought in the Blender 2.76 a and b patches to Bforartists

27.01.2016 - Bforartists 0.2.2 was mainly around a plugin to display the most needed hotkeys up left.

18.03.2016 - Bforartists 0.3.0 introduced the first incarnation of icon buttons in the tool shelf.

26.03.2016 - Bforartists 0.3.1 came with some small fixes that were overlooked for version 0.3.0. The splash screen was changed because of ongoing trolling.

02.08.2016 - Bforartists 0.4.0 was a small refinement release that was the final stroke below the try to implement Qt and new editor types. Which did simply not work.

04.09.2016 - Bforartists 0.4.1 brought mainly changes to the tooltips. Nearly every tooltip contains the tool name now too.

16.09.2016 - 0.4.2 is another small release mainly around catching some more tooltips and small quirks. New is the Materials Library FX addon, which is also natively included into Blender 2.78 now.

24.09.2016 - 0.5.0 is a milestone release. It marks the end of the first big development cycle. The tracker is empty for the first time since development start.

02.11.2016 - 0.6.0 brings fixes to the addons, first subtabs in the panels, and the Mini lightlib addon.

01.12.2016 - 0.7.0 was mainly cleanup work in the Properties editor.

08.01.2017 - Version 0.8.0 brings the new Toolbar editor.

27.02.2017 - Version 0.9.0 is the merge of the actual Blender version 2.78 C into Bforartists.

13.03.2017 - Version 0.9.1 is a bug fix release that fixes some show stoppers from version 0.9.0.

10.4.2017 - Version 0.9.2 is around cleaning up the menus and connecting some loose ends. And it introduces a Mac build.

13.9.2017 - Version 0.9.3 is the merge of Blender 2.79 into Bforartists. Plus a few smaller adjustments and fixes.

14.9.2017 - An emergency release because of a showstopper bug. The bake panels were missing.

02.03.2018 - Version 0.9.6 brings the changes from Blender 2.79a, and adds 260 changes from Bforartists side.

19.04.2018 - Version 0.9.7 brings the full keymap, the changes from Blender 2.79b, and lots of small improvements and fixes. More compact brush panels for example.

04.05.2018 - Version 1.0.0 RC1 marks the end of this development cycle. All initial development goals that could be fulfilled are fulfilled.

11.05.2018 - Version 1.0.0 is live.

Blender’s History

In 1988 Ton Roosendaal co-founded the Dutch animation studio NeoGeo. NeoGeo quickly became the largest 3D animation studio in the Netherlands and one of the leading animation houses in Europe. NeoGeo created award-winning productions (European Corporate Video Awards 1993 and 1995) for large corporate clients such as multi-national electronics company Philips. Within NeoGeo Ton was responsible for both art direction and internal software development. After careful deliberation Ton decided that the current in-house 3D toolset for NeoGeo was too old and cumbersome to maintain, and needed to be rewritten from scratch. In 1995 this rewrite began and was destined to become the 3D software creation we all know as Blender. As NeoGeo continued to refine and improve Blender it became apparent to Ton that Blender could be used as a tool for other artists outside of NeoGeo.

In 1998, Ton decided to found a new company called Not a Number (NaN) as a spin-off of NeoGeo to further market and develop Blender. At the core of NaN was a desire to create and distribute a compact, cross platform 3D application for free. At the time this was a revolutionary concept as most commercial 3D applications cost thousands of dollars. NaN hoped to bring professional level 3D modeling and animation tools within the reach of the general computing public. NaN’s business model involved providing commercial products and services around Blender. In 1999 NaN attended its first SIGGRAPH conference in an effort to more widely promote Blender. Blender’s first SIGGRAPH convention was a huge success and gathered a tremendous amount of interest from both the press and attendees. Blender was a hit and its huge potential confirmed!

Following the success of the SIGGRAPH conference in early 2000, NaN secured financing of €4.5M from venture capitalists. This large inflow of cash enabled NaN to rapidly expand its operations. Soon NaN boasted as many as fifty employees working around the world trying to improve and promote Blender. In the summer of 2000, Blender 2.0 was released. This version of Blender added the integration of a game engine to the 3D application. By the end of 2000, the number of users registered on the NaN website surpassed 250,000.

