

Technical Reference

Martin Hash's
**ANIMATION
MASTER**





Animation:Master
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Welcome to the Animation:Master Technical Reference

Animation:Master is a very powerful tool for you to tell your stories, and create exciting animation. Once you have acquainted yourself with its general tools by working through the tutorials in The Art of Animation:Master manual, you are now ready to explore many of Master's more esoteric features. The layout of this technical reference follows the layout of the Project Workspace Tree. You will also find more in-depth documentation in the "User Interface and Environment" section. Use Table Of Contents, Index and the Search function to look up areas of the software you want to explore further.

Projects

When you work in Animation:Master you always work in a project. It contains all of the models, materials, actions, and scenes of the animations you are creating. You can store your models, actions, etc. in separate files that the project references, or within the project file itself. It provides a convenient way to consolidate your data, and share it with other animators.

Project Menu

Delete	Removes the selected object from the project.
Revert	Returns the Project to its previously saved state.
Save	Saves the selected object with its current name.
Save As...	Saves the selected object with a new name.
Consolidate	Consolidates the project into a single directory structure.
Embed All	Embeds all materials, post effects, models, lights, actions, and choreographies into the project.
Export Project as HA:MR binary (*.PRJB)...	Exports the Project in binary format for HA:MR
Properties	Edits the selected object's properties.

Project Properties

File Info Visible: Cache Only, See File Info property.

FPS

Visible: Sometimes, Default: 30, Min: 0, Max: 1000. Sets the frame rate of the selected Project. Keyframes are associated with an exact time, measured in seconds. The time depends on two things: when the keyframe was created and the frame rate set for the project. With frame rate set at 30 frames per second (fps), frame "15" represents 0.5 seconds into the animation. If the frame rate is set at 24 fps, the same frame "15" represents 15/24 second, which equals 0.625 seconds, which causes the keyframe to

occur significantly later in the animation. Because of this, setting the project frame rate BEFORE animating is EXTREMELY important. The default is 30 fps. However, after the animating is complete, changing the frame rate allows you to render different numbers of frames per second. This means you can create a 2 hour movie, render it out at 24 fps for film with the frame rate set at "24", then set the frame rate to 30 fps and render for video, and you will see the same 2 hours of animation with the same timing, just more frames were rendered.

Plugin Properties

Custom properties added by plugins

File Info Properties

Embedded

Visible: Sometimes, Default: ON. Toggles whether to embed the object in the Project file or to save it in its own file (linked). Objects that are not embedded can be used by other projects, put in a library, and sent across the Internet, but embedded objects cause less files be created, lessening the clutter on your hard drive. To save the model in a separate file, simply choose Save As... from its context menu and choose name and place to save the object. This will turn the embedded property off. To embed an object that is currently a linked file, just turn the Embedded property on. The next time you save your project, the object will be included in the project file itself.

Filename

The complete path of the file on the computer.

Created By

Read-Only. The user's name that created this object. The created by property is automatically filled in when an object is created by using the information provided in the User Info page of the Options dialog.

Organization

Read-Only

The name of the organization that created this object.

URL

A link to the site for which you might find information on the creator of this object.

E-Mail

The email address for the creator of this object.

Preview

Visible: Cache Only. A picture of the object used by the Library panel.

Description

A description of the object. This description is displayed in the tooltip when you hold your mouse over an object in the library panel.

Notes

Notes is a good place to indicate which skeleton a model uses so that anyone using the model in the future can identify what actions are reusable with it. Notes can also notify a potential material user about forces that might be required to make “fire” or other specific effects.

Last Modified By

Read-Only. The user's name that last modified this object.

File Info Menu

Select Relationship

Select this properties Relationship if any.

Edit Relationship

Brings this property's Relationship up in its own private editing window.

Set To Default Value

Set this property to its default value.

Not Set

Remove any local or current choreography drivers from this property and mark it as not set.

Use Cache's Value

Remove any local or current choreography action drivers off of this property and use the value from another action or the cache.

Constant

Set this property to be Constant.

Time Based

Set this property to be able to change over time.

Edit Expression

Properties

Edits the selected object's properties.

Image Folder

Stills and Animations

Images are an integral part of computer animation, so the software makes it as easy as possible to interact with them. Animation:Master supports interaction with image manipulation programs from other vendors, like Photoshop, Paint Shop Pro or GIMP. Recommended formats are TGA and JPG.

Image Container Instance Menu

Delete Removes the selected object from the project.

Rename Rename the selected object

Select Cache () Highlights the object that this shortcut is to.

Properties Edits the selected object's properties.

Image Formats Supported

These file types will work anywhere an image can be utilized in Animation:Master.

Stills

BMP

Microsoft Windows “bitmap” is a format that is fairly compact. Animation:Master supports 24-bit BMP images.

JPEG

The Joint Photographic Experts Group (JPEG) format is a commonly used format that uses a compression scheme that effectively reduces file size by identifying and discarding extra data not essential to the display of the image. Keep in mind that the JPEG compression scheme is referred to as lossy because it discards data as the compression level increases.

PCX

*(Import Only)*PCX is an ancient but still widely used format, simply because it has been around for so long that everybody understands it. Most paint programs support the PCX format. Animation:Master supports 24-bit PCX files.

TGA

TGA, or “Targa” files, are the most robust of the image formats that are supported within Animation:Master. Targa files support any bit depth, and include features such as alpha channels, gamma settings, and built in thumbnails, and should be used whenever possible.

Animations

AVI

Microsoft Windows audio-video interleaved format. Alpha channels are not supported.

MOV

Apple QuickTime movies. Alpha channels are supported.

Animations can be QuickTime files, AVI files, or sequentially numbered image files. They can be used for decals, projection maps, rotoscopes, layers, fog images, and light gels.

Animation Instance Menu

Delete Removes the selected object from the project.

Rename Rename the selected object

Select Cache () Highlights the object that this shortcut is to.

Edit Opens a Window for the selected object. This can also be achieved by double-clicking the object in the Project Workspace.

Launch Associated Application

(Windows Only) Opens the selected object in the software application that is associated to files of this type. See "Associate a file name extension with a file type" in your Windows help for more information.

New Post Effect...

Imports a Post Effect that modifies the cameras output.

Properties Edits the selected object's properties.

Animation Properties

Filename

Visible: Sometimes The full path and filename of the image.

Start

Visible: Sometimes, Default: 0, Min: 0 The first frame to use out of the animation sequence. Zero being the first available frame. When using a sequence of images, this number is appended to the end of the filename, and the resulting name is then loaded.

End

Visible: Sometimes, Default: 0, Min: 0 The last frame to use out of the animation sequence.

FPS

Visible: Sometimes, Default: 30, Min: 1, Max: 1000 This value controls the playback speed of the animation. Most of the time you will set this to the FPS of the animation you are loading.

Cache Size

Visible: Sometimes, Advanced, Default: 30, Min: 1. This property allows you to control how many images out of the animation sequence will be held in memory at one time. Once more images have been used than this value, the least recently used image will be freed from memory.

Composite

Composites are a place to combine or modify buffers of other animations or images using post effects.

Composite Instance Menu

Delete Removes the selected object from the project.

Rename Rename the selected object

Select Cache () Highlights the object that this shortcut is to.

Edit Opens a Window for the selected object. This can also be achieved by double-clicking the object in the Project Workspace.

Launch Associated Application

(Windows Only) Opens the selected object in the software application that is associated to files of this type. See "Associate a file name extension with a file type" in your Windows help for more information.

New Post Effect...

Imports a Post Effect that modifies the cameras output.

Properties

Edits the selected object's properties.

Composite Properties

File Info *Visible: Sometimes, See File Info property.*

End *Visible: Sometimes, Default: 1, Min: 1* The last frame to use out of the animation sequence.

FPS *Visible: Sometimes, Default: 30, Min: 1, Max: 1000*

This value controls the playback speed of the animation. Most of the time you will set this to the FPS of the animation you are loading.

Cache Size

Visible: Sometimes, Advanced, Default: 30, Min: 1 This property allows you to control how many images out of the animation sequence will be held in memory at one time. Once more images have been used than this value, the least recently used image will be freed from memory.

Sound Folder

Removing Audio Files

To remove an audio file from a project, click on the sound name under the "Sounds" folder and press the <Delete> key on the keyboard. A confirmation message will appear verifying that you wish to remove the selected audio file from the project.

Sounds

Dialog and lip-sync are of paramount importance to character animation. Your characters need to be able to talk, yell, sing, laugh, and cry. With powerful commercial and shareware sound editing software and low cost sound cards and speakers, it is possible for you to create soundtracks and sound effects for your own stories. Animation:Master allows you to import your sound files and sync them with actions for your characters. From the sound of a bouncing rubber ball, to the burning of a dragon breathing fire, or a line of dialog for one of your actors, Animation:Master will easily import and work with audio files. Sounds are audio sample files that can be loaded and placed in actions to help create lip sync actions. You can also load sampled music to use as timing reference when animating to a song. You can scrub through animation will sound on the timeline, and create final animation with sounds saved in the animation file. Once a sound file is

added to a choreography, rendering an AVI or Movie file will automatically embed the added sound in the file.

Audio Formats Supported

Animation:Master supports standard, uncompressed PCM WAV files on both Mac and Windows. As long as the uncompressed PCM format is used, audio files of any frequency can be used, regardless of whether they are stereo or mono. Several shareware and freeware programs are available for converting sound files from other formats to the WAV format.

Using Sounds in An Animation

Once a sound file has been added to a project, it can be used by simply dragging and dropping the sound onto any Action or Choreography. This creates a Sound Shortcut. The shortcut will be visible in the timeline and can be moved to the desired starting time. Also the start and end play positions can be cropped as desired. Most often, the action will be for the model to which the audio belongs. For example, a hero in a story has a line of dialog such as "Look Out!" A new action is created for the hero model, and the sound is dropped into that action. Now, as you step through the frames, the audio will play frame by frame (called "scrubbing"), allowing you to create key frames to match the audio. Selecting the Sound Shortcut in the "Actions" folder of the Project Workspace tree allows you to make changes to the Sound Shortcut properties.

Sound Tips

When working with sounds, the Timeline will come in handy for reference when changes are made to start or end times of a particular sound clip. Remember to always use PCM Wave data.

Sound Instance Menu

- Delete** Removes the selected object from the project.
- Select Cache ()** Highlights the object that this shortcut is to.
- Play** Play
- Properties** Edits the selected object's properties.

Sound Properties

Filename

Visible: Cache Only, Read-Only The complete path of the file on the computer.

Crop

Visible: Instance Only Allows only a portion of the Sound Object to be used.

Start

Default: 0sec Start time of the Sound Object.

End

Default: 0sec End time of the Sound Object.

Length

Default: 0sec Length of time for the Sound Object.

Volume

Default: 100%, Min: 0%, Max: 100%, Percentage Volume of Sound for playback and rendering.

Mute

Default: OFF Allows the Sound to be muted.

Material Folder

Material Caveats

Nothing adds more realism to an image more easily than materials: Eroded Crinkle, Marble, Tile, etc. Materials are the algorithmic simulations of natural phenomena. Materials fall into the "you don't get what you want – you get what you get" category because they are hard to control. Materials are also slow to render (as much as eight times slower than no materials), for complex combinations. Animation:Master supports a "plug-in" technology for materials; meaning that you could write your own if you had a hankering to do so. Plug-in materials offer opportunities but make multi-computer and cross-platform compatibility a logistical nightmare because every computer must have the plug-in installed and the plug-in must be available for the different operating systems of Macintosh and Windows.

Materials are difficult to temporal antialias – meaning that during an animation, high frequency materials tend to flicker, especially in the distance. Your only recourse is to replace the material with a similar-looking bitmap or increase the scale of the material to lower the frequency.

Materials

Materials are algorithmic (computer generated) color patterns that you can apply to models. They can also contain surface properties like transparency, specularly, and reflectivity. Materials can be used with each other in combination. When a material is applied to a model, the individual values that have been set in that material will override those values for the model. For example, you can create a material that has only specularly set. When that material is applied to a model, the models other attributes are left unchanged, but the specularly is overridden with the material's value. When editing a material, the value fields are shown as "-not set-" when no value has been set for them. In this case the model's value will be used for this field. A material can also be applied to a group, rather than an entire model.

Material Override Precedence

The color and other surface properties of a model can be controlled on many levels. It is possible to override some or all of these values, but the order in which these values are set is very important. The base level is the model's attributes. A model's color, specularity, transparency, etc. can be set on under the model's surface properties. But, if you create a material and apply that material to the model, then the values you set in the material will override those values that were previously set for the model. Any named groups in the model can have their own attributes. These will override any materials that are applied to the whole model. They will also override the model's attributes. Materials applied to groups will override the group's attributes. So, you can selectively control areas of your model.

In summary, the surface settings can be overridden in the following order:

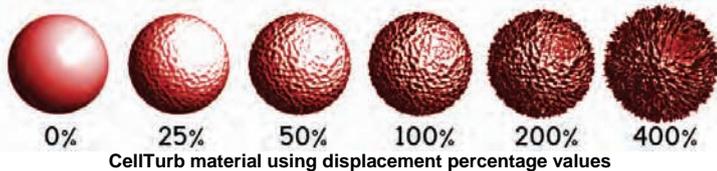
- Model
- Material on Model
- Group
- Material on Group

Camera and Render settings can also override the model's attributes in a scene. However, the only values they can affect are Toon Rendering (Toon lines, and Shading). There may be times when you design a character for rendering with the 2D Toon cel look, but you only want outlines on the hair. You could group the hair and set the toon lines off for that group. But, if you set Override Toon Lines in the Render panel, you can override the hair's setting. Toon settings are available in the Camera's properties, and on the Rendering tab of the Options and Render to file dialogs. Setting the Toon options on the Render panels will override the Camera's settings.

Editing Materials

Like everything else, "Materials" are located in the Project Workspace. To open a Material Window, double-click the Material in the Project Workspace.

Material Displacement



Materials can be used for color, bumps, or displacement. The difference between bumps and displacement is that bumps only affect the appearance

of the surface, while displacement actually changes the shape, but displacement has many caveats compared to bumps. Bumps can have lots of detail but displacement depends on the density of the mesh. This means the model should have many more patches than normally necessary when displacement is going to be used. Often both bump and displacement materials are applied ("water" for example). Displacement is used to make a surface's profile uneven, and bumps add the detail. Displacement also generally takes longer to render and uses more memory.

To make a material displace, in the material's Properties, set the "Displace" value. The material will not color the model it is applied to but instead use its grayscale value to displace the surface. Where the material is darker than median gray, the surface will move opposite the normal, and where the material is lighter than median gray, the surface move along the normal. To turn off displacement materials, pick the "Switch to not set" menu item.

Material Instance Menu

Delete	Removes the selected object from the project.
Rename	Rename the selected object
Select Cache ()	Highlights the object that this shortcut points to.
Properties	Edits the selected object's properties.

Material Properties

File Info Visible: Cache Only See File Info property.

Transform

The translation, scale and rotational offset from the model this material is on. This can be used to offset the pattern in a material from the origin of the model.

Bump Percent

Default: 0%, Percentage. The patterns created with materials can be used to create shading bumps on the surface (only the gray scale of the pattern will be used). To make a material cause bumps, set the Bump Percent property to a value. The higher the percentage value, the more pronounced the bump will be (negative values will invert the bump). To turn bump off, pick Mark as -not set- from the Bump Percent's context menu.

Displacement Percent

Default: 0%, Percentage. The patterns created with materials can be used to displace points on the surface (only the gray scale of the pattern will be used). To make a material cause displacement, set the Displace property to a any value. This value sets the maximum displacement in centimeters, as controlled by the gray value of the material at that point on the surface, (negative values will invert the displacement). To turn displacement off, pick Mark as -not set- from the Displacement context menu. Each patch only has

16 displaceable points, so high frequency displacement would require patches in the same area. Displaced patches take longer to raytrace.

Global Axis

Default: OFF Typically, a model looks like it is made from a material, meaning the pattern should stay firmly attached as the model moves and bends. This is the default method the software uses to compute material patterns. However, sometimes it is desirable to have a material appear as if it is part of the air and have the model pass through it. The Global Axis property causes this effect.

Attributes

Texture plugins are in house or third party textures that are supplemental to Animation:Master. These plugins are supplied in the form of an .ATX file, and are placed in your Textures folder. Once a compliant texture has been placed in one of your texture folders it will be available for use the next time the software is started.

Applying a Texture Plugin

Plugin textures are accessed by right-clicking (Control-clicking on a Mac) a material attribute and picking [Change Type To][Plugin]. Animation:Master includes many plug-in textures, including "Dented", "Planet", "Scales", and "Environment Map" and "Projection Map". Most texture names are self-explanatory, such as "Basketball" and "Crumple".

Adjusting Texture Plugins

Each plugin texture can have its own options which can be adjusted on their Properties panel when the texture is selected in the Project Workspace.

Turning an Attribute into a Combiner

There are currently four different kinds of combiners: Checker, Gradient, Spherical, and Turbulence plugins. You can change an attribute into a one of these combiners by right-clicking (Control-clicking on a Mac) the attribute and choosing Change Type To, then Combiner, then choosing the desired combiner type. When an Attribute is changed to a combiner, two Attributes are placed below the new combiner as children. This new combiner then combines these two child Attributes to form a patterned Material. These child Attributes can have their type changed just as this one did, to achieve the desired effect.

Attribute Instance Menu

- Delete** Removes the selected object from the project.
- Select Cache ()** Highlights the object that this shortcut is to.
- Properties** Edits the selected object's properties.

Attribute Properties

- Surface** Contains all of the surface attributes for this object.

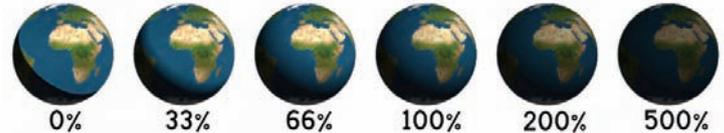
Surface Properties

Diffuse Color

You can select a surface color by clicking the Color chip and picking one from the palette.

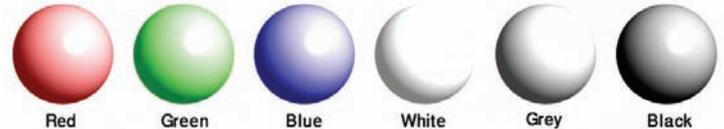
Diffuse Falloff

Visible: Sometimes, Default: 100%, Min: 0%, Percentage



Set the lighting falloff. Defaults to 100, with typical values from 0 to 300. This controls the transition from light to dark in shaded areas on a model. Planets tend to have little falloff, but a toy ball would have more.

Ambiance Color



You can select an ambient color by clicking the Color chip and picking one from the palette. The ambient color along with ambient intensity determines the brightness of an object even when no light is hitting it. If the ambient color is Not Set, then the ambient color will match the diffuse color even if that color ultimately comes from a decal. This is handy because it is most common to have diffuse color and ambient color match. If ambient intensity is 0 then ambient color will have no effect.

Ambiance Intensity

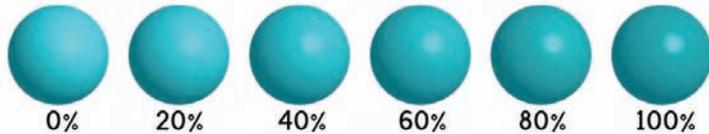
Visible: Sometimes, Default: 0%, Min: 0%, Max: 100%, Percentage



Ambiance is a value that determines the brightness of an object when no light is hitting it. A value of 0 would indicate the material is black when in shadow, where a value of 100 would mean it had all the intensity of its original color. A high ambient makes objects appear as if they are self-illuminating.

Ambiance Blend

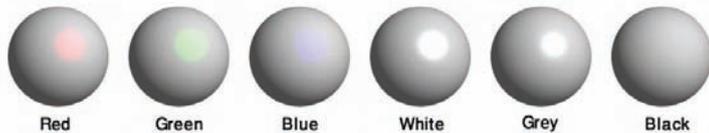
Visible: Sometimes, Default: 0%, Min: 0%, Max: 100%, Percentage



Ambiance Blend determines how ambient affects the brightness of an object where light is hitting it. A value of 0, the default, indicates the ambient brightness is added to the other light illuminations. This is the traditional ambient blending method required for when faking a material that would appear self-illuminating. A value of 100 means the diffuse color will get merged with the ambient settings. In other words, the object illumination will only vary between the ambient settings in shadows to the diffuse settings in full light.

Specular Color

Visible: Sometimes.

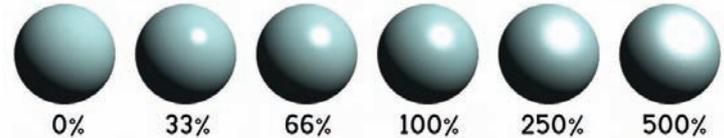


The Specular Color option allows you to change the color of the highlight that appears on an object. Metals, for example, have highlights that are the same color as the metal's base color. The default specular color is the color of the light source causing the highlight. If the specular color is Not Set, then the specular color will be set to match the diffuse color even if that color ultimately comes from a decal. This is handy because it is most common to

have diffuse color and specular color match.

Specular Size

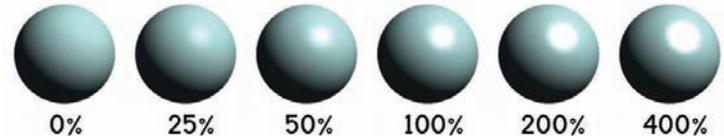
Default: 0%, Min: 0%, Max: 10000%, Percentage



There must be some size to the specular highlight or there will be no highlight at all. The higher the value, the larger the specular highlight, which causes the object to appear softer or rougher (conversely, small specular sizes make the object appear harder or smoother). Because "Specular Size" makes a surface appear smoother or rougher, which is a visual consequence of light reflected from a smooth or rough surface, it also controls two other reflectivity related render properties : Soft Reflections and Fresnel reflection. When "Soft Reflection" is turned ON (in the render properties), "Specular Size" controls the width of the reflection softness on reflective surfaces. The reflection softness will be the same width as the specular highlight. See Also Soft Reflections. When "Soft Reflection" is turned OFF, "Specular Size" controls the Fresnel effect on the edge of reflective objects. See Also Fresnel Term.

Specular Intensity

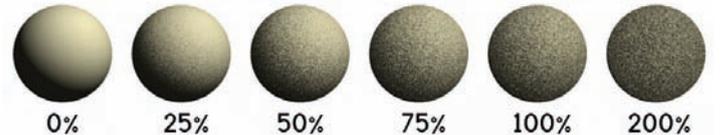
Visible: Sometimes, Default: 100%, Min: 0%, Percentage



Specularity is the bright highlight on a model that appears if the angle from your eye to the light source is just right. It makes the object appear polished.

Roughness

Default: 0%, Min: 0%, Percentage



Roughness is a turbulence function that perturbs the surface of the objects. The larger this value, the rougher the surface gets.

Roughness Scale

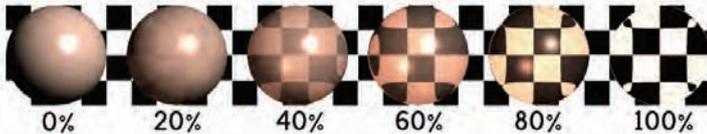
Default: 100%, Min: 0%, Percentage



Controls the size of the roughness. Small values show high frequency patterns. (Be careful not to set it too small or it can introduce chatter during animation.)

Transparency

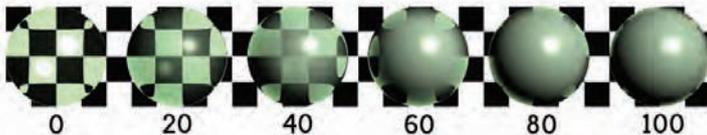
Visible: Sometimes, Default: 0%, Min: 0%, Max: 100%, Percentage



To be able to partially see through an object, use transparency. A value of 0 would mean the object is totally opaque. A value of 100 would mean the object is fully transparent.

Density

Visible: Sometimes, Default: 0, Min: 0, Max: 100



No object is purely transparent. As glass thickens, it eventually becomes opaque, and most water becomes opaque when only a few feet deep. Density is affected by size and is calibrated to the suggested scale used by Animation:Master (in increments of .001/cm), so transparent objects must be built to the correct scale (use the "Rulers" to adjust for appropriate size). Colored glass has a density of "2", while seawater has a density of "5".

Index of Refraction

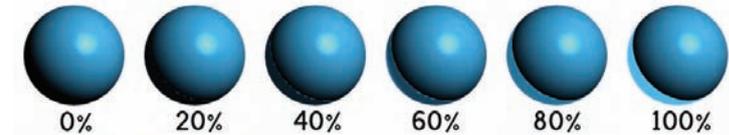
Visible: Sometimes, Default: 1, Min: 1, Max: 2



Refraction is the bending of light as it passes through a transparent object. The default value is 0, meaning no refraction. An object must have some transparency for the refraction value to be used.

Translucency

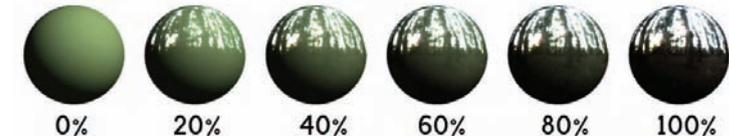
Visible: Sometimes, Default: 0%, Min: 0%, Max: 100%, Percentage



The effect of light coming through a surface from behind and brightening it is called "translucency". An example would be sunlight filtering through the back side of a leaf. The light can also be blocked by another object, causing a silhouette of the blocking object in the translucent object (similar to a shadow). If the blocking object is also translucent, the ambiance of the front object will be the combination of translucencies. Multiple light sources behind translucent objects are additive. Lights in front of translucent objects are ignored. Translucent light is like ambiance, in that it lightens the object without showing any shading. Translucency is often confused with transparency, but you cannot see through translucent objects. Translucency is a raytrace effect.

Reflectivity

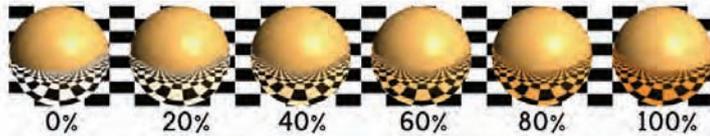
Visible: Sometimes, Default: 0%, Min: 0%, Max: 100%, Percentage



Setting a Reflectivity value above 0 causes the object to have reflections of the surrounding objects in it. A value of 100% means that the object is totally reflective and will add the color of the surrounding objects to its own color.

Reflection Filter

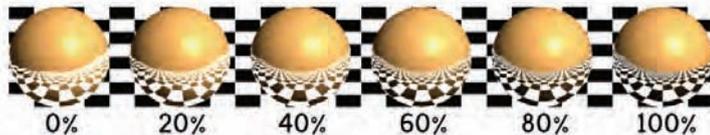
Visible: Sometimes, Default: 0%, Min: 0%, Max: 100%, Percentage



This property allows you to adjust the percentage of color filtering applied to reflected images. Some surfaces like paint or metals filter the reflected images by their own surface colors while others like lacquered surfaces reflect the environment as is. Other surfaces like plastics partially filter the reflected environment. At 0%, reflection colors are not filtered by the surface color. At 100%, reflection colors are fully filtered by the surface color.

Reflective Blend

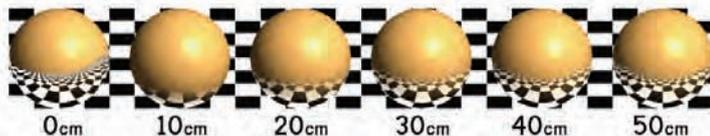
Visible: Sometimes, Default: 100%, Min: 0%, Max: 100%, Percentage



As a surface reflectivity increases, less and less of its own surface color is visible and more and more of the reflected environment is visible. This is controlled by Reflective Blend. 0% indicates the reflections are additive. That is the reflections are simply added to the surface color. This tends to produce reflections which appear brighter than the actual objects being reflected. 100% indicates the reflections are blended. That is the surface color is toned down in inverse relation to the reflectivity. Ultimately, at 100% Reflective Blend, a 100% reflective surface will not show its surface color at all.

Reflectivity-Falloff

Visible: Sometimes, Default: 0cm, Min: 0cm, Unit of Measurement

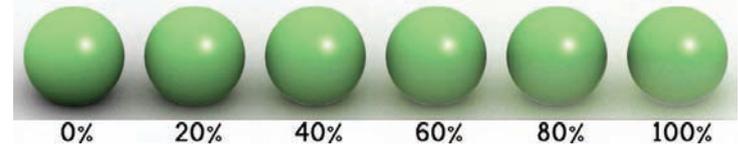


Your reflection in a tiled kitchen floor tends to fade away near your hips and the reflection is usually gone entirely by your shoulders and head. The more reflective the floor, however, the more of your reflection is visible, with strong mirroring right at your feet. This falloff phenomena results from the

fact that most reflective surfaces, other than mirrors, are not perfectly smooth, so the reflection rays are scattered increasingly the further the distance they take to bounce. "Reflection Falloff" is specified as the distance until no reflection is visible. The distance is measured from the ray's intersection to the reflecting surface.

Radiance

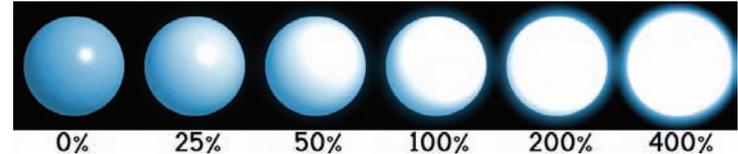
Visible: Sometimes, Default: 100%, Min: 0%, Percentage



Whether or not a surface is actually reflective, radiosity calculation assumes it is, so that light can bounce off of the surface towards other surfaces. Some soft surfaces simply do not reflect light (low Radiance values), and highly polished surfaces will brighten up everything around them (high Radiance values).

Glow

Default: OFF



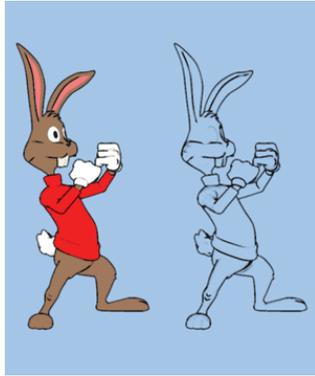
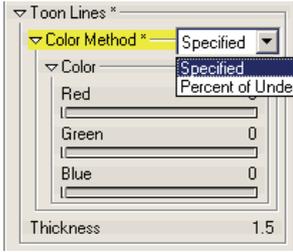
Selecting this option will cause a glow to appear around an object at render time. The glow is the color of the base attribute of the model, and the intensity is controlled by the glow intensity property of the choreography, and the radius of the glow is also a property of the Choreography.

Toon Lines

Visible: Sometimes Contains Toon line settings.

Color Method

Default: Specified. Selects how the toon lines are colored.



Specified



Percent of Underlying

Specified:

A specific color is used for the toon lines. This example shows a specified color method using black.

Percent of Underlying:

A percentage of the surface color is used for the toon lines.

Color

Visible: Sometimes The color to use for "Specified" color toon lines.

Percent

Visible: Sometimes, Default: 20%, Min: 0%, Max: 100%, Percentage
The Percentage of the underlying color to use for "Percent" colored toon lines.

Thickness

Default: 1.5, Min: 0, Max: 20

A percentage of the output render width at the camera's focal distance. This means that toon lines can get smaller as objects get further from the camera. Also related to the resolution of the rendered output.

Toon Bias

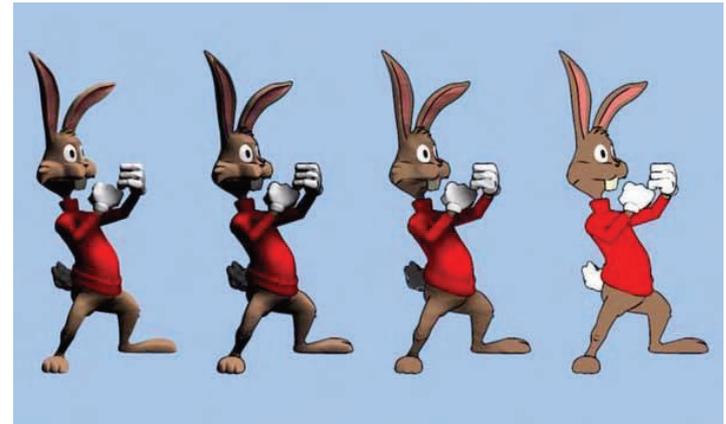
Default: 20, Min: 0.1, Max: 100

Controls the amount of detail shown in the toon lines.

Toon Shading

Visible: Sometimes Contains Toon shading settings

Method Default: Toon



Controls how the surface is shaded.

Standard: Renders with standard shading and lighting. Select this option for a regular rounded 3D look

Toon: Renders objects with a 2D look. Shadows and shading are drawn with the color scheme defined with the gradient below. Only the first light in the scene is used. The object's distance from the light will not affect its shading. However the light's color and intensity will influence the color of the surface. If the light is white and the intensity is 100% then the surface will shade the exact color of the gradient. Shadows darken the resulting color. Toon with multiple lights: Similar to the Toon option, except that all lights in the scene are used. For each light, the intensity is looked up in the gradient, and then the colors are mixed. Shadows darken the resulting color. Toon with Falloff: Similar to the Toon option, except that objects that are

farther away from light sources will be rendered darker. And all lights are used. For each light, the intensity is looked up in the gradient, and then the colors are mixed. Shadows darken the resulting color. Toon Gradient Only: Similar to the Toon with Falloff option, except that all of the lights' contributions are done first (including shadows), then the resulting intensity is looked up in the gradient. This way you are always guaranteed that the final pixel will have come from somewhere in the gradient. Again, all lights are used.

Gradient

Visible: Sometimes See Toon Gradient Property.

Diffuse Render Shader

Visible: Sometimes, Read-Only on Instance. Allows a plugin to override the standard shading calculations.

Specular Render Shader

Visible: Sometimes, Read-Only on Instance. Allows a plugin to override the standard specularly calculations.

Ambiance Render Shader

Visible: Sometimes, Read-Only on Instance. Allows a plugin to override the standard ambience calculations.

Average Normals

Visible: Sometimes, Advanced, Default: OFF. Hash patch models offer a surface fidelity and low-density unmatched by other modeling techniques which gives them the natural appearance of organic and earth made objects. Manmade technology produces its own smooth surface, and many models constructed using competing methods (such as polygons) have the ultra-smooth appearance of glazed ceramics. This property allows you to achieve this porcelain look, on your models. This option averages the surface normals, so much of the model's details will be lost, and it may shade oddly if the object is distorted during an animation.

Normal Weight

Visible: Sometimes, Default: 100%, Min: 0%, Max: 100%, Percentage Controls how distant normals affect each normal.

Material Combiners



Materials are usually a combination of two or more attributes combined in an interesting fashion. (Attributes include color, ambience, specularity,

roughness, transparency, reflectivity, glow, and refraction. Materials are displayed as a hierarchy in the Project Workspace.

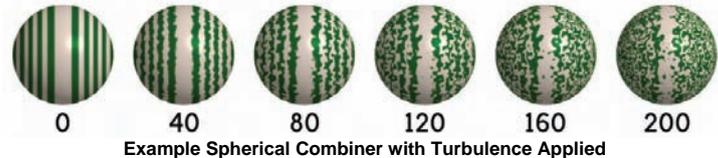
For example, "marble" is alternating slabs of attributes; one thin, the next thick, and the slabs flow randomly into each other because they are mixed up with some turbulence.

As another example, "wood" is a combination of four attributes, two combiners, and some turbulence. Two tan attributes, one darker than the other, are "Turbulence" combined, as are two brown attributes. The resulting combinations are then "Spherical" combined, and mixed up with some turbulence. Combiners allow you mix different attributes and materials. They provide the basis for any materials that are not one uniform color.

To change a standard attribute to a combiner, right-click (Control-click on a Mac) the attribute you wish to change and pick [Change Type To] and pick one of the combiner types.

Adding Turbulence to Combiners

Turbulence can not only be used as a combiner itself, but also to perturb other combiners as well. When a material is created using Checker, Gradient or Spherical combiners, the material will tend to have perfect edges where the combined Materials meet. Turbulence can be added to perturb these perfect edges for a more organic and natural appearance, but it takes longer to render.



Checker Combiners

To create a material using the Checker combiner, right-click (Control-click on a Mac) the attribute you wish to change and pick [Change Type To][Combiner][Checker]. Two new Attribute icons will appear in the Material's tree under the new "Checker" combiner icon.

Checker Instance Menu

- Delete** Removes the selected object from the project.
- Select Cache ()** Highlights the object that this shortcut points to.
- Add Turbulence**

Adds Turbulence to a volumetric light, giving it a more realistic look. Choose the type of turbulence you desire from the list of plugins installed. To

remove turbulence from a light, click the Turbulence icon under the Light icon in the Project Workspace and press on the keyboard.

Properties

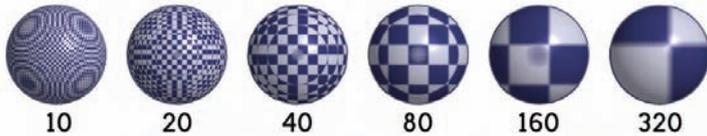
Edits the selected object's properties.

Checker Properties

Translate

The X, Y, and Z Translate fields reflect the checker's origin in 3D space as it animates.

Size



Example Checker Scaling

The X, Y, and Z Scale fields reflect the checker's scale as it animates. If any of the parameters are set to "0" the axis degenerates to alternating slabs instead of checkers.

Blur

Default: 10%, Min: 0%, Max: 100%, Percentage



Example Checker Blurring

The default blur for checker is none, giving the texture hard edges. The higher the blur value, the more smeared the edges of the checker texture gets.

Gradient Combiners

To create a material using the Gradient combiner, right-click (Control-click on a Mac) the attribute you wish to change and pick [Change Type To][Combiner][Gradient]. Two new Attribute icons will appear in the Material's tree under the new "Gradient" icon, between which it creates a gradation. This gradation can be a linear gradient from a given starting point to an ending point, or it can have "Edge Threshold", causing the color to gradate towards the edges of the object. There can also be a combination of both.

Gradient Instance Menu

Delete

Removes the selected object from the project.

Select Cache (Gradient)

Highlights the object that this shortcut points to.

Add Turbulence

Adds Turbulence to a volumetric light, giving it a more realistic look. Choose the type of turbulence you desire from the list of plugins installed. To remove turbulence from a light, click the Turbulence icon under the Light icon in the Project Workspace and press on the keyboard.

Properties

Edits the selected object's properties.

Gradient Properties

Start

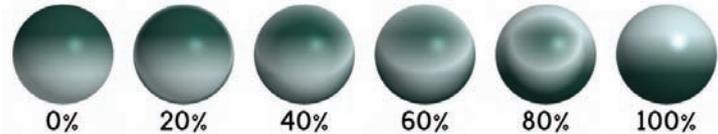
This is the distance from the material's pivot to where the gradient begins with the first color.

End

This is the distance from the material's pivot to where the gradient ends with the second color.

Edge Threshold

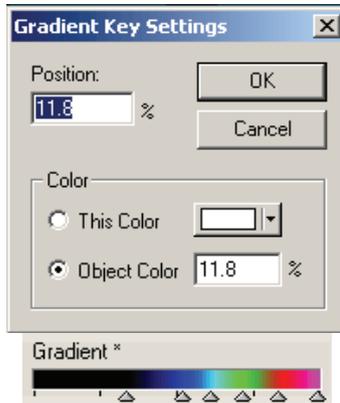
Default: 0%, Min: -100%, Max: 100%, Percentage



Example Edge Threshold Values

This value causes the edges and the face of the object to gradate between the two colors. This is useful when making velvet materials.

Gradient Key Settings



Select a key in the gradient property by clicking on the triangle and then right click (control click on the Mac) and select [Key Settings...] to open the settings for that selected key.

Position: The percentage from 0% to 100% where the key is positioned within the gradient property. When the surface is lit near this percentage by a light, the surface will be the selected color. For example if the Position is 100% then the color chosen here will be used when the surface is 100% lit.

Color:

This Color: Choose a color for the key.

Object Color: The color of the object will be used, but with the specified intensity.

Spherical Combiners

To create a material using the Spherical combiner, right-click (Control-click on a Mac) the attribute you wish to change and pick [Change Type To][Combiner][Spherical]. Two new Attribute icons will appear in the Material's tree under the new "Spherical" icon. The two attributes will be combined together in a spherical fashion, alternating back and forth between the two materials used to do the combine, similar to the layers in the Earth's crust.

Spherical Instance Menu

Delete

Removes the selected object from the project.

Select Cache (Spherical)

Highlights the object that this shortcut is to.

Add Turbulence

Adds Turbulence to a volumetric light, giving it a more realistic look. Choose the type of turbulence you desire from the list of plugins installed. To remove turbulence from a light, click the Turbulence icon under the Light icon in the Project Workspace and press **U** on the keyboard.

Properties

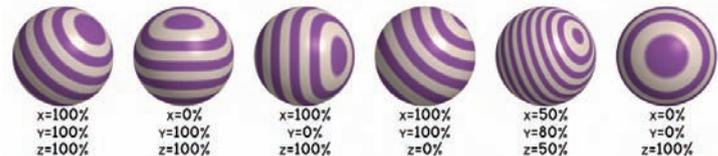
Edits the selected object's properties.

Spherical Properties

Translate

The Spherical texture occupies a 3-D space. The X, Y & Z Translation fields reflect the movement of the origin.

Scale

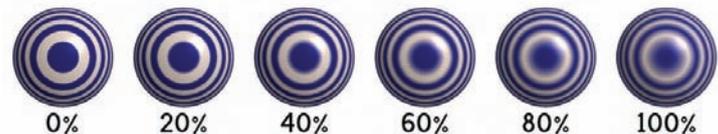


Examples of Spherical Scaling

The Spherical texture's X, Y and Z Scale fields show the values as the texture animates. If any of the axis are set to "0", that axis degenerates to layered cylinders, much like the rings in trees.

Blur

Default: 10%, Min: 0%, Max: 100%, Percentage



Examples of Spherical Blur Values

The default blur for spherical is 0, giving the texture hard edges. The higher the blur value, the more smeared the edges of the spherical texture gets.

Ring 1 Size

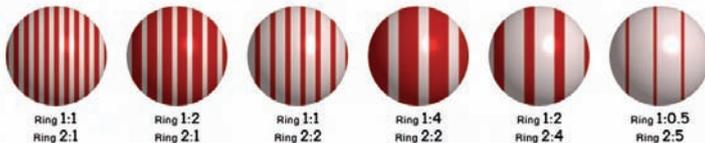
Default: 10cm, Min: 0cm, Max: 1e+008cm, Unit of Measurement



The sphere's thickness between the alternating materials can be changed by using the "Ring 1 Size" and "Ring 2 Size" parameters, meaning each attribute layer can have a different thickness.

Ring 2 Size

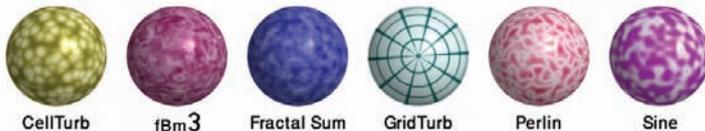
Default: 10cm, Min: 0cm, Max: 1e+008cm, Unit of Measurement



The sphere's thickness between the alternating materials can be changed by using the "Ring 1 Size" and "Ring 2 Size" parameters, meaning each attribute layer can have a different thickness.

Turbulence Combiners

To create a material using the "Turbulence" combiner, right-click (Control-click on a Mac) the attribute you wish to change and pick [Change Type To][Combiner][Turbulence]. Two new attributes will appear in the Material's tree under the new "Turbulence" combiner. Turbulence mixes up two attributes for an organic look, like granite. Turbulence is so important to the "look" of algorithmic created materials that Animation:Master offers several different kinds.



The above examples show how the same settings are represented with different kinds of turbulence (notice the similarities as well as the differences). Turbulence is really controlled anarchy that adds interesting

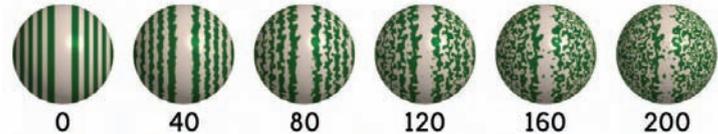
details similar to those found in nature. Turbulence is commonly used in volumetric lights to simulate swirling dust, and they can also be used with forces to simulate wind.

Octaves

Increasing the number of Octaves used in the turbulence will increase fine detail (but may cause temporal aliasing, which is jittering from frame to frame).

Adding Turbulence to Other Combiners

When a material is created using Checker, Gradient or Spherical combiners, the material will tend to have perfect edges where the combined Materials meet. Turbulence can be added to perturb these perfect edges for a more organic and natural appearance, but it takes longer to render.



Example Spherical Combiner with Turbulence Applied

To add Turbulence to a Combiner material, right-click (Control-click on Mac) the Combiner icon you wish to add Turbulence to, pick [Add Turbulence], then pick the kind of turbulence you want.

Turbulence Cache Menu

- Delete** Removes the selected object from the project.
- Select Cache ()** Highlights the object that this shortcut is to.
- Properties** Edits the selected object's properties.

Turbulence Properties

Translate

Turbulence occurs in a 3D space. The Translate fields can be used to animate the turbulence in a particular direction over time.

Scale

Scale determines the size of the turbulence pattern.

Amplitude

Default: 100%, Min: 0%, Max: 1e+010%, Percentage Amplitude increases the amount turbulence of between the attributes.

Material Containers

A sculptor will start with a solid block of wood and carve an object out of it. Every time the sculptor whittles away a sliver of wood, a new grain pattern will be exposed. Computer materials work in exactly the same way: they are essentially solid blocks of some material that have been carved to look like the object. If you change the shape of the object, the grain showing through the surface will change. A nice thing about materials is that they can be used over and over again, and they are easy to apply because you simply drag and drop them onto the object you want to apply them to. Materials also have infinite detail: no matter how close you get to the object the grain will show more resolution.

Material Container Instance Menu

Delete	Removes the selected object from the project.
Rename	Rename the selected object
Select Cache ()	Highlights the object that this shortcut is to.
Properties	Edits the selected object's properties.

Particle Systems

Some nice effects can be created by bouncing around dozens, hundreds, or even thousands of particles. Particles are a kind of material, so they are created, applied, adjusted, and removed like a material. Particles are emitted from surfaces, and they can realistically collide with other surfaces while showing the effects of gravity and other phenomena based on natural physics. Like all channel-based materials, the parameters of a particle system can be changed over time. For example, the rate at which individual particles are emitted from a surface can change during an animation.

Each surface that has particles applied as a Material is its own Particle System, and while particles from each individual system can collide with other surfaces in the scene, they cannot collide with each other. Particles appear to be randomly disbursed across the entire surface of the patches to which they are applied, but you will find that they retain cohesion from frame to frame. A Particle's initial direction is dictated by the normal of the surface exactly where the Particle first originated, and its initial velocity is set in the particles' properties. You may need to use the Flip Normals tool on your model to get the behavior you want. See Flipping Normals.

To create a particle system, right-click (Control-click on a Mac) on the attribute of a material, and pick [Change Type To][Particle System], then select the particle type you wish. A Particle object will appear beneath the materials name. Both Bloby and Streak particles have the same General and Collision property tabs.

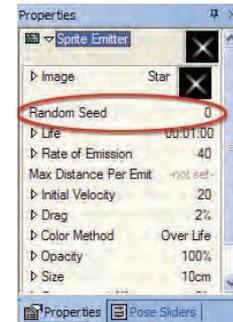
Adjusting the Particle Attributes

Beneath a particle emitter icon in the Project Workspace is an Attribute. Use this Attribute node to assign color, transparency, specularity, etc. An animated attribute works best because particles usually change color during an animation. Key frames can be created on this attribute simply by changing the frame number and typing in new values in the attributes' properties.

The reason this is different is because each particle is born at different times, and each particle will interpolate through the channel based on its life span not the time of your actual scene. For instance if you set the color of the attribute to red on frame 0 and green on frame 10, then each particle when it is born will start at red and at 10 frames after it was born will become green.

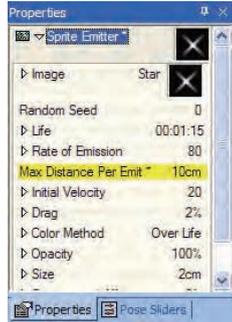
Particle systems can be added to a choreography by applying a material of a particle type to an object, either to an entire model or just a single patch. It is important to remember that because particles are a "simulation", when you choose to view a previous frame of the animation, the entire system must be recalculated from the beginning, whereas advancing through frames is almost instantaneous because the system only has to be calculated from the previous frame. If anything in the scene has changed, like a path has been moved or a model has been added, then the whole system must again be recalculated from the beginning of the scene (time 0).

Random Seed



Seed used for calculating random numbers needed for other properties of this particle system. Sprite emitters with the same seed and exactly the same property values will emit identically.

Max Distance Per Emit



Maximum distance an emitter can move without a forced sprite being emitted. This is useful for fast moving emitters like a torch. When the torch is waved quickly around it needs to emit more particles for the appearance of the fire to remain realistic.

Streaks

Streaks are particle materials that are drawn as lines rather than dots. They are ideal for falling rain, fire, smoke, sparks, a comet tail, or a waterfall.

Streak Instance Menu

- Delete** Removes the selected object from the project.
- Select Cache ()** Highlights the object that this shortcut points to.
- Properties** Edits the selected object's properties.

Streak Properties

Force

Visible: Sometimes. Allows you to specify an X, Y, and Z gravity that will affect the speed, direction, and distance that particles travel. Typically this will be all zeros, because the forces like gravity in the choreography will also take affect, causing the particles to fall. Gravity on a particle system is there to compensate for the gravity in a chor. For instance, fire or smoke would not only want to counteract the chors gravity (a value of 0,1,0), but would actually want the particles to rise from their emitter (maybe a value of 0,2,0).

Preroll

Visible: Sometimes, Default: 0sec. In many cases you will want your particles to have already populated your scene before your animation begins. This is where preroll comes into play. Preroll allows your particles to

begin emitting for any amount of time before your shots time starts. For example: you have a city scene and all the models begin their animation at time 0, but you want the whole scene to be filled with snow. You can add a preroll of 20 seconds to allow the particle to populate your scene before your animation begins at time 0.

Cast Shadows

Visible: Sometimes, Default: OFF. Different effects require particles to cast shadows or not. For example, smoke, or a cloud will cast as shadow but an explosion may not.

Life Expectancy

Default: 1sec. The amount of time (formatted in your current time units) a particle will live after it has been generated.

Rate of Emission

Default: 500, Min: 0. The number of particles that are to be generated each second by the particle system.

Initial Velocity

Default: 100. The initial speed of the particles (in units per second) as they are emitted from the models surface.

Viscosity

Default: 10%, Min: 0%, Max: 100%, Percentage. The resistance forces on the particles as they travel. Viscosity can be thought of as the thickness of the space through which the particles are traveling.... for example, air would have a much lower viscosity than motor oil.

Object Collisions

Default: OFF. Causes particles to collide with objects in a scene, otherwise particles will simply pass through any objects they encounter.

Bounce

Default: 10%, Min: 0%, Max: 100%, Percentage. Determines how far particles will bounce when they collide with an object in a scene. At 100%, a particle will bounce back to the height which it was emitted from.

Die On Impact

Default: OFF. This option causes particles to die, or disappear when they encounter another object within a scene.

Particle Collisions

Default: OFF. Causes particles to collide with other particles in a scene, otherwise particles will simply pass through any other particles they encounter.

Tail Duration

Default: 0.0333333sec. Specifies how long the streaks appear as they are emitted. This is specified in a time value representing the amount of time the tail lags behind the head of the streak.

Thickness

Default: 0.8cm, Min: 0cm, Unit of Measurement. Specifies how thick the

streaks are when they are emitted from the material.

Additive Color

Default: ON. Use this option if you wish the colors of your streaks to add together when they overlay one another. This is extremely useful when creating self illuminating particle systems like fire.

Particle Sprites with Collisions



Sprite particle settings now include “Object Collisions”, “Particle Collisions”, and “Die On Impact”. Object Collisions mean the particle will collide with other objects in the scene, like water tumbling down a waterfall. Particle Collisions mean the particles will collide with other particles in the same system (but not with different systems), causing a random scattering, like marbles pouring out of a bucket. (The collisions assume a sphere surrounds the particle). Die On Impact means that particles will disappear whenever a collision occurs, like rain falling.

Sprite Systems

A Sprite System is a particle system in which the individual particles are images or animations called Sprite Emitters. These can be used to create smoke, fire, explosions. They render much faster than volumetric effects, and work well in real-time.

Sprite System Instance Menu

- Delete** Removes the selected object from the project.
- Select Cache ()** Highlights the object that this shortcut is to.
- Change Type To**

Attribute Combiner	Plugin Properties
Checker	Changes the attribute to a checker combiner.
Gradient	Changes the attribute to a gradient combiner.
Spherical Particle System	Changes the attribute to a spherical combiner.
Streaks	Changes attribute to a streak particle system.
Blobbies	Changes attribute to a blobby particle system.
Hair	Changes attribute to a hair particle system.
Plugin	Changes the attribute to the chosen third party plugin texture type.
Properties	Edits the selected object's properties.

Sprite System Properties

Force

Visible: Sometimes. Allows you to specify an X, Y, and Z gravity that will affect the speed, direction, and distance that particles travel. Typically this will be all zeros, because the forces like gravity in the choreography will also take affect, causing the particles to fall. Gravity on a particle system is there to compensate for the gravity in a chor. For instance, fire or smoke would not only want to counteract the chors gravity (a value of 0,1,0), but would actually want the particles to rise from their emitter (maybe a value of 0,2,0).

Preroll

Visible: Sometimes, Default: 0sec. In many cases you will want your particles to have already populated your scene before your animation begins. This is where preroll comes into play. Preroll allows your particles to begin emitting for any amount of time before your shots time starts. For example: you have a city scene and all the models begin their animation at time 0, but you want the whole scene to be filled with snow. You can add a preroll of 20 seconds to allow the particle to populate your scene before your animation begins at time 0.

Cast Shadows

Visible: Sometimes, Default: OFF. Different effects require particles to cast shadows or not. For example, smoke, or a cloud will cast as shadow but an explosion may not.

Life

Default: 100%, Min: 0%, Percentage. A scale factor that gets multiplied by all child Sprite Emitters' Life properties. Use this value to stretch or shrink the overall life of the system.

Rate of Emission

Default: 100%, Min: 0%, Percentage. A scale factor that gets multiplied by all child Sprite Emitters' Rate of Emission properties.

Initial Velocity

Default: 100%, Min: 0%, Percentage. A scale factor that gets multiplied by all child Sprite Emitters' Initial Velocity properties.

Drag

Default: 100%, Min: 0%, Percentage. A scale factor that gets multiplied by all child Sprite Emitters' Drag properties.

Opacity

Default: 100%, Min: 0%, Percentage. A scale factor that gets multiplied by all child Sprite Emitters' Opacity properties.

Size

Default: 100%, Min: 0%, Percentage. A scale factor that gets multiplied by all child Sprite Emitters' Size properties.

Gravitational Affect

Default: 100%, Min: 0%, Percentage. A scale factor that gets multiplied by all child Sprite Emitters' Gravitation Effect properties.

Spin

Default: 100%, Min: 0%, Percentage. A scale factor that gets multiplied by all child Sprite Emitters' Spin properties.

Tint

When set, all sprites in the system add this color (factored by the sub-property Tint Strength) to their color.

Object Collisions

Default: OFF. Causes particles to collide with objects in a scene, otherwise particles will simply pass through any objects they encounter.

Bounce

Default: 10%, Min: 0%, Max: 100%, Percentage. Determines how far particles will bounce when they collide with an object in a scene. At 100%, a particle will bounce back to the height which it was emitted from.

Die On Impact

Default: OFF. This option causes particles to die, or disappear when they encounter another object within a scene.

Particle Collisions

Default: OFF. Causes particles to collide with other particles in a scene, otherwise particles will simply pass through any other particles they encounter.

Sprite Emitters

A Sprite System is a particle system in which the individual particles are images or animations called Sprite Emitters. These can be used to create smoke, fire, explosions. They render much faster than volumetric effects, and work well in real-time.

Sprite Emitter Instance Menu

Delete	Removes the selected object from the project.
Select Cache ()	Highlights the object that this shortcut is to.
Change Type To	
Attribute	Plugin Properties
Combiner	
Checker	Changes the attribute to a checker combiner.
Gradient	Changes the attribute to a gradient combiner.
Spherical	Changes the attribute to a spherical combiner.
Particle System	
Streaks	Changes attribute to a streak particle system.
Blobbies	Changes attribute to a blobby particle system.
Hair	Changes attribute to a hair particle system.
Plugin	Changes the attribute to the chosen third party plugin texture type.
Properties	Edits the selected object's properties.

