SOFTIMAGE®

SOFTIMAGE®|XSI™

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Glossary & Resource List

Avid

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Contents

Glossary

2D textures—Images that are mapped to the object surface during the shading computation. An algorithm is used for "wrapping" the texture around the object's surface so that the pattern curves and distorts realistically. The advantage of using texture is that the complexity of appearance does not have to be modeled in the object geometry. A common use of texture is to apply a label as a texture image on a three-dimensional bottle. 2D textures can also be used as transparency, reflection, and displacement maps.

3D manipulators—A set of 3D controls that allow you to manipulate primitives, properties, and operators in a viewport. Manipulators provide "handles" that can be directly moved in 3D space to modify specific parameter values associated to the objects or operators being manipulated. They provide a direct and visual way of editing properties and doing relatively complex manipulations that cannot be done as easily by inputting values in property pages. For example, you can use 3D manipulators to transform geometric objects, cameras, lights, and change the parameters of operators such as Twist and Bend.

3D objects—Anything with a position and a representation in 3D space. Some objects have a special role, such as cameras and lights, while others serve as controls for other objects, such as waves and manipulators. The most common 3D objects are geometric objects, which can be classified according to whether they are polygon meshes, surfaces, curves, implicits, or nulls.

3D textures—Also called solid or procedural textures. A 3D texture is created by a computer procedure with a set of parameters instead of a picture file. A 3D texture, when applied to the surface of a three-dimensional object, gives the appearance of an object that has been carved from a block of a substance such as wood or marble. In other words, the pattern follows logically inside the volume just as wood grain carries through inside a wooden object.

3D textures avoid many of the difficulties attributed to mapping a bitmap around the surface of an irregular object. These textures have no edges and provide a continuous-looking appearance.

Access keys—Also called mnemonics. These are the underlined letters in many menu names that you press to choose a command. For example, to quickly create a sphere, choose the Primitive menu and press **s** twice for **Surface** > **Sphere** or press **c** twice for **Curve** > **Circle**, etc. Not every menu command has an access key.

Action—An animation segment that you define once and apply as many times as you like. You can create an entire library of actions, like walk cycles or jumps, and copy them from one model to another. You can apply them one after the other in any sequence, mix actions together, or create compound actions that contain other actions. You work with actions as clips on tracks in the animation mixer.

Action clip—An instance of an action stored in a model's list of animation sources.

Adaptive supersampling—A way of antialiasing the surface of an object by decreasing the oversampling rate for those pixels that do not require the oversampling. The results of adaptive supersampling are slightly more localized and the computing time is often shorter than other sampling methods.

Alpha channel—One of the four channels (or components) of information with each pixel of an image—three channels for red, green, and blue (RGB) and one alpha channel. The alpha channel is really a mask—it specifies the transparency of each pixel, which allows portions of the foreground image to reveal the background when two images are overlaid. You do not define the alpha channel on a pixel-by-pixel basis but rather per object. Different parts of the object would have different levels of transparency depending on how much you wanted the background to show through. An alpha value of 0 means fully transparent, and 1 means fully opaque.

Ambiance—*See* Scene ambiance.

Ambient—A common surface shader parameter that adds a consistency to the color of an object's surface to simulate an ambient light that reaches all points in a scene. An ambient value is determined for individual surfaces. Scene ambience is multiplied with an object's ambient color. If the scene ambience is set to black, nothing alters the ambient color of an object except, of course, a light. The careful balance of ambient and direct light sources is the key to convincing lighting. Global illumination is an alternative to ambient light that is more accurate but takes longer to render. *See also* Diffuse and Specular.

Animatics—Preliminary animated versions of a final video or film presentation.

Animation—The movement of elements through time and space. Also, the process of creating and recording images that change over time. Everything in a scene is represented by numeric values and, as such, animation is also the process of changing these values—position, color, or any other property—over time.

Antialiasing—A method of smoothing the jagged edges along the lines and curves of text or graphics. This is done by a mathematical process that supersamples pixels. Aliasing is caused by limited display resolution. Aliasing effects include staircasing along diagonal lines, moiré effects in checkerboards, and temporal aliasing (strobing) in animated scenes.

Aperture—The opening width of a camera lens. The greater the aperture, the greater the field of view (and the greater the perspective distortion).

Approximation—*See* Geometric approximation.

Articulated chain—*See* Chain.

Chains can be 2D or 3D. When using IK, a 2D chain's joints can only rotate on the Z axis of the root, like hinge joints. A 3D chain's joints can rotate freely on any axis, like ball joints.

Aspect ratio—The ratio of width to height of a rectangular area such as a screen, window, or pixels. Images become distorted if forced into a different aspect ratio during enlargement, reduction, or transfers.

Area light source—A special kind of point or spotlight. The rays emanate from a geometric area instead of a single point (entire surface uniformly emits light). This is useful for creating soft shadows with both an umbra (the full shadow) and a penumbra (the partial shadow). *See also* Light sources.

Atmosphere—A volumic effect that simulates reduced visibility at long distances. *See* Depth cueing, Depth fading, Scene ambiance, and Volumic effects.

Audio clip—A sound file added as a clip in the animation mixer.

Axis, axes—The reference for describing the origin and position of an object in space, displayed by intersecting straight lines. By using two axes, a plane is determined: for example, the XY plane is defined by placing the X and Y axes so that they intersect at the global centre (point of origin). Three dimensions are determined by using three axes: X, Y, and Z.

Back culling—A technique that ignores geometry seen from behind so that only the fronts of objects that are facing the camera are rendered. Both faces of an object are rendered by default; that is, the ones whose normals are facing the camera as well as those that are not. You can choose which faces of the object you want to render as part of the rendering options: front, back, or both faces. Back culling (rendering only the front) can improve performance because less geometry needs to be rendered.

Background image—In compositing, the background image is the one on top of which all other images are placed. In 3D environments, this is an image, color, or environment rendered behind all objects in a scene. *See also* Rotoscoping.

Blinn shading—A method of computing the shading of three-dimensional surfaces developed by James Blinn. It uses four characteristics: diffusion, specularity, eccentricity, and refractive index. It is similar to Phong shading, except that it creates a slightly different highlight that is useful for defining rough or sharp edges.

Blurring—*See* Motion blur.

Bone—*See* Chain bone.

Browser—A tool used to search (browse) through scene databases, project directories, preset libraries, and other repositories whose files are required to build a project. Using the browser, you can import scene files from databases as well as load scene and project files. You can also perform file-management tasks such as moving, copying, renaming, and deleting files.

BSP—Binary Space Partitioning. A rendering-acceleration method for raytracing that recursively subdivides 3D space into voxels (volume elements arranged on a fixed regular grid that define objects in 3D space) to reduce the number of computations required for intersection computation during rendering. The BSP algorithm is aimed at accelerating "teapot-in-stadium" scenes—a scene with a small and complex object in a very large environment.

B-Spline—A particularly smooth class of approximating curves. B-Splines are fully approximating: such a curve generally passes through its control points if several of them are in the same location. B-Spline curves are converted to NURBS curves when imported into SOFTIMAGE|XSI.

Bump mapping—The process of creating and displaying a texture where the values of the texture are used to simulate the bumpiness of an object's surface. Bump mapping is used to add detail to an image without increasing the number of polygons. Bump maps do not move the geometry of an object, but they do affect the shading of a surface giving the illusion of a pattern being embossed on the surface. Bumps are applied by matching up a series of grayscale pixels with colored pixels on the rendered, colored object. Lighter grayscale pixels create a sense of maximum relief or maximum indentation; darker pixels have less effect. *See also* Displacement mapping.

Camera—The camera is analogous to a physical camera in the real world. It is an object that has a position from which a scene can be viewed and rendered. Like most objects, the camera has properties such as its rotation, depth of field, field of view, and clipping planes. In addition to the default camera, you can add others.

Camera views—Let you display your scene in a viewport from the point of view of a "real" camera in your scene. All other views such as User, Top, Front, and Right are points of view that are not associated to an actual camera. You can also display the viewpoint of a camera associated to the current render pass. Only a camera associated to a render pass is used in a final render.