Unfortunately, NaN’s ambitions and opportunities didn’t match the company’s capabilities and the market realities of the time. This over-extension resulted in restarting NaN with new investor funding and a smaller company in April 2001. Six months later NaN’s first commercial software product, Blender Publisher was launched. This product was targeted at the emerging market of interactive web-based 3D media. Due to disappointing sales and the ongoing difficult economic climate, the new investors decided to shut down all NaN operations. The shutdown also included discontinuing the development of Blender. Although there were clearly shortcomings in the then current version of Blender, such as a complex internal software architecture, unfinished features and a non-standard way of providing the GUI, the enthusiastic support from the user community and customers who had purchased Blender Publisher in the past meant that Ton couldn’t justify leaving Blender to fade into insignificance. Since restarting a company with a sufficiently large team of developers wasn’t feasible, Ton Roosendaal founded the non-profit organization Blender Foundation in March 2002.

The Blender Foundation’s primary goal was to find a way to continue developing and promoting Blender as a community-based open source project. In July 2002, Ton managed to get the NaN investors to agree to a unique Blender Foundation plan to attempt to release Blender as open source. The “Free Blender” campaign sought to raise €100,000 so that the Foundation could buy the rights to the Blender source code and intellectual property rights from the NaN investors and subsequently release Blender to the open source community. With an enthusiastic group of volunteers, among them several ex-NaN employees, a fund raising campaign was launched to “Free Blender”. To everyone’s surprise and delight the campaign reached the €100,000 goal in only seven short weeks. On Sunday October 13, 2002, Blender was released to the world under the terms of the GNU GPL. Blender development continues to this day driven by a team of dedicated volunteers from around the world led by Blender’s original creator, Ton Roosendaal.

Video: From Blender 1.60 to 2.50

https://vimeo.com/8567074

Version/Revision Milestones

The start!

- 1.00 - January 1994: Blender in development at animation studio NeoGeo.
- 1.23 - January 1998: SGI version published on the web, IrisGL.
- 1.30 - April 1998: Linux and FreeBSD version, port to OpenGL and X11.
- 1.3x - June 1998: NaN founded.
- 1.4x - September 1998: Sun and Linux Alpha version released.
- 1.50 - November 1998: First Manual published.
- 1.60 - April 1999: C-key (new features behind a lock, $95), MS-Windows version released.
- 1.6x - June 1999: BeOS and PPC version released.
- 1.80 - June 2000: End of C-key, Blender full freeware again.
- 2.00 - August 2000: Interactive 3D and real-time engine.
- 2.10 - December 2000: New engine, physics, and Python.
- 2.20 - August 2001: Character animation system.
- 2.21 - October 2001: Blender Publisher launch.
- 2.2x - December 2001: Mac OSX version.

Blender goes Open Source

- **13 October 2002: Blender goes Open Source, 1st Blender Conference**.
- 2.25 - October 2002: Blender Publisher becomes freely available.
- Tuhopuu1 - Oct 2002: The experimental tree of Blender is created, a coder’s playground.
- 2.26 - February 2003: The first true open source Blender release.
- 2.27 - May 2003: The second open source Blender release.
- 2.28x - July 2003: First of the 2.28x series.
- 2.30 - October 2003: Preview release of the 2.3x UI makeover presented at the 2nd Blender Conference.
- 2.31 - December 2003: Upgrade to stable 2.3x UI project.
- 2.32 - January 2004: Major overhaul of internal rendering capabilities.
- 2.33 - April 2004: Game Engine returns, ambient occlusion, new procedural textures.
- 2.34 - August 2004: Particle interactions, LSCM UV mapping, functional YafRay integration, weighted creases in subdivision surfaces, ramp shaders, full OSA, and many many more.
- 2.35 - November 2004: Another version full of improvements: object hooks, curve deforms and curve tapers, particle duplicators and much more.