Sprite Emitter Properties

Force

Visible: Sometimes. Allows you to specify an X, Y, and Z gravity that will affect the speed, direction, and distance that particles travel. Typically this will be all zeros, because the forces like gravity in the choreography will also take affect, causing the particles to fall. Gravity on a particle system is there to compensate for the gravity in a chor. For instance, fire or smoke would not only want to counteract the chors gravity (a value of 0,1,0), but would actually want the particles to rise from their emitter (maybe a value of 0,2,0).

Preroll

Visible: Sometimes, Default: 0sec. In many cases you will want your particles to have already populated your scene before your animation begins. This is where preroll comes into play. Preroll allows your particles to begin emitting for any amount of time before your shots time starts. For example: you have a city scene and all the models begin their animation at time 0, but you want the whole scene to be filled with snow. You can add a preroll of 20 seconds to allow the particle to populate your scene before your animation begins at time 0.

Cast Shadows

Visible: Sometimes, Default: OFF. Different effects require particles to cast shadows or not. For example, smoke, or a cloud will cast as shadow but an explosion may not.

Life

Default: 100%, Min: 0%, Percentage. A scale factor that gets multiplied by all child Sprite Emitters' Life properties. Use this value to stretch or shrink

the overall life of the system.

Rate of Emission

Default: 100%, Min: 0%, Percentage. A scale factor that gets multiplied by all child Sprite Emitters' Rate of Emission properties.

Initial Velocity

Default: 100%, Min: 0%, Percentage. A scale factor that gets multiplied by all child Sprite Emitters' Initial Velocity properties.

Drag

Default: 100%, Min: 0%, Percentage. A scale factor that gets multiplied by all child Sprite Emitters' Drag properties.

Opacity

Default: 100%, Min: 0%, Percentage. A scale factor that gets multiplied by all child Sprite Emitters' Opacity properties.

Size

Default: 100%, Min: 0%, Percentage. A scale factor that gets multiplied by all child Sprite Emitters' Size properties.

Gravitational Affect

Default: 100%, Min: 0%, Percentage. A scale factor that gets multiplied by all child Sprite Emitters' Gravitation Effect properties.

Spin

Default: 100%, Min: 0%, Percentage. A scale factor that gets multiplied by all child Sprite Emitters' Spin properties.

Tint

When set, all sprites in the system add this color (factored by the sub-property Tint Strength) to their color.

Object Collisions

Default: OFF. Causes particles to collide with objects in a scene, otherwise particles will simply pass through any objects they encounter.

Bounce

Default: 10%, Min: 0%, Max: 100%, Percentage. Determines how far particles will bounce when they collide with an object in a scene. At 100%, a particle will bounce back to the height which it was emitted from.

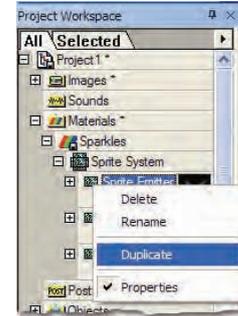
Die On Impact

Default: OFF. This option causes particles to die, or disappear when they encounter another object within a scene.

Particle Collisions

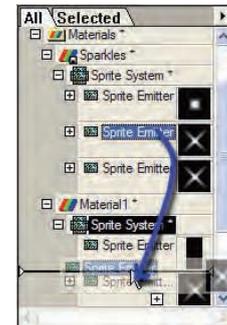
Default: OFF. Causes particles to collide with other particles in a scene, otherwise particles will simply pass through any other particles they encounter.

Duplicate Sprite Emitter



Right click (Control click on a Mac) on the Sprite Emitter and choose [Duplicate] to create an exact copy of the Sprite Emitter. This saves tremendous time when you wish to make a duplicate copy of a sprite emitter and only change a few property values afterwards.

Drag and Drop Sprite Emitters



Simply Drag and Drop Sprite Emitters from one Sprite System to another to make a copy of a Sprite Emitter on a different Material. Hold down the <Ctrl> key to make a copy of the Sprite Emitter and drop it within the same Sprite System.

Blobbies

Blobbies are a type of particle that acts like a liquid. As blobby particles come close to each other, they tend to merge and stick to each other. Many

blobbies stuck together can give the appearance of an undulating liquid mass. You can control the behavior of the merging by changing the "Blobbyness" value in the Blobby properties.

Blobby Instance Menu

Delete Removes the selected object from the project.
Select Cache () Highlights the object that this shortcut is to.
Properties Edits the selected object's properties.

Blobby Properties

Force

Visible: Sometimes. Allows you to specify an X, Y, and Z gravity that will affect the speed, direction, and distance that particles travel. Typically this will be all zeros, because the forces like gravity in the choreography will also take affect, causing the particles to fall. Gravity on a particle system is there to compensate for the gravity in a chor. For instance, fire or smoke would not only want to counteract the chors gravity (a value of 0,1,0), but would actually want the particles to rise from their emitter (maybe a value of 0,2,0).

Preroll

Visible: Sometimes, Default: 0sec. In many cases you will want your particles to have already populated your scene before your animation begins. This is where preroll comes into play. Preroll allows your particles to begin emitting for any amount of time before your shots time starts. For example: you have a city scene and all the models begin their animation at time 0, but you want the whole scene to be filled with snow. You can add a preroll of 20 seconds to allow the particle to populate your scene before your animation begins at time 0.

Cast Shadows

Visible: Sometimes, Default: OFF. Different effects require particles to cast shadows or not. For example, smoke, or a cloud will cast as shadow but an explosion may not.

Life Expectancy

Default: 1sec. The amount of time (formatted in your current time units) a particle will live after it has been generated.

Rate of Emission

Default: 500, Min: 0. The number of particles that are to be generated each second by the particle system.

Initial Velocity

Default: 100. The initial speed of the particles (in units per second) as they are emitted from the models surface.

Viscosity

Default: 10%, Min: 0%, Max: 100%, Percentage. The resistance forces on the particles as they travel. Viscosity can be thought of as the thickness of the space through which the particles are traveling.... for example, air would have a much lower viscosity than motor oil.

Object Collisions

Default: OFF. Causes particles to collide with objects in a scene, otherwise particles will simply pass through any objects they encounter.

Bounce

Default: 10%, Min: 0%, Max: 100%, Percentage. Determines how far particles will bounce when they collide with an object in a scene. At 100%, a particle will bounce back to the height which it was emitted from.

Die On Impact

Default: OFF. This option causes particles to die, or disappear when they encounter another object within a scene.

Particle Collisions

Default: OFF. Causes particles to collide with other particles in a scene, otherwise particles will simply pass through any other particles they encounter.

Size

Controls the size of the individual blobbies that are emitted. This includes size fluctuation and how their size changes over their life. At Birth Default: 3.5cm, Min: 0cm, Unit of Measurement. Allows you to specify how large or small a blobby particle is when it is emitted.

Percent At Death

Default: 100%, Min: 0%, Percentage. Causes a particle to shrink or grow over its life span. Specified as a percent of the Size at Birth.

Tolerance

Default: 50%, Min: 0%, Max: 100%, Percentage. A percent of the original size that is used to vary the sizes of the particles being emitted. Therefore, if Tolerance is set to 50%, and particle size is 100, emitted particles will randomly emit from 50 to 150 units in size. Particles are usually more visually interesting with varying sizes.

Blobbiness

Default: 50%, Min: 0%, Max: 100%, Percentage. Allows you to change the amount of blobbiness each particle has. Higher values will cause the particles to stick to each other in an undulating mass. Lower values will cause fewer particles to stick together.

Hair

A Hair Emitter contains the properties of one part of a Hair Particle System.

Hair Instance Menu

Delete	Removes the selected object from the project.
Rename	Rename the selected object
Select Cache ()	Highlights the object that this shortcut points to.
Duplicate	Makes an exact copy of the Hair Emitter.
Properties	Edits the selected object's properties.

Hair Properties

Image

The image or animation used on hairs emitted from this Hair Emitter.

Repeat

Visible: Sometimes. The number of times this image is to repeat itself.

Seamless

Visible: Sometimes, Default: OFF. When the image repeats, the seamless property flips the image on every repeat. Causing the image to look "seamless". This is most useful on repetitive textures.

Frame

Visible: Sometimes, Default: 0sec. When the image is an animation (or sequence of images), this property sets which frame to use out of the original animation. If this property is marked as "-not set-", the current frame from the interface is used automatically. This will cause the animation to animate as it was originally intended. This property can also be keyframed to have the sequence play out of order. For instance, if the original animation is one second, and at frame 0 you set the Time property to be 1 second, and at 2 seconds you set it to be 0, the sequence will play backwards at half speed.

Cap Ends

Default: OFF. With this option on, hair with a thickness and bow at the tip will be have an end cap added to make it appear to be solid.

Density

Visible: Cache Only, Default: 1, Min: 0, Max: 400. Sets the density of the hair in hairs per square cm.

Length

Default: 100%, Min: 0%, Max: 100%, Percentage. Sets the length of the hairs emitted from this emitter as a percentage of the length set in the parent hair system.

Variation

Default: 0%, Min: 0%, Max: 100%, Percentage. The amount of fluctuation from the above specified Length used to determine the length of each hair.

If Length is set to 5cm and its variation is 20%, individual hairs will be generated with lengths randomly ranging from 4-6cm.

Position Variation

Default: 100%, Min: 0%, Max: 100%, Percentage. Controls how sporadic the hairs placement on the surface of the model is. Without any positional variation, the hair will be emitted a perfect grid, assuming that all guide's densities are set to 100%.

Direction Variation

Default: 10%, Min: 0%, Max: 100%, Percentage. Controls how perfectly the hairs come straight out of the surface of the model. With no direction variation, all hair come perpendicularly out of the surface. The higher the variation, the less likely they are to come straight out

Surface

Contains all of the surface attributes for this object. See Surface Properties.

Brightness

Default: 100%, Min: 0%, Percentage. Darkens or lightens the diffuse color of the hairs along their length.

Variation

Default: 10%, Min: 0%, Max: 100%, Percentage. Varies the surface properties and brightness of individual hairs from the standard values set above.

Thickness

Default: 0.1cm, Min: 0.01cm, Unit of Measurement. Sets the thickness of the hair at its root.

Variation

Default: 10%, Min: 0%, Max: 100%, Percentage. Varies the thickness of individual hairs from the standard value set above.

Kinkiness

Default: 0%, Min: 0%, Percentage. Sets the kinkiness of the hair along its length.

Variation

Default: 10%, Min: 0%, Max: 100%, Percentage. Varies the kinkiness of individual hairs from the standard value set above.

Kink Scale

Default: 100%, Min: 0%, Percentage. Sets the size of the kinks in the hair along the length.

Variation

Default: 10%, Min: 0%, Max: 100%, Percentage. Varies the kink scale of individual hairs from the standard value set above.

Bow

Default: 75%, Min: -100%, Max: 100%, Percentage. Sets the amount of bow in the hair. 0% bow looks like flat strips which can be good for feathers,

100% looks like tubes and is more hair like.

Variation

Default: 0%, Min: 0%, Max: 100%, Percentage. Varies the amount of bow on individual hairs from the standard bow value set above.

Face Camera

Default: 100%, Min: 0%, Max: 100%, Percentage. With this option on, all hairs will face the camera, otherwise they lie in the direction of the surface that they came out of.

Variation

Default: 0%, Min: 0%, Max: 100%, Percentage. Varies the face camera value of individual hairs from the standard value set above.

Brighten Facing Hairs

Default: Brighten. This property changes the shading on the hair so that hairs that face the camera will not shade nearly black. Original: The hair will shade as before.

Brighten: The hair will be brightened.

Hair Guide CP Shortcuts

Guide CP Shortcuts contain the rotation drivers for a guide CP. This motion is specific to an instance of an object with hair.

Hair Guide CP Shortcut Cache Menu

Delete	Removes the selected object from the project.
Rename	Rename the selected object
Select Cache ()	Highlights the object that this shortcut is to.
Properties	Edits the selected object's properties.

Hair Guide CP Shortcut Properties

Object's Properties

Visible: Sometimes. Contains the properties of the object this shortcut is for.

Hair Guide Shortcuts

Hair Guide Shortcuts contain Guide CP Shortcuts which contain rotation and other information about a Guide Hair that is specific to an instance of an object with hair.

Hair Guide Shortcut Cache Menu

Delete	Removes the selected object from the project.
Rename	Rename the selected object
Select Cache ()	Highlights the object that this shortcut is to.
Properties	Edits the selected object's properties.

Hair Guide Shortcut Properties

Object's Properties

Visible: Sometimes. Contains the properties of the object this shortcut is for.

Hair Systems

A Hair Particle System is a particle system in which hair is emitted from the object's surface. This node of the material must have at least one Hair Emitter. Two or more hair emitters can be used for example long and sort hairs.

Hair System Instance Menu

Delete	Removes the selected object from the project.
Select Cache ()	Highlights the object that this shortcut is to.
Insert Hair Emitter...	Adds a Hair Emitter as a child of the Hair system.

Change Type To

Attribute	Plugin Properties
Combiner	
Checker	Changes the attribute to a checker combiner.
Gradient	Changes the attribute to a gradient combiner.
Spherical	Changes the attribute to a spherical combiner.
Particle System	
Streaks	Changes attribute to a streak particle system.
Sprites	Changes attribute to a sprite particle system.
Blobbies	Changes attribute to a blobby particle system.
Plugin	Changes the attribute to the chosen third party plugin texture type.

Properties	Edits the selected object's properties.
-------------------	---

Hair System Properties

Force

Visible: Sometimes. Allows you to specify an X, Y, and Z gravity that will affect the speed, direction, and distance that particles travel. Typically this will be all zeros, because the forces like gravity in the choreography will also take affect, causing the particles to fall. Gravity on a particle system is there to compensate for the gravity in a chor. For instance, fire or smoke would not only want to counteract the chors gravity (a value of 0,1,0), but would actually want the particles to rise from their emitter (maybe a value of 0,2,0).

Preroll

Visible: Sometimes, Default: 0sec. In many cases you will want your particles to have already populated your scene before your animation begins. This is where preroll comes into play. Preroll allows your particles to begin emitting for any amount of time before your shots time starts. For

example: you have a city scene and all the models begin their animation at time 0, but you want the whole scene to be filled with snow. You can add a preroll of 20 seconds to allow the particle to populate your scene before your animation begins at time 0.

Cast Shadows

Visible: Sometimes, Default: ON. This property can be changed to OFF so that the hair does not cast shadows. The hair tends to look more realistic with shadows, so this defaults to ON.

Control Points

Visible: Cache Only, Default: 2, Min: 1, Max: 25. This property determines how many control points are in the chain of each hair. The more CPs, the more the hair can bend into irregular shapes. Two is fine for short fur that just has a simple arc. Longer hair that needs to bend into S shapes and beyond will need at least three.

Dynamic Options

Default: OFF. This folder contains properties pertaining to the dynamic behavior of the hair guides.

Targeting

Default: Constraint. This option controls whether or not the dynamic chain tries to take the shape it was modeled or animated to.

None: No targeting will be performed.

Constraint: Constraints will be used to correct the bone towards the underlying modeled or animated position. The value represents is the amount it will move towards the target in one frame. It can range from 0% to 100%. Where 0% is the same as no targeting, and 100% is completely stiff.

Spring: This method uses the a traditional damped spring using Hook's Spring Law to encourage the chain towards the modeled or animated goal position. Frequency and damping are used to control the behavior of the spring.

Stiffness

Visible: Sometimes, Default: 50%, Min: 0%, Max: 100%, Percentage. Stiffness controls how stiff the dynamic chain acts. Higher stiffness makes the springs pull harder towards the target orientation.

Frequency

Visible: Sometimes, Advanced, Default: 1, Min: 0, Max: 1e+008. Natural Frequency is an alternative way of controlling how stiff the dynamic chain acts. When subjected to forces, this is how many times in one second, that the spring would tend to oscillate. Stiffer springs have higher natural frequency, while softer springs have lower.

Damping

Visible: Sometimes, Advanced, Default: 5, Min: 0, Max: 1e+008. Damping controls the motion of the chain. It damps the springs that force the chain towards its target. The faster the spring tries to pull, the more the damping

resists the motion. A higher number slows the oscillations more. Stiffer springs require higher damping values.

Is Rod

Visible: Sometimes, Default: ON. This option makes the targeting act like a fishing rod, the base of the rod influences the end of the rod. The end of the rod only tries to take on its intended shape and ignores the base. It tends to make whip like bends, and behaves the best if the bottom bones are either longer or stiffer than the ones at the ends.

Object Collisions

Visible: Sometimes, Default: OFF. Use this option to have the dynamic chain collide with other geometry.

Collision Radius

Visible: Sometimes, Default: 1cm, Min: 0cm, Unit of Measurement. Radius specifies the radius of the sphere at the end of the bones, which will be used to collide off of the geometry.

Bounce

Visible: Sometimes, Default: 50%, Min: 0%, Max: 1e+010%, Percentage. Bounce is often referred to in Physics as the "coefficient of restitution". It represents the percentage of energy that should be conserved after a collision. 100% represents a "perfect" ball. It would not lose energy and would bounce forever if there were no drag. 0% indicates that no bounce should occur at all, and that all energy should be lost in the direction of the impact. Neither 100%, nor 0% are realistic.

Friction

Visible: Sometimes, Default: 50%, Min: 0%, Max: 1e+010%, Percentage. Friction is how much drag should be placed on the object as it passes sideways along a surface. 100% will stop all motion in the sideways direction, 0% will allow free sliding like ice.

Mass

Visible: Sometimes, Default: 1, Min: 0. This property specifies the mass of each of the nodes at the end of the bones.

Drag

Visible: Sometimes, Default: 1%, Min: 0%, Max: 100%, Percentage. Drag is like adding a bit of syrup to the air. It represents the amount of reduction in velocity that will happen in one second. It can be thought of as global damping

Use Gravity

Visible: Sometimes, Default: ON. This determines whether the chain uses the gravity specified in the chor.

Use Forces

Visible: Sometimes, Default: ON. This determines whether the chain uses the force objects in the chor.

Force

Visible: Sometimes. This property provides a force or gravity to be used by this dynamic chain only. It allows you to specify an X, Y, and Z gravity that will affect the speed, direction, and distance that bones travel. Typically this will be all zeros, because the forces like gravity in the choreography will also take affect, causing the bones to fall.

Angle Limit

Visible: Sometimes, Default: 180°, Min: 0°, Max: 180°, Angle. This limits the maximum angle at which each bone of the chain can bend.

Simulate on the Fly

Visible: Sometimes, Default: ON. If ON, this constraint will compute its dynamics on the fly. The results are not accurate when going backwards or stepping forward by more than one frame. Use Simulate Spring Systems menu option from the Choreography or Action menu to store accurate results. The simulation will automatically turn this option OFF. The constraint must have simulated results in order to render accurately.

Density

Visible: Cache Only, Default: 100%, Min: 0%, Percentage. Sets the density factor of the hair.

Length

Default: 10cm, Min: 0cm, Unit of Measurement. Sets the length of the hair emitted from all child emitters. Child emitters can individually scale this value down to allow for different length hairs.

Thickness

Default: 100%, Min: 0%, Percentage. Sets the thickness factor of the hair at its root.

Kinkiness

Visible: Sometimes, Default: 100%, Min: 0%, Percentage. Sets the kinkiness factor of the hair.

Kink Scale

Visible: Sometimes, Default: 100%, Min: 0%, Percentage. Sets the size factor for the kinks in the hair.

Real-time

Visible: Cache Only. A set of properties aimed at letting the user choose between tactile real-time interaction with hair in the interface, or high quality real-time rendering. None of these settings will affect the final output.

Quality

Visible: Cache Only, Default: Shaded. Determines the quality of the real-time rendering of hair.

Don't Draw: The hair will not be rendered at all.

Wireframe: The hair will be rendered with lines using the diffuse color of the hair material. This is the fastest rendering mode.

Shaded: The hair will be rendered taking width, lighting and specular

highlights into consideration. This is slower than displaying the hair as wireframes, but comes much closer to representing what the final rendering will look like.

Density Factor

Visible: Cache Only, Default: 100%, Min: 0%, Max: 100%, Percentage For sake of speed, when rendering the hairs in the real-time interface, the density of the hair will be reduced by this factor.

Spline Subdivisions

Visible: Cache Only, Default: 50%, Min: 0%, Max: 100%, Percentage When rendering in the interface, the splines used to draw the hair are split into individual line segments. This value determines how many line segments to use when doing so. The smaller the number, the less line segments used, causing the hair system to render faster.

Hair Systems

Animation Master now has a very exciting and powerful hair system. This system can be used for fur, long human hair, grass, plants, trees, feathers, and scales to name a few. It is extremely versatile and has about every feature needed to create unsurpassed hair.

New Material

To add hair to a model you must first create a Hair Material. Select [File][New][Material] to do this. A new Material Window will appear. This window can be closed because we will want to work with our hair on the actual model.

Change Type

The Material must be changed from a simple Attribute Material to a Hair Material. Right click (control click on a Mac) on the Attribute object under the Material in the Project Workspace Tree and select [Change Type To] [Particle System] [Hair].

Apply Material to a Model.

The Material can now be applied to a Model so we can see the changes we make take effect in real-time. Simply drag and drop the Material onto a Model or a Group on a Model. If the Modeling Window is not currently open for the Model you just applied the Material to, simply double click the Model in the Project Workspace Tree to open it.

Default Hair Material

The hair doesn't look very realistic at this point, but we are just beginning to touch on the features that allow hair to come alive.

Draw Particles / Hair

Note: If the hair isn't visible on your Model first try pressing the <space bar> to refresh the screen. If that doesn't show the hair make sure that "Draw Particles / Hair" is turned on in the [Tools][Options] menu on the Render tab. This property only shows up if show advanced options is checked and the Quality is set to any of the real-time options (Default, Wireframe, Shaded). The Shortcut key for toggling "Draw Particles /Hair" ON and OFF is [Shift]+[8].

Hair System

Now that we have hair on our model it is time to customize it to fit our needs. A Hair System can contain more than one Hair Emitter. Just choose [Add Hair Emitter] from the Hair System's context menu, or choose [Duplicate] from a Hair Emitter's menu. The Hair System governs all child Hair Emitters. So changing values like Length, Density, etc. affect all child emitters. Whereas setting values on an individual Hair Emitter only affects that one. When the Hair System object is selected in the Project Workspace Tree, it's properties will appear in the Properties panel.

Hair System Properties

Preroll

Hair systems are affected by gravity and other forces when dynamics are turned on. Many times you want the hair to be in its resting state when you render the very first frame of an animation or when you are in a Modeling Window where there is no concept of time. Preroll allows you to type in an amount of time that you want the hair to be acted upon by forces before the first frame is drawn. For instance in our image below notice that the hair appears very stiff on the first frame when no preroll is applied. This is because for stiffness to take place it must be acted on by gravity. Using Preroll is necessary if you wish to see the effect of stiffness on your hair in a Modeling Window. Preroll is set to zero by default because it slows down the rate at which the hair can be drawn dramatically in many cases, especially when the hair is being groomed (the dynamics for all of the frames set in the Preroll have to be calculated to show you the results on the first frame). Usually most of your properties can be set with Preroll off, and then preroll can be turned on to adjust the stiffness of your hair or when you render a scene so your first few frames look correct, because your hair has been calculated and has reached its resting state. No Preroll / Preroll 00:01:00

Cast Shadows

Turn this option on when it is necessary for the hair to cast shadows. When this option is turned on it will slow down the render time only when you do a final quality render with shadows on in the render settings too.

Control Points

This value specifies how many control points are on each hair guide. This is where the power specifies starts with Hair Systems. Hair guides allow you to brush or style the hair that comes out of the patches. Hair Guides will be thoroughly explained later in this document. To see the Hair Guides you must be in Grooming Mode.

Hair Guides

Grooming Mode

There is a button on your "Mode" toolbar called Grooming Mode. When in Grooming Mode, you can see a guide hair coming from each control point that has hair on it. These hair guides define where the hairs are trying to get back to. When dynamics is turned on in the system, the hairs won't generally make it to these guides due to gravity and other forces. We will talk more about Grooming Mode in the Grooming section later.

Dynamics: Turn on dynamics if you want your hair to be affected by gravity and other forces. Many times when this option is turned on you will want to set a Preroll so the dynamic calculations can occur before the first frame of your animation.

Stiffness

Controls how stiff or ridged each hair strand is. The stiffer the value the less affect dynamics and forces such as gravity has on the hair. This value is a percentage to adjust all the child Hair Emitter's Stiffness values.

Density

Density depicts how many hair follicles come out of the patches with this Hair System on it. The larger the value the more hair follicles there will be. This value is a percentage to adjust all the child Hair Emitter's Density values.

Length

This value is the actual length of the Hair Guides, which in turn is the maximum length of the hair. This is reversed from all the other properties. Usually the Hair System properties are a percentage value that adjust all the child Hair Emitter properties. But in the case of Length it is the opposite. This is because there is only one set of hair guides, not a set for each Hair Emitter and hair can not be any longer than the Hair Guides. So this Length property allows you to set the maximum length of the hair, and you can make each of the Hair Emitters have shorter hair than this by specifying a percentage of this length.

Thickness

The Thickness property controls how thick each hair follicle is. This value is a percentage to adjust all the child Hair Emitter's Thickness values.

Kinkiness

Controls how kinky the hair is. This value is a percentage to adjust all the child Hair Emitter's Kinkiness values. Since the Hair Emitter's Kinkiness value defaults to 0 you will not see an effect by setting this value until you add a kinkiness value to the child Hair Emitters.

Kinkiness Scale

This value is a percentage to adjust all the child Hair Emitter's Kinkiness Scale values. Kinkiness scale controls how large or small the kinks are.

Real-time

Hair Systems can be computationally expensive, causing the response time to be become sluggish. These real-time properties are aimed at letting the user choose between tactile real-time interaction with hair in the interface, or high quality real-time rendering.

Quality

Determines the quality of the real-time rendering of hair.

Don't Draw

The hair will not draw in the interface but it will still Render. The hair guides are still visible for grooming.

Wireframe

The hair will be rendered with lines using the diffuse color of the hair material. This is the fastest rendering mode.

Shaded

The hair will be rendered taking lighting and specular highlights into consideration. This is slower than displaying the hair as flat shaded lines.

Density Factor

For sake of speed, when rendering the hairs in the real-time interface, the density of the hair will be reduced by this factor.

Spline Subdivision

When rendering in the interface, the splines used to draw the hair are split into individual line segments. This value determines how many line segments to use when doing so. The smaller the number, the less line segments used, causing the hair system to render faster.

Image

Select an image map to be wrapped onto each hair follicle. This is great for creating feathers on a bird, scales on a fish, or leaves on a tree. The image will be rendered with the exact same properties as the hair follicle would have used. For instance Thickness, Kinkiness, Bow, and all other hair properties will control how the image looks.

Cap ends

With this option on, hair with a thickness and bow will have an end cap added to the tip to make it appear to be solid. This property defaults to "OFF" because in most cases caps on the end of hair follicles are not even noticeable so there is no need for the added expense.

Density

Controls the quantity of hair emitted from the Hair Emitter.

Length

Controls the length of the hairs emitted from this emitter as a percentage of the length set in the parent Hair System.

Length Variation

The amount of fluctuation from the above specified Length percent used to determine the length of each hair. If Length of the Hair System is set to 10cm, and the Length of this Emitter is set to 50% (causing hairs to be 5cm), but its variation is 20%, individual hairs will be generated with lengths randomly ranging from 4-6cm, or 40-60% of the Hair System's length.

Position Variation

Controls how sporadic the hairs' placement on the surface of the model is. Without any positional variation, the hair will be emitted on a perfect grid, assuming that all guide's individual densities are set to 100%.

Direction Variation

Controls how perfectly the hairs come straight out of the surface of the model. With no direction variation, all hair come out perpendicular to the surface. The higher the variation, the less likely they are to come straight out.

Surface Properties

All of the surface properties (Diffuse Color, Specular Color, Specular Intensity, Transparency, etc...) can be set for the Hair Emitter. All of these properties can be set for any value along the length of the hair. Using the timeline you can set these properties from 0% - 100% along the hair.

Diffuse Color Timeline

In the grass example pictured above, the hair changes color from a dark green at the root to a transparent yellow at the tip.

Brightness

Darkens or lightens the diffuse color of the hairs along their length. This is most useful when the hair color is driving by the decal on the patch it is emitting from. This allows a variation of color still along the hairs length.

Surface Variation

Varies all of the surface properties and brightness of individual hairs from the standard values set above.

Thickness

Sets the thickness of the hair. The thickness can vary along its length allowing for some powerful shapes to be made.

Thickness Variation

Varies the thickness of individual hairs from the standard value set above.



Mr. Dodo Image Courtesy of William Sutton

The feathers for Mr. Dodo were created by changing the thickness of the hair along its length shown in the timeline image above.

Flowers are created by changing both the diffuse color and the thickness of the hair over the length of the follicle.

Bow

Sets the amount of bow in the hair. 0% bow looks like flat strips which can be good for feathers, 100% looks like tubes and is more hair like.

Bow Variation

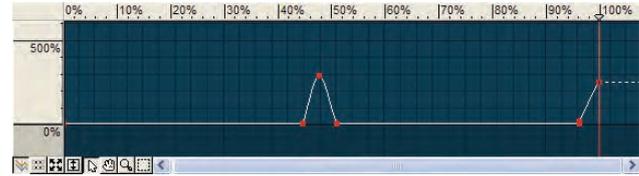
Varies the amount of bow on individual hairs from the standard bow value set above.

Kinkiness

Sets the kinkiness of the hair along its length. Use the timeline to control the location at which you want to set the hairs Kinkiness value.



Kinkiness along length of hair



Kinkiness Graph

The timeline image above shows how kinkiness was increased halfway along the hair and then also at the tip. The results are shown in the hair image above.

Kinkiness Variation

Varies the kinkiness of individual hairs from the standard value set above.

Kinkiness Scale

Sets the size of the kinks in the hair along the length. Use the timeline to control the location at which you want to set the hairs Kinkiness Scale value.

Kinkiness Scale Variation

Varies the kink scale of individual hairs from the standard value set above.

Face Camera

The hairs are always rendered as strips. With this option on (100%), all hair strips will face the camera. This gives the illusion that the hairs are rendered as tubes (good for hair). If it is turned off (0%), they lie in the direction of the surface that they came out of (good for feathers or grass blades).

Face Camera Variation

Varies the face camera value of individual hairs from the standard value set above.



Grooming Toolbar

Edit

When in this mode, you can grab any guide hair control point and drag it around as if it were an inverse kinematic chain.

Brush

This mode allows you to manipulate many guides at once. Just click and drag your mouse across the tips of the guide hairs to brush them in the direction of your mouse stroke.

Lengthen

This mode changes the relative length of individual guide hairs. All guide hairs start out at 100% of their Hair System's length. You can lengthen or shorten individual guides by clicking a point on the hair guide, and squishing/stretching in the direction of the hair guide.

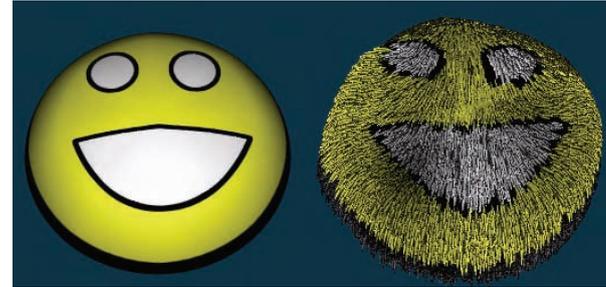
Density

Similar to Lengthen, this mode changes the relative hair density at individual guide hairs, potentially causing a bald or dense spot. To increase or decrease the density, just click a guide cp, and push or pull in the direction of the guide hair. You will see the hair go from black to white as the density increases. Each guide hair can not have a greater density than what is specified in the Hair System, so the range for this value is 0-100% of the system's density value. Because of this, the default value is 50%, allowing you to go up or down from the default (50% looks like a middle gray when scrubbing the density). All of these grooming tools can be used in an Action or Relationship to change the hair over time.

Note: When in the modeler, you are seeing frame 0, so no gravity has taken affect. Because of this, the hairs will be at their goal as described by the hair guides. It is sometimes a good idea to have a Preroll of about 20-30 frames on the Hair System to allow gravity to have taken place by frame 0. This will slow down the process of grooming though, because each time you manipulate a guide hair, those 20 frames have to be recomputed to show what the hair will now look like at frame 0.

Surface Driven Properties

Many times it is desired to use the surface's decals to control Hair Diffuse Color, Hair Length, or Hair Direction.



Decal Controlling Hair's Diffuse Color



Decal Image

To change a decal from coloring the surfaces of a model to controlling properties in a Hair System simply click the Image under the decal to show its properties in the Properties panel.

Decal Image Properties

Change the type of the Decal Image to "Other..." and a new Property will appear called "Properties Driven."

Adding a Property to Drive

Right click (Control click on a Mac) the "Properties Driven" property and choose [Add Property].



Driving Hair Diffuse Color

From the new Properties Driven Property, there is a list of surface controllable properties available on this model. Because this model has a hair system on it, it has the properties listed from that hair system. Select "Diffuse Color" to have this decals image control the diffuse color of the hair system.



Surface Driver

After the Diffuse Color was selected from the Properties Driven property the Surface.DiffuseColor Driver will appear under the Hair Emitter showing that the Diffuse Color is being controlled by the surface decal.

Hair Tips

A hair's color is determined in the following order:
Underlying surface color from the model (this includes materials but not decals).

If a decal drives the hair's Diffuse Color, it is used, and it overrides the color from above.

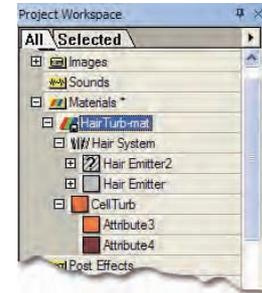
If the Diffuse Color is "Set" on the Hair Emitter, none of the above matters because it takes precedence. This color's timeline channel is interpolated along the hairs length.

Finally, no matter how the color is determined above, the color is multiplied

by the Hair Emitters Brightness property that is also interpolated along the hair's length.

Did you know you can create a single Material that not only has multiple hair emitters, but also has hair that varies in attributes across the surface of the model. This material is self contained and can be dropped on any model or group of control points as is, with no maps involved.

Hair Material with Multiple Attributes



Multiple Attribute Hair Material

Notice that everything needed to make this system have a two-toned look and have sparse gray hairs coming out of it is contained in the material.

To break it down:

HairTurb.Mat has two children: Hair System, and CellTurb. The hair system was made by creating a new Material, and right clicking the Attribute (Control click on the Mac) and choosing [Change Type To] [Particle System] [Hair]. The CellTurb combiner was created by choosing [New Attribute] from

HairTurb.Mat's context menu, and then changing its type to [Combiner] [Turbulence] [CellTurb]. Then change the colors on each of the Attributes under the CellTurb combiner. Scaled up the turbulence a little (it's kind of fun to play with this while watching the hair in the model window). The Hair System has a second Hair Emitter added to it by choosing [Insert Hair Emitter] from the Hair System's context menu. This one has a much lower density. Notice that the first one does not have a color set. This means that the hair emitted from this emitter will take its color from the underlying surface's color (which comes from the CellTurb combiner). The second one has overridden the color to a grayish color.

Locks of Hair



Locks of Hair feature allows strands of hair to be guided along a spline in a model. The hair will follow the spline and will be the same length as the spline. This feature is useful for pony tails and braids.



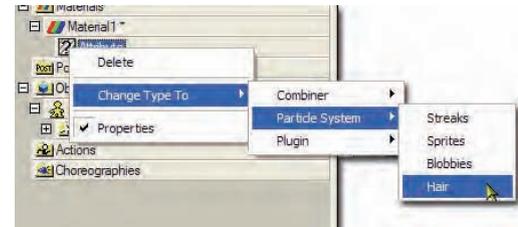
Spline for the Lock of Hair

To create locks of hair first add a spline in the modeler for the hair to follow.



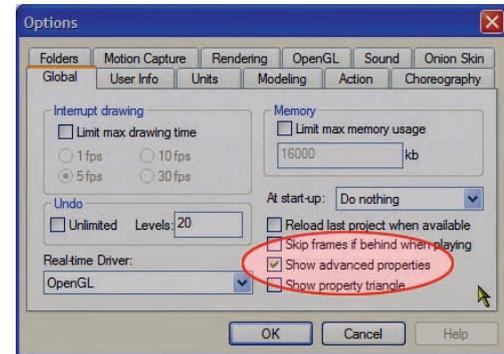
New Material

Create a new Material by right clicking (Ctrl Clicking on the Mac) and pick [New][Material].



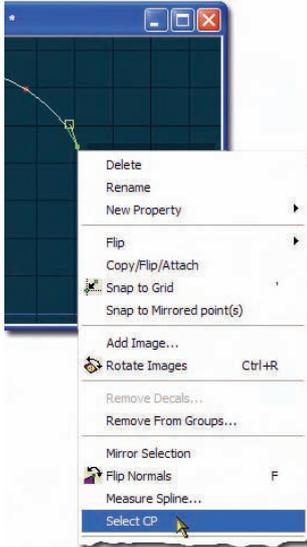
Change Material to Hair

Right click (Ctrl Click on the Mac) the Attribute icon under the material and pick [Change Type To] [Particle System] [Hair].



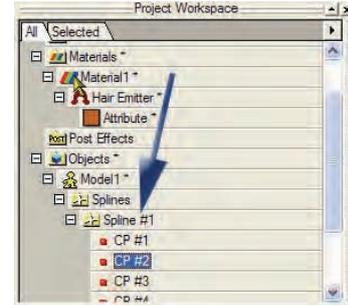
Show Advanced Properties

From the [Tools][Options] dialog on the Global Tab make sure that Show Advanced Properties is turned on. This is needed for the next step.



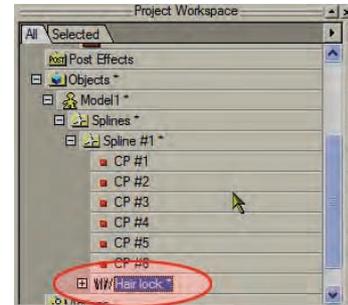
Select CP on Spline

Right click (Ctrl Click on the Mac) any Control Point (CP) on the spline and pick [Select CP]. This will highlight the CP in the project workspace tree. If Show Advance Properties was not turned on this menu item would not be visible because CPs and splines will not show up in the Project Workspace. The only purpose of this step is to show you the Spline in the Project Workspace that you want to add the Lock of Hair to.



Drag Material onto Spline

Drag the hair material you created onto the Spline above the CP that you just selected.



Hair Lock Object

After you drag the material onto the spline a Hair Lock object will appear under the spline in the Project Workspace.



Locks of Hair

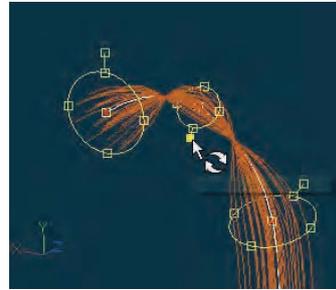


Lock of Hair Manipulators

When the Hair Lock object is selected the model window will show manipulators where every CP was along the spline.

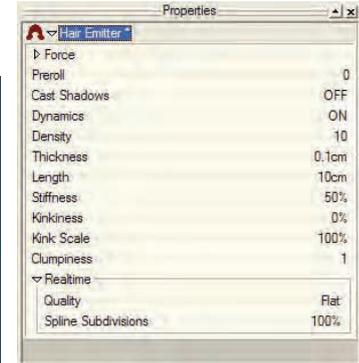
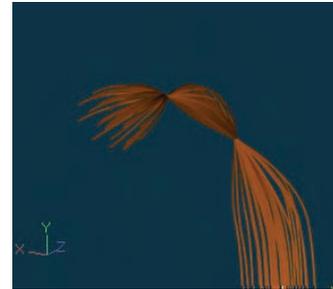


Scale Manipulator



Rotate Manipulators

Use any of the four knobs on the disc manipulator to scale the hair at that location on the hair lock. Use the Roll Handle to twist the hair at that location on the hair lock.



Use Density to create more hair in the hair lock and Kinkiness to add waves in each strand. Under the Real-time property you can choose Shaded for quality to get a more accurate representation on the shading of the hair in the interface. Note Shaded quality will be give slower draw times in the model window.

Texture Plugins

Texture plugins are in house or third party textures that are supplemental to Animation:Master. These plugins are supplied in the form of an .ATX file, and are placed in your Textures folder. Once a compliant texture has been placed in one of your texture folders it will be available for use the next time the software is started.

Applying a Texture Plugin

Plugin textures are accessed by right-clicking (Control-clicking on a Mac) a material attribute and picking [Change Type To][Plugin]. Animation:Master includes many plug-in textures, including "Dented", "Planet", "Scales", and "Environment Map" and "Projection Map". Most texture names are self-explanatory, such as "Basketball" and "Crumple".

Adjusting Texture Plugins

Each plugin texture can have its own options which can be adjusted on their Properties panel when the texture is selected in the Project Workspace.

Hash Inc. Plug-ins

Basketball – This plug-in creates a basketball line and color pattern on a sphere. The ball color will be orange and the lines will be black.

Wave – This creates a spherical wave pattern starting at the origin coordinate of the model. Since this a surface shader, the waves will not displace the model's surface. Amplitude controls the magnitude of the wave, how light and how dark it gets. Wave Length control width of the oscillations in the wave pattern. Damping controls the falloff of the wave amplitude. Propagate offsets the wave. Cycle controls the speed of the animated motion of the wave pattern by setting the number of frames it takes for one wave.

Alibi Plug-ins

Crumple - creates the appearance of wadded up paper or faceted rock face.

Dented - creates an eroded and pitted look.

Planet - creates an Earth type planetary surface with blue water, green and brown land masses and white polar caps. This is best used on a spherical model.

Scales - creates a fractured surface like cracked ice.

ToonNation Plug-ins

Brick - creates a simple brick pattern. The default is red bricks with white mortar. This can also be used for planks. Using this texture as a bump map really enhances this effect.

Cellular - creates an organic cell pattern. Use as bumps for scales/riverbeds, etc. High frequency cells make a nice component for a skin texture

Dusty - adds a layer of dust or frost to an object. The dust color can be set. A falloff value of “.5” appears like snow/frosting. Use noise to break up the edge of the dust.

Eyeball - creates a human eye pattern on a sphere. The colors, iris, and pupil size can be set. For a constant specular highlight, create a light and position around the camera's position. Set the light to specular only (un-check diffuse and shadows). The pupil size can be animated by dragging the radius parameter into the choreography/action, The eye is centered on the origin, along the Z-axis. Move it to where your geometry is by using the offsets.

Macro Photo - fades between two colors depending on the viewing angle. This shader works well in flat shaded mode. Red blood cell: create a sphere; scale oblong; use red as the background, white for the edge. Use Bump maps to enhance the macro photography look.

Metallic - creates a brushed metal look.

RimLit - uses diffuse falloff to create a rim light.

Spots - creates round spots on the model surface. Use low frequency noise for nice variation, animal spots

Villa - allows you to control the reflectivity and transparency of a material using the object's surface. For example, you can make an object more or less transparent at its edges. This works well as the last attribute in a material.

Weave - creates a weave pattern with two colors. This texture is useful for cloth simulation.

X-ray - creates an X-ray effect by making objects opaque on the edges, and transparent in the middle. Add an attribute with glow for a nice effect.

Sketch Type Texture Plug-ins

These textures work on a common principle: a virtual light is specified (which defaults to over the viewers right shoulder); as the surface is rendered, if the light hitting it is below a certain threshold then it is defined as on an edge. The softness of this threshold can be controlled. (These textures all work best in flat shaded mode).

Sketch - provides a pencil or ink sketch of the object. Noise can be added to give a rougher look. Scaling the noise in X or Y gives direction to the roughness. Set the camera background color to white in the choreography. Chatter adds random variation per frame to the noise. Center the light (x=0,y=0,z=-10) for even outlines. Intensity=30, Softness=5 gives a nice inked outline.

InkPen - uses hatching to give a stylized graphic ink pen look. The hatching appears in the soft area - larger soft values will increase the area over which the hatching appears. Higher light values will reduce the thickness of the solid ink. The X and Y noise scale parameters control the thickness (and direction) of the hatching

InkStroke - uses a texture map in the inked area of the render. Use a rough paper texture (like those in 'texturizer' in Adobe's Photoshop). Use a scribbled image for strokes.

Watercolor - produces a painterly sketch effect. The noise control brings through the paper color by adding white noise. High frequency noise gives a rough paper effect. Low frequency noise gives a washed effect to the colors. Use different colors for the dark and medium bands. Render with “Toon Lines” for a nice effect. Variation with low frequency creates a looser sketch.

Gooch - is used for a technical drawing. The shader works by adding blue to dark colors, and yellow to light colors. The reasoning being that you can still make out dark areas, as they are not all black. Also metal shading adds banding in the Y direction. This shader works really well with Toon Lines.

Joyce - is a pencil and paper shader ala William Joyce.

Landscape Type Texture Plugins

Lake - is a simple noisy texture for water. Small ripples create an effect of wind blown waves on a lake.

Landscaper - uses the slope of a surface to blend between two different textures. The color of the flat or sloped surface is determined by a noise function which blends between three user specified colors. A number of noise functions can be selected.

Multisky - creates the color and clouds in the sky. It should be used on a plane, a sphere, or a dome. Try stretching the clouds in either x or z directions for cirrus clouds. Move the clouds in x, y and z to get realistic motion, (moving in just y will cause the cloud formation to vary). The "Detail" field controls the contrast between the light and dark areas. (This can have a great effect on the cloud). The scaling of the clouds is very important. The "Sun Color" controls the color of the clouds: animate for sunsets.

Ocean - is a simple, wavy texture for water. The waves are bump mapped only. The color, reflection, and opacity vary with the viewing angle.

Projection Maps

Projection maps, like Environment maps, are a plug-in texture and they also stick to the surface to which they are applied, but DO NOT use the objects surface normals to determine the color to use for reflections. Projection maps can animate, and bend when the model animates. To add a Projection map, create a new material, expand its tree by clicking the plus (+) sign to the left of the Material icon, then click the Attribute icon under the material in the Project Workspace. Then, choose "Projection Map" from the plug-in textures menu.

Projection Map Properties

Image

Select an image from the Image list. You may need to import the image in the Image folder before selecting it.

Method

Projection maps can be applied as Spherical, Cylindrical, or Planar, which makes it easy to put images on models with these specific shapes. This is the method most closely resembles the shape of the model.

Type

Allows you to specify the image map type to be used. The same image map types are available for decals and projection maps except Displacement and Fractal.

Size

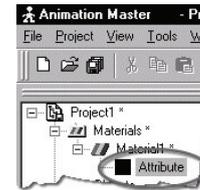
(the physical width and height of the model) is only allowed for Planar maps,

but Cylindrical maps can have Y Size (the vertical height of the cylinder that surrounds the model).

Environment Map

Environment maps are a plug-in texture. Environment maps give the illusion that a model has reflections like glass or chrome WITHOUT invoking the raytracer. That means they are much faster with the same effect (though not technically accurate).

To add an Environment map, pick [File][New][Material], expand its tree by clicking the plus (+) sign to the left of the Material icon, then click the Attribute icon under the material in the Project Workspace tree. Then, right-click (Control-click on the Mac) and pick [Change Type To][Plugin][Hash, Inc.][Environment map].



Keep in mind that Environment maps stick to the surface to which they are applied, and use the objects surface normals to determine what color to use for reflections. Therefore, if they were to be used for a planet and the planet was rotating, the map would appear to move (making it look as though the planet was rotating). In the event that you are using an environment map to simulate a reflected environment on an object, the Global Axis option needs to be set to ON.

The image used for Environment map can be a movie (AVI or Quicktime), and the opacity can use a channel to change over time.

Post Effects

Contains image processing effects. Each child starts processing with the parent of this containers image. Post Effects are used to modify the output of a camera, or image objects. For example a Tint Post Effect can be used to make your renderings black and white, or sepia toned etc. If used on a camera they are applied when a choreography is rendered from the camera's point of view.

To use a Post Effect, just drag the ones you want onto the camera or image you want to adjust. A Post Effect Container will appear with the Post Effects listed in the order that they will be applied. If you wish to use a sequence of Post Effects on more than object you can create a new Post Effect by right clicking on the Post Effect Container in the Project Workspace tree, and choosing "New Post Effect". You can then add a series of Post Effects that will happen with this Post Effect, by right clicking on the Post Effect and choosing "New, Sub Post Effect" and picking one from the list. Post Effects can be saved, with a preview image under its File Info property, and added to the Library panel for easy reuse.

Post Container Menu

- Delete** Removes the selected object from the project.
- Import Post Effect** Imports a Post Effect that modifies the cameras output.
- New Folder** Creates a new folder that can be used to organize objects. Once created objects can be dragged into the folder.
- Properties** Edits the selected object's properties.

Post Effect Instance Menu

- Delete** Removes the selected object from the project.
- Select Cache ()** Highlights the object that this shortcut is to.
- Insert Post Effect** Installed Post Effects will be listed here.
- Properties** Edits the selected object's properties.

Post Effect Properties

- File Info** *Visible: Sometimes* See File Info property.
- Active** *Visible: Sometimes, Default:ON* This option is for objects that need to appear and/or disappear during the course of an animation. Inactive objects are not seen in real-time or final renderings. You can use this to speed up scenes when this object is off screen, or temporarily not needed.

Post Effect Plugins

Film Grain

Film negatives consist of a clear Mylar strip covered with light-sensitive particles that change chemically when they are struck by a ray of light. When the negatives are processed, the chemically changed particles interact with color dyes to reproduce an image. Everything about this process is delicate: the particles have to be small, react quickly but not too fast, must be able to indicate the full range of color, and must be able to

represent both night and day and everything in between.

Normally light is so abundant that, statistically speaking, distribution is uniform, but the conditions inside of a camera are so exact that the number of light rays that strike each particle exhibit their true randomness. Places on the negative where a lot of light strikes are the brightest and every particle has a chemical reaction, but in darker regions fewer light rays leave many particles with partial reactions of varying degrees, causing a visibly "grain".

Different negative stocks that use particles with different sensitivities show different grain patterns, and stocks that use particles that are fast reacting for speed get even less light rays, exacerbating the problem. Film grain is therefore a combination of film speed and chemical sensitivity. Slow films, such as ASA100, have a lot of time to get light so there is better distribution, so there is less grain. Fast films, such as ASA400, have a lot of grain due to less light. Different negative stocks, such as that used in old 8mm film, have poor resolution so the grains are large, but most modern negative stocks have very fine random grain patterns. Low light levels at night or in darkness exhibit more grain for the same reasons.

Film Grain Presets

- OFF** No film grain applied.
- 100ASA** Average 100ASA film grain.
- 200ASA** Average 200ASA film grain.
- 400ASA** Average 400ASA film grain.
- Custom** Allows custom grain sizes and amounts.
- Size** The size of the grain as a percentage of the width of the negative.
- Grain Amount** Sets the intensity of the grain, making more or less apparent.

Bloom

The time it takes for the chemical reaction to occur as a film negative is exposed to light is called the "response". Of course, the exposure time is less than the frame rate of 24 frames per second, and is the length of time the shutter is open - approximately one-hundredth of a second. Longer exposure times can easily cause chemical reactions to saturate, called "over-exposure". The areas on the film negative getting the most light get over-exposed first, which bloom into the darker regions. This reaction is so sensitive to the amount of light that even short exposure times can exhibit blooming in very bright areas such as specular highlights. Blooming is most common when filming at night because a large amount of light is allowed to enter the camera. Daylight filming causes blooming where the amount of light varies greatly.

Though Blooming is a camera artifact that most camera operators try to avoid, it is a visual clue that all viewers are familiar with, therefore it tends to

make the image more realistic.

Bloom Presets

OFF No Bloom affect will be applied.

Day A daylight style bloom.

Night A nighttime style bloom.

Custom Allows custom control over the bloom.

Length Controls how apparent the over-exposure is. These values range from "1" to "100".

Threshold Sets the light level at which blooming begins. These values range from "1" to "95".

Radius Controls how much the over-exposed regions on the negative seep outwards. These values range from "0" to "16".

Tint

Early motion picture film stocks used to fade, assuming a bronze/orange color (called "sepia") or low contrast grayscale appearance. Also, early two-color film processes would fade towards one of the colors (depending on the chemicals used) so that the negative took on a decidedly blue or red tint. These looks have become synonymous with age, and are now used by filmmakers as an effect. Select from the following pre-defined tint settings, or select Custom to set your own.

Tint Presets

OFF No Tint will be applied.

BW This option makes the frames have a 1950's black and white film look.

Cobalt This uses blue and black and creates a night-time look. Think of it as a "day for night" filter.

Sepia This option makes the frames look like they were shot on film in the early 1900's.

X-Ray This option makes the frames look like a film negative.

Custom Allows custom tint settings.

Tint Percentage This is the percentage of the tint color that will be used. A lower value uses more of original frame's color, and a higher value uses the selected tint colors.

Tint Light Color Brighter pixels will be tinted with this color.

Tint Dark Color Darker pixels will be tinted with this color.

Blur

Camera lens can be made nearly perfect, but the light rays are still distorted by the glass. As a result, filmed images are slightly blurry (called "soft"). Larger lenses (35mm) produce sharper images because the ratio of imperfection to size is less. Surprisingly, computer generated images need

to be blurred to degrade them to film quality! Radius values range from "0" to "15".

Style

OFF No soften affect will be applied.

8MM Mimics the softness of a 8MM lens.

16MM Mimics the softness of a 16MM lens.

35MM Mimics the softness of a 35MM lens.

Custom Allows a custom softness setting.

Radius Size of the softness filter.

Gamma

Select this option to change the image's dynamic range as a post process, (the gamma value embedded in the file will be set to the gamma value set in the Output Settings, not this value, but the pixels will be adjusted in the image using this value. Use this option to change the look of a render image as an effect.

Style

OFF No Gamma Correction will be applied.

Monitor Gamma correct for a computer monitor.

NTSC Gamma correct for an NTSC video signal.

Custom Allows you to set your own gamma value.

Amount The gamma to adjust the image to.

Dither

Animation:Master calculates all color values in the full visible range. Unfortunately, the most common image file formats truncate the color to 24 bits (even the best file formats only save 30 bits). This is a significant reduction in the number of colors distinguishable by the human eye, and results in an undesirable artifact called "Mach banding". Mach banding is the visible change of a color gradient, usually the falloff of light on a flat, uniform surface. Because Animation:Master knows the true color before it gets truncated, the program can accumulate the color error and disperse it to the surrounding pixels, called "dithering". Dithering substantially masks Mach banding but destroys the image's uniformity when viewed closely. However, the trade-off is almost always appropriate for animation.

Video Safe

This option limits the color palette for any given image to only those colors that will appear in the NTSC color palette. This will prevent colors from appearing smeared if you record the animation to videotape.

De-Antialias

The true resolution of your computer monitor is not high enough to eliminate the rendering artifacts known as aliasing (sometimes called "jaggies"). Increasing the apparent resolution is called "antialiasing". Antialiasing is accomplished by dividing every true pixel into smaller sections, rendering into those sections, then combining all of them together to get the color that goes into the true pixel on the screen. This works quite well because edges that cover only fractions of a pixel give that pixel a "pre-multiplied" color plus an "alpha" value which is the proportion of background color to combine with the pixel color which increases perceived resolution. Unfortunately, many game engines and web graphic programs can not use alpha values because the time it takes to combine is too long for real-time operation. (An image that is pre-multiplied for alpha but does not use the alpha will appear to have a halo around it when composited into a game or web site). Selecting this option will remove the alpha values from an image and just leave the not-pre-multiplied color.

Objects

Models

Models are the characters, vehicles, scenery, plants, and animals you create and animate in Animation:Master.

Model Instance Menu

- Delete** Removes the selected object from the project.
- Rename** Rename the selected object
- Edit Model** Opens a Window for the selected object. This can also be achieved by double-clicking the object in the Project Workspace.
- Select Cache ()** Highlights the object that this shortcut is to.
- New Chor Action** Creates a new Choreography Action.
- New Action** Adds a new action to the selected script.
- New Pose Percentage** Add a new percentage property, and relationship to this model.
- New Pose On/Off** Add a new On/Off property, and relationship to this model.
- New Constraint**
- Aim At** Creates a new Aim At Constraint for this object.
- Kinematic** Creates a new Kinematic Constraint for this object.
- Path**

Creates a new Path Constraint for this object.

Translate To

Creates a new Translate To Constraint for this object.

Orient Like

Creates a new Orient Like Constraint for this object.