Cartesian coordinates—A mathematical representation of Euclidean space. Every point can be described by three coordinates (X, Y, Z) representing the position along the orthogonal X, Y, Z axes. The point (0, 0, 0) is called the origin, which is the global center of the 3D world.

Caustics—A light pattern created by specular reflection or refraction of light, such as the patterns of light on the bottom of a swimming pool.

Center—The reference point for defining an object's location, orientation, and size. The center is related to the coordinate system you choose. For example, the global center (called the origin) is the center of the 3D world in which you are drawing. When you create an object, its (local) center is located inside the object. However, you can move this center to another location for performing different modeling tasks.

Chain—A series of bones connected by articulated joints. A chain has three basic components: a root, bones, and an effector. Chains are used to animate objects and are invisible to the renderer. Chains are manipulated using inverse kinematics (IK) and forward kinematics (FK). A chain can use either IK or FK at any time. The method used depends on what part of the chain you manipulate: the effector for IK or the bones for FK.

Chain bone—A straight line that connects roots, joints, and effectors in a chain. A bone is always rotated about its joint, which is at the end of the previous bone. The first bone rotates around the root and it is a child to the chain root. All other bones are children to the previous bones in the chain.

Chain root—A null that acts as the starting point on a chain. Its position and rotation determine the position and rotation of the rest of the chain. In a 2D chain, the entire chain extends on the root's XY plane, called the resolution plane. A chain root can be the child of another chain's bone, root, or effector.

Chapters—These are the directories within a database in which your files are stored. These are predefined chapters sorted by the types of elements in a scene, such as MODELS, PICTURES, RENDERED_PICTURES, LIGHTS, CAMERA, etc. Scenes and their elements are saved within a project that does not enforce a predefined directory structure. *See also* Projects.

Clip—*See* Image clip, Action clip, Audio clip.

Cluster—A named group of object components defined for the purpose of being manipulated or having properties applied. The properties assigned to a cluster are shared by its members. A cluster has no geometry of its own; rather, it refers to other geometry. You can assign a center to make for easier manipulation. *See also* Components.

Color—A data type consisting of red, green, blue, and optional alpha components. *See also* RGB, HLS, and HSV color models.

Color bleeding—A global illumination effect that causes colored diffuse reflectors to tint neighboring surfaces. For example, color bleeding causes a white wall close to a red wall to appear pink because it receives red light from the wall.

Color model—An algorithm used to specify colors. You can set color according to the following color models: RGB (red, green, blue), HLS (hue, lightness, saturation), or HSV (hue, saturation, value). *See also* RGB, HLS, HSV.

Command line—A line typed in at an MS-DOS Command Prompt window or IRIX shell prompt.

Command mapping—*See* Keyboard mapping.

Components—The parts of a geometric object that can be manipulated or selected, such as points, vertices, polygons, edges, etc. You can modify an object by selecting and moving, adding, or deleting components such as points. You can group similar components to create clusters on one or more objects. The components of polygon meshes include points, edges, and vertices. The components of surfaces include points, knots, isolines, and isopoints. The components of surface meshes are subsurfaces.

Compositing—A layering technique that places one image on top of another, properly taking transparent pixels into account. Compositing utilities usually assume pre multiplication.

Constant shading—A type of shading method that considers the material on an object as being evenly lit. Only the diffuse color area is used. Reflectivity, transparency, refraction, and texture can be applied to a material shaded with Constant.

Construction history—A general term used to describe any set of operators applied to a specific object. *See also* Modeling relations or Operator stack.

Constraints—A way of animating one object by using the animation of another to which it is constrained. There are predefined constraints to constrain objects by position, direction, rotation, tangent, up vector, etc. You can also create your own constraints between objects using mathematical expressions. *See also* Expressions.

Control points—2D (UV) or 3D (XYZ) vertices that help define a curve or free-form surface.

Cook-Torrance shading—A shading model similar to Blinn, it reads the surface normals' orientation and interpolates between them to create an appearance of smooth shading. It also processes the relation among normals, the light, and the camera's point of view to create a specular highlight. This shading model is useful for simulating smooth and reflective objects, such as leather. Reflectivity, transparency, refraction, and texture can be applied to an object shaded with Cook-Torrance. Because this shading model is more complex to calculate, it takes longer to render than other shading models.

Curve—A collection of straight or curved line segments attached by their ends, or knots, to make a curve. The look of the resulting curve varies depending on the manner of interpolating the control points. The term curve refers to Linear or cubic NURBS curves. They can not be rendered because

they have no thickness, but they have many uses. For example, they can be used as the basis for constructing surfaces. They can also serve as paths along which an object is animated.

Custom parameters—A named, user-defined property set (with its own property editor) created from separate numeric and Boolean parameters and text. Custom parameters have the same characteristics as standard property sets, such as the ability to be propagated to parts of the scene, saved as presets, etc.

You typically create a custom parameter then connect it to other parameters using expressions or linked parameters. You can then use the sliders on the custom parameter's property editor to drive the connected parameters in your scene. *See also* Expressions and Property set.

Cycle—A series of frames which may be played over and over to create the illusion of continuing, repeated action.

DAG—*See* Scene DAG.

Database—*See* Projects.

Death event/decay—The moment of transformation when particles can either disappear or decay into one or more secondary particles. This moment can either be at the end of a particle's lifetime or at the moment of impact with an obstacle.

Often, a death event is associated with particles as they strike an obstacle, such as sparks from a welder's torch hitting the ground and disintegrating into a burst of other, smaller sparks before extinguishing.

Deformation—A way of changing the shape of objects by using another object (curve, surface, lattice, shape) as a deforming tool, using a deforming operator such as Twist, Bend, or Push. You can apply deformations to selected components of an object and use a weight map to modify the deformation. The deformation depends on two factors: the shape of the deforming tool and the transformation (scaling, rotation, or translation) of the deformed object.

Depth cueing—The process of reducing the apparent sharpness of an object the further away it is from the viewer or camera. This often enhances the perception of depth.

Depth fading—The process of varying colors in a scene depending on the distance from the camera.

Diffuse—Describes the essential color of an object. This is the color that the object reveals under pure white light. It is perceived as the color of the object itself rather than a reflection of the light. You can set the diffuse color separately from the ambient and specular colors. Diffuse color is distinguished from the color of specular reflection (highlights) off an object, which are generally the color of the light source itself. *See also* Ambient and Specular.

Directory—A special kind of file used to organize other files into a hierarchical structure. In operating systems, directories are presented as file folders in which files and other folders are stored. The term "folder" is often used interchangeably with directory. The files and directories at any level are contained in the directory above them. To access a file, you may need to specify the names of all the directories above it by specifying a path. The topmost directory in any file is called the root directory. *See also* Path and Root.

In SOFTIMAGE|3D, directories are known as chapters within a larger directory called a database.

Displacement mapping—A technique that allows you to move an object's vertices so that, during the rendering process, the object's geometry is altered to create a bumpy surface. Unlike regular bump mapping, the edges are visibly raised and can cast shadows. The roughness of the 2D texture is used to adjust the degree to which the object's geometry is displaced. Displacement mapping only alters the object's geometry in the rendered image and not the scene, so you can create highly complex objects without having to actually model them. *See also* Bump mapping.

Display types—Ways of displaying objects in a viewport. Display types are available only for geometry views. The available display types are Wireframe, Shade, Constant, Bounding box, Textured, and Hidden Line Removal. Display types do not affect what is shown in the render region.

Dolly—To move the camera forward (dolly in) or backward (dolly out). A dolly physically moves the camera closer to the point of interest without changing the length of the lens; perspective distortions peculiar to the lens length may result at the edges of the scene.

Drag and drop—To click and hold down the mouse button while moving the mouse (drag), then release the mouse button (drop). For example, a common use of drag and drop is to parent objects. In the explorer, click on an object node (while holding down the mouse button) and move the object over another object node, then release the mouse button.