- 2.36 - December 2004: A stabilization version, much work behind the scene, normal and displacement mapping improvements.
- 2.37 - June 2005: Transformation tools and widgets, softbodies, force fields, deflections, incremental subdivision surfaces, transparent shadows, and multi-threaded rendering.
- 2.40 - December 2005: Full rework of armature system, shape keys, fur with particles, fluids and rigid bodies.
- 2.41 - January 2006: Lots of fixes, and some game engine features.
- 2.42 - July 2006: The nodes release, array modifier, vector blur, new physics engine, rendering, lip sync, and many other features. This was the release following Project Orange.
- 2.43 - February 2007: Multi-resolution meshes, multi-layer UV textures, multi-layer images and multi-pass rendering and baking, sculpting, retopology, multiple additional matte, distort and filter nodes, modeling and animation improvements, better painting with multiple brushes, fluid particles, proxy objects, sequencer rewrite, and post-production UV texturing.
- 2.44 - May 2007: The big news, in addition to two new modifiers and re-awakening the 64-bit OS support, was the addition of subsurface scattering, which simulates light scattering beneath the surface of organic and soft objects.
- 2.45 - September 2007: Serious bug fixes, with some performance issues addressed.
- 2.46 - May 2008: The Peach release was the result of a huge effort of over 70 developers providing enhancements to provide hair and fur, a new particle system, enhanced image browsing, cloth, a seamless and non-intrusive physics cache, rendering improvements in reflections, AO, and render baking, a mesh deform modifier for muscles and such, better animation support via armature tools and drawing, skinning, constraints and a colorful Action Editor, and much more. It was the release following Project Peach.
- 2.47 - August 2008: Bugfix release.
- 2.48 - October 2008: The Apricot release, cool GLSL shaders, lights and GE improvements, snap, sky simulator, shrinkwrap modifier, and Python editing improvements. This was the release following Project Apricot.
- 2.49 - June 2009: Node-based textures, armature sketching (called Etch-a-Ton), boolean mesh operation improvements, JPEG2000 support, projection painting for direct transfer of images to models, and a significant Python script catalogue. GE enhancements included video textures, where you can play movies in-game, upgrades to the Bullet physics engine, dome (fish-eye) rendering, and more API GE calls made available.

Blender 2.5x - The Recode!

- 2.5x - From 2009 to August 2011: This series released four pre-version (from Alpha 0 in November 2009 to Beta in July 2010) and three stable versions (from 2.57 - April 2011 - to 2.59 - August 2011). It is one of the most important development projects, with a total refactor of the software with new functions, redesign of the internal window manager and event/tool/data handling system, and new Python API. The final version of this project was Blender 2.59 in August 2011.

Blender 2.6x to 2.7x - Improvements & Stabalizing

- 2.60 - October 2011: Internationalization of the UI, improvements in animation system and the GE, vertex weight groups modifiers, 3D audio and video, bug fixes, and the UI internationalization.

- 2.61 - December 2011: The Cycles renderer was added in trunk, the camera tracker was added, dynamic paint for modifying textures with mesh contact/approximation, the Ocean Sim modifier to simulate ocean and foam, new add-ons, bug fixes, and more extensions added for the Python API.
- 2.62 - February 2012: The Carve library was added to improve boolean operations, support for object tracking was added, the Remesh modifier was added, many improvements in the GE, matrices and vectors in the Python API were improved, new add-ons, and many bug fixes.
- 2.63 - April 2012: Bmesh was merged to trunk with full support for n-sided polygons, sculpt hiding, a panoramic camera for Cycles, mirror ball environment textures and float precision textures, render layer mask layers, ambient occlusion and viewport display of background images and render layers, new import and export add-ons were added, and 150 bug fixes.
- 2.64 - October 2012: Mask editor, improved motion tracker, OpenColorIO, Cycles improvements, sequencer improvements, better mesh tools (Inset and Bevel were improved), new keying nodes, sculpt masking, Collada improvements, new skin modifier, new compositing nodes backend, and many bugs were fixed.
- 2.65 - December 2012: Fire and smoke improvements, anisotropic shader for Cycles, modifier improvements, bevel tool now includes rounding, new add-ons, and over 200 bug fixes.
- 2.66 - February 2013: Dynamic topology, rigid body simulation, improvements in UI and usability (including retina display support), Cycles now supports hair, the bevel tool now supports individual vertex bevelling, new *Mesh Cache* modifier and the new *UV Warp* modifier, new SPH particle fluid solver. More than 250 bug fixes.
- 2.67 - May 2013: Freestyle was added, paint system improvements, subsurface scattering for Cycles, Ceres library in the motion tracker, new custom python nodes, new mesh modeling tools, better support for UTF8 text and improvements in text editors, new add-ons for 3D printing, over 260 bug fixes.
- 2.68 - July 2013: New and improved modeling tools, three new Cycles nodes, big improvements in the motion tracker, Python scripts and drivers are disabled by default when loading files for security reasons, and over 280 bug fixes.
- 2.69 - October 2013: Even more modeling tools, Cycles improved in many areas, plane tracking is added to the motion tracker, better support for FBX import/export, and over 270 bugs fixed.
- 2.70 - March 2014: Cycles gets basic volumetric support on the CPU, more improvements to the motion tracker, two new modeling modifiers, some UI consistency improvements, and more than 560 bug fixes.
- 2.71 - June 2014: Deformation motion blur and fire/smoke support is added to Cycles, UI popups are now draggable, performance optimizations for sculpting mode, new interpolation types for animation, many improvements to the GE, and over 400 bug fixes.
- 2.72 - October 2014: Cycles gets volume and SSS support on the GPU, pie menus are added and tooltips greatly improved, the intersection modeling tool is added, new sun beam node for the compositor, Freestyle now works with Cycles, texture painting workflow is improved, and more than 220 bug fixes.
- 2.73 - January 2015: Cycles gets improved volumetric support, major upgrade to grease pencil, MS-Windows gets Input Method Editors (IMEs) and general improvements to painting, freestyle, sequencer and add-ons.
- 2.74 - March 2015: Support for custom-normals, viewport compositing and improvements to hair dynamics.
- 2.75 - July 2015: Integrated stereo/multi-view pipeline, corrective smooth modifier and new dependency graph *(enable as a command line option)*.
- 2.76 - November 2015: Pixar OpenSubdiv support, Viewport and File Browser performance boost, node