Roll Like

Creates a new Roll Like Constraint for this object.

Aim Roll At

Creates a new Aim Roll At Constraint for this object.

Spherical Limits

Creates a new Spherical Limits Constraint for this object.

Euler Limits

Creates a new Euler Limits Constraint for this object.

Translate Limits

Creates a new Translate Limits Constraint for this object.

Surface

Creates a new Surface Constraint for this object.

Scale Like

Creates a new Scale Like Constraint for this object.

Aim Like Two

Creates a new Aim Like Two Constraint for this object.

Aim Roll Like Two

Creates a new Aim Roll Like Two Constraint for this object.

Bone To Spring

Creates a new Bone To Spring Constraint for this object.

Rigid Body

Creates a new Rigid Body Constraint for this object.

Import Action...

Imports a saved action and adds it to the selected object.

Bake All Actions...

Bake All Actions into Chor Action

This feature collects all of the actions, reusable or not, on an object and bakes them into just one simple choreography action. This choreography action can be saved out by right-clicking (Control-click on a Mac) a choreography name in the Project Workspace tree (this will save actions for all objects in the choreography), a model shortcut in a choreography, or within an object's manipulator in a choreography window. Then choose "Export Action As..." from the menu.

Draw Modes

Bound, Vector, Curved

Render Mode

Hidden, Wireframe, Shaded Mode, Shaded plus Wireframe

Pickable

Object Pickable/Unpickable

Add Polygon Modifier

Adds PolyModifier to a Model or Group. Choose the type of polymodifier you desire from the list of plugins installed. To remove a polymodifier from a model or group, click the PolyModifier icon under the action in the Project Workspace and press **⌘** on the keyboard.

Plug-ins

Extension Plugins (.hxt) may be available for this object.

Properties

Edits the selected object's properties.

Model Properties

Bone Position

Visible: Sometimes. Position of bone with out motion.

Transform

Read-Only on Cache. Stores any motion for this bone, includes translate, scale and rotate. and cannot be set on the cache, but is visible so that relationships can be created that are controlled by it.

Roll-Method

Advanced, Default: Y-Poles-Singularity. Default Roll Behavior There are several situations in which a bone is given clues about where to aim, but no further information about what should happen with the roll handle. In a sense only two of the three degrees of freedom are clearly defined: an Aim At constraint, inverse kinematics, and grabbing the end of the simple bone manipulator are a few examples. When this occurs, a bone's roll is determined by what is known as its "default roll behavior": it tells the bone how it should be rolled at any given aim direction, and is intended to be the best in most situations. Occasionally you may rotate a bone and find this default behavior undesirable. To remedy it, simultaneously press the **[Ctrl]** key on the keyboard (**[Cmd]** key on the Mac) to automatically compute a minimal visible roll, or use the Rotate manipulator, which defines all three degrees of freedom, or choose a different roll method. These roll behaviors do not occur between keyframes when using quaternion interpolation.

Z-Singularity: This is the default roll method for all geometry driving bones, the default roll behavior is to try not to roll at all if in the same hemisphere as the bone was defined. This gives the bone a kind of "sweet spot " in the shape of a hemisphere around the bone's original creation direction.

Y-Poles-Singularity: This roll method is used for all bones except geometry driving bones, such as lights, cameras, nulls, forces or models. Its behavior is not to roll unless pointed in the same or opposite direction as the roll handle. This creates the behavior of a camera that is mounted above a basketball court. It always tries to keep the top of the players heads up in

the frame of the camera. This is clearly defined everywhere except directly underneath (or on top) of the camera. That is why it is called Y-Poles. This behavior is good for lights and cameras.

Roll-History: This method determines the roll direction based on where the roll was before the bone was rotated. It essentially uses the history of the roll handle to determine where it should be. One downfall of this method is that given a certain direction for the bone, there is no definitive location that the roll handle will be. It depends on where it was before. However this technique has no singularities or odd rotating gimbal locations.

Euler Order

Advanced, Default: Automatic. This property controls the order which is used to convert a rotation into three euler angles (x,y,z). This property will rarely ever need to be changed from its default. The euler angles are used for 1-D smartskin, roll-like constraints, as well as expressions based on just one of the three components of a rotation. Animation Master internally stores and calculates rotations as quaternions. However if the angle came from a Euler rotation driver, it keeps the euler angles as well. It stores these unconverted raw euler angles for future use, and marks a flag that says the euler angles are valid. This serves two purposes; one is speed, why convert to an euler again, if we already have that answer. The second is to preserve large euler angles, so that they may be scaled up or down accurately by roll-like constraints or expressions. Many operations in AM can mess up this pre-computed euler angle state though. Any other kind of rotate driver, like a quaternion driver, or a vector driver, as well as all types of rotate constraints will store a quaternion, and tromp the carefully stored eulers. Even an additional Euler driver can mess it up, if the two are blended with add, since it is the quaternions which are added. The result is converted back to euler when needed. Rotation compensation applied by actions used on models whose bones are oriented differently than the one for which it was created will also invalidate the euler angles. When any of these invalidations occur, the euler angles are not available, so new euler angles are computed from the quaternion. This property controls how those euler angles are computed. The default is automatic. Occasionally this automatic behavior produces discontinuities in the resulting euler angle when the decision switches states. In this case, choosing one of the fixed euler orders is recommended.

XYZ: This is the same order used by the Euler Rotation Driver. It is the primary order used by Animation Master. Z rotations are king, and can range from -180 to 180 degrees. X rotations are next and can also range from -180 to 180 degrees. Y is last, and can only range from 0 to 180 degrees.

XYZ: This is an alternative order, and usually would only be desired when the returned Y rotation should have a broader range. Z rotations are still

king, and can range from -180 to 180 degrees. Y rotations are next and can also range from -180 to 180 degrees. In this case X is last, and can only range from 0 to 180 degrees.

Automatic: This order analyzes the rotation, in an attempt to determine which angle rotates more X or Y. It then chooses the YXZ or XYZ order depending on the result. This is the default way which Animation Master uses to determine Euler angles.

Attached to parent

Visible: Sometimes, Default: OFF. Set if this bone should form an IK chain with its parent.

Hidden

Visible: Sometimes, Default: OFF. Hides this bone.

Manipulator Options

Visible: Sometimes, Advanced. See Manipulator Options property.

Lock IK

Visible: Sometimes, Default: OFF. Locks the joint so Inverse Kinematic chain is broken in half at this bone's pivot.

Shortcut to

Visible: Sometimes. Sets which object under the Project's Objects folder this object is an instance of. This can be useful when animation has been made for an object in a choreography, but now you need to switch the object to a different one. If you were to delete the instance and put the new one in the choreography, all the animation would be lost. Switching which object the shortcut is an instance of using this property saves you from having to redo all that work. This can also be useful when using a low-density version of a model during the animation phase, and switching to the final high-density version once it is ready to render. This low-res version of a model is often called a "proxy model". You will only find this property on instances.

Active

Visible: Instance Only, Default: ON. This option is for objects that need to appear and/or disappear during the course of an animation. Inactive objects are not seen in real-time or final renderings. You can use this to speed up scenes when this object is off screen, or temporarily not needed.

Ignore Fog

Default: OFF. Turn this on if fog shouldn't be applied to this object.

Animate Mode

Default: ON. This property specifies whether keyframes should be created or not when the object is manipulated.

File Info *Visible: Sometimes*

Surface

Visible: Sometimes These settings can be overridden by Decals, Materials and Groups. Contains all of the surface attributes for this object.

Options

Visible: Sometimes The Model's options.

Front Projection Target

Default: OFF This option specifies that this model is to receive a projection of the Camera's Rotoscope image map.

Flat Shaded

Default: OFF Causes the model to render without shading.

Cast Reflections

Default: ON Allows the model to be seen in any other model in the scene that has a surface reflectivity greater than zero. In most cases this option should be on.

Cast Shadows

Default: ON Causes the model to cast shadows on itself and other objects in the choreography that have receive shadows turned on. Shadows will only be cast from Lights that have their Cast Shadows option turned on.

Receive Shadows

Default: ON Causes the model to receive shadows from any objects (including itself) in the choreography that are set to cast shadows.

Shadow Only

Visible: Sometimes, Default: OFF This property is only available when Receive Shadows is turned on. When this option is set, only the shadows that land on the model will be rendered, and not the model itself. This is useful when you wish to composite the shadows on in software outside of Animation:Master. The model will not render, but the shadows that are cast on the model will be stored in the Alpha channel of the rendered image.

Cast Occlusion

Default: ON Causes the model to be included in the ambient occlusion calculation for itself and the other objects in the choreography that are set to cast shadows.

Bone Falloff Curve

Visible: Cache Only, Advanced, Default: 0%, Min: 0%, Max: 100%, Percentage This property is used to store a channel. This channel can be used to control the falloff of a bone. This falloff is used for computing CP weights. This channel is only used if the bone's Falloff Type is set to Channel.

Plugin Properties

Custom properties added by plugins

Anime Eyebrows



An arcane feature of "anime" characters is that their eyebrows are always drawn on top of their bangs. To achieve this effect, you must apply some special materials. This requires that you first make the eyebrows as non-rendering splines, group them, name the group, then turn the "Render As Lines" option "ON" in the group's properties. (Also set the group's Color, Line Thickness and Randomness in the Surface properties). Drag and drop the "anime eyebrows" material onto the eyebrow group. Next, group the bangs (or whatever part of the hair is to be obscured by the eyebrows), name them, then drop the "obscured by eyebrows" material onto this group. (These special materials are located in the "Materials" folder on the Animation:Master CD).

Attaching Control Points

To attach one control point to another, drag one control point over the control point you want to attach to, then, while keeping the mouse button pressed, right-click. (Macintosh users press the <-> key on the keyboard, called a tilde).

When multiple control points are attached, only a single control point is visible, even though many splines may run through it. Moving such a control point will move all of the splines.

NOTE: Hooks are attached to another spline in the same fashion as attaching control points.

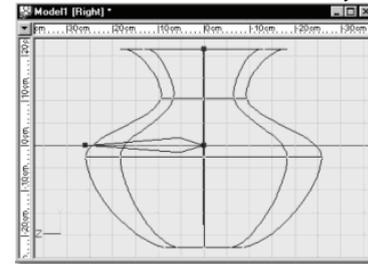
Default Model Bone

Every model you work with in Animation:Master has at least one bone, even if you do not add any bones yourself. This default bone is referred to as the "model bone" and is used for positioning the model within a choreography.

To view or reposition a model's default bone, click the model name in the

Project Workspace while in Bones mode.

The default bone will become visible, allowing you to make whatever changes to the position of the bone that are necessary.



For the most part, you will not need to make changes to this bone. However, if you create a model that contains no additional bones, it may be helpful to move the model bone to correctly position the model on a path.

Importing Models

Sometimes, when working on a model, it may be useful to incorporate another model within it. To import a saved model, right-click (Control-click on a Mac) on the model you want to add to, pick [Import][Model], and select the ".MDL" file to import.

To offer some backward file compatibility, Animation:Master allows you to import segment ".seg" files. Select a model you would like to import the segment into by right-clicking (Control-click on a Mac) its icon in the "Object" folder in the Project Workspace (this may be a new model), and pick [Import][V4.x Segment].

The Import Model menu can also be used to import DXF models. Do not expect to be able to import all DXF models or use a DXF model as is. It will likely require a lot of work to reach a point at which it is useable. For example, on average you will have to delete 60 control points from the imported model for every control point the patch version of the model actually needs. If you can reduce the number of polygons in the model before importing it, we recommend you do so.

Exporting Models

Many existing polygon based 3D programs read polygon files such as 3DS. For compatibility, 3DS, DXF, OBJ exports are possible from Animation:Master. Other file types are also available. AV2 and PLY are real-time formats developed by Hash, Inc. for use in real-time engines. These

formats are unique in that they can preserve the patch based nature of the model, and can include both surface and hierarchy information for the model.

There are also many third-party export plug-ins available for other file formats. If you are a developer and desire other export types than those available, an SDK (Software Developer's Kit) with a description of the API (Application Programming Interface) is available at: <ftp://ftp.hash.com/pub/sdk/>. This also includes information about the AV2 and PLY formats.

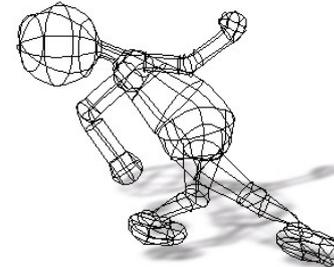
To export a model to a different file format, right-click (Control-click on a Mac) on the model in the Project Workspace tree and pick [Plug-ins][Export][format]..



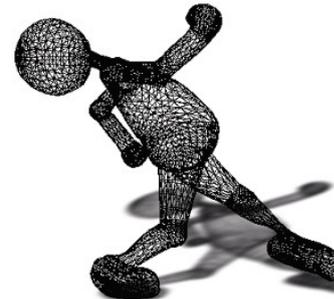
Export Options Dialog

The Export Options Dialog is an example of the parameters available when exporting using Hash's 3DS plug-in.

The Polygons Per Patch option specifies how many polygons to use to try to represent a single patch. Since patches have infinite resolution, it may take hundreds of polygons to represent one patch. The Variable polygons per patch option will actually create the minimal polygons needed to represent each patch. If the patch has a large amount of curvature it could possible create hundreds of polygons, whereas if the patch is square it will only create one polygon.



A model comprised of 249 patches.



After export, the model contains about 4,000 polygons.

Many model formats do not allow multiple maps to be applied to a single patch. Generate Model Maps was created to overcome these shortcomings. With this option selected, a BMP image file will be generated with the same name as the exported model name. The image file contains a small rendered image for every patch in your model. Each of these small images will contain all the color maps that overlapped on one patch. This option is also very important to real time game designers, where one map per patch in desirable.

Use the Min\Max Size options to set the desired range of sizes for each map created per patch. Don't confuse this with the size of the BMP file created. The BMP file will always be 1024 X ??, where the ?? are determined by how many patches your model has with texture maps on it and the Max Size you have chosen for each map that will be stored inside the BMP file.



Decal Image Shortcut Properties Panel, Export tab

Sometimes you may choose for a particular decal not to be added into the model's generated BMP image when exporting. For example if you use one decal of a picture of grass and stamp it end to end over multiple patches, you do not want each patch to create a map for itself, since each patch's map will look identical. The preferred method would be for each patch to use the same original map used to decal the model. This option is located on the Export tab on the Decal Image Shortcut Properties panel.

Duplicator Wizard

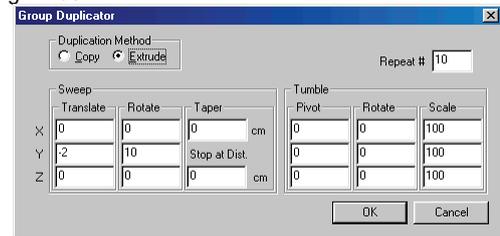
The Duplicator wizard is a very powerful tool designed for lofting, extruding, and copying. It is a group based wizard and must start with a group that you have created. The Duplicator will take that group, and either copy or extrude it a specified number of times, translating, scaling, and rotating with each iteration. It can be used to make springs, screws, propellers, and strange abstract shapes.

It is important to visualize the shape you want to construct before bringing up the Duplicator wizard. The wizard will essentially perform two functions, sweep and tumble. The sweep will take the group and spin it around the group's pivot. The tumble will swirl the group around another local pivot while it is swept around the group's pivot. It's kind of like a 3D Spirograph.

So, before you bring up the Duplicator wizard, you need to set the group's pivot. So, select the group you want to work with, and then select the Translate Mode button (Scale or Rotate will work as well) and move the pivot with the pivot manipulator to the desired location. A common location is to the right of the group. Remember that if you are making a spring, the vertical translate is controlled in the dialog and not the vertical location of

the pivot relative to the group. So, just moving the pivot the appropriate distance to sweep around is enough. If you want to create a spring at an angle you can use the pivot manipulator to rotate the pivot. You can also rotate the entire shape as a group after the wizard has finished, which gives you greater control.

When you have placed the group's pivot, bring up the Duplicator wizard by right clicking (Control-click on the Mac) the selected group in the Modeling window. Now pick [Plug-ins][Wizards][Duplicator]. You can also access group wizards by right clicking (Control-click on the Mac) the group in the Project Workspace. However, if the group is untitled, you must do this in the modeling window.



When the Duplicator wizard dialog appears, you will see options for controlling how the group is copied, translated, scale, and rotated.

Select Extrude if you want the group to extrude with each iteration and join the groups with splines. This is what you will usually use. It is best used for spring and spiral shapes. Select Copy if you do not want to create a new surface but just want to make multiple copies of the selected group. This would work well if you wanted to put spikes on a cylinder or on a tire.

Set the number of iterations by typing in a Repeat #.

The real power of the Duplicator wizard has to do with what happens to the group as it is copied. There are two groups of settings; they are Sweep and Tumble. As described before, sweep works with the group's pivot. If you are making a simple spring, you can ignore the tumble settings and just leave them at zero.

Set Translate to adjust the distance in X, Y, and Z that the group moves with each iteration. If you leave these values at zero, the group will be rotated around the pivot in a flat circle. If you want to make a vertical spring (from the front view), you will want to translate in the Y direction if you are pivoting around the Y-axis. Setting a translation value other than the axis of rotation will skew the spring in that direction. All translate values are measured in centimeters.

Set Rotate to adjust the rotation group as it sweeps around the group's pivot. Each value controls the degrees of rotation around the X, Y, and Z-

axes. To make a vertical spring from the front view, you will change only the Y rotate value. Since the group is being extruded, you will want to make sure that you have enough iterations in one revolution around the pivot to define a circular shape. If you set the rotation too high, say to 90 degrees, the spring will not have a circular look but have flattened sides.

The Taper setting is specifically for making a tapered screw shape. The taper value determines how much the group will spiral toward or away from the group's pivot. It is also measured in centimeters. A negative value will spiral in, and a positive value will spiral out. The Stop at Dist. setting allows you to stop the operation at a specific distance from the pivot. This is useful for making a screw shape stop the spiral when it reaches the center (set it at zero). Make sure you have enough repeat iteration for it to reach this point. When it reaches this value, it will stop duplicating the group and return.

The values in the Tumble group control a local rotation for the group as it sweeps around the pivot. Think of it as a control to make group spin as it performs the larger rotation. The Pivot values are a local offset from the copied group to rotate around. The offset is measured from the physical center of the group (the average of the points) and not the group's pivot. The Rotate values again control rotation in degrees around the X, Y, and Z-axes, but are relative to the group. So you should also think of them as an offset from the current rotation. Set Scale to adjust how the group changes in size for each iteration. It uses a percentage value, so set all three to 100 percent to keep the size the same. These values change only the size of the group, and not the shape of the spiral.

Grid Wizard

The Grid wizard allows you to create a flat or hilly terrain. It creates a grid with the dimensions you specify, and can use a noise algorithm to vary the height to make hilly or bumpy ground. The grid will be centered about the window's origin (coordinates 0, 0, 0).

Width and Height set the rectangular size of the grid. Step Width and Step Height set the size of the grid increments. Keep in mind the smaller the step sizes are relative to the size of the grid, the more grid subdivisions there will be. All sizes are measured in centimeters.

Orientation is used to determine which plane the grid is created on. Use the pivot in the modeling window as a reference. Select XY if you want to see the grid from the front view. Select XZ if you want to see it from the top view (this is what you want to select if you are creating a ground plane). Select YX if you want to see the grid from the left or right view.

Terrain allows you to turn the flat grid into a hilly or bumpy terrain. Scale determines the size of the terrain hills. The default is 100, which yields soft, gradual rolling hills. For a bumpier look, use a lower scale value. Magnitude controls the height of the bumps or hills in centimeters. Set this

value to 0 if you want a flat grid.

Hooks

Modeling with patches takes talent, either latent or learned, but the results are worth it. Patch models are elegant, with their low density and easy manipulation. For the most part, patch modeling is simple and straightforward: you build pieces and start attaching them together, but you need to keep a few rules in mind. Creasing occurs between two patches whose junction is ambiguous; meaning the renderer could not tell how to smooth between them. Normally you can intervene to indicate to the renderer what to do. 3-point patches are especially prone to creasing, so use them sparingly.

Even 4-point patches will crease under certain circumstances. Creasing normally occurs when the artist is trying to reduce geometry but retain legal patches. Trying to reduce lateral splines from a region with more geometry by making 3-point patches will almost always crease.

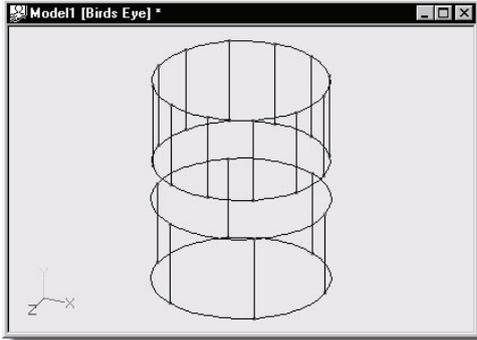
Reducing geometry is very common: consider how complex a hand is as compared to a wrist; or how much more complex a face is as compared to the side of a head. Because it is so common, a special facility, called "hooks", allows you to butt a dead-end spline against a legal 4-point patch. A hook reduces geometry without creasing.

The control point that will form a hook is attached to the center of a spline just as it would be attached to another control point. Hold the control point to be hooked over the center of a spline, and with the left mouse button down, right-click (on a Mac, press the <-> key on the keyboard, called a tilde).

To remove a hook, group it with one of the grouping tools, and press the <Delete> key on the keyboard.

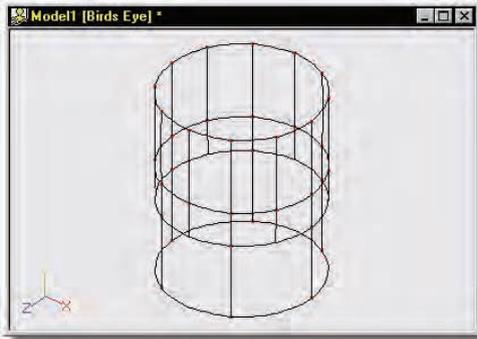
Since one of the goals of real-time modeling is to keep the number of patches at a minimum, hooks are ideal for eliminating redundant splines that are present for no other reason than to reduce creasing.

Consider parts of a body to be joined that are of varying resolution, such as a complex hand reducing to a fairly simple forearm.



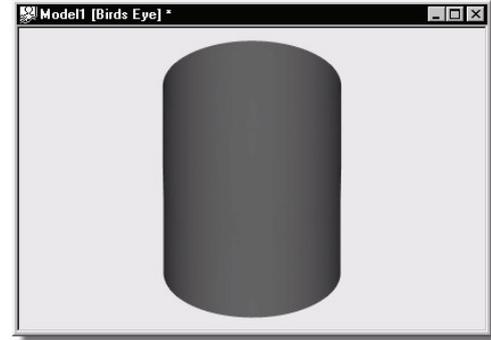
Differing Resolutions

To join these parts of varying resolutions, first the adjoining control points are connected with splines. Then, the remaining control points have a spline attached to them that is then hooked into the next available spline.



Hooks Added

The control points that are hooked are attached to a spline just as they would be attached to another control point. Hold the control point to be hooked over the center of a spline, and with the left mouse button down, right-click (on a Mac press the <-> key on the keyboard).



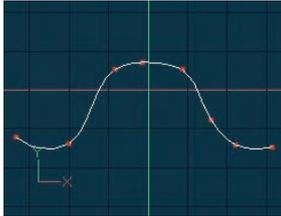
Rendered Hooks

Flipping Normals

The direction a surface is facing is of paramount importance to ing, fur, and real-time export. To see surfaces, put the window in "Shaded/Wireframe" (also turn off decals while flipping normals so that you do not have to wait for rebuilding of maps). Click the Group Patch button on the Modeling toolbar (or simultaneously press the <Shift><p> keys on the keyboard), put the cursor over the patch you want to flip (it may not be visible because the normal is pointing away from you), and click the mouse button. Repeat to add more patches to the group, then right-click (Control-click on the Mac) and pick "Flip Normals". The model should immediately redraw showing the change.

Maintain Curvature

Normally, during modeling when you insert a new control point into an existing spine, the curve changes shape. To make the existing splines maintain their curvature, keep the <Shift> key on the keyboard pressed while adding the new control point. Beware, for the program to keep a spline's shape, it must add bias to all the existing control points around the new control point (as many as eight new biases!) Typically, you don't want to maintain curvature because if there is bias, when the control points animate, the bias will have to be animated also, (a time-consuming process).



In the above example the first time the new CP is added the <Shift> key is not depressed so the curvature is not maintained. The second time the CP is added the <Shift> key is depressed and the curvature is maintained.

Patch Count

To view the number of patches in a model, right-click (Control-click on the Mac) the Model's icon in the Project Workspace under "Objects" and pick [Info...]. This will display the patch count along with other appropriate data.

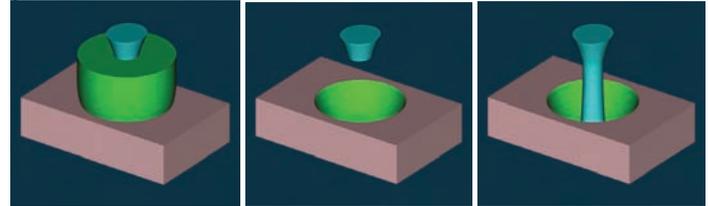
Selective Join

Normally, when a new control point is added to the end of a spline, it tries to "join", continuing the smooth arc. To prevent this, and cause the new spline to "attach" instead, keep the <Shift> key on the keyboard pressed when you click. An attach will not terminate the Add.



In the above example a new spline is added first by not depressing the <Shift> key while attaching to the existing spline, and second by pressing the <Shift> key while attaching to the existing spline.

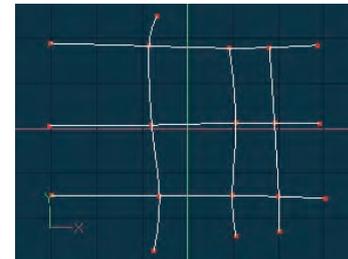
Specified Booleans



To make holes in complex geometry, it is sometimes necessary to use bones that cut using boolean operations. Boolean operations require special attention because they utilize the raytracer, and hence are only visible when rendered. (Also, boolean operations are not considered for z-buffer shadows or post effects like volumetrics). The rules for boolean operations are strict: the boolean cutter bone geometry AND the geometry to be cut MUST be closed surfaces (a sphere for example). To use a bone as a Boolean, build the cutting geometry, assign the control points to a bone, and select the "Boolean Cutter" option on the bone's Properties dialog. When rendered, the cutter bone's geometry will subtract from the model's other geometry, EXCEPT for geometry associated with bones that are children of the cutter bone, (in this way you can define parts of the model that lie inside the cutter but are to be left intact).

The first image above shows the three pieces of geometry with none of them acting as a Boolean cutter. The second image shows the green geometry cutting the other two pieces, and the third image shows the green geometry only cutting the pink base. This was accomplished by making the bone associated to the blue geometry a child of the bone that is associated with the green geometry.

Stitch



To insert a new spline into existing geometry, called “stitching”, click the Add button and click on the splines where you want the new control points inserted. To maintain the existing splines’ curvature, keep the <Shift> key on the keyboard pressed while clicking.

USERS OF PREVIOUS VERSIONS TAKE NOTE:

The Add accelerator key (normally <A>) is now defaults to Add Lock (since Add Lock will do almost everything Add will, and more). <Shift><Add> now defaults to a traditional Add.

To encourage new users to model with Add Lock, the original Add, Insert, and Group (because its not needed often) buttons have been removed from the default Modeling toolbar. (The functions still exist on the accelerator keys, and you can add them back to the toolbar if you want to.)

Bones

When adding bones, you are defining the hierarchy (called a skeleton), indicating which connections should be kinematic chains, and specifying the local space of each bone. Before adding a bone, you first select its parent (if no bone is selected, the new bone is added at the root). The skeleton can be adjusted later by using drag drop in the Project Workspace tree. A parent bone passes its translation, rotation, and scale on to its children. A good skeleton building technique is to place the pelvis at the root, make the abdomen and thighs children of the pelvis, then make the torso a child of the abdomen, then make the biceps and neck children of the torso, and so on. It is a good idea to position the bones that make up the spine (pelvis to the head) at 0 on the X-axis. This will make certain copy/paste operations easier. For inverse kinematics, add nulls at the root of the hierarchy for use with hand and feet constraints. The nulls can have a hierarchy of their own to ease in moving them together. For example, you can have a null that is the parent of all nulls, one that is the parent of the lower body nulls, the left leg nulls, etc... Reordering the bones in the Project Workspace tree with drag and drop can easily modify the skeleton. Rearranging the skeleton also can change the inverse kinematics.

Bone Orientation

The orientation of a bone defines its local frame of reference. Along the length of the bone defines the local Z-axis; the roll handle is the bone’s local Y-axis, and the local X-axis is perpendicular to both the bone and the roll handle. This is the coordinate system that scale, rotate and translates use when animating. Two models that are to share actions require the bones to have the same names and same basic hierarchical relationship. In addition, the bones and the roll handles should be placed into the model in the same

way. If the roll handle points to the back on one model, then it should point the same way on the other model. However, one character can be modeled with its arms out, and another with its arms down, and the actions can still be shared.

Bone Instance Menu

Delete

Removes the selected object from the project.

Rename

Rename the selected object

Select Cache ()

Highlights the object that this shortcut is to.

Edit

Opens a Window for the selected object. This can also be achieved by double-clicking the object in the Project Workspace.

New Constraint

Aim At

Creates a new Aim At Constraint for this object.

Kinematic

Creates a new Kinematic Constraint for this object.

Path

Creates a new Path Constraint for this object.

Translate To

Creates a new Translate To Constraint for this object.

Orient Like

Creates a new Orient Like Constraint for this object.

Dynamic Constraint

Creates a new Dynamic Constraint for this object.

Roll Like

Creates a new Roll Like Constraint for this object.

Aim Roll At

Creates a new Aim Roll At Constraint for this object.

Spherical Limits

Creates a new Spherical Limits Constraint for this object.

Euler Limits

Creates a new Euler Limits Constraint for this object.

Translate Limits

Creates a new Translate Limits Constraint for this object.

Surface

Creates a new Surface Constraint for this object.

Scale Like

Creates a new Scale Like Constraint for this object.

Aim Like Two

Creates a new Aim Like Two Constraint for this object.

Aim Roll Like Two

Creates a new Aim Roll Like Two Constraint for this object.

Bone To Spring

Creates a new Bone To Spring Constraint for this object.

New Smartskin

Creates a new Smart Skin relationship for this object. Or lets you edit existing ones

Lock

Lock the selected bone.

Properties

Edits the selected object's properties.

Bone Properties

Bone Position

Visible: Sometimes. Position of bone with out motion.

Transform

Read-Only on Cache. Stores any motion for this bone, includes translate, scale and rotate. and cannot be set on the cache, but is visible so that relationships can be created that are controlled by it.

Roll-Method

Advanced, Default: Z-Singularity. Default Roll Behavior There are several situations in which a bone is given clues about where to aim, but no further information about what should happen with the roll handle. In a sense only two of the three degrees of freedom are clearly defined: an Aim At constraint, inverse kinematics, and grabbing the end of the simple bone manipulator are a few examples. When this occurs, a bone's roll is determined by what is known as its "default roll behavior": it tells the bone how it should be rolled at any given aim direction, and is intended to be the best in most situations. Occasionally you may rotate a bone and find this default behavior undesirable. To remedy it, simultaneously press [Ctrl] key on the keyboard ([Cmd] key on the Mac) to automatically compute a minimal visible roll, or use the Rotate manipulator, which defines all three degrees of freedom, or choose a different roll method. These roll behaviors do not occur between keyframes when using quaternion interpolation.

Z-Singularity: This is the default roll method for all geometry driving bones, the default roll behavior is to try not to roll at all if in the same hemisphere as the bone was defined. This gives the bone a kind of "sweet spot" in the shape of a hemisphere around the bone's original creation direction.

Y-Poles-Singularity: This roll method is used for all bones except geometry driving bones, such as lights, cameras, nulls, forces or models. Its behavior is not to roll unless pointed in the same or opposite direction as the roll handle. This creates the behavior of a camera that is mounted above a basketball court. It always tries to keep the top of the players heads up in

the frame of the camera. This is clearly defined everywhere except directly underneath (or on top) of the camera. That is why it is called Y-Poles. This behavior is good for lights and cameras.

Roll-History: This method determines the roll direction based on where the roll was before the bone was rotated. It essentially uses the history of the roll handle to determine where it should be. One downfall of this method is that given a certain direction for the bone, there is no definitive location that the roll handle will be. It depends on where it was before. However this technique has no singularities or odd rotating gimbal locations.

Euler Order

Advanced, Default: Automatic This property controls the order which is used to convert a rotation into three euler angles (x,y,z). This property will rarely ever need to be changed from its default. The euler angles are used for 1-D smartskin, roll-like constraints, as well as expressions based on just one of the three components of a rotation. Animation Master internally stores and calculates rotations as quaternions. However if the angle came from a Euler rotation driver, it keeps the euler angles as well. It stores these unconverted raw euler angles for future use, and marks a flag that says the euler angles are valid. This serves two purposes; one is speed, why convert to an euler again, if we already have that answer. The second is to preserve large euler angles, so that they may be scaled up or down accurately by roll-like constraints or expressions. Many operations in AM can mess up this pre-computed euler angle state though. Any other kind of rotate driver, like a quaternion driver, or a vector driver, as well as all types of rotate constraints will store a quaternion, and tromp the carefully stored eulers. Even an additional Euler driver can mess it up, if the two are blended with add, since it is the quaternions which are added. The result is converted back to euler when needed. Rotation compensation applied by actions used on models whose bones are oriented differently than the one for which it was created will also invalidate the euler angles. When any of these invalidations occur, the euler angles are not available, so new euler angles are computed from the quaternion. This property controls how those euler angles are computed. The default is automatic. Occasionally this automatic behavior produces discontinuities in the resulting euler angle when the decision switches states. In this case, choosing one of the fixed euler orders is recommended.

YXZ: This is the same order used by the Euler Rotation Driver. It is the primary order used by Animation Master. Z rotations are king, and can range from -180 to 180 degrees. X rotations are next and can also range from -180 to 180 degrees. Y is last, and can only range from 0 to 180 degrees.

XYZ: This is an alternative order, and usually would only be desired when the returned Y rotation should have a broader range. Z rotations are still

king, and can range from -180 to 180 degrees. Y rotations are next and can also range from -180 to 180 degrees. In this case X is last, and can only range from 0 to 180 degrees.

Automatic: This order analyzes the rotation, in an attempt to determine which angle rotates more X or Y. It then chooses the YXZ or XYZ order depending on the result. This is the default way which Animation Master uses to determine Euler angles.

Attached to parent

Visible: Sometimes, Default: OFF. Set if this bone should form an IK chain with its parent.

Hidden

Visible: Sometimes, Default: OFF. Hides this bone.

Manipulator Options

Visible: Sometimes, Advanced. See Manipulator Options property.

Lock IK

Visible: Sometimes, Default: OFF. Locks the joint so Inverse Kinematic chain is broken in half at this bone's pivot.

Has Falloff

Visible: Cache Only, Default: OFF. If this bone has falloff information stored, to be used for computing CP weights, then this property is ON.

Pivot Outer

Visible: Cache Only, Default: 35%, Min: 0%, Max: 100000%, Percentage
This represents the outer falloff radius for the pivot of the bone. Any control points past this radius will have 0% weight for this bone. It is a percentage of the length of the bone.

Pivot Inner

Visible: Cache Only, Default: 30%, Min: 0%, Max: 100%, Percentage
This represents the inner falloff radius for the pivot of the bone. Any control points inside of this radius will have 100% weight for this bone. It is a percentage of the outer falloff radius.

Pivot Scale

Visible: Cache Only. This represents the scale for the hemisphere at the pivot of the bone. 100% represents a perfect sphere, z-scale of 50% is squished in half in the bone direction, and 200% is stretched in the direction of the bone. It is a percentage of the normal radius above.

End Outer

Visible: Cache Only, Default: 35%, Min: 0%, Max: 100000%, Percentage
This represents the outer falloff radius for the end of the bone. Any control points past this radius will have 0% weight for this bone. It is a percentage of the length of the bone.

End Inner

Visible: Cache Only, Default: 30%, Min: 0%, Max: 100%, Percentage
This represents the inner falloff radius for the end of the bone. Any control

points inside of this radius will have 100% weight for this bone. It is a percentage of the outer falloff radius.

End Scale

Visible: Cache Only. This represents the scale of the bone for the hemisphere at the far end of the bone. 100% represents a perfect sphere, z-scale of 50% is squished in half in the bone direction, and 200% is stretched in the direction of the bone. It is a percentage of the normal radius above.

Falloff Type

Advanced, Default: Cubic. This property controls how the weights transition from 0% weight to 100% weight. Control points within the inner falloff Pill Shape always get a weight of 100%, and control points outside the outer falloff Pill Shape always get a weight of 0%. This option controls how the part in between is determined.

Cubic: This is a nice smooth transition by using a default cubic curve. It is equivalent to using a channel with a point at 0%,0%, and a point at 100%, 100%, and zero-slope tangents at both end.

Linear: This uses a simple linear line from 0%,0% to 100%,100% like a peaked channel.

Channel: This method uses the falloff curve property in the Model to determine the falloff. This curve can be hand edited in the channel window.

Boolean Cutter

Default: OFF. Causes the selected bone's geometry to cut itself from any geometry in the same model it intersects with at render time. Boolean cutters can be used to create shapes that otherwise would be difficult to model. First you will need to associate some control points with this bone as well as turning the property ON. The boolean cut only occurs at render time, and not in wireframe mode.

When using booleans, the color or materials applied to the geometry associated with the cutter bone will appear on the cut surface during rendering. For example, if a cube is cut by a cylinder, and the cylinder has been colored red, the hole in the cube would be red. It is important to remember when using booleans that the boolean geometry will only cut if it is closed on all sides. (In the above example the ends of the cylinder need to be closed). Also, internal patches will cause undesirable artifacts during rendering.

Bone Position Menu

New Relationship

Create a new relationship for this property.

Select Relationship

Select this properties Relationship if any.

Edit Relationship

Brings this property's Relationship up in its own private editing window.

Set To Default Value

Set this property to its default value.

Not Set

Remove any local or current choreography drivers from this property and mark it as not set.

Use Cache's Value

Remove any local or current choreography action drivers off of this property and use the value from another action or the cache.

Constant

Set this property to be Constant.

Time Based

Set this property to be able to change over time.

Edit Expression

Online

Properties

Edits the selected object's properties.

Bone Position Properties

Start

Visible: Sometimes. Position of the start of the bone. This is what it rotates and scales about.

End

Visible: Sometimes. Position of the end of the bone.

Rotate

Angle of the bone compared to the standard orientation. The standard orientation is with the length of the bone running down the positive Z axis, and the roll handle pointing in the positive Y axis.

Length

Visible: Sometimes, Default: 10cm, Min: 0cm, Unit of Measurement
Length of the bone.

Manipulator Options Menu

Select Relationship

Select this properties Relationship if any.

Edit Relationship

Brings this property's Relationship up in its own private editing window.

Set To Default Value

Set this property to its default value.

Not Set

Remove any local or current choreography drivers from this property and mark it as not set.

Use Cache's Value

Remove any local or current choreography action drivers off of this property and use the value from another action or the cache.

Constant

Set this property to be Constant.

Time Based

Set this property to be able to change over time.

Edit Expression

Properties

Edits the selected object's properties.

Manipulator Options Properties

Manipulation

Visible: Sometimes, Default: Standard. Sets the Default Manipulator.

Standard: Defaults to the Standard Manipulator.

Translate Only: Defaults to the Translate Manipulator.

Rotate Only: Defaults to the Rotate Manipulator.

Limit Manipulators

Visible: Sometimes, Default: OFF. Limits manipulators to allow or disallow motion only on certain axes

Translate

Visible: Sometimes. Limits translations to X, Y, or Z axes.

Scale

Visible: Sometimes. Limits scale to X, Y, or Z axes.

Rotate

Visible: Sometimes. Limits rotations to X, Y, or Z axes.

Decals

Mapping 2D images on a 3D object is one of the secrets to making a richly textured and believable character. The process of taking a 2D image and gluing it onto an arbitrary 3D shape is called decaling (Projection maps use very specific shapes). A single model can have multiple images decaled onto it, and a single image can be decaled onto a model multiple times. Keep in mind that before applying a decal, the parts of the model you do not want the decal to apply to need to be hidden.

Begin by right-clicking (Control-click on a Mac) the "Images" folder in the Project Workspace tree and pick [Import][Image/Animation]. To create a decal for a model, drag an image into a modeling window, or right-click (Control-click on a Mac) the Model icon in the "Objects" folder of the Project Workspace tree (or on the object itself in a modeling window) and pick [New][Decal].

If you have no images already in the project, a dialog appears that allows

you to locate an image. It is important to note that if you wish to use a numbered series of images as a decal you must use the "Import as a sequence of images" check box on the dialog. Click "OK", and a new Image icon will be added to the "Images" folder of the Project Workspace tree. Otherwise you can choose from a list of the images in the project, or select "Other..."

Advanced Decaling

Many times you will want to apply a decal more than once. Right-click (Control-click on a Mac) on the "Decals" folder icon in the Project Workspace you and pick [Group Undecaled Control Points] option. Then click the Hide button on the Modeling toolbar to ensure that you do not decal a patch more than once.

Right-click (Control-click on a Mac) on a stamp, and pick [Select Control Points] to see which patches were decaled with that stamp.

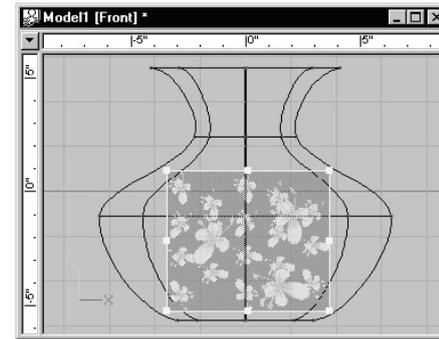
Once you have applied a stamp you can right-click (Control-click on a Mac) on it and choose the [Recall View/Position] option to reapply starting from the position and view that stamp was originally applied.

By selecting the control points of a stamp, hiding, then recalling the view and position of that stamp you can change the view and/or position slightly and reapply the stamp (then delete the original stamp), to fix how a stamp was applied.

If a group of patches was accidentally decaled, you can remove a stamp from just those patches by grouping the patches and then right-clicking on the group and pick [Remove Decals...]. A dialog will appear showing which stamps are applied to that group. Select a stamp to remove and click "Remove".

Applying a Decal

Double-click a Decal icon in the Project Workspace tree. The image will appear in the Modeling window with a manipulator surrounding it, allowing you to drag the image, or change the size to fit the model.



When the image is placed where you like it, with the mouse pointer over the manipulator, right-click (Control-click on a Mac) and pick [Apply]. You can move and apply the image again. Every application of the decal will add another Stamp icon under the "Stamps" folder under the Model icon in the Project Workspace tree. When finished, with the mouse pointer over the manipulator, right-click (Control-click on a Mac) and pick [Stop Positioning], (or click outside the manipulator). This will remove the image and its manipulator from the window. It is always a good idea to name your decals and stamps so they can be easily identified.

Edit decal position (UV editor)

To invoke the Decal View right click the decal (control click on the Mac) in the Project Workspace Tree and select [EDIT]. The Decal View can also be invoked from right clicking (control click on Mac) on a Stamp object in the Project Workspace Tree.

Decal view UV Editor

If the decal is selected in the Project Workspace Tree then all control points can be edited. If you select just a Stamp in the Project Workspace Tree then only the control points that were effected by that particular decals application (Stamp) can be edited.

The Decal view displays the patches of the model in the way they are covered by the decal. This allows fine control over how the decal is actually stamped onto the patches. Moving the geometry in the decal view actually is changing the position of the decal. You can have a modeling view and a decal view up at the same time and watch the results to your model in real time as you are adjusting the patches in the decal view.

Many new features were added to the Decal view editor in Version 11. These features consist of grouping, translate, scale, rotate, magnet mode, and you can use the Ctrl key to split patches.

Decal Image Properties

To bring up the properties for the image, select the desired animation under the decal's "Images" folder in the Project Workspace tree. See "Decal Clip Properties"

If you wish to have more control over how the animated map plays a sequence or is displayed, you can animate these properties in an action or a choreography action.

Decal Clip Containers

A decal can contain multiple images. Additional images can be added to a Decal by right-clicking (Control-click on a Mac) the "Images" icon in the "Decal" folder and picking [Add Image] or by dragging an image onto the container. This is useful if you have matching Bump, Specular, Color, and Diffuse maps and you need them to all be applied to the model in exactly the same place. The new image will be added, but it will use the same stamps as the decal. For example, this may be used for the skin of a dinosaur: you could make three maps; one for the Color map, one for the Bump map, and one for the Specular map. They all were created from the same original image and a paint program was used to filter them. You want to make sure these maps line up exactly, so pick [Add Image] or drag each of them into the decal clip container. and all three maps will be applied to the same location.

Decal Clip Container Instance Menu

- Delete** Removes the selected object from the project.
- Select Cache (Images)** Highlights the object that this shortcut is to.
- New Folder** Creates a new folder that can be used to organize objects. Once created objects can be dragged into the folder
- Add Image Other...** Load an single image or animation file.
- Properties** Edits the selected object's properties.

Decal Containers

This container includes all of the decals used in this model.

Decal Container Instance Menu

- Delete** Removes the selected object from the project.
- Select Cache (Decals)** Highlights the object that this shortcut is to.
- New Decal...** Adds a decal to the model, and selects it, making it ready to position, then apply..
- New Folder** Creates a new folder that can be used to organize objects. Once created objects can be dragged into the folder.

Group Undecaled Control Points

Groups control points from undecaled patches. Designed so you can stamp completely through a model from the side with out changing views, repositioning the decal or stamping a patch more than once.

- Properties** Edits the selected object's properties.

Decal Instance Menu

- Delete** Removes the selected object from the project.
- Rename** Rename the selected object
- Select Cache ()** Highlights the object that this shortcut is to.
- Edit** Opens a Window for the selected object. This can also be achieved by double-clicking the object in the Project Workspace.
- Position** Activates the decal manipulator, allowing positioning and application of the decal.
- Apply** Apply this decal to the underlying geometry.

Application Method

- Planar** - Apply the image straight onto the patches.
- Cylindrical** - Roll the image around the patches before applying.
- Spherical** - Wrap the image completely around the patches before applying.
- Flip Horizontally**

When decaling many times you may have one image that you use for both sides of a model. It is hard to line up the decal on each side with out calculating the correct position values and typing them in for the position of the decal on the second side. This Flip does the work for you by negating two of the position values of the decal, which mirrors the decal around the X or Y-axis.

For example the left and right sides of the giraffe from the CD-ROM were decaled with this feature. First the side decal was positioned and applied from the left. Then the view was switched to the "Right" view. Finally "Flip" and then "Horizontally" was chosen from the decal popup menu. You can also flip the decal "Vertically" for top and bottom maps.

Flip Vertically

Flip the selected decal vertically.

Select Control Points

Selects the control points that this is applied to.

Properties

Edits the selected object's properties.

Decal Properties

Translate

The center position of the image.

Scale

The scale of the image as a percentage of the image's original size.

Application Method

Visible: Cache Only, Default: Planar. The method used when applying this decal.

Planar: Projects the image onto the surface from the current window's point of view. The width and height of the decal are adjustable. Only the patches visible from this view will be stamped.

Cylindrical: Wraps the image around the object in a cylindrical fashion. The height of the cylinder is adjustable. For the back seam it sets the repeat to 3 in the x and uses the middle third of the map. All unhidden patches are stamped.

Spherical: Wraps the image around the object in a spherical fashion. For the seams it sets the repeat to 3 in the x and y and uses the middle ninth of the map. All unhidden patches are stamped.

Image Shown

When multiple images are associated with this decal, this property allows you to choose which one you see when applying the decal to the model.

Opacity

Default: 60%, Min: 0%, Max: 100%, Percentage. When applying a decal to a model, it is sometimes useful to be able to see the model through the decal so you can tell where you are stamping it. This property allows you to control how opaque the image is when applying it. Opacity has no affect on how the decal will render.

Display As Rotoscope

Default: OFF. Allows you to see the decal even when you deselect it and return to modeling.

Decal Clip

This is used to put stills or animations on a model. It selects which image to use, and how to use it. Decal Clips can be used with Decals or Groups.

Decal Clip Instance Menu

Delete

Removes the selected object from the project.

Rename

Rename the selected object

Select Cache ()

Highlights the object that this shortcut is to.

Properties

Edits the selected object's properties.

Decal Clip Properties

Image Sets the image used.

Repeat

Visible: Sometimes. The number of times this image is to repeat itself.

Seamless

Visible: Sometimes, Default: OFF. When the image repeats, the seamless property flips the image on every repeat. Causing the image to look "seamless". This is most useful on repetitive textures.

Frame

Visible: Sometimes, Default: 0sec. When the image is an animation (or sequence of images), this property sets which frame to use out of the original animation. If this property is marked as "-not set-", the current frame from the interface is used automatically. This will cause the animation to animate as it was originally intended. This property can also be keyframed to have the sequence play out of order. For instance, if the original animation is one second, and at frame 0 you set the Time property to be 1 second, and at 2 seconds you set it to be 0, the sequence will play backwards at half speed.

Decal Types

Visible: Sometimes, Default: Color. Sets the method that the render will use when applying this image to the Model surface. Map types can be changed once they have been applied without having to reapply them.

Color: The default type of map. A Color map merely takes an image file and maps it on your object. The colors in the image file are used instead of the color of the model. The Value field for a Color map determines the amount of color that comes from the image file versus the object's color. For example, a value of "75" would take 75% of the image map color and 25% of the underlying color. For Color maps, this number should range from 1 to 100.



Transparency Map

Transparency: Transparency maps are used to make an otherwise opaque surface have various amounts of colored transparency. Transparency maps are simply images that use the intensity of each color to indicate the amount of transparency on a pixel-by-pixel basis. The lower the intensity of the color, the greater the transparency. Totally black areas in the transparency map will cut a hole in the object's surface, while totally white areas will remain opaque.

The Value determines how much effect the image has on the surface. A higher number would make the surface more transparent. Reasonable values for Transparency maps are from 1 to 1000%.



Bump Map

Bump: Bump maps cause an otherwise smooth surface to appear irregular (even though it really is not). Bump maps are simply grayscale images that use the intensity of adjacent pixels to indicate surface perturbation. As you draw a Bump map using shades of gray, be aware that it is the change in intensity from one pixel to another that determines the amount of surface perturbation. For example, two black pixels next to each other have no effect, but a black pixel next to a white pixel will cause the maximum angular shift. To make a gradual incline, place increasing shades of gray together. Reverse the order of the pixels for a descending slope. Bump maps are often used as reliefs. For example, the face of a coin makes a good Bump map. Because bumps maps do not actually change the shape of the underlying surface (they are more of a visual trick), the surface's profile shape is not affected. An otherwise irregular bump map will still appear smooth when viewed along the surface's profile. (The key to a good bump map is using a blur filter on it).

The value determines how much effect the gray scale image has on the surface. A higher number would make the bumps appear higher. Reasonable values for bump maps can be from 1 to 1000%.

Specular Size: Specularity maps are another technique for adding a realistic touch to your models. Specularity maps are grayscale images. When applied to a model, dark areas on the Specularity map cause the specular intensity of the underlying object to lessen. Completely black areas of the Specularity map allow no surface specular intensity. If the amount of specular intensity varies across an object's surface, it makes the surface appear as if it is not perfectly smooth, just like objects in real life are rarely perfectly smooth. Of course, the angle of the light causing the specular highlighting must be right for the effect to occur. Specularity maps override the base specular intensity of an object. The value determines how much effect the grayscale image has on the surface. A higher number would make the specular intensity higher. Reasonable values for Specularity maps are from 1 to 1000%.



Specular Intensity: Specularity maps are another technique for adding a realistic touch to your models. Specularity maps are grayscale images. When applied to a model, dark areas on the Specularity map cause the specular intensity of the underlying object to lessen. Completely black areas of the Specularity map allow no surface specular intensity. If the amount of

specular intensity varies across an object's surface, it makes the surface appear as if it is not perfectly smooth, just like objects in real life are rarely perfectly smooth. Of course, the angle of the light causing the specular highlighting must be right for the effect to occur. Specularity maps override the base specular intensity of an object. The value determines how much effect the grayscale image has on the surface. A higher number would make the specular intensity higher. Reasonable values for Specularity maps are from 1 to 1000%.



Diffuse: Objects in real-life rarely have the same color uniformly across their surface. Things age and get scuffed up, leaving the color approximately the same but with obvious blemishes. An easy way to add this kind of real world, used appearance is with a Diffuse map. Diffuse maps are grayscale images. As colors get darker on the Diffuse map, the underlying color of the object gets darker. Completely white areas of the Diffuse map have no affect on the object, while completely black areas of the map make the underlying color completely black. A good-looking "scuff" mark would be varying shades of gray. The value determines how much effect the grayscale image has on the surface. A higher number would blemish the surface color more. Reasonable values for Diffuse maps are from 1 to 1000%.

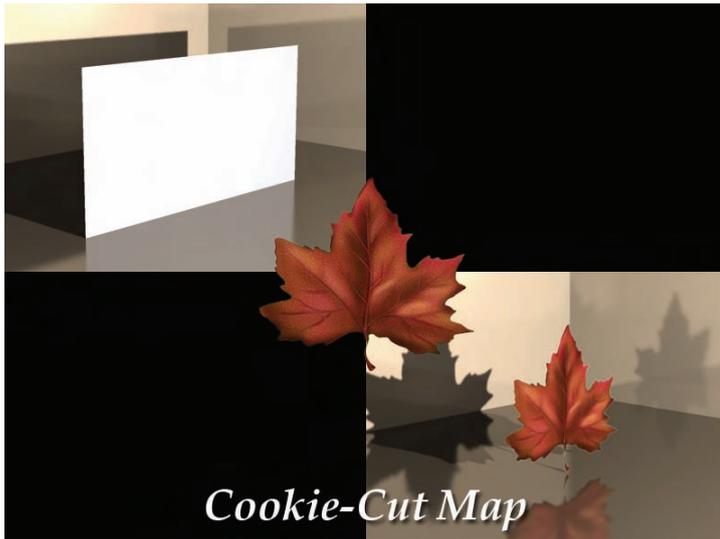


Reflectivity: To define an irregularly shaped mirror, you can specify the areas to be reflective by using a Reflectivity map. A Reflectivity map is a grayscale image where white is 100% mirror, and black is not reflective at all. The value determines how much effect the grayscale image has on the surface. A higher number would make the surface appear more reflective. Reasonable values for Reflectivity maps are from 1 to 1000%.



Ambiance Intensity: To achieve a self-illuminating effect on a particular area of an object, use an Ambiance map. This technique works well for making the appearance of lit windows on a building or spacecraft. It is generally used in conjunction with a Color map, since the Ambiance map simply tells how bright pixels are. Ambiance maps are grayscale images where white is 100% ambient, and black is 0%.

The value determines how much effect the grayscale image has on the surface. A higher number would make the surface appear more ambient. Reasonable values for Ambiance maps are from 1 to 1000%.

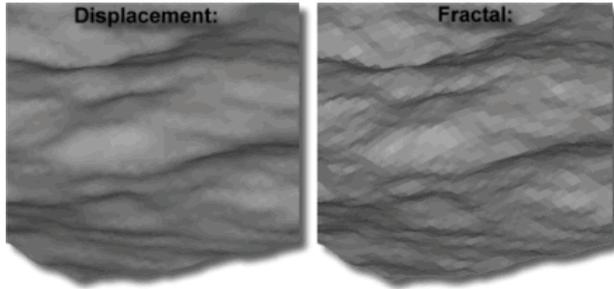


Cookie-Cut: Cookiecut maps work the same as Color maps, where the Background color of the image is used as a cut out. Using cookie cut maps, anywhere the background color is used, the object becomes invisible. This method can be used for making complex shapes out of simple surfaces, such as a maple leaf out of a patch grid. An image map with an Alpha channel can also be used. If an Alpha channel is present, the software will cut accordingly, including the Alpha channel's natural antialiasing. The "Value" determines the amount of color that comes from the image file versus the objects color (a value of "75" would take 75% of the image map color, and 25% of the underlying model color). This number should range from 1 to 100%. Value has no effect on the cut out portion of the picture. If no Background color is set for the image map, white will be assumed to indicate the cut out portion.