Dynamic property assignment—The means by which properties in a render tree are dynamically linked together. In the Render Tree editor, a connection is shown as an arrow with which you can dynamically link (connect) properties together.

Easing (Ease-in, Ease-out)—The reduction in the acceleration or deceleration of motion to present a smoother, more continuous movement. The shape of a function curve can reflect this when using a spline interpolation.

Effector—The last point in a chain displayed as a null. Moving the effector invokes inverse kinematics (IK), which modifies the angles of all the joints in the chain between the root and the effector. The effector is the child of the chain root. *See also* Chain.

Elements—Anything that can be visualized in 3D space or displayed. Elements can be renderable or non-renderable. They include projects, scenes, passes, lights, cameras, geometric objects, curves, nulls, etc.

Envelope—Any model, object, or "skin" that you assign to a skeleton. In most cases, an envelope moves with and is deformed by the skeleton once it is assigned. This can be used to simulate the muscles in flexing biceps or facial expressions. The deformations are modulated using weight maps.

Environment mapping—A texture conceptually wrapped around a scene without requiring a geometric object. It can be seen by the camera and can be seen as reflections and refractions. It is often used as an inexpensive replacement for raytracing, and works well for chrome effects and skies.

Expressions—Mathematical expressions which allow you to change the animation of an object. You can also create constraints between objects using expressions or create conditional animation. Expressions are very powerful for creating precise animations.

Extrude—To make a three-dimensional surface by giving a two-dimensional object depth in space. The extrusion has the curve as its cross-section.

Falloff—The diminishing of a light's intensity over distance, also called attenuation. Falloff options mimic the way light behaves naturally and are available for point and spotlights.

Fields—Interlaced images (video) consist of two fields that must be rendered independently and combined into one frame. Each field contains half the scanlines (either even or odd) and is a separate file. You can either render to fields or to frames.

Field of view—The amount of the scene visible to the camera, defined as the camera's aperture divided by its focal length. Wide-angle lenses have a large field of view, while telephoto has a small field of view.

File—A collection of data or information that has a name, called the file name. There are many different types of files: data files, text files, program files, directory files, and so on. Different types of files store different types of information. For example, program files store programs, whereas text files store text, scene files store scene information, etc.

Filters—Tools that lets you define the information to be displayed or manipulated in different types of views, thereby avoiding cluttering these views with unnecessary data. In an explorer, for example, you can choose to display only objects and their materials in a scene, or all objects but no property nodes. You can also use a variety of filters in the main command area to select objects and components.

Flexible envelope—*See* Envelope.

Flipbook—A way of displaying a sequence of cached frames (animation) in real time in either a viewport or a floating window. You can use any display type for the flipbook. Flipbooks can be exported in a variety of standard formats, such as AVI, MPEG, and QuickTime.

Focal length—The distance from a camera lens to its focal point.

Foreground image—The image closest to the camera.

Forward kinematics (FK)—A type of movement that is invoked by rotating a joint in the chain, allowing for complete control of the chain's behavior. Only the angle of the selected joint is affected; all other joint angles are preserved. With FK, positioning a skeleton's foot means rotating each joint in the leg, from the hip to the ankle. This method is more tedious to execute but the chain bends exactly as intended. Using FK allows you to create many types of movements that may not be possible to animate with inverse kinematics (IK) alone. *See also* Inverse kinematics.

Frame—A single complete picture of animation. A frame is a static image which, when followed by other static images sequentially, gives the illusion of motion. You can render to frames or to fields. One film frame is 1/24th of a film second.

Frame buffer—The memory a computer uses to hold one or more frames for later use.

Freeze—To collapse the stack of operators applied to an object. This discards the object's construction history and keeps only the current values for the object. You can no longer go back and change the parameters of the individual operators that were applied. However, the object requires less memory and computation time for updates. *See also* Operator.

You can also freeze transformations to an object—*see* Transformation.

Function curve—A function curve (fcurve) is a graphic representation of the relationship between time and property values (animation). Function curves are represented as a curve with points in an XY grid, where time is on the X, or horizontal, axis and values are on the Y, or vertical, axis. You can edit the function curves that represent your animation in the animation editor.

Geometric approximation—A description of how to tessellate a geometric object into less complex primitives, usually triangles. The process of setting parameters that control how the geometries of objects are approximated, the number of steps drawn per curve segment, and so on. The goal is to faithfully represent the object with the lowest possible number of triangles.

Geometry—The control points owned by an object. These control points are usually seen with objects that can be rendered. For example, a cube's geometry is composed of eight control points. By this definition, a curve has geometry since it is also composed of one or more control points, whereas nulls have no geometry.

Geometry shaders—Functions that create geometry procedurally at runtime, as opposed to loading geometry from a scene file. Geometry shaders are often used to automatically create helper objects that are used as bounding volumes.

Geometry views—Show you the geometry of objects in a scene in a viewport. They provide a viewpoint of your scene and can be viewed in the render region, but they cannot be rendered like camera views. Geometry views are Front, Top, Right (all orthographic), and User (perspective or orthographic). Geometry views can have different display types, such as wireframe, shade, or texture.

Global coordinates—A coordinate system that is used to locate an object in relation to a world origin. *See also* Cartesian coordinates.

Global illumination—A physical simulation of all lighting in a scene. This includes both direct and indirect lighting caused by diffuse reflections. Photon rays emanate from the light source in all directions and bombard the scene. When these photons hit an object, some stick and others are reflected and refracted. These reflected and refracted rays go on to illuminate other surfaces. For example, the underside of a table is not completely dark, even if it is not illuminated directly by a light or reflections from a shiny surface.

Group—A named collection of objects, including lights and cameras. Any object within a group is called a member of that group. When you select a group, all members of the group are selected. Properties assigned to a group are shared by its members, and override existing values previously assigned to an individual member in the group; however, original values are kept for each group member.

Hidden—Any element that is not shown in the current rendering of the scene but still exists.

Hierarchy—A way of defining objects in relationship to each other (using a parent-child or tree analogy). This relationship means that transformations, deformations, and any other property of the parent object affect all child objects. This allows separately modeled objects to be used in a scene as a single functional unit. The movement of a parent affects the movement of the child, but you can move the child by itself without affecting the parent. *See also* Parenting.

HLS—Hue, Lightness, Saturation: the three components of the HLS color model. Hue refers to the position of the color in the spectrum (red, yellow, green etc.). Lightness is the amount of white mixed in a color, such as the difference between a pure red and pink. Saturation is the purity of the color, such as the difference between a pure red and a dusty rose—low saturation means that there is more gray in the color.

HSB—Hue, Saturation, Brightness. *See* HSV.

HSV—Hue, Saturation, Value: the three components of the HSV color model. This color model defines the hue and saturation similar to the HLS model. Value is similar to lightness, as in HLS; however, a Value of 1 represents a pure color when Saturation is 1, while a Lightness of 1 yields white no matter what the Saturation. In both systems, 0 is black.

Hue—The position of the color in the spectrum that describes the tone or tint of a color (red, yellow, blue, etc.).

Image clip—A copy or instance of a source image. Each time you use a source image, an image clip of it is created. You can have as many clips of the same source as you need. You can then edit, crop, or even blur the clip without affecting the original source image. *See also* Source.

Image resolution—The number of pixels in the horizontal and vertical directions.

Implicits—Basic shapes defined by a mathematical formula. By themselves, they are not renderable but can be used, for example, to define bounding boxes when setting weights for envelopes. They are also the starting point for primitive polygon meshes and surfaces, which are actually primitives that have been converted.

In-betweening—*See* Interpolation.

Instances—Copies of an object or hierarchy that refer to the properties of the original object (master object). Modifications to the master are immediately reflected in all its instances. Transformations (scaling, rotation, translation) are local to the instance; however, any change to the geometry of the original is reflected in all of its instances. A duplicate and an instance are both copies of an object, except that the properties of the original object is shared with its instances instead of simply being duplicated.