auto-offset, and a text effect strip for the Sequencer.

About Free Software and the GPL

When one hears about “free software”, the first thing that comes to mind might be “no cost”. While this is typically true, the term “free software” as used by the Free Software Foundation (originators of the GNU Project and creators of the GNU General Public License) is intended to mean “free as in freedom” rather than the “no cost” sense (which is usually referred to as “free as in free beer” or *gratis*). Free software in this sense is software which you are free to use, copy, modify, redistribute, with no limit. Contrast this with the licensing of most commercial software packages, where you are allowed to load the software on a single computer, are allowed to make no copies, and never see the source code. Free software allows incredible freedom to the end user. Since the source code is universally available, there are also many more chances for bugs to be caught and fixed.

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For more on the GPL, check the its page on the GNU Project web site.

Note

The GPL only applies to the Bforartists application and **not** the artwork you create with it; for more info see the Bforartists or Blender License.

Manual Update History

09.10.2018 - Rewrite of the chapter 3.5 Editors - Movie Clip Editor.pdf

06.08.2018 - Added the new chapter 3.3.1 Editors - UV-Image Editor by tools.pdf- Fixed some small issues in chapter 3.1.1 - 3D View by tools - Tool Shelf.pdf

28.07.2018 - Added new chapter 3.13.1 Editors - User Preferences by tools

04.07.2018 - Added new chapter 3.11.1 Editors - File browser by tools.pdf

29.06.2018 - Added new chapter 3.6.1 Editors - Text Editor by tools.pdf. Changes in chapter 1 - Installing Bforartists. Path adjustments. And added the chapter 21 Manual Update History.

24.06.2018 - Added new chapter 3.12.1 Python Console by tools.pdf

11.05.2018 - Update to Bforartists 1.0.0 - Just the history pdf changed.

04.05.2018 - Update to Bforartists 1.0.0 RC1

Files modified:

2 Interface
3.1.1 - 3D View by tools - Tool Shelf
3.1.2 - 3D View by tools - Header
3.1.3 - 3D View by tools - Properties Sidebar
3.14 Editors - Toolbar Editor
3.3 Editors - UV-Image Editor
20 Bforartists History

23.04.2018 - Update to Bforartists 0.9.7

Files modified:

2.1 Bforartists Standard Keymap.odt
2.2 Layouts.odt
3.1.1 - 3D View by tools - Tool Shelf.odt
3.1.2 - 3D View by tools - Header.odt
3.1.3 - 3D View by tools - Properties Sidebar.odt

3.14 Editors - Toolbar Editor.odt
3.3 Editors - UV-Image Editor.odt
20 Bforartists History.odt

03.03.2018 - Update to Bforartists 0.9.6

Files added:

3.1.2 - 3D View by tools - Header.pdf
Bforartists_096_Manual.pdf

Files removed:

Bforartists_095_Manual.pdf

Files modified:

2.1 Bforartists Standard Keymap.pdf
3.1.1 - 3D View by tools - Tool Shelf.pdf
3.1.3 - 3D View by tools - Properties Sidebar.pdf
3.5 Editors - Movie Clip Editor.pdf
3.6 Editors - Text Editor.pdf
3.9 Editors - Outliner.pdf
3.14 Editors - Toolbar Editor.pdf
20 Bforartists History.pdf

05.12.2017 - Chapter 5.1 Modeling Meshes - Removed the hotkey hint for Inset, and changed the menu location hint.

11.11.2017 - Added new chapter 3.1.2 - 3D View by tools - Properties Sidebar, fixed small issue in 3.0 Editors

13.10.2017 - Fixed menu location for normals in chapter 5.1 Modeling - Meshes.pdf

10.10.2017 - Removed hotkey hints for render border in chapter 10.1.1 Render - General. We don't have hotkeys for it.

18.09.2017 - added the missing chapter Skin modifier in the pdf 5.7 Modeling - Modifiers.pdf, updated the Bforartists_094_Manual.pdf download

15.09.2017 - The update to Bforartist 0.9.4 brings quite a few changes. The structure has changed.

Files added:
10.3.3 Render - Cycles Render Engine - Lamps.pdf
10.3.7 Render - Cycles Render Engine - Render Features.pdf
10.3.8 Render - Cycles Render Engine - Cycles Settings.pdf
10.3.9 Render - Cycles Render Engine - GPU Rendering.pdf
10.3.10 Render - Cycles Render Engine - Render Baking.pdf
10.3.11 Render - Cycles Render Engine - Optimizing Rendering.pdf
10.4 Render - Render Output.pdf
10.5 Render - Post Processing.pdf
10.6 Render - Freestyle.pdf
10.7 Render - Workflows.pdf
10.8 Render - OpenGL Render.pdf
10.9 Render - Audio Rendering.pdf
13.1 Advanced - Command Line.pdf
13.2 Advanced - Scripting & Extending Bforartists.pdf
13.3 Advanced - Application Templates.pdf
13.4 Advanced - Working Limits.pdf

Files deleted:
10.3.2 Render - Cycles Render Engine - Render Settings.pdf
10.3.6 Render - Cycles Render Engine - Lamp.pdf
10.3.7 Render - Cycles Render Engine - Camera.pdf
10.3.9 Render - Cycles Render Engine - Features.pdf
10.3.10 Render - Cycles Render Engine - GPU Rendering.pdf
10.3.11 Render - Cycles Render Engine - Open Shading Language OSL.pdf
10.4 Render - Freestyle.pdf
10.5 Render - OpenGL Render.pdf
13 Scripting & Extending Bforartists.pdf
14 Command Line Arguments.pdf

Files modified:
2 Interface.pdf

2.1 Bforartists Standard Keymap.pdf
2.2 Layouts.pdf
3.1.1 - 3D View by tools - Tool Shelf.pdf
3.14 Editors - Toolbar Editor.pdf
10.3.2 Render - Cycles Render Engine - Materials.pdf
10.3.4 Render - Cycles Render Engine - World.pdf
10.3.5 Render - Cycles Render Engine - Nodes.pdf
10.3.6 Render - Cycles Render Engine - Camera.pdf
10.3.11 Render - Cycles Render Engine - Optimizing Rendering.pdf
13.2 Advanced - Scripting & Extending Bforartists.pdf
18 pipeline.pdf
20 Bforartists history

20.7.2017 - Fixed the chapter 2.2 Layouts. It contained images with the old blue layout
30.06.2017. Modified the chapter 3.1.1 - 3D View by tools - Tool Shelf.pdf. Deleted the chapter 10.3.12 Render - Cycles Render Engine - Render Baking.pdf as obsolete. This informations are now in the chapter 3.1.1 - 3D View by tools - Tool Shelf
11.06.2017. Modified the chapter 3.1.1 - 3D View by tools - Tool Shelf.pdf
03.05.2017. Added the new chapter 3.1.1 - 3D View by tools - Tool Shelf.pdf