Displacement: Bump maps are sufficient for most applications but they lose the illusion of bumpiness along the object's profile since no "bumps" actually exist. Displacement maps actually affect the object's surface, making real bumps but they are computationally and memory expensive, and are also more difficult to control. Sometimes, however, true surface perturbation is required, justifying the use of Displacement maps. 256 shade grayscale images are ideal for displacement maps. However, contrary to Bump maps, the gray value determines the amount of displacement, (Bump maps look for changes in value rather than the value itself): "128" being no displacement, while "255" equals 127 centimeters of displacement. The color "black" (0,0,0) displaces the surface down 127 centimeters. The transparent Background color and pixels with transparent Alpha components cause no surface perturbation. The "Value" of displacement will raise or lower the displacement by the specified percent. Negative values will cause the displacement to occur in the opposite direction. Displacement maps work best with small values of deformation, (large spikes shade unnaturally and look incongruous). As a model scales, so does its displacement.

Fractal: Fractal maps are simply displacements that flat shade the facets of perturbation as if they were polygons, whereas Displacement maps shade smoothly. Displacement/Fractal maps dynamically subdivide the patches they are applied to, limited to 16 subdivisions per patch. For more detail, large patches may have to be constructed out of many smaller patches.



Next Map Factor: Lessens the effect that the next map has on the surface by the amount in this map. White means use the next map as it is, black means the next map has no effect.

Other...: Allows you to pick one or more other surface properties that you want this map to control.

Normal: Normal maps cause an otherwise smooth surface to appear irregular (even though it really is not). Normal maps are simply color images that use the red and green channels to encode surface normal direction. The red channel value determines the left-right (or X) direction of the normal while the green channel value determines the up-down (or Y) direction of the normal. The X and Y values are assumed to be part of a X,Y,Z vector of length 255 so that the Z component can be derived from the X and Y values.

Properties Driven

Visible: Sometimes. The list of surface properties that this decal controls.

Percentage

Default: 100%, Min: 0%, Max: 100%, Percentage. This is a scalar value that will adjust the influence of the map. For example, if the map you are using is not affecting the surface enough, you can use the Value to scale the affect up. This is much more desirable than creating a new image map.

No Min or Max for a Bump Map

Map Export Method

Visible: Cache Only, Advanced, Default: Reference Original Maps
Sets the method used to export maps for this decal image when exporting this model to a different file format.

Reference Original Maps: This setting will save bitmap information for the patches with a reference to a single map. This is the preferred method. Include In Patch Maps: This setting will save map for each patch. Use this for export to polygon game engines.

Contribute To Shadow Color

Visible: Sometimes, Advanced, Default: ON. Allows the color of a semitransparent image to not affect the shadow. Designed for antialiased edges of cookie cut holes.

Decal Stamps

Each application of a decal is called a stamp, so any single use of the decal can be removed, (or all stamps if you delete the "Stamps" folder). To remove a stamp from a model, click the Stamp icon you wish to remove in the Project Workspace tree and press the **Delete** key on the keyboard. To remove an entire decal from a model, click the Decal icon to select it and press the **Delete** key on the keyboard. See the Stamp Menu for other options.

Stamp Menu

Delete

Removes the selected object from the project.

Rename

Rename the selected object

Edit

Opens a Window for the selected object. This can also be achieved by double-clicking the object in the Project Workspace.

Recall View/Position

Recalls the viewing angle and position of the decal when stamped

Select Control Points

Selects the control points this stamp was applied to.

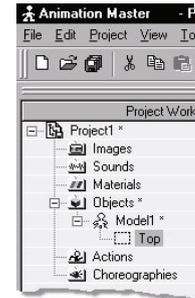
Properties

Edits the selected object's properties.

Groups

A group can consist of one or more control points. Groups can be used for the following:

- For manipulating several control points at once when modeling or animating.
- To name groups of control points, making it easier to hide or show areas of the model you are working with.
- To apply attributes to a specific part of a model. This is done by changing the Surface property of the group.
- To apply materials to a specific part of a model. This is done by dragging a material onto a group.
- To apply images to the patches contained in the group. This is done by dragging an image onto a group.



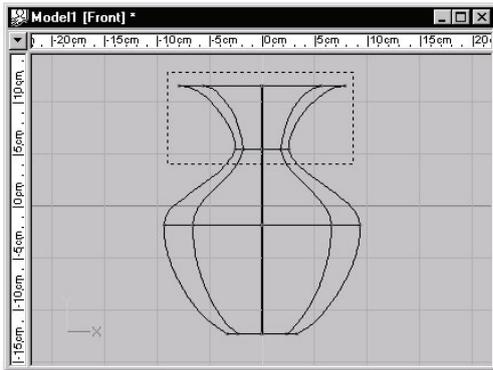
named group (top)

On the Group Properties panel, options tab, select “group has color”.

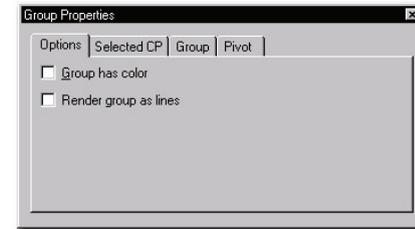
Applying Attributes to Groups

Every named group can be assigned different attributes.

Bound a group of control points.

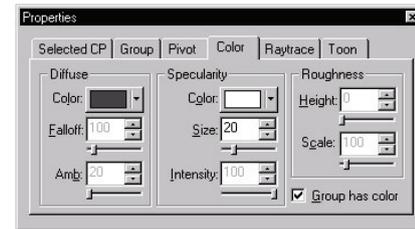


Select the group by clicking its icon in the Project Workspace tree. The default group is named “Untitled”, which will not accept attributes or materials. To rename this group (or any other group), select it by clicking its icon, then click the name and wait for the edit (or press the <F2> key on the keyboard) to edit the name.



Group Properties Panel Options tab

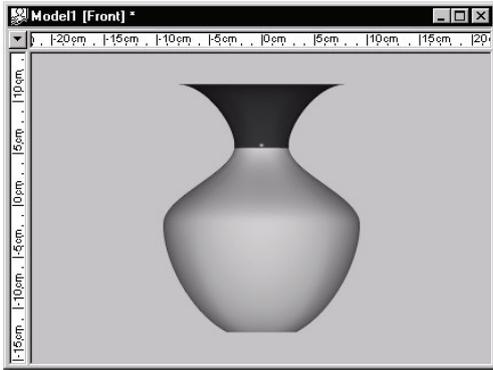
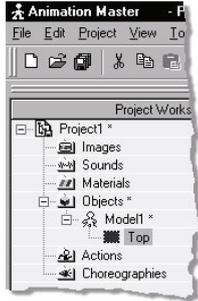
This will add a “color” tab which contains attributes that can be applied to a group.



Group Properties Panel Color tab

As you make changes to these fields, the data you have entered will be drawn in black. Those fields for which no data is entered will draw in gray. The fields that are drawn in gray get their values from the base settings of the model.

Notice that the box next to the Group icon in the Project Workspace tree changes to reflect the color you select.



Group Color after rendering

Applying Materials to Groups

Simply drag and drop a material from the “Materials” folder of the Project Workspace onto the Group icon under the Model icon in the “Objects” section of the Project Workspace. (Groups must be named before they will accept a material).

Group Instance Menu

Delete

Removes the selected object from the project.

Rename

Rename the selected object

Select Cache ()

Highlights the object that this shortcut is to.

Flip

X-Axis

Flip the selected group about the pivot's X axis.

Y-Axis

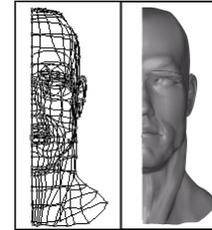
Flip the selected group about the pivot's Y axis.

Z-Axis

Flip the selected group about the pivot's Z axis.

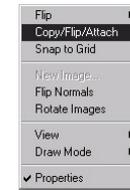
Copy/Flip/Attach

A common modeling practice is to build only one half of a symmetrical shape, such as a head, then attaching a mirrored copy together with the original.

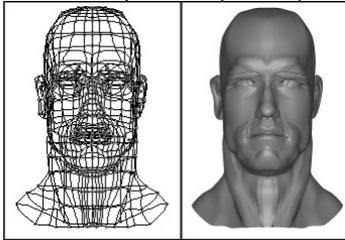


Half of a head model

To perform the Copy/Flip/Attach function, first build half of a model then group it. To indicate which axis to mirror around, simply Shift-click any control point close to the axis. (If you do not select a mirror point, the origin will be assumed). Right-click (Control-click on a Mac) within the yellow manipulator box and pick Copy/Flip/Attach.



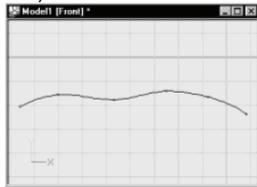
You must make sure that all of the control points along the mirror edge are aligned along an ordinal axis or they will not be attached. (If this is the case: Undo, make adjustments, and repeat the operation).



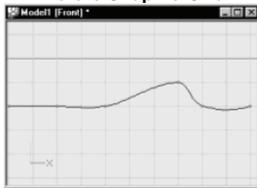
After selecting Copy, Flip, and Attach

Snap to Grid

This function is used to snap the grouped control points to the nearest grid intersection. The Snap to Grid function is useful in creating mechanical type models that require precise placement of points, or exact measurements (which can be adjusted through the grid spacing in the [Tools][Options] dialog on the “Modeling” tab).



Before Snap To Grid



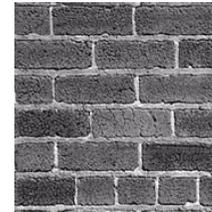
After Snap To Grid

Snap to Mirrored point(s)

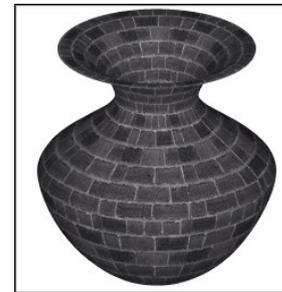
Snaps the CPs in this group to their mirrored CPs.

Add Image...

In videogames where speed and space are paramount, image maps are reused a lot. It is common for the same image to be applied to many, many patches, especially for repeating textures like walls and landscapes. One image entirely covers each patch's surface. (Hopefully the image has been made tileable so that the edges of the patches are not apparent, like the one shown here).



To add Patch Images, group the control points that identify the patches, then point at the group manipulator (the mouse cursor will change appearance when it is over the group manipulator), right-click (Control-click on a Mac), and pick [Add Image...]. When the Image dialog appears, browse to the image you want or pick one of those already available.



A vase model covered with patch images

Rotate Images

Often you will want to rotate the image so that it has a particular orientation on the patch. Right-click (Control-click on a Mac) the Patch Images Group icon in the Project Workspace and pick [Rotate Images]. Continue picking [Rotate Images] until the image is oriented like you want it.

Remove Decals...

Removes decals that are stamped on this group

Remove From Groups...

Removes Cps that are contained in this group from other groups.

Flatten

Flattening a group unwraps it as if it were a cylinder around the group's Z axis. It is designed to be used in a muscle action or pose to aid in decaling.

Mirror Selection

Selects the control points on the other side of the y-axis based on the Mirror Mode Tolerance from the Modeling tab of the options panel found under the tools menu.

Flip Normals

Flip the normals of all connected control points.

Measure Spline...

Measures the length of the spline in current units.

Select CP

Select the Control Point in the model.

Edit CP Weights...

To manually adjust CP weights. See CP weights.

Plug-ins

Extension Plug-ins (.hxt) may be available for this object.

Properties

Edits the selected object's properties.

Group Properties

Pivot

Visible: Cache Only. The point at which the group scales and rotates around.

Transform

Visible: Sometimes. Allows you to type in translate, scale and rotate values to manipulate the group.

Bias

Visible: Sometimes. Controls the curvature of the splines in this group. If all control points in the group have the same value for Alpha, Gamma or Magnitude, the value will be displayed. Otherwise the value will be blank. Either way, a new value can be entered and all control points in the group will get the new value.

Alpha

Default: 0°, Angle. Sets the angle at which the splines run through the control points in one of the two axis. Gamma sets the other axis.

Gamma

Default: 0°, Angle. Sets the angle at which the splines run through the control points in one of the two axis. Alpha sets the other axis.

In Magnitude

Default: 100%, Min: 0%, Percentage. Changes how much bulge the splines in this group have. Smaller values will head towards peaking the spline.

Out Magnitude

Default: 100%, Min: 0%, Percentage. Changes how much bulge the splines in this group have. Smaller values will head towards peaking the spline.

Surface

Visible: Sometimes. If this property is marked as "-not set-", the group has no surface properties, and is strictly there for modeling purposes. As soon as a surface property is set, the group will use that property instead of the matching surface property found in the Model. Contains all of the surface attributes for this object.

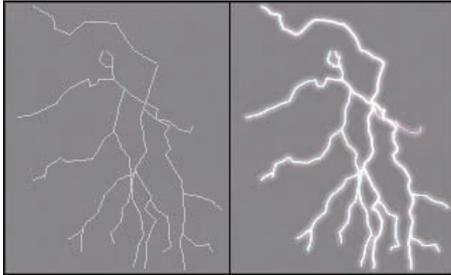
Render As Lines

Visible: Sometimes, Default: OFF. Tells whether to render this group as lines or not.

One of the objectionable artifacts of computer rendering is the broken-up appearance of very thin geometry. For example, the ropes on a Spanish galleon are necessarily long and very, very thin, which causes them to break up and temporal alias (chatter) during an animation. This phenomenon results from the fact that rendering resolution is not infinite. Animation: Master's a-buffer renderer alleviates the problem somewhat but the discrepancies often still manifest themselves.

A "line" geometry type should be used for long, thin lines; like whiskers of a cat, or antennas on a butterfly. When you are modeling, use splines to represent the long, thin geometry (don't make valid patches). Then group the control points that make up the long, thin geometry and name the group.

Animate the splines as you wish. (The "Line" option should not be used on groups that contain patches). When this property is "ON" the surface property contains the options you can use to set the lines look. These options include **Color**, **Width** and **Transparency**. **Randomness**, which controls how squiggly the line is. **Randomness Scale**, which controls the size of the squiggles. **Glw**, which with randomness can give the effect of lightning.



Example Lightning

Plugin Properties

Custom properties added by plugins

New Relationship

Create a new relationship for this property.

Select Relationship

Select this properties Relationship if any.

Edit Relationship

Brings this property's Relationship up in its own private editing window.

Set To Default Value

Set this property to its default value.

Not Set

Remove any local or current choreography drivers from this property and mark it as not set.

Use Cache's Value

Remove any local or current choreography action drivers off of this property and use the value from another action or the cache.

Constant

Set this property to be Constant.

Time Based

Set this property to be able to change over time.

Edit Expression

Online

Properties

Edits the selected object's properties.

Material Shortcut Properties

Offset

Change these values to adjust the origin of the material on the model. This is most useful for materials that use the spherical combiner, which has a

defined center.

Scale

Change these values to adjust the size of the material pattern on the model.

Aim

These values define a vector which controls the direction of the material on the model.

Roll

This value also controls the orientation of the material on the model, but controls the roll.

Global Axis

When this option is selected, the material is not anchored to the surface of the model, and the model appears to pass through the material.

Bump %

Use this value to adjust the influence of a bump texture on the model's surface. You can increase or decrease the effect of the bump map without changing the image file. Select the Bump option only if you want to change the value of the bump map from the file itself.

Rotoscopes

For those of us who are not natural artists, modeling can be difficult. It takes talent to draw a human face, and sculpting it in three dimensions makes it even more challenging. All of us, however, have traced over an existing picture with satisfactory result. Therefore, you can load a rotoscope image or animation in any window, over which you can draw or animate.

Rotoscope Instance Menu

Delete

Removes the selected object from the project.

Rename

Rename the selected object

Select Cache ()

Highlights the object that this shortcut is to.

Properties

Edits the selected object's properties.

Rotoscope Properties

Translate

The center position of the image.

Scale

The scale of the image as a percentage of the image's original size.

Image

The image or animation used in the Rotoscope.

Repeat

Visible: Sometimes. The number of times this image is to repeat itself.

Seamless

Visible: Sometimes, Default: OFF. When the image repeats, the seamless property flips the image on every repeat. Causing the image to look "seamless". This is most useful on repetitive textures.

Frame

Visible: Sometimes, Default: 0sec. When the image is an animation (or sequence of images), this property sets which frame to use out of the original animation. If this property is marked as "-not set-", the current frame from the interface is used automatically. This will cause the animation to animate as it was originally intended. This property can also be keyframed to have the sequence play out of order. For instance, if the original animation is one second, and at frame 0 you set the Time property to be 1 second, and at 2 seconds you set it to be 0, the sequence will play backwards at half speed.

View

Visible: Sometimes, Default: Front. The view in which the Rotoscope is visible: Front, Back, Left, Right, Top, Bottom.

Transparency

Default: 0%, Min: 0%, Max: 100%, Percentage. The amount of transparency of the Rotoscope. The higher this value, the more transparent it is.

On Top

Visible: Sometimes, Default: OFF. When set to ON, the image will be in front of the objects in the view rather than behind them.

Include in Alpha Buffer

Default: OFF. When set to ON, the image will appear when rendered even if the rendered image has an alpha buffer.

Relationships

A relationship allows the user to define motion that will be triggered by the changing of a controlling property. In previous Animation Master 8.5 technologies, both SmartSkin and Poses were types of relationships. They both are accomplished using relationships now. SmartSkin and poses probably will continue to be the most commonly used forms of relationships, but many other uses are now possible.

Think of a Relationship as a little Action file embedded in your model. In each Relationship you can do anything you might do in an Action. You can scale bones, rotate them, move control points, change the character's colors, etc. Relationships are very powerful. They define a controlling

relationship that defines what happens every time the controlling property changes.

In v9, Poses and SmartSkin are not exactly what they used to be. Poses add a new user property to your model which holds a percentage value. You can think of it as a slider value. The value itself however doesn't do anything. However, by also adding a relationship that is controlled by the new slider value, suddenly the slider value controls anything that was animated in the relationship. SmartSkin is just a special relationship. It is controlled by the rotation of a bone. Generally a smartSkin controls muscle motion on the cps of the model in the area near the base of the bone. Now it can control other properties of your model as well such as the percentage of a bump map value.

In v9, to create a Pose, right click (or Mac-Equal) on your model's name and select "New, Pose, Percentage." This will open a new Relationship window. Now do whatever you want in the window. You could, for instance, make your character frown. Then close the window.

Open a new Action and make the pose slider panel visible (Alt+4). You'll see your new Pose, and since you chose "Percentage", you can slide the slider to 100% and watch your character slowly frown. So far this is very similar to how previous versions of AM have handled poses.

In the Project Workspace, return to the Objects Folder and click on the little triangle next to your model's name to expand it's info. See the "User Properties" item at the bottom? Expand that, too. Inside, you'll find your new Pose. Now we'll do something revolutionary. Right-click on the Pose and select "New Relationship." A fresh Relationship window appears. You've just added ANOTHER Relationship to your pose slider! In this one you might decide to make your character's face turn purple, in rage. This brings us to an important difference: When you create a Pose in v9, you are actually creating a new property for your model. And every property can have one or more Relationships. You can keep adding Relationships to your new property. In previous versions of AM, if you created a Pose, you made this thing that looked like an Action Window, and that's where'd you do your stuff. And you couldn't do very much -- you were limited to muscle and bone actions. So why would you want more than one relationship on the same property? Each relationship can be individually turned on or off when it is actually used in your action or choreography. So in a sense you have the ability to create motion in layers by using relationships, much like you might layer reusable actions. For poses this may not seem all that useful, since you can always just choose to not animate a particular slider, or break the two layers of motion into two different sliders. However this is even handier when it comes to relationships like SmartSkin where the relationship is based on the rotation of the bone. You often can't just decide not to rotate a particular bone. Now you are able to turn your SmartSkin off

and on. In fact you can have two or more sets of Smartskin, and turn one on and the rest off. You could use this to create both strained and non-strained Smartskin. You turn the relationship off and on by changing the Enforcement property of the relationship in the instance of the model.

The enforcement property of a relationship is actually a multiplier. While the range of motion of a percentage property slider goes from 0 to 100, it may not be linear as it passes through 50%. It can do any crazy thing we like between 0 and 100. The artist manually creates the behavior of the pose slider. However, the enforcement, if not set to 100% will just scale the effect of the relationship up or down linearly. So enforcing a relationship 50% does it half as much, and 200% does it twice as much. I actually expect the enforcement will mostly be ignored except to turn certain relationships off or on.

In addition every relationship has its own lag, which allows it to be controlled by the controlling property based on its value a few frames ago. This value is animatable and can be set separately for each relationship on a property. This may be another reason to break your motion up into multiple relationships. You may want part of the motion to lag, while another does not.

Within your model there is folder called "Relationships." Inside that there is another folder called "User Properties Relationships." Since Poses are a type of "User Properties Relationships," you shall find a folder in here that contains your Pose relationships. To edit each Relationship, just double-click it.

This same paradigm applies to Smartskin. Bluntly: A Smartskin is a Relationship. When you create a Smartskin, you automatically create a subfolder, buried inside the model's "Relationships" folder, which holds the 'skin. New to v9: In the 'skin you may edit changes along any combination X, Y, and Z axes, (no more X-axis Smartskin, Y-axis Smartskin, etc.) Also new to v9 is the power and versatility of Relationships. You can create a character, and create a Smartskin to smooth out a shoulder joint. Later you can add a jacket to your character. To get the folds of the jacket looking right, lock out the CPs of the body's mesh, and then add a new Smartskin! That way there is no danger of accidentally damaging your character's shoulder, as you work to get the jacket looking right.

Finally, if you want constraints to be embedded in a Pose, just add them into the appropriate Relationship window, and, in your Action file, crank the pose slider to 100%. New to v9: Angular Limits can be activated by a slider!

Relationships relate properties within the same model, giving you a way to create "Smart Models". This information is saved within the model itself. It is possible to define a relationship directly in the model, in a choreography,

or in an action window. Any way you choose to define it, the results are always stored in the model. When defining a relationship from the model. A private editing window is created, that is essentially an action. The action gives you access to a shortcut of the model. This shows up in the project workspace, which gives you a place to access all the properties of the model that you may wish to animate.

Most relationships will be created during the model setup phase, which means they will be defined in a private editing window created from under the model itself. Being able to define or refine relationships in a scene may be useful after model setup when the animator realizes that the character isn't holding up well from a particular unforeseen view or situation. Rather than be forced to duplicate this situation in a private editing window, Animation Master allows the artist to refine their relationship right there and then. To do this, find the relationship shortcut under the shortcut to the model. Once the relationship is selected, the Edit Relationship button should be enabled. Pressing it will enter editing relationship mode. However since the relation keyframes created are still stored in the model, this change will persist in all future situations the model encounters.

For those familiar with previous versions of the software, the frame number, in a pose or smartskin window, no longer represents the value of the controlling property. Since the controlling property can be a multi-valued quantity like a rotation, a translation or a color, the controlling property itself is the only indication of its value. Where ever the controlling property appears it will be drawn with a red background. You can change this controlling property using the tree, the property page, the timeline, or using a manipulator if one is available. This is equivalent to changing the frame in an 8.5 pose or smartskin window. Changing any other property while in "Define relationship mode" results in that property being controlled by the relationship. In a choreography or an action the purpose of the frame number is obvious. In a private relationship window it is less clear. It may be used to create motion tests for your relationship allowing you to view your relationship in motion by pressing the play button.

In the event that another property already controls the one that controls the currently edited relationship, it too will appear with a lighter red background, and changing will result in a change to the controlling property. So this "Super Property" also becomes like a frame changer in previous versions of the software. This change is not stored as an effect of changing the controlling property. This would create a circularity.

When a relationship is driven by a 1D property, like a percentage slider, the keyframes are stored in a traditional 2 dimensional channel, where the x axis represents the value of the controlling property, and the Y axis represents the value of the property that is being controlled. These

channels can be graphically seen and edited in the timeline.

When a relationship is driven by a multidimensional property, the keyframes are stored in a special relationship storage driver. Every keyframe created can be seen in the project workspace. These key values can be stepped through using the next and previous keyframe buttons, but they cannot be displayed graphically. You can also double click on a keyframe in the project workspace, and the software will display that keyframe. You have the ability to define a default radius for the falloff that occurs from one keyframe to another. This falloff internally is actually the distance in the units of the controlling property. So for an angle it would be in degrees. The software already computes a default radius each time a new key is added. This default radius is equal to the distance between the two nearest keys. This seems to be a good starting point. You can set a multiplier on this radius to make it smaller or larger. Smaller numbers give more local influence, similar to small magnitude in a channel. A radius factor of 0 would be equivalent to peaked. Larger numbers increase the size of the falloff radius, and soften the interpolation to include more of neighboring keys. So 200% would be roughly twice as soft as normal. If this doesn't work, more keys will help define the transition that you want. Since the entire relationship uses the same falloff for all keyframes, it is important to attempt to keep the keyframes fairly evenly placed.

The good thing about using an automatic falloff radius is that in general the user doesn't need to know about falloff, or what distance is reasonable, or that such a setting even exists. Even if you do understand the concept, who would want to keep track of their keyframes? And just how many degrees is it from 30,15,45 to 10,90,-45 anyway? For a computer it is easy to measure and keep track of these things. However, one downfall of this automatic technique rather than have the artist enter an actual falloff distance is most easily seen by example. Suppose you have created a nice relationship with 4 keys, then you proceeded to tweak the radius factor a bit, and it looks pretty good. Then you decide that you really need a fifth key between two existing keys. If this new key is closer to an existing key than any pair was before, it changes the internal default radius, and essentially changes your interpolation. This will force you to re-tweak the radius factor to get the key transitions to look like they did before.

Relation Container Cache Menu

Delete

Removes the selected object from the project.

Select Cache (Relationships)

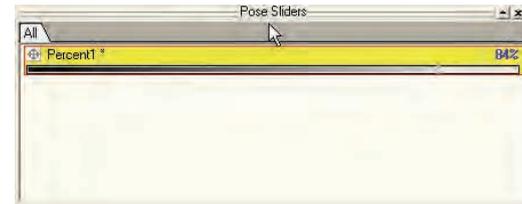
Highlights the object that this shortcut is to.

Properties

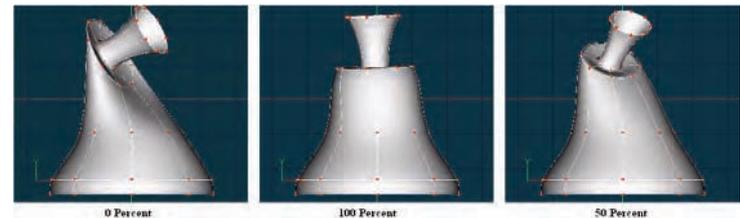
Edits the selected object's properties.



To add a relationship to a property, right click the property (Control click on the Mac), and select [New Relationship]. A Relationship View will open.



If you have the Pose Panel open you will see an instance of your property appear with in it. Now any changes you make to the model within the Relationship View will be keyed to the value that the property is set to in the pose slider.



I set the percent of the controlling property in the Pose Panel to 0% then rotated the top of my model. I then set the percent of the controlling property in the Pose Panel to 100% and straighten out the vase. Notice that when I set the pose panel to 50% that the model is a blend of the other two keys I added.

The primary purpose of creating these different poses key frames is to speed up the animation process later. When animating in a choreography window or within an action window the selected objects relationships will appear on the Pose Panel. You will then be able to key frame the actual controlling property to animate your model.

Relationships can be set up on any property. For instance you could set up a relationship on the rotation of a bone to control the position of CPs (Smart Skin). Or how about the rotation of a bone changing the eye color of your model. Lets go one step further. One could create a User Property for a Smile pose, and not only have it move CPs or bones, but have it change decals or even maybe a bump map percentage. The possibilities are endless.

Another application for Relationships would be to hide bones, or change a constraint rig on a character. You could add a "On/Off" user property that could change the enforcement of constraints, or the visibility of bones.

Relation Instance Menu

Delete

Removes the selected object from the project.

Select Cache ()

Highlights the object that this shortcut is to.

Edit Relationship

Opens a Window for the selected object. This can also be achieved by double-clicking the object in the Project Workspace.

Properties

Edits the selected object's properties.

Relation Properties

Enforcement

Visible: Sometimes, Advanced, Default: 100%, Min: -200%, Max: 200%, Percentage. Enforcement allows a relationship to be turned on or off. This is more useful for relationships like smartskin than poses, since setting the pose slider to 0% already turns the relationship off. The enforcement property of a relationship is actually a multiplier, and can exceed 100%. While the range of motion of a percentage property slider goes from 0 to 100, it may not be linear as it passes through 50%. It can do any crazy thing we like between 0 and 100. The artist manually creates the behavior of the pose slider. However, the enforcement, if not set to 100% just scales the effect of the relationship up or down linearly. So enforcing a relationship 50% does it half as much, and 200% does it twice as much. The enforcement will usually go unused except to turn certain relationships off or on.

Radius Factor

Visible: Sometimes, Advanced, Default: 100%, Min: 0.1%, Max: 1000%, Percentage. The software computes a default radius each time a new key is added to a Multi-dimensional relationship. This default radius is equal to the distance between the two nearest keys. This is a good starting point. You can set a multiplier on this radius to make it smaller or larger. This multiplier is called Radius Factor. Smaller numbers give more local influence, similar to a small magnitude in a channel. A radius factor of 0 would be equivalent to peaked. Larger numbers increase the size of the falloff radius, and soften the interpolation to include more of neighboring keys. So 200% would be roughly twice as soft as normal. If this doesn't work, more keys will help define the transition that you want. Since the entire relationship uses the same falloff for all keyframes, it is important to attempt to keep the keyframes fairly evenly placed.

Lag

Visible: Sometimes, Advanced, Default: 0sec. Lag allows a relationship to be controlled by the controlling property based on its value a few frames ago. This value is animatable and can be set separately for each relationship on a property. Lag is a measurement of time and will be displayed as frames or SMPTE depending on your global preferences. Lag may be one reason to break your motion up into multiple relationships. You may want part of the motion to lag, while another does not. The lag value has a default that is set on the relationship under the model, and it has another on the shortcut, which allows every shortcut to override the default lag.

Blend Method

Visible: Cache Only, Default: Add. Blend method determines whether the CP motion in this relationship is added to the CP motion of other relationships or blended with the others.

Add: Add implies that the CP motion in this relationship will be added to the CP motion in other relationships.

Blend: Blend allows all CP motion to be blended with the motion in other relationships like one big multi-dimension smartskin.

Blend Ratio

Visible: Sometimes, Default: 100%, Min: 0%, Max: 500%, Percentage The blend ratio determines how much of this action to include. When using cross blend, this action will be applied at this percent, and the previous action in the list will get 100 minus this value. When using add, this is a percent scalar that can be used to add more or less than the full action.

What about Smartskin?

In version 8.5 Smartskin was muscle motion which was controlled by the rotation of a bone. In version 9.0 lingo, Smartskin is a relationship which is controlled by the rotate property of a bone, and generally contains muscle motion.

How Do Relationships differ from version 8.5 Smartskin?

Several benefits were gained by a more general and robust treatment of these technologies as relationships.

- Bias can now be animated in smartskin (a frequently requested feature).
- A model can now have multiple SmartSkins, and they are switchable and combinable.
- A smartskin can be turned off.
- Smartskin can control skeletal motion or any other property.
- All rotational axes are keyed together in the same relationship eliminating the x, y and z axis windows. (This permits keys to be placed at difficult axes combinations).

What do I use Smartskin for?

This is great for creating bulging bicep muscles, bending elbows, opening jaws, as well as shoulders and hips that look great at any extreme.

How do I create Smartskin?

Creating the muscle motion for the Smart Skin is much like creating a multi-frame Pose. Select the bone in the model whose rotation will be controlling the muscle. For instance the "Left Bicep". Right-click (Control-click on a Mac) the bone and select New Smartskin. A new Relationship window will open, and the bone will be rotated 90 degrees about Y. Pick an extreme for the bone that needs muscle applied. To choose the extreme, you may type in angles on the property page or just use the rotate manipulator. Now switch to muscle mode and make any necessary changes to the model. Using a shaded/wireframe view can be useful. Now you can switch back to skeletal to use the bone's manipulator, or type in values to examine the in-between frames generated towards "0". If any adjustments are necessary, make them. Adjust again at the negative extreme of motion. This may be -90, maybe more, maybe less depending on the normal ranges of motion encountered for that bone. It is preferable for the blending functions to keep the keyframes somewhat equally spaced.

Can I make Smartskin in conjunction with constraints?

To create Smart Skin that works in conjunction with constraint bones that

utilize blending, either be sure that the pose containing the constraints is set to be on by default in the Model's properties, or leave Relationship Mode momentarily by using the Relationship button, then turn on the constraints, then turn the Relationship mode back on. If you forgot to leave Relationship mode, the act of turning the constraints on would be part of the Smartskin. Useful sometimes, but not what we want here.

While this process may sound tedious for just one bone, these modifications stay with and make sure it looks good regardless of how the skeleton is animated. It is a one time modeling process and can save tremendous amounts of time when animating. Smart Skin can also make libraries of skeletal motion much more reusable across different models, since each model has its own Smart Skin behavior in response to the same skeletal motion.

Poses

What about version 8.5 Poses?

In version 8.5 Poses were muscle or skeletal motion which was controlled by a pose slider. In 9.0 speak, a pose is a percentage property on the model combined with a relationship which controls muscle or skeletal motion. The new percentage properties added to the model by the user includes a slider to control them.

How Do Relationships Differ from version 8.5 Poses?

Several benefits were gained by a more general and robust treatment of these technologies as relationships.

- Pose motion can drive other pose motion. (also frequently requested)(This permits the Preston Blair lip shapes to be defined using primitive facial muscle sliders)
- Individual finger sliders can be used to create a hand clinch slider
- Poses can control colors, map values and any other property, not just muscle and skeletal.
- Poses can be arranged hierarchically into logical groups, like file folders.
- Poses can be enforced to more than 100% by using the enforcement property over and above the slider.
- More than one pose can default to being turned on. This replaces the clear action with blank pose feature in 8.5.
- Limits placed in poses can be applied after all actions, allowing them to correctly limit an action's motion.

Poses are nothing more than an Action that a model can carry out. The only difference between a Pose and a regular Action is that rather than being

based on time, a Pose is based on how extreme the Pose is. For instance, when you have an action, the frame bar let's you scrub through the length of that action in time. When you have a Pose, the frame bar allows you to go from -100 to 100 representing one extreme of the Pose to the opposite extreme. The Pose at the zero position is always just as the Model was modeled in its relaxed, default state.

Say for instance you are making a Pose for a hand clinch. At 100% the hand would be fully clinched, at 0% it would be in its natural relaxed form, and at -100% it might be fully spread to the extreme. Another example you might call Eye Lids, where 0% is at a natural eye opened state, 100% would be fully closed, and -100% would be wide surprised eyes.

When creating a Pose you can use any of the animation techniques used when creating an Action, which include Muscle motion, Skeletal motion, and even Constraints.

These Poses are stored with the model, and then can be used when creating an Action.

Poses vs. Actions

There are a number of ways to create motion in Animation:Master. Maybe you want to create some facial animation, say you had some dialog you wanted a character to speak and show a range of emotion while they are speaking. There are several ways you could achieve this. You could build bones in the face and use skeletal motion, but this is not recommended. You could use muscle motion and move all the control points around the mouth, cheeks, and eyebrows. You can get a great performance this way, but not only would it be time consuming, every control point you moved would have a channel created for it with data for the keyframes. This makes for very large actions, which take up memory, load slowly, and slow down rendering. For complex characters, this can really bog down your system. Furthermore, muscle actions are not reusable on other characters.

This is why pose sliders are so important. Facial animation consists mainly of repetitive motions. By building poses for the basic lip shapes and some basic facial expressions, you can easily build and tweak complex animation for your character. The model file will be larger because it has the poses stored in it, but the actions and choreographies will be much smaller. Only channels for each pose slider used will be saved. The difference is maybe four or eight channels versus hundreds or even thousands of channels. Not only that, they are much easier to edit, since there is much less information to change.

When building poses, you should still consider how many control points you are affecting. Many times you are isolating part of a model or part of a face and defining motion for just that part. For example, you will probably want to keep mouth shape poses separate from poses that affect the eyebrows.

Meaning, that the mouth shape poses are grouped on control points around the mouth and do not affect any control points in the eyebrows. That way these poses can be used in combination and can greatly increase the possible expressions. If you apply multiple poses that affect the same control points, the change in position will accumulate. Say that you have a pose that moves the corners of the mouth outward, and a pose that moves those control points downward and outward. If you use both of these poses at the same time in an action, the corners of the mouth will move downward, but move further outward since it's accumulating the outward distances from the two poses. This behavior is very predictable as long as you pay attention to what control points are used in the poses. A little planning will save you a lot of time down the road.

Using Poses with Constraints and Skeletal

Poses serve another purpose than just a muscle range of motion slider as described above. They provide a convenient storage device for frequently used constraints and skeletal positions for characters.

You can then drag and drop these poses into an action or choreography. To do this, click on the Pose icon you want to drag in the "Pose" folder of the model in the Project Workspace tree, and then with the mouse button still down, drag it into an Action window for that model, or to a Choreography window with that model selected. When you do this, it will copy the values at frame "100" to the current frame of the Action or Choreography window you are dragging it to. It is important to remember that dragging and dropping poses only works with frame "100" of the pose, it is not intended to copy multiple frames from a pose.

Poses can use muscle motion, skeletal motion, and constraints. You can drag and drop all of this information from a pose into an action or choreography. But, be careful when you drag and drop muscle poses, because it will copy channel information for each control point in the pose.

Custom Constraints

Optional constraint setups can be stored in a pose and labeled accordingly. These constraints can be overloaded onto the existing standard constraint setups, allowing you to swap constraint systems in and out throughout an Action.

Poses give you another way to control the motion of your characters. When you open an Action or Choreography window, and select a model, you will have access to the Pose Sliders panel.

Pose Sliders

Pose sliders are used to control a character's facial features or any other

kind of common motion you may find yourself animating on a frequent basis, like eye blinks, smiles, and lip shapes, etc. A Pose is really an action that gets saved as part of a model, and the slider controls how the action executes.

Pose motion is powerful. It encapsulates complex motion for a number of objects, and allows it to be driven by one simple slider, and is highly reusable across entirely different models. Poses can be a combination of muscle motion and skeletal motion. For example, facial pose sliders can control the muscle motion on control points of the face as well as skeletal jaw movement, including skeletal eye-lid blinks and eye glances. Hands, whose subtle but slight motion adds so much realism, can be animated easily with pose sliders.

Multiple pose sliders can control the same bone. These different motions are added together in the order they appear in the pose channel list. This allows you to create one pose for opening and closing the jaw bone, and another for slight left and right motion of the jaw.

Since a pose can be a range of motion, when you move the slider, it determines what part of the action is visible. When it is all the way to the left, you see the action at one end of the range, and when it is all the way to the right, you see the action at the other end of the range. That percentage can be animated on keyframes. There are two advantages to this. First, muscle motion can get very large, taking up storage space and memory, but Pose sliders that do the same thing are very small. And secondly, you can reuse Pose sliders on other characters (similarly named poses must be made for the other characters).

Pose sliders are just another kind of motion, like skeletal and muscle, and can be applied in combination with the others. This means that you may want to control general facial motion with Pose sliders, then tweak a few muscles here and there to get exactly what you want.

Creating Poses

To create a new pose, right-click (Control-click on a Mac) a Model icon in the “Objects” folder of the Project Workspace tree and pick [New][Pose] (or [Action][Create Pose] from an action window), which opens a new Pose window.

All poses are ranges of motion, even if you created only one frame, because the pose treats frame “0” as the default (unmoved) position and frame “100” as the new position. For example, you might want to make a simple mouth designed for lip-sync, with a flattened oval for the open position, and the lips together for the closed position. If the model was built with the mouth closed, you would make the Pose with the mouth open on frame “100”. This will give you a control that you can use for lip-sync by moving the slider back and forth from “0” to “100”.

When you select a model in an Action or Choreography window, the Pose Slider panel will display a Pose slider for every pose that is in the model (make sure the “Pose Sliders” option is selected in the “View” menu). When you drag a Pose slider, a keyframe will be added for the current frame. If you do not wish a slider to appear for a particular Pose, go to the Properties panel for the Pose, and deselect “Display slider on Pose Sliders window”. There are times when the neutral position is in the middle of the range of motion: eyebrows are a good example.

You'd like to be able to raise the eyebrows for expressions of happiness and surprise, keep them neutral for regular expressions, and lower them into a scowl for expressions of anger and consternation. So, when you build a new pose, you will move the eyebrows into the raised position on frame -100, make sure they are neutral at frame 0, and move them so they are lowered for frame 100. Even though the range of motion is defined between frames -100 and 100, that does not mean you are limited to three keyframes. You may add additional keyframes between -100 and 0 or 0 and 100 to define a smoother range of motion. You might also want to create separate Poses for the left and right eyebrows to allow a greater range of expressions.

Naming Poses

Newly created poses have a generic name (“Pose1”, “Pose2”, etc.) You can change the name of a pose by clicking once on the name in the Project Workspace tree to select it, and then click the name a second time (or press the <F2> key on the keyboard) to edit the name. The name of a pose is very important so they will match with reusable actions. This means that if you want to make mouth poses for a group of characters, you need to use the same pose names for all of the characters. You may make a mouth pose for the sound “oo” for several characters. They may differ based on the difference between the character models (one character might be a person, the other a bear), but the name of the pose should be “oo” for all of the characters.

Drivers

Contains keyframes for relationships that are controlled by more than one property. Example: SmartSkin uses Relation Storage Drivers for a bones x, y and z properties of its rotate.

Driver Menu

Delete

Removes the selected object from the project.

Properties

Edits the selected object's properties.

Time Based Drivers

Channels

Channels are used to store values on floating point properties that change over time. They are stored in a graph like fashion, and are interpolated smoothly using spines. They can be viewed in the timeline as a graph.

New Keyframes Past Frame “0”

When a keyframe is added past frame “0” to an empty channel, the default value for that channel is inserted at frame “0”. (This often results in unintentional movement from the default position to the key.) If you then try to delete the keyframe at “0”, it cannot really be deleted, rather the values from the next keyframe are copied down to frame “0”. This creates a hold at the newly keyed position from frame “0” to the new key.

Channel Driver Menu

Delete

Removes the selected object from the project.

Reduce...

Reduces the Channel Driver. This removes unnecessary control points from the Channel curve.

Properties

Edits the selected object's properties.

Hierarchical Objects

HIERARCHICAL CAMERAS

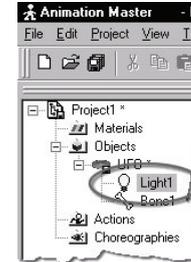
Sometimes, you may want a camera's position to be tied to a model. For example, the use of a “hierarchical camera” that is a child of a character's head, aimed directly at the face to carefully and clearly animate a character's lip-synch motion.

These are called “Hierarchical Cameras”, because they are part of the model hierarchy. Any object (lights, cameras, volumetric effects, etc.) can be made “hierarchical” in this fashion. See the section in this manual on Hierarchical Lights for more information on how to add a camera to an object's Hierarchy.

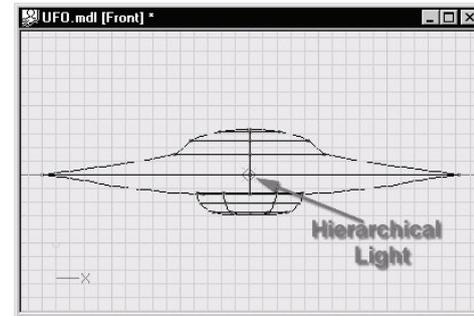
HIERARCHICAL LIGHTS

Sometimes, you may want a light's position to be tied to a model. For example, the position of headlights on a car would be difficult to define by drawing separate paths for each headlight and trying to match the car's speed, rotation, etc., but is quite easy if the headlights are simply part of the car model. These are called “Hierarchical Lights”, because they are part of the model hierarchy. Any object (lights, cameras, volumetric effects, etc.) can be made “hierarchical” in this fashion.

To add a light to a model, right-click (Control-click on a Mac) the model icon in the Project Workspace tree, and pick [New][Light].



The light object appears at the default 0,0,0 position (origin) within the modeling window.



The light can be repositioned by clicking the Bones Mode button, then clicking the Light Object in the model hierarchy. A bone that controls the light direction and position will become visible, allowing you to edit the position. When you have positioned the light, simply click the Model Mode button.

Distort Objects

Distort Objects allow you to distort all or part of a Model in an action. To create a Distort, right click (Control-Click on the Mac) on an Action and choose [New] [Distort]. A Distort will appear as an Action Object. Choose

the bone you wish to distort on the distorts action object Property panel. This bone and its children will be distorted. The resolution of the distort grid can be changed with the associated Distort under the Objects folder. Once a target and resolution are chosen the Distort can be animated in muscle mode. The Distort object also shows up under the action as a bone that can be constrained and animated like any other bone.

Distort Instance Menu

Delete

Removes the selected object from the project.

Rename

Rename the selected object

Select Cache ()

Highlights the object that this shortcut is to.

New Constraint

Aim At

Creates a new Aim At Constraint for this object.

Kinematic

Creates a new Kinematic Constraint for this object.

Path

Creates a new Path Constraint for this object.

Translate To

Creates a new Translate To Constraint Distort for this object.

Orient Like

Creates a new Orient Like Constraint for this object.

Roll Like

Creates a new Roll Like Constraint for this object.

Aim Roll At

Creates a new Aim Roll At Constraint for this object.

Spherical Limits

Creates a new Spherical Limits Constraint for this object.

Euler Limits

Creates a new Euler Limits Constraint for this object.

Translate Limits

Creates a new Translate Limits Constraint for this object.

Surface

Creates a new Surface Constraint for this object.

Scale Like

Creates a new Scale Like Constraint for this object.

Aim Like Two

Creates a new Aim Like Two Constraint for this object.

Aim Roll Like Two

Creates a new Aim Roll Like Two Constraint for this object.

Bone To Spring

Creates a new Bone To Spring Constraint for this object.

New

Pose

Percentage

Add a new percentage property, and relationship to this model.

On/Off

Add a new On/Off property, and relationship to this model.

Properties

Edits the selected object's properties.

Distort Properties

Bone Position

Visible: Sometimes. Position of bone with out motion.

Transform

Read-Only on Cache. Stores any motion for this bone, includes translate, scale and rotate. and cannot be set on the cache, but is visible so that relationships can be created that are controlled by it.

Roll-Method

Advanced, Default: Y-Poles-Singularity. Default Roll Behavior There are several situations in which a bone is given clues about where to aim, but no further information about what should happen with the roll handle. In a sense only two of the three degrees of freedom are clearly defined: an Aim At constraint, inverse kinematics, and grabbing the end of the simple bone manipulator are a few examples. When this occurs, a bone's roll is determined by what is known as its "default roll behavior": it tells the bone how it should be rolled at any given aim direction, and is intended to be the best in most situations. Occasionally you may rotate a bone and find this default behavior undesirable. To remedy it, simultaneously press [Ctrl] key on the keyboard ([Cmd] key on the Mac) to automatically compute a minimal visible roll, or use the Rotate manipulator, which defines all three degrees of freedom, or choose a different roll method. These roll behaviors do not occur between keyframes when using quaternion interpolation.

Z-Singularity: This is the default roll method for all geometry driving bones, the default roll behavior is to try not to roll at all if in the same hemisphere as the bone was defined. This gives the bone a kind of "sweet spot" in the shape of a hemisphere around the bone's original creation direction.
Y-Poles-Singularity: This roll method is used for all bones except geometry driving bones, such as lights, cameras, nulls, forces or models. Its behavior is not to roll unless pointed in the same or opposite direction as the roll handle. This creates the behavior of a camera that is mounted above a basketball court. It always tries to keep the top of the players heads up in

the frame of the camera. This is clearly defined everywhere except directly underneath (or on top) of the camera. That is why it is called Y-Poles. This behavior is good for lights and cameras.

Roll-History: This method determines the roll direction based on where the roll was before the bone was rotated. It essentially uses the history of the roll handle to determine where it should be. One downfall of this method is that given a certain direction for the bone, there is no definitive location that the roll handle will be. It depends on where it was before. However this technique has no singularities or odd rotating gimbal locations.

Euler Order

Advanced, Default: Automatic. This property controls the order which is used to convert a rotation into three euler angles (x,y,z). This property will rarely ever need to be changed from its default. The euler angles are used for 1-D smartskin, roll-like constraints, as well as expressions based on just one of the three components of a rotation. Animation Master internally stores and calculates rotations as quaternions. However if the angle came from a Euler rotation driver, it keeps the euler angles as well. It stores these unconverted raw euler angles for future use, and marks a flag that says the euler angles are valid. This serves two purposes; one is speed, why convert to an euler again, if we already have that answer. The second is to preserve large euler angles, so that they may be scaled up or down accurately by roll-like constraints or expressions. Many operations in AM can mess up this pre-computed euler angle state though. Any other kind of rotate driver, like a quaternion driver, or a vector driver, as well as all types of rotate constraints will store a quaternion, and tromp the carefully stored eulers. Even an additional Euler driver can mess it up, if the two are blended with add, since it is the quaternions which are added. The result is converted back to euler when needed. Rotation compensation applied by actions used on models whose bones are oriented differently than the one for which it was created will also invalidate the euler angles. When any of these invalidations occur, the euler angles are not available, so new euler angles are computed from the quaternion. This property controls how those euler angles are computed. The default is automatic. Occasionally this automatic behavior produces discontinuities in the resulting euler angle when the decision switches states. In this case, choosing one of the fixed euler orders is recommended.

YXZ: This is the same order used by the Euler Rotation Driver. It is the primary order used by Animation Master. Z rotations are king, and can range from -180 to 180 degrees. X rotations are next and can also range from -180 to 180 degrees. Y is last, and can only range from 0 to 180 degrees.

XYZ: This is an alternative order, and usually would only be desired when the returned Y rotation should have a broader range. Z rotations are still

king, and can range from -180 to 180 degrees. Y rotations are next and can also range from -180 to 180 degrees. In this case X is last, and can only range from 0 to 180 degrees.

Automatic: This order analyzes the rotation, in an attempt to determine which angle rotates more X or Y. It then chooses the YXZ or XYZ order depending on the result. This is the default way which Animation Master uses to determine Euler angles.

Attached to parent

Visible: Sometimes, Default: OFF. Set if this bone should form an IK chain with its parent.

Hidden

Visible: Sometimes, Default: OFF. Hides this bone.

Manipulator Options

Visible: Sometimes, Advanced. See Manipulator Options property.

Lock IK

Visible: Sometimes, Default: OFF. Locks the joint so Inverse Kinematic chain is broken in half at this bone's pivot.

Shortcut to

Visible: Sometimes. Sets which object under the Project's Objects folder this object is an instance of. This can be useful when animation has been made for an object in a choreography, but now you need to switch the object to a different one. If you were to delete the instance and put the new one in the choreography, all the animation would be lost. Switching which object the shortcut is an instance of using this property saves you from having to redo all that work. This can also be useful when using a low-density version of a model during the animation phase, and switching to the final high-density version once it is ready to render. This low-res version of a model is often called a "proxy model". You will only find this property on instances.

Active

Visible: Instance Only, Default: ON. This option is for objects that need to appear and/or disappear during the course of an animation. Inactive objects are not seen in real-time or final renderings. You can use this to speed up scenes when this object is off screen, or temporarily not needed.

Ignore Fog

Default: OFF. Turn this on if fog shouldn't be applied to this object.

Animate Mode

Default: ON This property specifies whether keyframes should be created or not when the object is manipulated.

File Info

Visible: Sometimes. See File Info property.

Resolution

Visible: Cache Only. This specifies the x, y, and z dimensions of the distortion box. The default is 2x2x2.

X

Visible: Cache Only, Default: 2, Min: 1, Max: 10. The X dimension of the Distortion box.

Y

Visible: Cache Only, Default: 2, Min: 1, Max: 10. The Y dimension of the Distortion box.

Z

Visible: Cache Only, Default: 2, Min: 1, Max: 10. The Z dimension of the Distortion box.

Plugin Properties

Custom properties added by plugins

Cameras

When a camera is dropped into a Choreography, a "Shortcut to" the camera is created. You can have many "Shortcut to" cameras in the choreography, and each can have its own settings.

Camera Instance Menu

Delete

Removes the selected object from the project.

Rename

Rename the selected object

Select Cache ()

Highlights the object that this shortcut is to.

New

Choreography Action

Creates a new Choreography Action.

Rotoscope...

Imports an image file to be used as a rotoscope.

Post Effect...

Imports a Post Effect that modifies the cameras output.

New Constraint

Aim At

Creates a new Aim At Constraint for this object.

Kinematic

Creates a new Kinematic Constraint for this object.

Path

Creates a new Path Constraint for this object.

Translate To

Creates a new Translate To Constraint for this object.

Orient Like

Creates a new Orient Like Constraint for this object.

Roll Like

Creates a new Roll Like Constraint for this object.

Aim Roll At

Creates a new Aim Roll At Constraint for this object.

Spherical Limits

Creates a new Spherical Limits Constraint for this object.

Euler Limits

Creates a new Euler Limits Constraint for this object.

Translate Limits

Creates a new Translate Limits Constraint for this object.

Surface

Creates a new Surface Constraint for this object.

Scale Like

Creates a new Scale Like Constraint for this object.

Aim Like Two

Creates a new Aim Like Two Constraint for this object.

Aim Roll Like Two

Creates a new Aim Roll Like Two Constraint for this object.

Bone To Spring

Creates a new Bone To Spring Constraint for this object.

Import Action

Imports a saved action and adds it to the selected object.

Bake All Actions...

Bake All Actions into Chor Action

This feature collects all of the actions, reusable or not, on an object and bakes them into just one simple choreography action. This choreography action can be saved out by right-clicking (Control-click on a Mac) a choreography name in the Project Workspace tree (this will save actions for all objects in the choreography), a model shortcut in a choreography, or within an object's manipulator in a choreography window. Then choose "Export Action As..." from the menu.

Render Mode

Hidden

Hidden

Wireframe

Wireframe

Pickable

Object Pickable/Unpickable

Plug-ins

Extension Plugins (.hxt) may be available for this object.

Properties

Edits the selected object's properties.

Camera Properties

Bone Position

Visible: Sometimes. Position of bone with out motion.

Transform

Read-Only on Cache. Stores any motion for this bone, includes translate, scale and rotate. and cannot be set on the cache, but is visible so that relationships can be created that are controlled by it.

Roll-Method

Advanced, Default: Y-Poles-Singularity. Default Roll Behavior There are several situations in which a bone is given clues about where to aim, but no further information about what should happen with the roll handle. In a sense only two of the three degrees of freedom are clearly defined: an Aim At constraint, inverse kinematics, and grabbing the end of the simple bone manipulator are a few examples. When this occurs, a bone's roll is determined by what is known as its "default roll behavior": it tells the bone how it should be rolled at any given aim direction, and is intended to be the best in most situations. Occasionally you may rotate a bone and find this default behavior undesirable. To remedy it, simultaneously press [Ctrl] key on the keyboard ([Cmd] key on the Mac) to automatically compute a minimal visible roll, or use the Rotate manipulator, which defines all three degrees of freedom, or choose a different roll method. These roll behaviors do not occur between keyframes when using quaternion interpolation.

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Roll-History: This method determines the roll direction based on where the roll was before the bone was rotated. It essentially uses the history of the roll handle to determine where it should be. One downfall of this method is that given a certain direction for the bone, there is no definitive location that the roll handle will be. It depends on where it was before. However this technique has no singularities or odd rotating gimbal locations.

Euler Order

Advanced, Default: Automatic. This property controls the order which is

used to convert a rotation into three euler angles (x,y,z). This property will rarely ever need to be changed from its default. The euler angles are used for 1-D smartskin, roll-like constraints, as well as expressions based on just one of the three components of a rotation. Animation Master internally stores and calculates rotations as quaternions. However if the angle came from a Euler rotation driver, it keeps the euler angles as well. It stores these unconverted raw euler angles for future use, and marks a flag that says the euler angles are valid. This serves two purposes; one is speed, why convert to an euler again, if we already have that answer. The second is to preserve large euler angles, so that they may be scaled up or down accurately by roll-like constraints or expressions. Many operations in AM can mess up this pre-computed euler angle state though. Any other kind of rotate driver, like a quaternion driver, or a vector driver, as well as all types of rotate constraints will store a quaternion, and tromp the carefully stored eulers. Even an additional Euler driver can mess it up, if the two are blended with add, since it is the quaternions which are added. The result is converted back to euler when needed. Rotation compensation applied by actions used on models whose bones are oriented differently than the one for which it was created will also invalidate the euler angles. When any of these invalidations occur, the euler angles are not available, so new euler angles are computed from the quaternion. This property controls how those euler angles are computed. The default is automatic. Occasionally this automatic behavior produces discontinuities in the resulting euler angle when the decision switches states. In this case, choosing one of the fixed euler orders is recommended.