Interpolation—The process used to estimate an unknown value between two or more known values. In animation, interpolation is the process used to calculate values at frames between two keyframes in a sequence. *See also* Keyframing.

Inverse kinematics (IK)—The movement and rotation of a chain in accordance to the location of the effector of a chain. When using IK, translating a bone or the end of the chain recalculates the previous joint angles in the chain. With IK, positioning a skeleton's foot is a matter of moving the foot to the right spot—how the leg should bend is calculated. To animate the foot, you keyframe its translation. *See also* Chain.

Joint—The mechanism that connects a series of bones in a chain. 2D chain joints are indicated by a circle. 3D chain joints are indicated by three circles, one along each axis. Joints are connected end-to-end with the local X axis pointing toward the next joint. They can be rotated at the point of articulation about the three axes. *See also* Chain.

Keyboard shortcuts—*See* Shortcut keys.

Keyboard mapping—Also referred to as command mapping, this is the ability to view a default set of shortcuts, as well as create shortcuts of your own. The mapping of shortcuts keys to operations are stored in your user-preferences file.

Keyframing—The process for animating values over time. Each keyframe is a frame that explicitly defines one or more parameter values. Values for frames between two keyframes are computed by interpolating (averaging) the values

at the keyframes. You can set keyframes for all animatable parameters on a property page using the Keyframe icon. Alternatively, you can automatically set keyframes for individual parameters as you work using Autokey mode.

Kinematics—Each 3D object in a scene has a set of kinematic properties that control its transformations. These transformation properties are used to modify the selected object's scaling (size), rotation (orientation), and translation (position) in X, Y, and Z in either local and global space. You can edit these properties in the Kinematics property editor. Although related, Kinematics are not to be confused with Inverse and Forward Kinematics for animation.

Knots—The points at which the segments that comprise curves or surfaces meet.

Lambert shading—A shading model based on the application of Lambert's cosine law, which deals with the intensity of reflected light, discovered in the 16th century by Johann Lambert. Objects are shaded to create a matte surface with no specular highlights. Two illumination areas are defined on the object's surface: ambient and diffuse. Lambert shading allows reflectivity, transparency, refractio, and texture to be applied to the object.

Lattice—A box made up of points that surrounds an object for the purpose of deforming it. Every point on a lattice is associated with a number of points on the object: when a point on the lattice is moved, the points on the object are also moved thus changing the object's shape.

Layers—A user-defined grouping of scene objects that help you organize, view, and edit the contents in your scene but do not affect the final render. You can put different objects in each layer and then hide a particular layer if you do not want to see that part of your scene. You can also make a layer unselectable. A new layer is always empty, visible, and selectable.

Layout—An arrangement of panels containing logically grouped sets of controls that occupy fixed areas of the main window. You can customize a layout by rearranging the location and size of these panels in a way that is the most comfortable and efficient for you. You may require different layouts for different types of projects. You can create as many layouts as you need. Layouts can be saved and displayed again in subsequent sessions.

Library—A collection of pictures, materials, textures, tools, shaders, etc. from which you can select. Libraries are viewed in the browser.

Light Source—Illuminates the objects in a scene. A light source can be an infinite light, point light, or spotlight. Lights affect the way all objects' surfaces appear, including their color. Lights are referenced to materials, so that only those lights which a material references will illuminate surfaces which use that material. This lets you set selective lighting. Lights can also be set to cast shadows. Any of the standard spot and point lights can be turned into an area light. The main purpose of area lights is to generate more realistic lighting resulting in soft shadows.

Local coordinates—An object's coordinate system with its own center as the reference point (origin), as compared to global coordinates which includes an origin for all objects in the world space. For example, if you animate a child object in a hierarchy using local coordinates, the animation is relative to its parent, not the global origin.

Loft—A modeling tool that creates surfaces from a series of profile curves.

Loop—A continuous playback of an animation sequence.

Luminance—The black and white information (brightness, sharpness, and contrast) encoded in a color. The amount of luminance contained in a color is directly proportional to the amount of light intensity.

Mapping—In general, mapping is the process of making one image conform to the size, shape, and/or texture of another image. *See also* Bump mapping, Displacement mapping, Environment mapping.

This is also the process of applying weight maps to cluster of points on an object—*see* Weight maps.

Material—In a general sense, a material determines the response of a surface to illumination. A material is implemented as a material node or placeholder for the various shaders (surface, shadow, contour, photon, environment, and so on) that combine to define the surface characteristics of an object. *See also* Material node, Surface shader, and Scene material.

Material node—A base connection point or placeholder for the different shaders that combine to define an object's material. The most important of these is the surface shader. Optional shaders, such as photon, volume displacement, shadow, and environment shaders, may also be used for a specific purpose or effect, but are not necessary to the object's material definition. Every object has a base material node with no values attached to it. It automatically takes on the values of the default scene material. *See also* Surface shader.

Memory mapping—A technique that makes a texture image available to mental ray® rendering software without loading it all into memory and decompressing it. This has great performance and memory advantages.

Memory swapping—The transferring of data back and forth between active RAM memory and disk. When this happens, it can considerably slow down computing tasks such as rendering. Various settings in the Rendering Options property editor let you reduce memory demands and avoid swapping.

mental ray rendering software—A high-quality, photo-realistic raytracing renderer. The mental ray rendering software provides an extensive set of built-in functions and can be dynamically linked with user-defined shaders during the rendering process to create procedural textures (including bump and displacement maps), materials, atmosphere and other volume rendering effects, environments, camera lenses, and light sources, etc.

mi Scene File—An mi (mental images®) scene is one that has been saved in the .mi file format. The mi format is the basic render file format to which scenes are exported and rendered by mental ray rendering software. It is sometimes referred to as the "mental ray rendering software scene description language." An mi scene contains information about the scene's cameras, lights, and 3D objects. An mi2 file is an .mi format file, but the "2" signifies that it is for mental ray rendering software version 2.0.

Mnemonics—*See* Access keys.

Models—A powerful way of organizing objects in your scenes and projects. Models contain not just the geometry of hierarchies, but also the function curves, shaders, and other properties that have been applied to it. They can also contain internal expressions and constraints; that is, those expressions and constraints that refer only to elements within the model's hierarchy. Models can be easily reused in other scenes and projects.

This term also loosely refers to objects and characters.

Modeling—The process of building three-dimensional objects in a computer.

Modeling relations—When you create objects from other objects, a modeling relation is established. For example, if you create a surface by extruding one curve along another curve, the resulting surface is linked to its generator curves. If you modify the curves, the surface updates automatically. To break the link, you can freeze the surface's operator stack. *See also* Operator stack.

Motion blur—The blurring of objects that move while the camera shutter is open, creating the illusion of movement. Motion blur also prevents strobing caused by too-rapid movement.

Mute—Temporarily turning off an operator, thus preventing it from affecting the objects on which it is applied. All operators can be muted. This can be useful to improve the speed of interaction in large scenes, or to make other selections and adjustments. *See also* Freeze.

Mute can also mean to temporarily disable a viewport by middle-clicking on its letter identifier in the upper-left corner. Middle-click it a second time to reactivate the viewport.

Mute can also mean to temporarily disable tracks in the animation mixer.

Namespace—A unique identifier for models. Each model maintains its own namespace. Each 3D object in a model's hierarchy must have a unique name, but 3D objects in different models can have the same name. For example, two characters in the same scene can both have chains named left_arm, right_arm, and so on. Namespaces let you reuse animations that have been stored as actions. If an action contains animation for one model's left_arm chain, you can apply the action to another model and it automatically connects to the second model's left_arm chain. If your models contain elements with different naming schemes, for example LEFTARM or LeftArm, you can use connection mapping templates to specify the proper connections.

In SOFTIMAGE|XSI, the concepts of models and namespaces replace the method of using a prefix to organize scene elements in SOFTIMAGE|3D.

Node—Any type of data that is represented in a tree view. Each node is identified by an icon and a name. The explorers, render tree, schematic view, and browser all display nodes.

