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.