YXZ: This is the same order used by the Euler Rotation Driver. It is the primary order used by Animation Master. Z rotations are king, and can range from -180 to 180 degrees. X rotations are next and can also range from -180 to 180 degrees. Y is last, and can only range from 0 to 180 degrees.

XYZ: This is an alternative order, and usually would only be desired when the returned Y rotation should have a broader range. Z rotations are still king, and can range from -180 to 180 degrees. Y rotations are next and can also range from -180 to 180 degrees. In this case X is last, and can only range from 0 to 180 degrees.

Automatic: This order analyzes the rotation, in an attempt to determine which angle rotates more X or Y. It then chooses the YXZ or XYZ order depending on the result. This is the default way which Animation Master uses to determine Euler angles.

Attached to parent

Visible: Sometimes, Default: OFF. Set if this bone should form an IK chain with its parent.

Hidden

Visible: Sometimes, Default: OFF. Hides this bone.

Manipulator Options

Visible: Sometimes, Advanced. See Manipulator Options property.

Lock IK

Visible: Sometimes, Default: OFF. Locks the joint so the Inverse Kinematic chain is broken in half at this bone's pivot.

Shortcut to

Visible: Sometimes. Sets which object under the Project's Objects folder this object is an instance of. This can be useful when animation has been made for an object in a choreography, but now you need to switch the object to a different one. If you were to delete the instance and put the new one in the choreography, all the animation would be lost. Switching which object the shortcut is an instance of using this property saves you from having to redo all that work. This can also be useful when using a low-density version of a model during the animation phase, and switching to the final high-density version once it is ready to render. This low-res version of a model is often called a "proxy model". You will only find this property on instances.

Active

Visible: Instance Only, Default: ON. This option is for objects that need to appear and/or disappear during the course of an animation. Inactive objects are not seen in real-time or final renderings. You can use this to speed up scenes when this object is off screen, or temporarily not needed.

Ignore Fog

Default: OFF. Turn this on if fog shouldn't be applied to this object.

Animate Mode

Default: ON. This property specifies whether keyframes should be created or not when the object is manipulated.

Type

Visible: Cache Only, Default: Perspective

Orthogonal:

A special kind of camera, used primarily for video game art creation, is the orthogonal camera. Orthogonal cameras don't have perspective, so objects in the background are not automatically made smaller than those objects closer to the lens. Video game artists make background objects purposefully smaller to mimic perspective in their games but don't have the endless number of different sized backgrounds that a true perspective camera would require.

Perspective:

The perspective camera operates like a camera in real life: objects farther away appear smaller due to perspective. The amount of perspective depends on the camera lens' focal length.

Background

When you build a complete choreography, such as a room with walls, where every part of the final image has something in it, you do not have to worry about Background color. However, if parts of the final image have nothing in them, then the Background color will appear. The default Background color is black (or light blue in the Default choreography), but you can change it by clicking on the Background color chip on the right part of the Background color property item in the Project Workspace. This will bring up a color palette where you can pick the appropriate color.

Focal Length

Default: 50, Min: 1. The Focal Length of the lens determines the amount of the scene the camera can see left and right, and up and down. Smaller focal length values see larger amounts of the scene, and larger values see smaller parts of the scene (a typical camera has a focal length of 35-50). Typical focal lengths range from 20 to 200.

Global Ambiance

Default: 0%, Percentage. To raise the light level of the entire rendered scene, increase the Global Ambiance value. Areas in shadow will become brighter as the ambiance value increases.

Render Options

See Render Options next.

Output Options

See Output Options next.

Camera Frame

Default: ON. The camera frame is a rectangular box drawn from the camera's point of view that shows what part of the view will be in a rendered image. If this is off TV Safe and Title Safe will be off too.

TV Safe

Default: Square. TV Safe is a rectangular box drawn from the camera's point of view that shows what will ultimately be visible on a home television.

OFF: No Safe Rectangle.

Square: The Safe Rectangle will have square corners.

Rounded: The Safe Rectangle will have square corners.

Title Safe

Advanced, Default: OFF. Title Safe is a rectangular box drawn from the camera's point of view that shows where titles will display correctly on a home television.

OFF: No Safe Rectangle.

Square: The Safe Rectangle will have square corners.

Rounded: The Safe Rectangle will have square corners.

Draw Camera Cone

Advanced, Default: ON. The camera cone is a visual representation of the pyramid through which the camera can see. This property controls the display of these lines.

File Info

Visible: Cache Only. See File Info property.

Output Options Menu

New Relationship

Create a new relationship for this property.

Select Relationship

Select this properties Relationship if any.

Edit Relationship

Brings this property's Relationship up in its own private editing window.

Set To Default Value

Set this property to its default value.

Not Set

Remove any local or current choreography drivers from this property and mark it as not set.

Use Cache's Value

Remove any local or current choreography action drivers off of this property and use the value from another action or the cache.

Constant

Set this property to be Constant.

Time Based

Set this property to be able to change over time.

Edit Expression

Online

Properties

Edits the selected object's properties.

Output Options Properties

Format

Allows you to choose the file format to use for the rendered output.

Save Options

Visible: Sometimes. Click this property to bring up the animation save options dialog. This is only available for file formats which supports save options.

Filename

The file path for the output file. If a sequential format (like "Targa Sequence") is chosen, the frame number will be appended to the end of the filename for each frame. You can put zeros in as placeholders so that the frame numbers that are appended are padded with zeros. For example, if you rendered frames 9-11 as a Targa sequence with the filename "MyAnim", you would get three files named "MyAnim9.tga", "MyAnim10.tga" and "MyAnim11.tga". Where as if you had named the file "MyAnim000", you

would get "MyAnim009.tga", "MyAnim010.tga" and "MyAnim011.tga".

Range

Default: Frame Range. Allows you to choose whether to render a straight range of frames, or a custom list of frames.

Frame Range: Select this option when you are rendering sequential frames incremented by a constant step value.

Custom Range: Select this option when you wish to render specific frames and ranges. This is useful when re-rendering bad or missing frames.

Start

Visible: Sometimes, **Default:** 0sec. The frame you want the rendering to begin with.

End

Visible: Sometimes, **Default:** 0sec. The frame you want the rendering to stop at.

Step

Visible: Sometimes, **Default:** 1, **Min:** 1. The number of frames you want to increment by when rendering a sequence. This value is measured in frames.

Custom Range

Visible: Sometimes. Custom Range allows you to enter multiple frames or multiple ranges to be rendered. For example: entering "1,3,5-8" would render frames 1, 3, 5, 6, 7, and 8.

Resolution

Default: VGA. The width, height and aspect to render the image(s) to. You can choose from one of the presets or pick "Custom" and type your own output resolution.

Mini: Width: 80, Height: 60, Aspect: 1.0. Useful for quick test renderings.

Low: Width: 320, Height: 240, Aspect: 1.0. A common size for distribution on the internet.

TGA: Width: 512, Height: 486, Aspect: 1.266.

VGA: Width: 640, Height: 480, Aspect: 1.0

Par: Width: 752, Height: 486, Aspect: 0.875

DV: Width: 720, Height: 480, Aspect: 0.9

D1 - NTSC: Width: 720, Height: 486, Aspect: 0.9

D1 - PAL: Width: 720, Height: 576, Aspect: 1.067

HDTV - 720p: Width: 1280, Height: 720, Aspect: 1.0

HDTV - 1080: Width: 1920, Height: 1080, Aspect: 1.0

Panavision: Width: 2048, Height: 871, Aspect: 1.0

VistaVision: Width: 2048, Height: 1366, Aspect: 1.0

Super35: Width: 2048, Height: 1536, Aspect: 1.0

Custom: Use this option to set your own custom output resolution.

Width

Default: 640, Min: 1. The width, in pixels, of the output image.

Height

Default: 480, Min: 1. The height, in pixels, of the output image.

Aspect

Default: 1, Min: 0.01. The pixel aspect ratio of the output image.

Gamma

Default: None. Gamma correction is the color adjustment needed to match an image's intended "look" on the actual output display device such as a monitor, television, or film. Using this property will adjust the rendered image and embed the gamma value in the image's output file (for targa and PNG files) as a variable. Gamma can also be applied to adjust the images "look". Used as an artistic tool in this fashion, it is said to be changing the colors dynamic range. This artistic use of gamma can better be accomplished via the Post Gamma effect property in the Render Options properties.

None: Value: 1.0. Applies no gamma to the image. Saves the image in linear light space. Recommended if further image processing must be performed on the output image or is the image must be used back as a color map.

Macintosh monitor: Value: 1.8. Applies the gamma correction needed to correctly display the image on a Macintosh computer monitor.

NTSC / sRGB: Value: 2.2. Applies the gamma correction needed to correctly display the image on a NTSC television and/or on the Internet according the sRGB specifications.

PC monitor: Value: 2.5. Applies the gamma correction needed to correctly display the image on a non gamma corrected Win/PC computer monitor. Custom: Allow you to set a your own gamma value.

Value

Default: 1, Min: 0, Max: 10. The amount of gamma to set in the rendered image file.

Buffers

Contains the additional buffer output options when rendering to a file. Buffers are extra information that can be saved with a rendered file that can be used with post-production compositing software. Most of the time you will not need these.

Alpha

Visible: Sometimes, Default: ON. This is commonly referred to as the Alpha Channel. This is stored in the final rendered file and defines what parts of the image have transparency and how much. Not all file formats support Alpha buffers.

Light Buffers

Default: OFF. This option will include buffers for lights. Then number of buffers is controlled by the Light Buffer Type sub property.

Light Buffer Type

Visible: Sometimes, Default: Light Buffer objects . Allows you choose the number of light buffers.

Single: Select this option when you want all lights in one buffer.

Light Buffer objects: Select this option when you want to group lights in to two or more buffers. The buffers are added with the Insert Light Buffer context menu option on the choreography. If no Light Buffer objects exist in the choreography then a single light buffer will be created. Each light in its own buffer: This option works best when there are just a few lights in the choreography.

Shadow

Visible: Sometimes, Default: OFF. This option will save ONLY the shadow information. You must render the shadow only buffers as a separate pass from the regular rendering. The file will be created using the specified filename and format.

Depth

Visible: Sometimes, Default: OFF. The depth buffer is an image map that defines the distance that each pixel in the rendered image is away from the camera. This information is saved in a separate file than the image in Targa format with a .dep extension.

Surface Normal

Visible: Sometimes, Default: OFF. This buffer stores information about the surface normal at each pixel. Normals are the direction a surface is facing in the 3D scene. This information is used for lighting. This file is saved in a separate file in the Targa format with a .nml extension.

Apply camera's Post Effects to renderings

Default: OFF. Select this option to apply the camera's post effects to the rendered file. If there are post effects on the camera and this option is OFF a composite will be created to apply the post effects. This only has effect when rendering from a camera view. Warning when this option is on image formats that save only the first buffer will not contain the initial rendering if there are any post effects on the camera.

Render Options Menu

New Relationship

Create a new relationship for this property.

Select Relationship

Select this properties Relationship if any.

Edit Relationship

Brings this property's Relationship up in its own private editing window.

Set To Default Value

Set this property to its default value.

Not Set

Remove any local or current choreography drivers from this property and mark it as not set.

Use Cache's Value

Remove any local or current choreography action drivers off of this property and use the value from another action or the cache.

Constant

Set this property to be Constant.

Time Based

Set this property to be able to change over time.

Edit Expression

Online

Properties

Edits the selected object's properties.

Render Options Properties

Quality

Visible: Sometimes, Default: Final. Selects the render type.

Default: Causes the render to use whatever mode the choreography (or whatever window you are rendering from) is set to.

Wireframe: Renders the scene in a wireframe representation.

Shaded: Shades the models according to the options below that affect real time renders.

Shaded & Wireframe: Same as Shaded but includes the wireframe.

Final: Renders with final quality.

Multi-Pass

Default: OFF. This option will render the scene multiple times per frame. The more passes used to render the frame the longer it will take to complete it. However the more passes rendered the better the image quality will be. When multipass rendering is enabled an extremely fast z-buffer renderer is used which does not antialias. The antialias is pickup by rendering many passes. Since the scene is being rendered multiple times per frame it has no cost to enable depth of field or motion blur. Unlike the simulated depth of field and motion blur used when not rendering multipass, multi pass motion blur and depth of field is physically real but takes many passes to get a non strobed look.

Motion Blur

Visible: Sometimes, Default: OFF. Select this option to simulate blur that occurs on film when fast moving objects move while the camera's shutter is open. Motion blur is one of those things whose absence is visible, because though you aren't aware of it, you are used to seeing moving things blur. Animation:Master's motion blur is implemented to be as fast as possible so that you can use it all the time for animations.

Percent

Visible: Sometimes, Default: 20%, Min: 0%, Max: 100%, Percentage
This value determines the percentage of time the shutter is open as defined by the physical motion of a shutter in a motion picture camera. It can be any value from 1 to 100. "25" is the most natural appearance, but provides the shortest blur. A 50 percent shutter would leave the lens open for half of the frame (i.e. from frame 3 to 3.5) and increase the amount of motion blur, where 100 would be the entire frame (3 to 4 in the previous example) and show the maximum motion blur.

Depth of Field

Visible: Sometimes, Default: OFF. Selecting this option activates Depth of Field settings. Depth of Field renders objects at the focal distance of the camera in focus, and those in front of or behind this point out of focus. When this option is not set, all objects will be in focus.

Changing the depth of field values for a camera, changes how it focuses on objects in a scene. Cinematographers have used depth of field to help tell their stories since the camera was invented. Depth of Field is the phenomena whereby the point of interest in the frame is crisp and in focus, but things behind and in front are blurry. Stories benefit from this effort because the audience's eye is drawn directly to the in-focus object, and they ignore everything blurry. In real life, the depth of field is modified by changing the aperture of the camera lens, which also affects exposure time (a tricky process). One advantage of using a virtual camera is that depth of field can be so easily controlled. Depth of field can also be animated to create dramatic rack focus effects.

Three settings define how depth of field affects what the camera sees. The first is the focal distance or how far from the camera objects appear in focus. The others are the distance in front and back of the focal distance that objects remain in focus. To see depth of field in the Quick Rendering (not available in raytracing), first make sure the "Depth of Field" option is selected on the Camera (not "Shortcut to Camera") Properties panel, (or "Hash Depth of Field" is selected on [Tools][Options][Rendering] with "Use these settings for All views").

Focus Distance

Visible: Sometimes, Default: 600cm, Min: 0.01cm, Unit of Measurement
The point where everything is in focus.

Near Focus

Visible: Sometimes, Default: 100cm, Min: 0cm, Unit of Measurement
Defines an area in front of the Focus Distance where everything is in focus.

Far Focus

Visible: Sometimes, Default: 100cm, Min: 0cm, Unit of Measurement
Defines an area behind the Focus Distance where everything is in focus.

Shadows

Visible: Sometimes, Default: ON. Shadows add a lot to a picture, but they are expensive in terms of render time. Remember, this does not turn off shading, just shadows cast by other objects. Turn on shadows only when you need them.

Ambiance Occlusion

Visible: Sometimes, Default: OFF. Ambiance Occlusion work by sending out multiple rays to determine how much of the environment is occluded by objects. It adds soft shadows to the ambiance illumination.

Occlusion Sampling

Visible: Sometimes, Default: 30%, Min: 10%, Max: 100%, Percentage Higher quality is more critical during animation.

Reflections

Visible: Sometimes, Default: ON. Select this option when you have objects in the scene that reflect the objects around them. Be aware that this invokes the raytracer and can increase render times. Since reflections are performed lazily, leaving this option on when nothing in the scene is reflective does not slow down your rendering.

Levels

Visible: Sometimes, Default: 2, Min: 1, Max: 10. Specifies the number of times a given ray will bounce. Lower numbers usually render faster but may miss multiple reflected rays.

Soft

Visible: Sometimes, Default: OFF. Soft reflections work by sending out multiple reflection rays. The sharpness to softness of each surface reflection is determined by the surface's "Specularity size" property. This can increase render time quite a bit. [Click here for more info.](#)

Quality

Visible: Sometimes, Default: 40%, Min: 10%, Max: 100%, Percentage Higher quality is more critical for surfaces with very wide soft reflections. [Click here for more info.](#)

Draw Particles / Hair

Default: ON. This option controls whether or not hair, particle systems, or dynamics constraints are calculated.

Fog

Default: OFF. The collection of properties controlling fog.

Start

Visible: Sometimes, Default: 200cm, Unit of Measurement. This value is the distance from the camera to the point where you begin to see fog. Objects closer to the camera than this distance will no be influenced by fog.

End

Visible: Sometimes, Default: 800cm, Unit of Measurement. This value is the distance from the camera to the point where objects will be completely

obscured by fog. Objects beyond this distance from the camera will not be visible.

Image

Visible: Sometimes. Occasionally, you may want to have your objects fade into something other than a solid fog color. Select an image from the list of loaded images to have the fog go to an image color rather than a solid color. If you change your mind, you can choose the Mark As Not Set menu item from this property's context menu.

Repeat

Visible: Sometimes. The number of times this image is to repeat itself.

Seamless

Visible: Sometimes, Default: OFF. When the image repeats, the seamless property flips the image on every repeat. Causing the image to look "seamless". This is most useful on repetitive textures.

Frame

Visible: Sometimes, Default: 0sec. When the image is an animation (or sequence of images), this property sets which frame to use out of the original animation. If this property is marked as "-not set-", the current frame from the interface is used automatically. This will cause the animation to animate as it was originally intended. This property can also be keyframed to have the sequence play out of order. For instance, if the original animation is one second, and at frame 0 you set the Time property to be 1 second, and at 2 seconds you set it to be 0, the sequence will play backwards at half speed.

Toon Render

Visible: Sometimes, Default: OFF. Cartoon animation is uniquely identified by the lines drawn around the characters. Animation:Master has a full set of options for line color, thickness and softness in the Toon properties which will become available when Toon Renderer is selected.

Lines Only

Visible: Sometimes, Default: OFF. Select this option to render ONLY the lines. This creates the effect of hand drawn cartoon drawings. Note that there will not be color or shading in the rendered objects. Lines Only uses the camera's background color behind the lines. Use white for a hand drawn look.

Override Lines

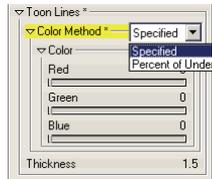
Visible: Sometimes, Default: OFF. Select this option to draw Toon Lines in final rendered frames. When used in a Material, camera property, or render option, this will override the Toon Line setting of the underlying model or group.

Render Lines

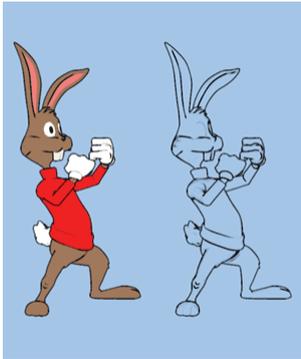
Visible: Sometimes, Default: ON. These properties allow you to override all model toon settings. Set to "ON" to render all models with Toon Lines.

Color Method

Default: Specified



Selects how the toon lines are colored.



Specified



Percent of Underlying

Specified:

A specific color is used for the toon lines. This example shows a specified color method using black.

Percent of Underlying:

A percentage of the surface color is used for the toon lines.

Color

Visible: Sometimes. The color to use for "Specified" color toon lines.

Percent

Visible: Sometimes, Default: 20%, Min: 0%, Max: 100%, Percentage The Percentage of the underlying color to use for "Percent" colored toon lines.

Thickness

Default: 1.5, Min: 0, Max: 20. A percentage of the output render width at the camera's focal distance. This means that toon lines can get smaller as objects get further from the camera. Also related to the resolution of the

rendered output.

Toon Line Bias

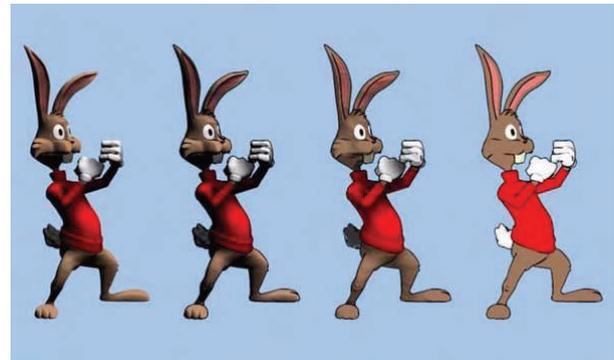
Visible: Sometimes, Default: 20, Min: 0.01, Max: 1000. "Toon Lines" are created by an algorithmic examination of a high resolution depth buffer created especially for that purpose. In a 3X3 square sample, if the depth value varies more than a predetermined amount, called the "Toon Bias", a line is created. Normally, the default bias used by the software is adequate for most situations, but sometimes to get more detailed lines you will want to reduce the Toon Bias value. Increasing Toon Bias will reduce extraneous lines but will also reduce detail.

Override Shading

Visible: Sometimes, Default: OFF. Select this option to render the frames with Toon Shading. When used in a Material, camera property, or render option, this will override the Toon Line setting of the underlying model or group.

Method

Default: Toon



Controls how the surface is shaded.

Standard: Renders with standard shading and lighting. Select this option for a regular rounded 3D look.

Toon: Renders objects with a 2D look. Shadows and shading are drawn with the color scheme defined with the gradient below. Only the first light in the scene is used. The object's distance from the light will not affect its shading. However the light's color and intensity will influence the color of the surface. If the light is white and the intensity is 100% then the surface will shade the exact color of the gradient. Shadows darken the resulting color.

Toon with multiple lights: Similar to the Toon option, except that all lights in the scene are used. For each light, the intensity is looked up in the gradient, then the colors are mixed. Shadows darken the resulting color.

Toon with Falloff: Similar to the Toon option, except that objects that are farther away from light sources will be rendered darker. And all lights are used. For each light, the intensity is looked up in the gradient, then the colors are mixed. Shadows darken the resulting color.

Toon Gradient Only: Similar to the Toon With Falloff option, except that all of the lights' contributions are done first (including shadows), then the resulting intensity is looked up in the gradient. This way you are always guaranteed that the final pixel will have come from somewhere in the gradient. Again, all lights are used.

Gradient

Visible: Sometimes. See Toon Gradient Property.

Field Render

Default: OFF. This option is specific to rendering for television display. Televisions actually draw a frame with two passes of alternating lines. By interpolating motion between these two fields you can create the illusion of animation that run at 60 frames per second, instead of NTSC's 30 frames per second.

Field Order

Visible: Sometimes, Default: Odd. The video device that you are planning to use your field rendered animation on will have a field it uses first that will be even or odd. This varies among devices. Check your video device manual and choose the appropriate option before rendering the animation.

Odd: This will make the first frame have the second line first.

Even: This will make the first frame have the first line first.

Stereo

Visible: Sometimes, Default: OFF. Turns on or off stereo rendering. See also Stereo Tutorials

Plugin Shaders

Visible: Sometimes, Default: OFF. Allows the rendering calculations to be overridden by plugins. Diffuse Render Shader

Visible: Sometimes, Read-Only on Instance. Overrides the standard shading calculations with a plugin's.

Specular Render Shader

Visible: Sometimes, Read-Only on Instance. Overrides the standard

specular calculations with a plugin's

Ambiance Render Shader

Visible: Sometimes, Read-Only on Instance. Overrides the standard ambience calculations with a plugin's. . See also Ambiance Shader

Polys Per Patch

Visible: Sometimes, Default: 4. Selects the number of polygons per patch for real time renders (non final shaded renders).

1: One polygon per patch.

4: Four polygons per patch

16: 16 polygons per patch

Adaptive: A variable amount of polygons per patch. Depends on curvature, and zoom.

Show Back Facing Polys

Visible: Sometimes, Default: ON. With this option on real-time renders draw polygons even if their normals face away.

Show Decals

Visible: Sometimes, Default: ON. Allows decals to be turned off in real-time renders.

Show CPs

Visible: Sometimes, Default: OFF. Selecting this option will cause the control points to be drawn over the wireframe representation of the model. This is useful for previewing Muscle animations. For real-time renders.

Show Bones

Visible: Sometimes, Default: OFF. Selecting this option will cause the bones to be drawn over the rendered image. This is useful in previewing actions. For real-time renders.

Show Grid

Visible: Sometimes, Default: OFF. Allows the grid to be displayed in real-time renders.

Toon Gradient Property

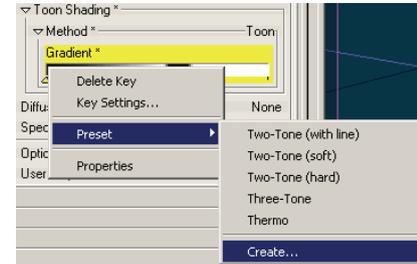


The Toon Gradient control can only be seen if the Color Method is set to "Toon" or "Toon with Falloff".

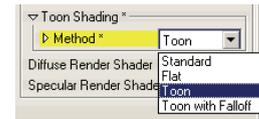


This property allows full control over the colors due to shading. The above example is of the Thermo preset. This example easily shows how the gradient affects the shading of the surface. The right side of the gradient or 100% defines the color of a fully lit surface. 0% defines the color of the surface that is completely in shadow. Click anywhere on the gradient control to add a new color key. To modify the keys color, right click (control click on the Mac) and pick [Key_Settings...]. If you create your own custom gradient and wish to save it as a preset, right click (control click on the Mac) and select [Preset][Create]. This will save your gradient preset in the "Gradient" folder where your Animation Master is installed, and every time you launch Animation Master your gradient will appear in the preset menu.

Toon Shading Presets



Right click (Control on a Mac) on a toon gradient control to pick a preset. If you create your own gradient, you may right click (Control click on the Mac) and select [Preset] [Create]. This will save your preset in the Gradient folder where your Animation Master is installed to, and it will also allow it to show up in the preset menu every time you launch Animation Master.



Presets are only available if the Toon Shading method is set to Toon or Toon with Falloff. The following are examples of the presets that ship by default with Animation Master.



Two -Tone (With Line)



Two-Tone (Soft)



Two-Tone (Hard)



Three-Tone



Thermo

Stereo

Stereo Menu

Select Relationship

Select this properties Relationship if any.

Edit Relationship

Brings this property's Relationship up in its own private editing window.

Set To Default Value

Set this property to its default value.

Not Set

Remove any local or current choreography drivers from this property and mark it as not set.

Use Cache's Value

Remove any local or current choreography action drivers off of this property and use the value from another action or the cache.

Constant

Set this property to be Constant.

Time Based

Set this property to be able to change over time.

Edit Expression

Online

Properties

Edits the selected object's properties.

Stereo Properties

Eye Spacing

Visible: Sometimes, Default: 7.62cm, Min: 0cm, Unit of Measurement
This value should be set to match the scale of your scene. If your scene is built at 1/2 scale, then this distance should be set to 1/2 the distance between the centers of your eyes. Some camera placements will need slightly different eye spacing. A good rule of thumb is that Eye Spacing should be about 1/30th of the distance from the camera to the closest object in the scene. The value is for the current frame. If you want it to remain constant, make sure you are at the beginning of the choreography.

Use Frame Distance

Visible: Sometimes, Default: ON. When Frame Distance is turned on, it moves the camera to the side by 1/2 the Eye Spacing, and then temporarily changes the camera's focal length to ensure that the original camera's Camera Cone is in view at the Frame Distance, then bound renders the portion of the each eye's view that is inside of the original camera's view at the Frame Distance.

Frame Distance

Visible: Sometimes, Default: 300cm, Min: 0cm, Unit of Measurement

Frame Distance determines how depth of the scene appears in relation to the viewing medium. A good rule of thumb is to set it just in front of the object closest to the camera. This ensures that everything is behind the viewing medium.

Stereo Type

Visible: Sometimes, Default: Free Viewing. Sets the stereo viewing style. Free Viewing: Choose this setting to view your stereo pairs side by side with out glasses. This method represents colors the best. Though it takes practice! When rendering to file, the images will be saved with “-L” before the frame number for the left image, and “-R” for the right image. You can choose whether you want the viewing style to be “Parallel” or “Cross-eyed” under the “Left Right Pair Style” section on the Stereo panel of the Render to File dialog. (This is only for viewing in the Render to File dialog. When saved, the -L image is always the left eye.) Note stereo pairs can only be saved if your output type is a still image such as “.TGA” (Targa) or JPG format.

Anaglyph: Choose this setting to view with colored glasses. An anaglyph is a single image that has some colors from one eye's view, and some colors from the other eye's view depending on the type of glasses you use. This method works well, except for with some color/glasses combinations.

Interlaced: Choose this setting to view with shutter glasses. This method works best with a high refresh rate, but can be expensive.

Free Viewing Type

Visible: Sometimes, Default: Parallel. Sets the free viewing style.

Parallel: With this viewing style your eyes look at the image in front of it.

Cross-eyed: With this viewing style your eyes look at the image in front of the other eye.

Anaglyph Type

Visible: Sometimes, Default: Pure. Sets the anaglyph style

Pure: This is the most accurate stereographically, but has a magenta tint. Grey: This option removes the magenta tint, but is less accurate stereographically.

Color: This option matches the colors as much as possible (not always well)

Glasses L/R

Visible: Sometimes, Default: Red/Blue. Sets the style of glasses you are rendering for.

Red/Blue: Sets the anaglyph style to left eye red, right eye blue.

Blue/Red: Sets the anaglyph style to left eye blue, right eye red.

Red/Green: Sets the anaglyph style to left eye red, right eye green.

Green/Red: Sets the anaglyph style to left eye green, right eye red

Interlace Order

Visible: Sometimes, Default: Left. Sets the order of the interlaced stereo rendering.

Left: Sets the first interlaced line to be from the left eye's view.

Right: Sets the first interlaced line to be from the Right eye's view.

Camera Rotoscopes

A Camera Rotoscope is an image or animation that is visible in the camera's view. This rotoscope will be rendered when you render frames from the camera's view. This is used when you are rendering CG characters or objects over a live action background. You can also use this feature for adding a sky or star field to your animations. Since this rotoscope is locked to the camera, you probably won't want to move the camera in the shot, since it will usually ruin the illusion.

Camera Rotoscope Menu

Delete

Rename

Jump To Image

View

Properties

Camera Rotoscope Properties

To allow the rotoscope translation and scale to work seamless when rendered at different resolutions, the values must be stored as a percentage of the width, and height rather than discreet pixel locations. A translation of (0,0) will center the rotoscope dead center in the camera's viewable area, whereas a value of (50,50) would put the rotoscope in the upper right hand corner. A scale of (100,100) would make the rotoscope fill the entire camera's viewable, whereas a scale of (50,50) would make the rotoscope half the size of the camera's viewable area.

Shortcut To

This list allows you to change the image associated with the rotoscope.

Frame

The frame of the animated image.

Transparency

A percentage value between 0 and 100 depicting how transparent the image is.

Visible

If checked, the rotoscope is visible in the view.

Pickable

If checked the rotoscope can be selected in the interface. This is handy when you do not want to accidentally select the rotoscope.

Render on top

Normally, rotoscope images go behind all of the models in a rendering,

however, the “Render on top” option on the Rotoscope Properties panel causes the rotoscope to go in front of everything. The image used for a rotoscope that has this option set must have some Background color or some transparency in the alpha channel, otherwise it will cover everything else up completely. Front rotoscopes are useful for simulating control panels, window frames, or a hand holding a gun, like in a shoot ‘em up.

Repeat

How many times the image will repeat across the rotoscope.

Seamless:

This will flip the image with each repeat. This will allow common edges to but up next to one another and appear to be seamless.

Lights

To begin with, rightly or wrongly, this generation of computer image critics expect to see complex images that seem to be photographs of physical models, with the detailed glints, shading, and shadows that suggest reality. Human vision gets its depth cues via changes in contrast. Contrast is the difference between the intensities of two colors (the gray value), but your eye primarily perceives only contrasts that double the previous intensity. Ambiance is the base level of intensity an object starts with to simulate the inter-reflection of light all around us in complex environments (called “radiosity”). Different levels of ambiance profoundly affect the contrast of the rendered scene because the first perceived depth cue will be double the ambiance value. Outdoor scenes, presumably lit by the sun with lots of reflection off of the ground, have high ambiance values, and appear flatter. Indoor scenes, with their lack of brilliant light, usually start with low or no ambiance values, and appear rounder.

Multiple specular highlights are of paramount importance for providing visual clues that an object is round. Use “specular” only lights to achieve this effect at virtually no cost to rendering.

Indoor scenes lit with one light appear round because the shading on a ball will vary from no light to full intensity, but one-light scenes are not common except in your bedroom at night, so you usually have two or three lights. Light is additive, so the intensities and falloffs of all lights must be adjusted so that good contrast remains. The “key” light can still have an intensity of 100-120, but it needs to have lots of falloff so that only its intended subjects receives full intensity. Values of 30-40 are common for a “fill” light, once again adjusting falloff to encompass only appropriate subjects. “Rim” lights (coming from behind the subject) usually range from 60-70. Light color is also a visual cue: indoor lights are “warm” – red tinted, while outdoor lights are “cold” – blue tinted.

Indoor lights should be localized sources, like bulbs or kliegs. Outdoor light is quite uniform, like a sun.

Klieg lights are especially good for fill lights since they can be precisely controlled as to what they hit.

Lights are objects that act very much like lights do in the real world. They can be used to illuminate your scene in any way you want. You can create a daytime scene, nighttime scene, or use theatrical lighting techniques. Lights can be moved and change over time. And since they are objects, they can be built in to models, like the headlights of a car.

Deep Shadow Buffers

Z-Buffer shadows with “softness” are much faster with “deep” shadow buffers because the blur is pre-calculated, (however, they require substantially more memory). There may be a pause the first time a particular deepness is computed, (very much like MIP-mapped textures). Z-Buffer shadows are made “deep” automatically.

Penumbral Shadows



Klieg lights can cast penumbral shadows (shadows that get softer due to the width of the light). These new shadows are actually an average of nine shadow maps, but the object’s surface is also lighted nine times, giving a more globally illuminated look. In combination with a big light “Width”

(50cm), a low shadow "Darkness" value (50%), and a low shadow "Softness" value (10%), lighting can look very soft indeed. Turn the "Penumbra" option "ON" in the "Options/Cast Shadows" properties of the light (the light must be a Klieg). Also, Raytrace shadows now have the "Darkness" setting.

Naming Lights

To name a light, click the light's name in the Project Workspace, then click to obtain an edit field (or press the <F2> key on the keyboard).

Light Instance Menu

Delete

Removes the selected object from the project.

Rename

Rename the selected object

Select Cache ()

Highlights the object that this shortcut is to.

New

Choreography Action

Creates a new Choreography Action.

Rotoscope...

Imports an image file to be used as a rotoscope.

New Constraint

Aim At

Creates a new Aim At Constraint for this object.

Kinematic

Creates a new Kinematic Constraint for this object.

Path

Creates a new Path Constraint for this object.

Translate To

Creates a new Translate To Constraint for this object.

Orient Like

Creates a new Orient Like Constraint for this object.

Roll Like

Creates a new Roll Like Constraint for this object.

Aim Roll At

Creates a new Aim Roll At Constraint for this object.

Spherical Limits

Creates a new Spherical Limits Constraint for this object.

Euler Limits

Creates a new Euler Limits Constraint for this object.

Translate Limits

Creates a new Translate Limits Constraint for this object.

Surface

Creates a new Surface Constraint for this object.

Scale Like

Creates a new Scale Like Constraint for this object.

Aim Like Two

Creates a new Aim Like Two Constraint for this object.

Aim Roll Like Two

Creates a new Aim Roll Like Two Constraint for this object.

Bone To Spring

Creates a new Bone To Spring Constraint for this object.

Import Action

Imports a saved action and adds it to the selected object.

Bake All Actions...

Bake All Actions into Chor Action

This feature collects all of the actions, reusable or not, on an object and bakes them into just one simple choreography action. This choreography action can be saved out by right-clicking (Control-click on a Mac) a choreography name in the Project Workspace tree (this will save actions for all objects in the choreography), a model shortcut in a choreography, or within an object's manipulator in a choreography window. Then choose "Export Action As..." from the menu.

Render Mode

Hidden

Hidden

Wireframe

Wireframe

Shaded

Shaded Mode for the Selected Model

Shaded Wireframe

Shaded && Wireframe

Pickable

Object Pickable/Unpickable

Add Turbulence

Adds Turbulence to a volumetric light, giving it a more realistic look. Choose the type of turbulence you desire from the list of plugins installed. To remove turbulence from a light, click the Turbulence icon under the Light icon in the Project Workspace and press [Delete] on the keyboard.

Properties

Edits the selected object's properties.

Light Properties

Bone Position

Visible: Sometimes. Position of bone with out motion.

Transform

Read-Only on Cache. Stores any motion for this bone, includes translate, scale and rotate. and cannot be set on the cache, but is visible so that relationships can be created that are controlled by it.

Roll-Method

Advanced, Default: Y-Poles-Singularity. Default Roll Behavior There are several situations in which a bone is given clues about where to aim, but no further information about what should happen with the roll handle. In a sense only two of the three degrees of freedom are clearly defined: an Aim At constraint, inverse kinematics, and grabbing the end of the simple bone manipulator are a few examples. When this occurs, a bone's roll is determined by what is known as its "default roll behavior": it tells the bone how it should be rolled at any given aim direction, and is intended to be the best in most situations. Occasionally you may rotate a bone and find this default behavior undesirable. To remedy it, simultaneously press [Ctrl] key on the keyboard ([Cmd] key on the Mac) to automatically compute a minimal visible roll, or use the Rotate manipulator, which defines all three degrees of freedom, or choose a different roll method. These roll behaviors do not occur between keyframes when using quaternion interpolation.

Z-Singularity: This is the default roll method for all geometry driving bones, the default roll behavior is to try not to roll at all if in the same hemisphere as the bone was defined. This gives the bone a kind of "sweet spot" in the shape of a hemisphere around the bone's original creation direction.

Y-Poles-Singularity: This roll method is used for all bones except geometry driving bones, such as lights, cameras, nulls, forces or models. Its behavior is not to roll unless pointed in the same or opposite direction as the roll handle. This creates the behavior of a camera that is mounted above a basketball court. It always tries to keep the top of the players heads up in the frame of the camera. This is clearly defined everywhere except directly underneath (or on top) of the camera. That is why it is called Y-Poles. This behavior is good for lights and cameras.

Roll-History: This method determines the roll direction based on where the roll was before the bone was rotated. It essentially uses the history of the roll handle to determine where it should be. One downfall of this method is that given a certain direction for the bone, there is no definitive location that the roll handle will be. It depends on where it was before. However this technique has no singularities or odd rotating gimbal locations.

Euler Order

Advanced, Default: Automatic. This property controls the order which is used to convert a rotation into three euler angles (x,y,z). This property will

rarely ever need to be changed from its default. The euler angles are used for 1-D smartskin, roll-like constraints, as well as expressions based on just one of the three components of a rotation. Animation Master internally stores and calculates rotations as quaternions. However if the angle came from a Euler rotation driver, it keeps the euler angles as well. It stores these unconverted raw euler angles for future use, and marks a flag that says the euler angles are valid. This serves two purposes; one is speed, why convert to an euler again, if we already have that answer. The second is to preserve large euler angles, so that they may be scaled up or down accurately by roll-like constraints or expressions. Many operations in AM can mess up this pre-computed euler angle state though. Any other kind of rotate driver, like a quaternion driver, or a vector driver, as well as all types of rotate constraints will store a quaternion, and trump the carefully stored eulers. Even an additional Euler driver can mess it up, if the two are blended with add, since it is the quaternions which are added. The result is converted back to euler when needed. Rotation compensation applied by actions used on models whose bones are oriented differently than the one for which it was created will also invalidate the euler angles. When any of these invalidations occur, the euler angles are not available, so new euler angles are computed from the quaternion. This property controls how those euler angles are computed. The default is automatic. Occasionally this automatic behavior produces discontinuities in the resulting euler angle when the decision switches states. In this case, choosing one of the fixed euler orders is recommended.

YXZ: This is the same order used by the Euler Rotation Driver. It is the primary order used by Animation Master. Z rotations are king, and can range from -180 to 180 degrees. X rotations are next and can also range from -180 to 180 degrees. Y is last, and can only range from 0 to 180 degrees.

XYZ: This is an alternative order, and usually would only be desired when the returned Y rotation should have a broader range. Z rotations are still king, and can range from -180 to 180 degrees. Y rotations are next and can also range from -180 to 180 degrees. In this case X is last, and can only range from 0 to 180 degrees.

Automatic: This order analyzes the rotation, in an attempt to determine which angle rotates more X or Y. It then chooses the YXZ or XYZ order depending on the result. This is the default way which Animation Master uses to determine Euler angles.

Attached to parent

Visible: Sometimes, Default: OFF. Set if this bone should form an IK chain with its parent.

Hidden

Visible: Sometimes, Default: OFF. Hides this bone.

Manipulator Options

Visible: Sometimes, Advanced. See Manipulator Options property.

Lock IK

Visible: Sometimes, Default: OFF. Locks the joint so Inverse Kinematic chain is broken in half at this bone's pivot.

Shortcut to

Visible: Sometimes. Sets which object under the Project's Objects folder this object is an instance of. This can be useful when animation has been made for an object in a choreography, but now you need to switch the object to a different one. If you were to delete the instance and put the new one in the choreography, all the animation would be lost. Switching which object the shortcut is an instance of using this property saves you from having to redo all that work. This can also be useful when using a low-density version of a model during the animation phase, and switching to the final high-density version once it is ready to render. This low-res version of a model is often called a "proxy model". You will only find this property on instances.

Active

Visible: Instance Only, Default: ON. This option is for objects that need to appear and/or disappear during the course of an animation. Inactive objects are not seen in real time or final renderings. You can use this to speed up scenes when this object is off screen, or temporarily not needed.

Ignore Fog

Default: OFF. Turn this on if fog shouldn't be applied to this object.

Animate Mode

Default: ON. This property specifies whether keyframes should be created or not when the object is manipulated.

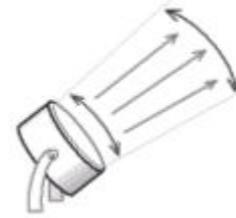
Type

Visible: Cache Only, Default: Bulb. There are 3 types of lights to choose from.

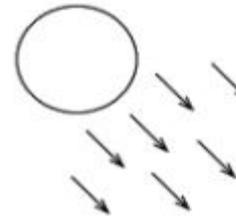
Bulb: Bulbs are omnidirectional, meaning they cast light rays out as a sphere. A Bulb's intensity starts to decrease, or fall-off, at the "Dist to Fall-off".



Klieg: Klieg lights are omnidirectional but the cone defined by the width at the small end, and the Focal Length at the large end circumscribes their area of illumination. "Dist to Fall-off" defines where the light will begin fall-off. There is also a full intensity inner cone, outside of which is called "softness" where the light intensity diminishes outward towards the cone angle. Klieg lights are the only light type that has an option for using Shadow Maps (soft shadows), which speed up rendering, and provide softer looking shadows.



Sun: Suns are unidirectional in the direction of the Sun is pointing. Changes in Width, Focal length, and Distance have no effect on Suns. A Sun's intensity remains constant; meaning there is no fall-off.



Width

Visible: Sometimes, Default: 10cm, Min: 0cm, Unit of Measurement The width of the truncated top of a cone, "Width" also affects soft shadows, larger widths making larger penumbras.

Width Softness

Visible: Sometimes, Default: 50%, Min: 0%, Max: 100%, Percentage A percentage that controls how much of the total cone angle softens.

Fall-Off

Visible: Sometimes, Default: 500cm, Min: 0cm, Unit of Measurement The light intensity diminishes the farther away it is from the source; this is

called fall-off. The Distance controls the distance from the light at which this begins to occur. Objects closer to the light than this distance receive the full intensity of light. As objects get farther than this distance, less and less light falls on them.

Fall-Off Softness

Visible: Sometimes, Default: 80%, Min: 0%, Max: 100%, Percentage
This setting is only used when a object is set to be volumetric. Changes how smoothly a light falls off to the background color. A value of 0 causes an abrupt edge where the object falls off to the background color. Higher values soften the edge caused by the falloff.

Cone Angle

Visible: Sometimes, Default: 60°, Min: 0°, Max: 180°, Angle. Defines the angle of a cone shaped object.

Color

Sets the color of the light.

Intensity

Default: 100%, Percentage. This sets the brightness of the light.

Attenuation

Visible: Sometimes, Default: 100%, Min: 0%, Max: 100%, Percentage
Controls how the light falls off with distance. 0% attenuation = Constant lighting with no falloff, 50% attenuation = (Linear Fall off) the light falls off proportionally to the distance to the light, 100% attenuation = (Quadratic Fall off) the light falls off proportionally to the square of the distance to the light.

Options

Contains options for how the light affects renderings.

Diffuse

Default: ON. Select this option if you want this light to illuminate objects in the scene. Deselect this option when you just want to use the light to affect specular or shadows, or if you only want to use it as a volumetric or lens flare effect.

Specularity

Default: ON. Select this option if you want this light to create specular highlights on objects in the scene.

Volumetric

Visible: Sometimes, Default: OFF. Toggles whether the selected light is volumetric or not. Volumetric lights are a popular, often seen effect of visible light beams. Volumetric lights are affected by the light's color, width, and intensity all of which can change over time.

Quality

Default: 200%, Min: 1%, Percentage. Increase this value to decrease banding. Quality values that are too low will fail to make the effect visible. Note that higher values will increase render time.

Brightness

Default: 30%, Min: 0%, Max: 100%, Percentage. Brightness values range from 0% on up. Higher values make the effect more visible.

Contrast

Default: 50%, Min: 0%, Max: 100%, Percentage. When turbulence is used with volumetric effects, contrast values more than "50%" will make the tendrils more pronounced. Contrast values less than "50%" will de-emphasize the tendrils.

Cast Shadows

Visible: Sometimes, Default: ON. Toggles whether the selected light casts shadows or not. Shadows are important for anchoring objects in place and keeping them from appearing as if they are floating. Many shadow casting lights do not add enough detail to a scene to justify their computation time. Normally, you only need one or two shadow casting lights.

Type

Visible: Sometimes, Default: Raytraced. Shadows can be either Raytraced or Z-Buffered.

Raytraced: Raytraced Shadows take longer to render, but work with all kinds of lights and are less prone to visual anomalies. Raytrace shadows exhibit falloff, calculated as the ratio of the distance to the shadowing object from the shadowed surface times the light's width divided by the distance to the light. This falloff is automatic. If you want no falloff for a raytraced shadow, set the light's "Width" to "0". The effect of this is that the shadow gets lighter as it gets further from the object.

Z-Buffered: If the selected light source is a Klieg type light, the "Z-Buffered Soft Shadows" option will become available.

The way z-buffer shadows work is the computer automatically renders the choreography from the light's point of view, then as the camera renders the same scene, it compares the shadow's depth against the camera's depth on each pixel to determine which of the two is closer - if the shadow buffer depth is closer, then the camera sees a shadow. Though this process sounds simple, in actuality it causes many practical problems. For one, only klieg lights can create shadow buffers because they are the only kind of light that operates similar to a camera. Second, the resolution that the light renders at had better be close to the camera's resolution or discrepancies start occurring - this precludes using a single klieg light to cover a whole scene because shadows created by such a wide, all-encompassing angle often are little more than tiny spots and the camera cannot accurately compare depths.

Z-buffer shadows also have the peculiar habit of causing visible artifacts, called "self-shadowing" (making the shadows more blurry makes the self-shadowing less objectionable). Also, z-buffer shadows tend to cut-off abruptly when the objects they are rendering across the boundaries of the

light's visibility rectangle.

Z-buffer shadows do not recognize Boolean operations, and transparent objects are only approximated.

If you want to use z-buffer shadows you must become an expert in overcoming their limitations, sometimes on a frame-by-frame basis. For all of their disadvantages, z-buffer shadows are usually very fast and look good.

Rays Cast

Visible: Sometimes, Default: 1, Min: 1, Max: 100. "Rays cast" is used to add penumbras to raytrace shadows "1". Depending how large the penumbra of the shadow will be (the soft region caused by the light's width and distance from the object), the "Rays cast" setting may have to be as high as "32". For speed, you will have to experiment to find the minimum number of rays cast - too few rays will cause the shadow to appear grainy. Klieg lights can use the "Penumbra" light setting (so leave "Rays cast" set to "1").

Bias

Visible: Sometimes, Advanced, Default: 0.05cm, Min: 0cm, Unit of Measurement. Scenes using geometry that represent very large sizes may experience math precision errors during rendering (the visual symptom can be unwanted speckles in raytraced shadows). It may be necessary to increase the Shadow Bias Value to reduce the ray intersection precision. Values as high as 100 may be necessary.

Softness

Visible: Sometimes, Default: 25%, Min: 0%, Max: 100%, Percentage. This slider controls how soft Z-Buffered shadows will look.

Darkness

Visible: Sometimes, Default: 80%, Min: 0%, Max: 100%, Percentage. The darkness of all shadows. Smaller values make the shadow appear washed-out, as if light is coming from many directions.

Tint

Visible: Sometimes. Raytrace shadows are colored if they result from colored transparent objects, but are black otherwise. Zbuffer shadows, are created via another technique which allows you to specify a color that may have no connection with any object or light in the scene. For example, bright blue shadows may be cast by a white light. Colored shadows used in this manner can give the rendering a "warm" feeling (dark autumn-colored shadows of orange and red), or stylized for art's sake, and colored shadows are very common in "anime" style rendering with toon lines and toon shading.

Use this color chip to set the shadow color. This color is mixed with the underlying color depending on the shadow Darkness.

Map Resolution

Visible: Sometimes, Default: 512x512. Selects the resolution of the shadow

map. Smaller sizes are faster. Larger sizes are only needed if you see blocky artifacts the shadows.

Bias

Visible: Sometimes, Advanced, Default: 1cm, Min: 0cm, Unit of Measurement

Increase the Shadow Bias Value if you are seeing banding in the z-buffered shadows on objects. Try to keep it between 2 and 4.

Scenes that use geometry that represent very large sizes may experience math precision errors during rendering (the visual symptom can be unwanted speckles in raytraced shadows). It may be necessary to increase the Shadow Bias Value to reduce the ray intersection precision. Values as high as 100 may be necessary.

Penumbra

Visible: Sometimes, Default: OFF. Shadows will have penumbras, lightening as they get further away (but the render time is significantly increased.) Object shading will also be affected. Light width and distance away controls the effect.

Lens Flare

Read-Only on Instance, Default: OFF. See Lens Flares.

Light Default Models

Visible: Instance Only, Default: ON. "ON" means that this light will light models with out light lists. "OFF" means that only models with this light in its light list will be light by this light. . See also Light Lists

File Info

Visible: Cache Only. See File Info property.

Light Gels

The light through a rain splattered window projects ghostly images of raindrops and rivulets into a room; light through stained glass carries with it the vibrancy of the colored panes; and the underwater caustics due to rippling waves overhead in a pool scene are easily simulated with a light gel.

To add an image to a light, simply right-click (Control-click on a Mac) in a Choreography window, or on the "Shortcut to" Light item under the choreography in the "Choreographies" section of the Project Workspace, and pick [New][Rotoscope]. You will then have the opportunity to select the image you wish to use.

If a gel is on the light, the color of the volumetric is likewise affected. This means that if you have a scene with a stained-glass window, you could select the stained-glass image as a light gel and the volumetric shafts will show the colors of the gel.

Materials can also be used as light gels. The material colors will be projected onto everything the light touches, and will color the light's

volumetric effect if it has one. Dark colors will block the light. To apply a material to a light, simply select the material you want under the “Materials” folder in the Project Workspace, then drag and drop it onto the light’s icon in a choreography.

Light Containers

This container includes all of the light objects used for rendering this model besides the lights set to light all models.

Light Container Menu

Properties Edits the selected object’s properties.

Forces

Force objects are used for influencing hair, cloth, particles, and dynamic simulations. There are three kinds of forces: Fans (which can blow or suck), Friction (which can slow down or speed up), and Vortexes (which create tornadoes in either the clockwise or counter-clockwise direction). The sign of the force’s magnitude determines the direction. Forces can include turbulence (simply set a force’s magnitude to “0” if you only want turbulence).

To add a Force Object to a choreography, right-click (Control-click on a Mac) the Choreography icon in the Project Workspace tree and pick [New][Force], (the default spherical force object will appear in the Choreography window). When the object is selected, changes to the shape and magnitude of the force can be made in the force’s properties.

Force Instance Menu

Delete

Removes the selected object from the project.

Rename

Rename the selected object

Select Cache ()

Highlights the object that this shortcut is to.

New Constraint

Aim At

Creates a new Aim At Constraint for this object.

Kinematic

Creates a new Kinematic Constraint for this object.

Path

Creates a new Path Constraint for this object.

Translate To

Creates a new Translate To Constraint for this object.

Orient Like

Creates a new Orient Like Constraint for this object.

Roll Like

Creates a new Roll Like Constraint for this object.

Aim Roll At

Creates a new Aim Roll At Constraint for this object.

Spherical Limits

Creates a new Spherical Limits Constraint for this object.

Euler Limits

Creates a new Euler Limits Constraint for this object.

Translate Limits

Creates a new Translate Limits Constraint for this object.

Surface

Creates a new Surface Constraint for this object.

Scale Like

Creates a new Scale Like Constraint for this object.

Aim Like Two

Creates a new Aim Like Two Constraint for this object.

Aim Roll Like Two

Creates a new Aim Roll Like Two Constraint for this object.

Bone To Spring

Creates a new Bone To Spring Constraint for this object.

Import Action

Imports a saved action and adds it to the selected object.

Add Turbulence

Adds Turbulence to a volumetric light, giving it a more realistic look. Choose the type of turbulence you desire from the list of plugins installed. To remove turbulence from a light, click the Turbulence icon under the Light icon in the Project Workspace and press [Delete] on the keyboard.

Properties

Edits the selected object’s properties.

Force Properties

Bone Position

Visible: Sometimes. Position of bone with out motion. See Bone Position properties.

Transform

Read-Only on Cache. Stores any motion for this bone, includes translate, scale and rotate. and cannot be set on the cache, but is visible so that relationships can be created that are controlled by it.

Roll-Method

Advanced, Default: Y-Poles-Singularity. Default Roll Behavior There are several situations in which a bone is given clues about where to aim, but no

further information about what should happen with the roll handle. In a sense only two of the three degrees of freedom are clearly defined: an Aim At constraint, inverse kinematics, and grabbing the end of the simple bone manipulator are a few examples. When this occurs, a bone's roll is determined by what is known as its "default roll behavior": it tells the bone how it should be rolled at any given aim direction, and is intended to be the best in most situations. Occasionally you may rotate a bone and find this default behavior undesirable. To remedy it, simultaneously press [Ctrl] key on the keyboard ([Cmd] key on the Mac) to automatically compute a minimal visible roll, or use the Rotate manipulator, which defines all three degrees of freedom, or choose a different roll method. These roll behaviors do not occur between keyframes when using quaternion interpolation.

Z-Singularity: This is the default roll method for all geometry driving bones, the default roll behavior is to try not to roll at all if in the same hemisphere as the bone was defined. This gives the bone a kind of "sweet spot " in the shape of a hemisphere around the bone's original creation direction.

Y-Poles-Singularity: This roll method is used for all bones except geometry driving bones, such as lights, cameras, nulls, forces or models. Its behavior is not to roll unless pointed in the same or opposite direction as the roll handle. This creates the behavior of a camera that is mounted above a basketball court. It always tries to keep the top of the players heads up in the frame of the camera. This is clearly defined everywhere except directly underneath (or on top) of the camera. That is why it is called Y-Poles. This behavior is good for lights and cameras.

Roll-History: This method determines the roll direction based on where the roll was before the bone was rotated. It essentially uses the history of the roll handle to determine where it should be. One downfall of this method is that given a certain direction for the bone, there is no definitive location that the roll handle will be. It depends on where it was before. However this technique has no singularities or odd rotating gimbal locations.

Euler Order

Advanced, Default: Automatic. This property controls the order which is used to convert a rotation into three euler angles (x,y,z). This property will rarely ever need to be changed from its default. The euler angles are used for 1-D smartskin, roll-like constraints, as well as expressions based on just one of the three components of a rotation. Animation Master internally stores and calculates rotations as quaternions. However if the angle came from a Euler rotation driver, it keeps the euler angles as well. It stores these unconverted raw euler angles for future use, and marks a flag that says the euler angles are valid. This serves two purposes; one is speed, why convert to an euler again, if we already have that answer. The second is to preserve large euler angles, so that they may be scaled up or down accurately by roll-like constraints or expressions. Many operations in AM can mess up this

pre-computed euler angle state though. Any other kind of rotate driver, like a quaternion driver, or a vector driver, as well as all types of rotate constraints will store a quaternion, and trump the carefully stored eulers. Even an additional Euler driver can mess it up, if the two are blended with add, since it is the quaternions which are added. The result is converted back to euler when needed. Rotation compensation applied by actions used on models whose bones are oriented differently than the one for which it was created will also invalidate the euler angles. When any of these invalidations occur, the euler angles are not available, so new euler angles are computed from the quaternion. This property controls how those euler angles are computed. The default is automatic. Occasionally this automatic behavior produces discontinuities in the resulting euler angle when the decision switches states. In this case, choosing one of the fixed euler orders is recommended.