Normals—Vectors at right angles to the plane or surface of an object. An object's normals are represented by thin blue lines. Normals indicate the side of the object that should be visible to the camera. By default, the renderer shows only the side with the normals. Normals are computed to optimize shading between surface triangles.

When normals are oriented in the wrong direction, causing modeling or rendering problems, you can invert them using **Modify** > **Surface** > **Inverse** on the Model toolbar.

NTSC—National Television Standards Committee. The organization that defined the standard video signal used in North America and some countries abroad. It is now used in reference to a video signal that conforms to the NTSC guidelines. The NTSC signal is a composite video signal of 525 scan lines, interlaced, 60 fields per second with a bandwidth limited to 4.2MHz so that it will fit into a 6MHz broadcast television channel without interfering with adjacent channels.

Nulls—Points in space. Although simple, they have many uses, such as setting constraints, organizing objects in hierarchies, and so on. By default, a null is displayed in the viewports as three intersecting lines, and is not visible in a rendered scene.

NURBS—Non-Uniform Rational B-Spline. A type of curve or surface for which the delta (difference) between successive knots need not be expressed in uniform increments of 1. This non-uniformity distinguishes NURBS from other curve types.

Objects—*See* 3D Objects.

Operator—A node that processes inputs to produce an output. An operator modifies an object, geometry, cluster or property and can be seen in its history.

Operator stack—Multiple operators that are applied, one after the other, onto given nodes. It is a history list of all the operators that have been applied to an object, letting you go back and modify or delete them.The operator stack is not the same as undo/redo history: it is an object-based operator pipeline that modifies objects, geometry, clusters, or properties.

Orthogonal—A view that displays a parallel projection along one of the major axes. In these views the camera is oriented so it is perpendicular (orthogonal) to specific planes: the Top view faces the XZ plane, the Front view faces the XY plane, and the Right view faces the YZ plane. An orthogonal view eliminates the effect of distance from a viewpoint, which provides a useful means of locating points and objects in 3D space and is particularly helpful when modeling objects in wireframe. Orthogonal viewing is in contrast to perspective viewing.

Override—A collection of parameters, property sets, and shaders that have been stored apart from any particular object or model and can be assigned as a single package to a different object or model with similar topology. For example, all the materials that make up a character's "dress" can be packaged into one override. Then, other characters can be "dressed" in the same way by applying the override to the character's root, saving the time of re-applying individual property sets. You can override (through propagation) the parameters, shaders, or any other property set defined on an object.

PAL—Phase Alternate Line. The video signal standard used in Western Europe and the United Kingdom. Video products destined for that area must be compatible with this standard as opposed to NTSC standards. PAL is based on the 50Hz power system and displays 625 scan lines interlaced at 50 fields per second (25 frames per second). Conversion between PAL and NTSC is possible, but the standards are incompatible.

Palette—A collection of colors available for defining materials, textures, and object wireframe colors. You can use predefined palettes or create your own.

Pan—A camera technique in which the focal point is adjusted by pivoting the camera direction, usually slowly across a scene.

Parallel projection—The Top, Front, and Right views are parallel projection views, called such because an object's projection lines do not converge in these views (as they do in perspective views). Because of this, the distance between an object and the camera has no influence on the scale of the object. If one object is close to the camera, and another is farther away, both appear to be the same size.

Parameters—Also known generally as *properties*, parameters are the "atomic" elements of a property set (for example, the posx in Cone.kine.ltransfo.pos.posx) whose values determine the behavior of something. A parameter is one degree of freedom. You can set parameters in property editors. *See also* Property set and Custom parameters.

Parenting—The process of creating a hierarchical organization of objects in a scene. In parenting, an object (called the parent object) is "parented" to another object (called the child object). Parenting relationships can be nested to any degree, so that one or more objects are the children of another object, which is in turn the child of another. *See also* Hierarchy.

Particles—A pixel-based particle generation system that simulates types of natural phenomena that contain many particles. The particles system simulates particle dynamics by applying forces and recreating events, such as decay (disintegration) and obstacles, that affect natural particles. This allows you to animate particle streams such as sparks rising from a campfire, fireworks, or the tail of a comet trailing off into space.

Partition—A division of a render pass for the purposes of modifying objects separately. Partitions can contain either geometric objects or lights. You can edit the properties of a partition, as well as apply shaders to it. *See also* Render pass.

Pass—*See* Render pass.

Patch—*See* Surface.

Path—The prescribed path (curve) along which an object is animated.

A path is also the directory path to a certain file in the operating system's directory structure. Path names always starts from the root directory. Each operating system has its own rules for specifying paths. In Windows NT, for example, the root directory is named \, and each subdirectory is separated by an additional backslash. In UNIX, the root directory is named /, and each subdirectory is followed by a slash.

Penumbra—The secondary "fringe" area of a shadow when the object only partially blocks the light.

Perspective—A traditional art method of creating the illusion of three-dimensional form and distance on a two-dimensional surface. Perspective is a view that provides a three-dimensional view of the scene that indicates depth. In a perspective view, objects appear to converge toward a central vanishing point, and objects closer to the camera appear larger than those farther away. Perspective viewing is in contrast to orthogonal viewing.

Phong shading—A method of shading used in modeling the surfaces of three-dimensional objects developed by Phong Biu-Tuong. The Phong model uses three characteristics—diffusion, specularity, and ambience—to shade curved surfaces with light-reflecting highlights.

Picking—A way of selecting an object when in a certain mode of action. For example, to create a surface from a series of curves, you select the first curve, choose the Loft command, and pick each of the other curves in the series in order, and then right-click to end the picking session.

Pixel—A discrete unit of picture information meaning picture element, the smallest unit of raster graphics. The resolution in a computer-generated digital image is directly related to the density of the pixels that make up the image.

Point—A fundamental building element of an object in 3D space with an XYZ location. Point coordinates are the minimum information from which the geometry of an object can be calculated.

Polygon—A geometric primitive consisting of a non-intersecting set of contiguous line segments joining points that all lie in the same plane and enclose some single area. Polygon mesh objects are composed of four or more polygons.

Polygon mesh—A "quilt" of polygons joined at their edges and vertices. Polygon mesh objects are less "costly" than surface objects in terms of rendering time.

Preferred angles—The joint angles that are used to preserve the shape defined by the resting (home) state of an articulated inverse kinematic (IK) chain. When you draw a chain, the preferred angles of a joint are the local rotation angles. These angles influence the behavior of the entire chain depending on the selected IK behavior. When using 2D IK chains, only the preferred angle in the Z axis of a joint is used. Each joint is constrained to remain on a single plane, and can rotate only around its local Z axis when the effector is moved (if you have applied an up-vector constraint, the preferred angle in the X axis of the joint is also used). When using 3D IK chains, the preferred angle for the X, Y, and Z axes of the joints are used, since 3D joints work like ball joints.

Presets—Files that contain values for a property set. They let you save values so that you can load and use them again later. Presets have a *.preset* file name extension.

Primitive—A low-level object from which higher-level, more complex objects can be constructed. Primitives are basic predefined 2D and 3D shape such as circles, spheres, cubes, spirals, multi-sided figures, and so on. These primitives can be used "as is" or modified. Typically, you select a primitive form and then transform it or combine it with other modified pieces, which is much easier than drawing an object point by point.

Primitives can be polygon mesh objects, surfaces, or implicits.

Procedural textures—*See* 3D Textures.

Project—A way of managing information. Work is always done within the structure of a project. Projects exist as folders and contain scene information in the form of scene description files. Scene files are recognized by their **.scn** file name extension. You view the hierarchy of a project as a tree in an explorer.

Property—*See* Property set.

Property editor—A tool similar to a dialog box that allows interactive editing of the properties that define the objects and models in a scene. As you make changes, the scene is updated to reflect these changes. A property editor contains tabs that indicate property pages; icons for controlling the way a property editor behaves (Focus, Recycle, Lock, and Close); controls for saving, loading, and viewing presets; and keyframing icons for animating parameters.

Property set—Also referred to as a *property*, it is a collection of parameters whose values can determine the appearance, behavior, or simply provide information about an element in a scene. Properties are used to define the visual aspect of objects as displayed in the viewport; others provide motion information such as time; and others are used internally to control the way specific operations are performed. The parameters of most properties can be edited and animated in property editors. Related parameters are usually displayed as a property page within a property editor. You can save presets at the property set level. *See also* Custom parameters.

Quickstretch—An animated deformation that changes an object's shape automatically, based on its motion. It calculates deformations on the fly according to the object's speed and acceleration. Quickstretch uses four types of motion—linear velocity, linear acceleration, rotational velocity, and rotational acceleration—to calculate the deformation. For each type of motion, you can choose to deform by flexing, stretching, or yielding.

Raytracing—A rendering method that plots a view of every pixel in a scene through a virtual camera's lens. The mental ray rendering software is a raytracing renderer. Rays are cast from the camera, taking into account the location, strength, and quality of all light sources, along with the surface characteristics of each object in the scene including transparency, reflectivity, refraction, and shadows. Shiny objects reflect other objects, and realistic shadows are cast. Raytracing bounces the light through the model rather than terminating light values when they first intersect an object. The color and direction of light is changed by the reflective and spectral properties of the object.

Reflection—A surface characteristic used to determine to what extent a material reflects other objects in the scene like a mirror.

Reflection mapping—A method of mapping an image onto an object in which the image is a rendering of the object's environment. The resulting mirror effect adds realism and takes much less time to calculate than raytracing.

Refraction—The bending of light as it passes through a transparent or translucent object. The degree to which light bends when passing through a transparent or translucent object is determined by its refractive index.

Refractive index—The degree to which light bends when passing through a transparent or translucent object. For reference, the refractive index of a vacuum is 0, air is 1, and water is 1.33.

Refresh—To update information shown on the monitor.

Relational modeling—*See* Modeling relations.

Render pass—A division of a scene according to different aspects (such as highlight, mattes, shadows, etc.) for the purposes of applying specific rendering options. Passes can then be composited during post-production. The default pass is the beauty pass, which includes all objects in the scene.

Preset passes include matte, shadow, and highlight passes. You can also define your own passes to include any object you want to be affected by specific rendering properties. Render passes are further divided into partitions.

Render pass view—A camera view that shows the viewpoint of the particular camera associated to the current render pass. Only a camera associated to a render pass is used in a final render.

Render tree—A graphical set of nodes interconnected for the purpose of creating shader effects. Each node takes parameters from its children and produces parameters for its parent. Render tree nodes can be shaders or functions known as tools. Each type of node performs a specific operation. Tools are nodes such as pattern generators (to create noise for example), mathematical functions, converters (to convert a scalar to a color [rgb] value), mixers, blends, and so on.

A render tree is displayed in the Render Tree editor. In this view, you can connect nodes to create any number of shader effects. For example, you can use a 2D or 3D texture as the color, specularity, or reflectivity of a material. This means that the inputs to the shading model can be manipulated procedurally. Color and transparency textures, reflection mapping, bump mapping, displacement mapping and solid texturing can all be implemented using render trees.

Rendering—The process of creating a final image or sequence of images from a scene description. The process of taking a geometric model, a lighting model, a camera view, and other image generation parameters such as maps, and computing an image in raster. Rendering techniques such as shading, light source, or depth cueing are sometimes used to make the image look realistic. *See also* Raytracing and Scanline rendering.

Resolution—Signifies the number of horizontal versus the number of vertical pixels (as in 640 x 480 or 1024 x 768) that can be displayed on a monitor. In analog video (such as NTSC), resolution is described as the number of scan lines that can be displayed on a monitor.

Revolution—A modeling term defining a surface made by rotating a curve around the axis of another curve.

RGB—The abbreviation for red, green, and blue, the three additive color components used to create any color by mixing them. Computer monitors use this concept to create the various colors they display. The number of colors that can be displayed is limited only by the number of graduations possible in each primary color. In digital systems, there is a finite number limited by the bit depth of the image and the ability of the graphics adapter and monitor to differentiate the colors.

Root—The parent node of any chain. Action affecting the root affects the rest of the chain. *See also* Inverse and Forward kinematics.

A root is also the root directory in the operating system's directory structure. In Windows NT, the root directory is named \, and each subdirectory is separated by an additional backslash. In UNIX, the root directory is named /, and each subdirectory is followed by a slash.

Rotation—A transformation in which an object turns ("spins") on one or more of its three axes (X, Y, Z, or any combination of them) to change its orientation.

Rotoscoping—A technique in which video or film images are placed in the background of a scene, one frame at a time. You can use these reference images to create your own animation by tracing objects from the images or matching your objects with the images' motion. You can zoom and pan the scene while maintaining perfect registration with the imported background.

Saturation—The purity of a color (hue). The saturation of a color is diluted by gray (for example, pink is less saturated than red). A color that is 100 percent saturated contains no gray.

Scaling—A transformation that changes the size of an object by moving all the points outward from the object's center (enlarging it), or shrinking it by drawing them all in toward that center.

Scanline rendering—A rendering method used to determine primary visible surfaces. The image is rendered one vertical scanline at a time rather than object-by-object as in raytracing. Scanline rendering is faster than raytracing but does not produce as realistic results.

Scene—A file containing all the information necessary to identify and position all of the models and their animation, lights, and cameras for rendering.

Scene ambience—The lighting or illumination in a scene which is assumed to come from any direction and is thus independent of the presence of objects, the viewer position, or the actual light sources in the scene. Without ambient light, objects in shadow would be completely black. The scene ambiance node appears under the scene root as well under each object node. It is the same whether it is applied under the scene root or the object. Any changes made at the object level are reflected at the scene root level.

A scene's ambient lighting is equivalent to a SOFTIMAGE|3D scene's Atmosphere Ambience.

Scene DAG—The Directed Acyclic Graph that contains all the scene data elements. It is traversed every time the scene needs to be refreshed. The scene DAG contains hierarchical data that can be represented either graphically (in the schematic view) or using a tree view (in the explorer).

Scene material (default)—The default material of a scene is defined by a Phong surface shader which is applied to any object that does not have another surface shader explicitly assigned to it. This surface shader can be changed by modifying values in its property editors or by dragging and dropping a different surface shader onto the scene root. In the explorer, the default scene material appears as a subnode of the scene. If you delete a surface on an object, the default surface shader is assumed.

Schematic view—A way of displaying objects in a scene in their hierarchical structure. It also shows the relationship between elements such as lights, cameras, material, animation, etc. *See also* Hierarchy.

Scrubbing—To enter information by gestural input. Click and drag the mouse pointer in a circular motion over a text box that supports numeric values. To increase the value, "scrub" in a clockwise direction; to decrease the value, scrub in a counterclockwise direction.

SECAM—Séquential Couleur à Memoire. The television broadcast standard for France, the former USSR, and various eastern European countries. Like PAL, SECAM is based on a 50Hz power system, but it uses a different encoding process and displays 819 lines interlaced at 50 fields per second. SECAM is not compatible with NTSC or PAL, but conversion between the standards is possible. *See also* NTSC and PAL.

Segment—A portion of a curve.

Selectability—A property that controls whether you can select or pick an object in a viewport. You can always select objects in the explorer no matter what the value of its selectability parameter.

Selecting—A way of making a certain object in the scene active so that all subsequent actions are performed on it. You can select an object by just clicking on it. More than one object can be active at the same time.

Sequence—A series of images or frames, usually in an animation.

Shader—A procedural plug-in, loaded into the mental ray renderer in the form of a shader library, that defines the surfaces of objects in a certain way. Originally, shaders computed only surface shading, but the term stuck as new types of shaders were invented that had nothing to do with shading. Shaders are grouped as the following types: surface, environment, volume, shadow, photon, volume photon, texture, light, light photon, lens, displacement, contour, and output.