YXZ: This is the same order used by the Euler Rotation Driver. It is the primary order used by Animation Master. Z rotations are king, and can range from -180 to 180 degrees. X rotations are next and can also range from -180 to 180 degrees. Y is last, and can only range from 0 to 180 degrees.

XYZ: This is an alternative order, and usually would only be desired when the returned Y rotation should have a broader range. Z rotations are still king, and can range from -180 to 180 degrees. Y rotations are next and can also range from -180 to 180 degrees. In this case X is last, and can only range from 0 to 180 degrees.

Automatic: This order analyzes the rotation, in an attempt to determine which angle rotates more X or Y. It then chooses the YXZ or XYZ order depending on the result. This is the default way which Animation Master uses to determine Euler angles.

Attached to parent

Visible: Sometimes, Default: OFF. Set if this bone should form an IK chain with its parent.

Hidden

Visible: Sometimes, Default: OFF. Hides this bone.

Manipulator Options

Visible: Sometimes, Advanced. See Manipulator Options property.

Lock IK

Visible: Sometimes, Default: OFF. Locks the joint so Inverse Kinematic chain is broken in half at this bone's pivot.

Shortcut to

Visible: Sometimes. Sets which object under the Project's Objects folder this object is an instance of. This can be useful when animation has been made for an object in a choreography, but now you need to switch the object to a

different one. If you were to delete the instance and put the new one in the choreography, all the animation would be lost. Switching which object the shortcut is an instance of using this property saves you from having to redo all that work. This can also be useful when using a low-density version of a model during the animation phase, and switching to the final high-density version once it is ready to render. This low-res version of a model is often called a "proxy model". You will only find this property on instances.

Active

Visible: Instance Only, Default: ON. This option is for objects that need to appear and/or disappear during the course of an animation. Inactive objects are not seen in real-time or final renderings. You can use this to speed up scenes when this object is off screen, or temporarily not needed.

Ignore Fog

Default: OFF. Turn this on if fog shouldn't be applied to this object.

Animate Mode

Default: ON. This property specifies whether keyframes should be created or not when the object is manipulated.

Type

Visible: Cache Only, Default: Cone. Sets the influence shape of the Force to one of the following: Sphere, Cone, Cylinder, or Box.

Width

Visible: Sometimes, Default: 5cm, Min: 0cm, Unit of Measurement
Sets the width of the object.

Width Softness

Visible: Sometimes, Default: 50%, Min: 0%, Max: 100%, Percentage
A percentage that controls how much of the total cone angle softens.

Fall-Off

Visible: Sometimes, Default: 50cm, Min: 0cm, Unit of Measurement
Controls how far away from the objects origin the fall-off occurs.

Fall-Off Softness

Visible: Sometimes, Default: 80%, Min: 0%, Max: 100%, Percentage
This setting is only used when a object is set to be volumetric. Changes how smoothly a light falls off to the background color. A value of 0 causes an abrupt edge where the object falls off to the background color. Higher values soften the edge caused by the falloff.

Cone Angle

Visible: Sometimes, Default: 60°, Min: 0°, Max: 180°, Angle
Defines the angle of a cone shaped object.

Magnitude

Default: 100%, Percentage. This is the amount of the force's influence. A positive number will push, and a negative number will pull. Set the Magnitude to 0 if you just want the turbulence to have an effect.

Kind

Visible: Cache Only, Default: Fan. There are three kinds of forces: Fans, Friction, and Vortexes. Fans can blow or suck. Friction can speed up or slow down. Vortexes can create tornados in either the clockwise or counter-clockwise direction.

Fan: Select this kind of force for a force that blows (positive Magnitude) or sucks (negative Magnitude).

Vortex: Select this kind of force to create tornados in either clockwise (positive Magnitude) or counter-clockwise (negative Magnitude).

Friction: Select this kind of force to slow down (positive Magnitude) or speed up (negative influence) objects in its influence region.

Nulls

Nulls are non-rendering objects used in constraint setups or as action objects. Nulls can be added to objects, actions, and in choreographies. One common use is using a Null as an Aim At object for a constraint (e.g. aiming the character's eyes).

Null Object Instance Menu

Delete

Removes the selected object from the project.

Rename

Rename the selected object

Select Cache ()

Highlights the object that this shortcut is to.

New

Choreography Action

Creates a new Choreography Action.

New Constraint

Aim At

Creates a new Aim At Constraint for this object.

Kinematic

Creates a new Kinematic Constraint for this object.

Path

Creates a new Path Constraint for this object.

Translate To

Creates a new Translate To Constraint for this object.

Orient Like

Creates a new Orient Like Constraint for this object.

Roll Like

Creates a new Roll Like Constraint for this object.

Aim Roll At

Creates a new Aim Roll At Constraint for this object.

Spherical Limits

Creates a new Spherical Limits Constraint for this object.

Euler Limits

Creates a new Euler Limits Constraint for this object.

Translate Limits

Creates a new Translate Limits Constraint for this object.

Surface

Creates a new Surface Constraint for this object.

Scale Like

Creates a new Scale Like Constraint for this object.

Aim Like Two

Creates a new Aim Like Two Constraint for this object.

Aim Roll Like Two

Creates a new Aim Roll Like Two Constraint for this object.

Bone To Spring

Creates a new Bone To Spring Constraint for this object.

Rigid Body

Creates a new Rigid Body Constraint for this object.

Import Action

Imports a saved action and adds it to the selected object.

Properties

Edits the selected object's properties.

Null Object Properties

Bone Position

Visible: Sometimes. Position of bone with out motion. See Bone Position properties.

Transform

Read-Only on Cache. Stores any motion for this bone, includes translate, scale and rotate. and cannot be set on the cache, but is visible so that relationships can be created that are controlled by it.

Roll-Method

Advanced, Default: Y-Poles-Singularity. Default Roll Behavior There are several situations in which a bone is given clues about where to aim, but no further information about what should happen with the roll handle. In a sense only two of the three degrees of freedom are clearly defined: an Aim At constraint, inverse kinematics, and grabbing the end of the simple bone manipulator are a few examples. When this occurs, a bone's roll is determined by what is known as its "default roll behavior": it tells the bone how it should be rolled at any given aim direction, and is intended to be the best in most situations. Occasionally you may rotate a bone and find this default behavior undesirable. To remedy it, simultaneously press [Ctrl] key

on the keyboard ([Cmd] key on the Mac) to automatically compute a minimal visible roll, or use the Rotate manipulator, which defines all three degrees of freedom, or choose a different roll method. These roll behaviors do not occur between keyframes when using quaternion interpolation.

Z-Singularity: This is the default roll method for all geometry driving bones, the default roll behavior is to try not to roll at all if in the same hemisphere as the bone was defined. This gives the bone a kind of "sweet spot " in the shape of a hemisphere around the bone's original creation direction.

Y-Poles-Singularity: This roll method is used for all bones except geometry driving bones, such as lights, cameras, nulls, forces or models. Its behavior is not to roll unless pointed in the same or opposite direction as the roll handle. This creates the behavior of a camera that is mounted above a basketball court. It always tries to keep the top of the players heads up in the frame of the camera. This is clearly defined everywhere except directly underneath (or on top) of the camera. That is why it is called Y-Poles. This behavior is good for lights and cameras.

Roll-History: This method determines the roll direction based on where the roll was before the bone was rotated. It essentially uses the history of the roll handle to determine where it should be. One downfall of this method is that given a certain direction for the bone, there is no definitive location that the roll handle will be. It depends on where it was before. However this technique has no singularities or odd rotating gimbal locations.

Euler Order

Advanced, Default: Automatic. This property controls the order which is used to convert a rotation into three euler angles (x,y,z). This property will rarely ever need to be changed from its default. The euler angles are used for 1-D smartskin, roll-like constraints, as well as expressions based on just one of the three components of a rotation. Animation Master internally stores and calculates rotations as quaternions. However if the angle came from a Euler rotation driver, it keeps the euler angles as well. It stores these unconverted raw euler angles for future use, and marks a flag that says the euler angles are valid. This serves two purposes; one is speed, why convert to an euler again, if we already have that answer. The second is to preserve large euler angles, so that they may be scaled up or down accurately by roll-like constraints or expressions. Many operations in AM can mess up this pre-computed euler angle state though. Any other kind of rotate driver, like a quaternion driver, or a vector driver, as well as all types of rotate constraints will store a quaternion, and tromp the carefully stored eulers. Even an additional Euler driver can mess it up, if the two are blended with add, since it is the quaternions which are added. The result is converted back to euler when needed. Rotation compensation applied by actions used on models whose bones are oriented differently than the one for which it was created will also invalidate the euler angles. When any of these invalidations occur,

the euler angles are not available, so new euler angles are computed from the quaternion. This property controls how those euler angles are computed. The default is automatic. Occasionally this automatic behavior produces discontinuities in the resulting euler angle when the decision switches states. In this case, choosing one of the fixed euler orders is recommended.

XYZ: This is the same order used by the Euler Rotation Driver. It is the primary order used by Animation Master. Z rotations are king, and can range from -180 to 180 degrees. X rotations are next and can also range from -180 to 180 degrees. Y is last, and can only range from 0 to 180 degrees.

XYZ: This is an alternative order, and usually would only be desired when the returned Y rotation should have a broader range. Z rotations are still king, and can range from -180 to 180 degrees. Y rotations are next and can also range from -180 to 180 degrees. In this case X is last, and can only range from 0 to 180 degrees.

Automatic: This order analyzes the rotation, in an attempt to determine which angle rotates more X or Y. It then chooses the YXZ or XYZ order depending on the result. This is the default way which Animation Master uses to determine Euler angles.

Attached to parent

Visible: Sometimes, Default: OFF. Set if this bone should form an IK chain with its parent.

Hidden

Visible: Sometimes, Default: OFF. Hides this bone.

Manipulator Options

Visible: Sometimes, Advanced. See Manipulator Options property.

Lock IK

Visible: Sometimes, Default: OFF. Locks the joint so Inverse Kinematic chain is broken in half at this bone's pivot.

Shortcut to

Visible: Sometimes. Sets which object under the Project's Objects folder this object is an instance of. This can be useful when animation has been made for an object in a choreography, but now you need to switch the object to a different one. If you were to delete the instance and put the new one in the choreography, all the animation would be lost. Switching which object the shortcut is an instance of using this property saves you from having to redo all that work. This can also be useful when using a low-density version of a model during the animation phase, and switching to the final high-density version once it is ready to render. This low-res version of a model is often called a "proxy model". You will only find this property on instances.

Active

Visible: Instance Only, Default: ON. This option is for objects that need to

appear and/or disappear during the course of an animation. Inactive objects are not seen in real-time or final renderings. You can use this to speed up scenes when this object is off screen, or temporarily not needed.

Ignore Fog

Default: OFF. Turn this on if fog shouldn't be applied to this object.

Animate Mode

Default: ON. This property specifies whether keyframes should be created or not when the object is manipulated.

Plugin Properties

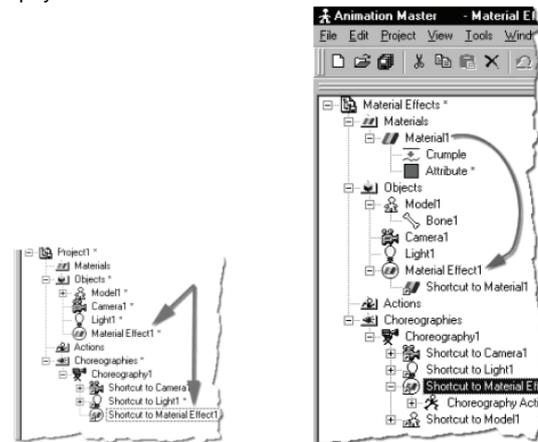
Custom properties added by plugins

Material Effectors

Material Effectors are essentially areas of influence, which when intersecting a model, causes their own characteristics to appear on the surface of the model.

To create a Material Effect, right-click (Control-click on a Mac) in a Choreography window, or on a Choreography icon in the "Choreographies" folder in the Project Workspace, and pick [New][Material Effect].

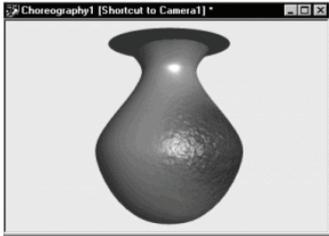
A Material Effect icon will appear in the "Objects" folder in the Project Workspace, and a "Shortcut to" Material Effect icon will appear the Choreography.



Now drag and drop any material to onto the Material Effect icon in the

"Objects" folder in the Project Workspace.

Any model that the Material Effector intersects in a choreography will gain the material applied to the Material Effect with the appropriate shape and falloff of the selected Influence shape.



Material Effects are powerful effects tools because they can be applied to a path and animated, (the material applied to the Material Effector can also be animated, allowing for even more flexibility). Often times, these types of effects are used to create a "burning hole" effect, where at first the material affects only a small portion of the model and grows outwards slowly.

Material Effect Instance Menu

Delete

Removes the selected object from the project.

Rename

Rename the selected object

Select Cache ()

Highlights the object that this shortcut is to.

New Constraint

Aim At

Creates a new Aim At Constraint for this object.

Kinematic

Creates a new Kinematic Constraint for this object.

Path

Creates a new Path Constraint for this object.

Translate To

Creates a new Translate To Constraint for this object.

Orient Like

Creates a new Orient Like Constraint for this object.

Roll Like

Creates a new Roll Like Constraint for this object.

Aim Roll At

Creates a new Aim Roll At Constraint for this object.

Spherical Limits

Creates a new Spherical Limits Constraint for this object.

Euler Limits

Creates a new Euler Limits Constraint for this object.

Translate Limits

Creates a new Translate Limits Constraint for this object.

Surface

Creates a new Surface Constraint for this object.

Scale Like

Creates a new Scale Like Constraint for this object.

Aim Like Two

Creates a new Aim Like Two Constraint for this object.

Aim Roll Like Two

Creates a new Aim Roll Like Two Constraint for this object.

Bone To Spring

Creates a new Bone To Spring Constraint for this object.

Import Action

Imports a saved action and adds it to the selected object.

Properties

Edits the selected object's properties.

Material Effect Properties

Bone Position

Visible: Sometimes. Position of bone with out motion. See Bone Position properties.

Transform

Read-Only on Cache. Stores any motion for this bone, includes translate, scale and rotate. and cannot be set on the cache, but is visible so that relationships can be created that are controlled by it.

Roll-Method

Advanced, Default: Y-Poles-Singularity. Default Roll Behavior There are several situations in which a bone is given clues about where to aim, but no further information about what should happen with the roll handle. In a sense only two of the three degrees of freedom are clearly defined: an Aim At constraint, inverse kinematics, and grabbing the end of the simple bone manipulator are a few examples. When this occurs, a bone's roll is determined by what is known as its "default roll behavior": it tells the bone how it should be rolled at any given aim direction, and is intended to be the best in most situations. Occasionally you may rotate a bone and find this default behavior undesirable. To remedy it, simultaneously press [Ctrl] key on the keyboard ([Cmd] key on the Mac) to automatically compute a minimal

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Euler Order

Advanced, Default: Automatic. This property controls the order which is used to convert a rotation into three euler angles (x,y,z). This property will rarely ever need to be changed from its default. The euler angles are used for 1-D smartskin, roll-like constraints, as well as expressions based on just one of the three components of a rotation. Animation Master internally stores and calculates rotations as quaternions. However if the angle came from a Euler rotation driver, it keeps the euler angles as well. It stores these unconverted raw euler angles for future use, and marks a flag that says the euler angles are valid. This serves two purposes; one is speed, why convert to an euler again, if we already have that answer. The second is to preserve large euler angles, so that they may be scaled up or down accurately by roll-like constraints or expressions. Many operations in AM can mess up this pre-computed euler angle state though. Any other kind of rotate driver, like a quaternion driver, or a vector driver, as well as all types of rotate constraints will store a quaternion, and tromp the carefully stored eulers. Even an additional Euler driver can mess it up, if the two are blended with add, since it is the quaternions which are added. The result is converted back to euler when needed. Rotation compensation applied by actions used on models whose bones are oriented differently than the one for which it was created will also invalidate the euler angles. When any of these invalidations occur, the euler angles are not available, so new euler angles are computed from

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Visible: Sometimes, Default: OFF. Set if this bone should form an IK chain with its parent.

Hidden

Visible: Sometimes, Default: OFF. Hides this bone.

Manipulator Options

Visible: Sometimes, Advanced. See Manipulator Options property.

Lock IK

Visible: Sometimes, Default: OFF. Locks the joint so Inverse Kinematic chain is broken in half at this bone's pivot.

Shortcut to

Visible: Sometimes. Sets which object under the Project's Objects folder this object is an instance of. This can be useful when animation has been made for an object in a choreography, but now you need to switch the object to a different one. If you were to delete the instance and put the new one in the choreography, all the animation would be lost. Switching which object the shortcut is an instance of using this property saves you from having to redo all that work. This can also be useful when using a low-density version of a model during the animation phase, and switching to the final high-density version once it is ready to render. This low-res version of a model is often called a "proxy model". You will only find this property on instances.

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Ignore Fog

Default: OFF. Turn this on if fog shouldn't be applied to this object.

Animate Mode

Default: ON. This property specifies whether keyframes should be created or not when the object is manipulated.

Type

Visible: Cache Only, Default: Sphere. Select the shape of the object.

Width

Visible: Sometimes, Default: 5cm, Min: 0cm, Unit of Measurement. Sets the width of the object.

Width Softness

Visible: Sometimes, Default: 50%, Min: 0%, Max: 100%, Percentage
A percentage that controls how much of the total cone angle softens.

Fall-Off

Visible: Sometimes, Default: 50cm, Min: 0cm, Unit of Measurement
Controls how far away from the objects origin the fall-off occurs.

Fall-Off Softness

Visible: Sometimes, Default: 80%, Min: 0%, Max: 100%, Percentage
This setting is only used when a object is set to be volumetric. Changes how smoothly a light falls off to the background color. A value of 0 causes an abrupt edge where the object falls off to the background color. Higher values soften the edge caused by the falloff.

Cone Angle

Visible: Sometimes, Default: 60°, Min: 0°, Max: 180°, Angle
Defines the angle of a cone shaped object.

Volumetric Effects

Interesting atmosphere can be simulated by using Volumetric Effects. You can think of them as a way to simulate very small particles in the air using a mathematical formula. These effects are created and used like any other object. They use an Influence Shape to control the shape and direction of the effect, and one of the Volumetric Effects plugins to create the effect.

Volumetric Dust Dust simulates swirling particle dust in the air.

Volumetric Mist Mist is a ground haze that gets thinner as it goes up.

Volumetric Steam Steam simulates hot steam that dissipates as it travels vertically.

Volumetric Effect Instance Menu

Delete Removes the selected object from the project.

Rename Rename the selected object

Select Cache () Highlights the object that this shortcut is to.

New Constraint

Aim At

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Kinematic

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Aim Roll Like Two

Creates a new Aim Roll Like Two Constraint for this object.

Bone To Spring

Creates a new Bone To Spring Constraint for this object.

Import Action

Imports a saved action and adds it to the selected object.

Add Turbulence

Adds Turbulence to a volumetric light, giving it a more realistic look. Choose the type of turbulence you desire from the list of plugins installed. To remove turbulence from a light, click the Turbulence icon under the Light icon in the Project Workspace and press [Delete] on the keyboard.

Properties

Edits the selected object's properties.

Volumetric Effect Properties

Bone Position

Visible: Sometimes. Position of bone with out motion. See Bone Position properties.

Transform

Read-Only on Cache. Stores any motion for this bone, includes translate, scale and rotate, and cannot be set on the cache, but is visible so that relationships can be created that are controlled by it.

Roll-Method

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Attached to parent

Visible: Sometimes, Default: OFF. Set if this bone should form an IK chain with its parent.

Hidden

Visible: Sometimes, Default: OFF. Hides this bone.

Manipulator Options

Visible: Sometimes, Advanced. See Manipulator Options property.

Lock IK

Visible: Sometimes, Default: OFF. Locks the joint so Inverse Kinematic chain is broken in half at this bone's pivot.

Shortcut to

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Active

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Ignore Fog

Default: OFF. Turn this on if fog shouldn't be applied to this object.

Animate Mode

Default: ON. This property specifies whether keyframes should be created or not when the object is manipulated.

Type

Visible: Cache Only, Default: Sphere. Select the shape of the object.

Width

Visible: Sometimes, Default: 5cm, Min: 0cm, Unit of Measurement Sets the width of the object.

Width Softness

Visible: Sometimes, Default: 50%, Min: 0%, Max: 100%, Percentage A percentage that controls how much of the total cone angle softens.

Fall-Off

Visible: Sometimes, Default: 50cm, Min: 0cm, Unit of Measurement. Controls how far away from the objects origin the fall-off occurs.

Fall-Off Softness

Visible: Sometimes, Default: 80%, Min: 0%, Max: 100%, Percentage This setting is only used when a object is set to be volumetric. Changes how smoothly a light falls off to the background color. A value of 0 causes an abrupt edge where the object falls off to the background color. Higher values soften the edge caused by the falloff.

Cone Angle

Visible: Sometimes, Default: 60°, Min: 0°, Max: 180°, Angle. Defines the angle of a cone shaped object.

Color

Selects the color of the volumetric effect.

Sampling Rate

Default: 20%, Min: 1%, Percentage. Increase the number of steps used to determine volumetric opacity which decreases banding but also increases render time.

Brightness

Default: 300%, Min: 0%, Percentage. Brightness values range from 0% on up. Higher values make the effect more visible.

Contrast

Default: 50%, Min: 0%, Max: 100%, Percentage. When turbulence is used with volumetric effects, contrast values more than "50%" will make the tendrils more pronounced. Contrast values less than "50%" will de-emphasize the tendrils.

Turbulence on Volumetric Lights

Turbulence can also be added to a volumetric light source. To do this, right-click (Control-click on a Mac) the desired light in the "Objects" folder of the Project Workspace, and pick [Add Turbulence], and the kind of turbulence you want.

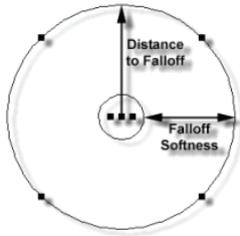
To remove turbulence from a light, click the Turbulence icon under the Light icon in the Project Workspace tree and press <Delete> on the keyboard.

Volumetric Influence Shapes

Volumetric effects, forces, and material effectors are only visible within a predefined shape, called an influence shape: sphere, cone, cylinder, or box. For example, if a material effector uses a sphere as an influence shape, the material will only affect where the sphere intersects with other objects.

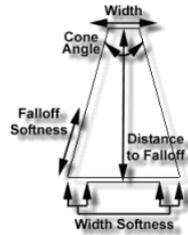
The "Sphere", "Cone", "Cylinder", or "Box" tab will change accordingly when different shapes are selected.

Usually you do not want the material to abruptly begin at the edge of the influence shape, so you can define Dist To Fall-Off and some Fall-Off Softness.



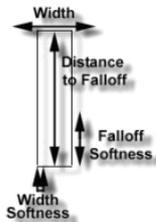
Sphere

A **Sphere** influence shape has a radius and a softness. Any point from the center to where the softness starts is 100% affected by the material effectors, force or whatever, and any point outside the sphere is not affected at all, but points that lie in the softness area have falloff



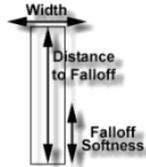
Cone

A **Cone** influence shape has an angle, a softness, a width, a length, and a length softness. Any point outside the angle or the length or inside the clipped off top is not affected. Points inside the cone but not inside the soft regions will be affected 100%, but a point laying inside the soft regions will falloff.



Cylinder

Cylinder influence shapes only affect points within the cylinder's length and radius. Points that exist between the origin at the center of the base and the soft regions are 100% affected, but points inside the soft regions will falloff.



Box

The **Box** influence shape has an origin in the center of the base. The softness is measured from all sides. Points inside the block but not inside the soft regions are affected 100%, but points inside the soft regions will falloff.

All of the influence shapes are represented by an appropriate three

dimensional shape in the interface, including soft falloff limits

Volumetric Dust, Mist and Steam

Volumetric Objects animate. You can animate their position, size and orientation.

Speed changes the rate at which the object appears to move.

Swirl changes how quickly it rotates around the Z-axis.

Scale changes the density of the turbulence patterns.

By default, volumetric objects have turbulence applied to them. To add additional turbulence, or change the turbulence type, simply right-click (Control-click on a Mac) on the Volumetric object icon in the "Objects" section of the Project Workspace and pick [Add Turbulence]. Turbulence can be deleted by selecting it and clicking the Delete button on the Standard toolbar (or by pressing the <Delete> key on the keyboard). You can also animate the position and orientation of the turbulence.

Volumetric Dust, Mist and Steam Properties

Type

Sets the influence shape of the Volumetric Effect to one of the following: Sphere, Cone, Cylinder, or Box.

Color

Sets the color for the volumetric effect. Use the color chip to select the color of your choice.

Quality

Increase this value to decrease banding. Quality values that are too low will fail to make the effect visible. Note that higher values will increase render time.

Brightness

Brightness values range from 0 on up. Higher values make the effect more visible.

Contrast

When turbulence is used with volumetric effects, contrast values more than "50" will make the tendrils more pronounced. Contrast values less than "50" will de-emphasize the tendrils. The maximum value is "100".

Flocks

When animating characters, you will usually deal with only a few of them within a scene, but there are times when you will want to have dozens, hundreds and even thousands in a crowd scene, or a flock of birds, or a swarm of bees. Creating motion paths, and assigning actions to each character many times over can be very tedious, and could easily burn up

the time you have to finish your animation. Flocking provides a mechanism to govern the behavior and motion of large numbers of objects. It is plug-in based, so it is versatile enough to be used for flocks, swarms, crowds, and even forests and fields of flowing grass. You should consider using flocks anytime you want to use the same character or object many times in the same choreography.

A flock is an animatable object in the choreography. It uses an Influence shape like those used for volumetric lights. The Influence shape, which can be a sphere, cylinder, cone, or box, governs the shape of the flock, and can be used to control it during the animation. (The behavior will also depend on the plug-in). Any model can be used in the flock. A flock is like any other object in a choreography: it can be moved, scaled, and rotated over time, and even constrained to a path. Depending on the plug-in assigned to the flock, the motion of the flock object can affect the motion of the elements with that flock.

To create a flock, right-click (Control-click on the Mac) the Choreography icon in the Project Workspace. Pick [New][Flocking] and then pick a plug-in from the submenu list. The flock will appear in the choreography as an Influence manipulator.

You will need to drag and drop a model onto the Flock icon before individual elements appear. To do this, expand the “Objects” folder in the Project Workspace, then drag the model of your choice and drop it on the “Shortcut to Flock” icon that you just added. When the Choreography window redraws, the model will draw in the Influence shape.

If you wish to put an action on the model used in the flock, simply drag and drop an action from the “Actions” folder in the Project Workspace and drop it onto the “shortcut to Model” icon under “shortcut to Flock”. (The action will be cycled). You can have the plug-in offset the action for each element by setting the maximum action offset value. This will prevent all of the members from acting in unison.

To set or change the shape of the flock, select the Influence shape: sphere, cylinder, cone or a box. All of the members of the flock should remain within or near the shape, but their movement within the shape is dependent on the particular flock plug-in.

Flock Effect Instance Menu

Delete

Removes the selected object from the project.

Rename

Rename the selected object

Select Cache ()

Highlights the object that this shortcut is to.

New Constraint

112

Aim At

Creates a new Aim At Constraint for this object.

Kinematic

Creates a new Kinematic Constraint for this object.

Path

Creates a new Path Constraint for this object.

Translate To

Creates a new Translate To Constraint for this object.

Orient Like

Creates a new Orient Like Constraint for this object.

Roll Like

Creates a new Roll Like Constraint for this object.

Aim Roll At

Creates a new Aim Roll At Constraint for this object.

Spherical Limits

Creates a new Spherical Limits Constraint for this object.

Euler Limits

Creates a new Euler Limits Constraint for this object.

Translate Limits

Creates a new Translate Limits Constraint for this object.

Surface

Creates a new Surface Constraint for this object.

Scale Like

Creates a new Scale Like Constraint for this object.

Aim Like Two

Creates a new Aim Like Two Constraint for this object.

Aim Roll Like Two

Creates a new Aim Roll Like Two Constraint for this object.

Bone To Spring

Creates a new Bone To Spring Constraint for this object.

Flock Surface

Creates a new Flock Surface Constraint for this object.

Import Action

Imports a saved action and adds it to the selected object.

Properties

Edits the selected object's properties.

Flock Effect Properties

Bone Position

Visible: Sometimes. Position of bone with out motion. See Bone Position properties.

Transform

Read-Only on Cache. Stores any motion for this bone, includes translate, scale and rotate. and cannot be set on the cache, but is visible so that relationships can be created that are controlled by it.

Roll-Method

Advanced, Default: Y-Poles-Singularity. Default Roll Behavior There are several situations in which a bone is given clues about where to aim, but no further information about what should happen with the roll handle. In a sense only two of the three degrees of freedom are clearly defined: an Aim At constraint, inverse kinematics, and grabbing the end of the simple bone manipulator are a few examples. When this occurs, a bone's roll is determined by what is known as its "default roll behavior": it tells the bone how it should be rolled at any given aim direction, and is intended to be the best in most situations. Occasionally you may rotate a bone and find this default behavior undesirable. To remedy it, simultaneously press [Ctrl] key on the keyboard ([Cmd] key on the Mac) to automatically compute a minimal visible roll, or use the Rotate manipulator, which defines all three degrees of freedom, or choose a different roll method. These roll behaviors do not occur between keyframes when using quaternion interpolation.

Z-Singularity: This is the default roll method for all geometry driving bones, the default roll behavior is to try not to roll at all if in the same hemisphere as the bone was defined. This gives the bone a kind of "sweet spot " in the shape of a hemisphere around the bone's original creation direction.

Y-Poles-Singularity: This roll method is used for all bones except geometry driving bones, such as lights, cameras, nulls, forces or models. Its behavior is not to roll unless pointed in the same or opposite direction as the roll handle. This creates the behavior of a camera that is mounted above a basketball court. It always tries to keep the top of the players heads up in the frame of the camera. This is clearly defined everywhere except directly underneath (or on top) of the camera. That is why it is called Y-Poles. This behavior is good for lights and cameras.

Roll-History: This method determines the roll direction based on where the roll was before the bone was rotated. It essentially uses the history of the roll handle to determine where it should be. One downfall of this method is that given a certain direction for the bone, there is no definitive location that the roll handle will be. It depends on where it was before. However this technique has no singularities or odd rotating gimbal locations.

Euler Order

Advanced, Default: Automatic. This property controls the order which is used to convert a rotation into three euler angles (x,y,z). This property will rarely ever need to be changed from its default. The euler angles are used for 1-D smartskin, roll-like constraints, as well as expressions based on just one of the three components of a rotation. Animation Master internally

stores and calculates rotations as quaternions. However if the angle came from a Euler rotation driver, it keeps the euler angles as well. It stores these unconverted raw euler angles for future use, and marks a flag that says the euler angles are valid. This serves two purposes; one is speed, why convert to an euler again, if we already have that answer. The second is to preserve large euler angles, so that they may be scaled up or down accurately by roll-like constraints or expressions. Many operations in AM can mess up this pre-computed euler angle state though. Any other kind of rotate driver, like a quaternion driver, or a vector driver, as well as all types of rotate constraints will store a quaternion, and trump the carefully stored eulers. Even an additional Euler driver can mess it up, if the two are blended with add, since it is the quaternions which are added. The result is converted back to euler when needed. Rotation compensation applied by actions used on models whose bones are oriented differently than the one for which it was created will also invalidate the euler angles. When any of these invalidations occur, the euler angles are not available, so new euler angles are computed from the quaternion. This property controls how those euler angles are computed. The default is automatic. Occasionally this automatic behavior produces discontinuities in the resulting euler angle when the decision switches states. In this case, choosing one of the fixed euler orders is recommended.

YXZ: This is the same order used by the Euler Rotation Driver. It is the primary order used by Animation Master. Z rotations are king, and can range from -180 to 180 degrees. X rotations are next and can also range from -180 to 180 degrees. Y is last, and can only range from 0 to 180 degrees.

XYZ: This is an alternative order, and usually would only be desired when the returned Y rotation should have a broader range. Z rotations are still king, and can range from -180 to 180 degrees. Y rotations are next and can also range from -180 to 180 degrees. In this case X is last, and can only range from 0 to 180 degrees.

Automatic: This order analyzes the rotation, in an attempt to determine which angle rotates more X or Y. It then chooses the YXZ or XYZ order depending on the result. This is the default way which Animation Master uses to determine Euler angles.

Attached to parent

Visible: Sometimes, Default: OFF. Set if this bone should form an IK chain with its parent.

Hidden

Visible: Sometimes, Default: OFF. Hides this bone.

Manipulator Options

Visible: Sometimes, Advanced. See Manipulator Options property.

Lock IK

Visible: Sometimes, Default: OFF. Locks the joint so Inverse Kinematic chain is broken in half at this bone's pivot.

Shortcut to

Visible: Sometimes. Sets which object under the Project's Objects folder this object is an instance of. This can be useful when animation has been made for an object in a choreography, but now you need to switch the object to a different one. If you were to delete the instance and put the new one in the choreography, all the animation would be lost. Switching which object the shortcut is an instance of using this property saves you from having to redo all that work. This can also be useful when using a low-density version of a model during the animation phase, and switching to the final high-density version once it is ready to render. This low-res version of a model is often called a "proxy model". You will only find this property on instances.

Active

Visible: Instance Only, Default: ON. This option is for objects that need to appear and/or disappear during the course of an animation. Inactive objects are not seen in real-time or final renderings. You can use this to speed up scenes when this object is off screen, or temporarily not needed.

Ignore Fog

Default: OFF. Turn this on if fog shouldn't be applied to this object.

Animate Mode

Default: ON. This property specifies whether keyframes should be created or not when the object is manipulated.

Type

Visible: Cache Only, Default: Sphere. Select the shape of the object.

Width

Visible: Sometimes, Default: 5cm, Min: 0cm, Unit of Measurement. Sets the width of the object.

Width Softness

Visible: Sometimes, Default: 50%, Min: 0%, Max: 100%, Percentage. A percentage that controls how much of the total cone angle softens.

Fall-Off

Visible: Sometimes, Default: 50cm, Min: 0cm, Unit of Measurement Controls how far away from the objects origin the fall-off occurs.

Fall-Off Softness

Visible: Sometimes, Default: 80%, Min: 0%, Max: 100%, Percentage This setting is only used when a object is set to be volumetric. Changes how smoothly a light falls off to the background color. A value of 0 causes an abrupt edge where the object falls off to the background color. Higher values soften the edge caused by the falloff.

Cone Angle

Visible: Sometimes, Default: 60°, Min: 0°, Max: 180°, Angle. Defines the

angle of a cone shaped object.

Preroll

Default: 0sec. This is the time that the flock motion is pre-calculated before it draws the first frame. It is important for flocks that govern their own spacing like birds and swarms, (very similar to pre-roll for particles).

Force

Visible: Sometimes. A force acting on the flock.

Antigravity

Since flocks can be affected by forces and gravity in the scene, antigravity is meant to counter the gravity of the choreography. (The default antigravity nullifies the choreography's gravity). If you want the motion of the elements of the flock to be affected by choreography's gravity, then set the antigravity X, Y, and Z values to "0".

Population

Visible: Sometimes, Default: 20, Min: 0. This is the number of objects in the flock. Adjust this value until the scene you achieve the density you want. (Try not to get carried away with too many).

Max. Action Offset

Visible: Sometimes, Default: 0, Min: 0. This value will allow the plug-in to offset the actions on the flock members, so that they do not act in unison. Marching soldiers would have no offset, but flocking birds or swimming fish probably would. This value is the maximum value they can vary from one another.

Draw As Dots

Visible: Sometimes, Default: OFF. Select this option when you are experimenting with the flock motion and do not need to see each individual model draw in the interface. This option will draw each member as a dot, and will greatly speed up wireframe redrawing in the interface.

Space Subdivisions

Visible: Sometimes. Many flock plug-ins calculate the motion of the individual members based on the location of their neighbors. To manage the search process, the flock region is subdivided into 3D boxes. These subdivision values determine how much of the region is subdivided. (Ideally, there should be three to five members to a box). After you have determined the population and scale of your flock, you can experiment with the subdivision values to see how they affect the motion of the flock members.

X

Default: 10, Min: 1, Max: 1000. The number of flock space boxes in the X direction.

Y

Default: 10, Min: 1, Max: 1000. The number of flock space boxes in the Y direction.

Z

Default: 10, Min: 1, Max: 1000. The number of flock space boxes in the Z direction.

Birds

The "Birds" plug-in, as the name implies, is designed for flocks of birds. Each bird tries to stay close to its neighbors, and uses the motion of the entire flock to decide how it flies.

Minimum Distance:

This is the distance that each bird will try to maintain with its neighbors. If the bird is closer than this value from its nearest neighbor, it will steer away from that neighbor. This distance is measured from the pivot of one bird to the pivot of the next, so you should allow for the size of the model. . (You will want to set this value after you scale the model used in the flock).

Jitter:

This is a randomizing value used to make the flock more chaotic. The higher this value, the more the members of the flock will adjust their steering. You might try a higher value for bats.

Maximum Speed:

This is the maximum speed of each member of the flock. You will probably want to use a lower value for geese, and a higher value for swallows.

Acceleration:

This value affects the amount of course correction a bird can make per frame. Slower birds, like geese, should have a lower value than bats or swallows.

Type

Sets the influence shape of the Flock to one of the following: Sphere, Cone, Cylinder, or Box.

Crowds

Crowd is a special kind of flock intended for groups of characters or plants that are on a surface like the ground. The members are distributed in the flock region in a flat plane. When a Flock Surface Constraint is applied to the flock, the members of the flock can all be placed on an uneven surface. Unlike the birds and swarm flocks, the members of the flock will not move within the flock. But you can still apply an action to the members.

Swarm

The "Swarm" plug-in is designed for the kind of motion observed for flies and bees. The members of a swarm have no formation or cohesion, but rather fly around a centralized region.

Minimum Distance:

This value will determine the density of the swarm. This will also affect the behavior of the individual members, since the density will determine how much and how often they have to modify their paths. A fly swarm will probably be less dense than a bee swarm.

Jitter:

This is a randomizing value used to make the flock more chaotic. The higher this value, the more the members of the flock will adjust their direction.

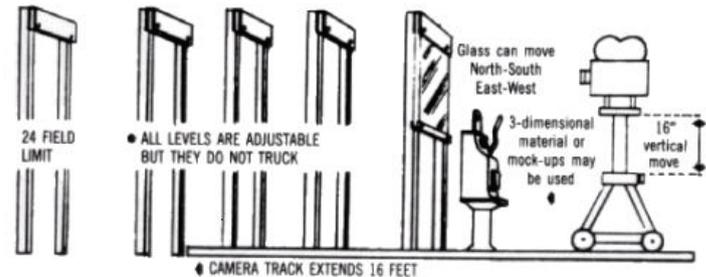
Maximum Speed:

This is the maximum speed of each member of the swarm. (Think of it as a speed limit). You will probably want to use a lower value for flies, and a higher value for bees and gnats.

Acceleration:

Use this value to affect the steering ability of the swarm members. The higher the value, the tighter the members can turn and readjust their paths.

Layers



The composition of a scene is important; ask any artist. Your mind uses visual cues to understand an image, otherwise the raw, cavalcade of information would be impossible to understand. It is always better to provide a feeling of depth. A painting or an animation or a frame of film is not simply objects floating over a sea of blackness; other things should be visible: such as the sky, ground, and possibly a tree in the distance. Simply stated, every scene is composed of many layers. The layers add a richness to the story, providing a vast treasure trove of clues for your imagination's weaving. Usually, the better the layers are integrated into the scene (for example, casting shadows), the better the image.

The art of compositing is not a new concept. The multiplane camera used by Walt Disney Studios was the first of many attempts to add perspective

and depth into compositing. The art of digital compositing is fairly new however, and the possibilities are endless. "Multiplane" layering in Animation:Master is the modern day equivalent of the multiplane camera, but of course, adding much more flexibility and power.

When we designed our digital composition functions in the "Multiplane" section of Animation:Master, we had animation in mind, (most paint programs only composite single pictures). Animation compositing is repetitive and can be left unattended: a perfect job for a computer to do, and one we can take advantage of.

To create a layer simply right-click (Control-click on the Mac) the Objects folder and select [New][Layer]. This will prompt you to pick an image or animation for the layer. Once a layer has been created it can be added to a choreography by dragging it into a choreography window or under a choreography icon in the project workspace tree. A layer can be manipulated using the same tools as all other objects. For instance you can use the Translate manipulator, Scale manipulator, and Rotate Manipulator to move and change the orientation of the layer.

Layer Instance Menu

Delete

Removes the selected object from the project.

Rename

Rename the selected object

Select Cache ()

Highlights the object that this shortcut is to.

New

Choreography Action

Creates a new Choreography Action.

New Action

Adds a new action to the selected script.

New Constraint

Aim At

Creates a new Aim At Constraint for this object.

Kinematic

Creates a new Kinematic Constraint for this object.

Path

Creates a new Path Constraint for this object.

Translate To

Creates a new Translate To Constraint for this object.

Orient Like

Creates a new Orient Like Constraint for this object.

Roll Like

Creates a new Roll Like Constraint for this object.

Aim Roll At

Creates a new Aim Roll At Constraint for this object.

Spherical Limits

Creates a new Spherical Limits Constraint for this object.

Euler Limits

Creates a new Euler Limits Constraint for this object.

Translate Limits

Creates a new Translate Limits Constraint for this object.

Surface

Creates a new Surface Constraint for this object.

Scale Like

Creates a new Scale Like Constraint for this object.

Aim Like Two

Creates a new Aim Like Two Constraint for this object.

Aim Roll Like Two

Creates a new Aim Roll Like Two Constraint for this object.

Bone To Spring

Creates a new Bone To Spring Constraint for this object.

Rigid Body

Creates a new Rigid Body Constraint for this object.

Bake All Actions...

Bake All Actions into Chor Action

This feature collects all of the actions, reusable or not, on an object and bakes them into just one simple choreography action. This choreography action can be saved out by right-clicking (Control-click on a Mac) a choreography name in the Project Workspace tree (this will save actions for all objects in the choreography), a model shortcut in a choreography, or within an object's manipulator in a choreography window. Then choose "Export Action As..." from the menu.

Import

Action

Imports a saved action and adds it to the selected object.

Add Polygon Modifier

Adds PolyModifier to a Model or Group. Choose the type of polymodifier you desire from the list of plugins installed. To remove a polymodifier from a model or group, click the PolyModifier icon under the action in the Project Workspace and press on the keyboard.

Properties

Edits the selected object's properties.

Layer Properties

Bone Position

Visible: Sometimes. Position of bone with out motion. See Bone Position properties.

Transform

Read-Only on Cache. Stores any motion for this bone, includes translate, scale and rotate. and cannot be set on the cache, but is visible so that relationships can be created that are controlled by it.

Roll-Method

Advanced, Default: Y-Poles-Singularity. Default Roll Behavior There are several situations in which a bone is given clues about where to aim, but no further information about what should happen with the roll handle. In a sense only two of the three degrees of freedom are clearly defined: an Aim At constraint, inverse kinematics, and grabbing the end of the simple bone manipulator are a few examples. When this occurs, a bone's roll is determined by what is known as its "default roll behavior": it tells the bone how it should be rolled at any given aim direction, and is intended to be the best in most situations. Occasionally you may rotate a bone and find this default behavior undesirable. To remedy it, simultaneously press [Ctrl] key on the keyboard ([Cmd] key on the Mac) to automatically compute a minimal visible roll, or use the Rotate manipulator, which defines all three degrees of freedom, or choose a different roll method. These roll behaviors do not occur between keyframes when using quaternion interpolation.

Z-Singularity: This is the default roll method for all geometry driving bones, the default roll behavior is to try not to roll at all if in the same hemisphere as the bone was defined. This gives the bone a kind of "sweet spot" in the shape of a hemisphere around the bone's original creation direction.

Y-Poles-Singularity: This roll method is used for all bones except geometry driving bones, such as lights, cameras, nulls, forces or models. Its behavior is not to roll unless pointed in the same or opposite direction as the roll handle. This creates the behavior of a camera that is mounted above a basketball court. It always tries to keep the top of the players heads up in the frame of the camera. This is clearly defined everywhere except directly underneath (or on top) of the camera. That is why it is called Y-Poles. This behavior is good for lights and cameras.

Roll-History: This method determines the roll direction based on where the roll was before the bone was rotated. It essentially uses the history of the roll handle to determine where it should be. One downfall of this method is that given a certain direction for the bone, there is no definitive location that the roll handle will be. It depends on where it was before. However this technique has no singularities or odd rotating gimbal locations.

Euler Order

Advanced, Default: Automatic. This property controls the order which is

used to convert a rotation into three euler angles (x,y,z). This property will rarely ever need to be changed from its default. The euler angles are used for 1-D smartskin, roll-like constraints, as well as expressions based on just one of the three components of a rotation. Animation Master internally stores and calculates rotations as quaternions. However if the angle came from a Euler rotation driver, it keeps the euler angles as well. It stores these unconverted raw euler angles for future use, and marks a flag that says the euler angles are valid. This serves two purposes; one is speed, why convert to an euler again, if we already have that answer. The second is to preserve large euler angles, so that they may be scaled up or down accurately by roll-like constraints or expressions. Many operations in AM can mess up this pre-computed euler angle state though. Any other kind of rotate driver, like a quaternion driver, or a vector driver, as well as all types of rotate constraints will store a quaternion, and tromp the carefully stored eulers. Even an additional Euler driver can mess it up, if the two are blended with add, since it is the quaternions which are added. The result is converted back to euler when needed. Rotation compensation applied by actions used on models whose bones are oriented differently than the one for which it was created will also invalidate the euler angles. When any of these invalidations occur, the euler angles are not available, so new euler angles are computed from the quaternion. This property controls how those euler angles are computed. The default is automatic. Occasionally this automatic behavior produces discontinuities in the resulting euler angle when the decision switches states. In this case, choosing one of the fixed euler orders is recommended.

YXZ: This is the same order used by the Euler Rotation Driver. It is the primary order used by Animation Master. Z rotations are king, and can range from -180 to 180 degrees. X rotations are next and can also range from -180 to 180 degrees. Y is last, and can only range from 0 to 180 degrees.

XYZ: This is an alternative order, and usually would only be desired when the returned Y rotation should have a broader range. Z rotations are still king, and can range from -180 to 180 degrees. Y rotations are next and can also range from -180 to 180 degrees. In this case X is last, and can only range from 0 to 180 degrees.

Automatic: This order analyzes the rotation, in an attempt to determine which angle rotates more X or Y. It then chooses the YXZ or XYZ order depending on the result. This is the default way which Animation Master uses to determine Euler angles.

Attached to parent

Visible: Sometimes, Default: OFF. Set if this bone should form an IK chain with its parent.

Hidden

Visible: Sometimes, Default: OFF. Hides this bone.

Manipulator Options

Visible: Sometimes, Advanced. See Manipulator Options property.

Lock IK

Visible: Sometimes, Default: OFF. Locks the joint so Inverse Kinematic chain is broken in half at this bone's pivot.

Shortcut to

Visible: Sometimes. Sets which object under the Project's Objects folder this object is an instance of. This can be useful when animation has been made for an object in a choreography, but now you need to switch the object to a different one. If you were to delete the instance and put the new one in the choreography, all the animation would be lost. Switching which object the shortcut is an instance of using this property saves you from having to redo all that work. This can also be useful when using a low-density version of a model during the animation phase, and switching to the final high-density version once it is ready to render. This low-res version of a model is often called a "proxy model". You will only find this property on instances.

Active

Visible: Instance Only, Default: ON. This option is for objects that need to appear and/or disappear during the course of an animation. Inactive objects are not seen in real time or final renderings. You can use this to speed up scenes when this object is off screen, or temporarily not needed.

Ignore Fog

Default: OFF. Turn this on if fog shouldn't be applied to this object.

Animate Mode

Default: ON. This property specifies whether keyframes should be created or not when the object is manipulated.

Surface

Visible: Sometimes. These settings can be overridden by Decals, Materials and Groups. Contains all of the surface attributes for this object. See Surface Properties.

Options

Visible: Sometimes. The Model's options.

Flat Shaded

Default: OFF. Causes the model to render without shading.

Cast Reflections

Default: ON. Allows the model to be seen in any other model in the scene that has a surface reflectivity greater than zero. In most cases this option should be on.

Cast Shadows

Default: ON. Causes the model to cast shadows on itself and other objects in the choreography that have receive shadows turned on. Shadows will

only be cast from Lights that have their Cast Shadows option turned on.

Receive Shadows

Default: ON. Causes the model to receive shadows from any objects (including itself) in the choreography that are set to cast shadows.

Shadow Only

Visible: Sometimes, Default: OFF. This property is only available when Receive Shadows is turned on. When this option is set, only the shadows that land on the model will be rendered, and not the model itself. This is useful when you wish to composite the shadows on in software outside of Animation:Master. The model will not render, but the shadows that are cast on the model will be stored in the Alpha channel of the rendered image.

Cast Occlusion

Default: ON. Causes the model to be included in the ambient occlusion calculation for itself and the other objects in the choreography that are set to cast shadows.

Bone Falloff Curve

Visible: Cache Only, Advanced, Default: 0%, Min: 0%, Max: 100%, Percentage This property is used to store a channel. This channel can be used to control the falloff of a bone. This falloff is used for computing CP weights. This channel is only used if the bone's Falloff Type is set to Channel.

Image

Read-Only on Instance. Sets the image used on the Layer

Repeat

Visible: Sometimes. The number of times this image is to repeat itself.

Seamless

Visible: Sometimes, Default: OFF. When the image repeats, the seamless property flips the image on every repeat. Causing the image to look "seamless". This is most useful on repetitive textures.

Frame

Visible: Sometimes, Default: 0sec. When the image is an animation (or sequence of images), this property sets which frame to use out of the original animation. If this property is marked as "-not set-", the current frame from the interface is used automatically. This will cause the animation to animate as it was originally intended. This property can also be keyframed to have the sequence play out of order. For instance, if the original animation is one second, and at frame 0 you set the Time property to be 1 second, and at 2 seconds you set it to be 0, the sequence will play backwards at half speed.

Props

In the stone age of computer graphics, models were made of "polygons"; small, usually triangular surfaces that were glued together to form a faceted representation of a real object. Because of their simplicity and the large body of existing expertise, polygons refuse to go away, much like horse-and-buggies at the beginning of the automobile age. For convenience, Animation:Master will import/export polygon models to use them as props in a scene. Unfortunately, none of Animation:Master's powerful features, like bones and actions, are compatible with these props, but the props can be translated, scaled, rotated, and rendered.



To open a polygon model, right click on the Objects folder and choose[Import][Prop]. A list of available polygon formats will appear in the open dialog based on the polygon plugins you have installed on your computer system. Choose a polygon model and click OK. The model will be opened and displayed in a window.



The prop (polygon model) can be dragged into a choreography just like a model, light or camera.

Prop Instance Menu

Delete

Removes the selected object from the project.

Rename

Rename the selected object

Select Cache ()

Highlights the object that this shortcut is to.

New

Choreography Action

Creates a new Choreography Action.

New Constraint

Aim At

Creates a new Aim At Constraint for this object.

Kinematic

Creates a new Kinematic Constraint for this object.

Path

Creates a new Path Constraint for this object.

Translate To

Creates a new Translate To Constraint for this object.

Orient Like

Creates a new Orient Like Constraint for this object.

Roll Like

Creates a new Roll Like Constraint for this object.

Aim Roll At

Creates a new Aim Roll At Constraint for this object.

Spherical Limits

Creates a new Spherical Limits Constraint for this object.

Euler Limits

Creates a new Euler Limits Constraint for this object.

Translate Limits

Creates a new Translate Limits Constraint for this object.

Surface

Creates a new Surface Constraint for this object.

Scale Like

Creates a new Scale Like Constraint for this object.

Aim Like Two

Creates a new Aim Like Two Constraint for this object.

Aim Roll Like Two

Creates a new Aim Roll Like Two Constraint for this object.

Bone To Spring

Creates a new Bone To Spring Constraint for this object.

Render Mode

Hidden, Wireframe, Shaded, Shaded and Wireframe

Pickable

Object Pickable/Unpickable

Properties

Edits the selected object's properties.

Prop Properties

Bone Position

Visible: Sometimes. Position of bone with out motion. See Bone Position properties.

Transform

Read-Only on Cache. Stores any motion for this bone, includes translate, scale and rotate. and cannot be set on the cache, but is visible so that relationships can be created that are controlled by it.

Roll-Method

Advanced, Default: Y-Poles-Singularity. Default Roll Behavior There are several situations in which a bone is given clues about where to aim, but no further information about what should happen with the roll handle. In a sense only two of the three degrees of freedom are clearly defined: an Aim At constraint, inverse kinematics, and grabbing the end of the simple bone manipulator are a few examples. When this occurs, a bone's roll is determined by what is known as its "default roll behavior": it tells the bone

how it should be rolled at any given aim direction, and is intended to be the best in most situations. Occasionally you may rotate a bone and find this default behavior undesirable. To remedy it, simultaneously press [Ctrl] key on the keyboard ([Cmd] key on the Mac) to automatically compute a minimal visible roll, or use the Rotate manipulator, which defines all three degrees of freedom, or choose a different roll method. These roll behaviors do not occur between keyframes when using quaternion interpolation.

Z-Singularity: This is the default roll method for all geometry driving bones, the default roll behavior is to try not to roll at all if in the same hemisphere as the bone was defined. This gives the bone a kind of "sweet spot" in the shape of a hemisphere around the bone's original creation direction.
Y-Poles-Singularity: This roll method is used for all bones except geometry driving bones, such as lights, cameras, nulls, forces or models. Its behavior is not to roll unless pointed in the same or opposite direction as the roll handle. This creates the behavior of a camera that is mounted above a basketball court. It always tries to keep the top of the players heads up in the frame of the camera. This is clearly defined everywhere except directly underneath (or on top) of the camera. That is why it is called Y-Poles. This behavior is good for lights and cameras.

Roll-History: This method determines the roll direction based on where the roll was before the bone was rotated. It essentially uses the history of the roll handle to determine where it should be. One downfall of this method is that given a certain direction for the bone, there is no definitive location that the roll handle will be. It depends on where it was before. However this technique has no singularities or odd rotating gimbal locations.

Euler Order

Advanced, Default: Automatic. This property controls the order which is used to convert a rotation into three euler angles (x,y,z). This property will rarely ever need to be changed from its default. The euler angles are used for 1-D smartskin, roll-like constraints, as well as expressions based on just one of the three components of a rotation. Animation Master internally stores and calculates rotations as quaternions. However if the angle came from a Euler rotation driver, it keeps the euler angles as well. It stores these unconverted raw euler angles for future use, and marks a flag that says the euler angles are valid. This serves two purposes; one is speed, why convert to an euler again, if we already have that answer. The second is to preserve large euler angles, so that they may be scaled up or down accurately by roll-like constraints or expressions. Many operations in AM can mess up this pre-computed euler angle state though. Any other kind of rotate driver, like a quaternion driver, or a vector driver, as well as all types of rotate constraints will store a quaternion, and tromp the carefully stored eulers. Even an additional Euler driver can mess it up, if the two are blended with add, since it is the quaternions which are added. The result is converted back to euler

when needed. Rotation compensation applied by actions used on models whose bones are oriented differently than the one for which it was created will also invalidate the euler angles. When any of these invalidations occur, the euler angles are not available, so new euler angles are computed from the quaternion. This property controls how those euler angles are computed. The default is automatic. Occasionally this automatic behavior produces discontinuities in the resulting euler angle when the decision switches states. In this case, choosing one of the fixed euler orders is recommended.

YXZ: This is the same order used by the Euler Rotation Driver. It is the primary order used by Animation Master. Z rotations are king, and can range from -180 to 180 degrees. X rotations are next and can also range from -180 to 180 degrees. Y is last, and can only range from 0 to 180 degrees.

XYZ: This is an alternative order, and usually would only be desired when the returned Y rotation should have a broader range. Z rotations are still king, and can range from -180 to 180 degrees. Y rotations are next and can also range from -180 to 180 degrees. In this case X is last, and can only range from 0 to 180 degrees.

Automatic: This order analyzes the rotation, in an attempt to determine which angle rotates more X or Y. It then chooses the YXZ or XYZ order depending on the result. This is the default way which Animation Master uses to determine Euler angles.

Attached to parent

Visible: Sometimes, Default: OFF. Set if this bone should form an IK chain with its parent.

Hidden

Visible: Sometimes, Default: OFF. Hides this bone.

Manipulator Options

Visible: Sometimes, Advanced. See Manipulator Options property.

Lock IK

Visible: Sometimes, Default: OFF. Locks the joint so Inverse Kinematic chain is broken in half at this bone's pivot.

Shortcut to

Visible: Sometimes. Sets which object under the Project's Objects folder this object is an instance of. This can be useful when animation has been made for an object in a choreography, but now you need to switch the object to a different one. If you were to delete the instance and put the new one in the choreography, all the animation would be lost. Switching which object the shortcut is an instance of using this property saves you from having to redo all that work. This can also be useful when using a low-density version of a model during the animation phase, and switching to the final high-density version once it is ready to render. This low-res version of a model is often

called a "proxy model". You will only find this property on instances.

Active

Visible: Instance Only, Default: ON. This option is for objects that need to appear and/or disappear during the course of an animation. Inactive objects are not seen in real time or final renderings. You can use this to speed up scenes when this object is off screen, or temporarily not needed.

Ignore Fog

Default: OFF. Turn this on if fog shouldn't be applied to this object.

Animate Mode

Default: ON. This property specifies whether keyframes should be created or not when the object is manipulated.

Polygons

Visible: Cache Only, Read-Only, Default: 0, Min: 0. Number of polygons that make up this Prop

Filename

Visible: Cache Only. The complete path of the polygon file on the computer.

Options

Visible: Sometimes. The Model's options.

Front Projection Target

Default: OFF. This option specifies that this model is to receive a projection of the Camera's Rotoscope image map.

Flat Shaded

Default: OFF. Causes the model to render without shading.

Cast Reflections

Default: ON. Allows the model to be seen in any other model in the scene that has a surface reflectivity greater than zero. In most cases this option should be on.

Cast Shadows

Default: ON. Causes the model to cast shadows on itself and other objects in the choreography that have receive shadows turned on. Shadows will only be cast from Lights that have their Cast Shadows option turned on.

Receive Shadows

Default: ON. Causes the model to receive shadows from any objects (including itself) in the choreography that are set to cast shadows.

Shadow Only

Visible: Sometimes, Default: OFF. This property is only available when Receive Shadows is turned on. When this option is set, only the shadows that land on the model will be rendered, and not the model itself. This is useful when you wish to composite the shadows on in software outside of Animation:Master. The model will not render, but the shadows that are cast on the model will be stored in the Alpha channel of the rendered image.

Cast Occlusion

Default: ON. Causes the model to be included in the ambient occlusion

calculation for itself and the other objects in the choreography that are set to cast shadows.

Materials on Props

Props can now have Materials applied to them. Simply drag a Material on to the Prop in the Project Workspace Tree. This is useful when importing terrain or a world that is a prop and you wish to adjust its specular, transparency, or diffuse color.

Action Folder

This container includes all of the actions shortcuts used in the Object shortcut in the Choreography.

Action Shortcut Containers

This container includes all of the actions shortcuts used in the Object shortcut in the Choreography.

Action Shortcut Container Menu

Delete Removes the selected object from the project.

New Choreography Action Creates a new Choreography Action.

New Action Adds a new action to the selected script.

New Folder

Creates a new folder that can be used to organize objects. Once created objects can be dragged into the folder

Properties

Edits the selected object's properties.

Action Container Menu

Delete

Removes the selected object from the project.

New

Choreography Action

Creates a new Choreography Action.

Action

Adds a new action to the selected script.

Folder

Creates a new folder that can be used to organize objects. Once created objects can be dragged into the folder

Properties

Edits the selected object's properties.

Kinds of Actions

Animation:Master has two basic methods to create animation. These methods are called actions. The first type of action is called "Action". It is intended to be reusable and is made in an action window. The second type of action is called "Choreography Action". This is an action that is used one time in a choreography and is specific to the scene and model. Choreography actions are created automatically for a model when animate in a choreography window.

Export Action As

This feature is used to save the motion created in the choreography as a reusable action. This is useful when the motion is most easily created in choreography, but will be reused again in a different shot or on a different model. It does not replace or change the choreography motion to reusable. Right-click (Control-click on a Mac) the Choreography icon Action icon in the Project Workspace tree, then pick [Export Action As...], then delete the choreography action, then import the reusable action that you just saved. This only saves the choreography action, not the other underlying reusable actions. (To save everything as a single action, first bake them into the choreography action). "Export Action As..." can also be used to layer motion where a different time interval between the keyframes is required. You can make your low frequency motion first, then save it out, delete it and bring it back in as an action, then using "Add to Underlying Motion" selected on the Choreography Action Properties panel, add the high frequency motion. This could be an arm that swings, but twitches while it swings. This layering technique can be used for layering facial motion, secondary clothes motion etc...

Bake All Actions into Chor Action

This feature collects all of the actions, reusable or not, on an object and bakes them into just one simple choreography action. This choreography action can be saved out by right-clicking (Control-click on a Mac) a choreography name in the Project Workspace tree (this will save actions for all objects in the choreography), a model shortcut in a choreography, or within an object's manipulator in a choreography window. Then choose "Export Action As..." from the menu.

Types Of Motions Used To Animate

Character animation requires a lot of flexibility so that your characters can show all the life and emotion needed to tell your story. The kinds of motions used to animate are named after their most common uses: Skeletal motion is the movement of a character's bones, Muscle motion is the movement of

the characters skin, Pose motions are commonly used gestures that are built into the character for easy manipulation. Each of these three types of motions can be used in Actions and Choreography Actions.

Reusable Actions

Anytime the animation you are creating has repetition, or multiple actors are to act out the same motion, or you will use the motion in multiple scenes, then a reusable action should be created. Here is a list of some examples that would make good reusable actions.

Any motion that can cycle:

- Walking
- Running
- Skipping
- A bird flapping it's wings to fly.
- The prop spinning on an airplane or helicopter.

Any motion that multiple models will be acting out:

- Dancing
- Waving
- Cheering
- Clapping

Any motion that a model might use in multiple scenes, or multiple times in a scene:

- Standing up
- Sitting down
- Laying down
- Punching
- Kicking
- Actions

Multiple Actions

Each character in a choreography can have a number of things to do. For example, Thom might use the reusable actions: “walk”, “stand”, “wave”, and “sit down”. The actions are not in chronological order in the list since some actions, like “wave”, may be applied at the same time as the “stand” action (see the “Shortcut to” action Properties to set the chronology, and see it displayed in the timeline). There might also be non-reusable choreography action transitions between the reusable actions. Choreography actions might also tilt Thom’s head while he’s standing, and cross his legs once he’s sitting down.

To put a reusable action into Thom’s list of actions, drag the action’s icon from the “Actions” folder in the Project Workspace and drop it onto the

“Shortcut to Thom” icon in the “Choreographies” folder, or right-click (Control-click on a Mac) and pick [Import Action]. A new icon, called “Shortcut to” action will appear in Thom’s list of actions under the “Shortcut to Thom” icon.

A newly added “Shortcut to” action defaults to using the entire length of the action, and places it immediately after any other reusable actions that are already in the list of actions.

To reorder the actions in the list, simply drag the “Shortcut to” Action icon you want to move to the new location in the list, (however, this has no effect on chronology).

Overloading Actions

The order of the actions in the list on a “Shortcut to” model does not imply chronology, but it is used to tell which action should be applied first in the case of overloading. Overloading occurs when two actions occur at the same time in the choreography. Sometimes when two actions occur at the same time, the result is obvious. For instance, if the smile action occurs during the middle of the walk action, the smile affects a totally different part of the body, so the character can clearly do both at the same time. Two other situations can arise: two actions can define skeletal motion on the same bone at the same time, or two actions can define muscle motion on the same control point at the same time.

If two actions define skeletal motion on the same bone at the same time, and the blend method is set to “Replace”, the one that was applied last wins. So if you have a walk action with swinging arms, and a wave action that waves the right arm of your model, then to work properly place the “wave” action after the “walk” action. The wave of the arms will win over the swinging arms, so now your model is walking, and waves one arm. If the wave came first, then the wave would not show up at all, the swinging of the right arm would overload the wave.

When animating in a Choreography window, the same kind of overloading occurs. This is why the choreography actions generally come last. They usually need to overload all other actions.

Action Blending

In a choreography’s Action List, actions are listed in order of precedence. The default behavior for a skeletal motion later in the list is to replace whatever motion was before it. However, two additional choices are available: “Add” and “Cross Blend”.

“Add” makes the motion in later actions add to the existing motion, (like muscle motion). This is useful for adding hip sway to a previously designed walk cycle, or you can add some extra bounce or head bob. Add is also

useful for modifying a complex or motion captured action. For instance, a tennis swing that swings a bit too low for the shot can be quickly modified with only simple additive changes in the choreography. Since this is stored as an additional rotate offset, it will be carried on to subsequent keyframes. Now the entire swing will be higher with any built-in nuances in the underlying swing motion left intact. If the arm isn't quite in the correct position at later frame, small changes can be made to the offset at that frame. The frames chosen for the offset action's keyframes don't need to match the keyframes of the original action.

The preceding example uses a choreography action (as opposed to an action created in an Action window). Of course, options exist to have the choreography action replace or add to the underlying action. Replace is the default. This is because most new motion isn't just a simple change to the previous motion; rather it is a completely different type of motion. For instance, if in the middle of a walk cycle, a character is going to wave. The previous arm keyframes from the walk don't help to create a wave - in fact, they get in the way.

Motion "Cross Blend" is useful for averaging between actions in the Action list. For example, a "wave" can be averaged with a "walk". The "wave" action can be created with no knowledge of the "walk" action.

Action Transitions

In the Time Line, actions commonly appear one following another. If you leave a time gap between them, the software will try and interpolate between the last frame of the preceding action and the first frame of the next action if you turn on the "Transition to Next Action" option on the "Blend" section of the action's properties. This creates a simple but smooth transition between the two actions. (The actions that are being blended need to use compatible constraint setups).

The gap between the two actions can be any size, and if the size changes, the transition adjusts. The timeline shows the transition as a semi-highlighted diagonal bar between the two actions.

Action Menu

Delete

Removes the selected object from the project.

Rename

Rename the selected object

Edit

Opens a Window for the selected object. This can also be achieved by double-clicking the object in the Project Workspace.

Edit With...

Opens the selected object for editing.

Save

Saves the selected object with its current name.

Save As...

Saves the selected object with a new name.

New

Distort

Inserts a Distort Object.

Camera

Inserts a Camera.

Light

Inserts a Light.

Force

Inserts a Force.

Null

Inserts a Null Object.

Material Effect

Inserts a Material Effect.

Spring System

Inserts a Spring System.

Dope Sheet

Inserts a Dope Sheet. See Also About Dope Sheets

Rotoscope...

Imports an image file to be used as a rotoscope.

Motion Capture Device

Adds the chosen motion capture plugin.

Volumetric Effect

Adds the chosen volumetric plugin.

Import

Model (*.MDL)...

Sometimes, when working on a model, it may be useful to incorporate another model within it. To import a saved model, right-click (Control-click on a Mac) on the model you want to add to, pick [Import][Model], and select the ".MDL" file to import.

Light (*.LIT)...

Import a Light file.

Camera (*.CAM)...

Import a Camera file.

Sound (*.WAV)...

Displays the Open Sound dialog, allowing a wave file to be added to the project. Select a wave file, then click the Open button to create a Sound Object.

Export

Model (*.MDL)...

An entire choreography can be saved as a single model. The geometry and bones of each model will be inserted into the new model. The model's positions due to translations, rotations, skeletal motion and constraints will all be reflected in the position of the control point's in the new model. Right-click (Control-click on a Mac) the Choreography in the Project Workspace, pick [Export][Model (*.mdl)...].

Simulate Spring Systems

Simulate all Spring Systems.

Remove Simulation Data

Removes the simulated data from this choreography.

Clear

Clear the selected action.

Create Shortcut in Library

Create Shortcut in Library Panel.

Plug-ins

Extension Plugins (.hxt) may be available for this object.

Properties

Edits the selected object's properties.

Action Properties

File Info

Visible: Sometimes. See File Info property.

Length

Read-Only, Default: 0sec. This is the duration of the action in time. The length of the longest channel.

Dynamics

Visible: Cache Only. This contains the dynamic information pertaining to the action such as gravity.

Force

Visible: Cache Only. The force direction vector that will globally affect particles and dynamics in the choreography. This is typically used to simulate gravity, and so it is specified as a percentage of gravity. The default is X:0%, Y:-100%, and Z:0%, which sends objects downward at the rate of Earth's gravity.

Rigid Subsamples

Visible: Sometimes, Default: 16. Specifies how many discreet steps in time the simulation should take for every frame of motion. This number is the maximum steps the simulation will take per frame. If no collisions are occurring, the simulation will step forward a full frame at a time regardless of this setting. A higher number of subsamples will yield more accurate results with less object penetration, however lower subsamples will simulate faster.

In any case, the simulation only stores its result once per frame, so memory consumption and file size for the different subsamples is unaffected.

Rigid Drag

Visible: Cache Only, Default: 100, Min: 0. Performs general damping on the rigid-body. It simple resists motion more for a model as it moves faster. It slows both linear and rotational motion. 0% means no drag, and 100% is similar to what we experience through air for most objects. 1000% would seem as if the object was suspended in water.

Display While Simulating

Default: ON. This option toggles whether to update the window when simulating soft and/or right body dynamics.

Reduction Error Tolerance

Visible: Cache Only, Default: 0.1, Min: 0. If this number is greater than zero, then after the simulation the resulting channels will be reduced. This number will represent the maximum error that will be permitted in the newly reduced channel.

Crop Range

Visible: Instance Only. These are the times for the start and end of the action as it will be used in the choreography. It permits cropping off the first or last frames of the action.

Chor Range

Visible: Instance Only. These Start and End values represent the range of time that the action is executed in the choreography. They can be used to speed up or slow down the action, or just have it start at a different time.

Cycle Length

Visible: Instance Only, Default: 0sec. This property represents the length of time for one cycle in the choreography. If the repeat is just one, then it is just the end minus the start. If there is a repeat, it is also divided by the repeat. It represents an easy way to tell how much the action is being scaled up or down in length.

Repeat

Visible: Sometimes, Default: 1, Min: 1. Set this value to the number of times you want the action to cycle in the choreography. You will not be able to set this value if you have Stride Length set, because the repeat count is then determined by the length of the path.

Hold Last Frame

Visible: Instance Only, Default: ON. Select this option to keep the model posed with the last frame of the action after the end of the action frames have been reached.

Transition to next action

Visible: Instance Only, Default: OFF. In the Time Line, actions commonly appear one following another. If you leave a time gap between them, the software will try and interpolate between the last frame of the preceding

action and the first frame of the next action if you select the "Transition to Next Action" option on the action's "Blend" Properties panel. This creates a simple but smooth transition between the two actions. (The actions that are being blended need to use compatible constraint setups).

Blend Method

Visible: Instance Only, Default: Replace. In a choreography's Action List, actions are listed in order of precedence. The default behavior for an action later in the list is to replace whatever motion was before it. However, two additional choices are available: "Add" and "Cross Blend". Replace: This option simply replaces the motion of one action when it overlaps a preceding action.

Add: Add makes the motion in later actions add to the existing motion, (like muscle motion). This is useful for adding hip sway to a previously designed walk cycle, or you can add some extra bounce or head bob. Add is also useful for modifying a complex or motion captured action. For instance, a tennis swing that swings a bit too low for the shot can be quickly modified with only simple additive changes in the choreography. Since this is stored as an additional rotate offset, it will be carried on to subsequent keyframes. Now the entire swing will be higher with any built-in nuances in the underlying swing motion left intact. If the arm isn't quite in the correct position at later frame, small changes can be made to the offset at that frame. The frames chosen for the offset action's keyframes don't need to match the keyframes of the original action.

Blend: Motion Cross Blend is useful for averaging between actions in the Action list. For example, a wave; can be averaged with a walk, (this technique does not make sense for choreography actions). The wave action can be created with no knowledge of the walk action.

Blend Ratio

Visible: Sometimes, Default: 100%, Min: 0%, Max: 500%, Percentage The blend ratio determines how much of this action to include. When using cross blend, this action will be applied at this percent, and the previous action in the list will get 100 minus this value. When using add, this is a percent scalar that can be used to add more or less than the full action.

Has Stride Length

Visible: Cache Only, Default: OFF. Use this option to keep a character from sliding when moving along a path. After turning this on, set the length and time duration for the stride. Stride length cannot be used unless the model is constrained to a path.

Stride Length

Visible: Sometimes, Default: 1, Min: 0. This is the distance that the character moves from the stride's Start and End frames. Note that you often measure a stride as half of a walk cycle.

Stride Range

Visible: Sometimes. This contains the start and end time for the stride that is measured.

Ease

Visible: Sometimes, Default: 0%, Min: 0%, Max: 100%, Percentage Action Ease represents the percentage of the animation you see on a particular frame. The beginning of the action is 0%, the middle is 50%, and the end is 100%. This allows many models in an audience to use the same action, yet each can look slightly different, by using slightly different eases (as defined in the action's Ease channel). By default, when no action ease channel exists, the action begins at the starting choreography frame number, and uses the first frame number out of the crop range specified. This is 0% through the range of the action and considered 0% ease. At the last active frame for this action in the choreography, it uses the last frame number out of the crop range specified. This is considered 100% ease. The default behavior is to progress in a linear fashion from 0% to 100% over the course of time from the start to the end of the action in the choreography. But, by adding an Ease channel, you can make it start out slow, speed up, then slow again or the action can repeat or be applied backwards using the Ease channel. Motion along a path is another case of the Ease channel. When a model is placed on a path and controlled with a stride length motion, its position on the path is determined by the Ease channel in the path constraint, not this ease.

Reusable Translations Scale Method

Visible: Sometimes, Advanced, Default: None. Set this option to apply this action to a character that is build at a different scale. Select a bone that is not at the origin, and is a good indicator of the size of the object. For biped characters, Pelvis or Left Thigh are good bones to use for this. All translates in the action will be scaled by a factor that is determined by the chosen bone and method. You can use the bone's length or position as reference. None: The translates will not be scaled at all, but left as they were defined. Length: Select this option to use the length of the selected bone as a reference for the scale of the character. All translates will be scaled based on this bone as a reference.

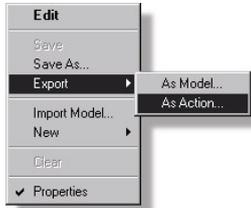
Position: Select this option as an alternate method of scaling the action's translations to a different character. This uses the position of the selected bone, instead of its length. Using this method allows translates to be scaled based on the height of the pelvis for instance. This will essentially use the length of the entire leg as a scale reference.

Bone

Visible: Sometimes. This is the bone to use as a scale reference. When the action is first saved, the model on which is applied is used as the reference for which future models will be compared to.

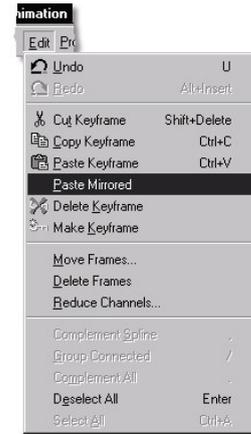
Export From An Action Window

To export an action to a MOT file format, right-click (Control-click on a Mac) on the Action icon in the Project Workspace tree and pick [Export][As Action], (the Export item will only be enabled if the Action window is open and active). The exported action will not have any information about the model, only the information about the action. This is useful for game designers who want to create actions for their models to use in a real-time environment. More information on this topic is located at: <ftp://ftp.hash.com/pub/sdk>



Action Paste Mirrored

Paste mirrored is used to paste a copied pose while reversing the left motion with the right. This is used for making the identical extremes of a walk or run cycle where the right side is doing what the left was and vice versa. A simple walk can now be created by posing one extreme at frame "0", then "Copy". Advance to frame "15" and "Paste Mirrored", advance to frame "30" and "Paste" - that's all there is to it. It is important to build the model so that the spine bones (pelvis to the head) are positioned at 0 along the X-axis. If the model is asymmetric, and it is not possible to change the bone positions of the model, you can set the Mirror Mode Tolerance in the Tools:Options:Modeling panel to be larger than the largest x start position value of a central bone.



The Key Mode filters used for standard paste functions also work for paste mirrored. This means that "Paste Mirrored" can be used on just the selected branch, just muscle, onto the selected group, etc. Paste Mirrored works on Skeletal, Muscle and Pose motion. Keep in mind that for the software to differentiate between what is left and what is right in Skeletal and Pose motions, the Bone or Pose name must include the word "Left", or "Right" (the word match is not case sensitive so "left" or "right" will work as well). For muscle to correctly mirror, the two points must be nearly exact mirror images of one another across the X-axis in the modeling window. Usually this is accomplished by using Flip-X with the pivot at 0, or the "Copy/Flip/Attach" feature. Poses that contain the words "Left" and "Right" are negated when Paste Mirrored is used. This is useful for poses like "Sneer Left - Right", where positive is on one side, and negative on the other.

If two actions define muscle motion on the same control points, the result is somewhat simpler. The muscle movements in each action are added together and placed on that control point. This usually ends with great results. An action that says "hello" can be combined with a happy action, and even though both move some of the same control points on the lips, you end up with a hello motion with an upturned mouth, which is a happy hello.

Click the "Shortcut to" Action icon to select it. You can change its properties for each keyframe in the Project Workspace.

Use Stride Length is only available for actions that have stride length. It is

selected by default if an action does contain stride length information. Stride length will still not be used unless the model is constrained to a path.

Hold Last Frame retains the action's last frame on the character until another action is chronologically it. (default operation)

Start indicates at which choreography frame/time the action will start.

End indicates at which choreography frame/time the action will end.

Length indicates the duration of the action that will be used, (Length does not include the repeating). Actions have a default length but they can be any length, and will stretch or squeeze time to fit into the length indicated.

Repeat indicates how many times the action will be repeated (the action should have been designed to loop).

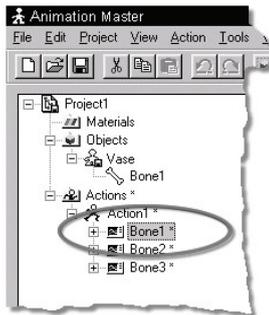
Crop Range Start indicates the first frame/time to use from the action.

Crop Range End indicates the last frame/time to use from the action

Crop Range Length is just for reference (cannot be edited) and indicates the length of the action in time, frames or cels.

Removing Actions from Specific Bones

If you wish to remove just part of a Skeletal action, delete the appropriate Bone Channel icons under the Action.



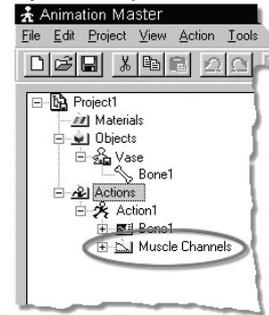
Removing Part of a Skeletal Action

“Save As” Skeletal Action

New Skeletal actions are embedded in the project you are working on. To be able to use the Skeletal action in other projects, it must be saved separately on your hard drive. Right-click (Control-click on a Mac) on the Action icon in the Project Workspace and pick [Save As], (pick [Save] if this action is already reusable). Use the Save Action dialog to direct where the action should be saved on the hard drive.

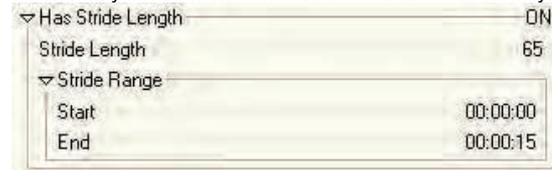
Removing Muscle Action

If for some reason, you wish to remove just the muscle motion from a character, delete the “Muscle Channels” folder under the Action icon in the “Actions” folder of the Project Workspace tree.



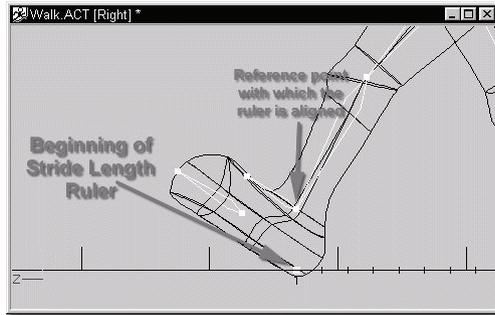
Stride Length

Keeping a character's feet from slipping while traveling along a path must always be considered. Stride length helps the program determine just how far the character needs to move each frame to make its feet appear solidly anchored to the ground with each step. Usually, you will create a "walk" action that can be cycled to make the character walk continuously.



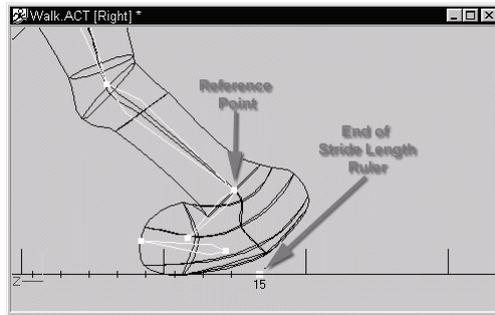
To set the stride length for this "walk" Action, click the Action icon in the “Actions” folder in the Project Workspace tree. On the Action Properties panel, select the “Has Stride Length” option.

Be sure that you are looking at your character from a side or Bird's Eye view.



Start of Stride Length

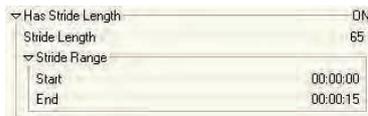
At the point where your character's foot first touches the ground (generally frame "0"), slide the front end of the stride length indicator under the foot.



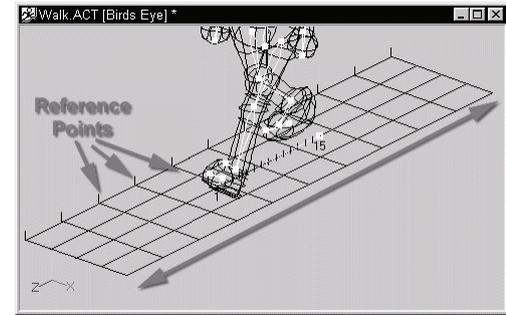
End of Stride Length

Advance frames until the same foot reaches the back of a step (just before it comes off the ground).

Slide the back end of the stride length indicator beneath the foot until it lines up with the same point used in setting the beginning of the stride.



The stride of the character has now been set. The Action Properties panel will reflect the beginning and end frames of the stride, as well as the length (in the unit type you have selected in the [Tools][Options][Units] panel).



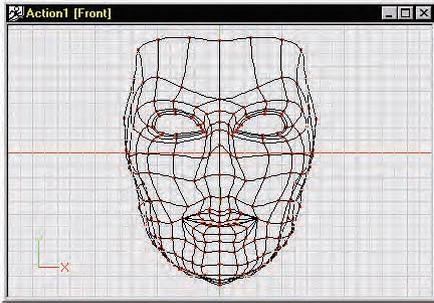
From a Bird's Eye view, a reference grid is visible beneath the character's feet (it can also be seen from a side view, but offers better visual feedback from Bird's Eye). Stepping through the frames (use the scrub bar, frame buttons, or the <+> and <-> keys on the numeric keypad) will cause this grid to move forward/backward. By lining the foot up with one of the lines on the reference grid, any adjustments that are necessary can be made to the character's stride to prevent slipping.

Stride length can also be used to keep round objects such as wheels from slipping. At frame "0", move the front of the stride length ruler to the center of the wheel. Advance frames to where the wheel completes one revolution. Move the back of the stride length ruler to the perimeter of the wheel.

If you make a mistake creating a Stride Length, or you simply want to remove it from a character, disable the "Has Stride Length" option on the Action Properties panel "General" tab.

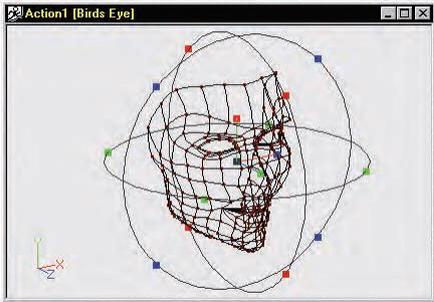
Flatten

There is a subtle secret to keep in mind while you are applying decals: decals do not care how the model is shaped during application. With that in mind, it is possible to flatten, or unwrap, an object before applying decals. This method also comes in to use because an object can first be flattened, then a decal created from the flattened template.



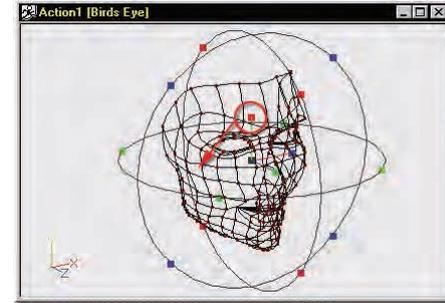
A face model in Muscle mode

The easiest way to flatten is from a slightly turned view. You can use the Turn tool to turn the model slightly away from the front view. Hide all but the part of the model you wish to apply a flattened decal to. If the group is connected around the back hide the back spline too. Then Group what is left and select the Rotate Manipulator on the Manipulator toolbar.



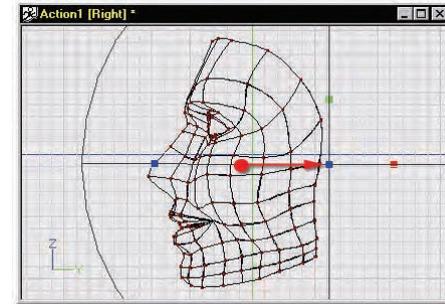
The Mask model in Muscle mode with all points selected and the Rotate Manipulator active

Flatten uses the Z-axis (blue) to create an invisible "cylinder" around the selected points which are then split at the Y-axis (green). This may make it necessary to reorient the pivot. To correctly orient the pivot, click on the Red handle at the end of the Green Axis (to orient the pivot around the X axis) and drag in the direction of the arrow in the image below until the Properties panel shows -90° rotation in the X axis.



Rotating the pivot -90° X

Change to a right view and drag the Blue handle of the pivot backwards until it lies just behind the back spline of the model, as shown below:

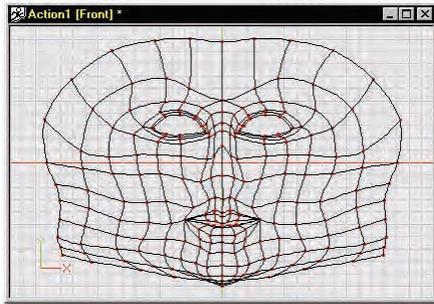


Repositioning the Pivot along the Z-Axis.

Right-click (Command-click on a Mac) within the Rotate Manipulator and select Flatten from the menu.



The result should look similar to below:



Flattened Face Group of a Model

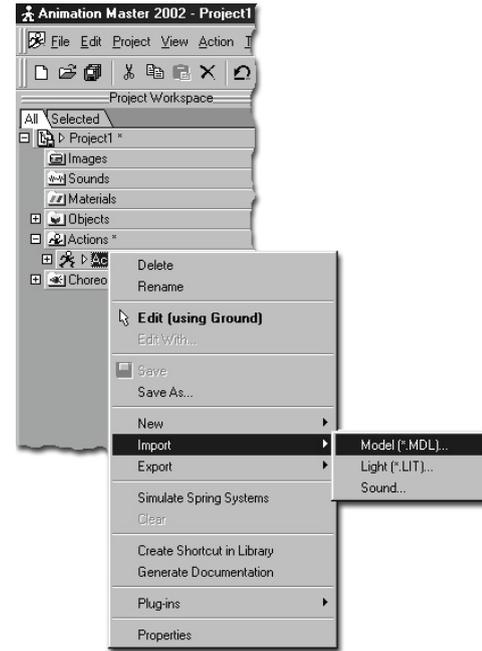
At this point if a decal isn't available, a screen shot could be taken and used to create decals with, which could then be placed on the flattened model.

To capture a screen on the PC, press the <print screen> key on the keyboard. This will copy the contents of the screen to the clipboard. Open a paint program, start a new file, paste your screen capture into the new file and save it as an image file

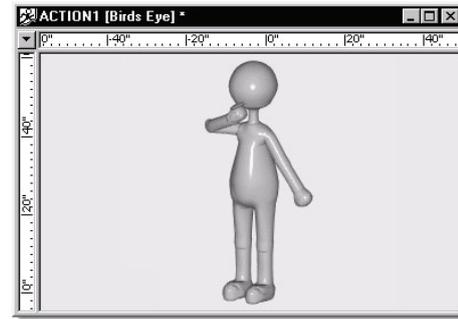
To capture a screen on a Macintosh, press <shift+3> on the keyboard. This will create an image file called "Picture 1" in the root of your Hard Drive that you can open in a paint program.

Action Objects

Many actions need props, such as hats, juggling balls, canes, costumes, vehicles, etc. When other characters reuse these actions, they will need the props also, so they are included with the action. Models, lights, nulls, cameras, etc. that are included as part of an action are called "action objects".

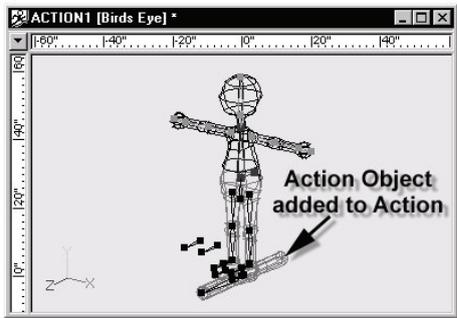


To add a prop to an action as an action object, create a new action, then right-click (Control-click on a Mac) the action icon in the Project Workspace tree and pick [Import Model].

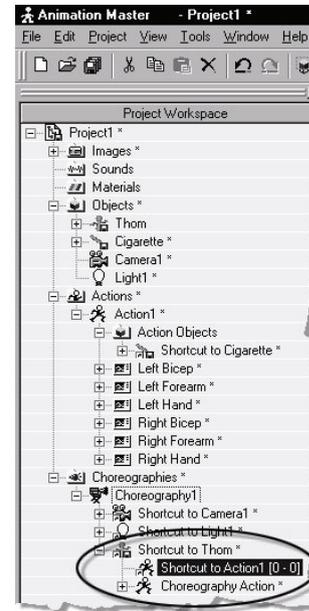


The cigarette was scaled to fit the scene a little more appropriately, and an action of the Thom model raising the cigarette to his mouth was created.

In this example, the model that was imported was a cigarette. An "Action Objects" folder is automatically created under the Action icon and a "Shortcut to Cigarette" is put into it, (the "Cigarette" model itself is put into the "Objects" folder).

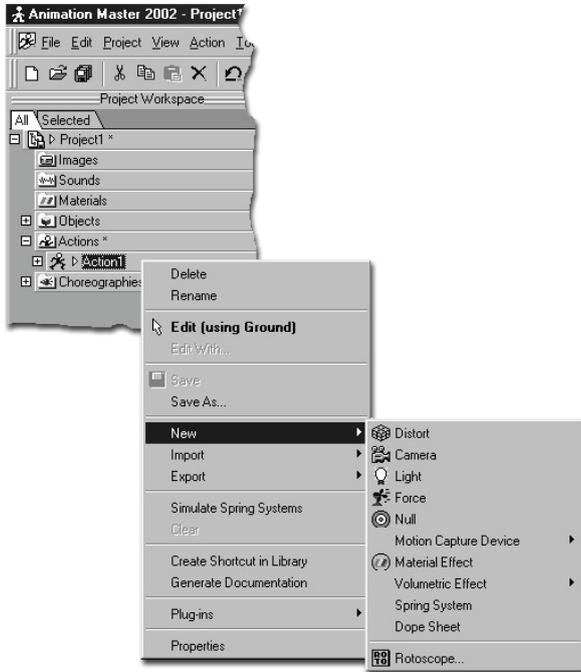


The "Cigarette" model was also added into the Action window at the origin. (Notice it maintains its original scale).



Now add a new Choreography, drop Thom into it, then drag and drop the newly created action onto the “Shortcut to Thom” icon in the “Choreographies” folder of the Project Workspace tree.

The action automatically uses the cigarette model. This action could be saved as a separate file (using the [Save As] option), and reused on other models with similar hierarchies so that they could also hold cigarettes. Action objects are unique to Animation:Master and are one of the secrets of reusability.



To add other kinds of action objects, right-click (Control-click on a Mac) the Action icon in the “Actions” folder of the Project Workspace tree, and pick [New], then the item you wish to use as an action object: [Camera], [Light], [Force], [Null], [Material Effect], etc.

Action Object Container Menu

Delete

Removes the selected object from the project.

New

Distort

Inserts a Distort Object.

Camera

Inserts a Camera.

Light

Inserts a Light.

Force

Inserts a Force.

Null

Inserts a Null Object.

Motion Capture Device

-none-

Inserts a Motion Capture Device plugin.

Material Effect

Inserts a Material Effect.

Spring System

Inserts a Spring System.

Folder

Creates a new folder that can be used to organize objects. Once created objects can be dragged into the folder

Volumetric Effect

Adds the chosen volumetric plugin.

Import

Model...

Sometimes, when working on a model, it may be useful to incorporate another model within it. To import a saved model, right-click (Control-click on a Mac) on the model you want to add to, pick [Import][Model], and select the ".MDL" file to import.

Light...

Import a Light file.

Properties

Edits the selected object's properties.

Action Object Actions

A Choreography Action is similar to a regular action except that is not reusable. When you animate a character or object directly in the choreography window, it creates a choreography action. They can also be used to tweak reusable action in a choreography. Choreography actions are

saved within the choreography. Multiple choreography actions can be created by selecting [New][Choreography Action] from the Model or the Action shortcut container

Action Object Placeholders

This is an item in the Project Workspace tree in an actions Action Objects folder. Action Objects are not applied until the action is applied to a specific model. This placeholder allows you to change what model is used for the action object. The Object property allows you to pick an object from the list of loaded models.

Action Object Placeholder Menu

Delete Removes the selected object from the project.

Rename Rename the selected object

Properties Edits the selected object's properties.

Action Object Placeholder Properties

Object

This property indicates which object will duplicated in the action as an action object. It can be a model, a null, a light or any other object in the Objects folder.

Target

Visible: Sometimes. This bone and its children will be controlled by the distortion object.

Object's Properties

Visible: Sometimes Contains the properties of the object this action object placeholder is for.

Action Object Action Menu

Delete

Removes the selected object from the project.

Rename

Rename the selected object

Export As Action...

This feature is used to save the motion created in the choreography as a reusable action. This is useful when the motion is most easily created in choreography, but will be reused again in a different shot or on a different model. It does not replace or change the choreography motion to reusable. Right-click (Control-click on a Mac) the Choreography icon Action icon in the Project Workspace tree, then pick [Export Action As...], then delete the choreography action, then import the reusable action that you just saved.

This only saves the choreography action, not the other underlying reusable actions. (To save everything as a single action, first bake them into the choreography action). "Export Action As..." can also be used to layer motion where a different time interval between the keyframes is required. You can make your low frequency motion first, then save it out, delete it and bring it back in as an action, then using "Add to Underlying Motion" selected on the Choreography Action Properties panel, add the high frequency motion. This could be an arm that swings, but twitches while it swings. This layering technique can be used for layering facial motion, secondary clothes motion etc...

Properties

Edits the selected object's properties.

Action Object Action Properties

Chor Range

These Start and End values represent the range of time that this choreography action will be active.

Hold Last Frame

Default: ON. Select this option to keep the model posed with the last frame of the action after the end of the action frames have been reached.

Transition to next action

Default: OFF. In the Time Line, actions commonly appear one following another. If you leave a time gap between them, the software will try and interpolate between the last frame of the preceding action and the first frame of the next action if you select the "Transition to Next Action" option on the action's "Blend" Properties panel. This creates a simple but smooth transition between the two actions. (The actions that are being blended need to use compatible constraint setups).

Blend Method

Default: Replace. In a choreography's Action List, actions are listed in order of precedence. The default behavior for an action later in the list is to replace whatever motion was before it. However, two additional choices are available: "Add" and "Cross Blend".

Replace: This option simply replaces the motion of one action when it overlaps a preceding action.

Add: Add makes the motion in later actions add to the existing motion, (like muscle motion). This is useful for adding hip sway to a previously designed walk cycle, or you can add some extra bounce or head bob. Add is also useful for modifying a complex or motion captured action. For instance, a tennis swing that swings a bit too low for the shot can be quickly modified with only simple additive changes in the choreography. Since this is stored as an additional rotate offset, it will be carried on to subsequent keyframes. Now the entire swing will be higher with any built-in nuances in the

underlying swing motion left intact. If the arm isn't quite in the correct position at later frame, small changes can be made to the offset at that frame. The frames chosen for the offset action's keyframes don't need to match the keyframes of the original action.

Blend: Motion Cross Blend is useful for averaging between actions in the Action list. For example, a wave; can be averaged with a walk, (this technique does not make sense for choreography actions). The wave action can be created with no knowledge of the walk action.

Blend Ratio

Visible: Sometimes, Default: 100%, Min: 0%, Max: 500%, Percentage
The blend ratio determines how much of this action to include. When using cross blend, this action will be applied at this percent, and the next action in the list will get 100 minus this value. When using add, this is a percent scalar that can be used to add more or less than the full action.

Dope Sheets

A Dope sheet allows you to take dialog in the form of text, and automatically translate it into mouth shapes for lip sync animation. See Also Add a Sentence.

Dope Sheet Menu

Delete

Removes the selected object from the project.

Rename

Rename the selected object

Tack Children

Adds and Tacks all of Object's Children into the Timeline.

Edit

Opens a Window for the selected object. This can also be achieved by double-clicking the object in the Project Workspace.

Add Sentence

Opens a text entry dialog where you can enter a sentence of written dialog. Text will be inserted at the current position of the timeline indicator.

Properties

Edits the selected object's properties.

Add Sentence Dialog

Type in the sentence that you want to create lip-sync animation to. Animation:Master will then use the loaded dictionary to translate the words into phoneme mouth shapes. The "Can You Say That?" tutorial in The Art of Animation:Master manual covers this feature in detail.

Phonemes

Phonemes are set of functionally equivalent sounds that when put together make up the spoken word. In Animation:Master these words are represented as Text Objects. Animation:Master primarily uses the Preston Phoneme set for simpler characters. It will work well for most of your lip sync needs.

Phoneme Cache Menu

Delete

Removes the selected object from the project.

Select Cache ()

Highlights the object that this shortcut is to.

Properties

Edits the selected object's properties.

Preston Phoneme Set

A I

E

O

U

M B P

F V C D G K N R S T H Y Z

L

The phoneme translation supports the following, higher level phoneme set. You can make poses for any or all of these phonemes if you want more accurate lip shapes.

'aa'	'ar'	'a'	'ai'	'ah'	'i'	'b'	'ch'	'd'	'er'
'e'	'eh'	'e'	'f'	'g'	'h'	'w'	'ih'	'i'	'ach'
'ge'	'c'	'k'	'l'	'm'	'ng'	'n'	'oi'	'ah'	'eu'
'ow'	'aw'	'o'	'oo'	'ooh'	'p'	'r'	'sh'	's'	
'th'	't'	'uh'	'ur'	'v'	'w'	'u'	'z'	'zz'	

You will need to have a matching Pose for each Phoneme you will use for lip sync.

Phoneme Properties

Start

Default: 0sec. Phoneme start time.

End

Default: 0sec. Phoneme end time.

Length

Default: 0sec. Phoneme length.

Text Dialog

Text Objects are the individual spoken words which are added to a Dope Sheet. These words are broken down into individual Phonemes. In the timeline view these words can be moved to sync with the Sound waveform. When viewed in the timeline view they will be a light blue color if matching poses were found for all of the words phonemes. If poses were not found the word will be displayed red. After the necessary poses are added to the model right-click the word in the Project Workspace and select 'Auto Phoneme Breakdown' to lookup the phonemes and match them with the correct poses.

Text Dialog Instance Menu

Delete

Removes the selected object from the project.

Rename

Rename the selected object

Select Cache ()

Highlights the object that this shortcut is to.

Tack Children

Adds and Tacks all of Object's Children into the Timeline.

Auto Phoneme Breakdown

Generates Phoneme breakdown using Dictionary lookup of selected Word.

Add Single Phoneme

Allows Selection of Individual Phoneme from Model to be added to TimeLine.

Properties

Edits the selected object's properties.

Text Dialog Properties

Start *Default: 0sec.* Text start time.

End *Default: 0sec.* Text end time.

Length *Default: 0sec.* Length of Text Object.

Drivers

Drivers are the channels, constraints, expressions, etc... that control the behavior of a model. Drivers are what makes an action actually do something. You can see all drivers beneath an action or choreography action by opening it in the Project Workspace. You can display which drivers currently control a property by choosing [Select][Driver] from any property's context menu.

Animatable Drivers

Animatable Drivers are used to store values on non floating point properties that change over time. They store a copy of the driven property at each key, and are interpolated in hold style. When a keyframe is added past frame "0" to an empty Time Based Driver, the default value for that channel is inserted at frame "0". (This often results in an unintentional change from the default position to the key.) If you then try to delete the keyframe at "0", it cannot really be deleted, rather the values from the next keyframe are copied down to frame "0". This way the value will not change until you add another new key.

Animatable Driver Keyframe Menu

Delete Removes the selected object from the project.

Properties Edits the selected object's properties.

Animatable Driver Menu

Delete Removes the selected object from the project.

Properties Edits the selected object's properties.

Driver Menu

Delete Removes the selected object from the project.

Properties Edits the selected object's properties.

Dynamic Results Drivers

Dynamic Storage Drivers are Rotate Drivers that are used to store the results of Dynamic Constraints.

Dynamic Results Driver Menu

Delete

Removes the selected object from the project.

Change To Euler Driver

Selecting this will convert all keyframes to Euler interpolation. This is best for rotating objects more than 180 degrees.

Change To Quaternion Driver

Selecting this will convert all keyframes to Quaternion interpolation. This is best for smooth interpolation with out gimbal or roll problems.

Change To Vector Driver

Selecting this will convert all keyframes to Vector interpolation.

Properties

Edits the selected object's properties.

Empty Drivers

Used in Actions or relations to contain drivers of a property's sub properties.

Empty Driver Cache Menu

- Delete** Removes the selected object from the project.
- Select Cache ()** Highlights the object that this shortcut is to.
- Properties** Edits the selected object's properties.

Constant Drivers

By default, objects in Animation:Master automatically animate. If you move an object at a given frame, a keyframe is automatically created at that frame. Occasionally this is not desirable; it can be particularly annoying with cameras and lights. For example, suppose that in a choreography, the main character does not walk on set until three seconds have elapsed. At that time you determine the lighting needs some changes. You want to move the lights, but you don't want the lights to slide there starting at time 0:00:00. This is exactly what animate mode is for. Select the light, deselect "Animate Mode" on the Properties Panel, then move the light. If the light will never be animated, just leave the "Animate Mode" off. You can set any light, camera, null, or model shortcut the same way. Now you can see the results on the frame you care about, yet the key will be placed at time 0:00:00, and the results will be visible at the frame you are on. The preceding scenario is the most common reason to use this feature. However, the way this works when keyframes already exist is slightly more complex. Suppose that your light already had keyframes at 0:00:00, 0:02:00, 0:04:00 and 0:06:00 that formed a small circular motion. Now at 0:03:00 you wish this entire motion was keyed higher and farther to the left. By turning off "Animate Mode", you can make this adjustment at 0:03:00. Simply translate the light higher and to the left. No keyframe will be created at 0:03:00, but the light will follow your mouse. This is achieved by modifying all of the existing keyframes by the requested amount of change.

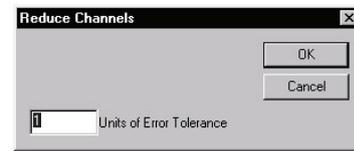
Time Based Drivers

Channel Reduction

A single animated arm gesture may involve dozens, even hundreds of channels. An entire animated sequence will easily require thousands of channels and tens of thousands of control points, since every piece of the body moves (forearms, wrists, palms, fingers, etc.) Their voluminous nature and their importance to believable motion require a special understanding and consideration.

Frames between keyframes of an animation are determined from the in-between shape of the channel splines. Sometimes, during key framing, and especially during motion capture, those splines can become quite dense with control points. If you look closely at most splines you will determine that many, perhaps most, of the control points are superfluous – the spline could be perfectly reconstructed with a few, strategically placed control points. This is called "channel reduction".

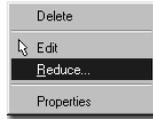
Channel reduction has two major advantages. First: less data is always a good idea, and channels are the most space consuming part of computer animation. However, the second aspect of channel reduction is of major importance. An example may help illustrate the strategic importance of a low density channels. Consider a channel spline obtained from motion capture data. The splines are elegantly smooth, with beautifully sloping curves representing motion ease and the natural frequency of human movement. Unfortunately, motion capture data is traditionally dense, with a control point on every frame – essentially every frame is a keyframe. Suppose you wanted to slightly adjust one of the movements. Since every frame is a keyframe, your change would only affect the frame on which you made the adjustment. This causes an undesired glitch in the movement because the natural curve of the graph has been disrupted. You would have to adjust the preceding and next frames, and possibly the frames before and after those, and so on – for every channel spline affected by your change. But, if the channel splines were low density – meaning keyframes are placed relatively far from each other (10 or so frames away), then an adjustment on one frame can affect all of the in-between frames to the next keyframe (and beyond due to the continuous, smooth, nature of spline channels).



It is suggested that all motion capture data be channel reduced. Hand animated movement contains far fewer redundant control points, but even those channel splines will benefit from channel reduction (maybe as high as a 50% reduction), and the resulting channels are easier to adjust (due to the reasons already cited). The error "Tolerance" field (measured in units from the original location) on the Channel Reduce dialog determines just how much data will be removed. Of course, high frequency data (lots of

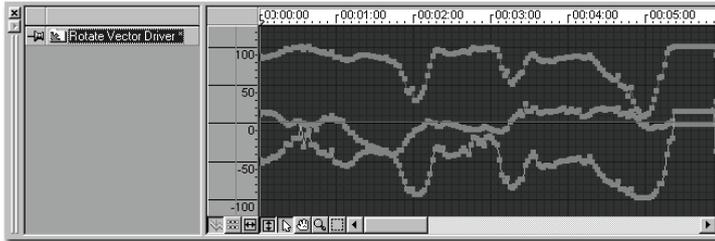
curviness) will reduce less than low frequency data (long, sweeping arcs).

To reduce all of the splines in a single channel, right-click (Control-click on a Mac) the appropriate Channel icon in the Project Workspace tree, and pick [Reduce].

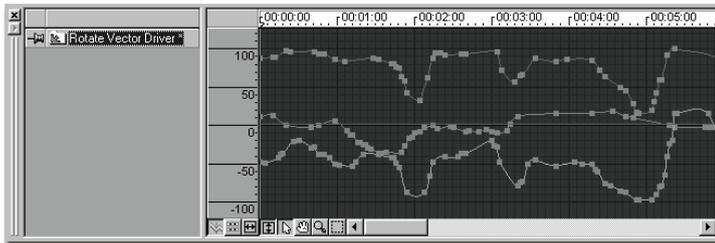


To reduce a single channel item, right-click (Control-click on a Mac) that item's icon in the Project Workspace tree, and pick [Reduce].

To reduce the thousands of channels in an action sequence, while in an Action mode, such as Skeletal or Muscle, pick [Edit][Reduce Channels]. The Key Mode buttons on the Frame toolbar will selectively control which kinds of channels will be reduced.



Before Reduction



After Reduction

Translate Driver

Channels are used to store values on floating point properties that change over time. They are stored in a graph like fashion, and are interpolated smoothly using splines. They can be viewed in the timeline as a graph.

New Keyframes Past Frame "0"

When a keyframe is added past frame "0" to an empty channel, the default value for that channel is inserted at frame "0". (This often results in unintentional movement from the default position to the key.) If you then try to delete the keyframe at "0", it cannot really be deleted, rather the values from the next keyframe are copied down to frame "0". This creates a hold at the newly keyed position from frame "0" to the new key.

Translate Driver Menu

Delete

Removes the selected object from the project.

Reduce...

Reduces the Channel Driver. This removes unnecessary control points from the Channel curve.

Properties

Edits the selected object's properties.

Quaternion Rotate Driver

Quaternion Interpolation achieves the smoothest possible interpolation between any possible keyframes. However, a human does not easily decipher the values stored in the channels. The channels can be used to adjust the magnitude, timing, softness and ease of the rotational transitions. Understanding the values in the channels should not be necessary to make those adjustments. Quaternion interpolation achieves the smoothest interpolation, hence it is the default. In nearly all cases it is the best choice. However in some cases, when an object needs to rotate many degrees, like a tumbling object that needs to rotate 720 degrees, quaternion is not always the best choice. Since quaternion always chooses the shortest and smoothest path, you need to manually keyframe several times each possibly 120 degrees apart to lead the object around so that it will rotate around and around. In this case euler would be the better choice.

Quaternion Details

Understanding the values in the quaternion channels should not be necessary to make magnitude adjustments. For those of you that just must know, the four values in the channels consist of x-quat, y-quat, and z-quat, which hold a vector that represents the axis of rotation. So (80,0,0) would

indicate that the bone is being rotated around the x-axis. The w-quat value holds a number that represents how much it was rotated. However this number is not in degrees, rather it is the cosine of half of the angle, scaled up by 100 for easier viewing in the channels. These numbers range from -100 to 100, 100 means no rotation, and -100 which represents 360 degrees. A w-quat value of 0 represents a 180 degree rotation about the axis specified in x-quat, y-quat, and z-quat.

Quaternion Rotate Driver Menu

Delete

Removes the selected object from the project.

Change To Euler Driver

Selecting this will convert all keyframes to Euler interpolation. This is best for rotating objects more than 180 degrees.

Change To Vector Driver

Selecting this will convert all keyframes to Vector interpolation.

Properties

Edits the selected object's properties.

Euler Rotate Driver

Euler (pronounced "oiler") angles work great for mechanically designed animations that first rotate this way then rotate that way around common axes. They can also rotate repeatedly like wheels or airplane propellers. Cameras and lights use Euler angles. However, Euler angles do not interpolate well through the kinds of motion people and animals make

Euler Details

Euler angles are very common in computer graphics. Orientations of an object are represented by rotations around the local X, Y, and Z-axes of the bone. These angles are fairly easy to understand especially when only one is changed at time. Compound rotations get a little more complicated to predict. Since each rotation must be done to the data one after another, and the axes stay put as the object is rotated, Euler angles are order dependent. There are actually six variations of ordering XYZ, XZY, YXZ, YZX, ZYX, and ZXY. Animation:Master uses ZXY. Since Z rotations are done first they have the ultimate control. You can always rotate your object around the Z-Axis and know that it will roll around the length of the bone. X rotation is done before Y so that the gimbal lock location would be in the positive and negative Y directions. This location is needed less often for typical Animation:Master rotations, so gimbal lock is not all that common. Gimbal lock is what happens when an object is first rotated in such a way that one axis of freedom lies directly on another. For example, the rotation X=90, Y=0, and Z=0, rotates the object that was facing forward to straight up. Now

since the Z rotation is performed first, it rotates along the bone axis, and since Y is performed last, it is done after the X rotate, which means it also rotates along the bone axis. This alignment of the Z and the Y axes is referred to gimbal lock: it is not stuck, just limited in its possible movements since one degree of freedom has been lost. The object can be rotated around the vertical axis or the horizontal axis, but not the Z-axis that points towards us. To get to some places, one of the other angles will need to be changed first. Any orientation can be expressed using Euler; however gimbal lock causes certain areas to be trickier than others to reach. Euler is good for multiple rotations and rotations that need constant angular speeds. This makes it a good choice for simple cases. However, Euler doesn't always interpolate the way you would expect between one keyframe and another if the rotation is complex.

Euler Rotate Driver Menu

Delete

Removes the selected object from the project.

Change To Quaternion Driver

Selecting this will convert all keyframes to Quaternion interpolation. This is best for smooth interpolation with out gimbal or roll problems.

Change To Vector Driver

Selecting this will convert all keyframes to Vector interpolation.

Properties

Edits the selected object's properties.

Empty Relation

Used to represent the parent property that a relation is for.