Shading—Sometimes referred to as *surfacing*, this is the process of assigning values to the surfaces of objects. These values generally control how the surface interacts with light in the scene to create the object's color, specularity (highlights), reflective qualities, transparency, and, if the surface is at all transparent, refraction. Basically, shading controls those qualities that suggest the material that an object is made of, whether wood or plastic or metal. Most sophisticated shading techniques provide smooth transitions on curved objects and let objects cast shadows.

Shading model—An algorithm used to define how an object's surface reacts to light in terms of shading. Shading is the difference in color across a surface due to different surface properties and lighting. You can set shading according to the following shading models: Blinn, Phong, Lambert, Cook-Torrance, and Constant.

Shadow—An area that is totally or partially obscured from light by an object. A shadow is composed of an umbra area (the main shadow when an object completely blocks the light) and a fringe penumbra area (when the object only partially blocks the light). You can create shadows in one of two ways: raytracing or shadow mapping.

Shortcut keys—The keys or key combinations that provide quick access to frequently performed commands or operations. A keyboard shortcut is the keyboard equivalent of a command, tool, or operation that is also available elsewhere in SOFTIMAGE|XSI.

Shrinkwrap—A type of deformation that projects a wrapper object onto the surface of a target object. You can completely engulf the target thereby giving the wrapper the same overall shape or apply the wrapper onto the target like a decal.

Skeleton—A group of chains grouped together in a hierarchy. *See* Chain.

Skin—*See* Loft or Envelopes.

Soft body—A custom effect that simulates the dynamic behavior of non-rigid objects when they are subjected to physical forces and obstacles. Soft body computes the movements and deformations of the object by means of a spring-based lattice. The lattice is automatically created inside the volume of the model hierarchy. The higher the resolution you set, the better the lattice mimics the shape of the object.

Spline—A smooth curve that passes through two or more points. Splines are generated with mathematical formulas.

Smoothing—The process of eliminating jagged edges. *See* Antialiasing.

Solid Texture—*See* 3D textures.

Solo—A way of speeding up the refresh rate of a single viewport. To put a viewport in solo mode (while the others are muted), click on its letter identifier. Click a second time to reactive all viewports. *See also* Mute.

Also a way of singling out tracks in the animation mixer.

Source—The original image, animation, or audio file copied into a SOFTIMAGE|XSI folder. It is defined as read-only and is saved with your scene. It does not have to be reloaded when you reopen your scene. Each time you use a source, an image clip is created of it. You can have as many clips of the same source as you need. You can then edit the clip without affecting the original source.

SPDL—Softimage Plug-in Definition Language. An ASCII configuration file that defines a property set and the parameters of an object and how they appear in the property editor.

Specular—The highlights created by light rays reflecting off a shiny surface. It is an important component of a material's definition because it suggests curvature in 3D space. Specular reflection depends on the position of the camera, whereas diffuse light does not.

Spines—Curves that can be used as deformers to change an object's shape, similar to the way that you can deform envelopes by moving bones in a chain. Each curve defines a cylinder of influence with an associated radius, and object points within a curve's influence are assigned to that curve. If an object point is close to two or more curves, it is weighted between them. However, unlike envelopes, you cannot manually adjust the weighting.

Spotlight view—Sets the point of view in the active viewport relative to the chosen spotlight. The point of view is set according to the direction of the light cone defined for the chosen spotlight.

Sticky mode—A mode for using supra keys where you do not need to hold the key down to activate the tool. Tools can be activated by supra keys in one of two modes: "sticky" and "temporary." In temporary mode, you must hold down the key for the tool to remain active.

You can activate a tool in sticky mode by quickly pressing and releasing its key. The tool remains active until you choose another tool or press another shortcut key to perform a different operation. Pressing the key a second time takes you out of sticky mode. *See also* Temporary mode and Supra keys.

Subcomponents—*See* Components.

Supra keys—A set of shortcut keys mapped to the most commonly used tools. It is usually a single alphanumeric key that activates a specific tool or command. Once the tool is active, any actions you perform with the mouse are related to that tool. For example, pressing the **z** key activates the pan and zoom tool so that right-clicking and dragging in the viewport zooms out of the scene, and middle-clicking zooms in. The mouse pointer changes shape to indicate which tool is active. *See also* Sticky mode and Temporary mode.

Surface—A 2D parametric shape that defines the boundary or "skin" of an object in three dimensions. Surfaces are NURBS patches formed by intersecting U and V isolines.

Surface meshes—Surface meshes are "quilts" of NURBS subsurfaces acting as a single geometry. You can control the continuity at the seams between subsurfaces.

Surface shader—The most basic of shaders used for defining an object's material. Surface shaders come in different shading models (Blinn, Phong, Lambert, Constant, etc.) and define the basic color, reflectivity, and transparency of an object. *See also* Materials and Material node.

Swift keys—*See* Shortcut keys.

Tangent—A vector that determines the slope of a curve or a surface at a given point.

Temporary mode—A mode for using supra keys where you need to hold down the key to keep the tool active. Tools can be activated by supra keys in one of two modes: "sticky" and "temporary." In sticky mode, you don't need to hold down the key for the tool to remain active.

You can activate a tool in temporary mode by holding down its key for longer than half a second. This activation mode is most often used when you hold down a key and drag the mouse to implement the tool. The tool is deactivated after you release the key. For example, when you release the o key after holding it down and dragging the mouse, you deactivate the "orbit" tool.

Tessellation—The way that the surface of an object is divided into triangles for the purpose of rendering. The number of triangles is determined by the surface approximation properties of an object.

Texture mapping—The way a picture file is mapped onto an object to be used as a 2D texture. When a picture is mapped onto an object, the correspondence between the picture's pixels and points on the object's surface is calculated. You can map a picture file to the object's XY, YX, or YZ coordinates. You can also map cylindrically, spherically, or by an object's UV coordinates.

Textures—*See* 2D textures and 3D textures.

Timeline—A tool used to display the current frame of the animation and to manually move between different frames. The current frame is indicated by the position of the playback cursor in the timeline display box. The current position of the animation can also be controlled using the playback controls.

Toggle—A command or option that is active or inactive. Each time you select it, it inverses the current state.

Toolbars—The horizontal panels on the left of the main window containing the commands that make up a specific toolset: animation, model, and render are the standard toolbars. You can also create custom toolbars to house specific commands or macros that you work with frequently.

Tracking—To pan the camera to follow the movement of an object.

Transformation—The movement of points by changing their coordinates. The transformation of coordinates permits you to perform translation (change the location), rotation (change the orientation), and scaling (change the size) of objects.

Transformation modes—Allow you to transform (scale, rotate, or translate) objects according to different points of reference. These points of reference can be local to the object (Local), in reference to the global axes (Global), according to the local space of a parent object (Parent), according to the local space of another selected object (Ref), based on the axes in the viewport view (View), or according to the common center of a set of selected objects (COG). You can transform objects, tagged points, centers, 2D texture supports, or polygons on a polygon mesh object.

Translation—A transformation in which the position of an object is changed (moved) without changing its shape, size, or orientation.

Transparency—The amount of light that travels through a surface. Complete transparency allows all light through; no transparency makes the surface completely opaque.

Transparency map—A texture map that varies the transparency and transparent color across a surface.

Tree—A hierarchy of nodes starting from a root (either a project node or a scene node).

Umbra—The main (darkest) area of a shadow when an object completely blocks out light.

User view—A user-defined viewpoint that shows objects in a scene from a virtual camera's point of view. This view can be either perspective or orthographic. The User point of view can be placed at any position and at any angle within the global 3D coordinate system. You can orbit, dolly, zoom, and pan in this view.

UV coordinates—Two-dimensional coordinates that describe the position of any point on surfaces in terms of direction (U and V). UV coordinates are useful for mapping two-dimensional textures onto objects.

Value—Lightness or darkness of a color. A component of the HSV (Hue, Saturation, Value) color model.

Vertex, vertices—*See* Points.

Viewing area—Four viewing windows on the main window called *viewports* for displaying the objects in a scene. By default, three of the viewports display parallel projection views (Top, Right, and Front windows) and one viewport is a perspective view (Camera). You can also change these views to display tools such as the explorer, schematic view, animation editor, etc.

Viewpoints—Allows you to see a scene in a viewport in a specific way, but is not a camera. You can choose from four default viewpoints in the viewport: User, Front, Top, and Right. In many ways, cameras and viewpoints are similar except that viewpoints, unlike cameras, are not actual objects: they are only tools for viewing your scene. You cannot animate a viewpoint, nor can you render from a viewpoint as you can from a camera. *See also* Views.

Viewport-navigation controls—A set of basic "camera" controls that allow you to view a scene in different ways in a geometry view in the viewport. You can orbit, zoom, dolly, pan, tilt, roll, frame all, and frame selection with the camera.

Viewports—The viewing area of the main window where you can view and work on your scene. You can display up to four viewports. By default, three of the viewports are parallel projection views (Top, Right, and Front) and one is a perspective view (User). Viewports can have different geometry views (Top, Front, Right, and User) and display types (Shade, Wireframe, Texture, Hidden Line, etc.). They can also display other views such as the animation editor, browser, and the explorer. Any viewport can display any type of view.

Views—The means by which you view a scene in a viewport. Views can be geometry views, camera and render pass views, spotlight views, or tools such as the explorer, the schematic view, property editors, the animation editor, and the browser. Geometry views are Front, Top, Right (all orthographic) and User (perspective or orthographic).

Visibility—Properties that determine whether an object appears in the viewports and when rendering.

Volume shader—A type of shader that controls what happens to rays that travel through a volume.

Volumic effects—Types of effects achieved by applying a volume shader which affects color according to the distance the rays travel outside or inside an object. This capability can be used, for example, to create fog or visible light beams. These volume shaders are used to modify rays as they pass through an object (local volume shader) or the scene as a whole (global volume shader). They can simulate effects such as clouds, smoke, fog and fire.

Voxels—Volume elements arranged on a fixed regular grid that define objects in 3D space. The voxel is the building block of raytracing acceleration methods such as BSP trees.

Waves—Animated deformations that travel in both time and space. You can create shock waves, water waves, and other types of natural disturbances with wave deformations.

Weighting—The technique of applying weight maps that let you modulate deformations applied to clusters. Each cluster can have multiple weight maps so that you can modulate different parameters in different ways. Weight maps can also be painted onto clusters using the paint tool (GAP).

Wireframe—A display type that shows the geometric object made up of its edges and drawn as lines resembling a model made of wire. This image displays all edges or contour lines without removing invisible or hidden parts or filling surfaces. By default, the Wireframe display type is shown in the viewports.

XYZ axes—The three axes in the Cartesian coordinate system that represent three-dimensional space: the X axis is horizontal space, the Y axis is vertical space, and the Z axis is depth. The point at which these three axes intersect is called the origin. All three axes have positive and negative values, depending on which side of the origin they are.

XYZ Coordinates—With the Cartesian coordinate system, you can locate any point in space using three coordinates called X, Y, and Z. For example, a point with X = +6, Y = –6, Z = +6 would be located to 6 units the right of, 6 units below, and 6 units in front of the origin.

XZ, XY, YZ Planes—The perpendicular axes that extend as 2D planes. In the viewports, these planes correspond to three of the parallel projection views: Top, Front, and Right. Imagine that the XZ, XY, and YZ planes are folded together like the top, front, and right side of a box.

Zoom—Increases the length of the camera lens, magnifying an aspect of a scene. The results of a zoom and a dolly are different. A dolly physically moves the camera closer to the point of interest without changing the length of the lens; perspective distortions peculiar to the lens length may result at the edges of the scene. Zoom increases the size of the point of interest by increasing the lens length; depth is not as well perceived as with a shorter lens.

Related Books, Videos & Web Sites

Related Books, Videos & Web Sites

The following is a list of books, videos, and web sites that cover many topics about 3D modeling, animation, and surfaces. While most of these are not specific to SOFTIMAGE|3D, they can help you in your quest for knowledge about 3D animation in general.

Web sites existed at time of printing, April 2000.

Books and Videos

Many of these books are available from **www.amazon.com**

SOFTIMAGE|3D

Inside Softimage 3D by Anthony Rossano. Indianapolis: New Riders Publishing, 1998. ISBN: 1562058851

Softimage 3D Design Guide by Barry Ruff and Gene Bodio. The Coriolis Group, 1997. ISBN: 1576101479

Videos

Secrets of Softimage 3D by Jeremy Birn. Video training tape, 1997. **www.3drender.com/softimage/secrets.html**

Softimage Character Kits I and II by David Gallagher. Video training tapes, 1998. **www.cineframe.com/videos.htm**

Realistic 3D Character Development by Chris Maraffi. Video training tape. Intent Productions: **www.intentp.com**

Animation

Animals in Motion by Eadweard MuyBridge. Dover Publications, 1957. ISBN: 0486202038

Animation: From Script to Screen by Shamus Culhane. St. Martin's Press, 1988.

Cartoon Animation by Preston Blair. Walter Foster Publishing, 1994.

Creating 3D Animation: The Aardman Book of Filmmaking by Peter Lord and Brian Sibley. Harry N. Abrams, 1998. ISBN: 0810919966

Digital Character Animation by George Maestri. Indianapolis: New Riders Publishing, 1996. ISBN: 1562055593

Dynamic Anatomy by Burne Hogarth. New York: Watson-Guptill Publications, 1958; paperback 1990.

How to Draw the Human Head: Techniques and Anatomy by Louise Gordon. Viking Press, 1977; Penguin Books, 1983.

The Animator's Workbook by Tony White. New York: Watson-Guptill Publications, 1986; paperback 1988. ISBN: 0823002292

The Art of 3D Computer Animation and Imaging by Isaac Victor Kerlow. John Wiley & Sons, 1996. ISBN: 0471286494

The Artist's Complete Guide to Facial Expression by Gary Faigin. New York: Watson-Guptill Publications, 1990.

The Human Figure in Motion by Eadweard MuyBridge. Dover Publications, 1989. ISBN: 0486202046

The Illusion of Life: Disney Animation by Frank Thomas Ollie Johnson. Hyperion, 1995. ISBN: 0786860707

Computer Graphics

3D Computer Graphics: A User's Guide for Artists and Designers by Andrew Glassner. The Lyons Press, 1994. ISBN: 1558213058

Quick Reference to Computer Graphics Terms by Roger T. Stevens. Ap Professional, 1993. ISBN: 0126683107

The Dictionary of Computer Graphics and Virtual Reality by Roy Latham. Springer Verlag, 1995. ISBN: 0387944052

The Way Computer Graphics Works by Olin Lathrop. Wiley Computer, 1997. ISBN: 0471130400

Web Sites

The following are animation industry–related web sites.

- **members.spree.com/thearts/animateclay**: clay animation "how to"
- **members.xoom.com/shaunchap/frames_SI.html:** archived information from earlier versions of SOFTIMAGE|3D
- **www.3dcafe.com**: resource for computer graphic artists
- **www.3drender.com**: 3D animator's resource list
- **www.cg-char.com**: 3D CG character animators' mailing list
- **www.cinemarquee.com**: resource for filmmakers by filmmakers
- **www.digitalanimators.com**: digital animation
- **www.lumis.com**: *the* 3D artist resource list. Includes an extensive list of animation industry–related books.
- **www.nativedreams.com**: SOFTIMAGE|3D tutorials and information in Italian
- **www.perp.com/animate:** animator's mailing list
- **www-scm.tees.ac.uk/users/c.williams**: Softimage source book, a page of links primarily assembled for animation students at University of Teesside in England
- **www.stopmotionanimation.com**: stop motion animation
- **www.thecycle.com**: dedicated to education related to animation
- **www.webreference.com/3d:** 3D animation workshop
- **vizlab.beckman.uiuc.edu/softimage**: Softimage users' page