Empty Relation Cache Menu

Delete

Removes the selected object from the project.

Select Cache ()

Highlights the object that this shortcut is to.

Properties

Edits the selected object's properties.

Vector Rotate Driver

Vector representation of angles has been replaced by quaternion interpolation and it remains only for backward compatibility with older action files. Vector interpolation is unique to Hash software. It was created when inverse kinematics were first introduced in Version 2.0 in 1993. It contains four components X-Aim, Y-Aim, Z-Aim and Roll. The X, Y, and Z components define the direction the end of the bone will aim. The roll is an angle of rotation about the local Z-axis.

Vector Rotate Driver Menu

Delete

Removes the selected object from the project.

Change To Euler Driver

Selecting this will convert all keyframes to Euler interpolation. This is best for rotating objects more than 180 degrees.

Change To Quaternion Driver

Selecting this will convert all keyframes to Quaternion interpolation. This is best for smooth interpolation with out gimbal or roll problems.

Properties

Edits the selected object's properties.

Constraints

Computer animation provides excellent tools, unknown to the traditional clay animator, however the computer deals poorly with everyday, take-it-for-granted physics, like preventing the arm from passing through the body, or keeping the feet firmly on the floor. Professional animators, new to computer animation, are caught unaware by these deficiencies.

As humans, we move as if all the parts of our body are independent, even though every part is connected in some fashion to every other part. For example, we aren't even aware of the complex interaction between feet, hips, and pelvis that keeps our feet firmly on the ground while we walk forward. But as soon as you start to animate, it immediately becomes apparent that keeping the proper interrelationships is very, very difficult. Animation:Master makes this job a whole lot easier with its robust and unique "constraints". A constraint that simply says "Aim At" may indirectly drive an entire chain of hierarchical bone relationships in the way a car's wheels automatically turn with the steering wheel. Similarly, adding an "Orient Like", and "Translate to" constraint will hold a foot perfectly on the ground while the rest of the character performs all kinds of complex gymnastics. Constraints may seem hard because they are unfamiliar, but what's really hard is trying to animate without them. They remove much of the technicalities, leaving you time to learn the mechanics. Constraints are so-named because their purpose is to constrain movement.

Animating Constraints

Constraints can be turned on or off during an animation, so a character can pick up a ball, then release it. Like all animation, channels specify the frames when things are to happen, but there is a subtle technicality - the ball is actually constrained to two bones: the table, and the hand. On frame "0", for example, the ball is "100%" constrained to the table, and "0%" constrained to the hand. Then on frame "75", it becomes "100%"

constrained to the hand, and "0%" constrained to the table; then finally, on frame "150", it becomes "100%" constrained to the table again, and "0%" constrained to the hand. For the example to work, the "Translate To" table and "Translate To" hand constraints for a ball must be ordered one after the other in the ball's Constraint list. The constraints were enforced either 0% or 100%, but they could also be blended. For example, the ball could levitate to halfway between the hand and the table if both constraints were enforced "50%".

Blending Constraints

To blend two constraints OF THE SAME TYPE, simply have them ordered together in the Constraint list for the bone. The "Enforcement" variable ("0" to "100" percent) of each constraint determines the amount of blending.

Constraint Offsets

When one object is constrained in some fashion, Animation:Master allows that constraint to be offset by some amount. For example, you may want to use a Translate To constraint to put a gun to a character's hand. By default, the gun's origin will align with the hand's origin (unlikely to be where you want the gun). Most constraints support offsets. In our gun example, simply translate the gun with the Standard or Translate manipulator.

Orientation constraints also support offsets. You probably want the gun to be oriented in the hand. Do this by first adding an Orient Like "Hand" bone constraint to the gun (but the gun needs to be adjusted slightly). Simply use the Rotate manipulator to make the adjustments, and offsets will be created. Offsets may be keyframed to animate. Offset fields are located on the constraint's Properties panel and can be typed in.

Once a complex constraint setup is in place with all the proper offsets, it is often convenient to prevent further modification of these offsets. Each Constraint Properties panel has an option called "Allow Offsets", which prevents any further changes to the offsets except by type in.

Circular Constraints

It is possible, but undesirable to create circular constraints. A simple example of a circular constraint is to translate the right shoulder to the right wrist. The shoulder can't be positioned until the wrist is positioned, but the wrist position depends on the shoulder position. This is considered circular and can not be solved, resulting in a "Circular Constraint Detected" error message.

Constraint Order

Each bone can have a list of constraints in the order they are to be applied. When a new constraint is added, it appears at the bottom of the list, so it takes precedence. You can then drag and drop the new constraint into the list wherever its precedence really belongs. For example, many bones have “Spherical Limits” constraints as part of their poses. If you add an “Aim At” constraint to the bottom of the constraint list of an arm, the “Spherical Limits” constraint will be over-ridden by the “Aim At” constraint. Drag and drop the “Aim At” constraint above the “Spherical Limits” to cause the arm to point at a bird as long as it doesn’t exceed the arm’s freedom of movement.

Compensate Mode

Compensate mode is used to compensate for a change that you are about to make. The most common use is when adding a new constraint. For instance, suppose you have wrapped the hand of your character around a glass, which is sitting on the table. Now you want to pick the glass up. But if you translate the glass to the hand, the glass will hop to the origin of the hand bone, and you will have to manually move it back, guessing where to place it. What you want is the translate constraint to use the hands current position. To do this, select the Compensate Mode button on the Manipulator toolbar before you add the new constraint. After applying the constraint, the Compensate Mode button deselected, so you have to select Compensate Mode before each operation. Compensate mode applies constraint offsets automatically. Similarly, the glass orientation in the hand can be maintained. Compensate Mode can remove the effect of moving or rotating an object's dependents (both its children, and objects constrained to it) . For example, in the case of the glass in the hand after the constraint was applied, if you translate the glass, offsets are computed so that the glass follows your mouse. If instead you wanted to move the hand without the glass moving, you could enter Compensate Mode, then rotate or translate the hand. Another example might be translating or rotating a ship that has some objects on it that are children, and some that are constrained to it. With compensate mode, you could move the ship “under” the props.

Using “Make Keyframe” Before Turning Constraints Off

A glass may be picked up and set down. To pick it up without moving, use Compensate Mode. To set it down, turn the constraints off. However, when the constraint is turned off (enforce percentage=0), the object will move back to the place it was last keyframed to, so before turning the constraint off, click “Make Keyframe” to put the rotation, translation or both (the net result of the constraints) into its channels. Now when the constraint is turned off, the object will remain stationary.

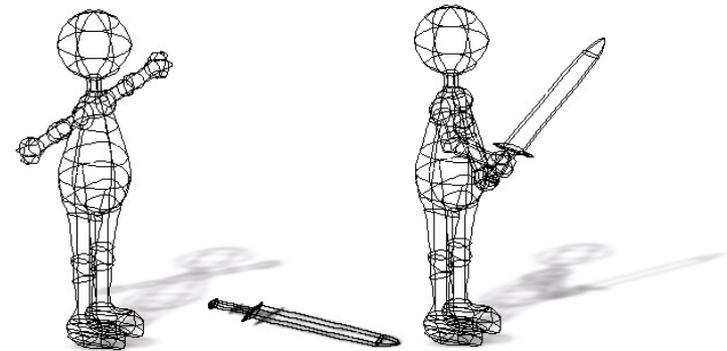
Constraint Use With Motion Captured Actions

Sometimes you will want a normally proportioned human being wearing a motion capture suit to play the part of an eccentrically proportioned computer character, such as a dwarf. The difference in proportions between the two will require you to intervene during the action by placing constraints on the dwarf’s feet to keep them from slipping on the ground. At other places in the motion capture action you might also have to place constraints on the dwarf’s hand to keep it correctly positioned on a doorknob in the scene, or to hold his hips in the correct place. The motion capture actor can thereby impart his natural timing and sense of weight to a non-proportional computer actor while maintaining important positional relationships.

Translate To

Translate To Constraint

The Translate To constraint will reposition the constrained object to the location of the target object. The pivot of the object is considered its position. This constraint supports blending with other translate constraints. This type of constraint would be very useful for putting a ball into a character’s hand, or a hat on his head. (When trying to decide whether to use a Kinematic or Translate To constraint, the Translate To constraint is best when the character drives the animation).



sword “Translated to” the characters hand

To make a character hold the sword, right-click (Ctrl-click on a Mac) the sword icon in the Project Workspace tree and pick [New Constraint] [Translate To]. When the mouse pointer will change to a Picker cursor, click on the character’s right hand in the window, (or choose the character and the hand with the Constraint Properties panel). Now the sword will follow the hand.

Translate To Constraint Menu

Delete

Removes the selected object from the project.

Select Target

Choose the target this constraint is affected by

Properties

Edits the selected object's properties.

Translate To Constraint Properties

Enforcement

Default: 100%, Min: 0%, Max: 100%, Percentage. Enforcement controls whether a constraint is off or on. Constraints can be turned on or off during an animation, so a character can pick up a ball, then release it. Like all animation, channels specify the frames when things are to happen, but there is a subtle technicality - the ball is actually constrained to two bones: the table, and the hand. On frame "0", for example, the ball is "100%" constrained to the table, and "0%" constrained to the hand. Then on frame "75", it becomes "100%" constrained to the hand, and "0%" constrained to the table; then finally, on frame "150", it becomes "100%" constrained to the table again, and "0%" constrained to the hand. For the example to work, the "Translate To" table and "Translate To" hand constraints for a ball must be ordered one after the other in the ball's Constraint list. The constraints were enforced either 0% or 100%, but they could also be blended. For example, the ball could levitate to halfway between the hand and the table if both constraints were enforced "50%". Because it is more common for constraints to be turned only off or on, the default channel interpolation method is hold. This method holds the value of the keyframe exactly until the next keyframe. If you want normal blend-like interpolation, change the interpolation method to "Spline"

Apply Before Action

Visible: Sometimes, Advanced, Default: OFF. Constraints which are stored in poses can be applied before or after the actions are applied. Usually constraints are done after the actions. This way rigs and limits are performed after the action changes. However occasionally a constraint needs done before the actions. The most common case for this is when in the action, the user needs to set offsets from a translate or orient like constraint. The software can't actually store this as an offset on the constraint, since the constraint is in a pose and shouldn't be changed. So instead, a new translate channel is added in the action. If the actions occur after the constraint then the action channel is added to the constraint results. This essentially creates an offset. This is used on the pelvis bone of the Hash 2001 Rigs.

Lock Offsets

Visible: Sometimes, Advanced, Default: OFF. Putting offsets on constraints is very common and easy to do. "Lock Offsets" prevents accidentally changing them, and is an option on every constraint that contains offsets. (Hiding the bone on which the constraint is applied has a similar effect, because if the bone can't be selected, it can't be offset). If offsets are already set they will remain, but it will lock out any further changes.

Lag

Visible: Sometimes, Default: 0sec, Min: -15907sec. Every constraint with a target has its own lag, which allows it to be controlled by the target bone based on its position/orientation a few frames ago. The units are time. It will be displayed in frames or SMPTE depending on the global options dialog. This value is animatable, so it may change over time.

Target

Visible: Cache Only. This is the target bone for the constraint.

Translate Offset

This offset allows a bone to be constrained not exactly to the target bone, but a little up, down or to the side. The offset can be set by typing in values or just translating the constrained bone with a translate manipulator. It also may be set while adding the constraint, by using compensate mode. It specifies a translate offset vector in the target bone's space.

Aim At

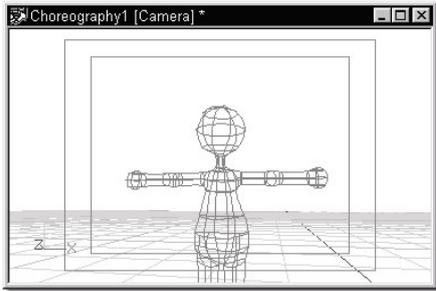
The Aim At constraint aims the pivot of the constrained bone in the direction of the pivot of the target object (bone, light, camera, null). This constraint supports blending with adjacent Aim At constraints.

Aim At is often used to point cameras and lights at a character's face, or to make the character's eyes follow a passing car. They are also commonly used to give hints to the kinematic constraint for the direction of the first bone in a kinematic chain. Like aim "high" at "thigh target".

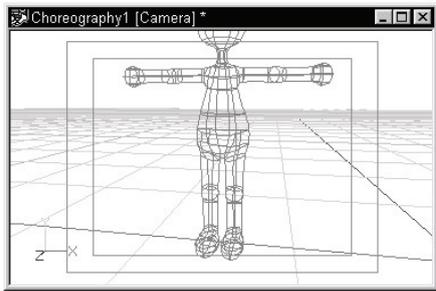
Scale To Reach Option

This option allows the bone to stretch to reach a target. You have the option to limit the scale to just the Z-axis only or all three axes. Interactive IK also has the ability to scale to reach. While dragging the end of a chain, hold down the "Shift" key: this will scale the Z-axis. To interactively scale all axes, hold down the "Alt" key while dragging.

Note: the X, Y, Z offset channels allow you to create an offset in the targets space rather the objects space which is what X, Y, Z orient-offset do.



Camera Aim At "head"



Camera Aim At "pelvis"

Aim At Constraint Menu

Delete

Removes the selected object from the project.

Select Target

Choose the target this constraint is affected by

Properties

Edits the selected object's properties.

Aim At Constraint Properties

Enforcement

Default: 100%, Min: 0%, Max: 100%, Percentage. Enforcement controls whether a constraint is off or on. Constraints can be turned on or off during an animation, so a character can pick up a ball, then release it. Like all animation, channels specify the frames when things are to happen, but

there is a subtle technicality - the ball is actually constrained to two bones: the table, and the hand. On frame "0", for example, the ball is "100%" constrained to the table, and "0%" constrained to the hand. Then on frame "75", it becomes "100%" constrained to the hand, and "0%" constrained to the table; then finally, on frame "150", it becomes "100%" constrained to the table again, and "0%" constrained to the hand. For the example to work, the "Translate To" table and "Translate To" hand constraints for a ball must be ordered one after the other in the ball's Constraint list. The constraints were enforced either 0% or 100%, but they could also be blended. For example, the ball could levitate to halfway between the hand and the table if both constraints were enforced "50%". Because it is more common for constraints to be turned only off or on, the default channel interpolation method is hold. This method holds the value of the keyframe exactly until the next keyframe. If you want normal blend-like interpolation, change the interpolation method to "Spline"

Apply Before Action

Visible: Sometimes, Advanced, Default: OFF. Constraints which are stored in poses can be applied before or after the actions are applied. Usually constraints are done after the actions. This way rigs and limits are performed after the action changes. However occasionally a constraint needs done before the actions. The most common case for this is when in the action, the user needs to set offsets from a translate or orient like constraint. The software can't actually store this as an offset on the constraint, since the constraint is in a pose and shouldn't be changed. So instead, a new translate channel is added in the action. If the actions occur after the constraint then the action channel is added to the constraint results. This essentially creates an offset. This is used on the pelvis bone of the Hash 2001 Rigs.

Lock Offsets

Visible: Sometimes, Advanced, Default: OFF. Putting offsets on constraints is very common and easy to do. "Lock Offsets" prevents accidentally changing them, and is an option on every constraint that contains offsets. (Hiding the bone on which the constraint is applied has a similar effect, because if the bone can't be selected, it can't be offset). If offsets are already set they will remain, but it will lock out any further changes.

Lag

Visible: Sometimes, Default: 0sec, Min: -15907sec. Every constraint with a target has its own lag, which allows it to be controlled by the target bone based on its position/orientation a few frames ago. The units are time. It will be displayed in frames or SMPTE depending on the global options dialog. This value is animatable, so it may change over time.

Target

Visible: Cache Only. This is the target bone for the constraint.

Scale To Reach

Default: OFF. This option allows the bone to stretch to reach a target. You have the option to limit the scale to the Z-axis only or all three axes. Interactive IK also has the ability to scale to reach. While dragging the end of a chain, hold down the [Shift] key: this will scale the Z-axis. To interactively scale all axes, hold down the [Alt] key while dragging.

Z Axis Only

Visible: Sometimes, Default: OFF. If on, the constrained bone will only scale along the Z-axis, otherwise it scales along all three axes.

Rotate Offset

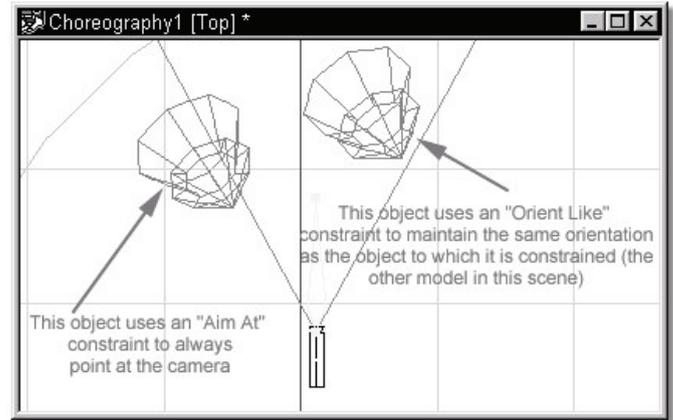
Usually the Aim At constraint aims the bone directly at the target bone. The rotate offset allows the constrained bone to be rotated to a new direction that is relative to this aim direction. For example, a bone may be oriented 90 degrees to around Y compared to the target bone. This offset may be set by just rotating the constrained bone with the rotate manipulator, or by typing in angle values. It also may be set by using compensate mode before picking the target, or before turning the constraint on.

Translate Offset

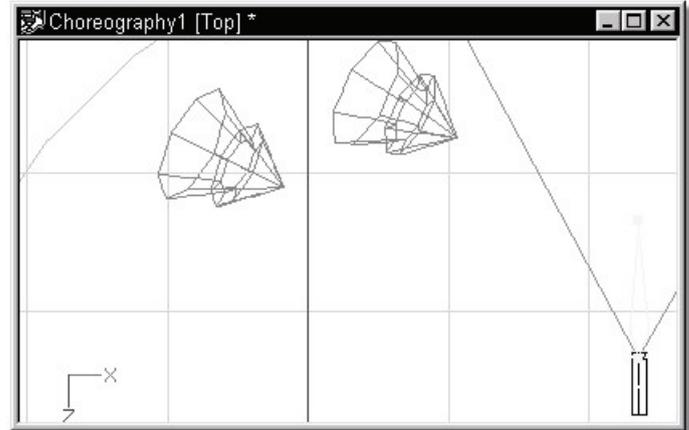
This option allows a camera to be constrained not exactly to aim at the target bone, but rather a little to the side. The offset can be set by typing in values. It specifies a translate offset vector in the target bone's space.

Orient Like

The Orient Like constraint orients the constrained object in the same 3D orientation as the target object. Both the object and the roll handle will aim in the same direction. This constraint is generally used in combination with another (such as Aim At) to orient two objects similarly



A choreography contains two models. The one on the left is constrained to Aim At the camera. The object on the right is constrained to Orient Like the first object.



As the camera moves about the scene, the first model will always rotate to aim at it. The second model, while it may or may not end up pointing at the camera will always be oriented like the first object.

Orient Like Constraint Menu

Delete

Removes the selected object from the project.

Select Target

Choose the target this constraint is affected by

Properties

Edits the selected object's properties.

Orient Like Constraint Properties

Enforcement

Default: 100%, Min: 0%, Max: 100%, Percentage. Enforcement controls whether a constraint is off or on. Constraints can be turned on or off during an animation, so a character can pick up a ball, then release it. Like all animation, channels specify the frames when things are to happen, but there is a subtle technicality - the ball is actually constrained to two bones: the table, and the hand. On frame "0", for example, the ball is "100%" constrained to the table, and "0%" constrained to the hand. Then on frame "75", it becomes "100%" constrained to the hand, and "0%" constrained to the table; then finally, on frame "150", it becomes "100%" constrained to the table again, and "0%" constrained to the hand. For the example to work, the "Translate To" table and "Translate To" hand constraints for a ball must be ordered one after the other in the ball's Constraint list. The constraints were enforced either 0% or 100%, but they could also be blended. For example, the ball could levitate to halfway between the hand and the table if both constraints were enforced "50%". Because it is more common for constraints to be turned only off or on, the default channel interpolation method is hold. This method holds the value of the keyframe exactly until the next keyframe. If you want normal blend-like interpolation, change the interpolation method to "Spline"

Apply Before Action

Visible: Sometimes, Advanced, Default: OFF. Constraints which are stored in poses can be applied before or after the actions are applied. Usually constraints are done after the actions. This way rigs and limits are performed after the action changes. However occasionally a constraint needs done before the actions. The most common case for this is when in the action, the user needs to set offsets from a translate or orient like constraint. The software can't actually store this as an offset on the constraint, since the constraint is in a pose and shouldn't be changed. So instead, a new translate channel is added in the action. If the actions occur after the constraint then the action channel is added to the constraint results. This essentially creates an offset. This is used on the pelvis bone of the Hash 2001 Rigs.

Lock Offsets

Visible: Sometimes, Advanced, Default: OFF. Putting offsets on constraints is very common and easy to do. "Lock Offsets" prevents accidentally changing them, and is an option on every constraint that contains offsets. (Hiding the bone on which the constraint is applied has a similar effect, because if the bone can't be selected, it can't be offset). If offsets are already set they will remain, but it will lock out any further changes.

Lag

Visible: Sometimes, Default: 0sec, Min: -15907sec. Every constraint with a target has its own lag, which allows it to be controlled by the target bone based on its position/orientation a few frames ago. The units are time. It will be displayed in frames or SMPTE depending on the global options dialog. This value is animatable, so it may change over time.

Target

Visible: Cache Only. This is the target bone for the constraint.

Store Roll

Default: ON. Usually the orient like constraint duplicates all parts of the orientation of an object. However by setting Store Roll to OFF, the roll portion will not be stored. The result will be that the constrained bone will aim in the same direction as the target bone, but the roll will remain as it was before the Orient Like constraint was applied.

Rotate Offset

Usually the Orient Like constraint orients the bone the same as the target bone. The rotate offset allows the constrained bone to be rotated to a new direction that is relative to the target bone. For example, a bone may be oriented 90 degrees to around Y compared to the target bone. This offset may be set by just rotating the constrained bone with the rotate manipulator, or by typing in angle values. It also may be set by using compensate mode before picking the target, or before turning the constraint on. This offset is useful when the hands of a model are supposed to Orient Like the steering wheel, but not aimed the same direction as the steering wheel bone.

Aim Like Two

Aims a bone like a line between two other bones. Often used in motion capture constraint systems.

Aim Like Two Constraint Menu

Delete

Removes the selected object from the project.

Select Target

Choose the target this constraint is affected by

Properties

Edits the selected object's properties.

Aim Like Two Constraint Properties

Enforcement

Default: 100%, Min: 0%, Max: 100%, Percentage. Enforcement controls whether a constraint is off or on. Constraints can be turned on or off during an animation, so a character can pick up a ball, then release it. Like all animation, channels specify the frames when things are to happen, but there is a subtle technicality - the ball is actually constrained to two bones: the table, and the hand. On frame "0", for example, the ball is "100%" constrained to the table, and "0%" constrained to the hand. Then on frame "75", it becomes "100%" constrained to the hand, and "0%" constrained to the table; then finally, on frame "150", it becomes "100%" constrained to the table again, and "0%" constrained to the hand. For the example to work, the "Translate To" table and "Translate To" hand constraints for a ball must be ordered one after the other in the ball's Constraint list. The constraints were enforced either 0% or 100%, but they could also be blended. For example, the ball could levitate to halfway between the hand and the table if both constraints were enforced "50%". Because it is more common for constraints to be turned only off or on, the default channel interpolation method is hold. This method holds the value of the keyframe exactly until the next keyframe. If you want normal blend-like interpolation, change the interpolation method to "Spline"

Apply Before Action

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Lock Offsets

Visible: Sometimes, Advanced, Default: OFF. Putting offsets on constraints is very common and easy to do. "Lock Offsets" prevents accidentally changing them, and is an option on every constraint that contains offsets. (Hiding the bone on which the constraint is applied has a similar effect, because if the bone can't be selected, it can't be offset). If offsets are already set they will remain, but it will lock out any further changes.

Lag

Visible: Sometimes, Default: 0sec, Min: -15907sec. Every constraint with a

target has its own lag, which allows it to be controlled by the target bone based on its position/orientation a few frames ago. The units are time. It will be displayed in frames or SMPTE depending on the global options dialog. This value is animatable, so it may change over time.

Target

Visible: Cache Only. This is the target bone for the constraint.

Target2

Visible: Cache Only. This is the second target bone for the constraint.

Translate Offset

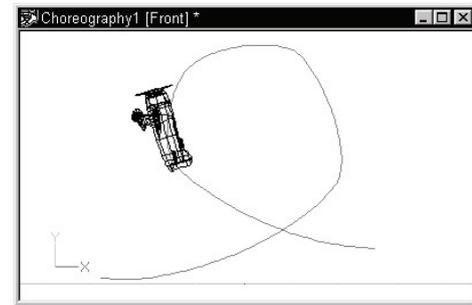
This option allows the constrained bone to aim its roll handle not exactly at the target, but a bit away from the target. The offset can be set by typing in values. It specifies a translate offset in the target bone's space.

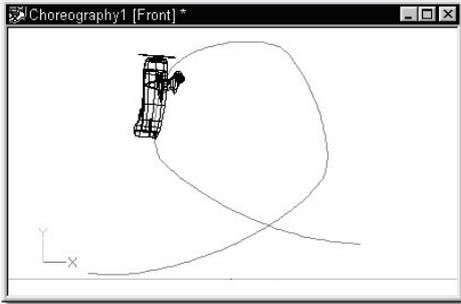
Translate Offset 2

This option allows the constrained bone to aim its roll handle not exactly at the target, but a bit away from the target. The offset can be set by typing in values. It specifies a translate offset in the second target bone's space.

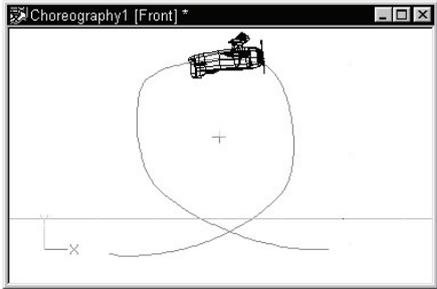
Aim Roll At

The Aim Roll At constraint aims the roll handle of the constrained object at the target object's pivot. Aim Roll At has subtle uses that aren't immediately apparent. A simple example would be to put Aim Roll At on a tank turret so that as the tank travels along a path, its turret remains pointed at a particular target, (a simple Aim At constraint could cause the turret to also tilt - which could be prevented with Spherical Limits constraints). More often, Aim Roll At constraint is used in conjunction with other constraints to ensure orientation.





During a loop-the-loop, an airplane constrained to a path would naturally turn over partially along the path.



Aim Roll At Constraint to Prevent Flipping

To keep the plane upside down at the top of the loop, add a Null object by right-clicking (Control-click on a Mac) the Choreography icon in the Project Workspace tree and pick [New][Null Object]. Place the Null object in the center of the loop, and put an Aim Roll At constraint on the airplane.

Aim Roll At Constraint Menu

Delete

Removes the selected object from the project.

Select Target

Choose the target this constraint is affected by

Properties

Edits the selected object's properties.

Aim Roll At Constraint Properties

Enforcement

Default: 100%, Min: 0%, Max: 100%, Percentage. Enforcement controls whether a constraint is off or on. Constraints can be turned on or off during an animation, so a character can pick up a ball, then release it. Like all animation, channels specify the frames when things are to happen, but there is a subtle technicality - the ball is actually constrained to two bones: the table, and the hand. On frame "0", for example, the ball is "100%" constrained to the table, and "0%" constrained to the hand. Then on frame "75", it becomes "100%" constrained to the hand, and "0%" constrained to the table; then finally, on frame "150", it becomes "100%" constrained to the table again, and "0%" constrained to the hand. For the example to work, the "Translate To" table and "Translate To" hand constraints for a ball must be ordered one after the other in the ball's Constraint list. The constraints were enforced either 0% or 100%, but they could also be blended. For example, the ball could levitate to halfway between the hand and the table if both constraints were enforced "50%". Because it is more common for constraints to be turned only off or on, the default channel interpolation method is hold. This method holds the value of the keyframe exactly until the next keyframe. If you want normal blend-like interpolation, change the interpolation method to "Spline"

Apply Before Action

Visible: Sometimes, Advanced, Default: OFF. Constraints which are stored in poses can be applied before or after the actions are applied. Usually constraints are done after the actions. This way rigs and limits are performed after the action changes. However occasionally a constraint needs done before the actions. The most common case for this is when in the action, the user needs to set offsets from a translate or orient like constraint. The software can't actually store this as an offset on the constraint, since the constraint is in a pose and shouldn't be changed. So instead, a new translate channel is added in the action. If the actions occur after the constraint then the action channel is added to the constraint results. This essentially creates an offset. This is used on the pelvis bone of the Hash 2001 Rigs.

Lock Offsets

Visible: Sometimes, Advanced, Default: OFF. Putting offsets on constraints is very common and easy to do. "Lock Offsets" prevents accidentally changing them, and is an option on every constraint that contains offsets. (Hiding the bone on which the constraint is applied has a similar effect, because if the bone can't be selected, it can't be offset). If offsets are

already set they will remain, but it will lock out any further changes.

Lag

Visible: Sometimes, Default: 0sec, Min: -15907sec. Every constraint with a target has its own lag, which allows it to be controlled by the target bone based on its position/orientation a few frames ago. The units are time. It will be displayed in frames or SMPTE depending on the global options dialog. This value is animatable, so it may change over time.

Target

Visible: Cache Only. This is the target bone for the constraint.

Translate Offset

This option allows the constrained bone to aim its roll handle not exactly at the target, but a bit away from the target. The offset can be set by typing in values. It specifies a translate offset in the target bone's space.

Roll Offset

Default: 0. This is an angle offset. It allows the constrained bone to have a roll that is more or less than the roll that would be required to aim the roll at the target bone. It is added to the roll found by aiming the roll at the target bone.

Roll Like

The Roll Like constraint orients the constrained object in the same roll orientation as the target object. Unlike the "Orient Like" constraint, the object and the roll handle will not necessarily aim in the same direction. This constraint is generally used in combination with another constraint (such as Aim At) to orient two objects similarly. A scale channel is available which allows you to specify a percentage of the roll you want to be enforced. It also accepts negative numbers which reverse the roll.

Roll Like Constraint Menu

Delete

Removes the selected object from the project.

Select Target

Choose the target this constraint is affected by

Properties

Edits the selected object's properties.

Roll Like Constraint Properties

Enforcement

Default: 100%, Min: 0%, Max: 100%, Percentage. Enforcement controls whether a constraint is off or on. Constraints can be turned on or off during an animation, so a character can pick up a ball, then release it. Like all animation, channels specify the frames when things are to happen, but

there is a subtle technicality - the ball is actually constrained to two bones: the table, and the hand. On frame "0", for example, the ball is "100%" constrained to the table, and "0%" constrained to the hand. Then on frame "75", it becomes "100%" constrained to the hand, and "0%" constrained to the table; then finally, on frame "150", it becomes "100%" constrained to the table again, and "0%" constrained to the hand. For the example to work, the "Translate To" table and "Translate To" hand constraints for a ball must be ordered one after the other in the ball's Constraint list. The constraints were enforced either 0% or 100%, but they could also be blended. For example, the ball could levitate to halfway between the hand and the table if both constraints were enforced "50%". Because it is more common for constraints to be turned only off or on, the default channel interpolation method is hold. This method holds the value of the keyframe exactly until the next keyframe. If you want normal blend-like interpolation, change the interpolation method to "Spline"

Apply Before Action

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Lock Offsets

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Lag

Visible: Sometimes, Default: 0sec, Min: -15907sec. Every constraint with a target has its own lag, which allows it to be controlled by the target bone based on its position/orientation a few frames ago. The units are time. It will be displayed in frames or SMPTE depending on the global options dialog. This value is animatable, so it may change over time.

Target

Visible: Cache Only. This is the target bone for the constraint.

Roll Offset

Default: 0, Min: -360, Max: 360. This is an angle offset. It allows the constrained bone to have a roll that is more or less than the roll of the target bone. It is added to the roll of the target bone.

Roll Scale

Default: 100. This property indicates a percentage of the roll to be enforced. Gears can be made to turn 300% as fast as another, and so forth. It also accepts negative numbers which reverse the roll.

Aim Roll Like Two

This constraint is also primarily used for optical motion capture, but could be used in other situations where two positional data points need to control the direction of the roll of a bone. Visualize a direction vector or arrow that has its base at the first target and its head at the second target. This defines the direction that the roll handle of the constrained bone will aim. Since the roll handle can only move in the disk that is at a right angle to the bone, the roll handle may not aim in exactly the direction defined by the targets. The roll handle will be aimed at the closest possible projection.

Aim Roll Like Two Constraint Menu

Delete

Removes the selected object from the project.

Select Target

Choose the target this constraint is affected by

Properties

Edits the selected object's properties.

Aim Roll Like Two Constraint Properties Enforcement

Default: 100%, Min: 0%, Max: 100%, Percentage. Enforcement controls whether a constraint is off or on. Constraints can be turned on or off during an animation, so a character can pick up a ball, then release it. Like all animation, channels specify the frames when things are to happen, but there is a subtle technicality - the ball is actually constrained to two bones: the table, and the hand. On frame "0", for example, the ball is "100%" constrained to the table, and "0%" constrained to the hand. Then on frame "75", it becomes "100%" constrained to the hand, and "0%" constrained to the table; then finally, on frame "150", it becomes "100%" constrained to the table again, and "0%" constrained to the hand. For the example to work, the "Translate To" table and "Translate To" hand constraints for a ball must be ordered one after the other in the ball's Constraint list. The constraints were enforced either 0% or 100%, but they could also be blended. For example, the ball could levitate to halfway between the hand and the table if both

constraints were enforced "50%". Because it is more common for constraints to be turned only off or on, the default channel interpolation method is hold. This method holds the value of the keyframe exactly until the next keyframe. If you want normal blend-like interpolation, change the interpolation method to "Spline"

Apply Before Action

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Lock Offsets

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Lag

Visible: Sometimes, Default: 0sec, Min: -15907sec. Every constraint with a target has its own lag, which allows it to be controlled by the target bone based on its position/orientation a few frames ago. The units are time. It will be displayed in frames or SMPTE depending on the global options dialog. This value is animatable, so it may change over time.

Target

Visible: Cache Only. This is the target bone for the constraint.

Target2

Visible: Cache Only. This is the second target bone for the constraint.

Translate Offset

This option allows the constrained bone to aim its roll handle not exactly at the target, but a bit away from the target. The offset can be set by typing in values. It specifies a translate offset in the target bone's space.

Translate Offset 2

This option allows the constrained bone to aim its roll handle not exactly at the target, but a bit away from the target. The offset can be set by typing in values. It specifies a translate offset in the second target bone's space.

Scale Like

The Scale Like constraint makes one bone's scale the same as another's. It supports two types of offsets: "Scale Offset" allows the constrained bone to have a slightly higher or lower scale number than the target bone (it is an additive offset). The "Scale Scale" parameter allows the scale of the constrained bone to be some multiple of the target bone's scale, such as twice the scale of the target bone, or half the scale of the other bone.

Scale Like Constraint Menu

Delete

Removes the selected object from the project.

Select Target

Choose the target this constraint is affected by

Properties

Edits the selected object's properties.

Scale Like Constraint Properties

Enforcement

Default: 100%, Min: 0%, Max: 100%, Percentage. Enforcement controls whether a constraint is off or on. Constraints can be turned on or off during an animation, so a character can pick up a ball, then release it. Like all animation, channels specify the frames when things are to happen, but there is a subtle technicality - the ball is actually constrained to two bones: the table, and the hand. On frame "0", for example, the ball is "100%" constrained to the table, and "0%" constrained to the hand. Then on frame "75", it becomes "100%" constrained to the hand, and "0%" constrained to the table; then finally, on frame "150", it becomes "100%" constrained to the table again, and "0%" constrained to the hand. For the example to work, the "Translate To" table and "Translate To" hand constraints for a ball must be ordered one after the other in the ball's Constraint list. The constraints were enforced either 0% or 100%, but they could also be blended. For example, the ball could levitate to halfway between the hand and the table if both constraints were enforced "50%". Because it is more common for constraints to be turned only off or on, the default channel interpolation method is hold. This method holds the value of the keyframe exactly until the next keyframe. If you want normal blend-like interpolation, change the interpolation method to "Spline"

Apply Before Action

Visible: Sometimes, Advanced, Default: OFF. Constraints which are stored

in poses can be applied before or after the actions are applied. Usually constraints are done after the actions. This way rigs and limits are performed after the action changes. However occasionally a constraint needs done before the actions. The most common case for this is when in the action, the user needs to set offsets from a translate or orient like constraint. The software can't actually store this as an offset on the constraint, since the constraint is in a pose and shouldn't be changed. So instead, a new translate channel is added in the action. If the actions occur after the constraint then the action channel is added to the constraint results. This essentially creates an offset. This is used on the pelvis bone of the Hash 2001 Rigs.

Lock Offsets

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Lag

Visible: Sometimes, Default: 0sec, Min: -15907sec. Every constraint with a target has its own lag, which allows it to be controlled by the target bone based on its position/orientation a few frames ago. The units are time. It will be displayed in frames or SMPTE depending on the global options dialog. This value is animatable, so it may change over time.

Target

Visible: Cache Only. This is the target bone for the constraint.

Scale Offset

Default: 0. This property allows the scale of the controlled bone to be a fixed percent more or less than the scale of the target bone. Setting this to 30% would make the scale of the controlled bone be 80% when the target bone is scaled to 50%.

Scale Scale

Default: 100. This property allows the scale of the controlled bone to be multiplied by this factor. Setting this to 50% would make the scale of the controlled bone be 40% when the target bone is scaled to 50%.

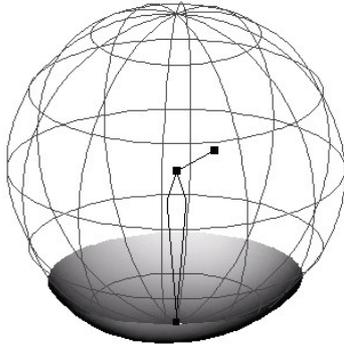
Spherical Limits

Spherical Limits are a common constraint because most bones have their freedom of movement restricted in some manner, (for example, your elbows do not bend backwards). Spherical Limits also help you while you are animating because as you drag a character's arm, the elbow won't bend backwards.

When you first add spherical limits to a figure in an action or pose, its limits

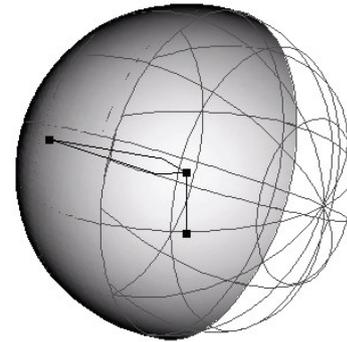
are set to completely free. (A completely free bone is accomplished by allowing longitude to run anywhere from -180° to 180° , creating a full 360° movement sphere).

The best way to show this is by using a globe. This means that were the figure in the center of the globe, the bone is allowed to point towards any of the vertically oriented time zones (or longitude). In addition, the latitude is allowed to go from 0 (straight down to the South Pole), to 180° (straight up to the North Pole).



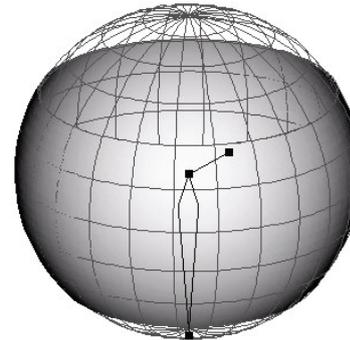
Latitude 0 to 45°

By constraining the Latitude, a bone's ability to move up and down its sphere is restricted. For example, possible limits for a thigh would be to leave Longitude -180 to 180° , and restrict Latitude to 0 to 45° . Now the leg may lift up in any direction, but may only lift up 45° . For example, it can lift 45° in front, back, at the right or left side, or anywhere in between. This creates a vertical cone of freedom.



Latitude 0 to 95°

A character's upper arms can be constrained in exactly this fashion, but with the world setting on its side. Latitude can be set at 0 to 95° , allowing them to move the entire southern hemisphere, plus 5° further. In this case, the southern hemisphere is not straight down, rather it is to the right for the right arm since the bone is oriented in the arm horizontally.

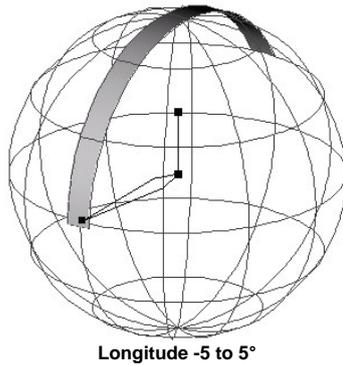
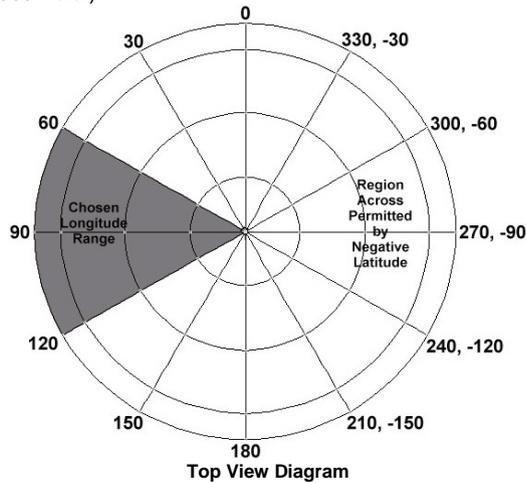


Latitude 60 to 135°

Latitude may also be restricted to a range by setting its minimum and maximum (Min and Max). For example, a bone can be constrained to point only at the sun belt, say from 60 to 135° .

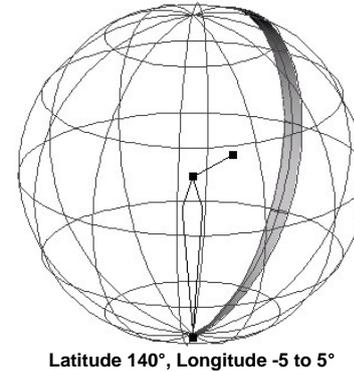
By default, Longitude Limits are -180 to 180° . Looking down on the movement sphere (using the face of a clock for reference), the 0° position is straight towards the back (6 o'clock). The positive 90° position is counter

clockwise to the left (3 o'clock), the positive 180° position is towards the front (12 o'clock), and the 270° (or -90°) position is at the right (9 o'clock). When setting Longitude limits, values from -360 to 360° may be used for regions which cross over 0°, (provided that the defined sphere is equal to or less than 360° total).



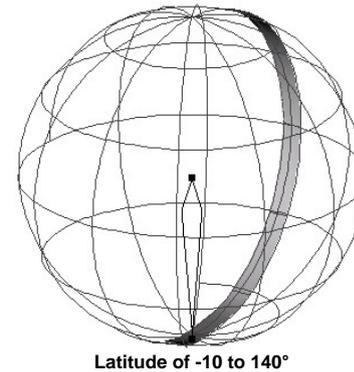
To constrain a calf, it is necessary to limit movements on the back side of the movement sphere. By leaving the Latitude at its default 0 to 180°, the

calf may point anywhere from straight down to straight up. By setting the Longitude limits from -5 to 5°, the calf must stay in a 10° wide strip towards the back.



Because it is impossible for a person to move their calf all the way straight up, the above limits would be more realistic if we set the Max Latitude to 140°.

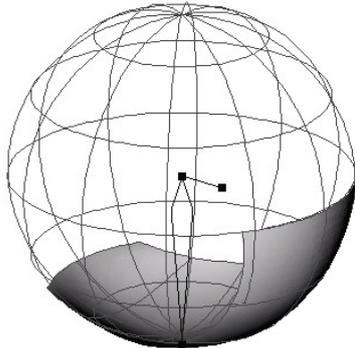
Negative Latitude Values



Many people can hyper extend their knee joint and allow their calf to angle past straight down. Usually, the legal range for Min Latitude is 0 to 180°.

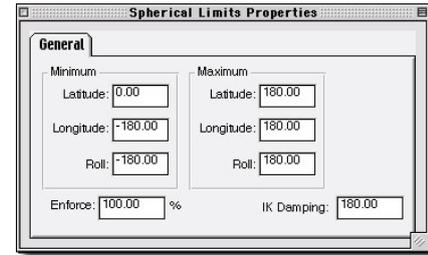
However, if a narrow Longitude region (less than 180°) is specified, as in the previous calf example (only 10°), then negative values of Min Latitude are allowed. The negative Min Latitude allows the calf to extend to the opposite side of the movement sphere, in this case the front, as many degrees as you wish. Assuming our figure has extremely flexible knee joints, we could specify Latitude limits of -10 to 140°. Now our region extends past the bottom of the sphere.

Careful observation of the figure below showing the calf limits will reveal that at the bottom of the movement sphere (the South Pole), the limit region does not get narrow to a point like a bow tie. A wider example makes this more apparent. For instance, assume Longitude limits of 60 to 120°. (See Top View Diagram) Suppose latitude values are from -45 to 90°. The positive Latitude limit (90) is allowed on the side of the sphere that the Longitude limits specify. The negative Latitude limit (-45) is allowed directly across (60+180 to 120+180 = 240 to 300°). Connecting these limits by two vertical planes creates a wide patch region in which positioning is allowed. This situation is worth mentioning because often in a Pose or Action, longitude values outside 60-120° and 240 to 300° will be allowed to permit motion in this region.



longitude values outside 60-120° and 240 to 300

The previously discussed four limit numbers, allow many different constrained regions to be defined. The Roll axis of a bone can also be constrained, with values ranging from -180 to 180°.



Spherical Limits Constraints Properties Panel

Spherical Limits Menu

Delete

Removes the selected object from the project.

Properties

Edits the selected object's properties.

Spherical Limits Properties

Enforcement

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Apply Before Action

Visible: Sometimes, Advanced, Default: OFF. Constraints which are stored

in poses can be applied before or after the actions are applied. Usually constraints are done after the actions. This way rigs and limits are performed after the action changes. However occasionally a constraint needs done before the actions. The most common case for this is when in the action, the user needs to set offsets from a translate or orient like constraint. The software can't actually store this as an offset on the constraint, since the constraint is in a pose and shouldn't be changed. So instead, a new translate channel is added in the action. If the actions occur after the constraint then the action channel is added to the constraint results. This essentially creates an offset. This is used on the pelvis bone of the Hash 2001 Rigs.

Lock Offsets

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Minimum

This is holds the smallest latitude, longitude and roll angles which will be allowed by the Spherical Limit constraint

Maximum

This is holds the largest latitude, longitude and roll angles which will be allowed by the Spherical Limit constraint

IK Damping

Default: 180°. Angle. Damping controls the way a kinematic constraint finds its solution when set to support limits and damping. The normal way for the solver to operate is to prioritize the movement of the bones at the end of the chain first. This is normally the most natural way. However, sometimes it is preferred to have the last joint of a chain to behave rather stiffly, forcing the solver to prefer to move the next bone up. Damping allows this to be accomplished. By setting the damping on the last bone to a small number it will make the last joint stiffer. The damping value represents the number of degrees the bone is allowed to rotate in one iteration of the solver. So small values resist movement more, and large numbers resist movement less. By default damping is set to 180, which is totally free movement.

Euler Limits

"Euler Limits" are very similar to Spherical limits. They are useful for limiting the motion of joints. They are particularly helpful when limiting joints that are smart-skinned to stay within certain X, Y and Z angles. The same X, Y and Z minimums and maximums that were used when designing the smartskin can be typed directly into the Euler limits constraint. Although they are not

as flexible for describing common shapes on the sphere as "spherical limits", they are useful for simple rotations.

Euler Limits Menu

Delete

Removes the selected object from the project.

Properties

Edits the selected object's properties.

Euler Limits Properties

Enforcement

Default: 100%, Min: 0%, Max: 100%, Percentage. Enforcement controls whether a constraint is off or on. Constraints can be turned on or off during an animation, so a character can pick up a ball, then release it. Like all animation, channels specify the frames when things are to happen, but there is a subtle technicality - the ball is actually constrained to two bones: the table, and the hand. On frame "0", for example, the ball is "100%" constrained to the table, and "0%" constrained to the hand. Then on frame "75", it becomes "100%" constrained to the hand, and "0%" constrained to the table; then finally, on frame "150", it becomes "100%" constrained to the table again, and "0%" constrained to the hand. For the example to work, the "Translate To" table and "Translate To" hand constraints for a ball must be ordered one after the other in the ball's Constraint list. The constraints were enforced either 0% or 100%, but they could also be blended. For example, the ball could levitate to halfway between the hand and the table if both constraints were enforced "50%". Because it is more common for constraints to be turned only off or on, the default channel interpolation method is hold. This method holds the value of the keyframe exactly until the next keyframe. If you want normal blend-like interpolation, change the interpolation method to "Spline"

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Lock Offsets

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Minimum

This is holds the smallest x, smallest y, and smallest z angles which will be allowed by the Euler Limit constraint

Maximum

This is holds the largest x, largest y, and largest z angles which will be allowed by the Euler Limit constraint

IK Damping

Default: 180°. Angle. Damping controls the way a kinematic constraint finds its solution when set to support limits and damping. The normal way for the solver to operate is to prioritize the movement of the bones at the end of the chain first. This is normally the most natural way. However, sometimes it is preferred to have the last joint of a chain to behave rather stiffly, forcing the solver to prefer to move the next bone up. Damping allows this to be accomplished. By setting the damping on the last bone to a small number it will make the last joint stiffer. The damping value represents the number of degrees the bone is allowed to rotate in one iteration of the solver. So small values resist movement more, and large numbers resist movement less. By default damping is set to 180, which is totally free movement.

Translate Limits

Translate limits constrain the translate motion of a bone to remain within a box of specified boundaries. This is useful for constraint setups that require a sliding control that is only supposed to be free in one or two axes. This way regardless of the view an animator is viewing from, it is possible to translate the object correctly without the need to hold down the 1, 2, or 3 keys to constrain the motion.

Translate Limits Menu

Delete

Removes the selected object from the project.

Properties

Edits the selected object's properties.

Translate Limits Properties

Enforcement

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Minimum

This is holds the smallest x, smallest y, and smallest z which will be allowed

by the Translate Limit constraint

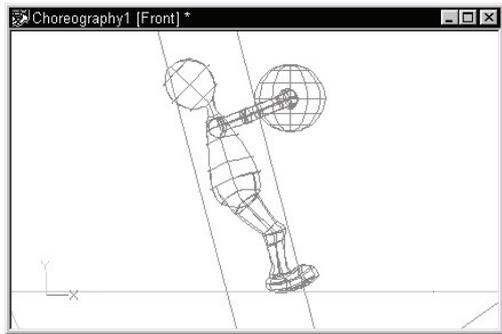
Maximum

This is holds the largest x, largest y, and largest z which will be allowed by the Translate Limit constraint

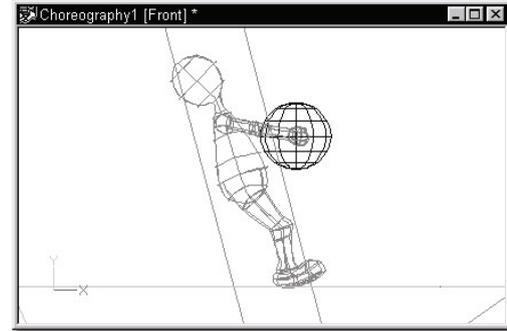
Kinematic Constraints

A Kinematic constraint lets a character hold onto a steering wheel as it turns, or the leg follow as you position a character's feet walking up stairs.

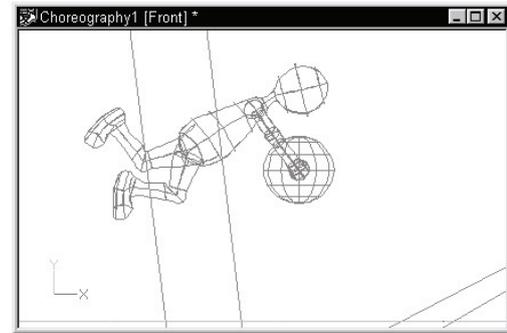
The word "kinematic" is unknown to most people, but it is a common animation tool. When you grab the end of a character's finger to pull the arm around, that is kinematics, (often called "inverse kinematics"). When you apply a Kinematic constraint to a bone you are temporarily redefining how the existing hierarchy works. For example, nulls (non-rendering targets), are often placed in a character's hierarchy at the same level as the pelvis, (when the pelvis moves these targets do not). A Kinematic constraint is added from the calves to these targets: now, when you move the targets, the legs will follow, but the targets won't move if the pelvis moves. In other words, the feet remain firmly on the floor no matter what the rest of the character is doing. Kinematic constraints are used to help hold a bone in place while other bones higher in the bone hierarchy are moved. Conversely, if the bones that are the object of the kinematic constraint are moved, the hierarchy of the model will accommodate it. (When trying to decide whether to use a Kinematic or a Translate To constraint, the Kinematic constraint is best when the target object drives the animation).



To hold onto a ball, the character's hands were kinematically constrained to the ball.



The characters forearms will now always try to reach the ball, wherever the ball is moved, or the characters body is moved.



Scale To Reach Option

This option allows the bone to stretch to reach a target. You have the option to limit the scale to the Z-axis only or all three axes. Interactive IK also has the ability to scale to reach. While dragging the end of a chain, hold down the "Shift" key: this will scale the Z-axis. To interactively scale all axes, hold down the "Alt" key while dragging.

Offsets

The offset channels allow you to create a translation offset in the targets

space. There is also a rotational offset in the constrained object's space (the orient-offset and roll offset channels). For more description of offsets in general see below.

Kinematic Constraint Limits tab

The kinematic constraint can be set to support angular limits on the bones within the chain. To do this check "Support limits and damping" on the Limits page. When checked the software will enforce the limits at each step of the solving process. In this way if the goal may be reached with the limits enforced, it will succeed. If not checked the limits are only enforced after a solution that meets the goal is found. This often results in the goal not being reached even though a solution may be possible.

Damping can be set on any angular limit. That includes "spherical limits" and the "euler limits". The normal way for the solver to operate is to prioritize the movement the bones at the end of the chain first. This is normally the most natural way. However, sometimes it is preferred to have the last joint of a chain to behave rather stiffly, forcing the solver to prefer to move the next bone up. Damping allows this to be accomplished. By setting the damping on the last bone to a small number it will make the last joint stiffer. The damping value represents the number of degrees the bone is allowed to rotate in one iteration of the solver. So small values resist movement more, and large numbers resist movement less. By default damping is set to 180, which is totally free movement.

When limits and damping are supported, the solver can also compute roll. Do this by checking "Compute Roll" on the limits page. Computing roll on a bone can help accomplish a kinematic solution that may not be possible without either the option or by setting the roll by hand. This can be useful in mechanisms such as the human elbow where it is preferable to roll the bicep rather than allowing the elbow to rotate sideways against the direction of the natural hinge joint of the elbow. This can be accomplished by placing angular limits on the forearm to restrict its movement naturally, then allow the kinematic solver to compute the roll on the chain, which can roll the bicep within its roll limits to accomplish the requested goal.

Kinematic Constraint Menu

Delete

Removes the selected object from the project.

Select Target

Choose the target this constraint is affected by

Properties

Edits the selected object's properties.

Kinematic Constraint Properties

Enforcement

Default: 100%, Min: 0%, Max: 100%, Percentage. Enforcement controls whether a constraint is off or on. Constraints can be turned on or off during an animation, so a character can pick up a ball, then release it. Like all animation, channels specify the frames when things are to happen, but there is a subtle technicality - the ball is actually constrained to two bones: the table, and the hand. On frame "0", for example, the ball is "100%" constrained to the table, and "0%" constrained to the hand. Then on frame "75", it becomes "100%" constrained to the hand, and "0%" constrained to the table; then finally, on frame "150", it becomes "100%" constrained to the table again, and "0%" constrained to the hand. For the example to work, the "Translate To" table and "Translate To" hand constraints for a ball must be ordered one after the other in the ball's Constraint list. The constraints were enforced either 0% or 100%, but they could also be blended. For example, the ball could levitate to halfway between the hand and the table if both constraints were enforced "50%". Because it is more common for constraints to be turned only off or on, the default channel interpolation method is hold. This method holds the value of the keyframe exactly until the next keyframe. If you want normal blend-like interpolation, change the interpolation method to "Spline"

Apply Before Action

Visible: Sometimes, Advanced, Default: OFF. Constraints which are stored in poses can be applied before or after the actions are applied. Usually constraints are done after the actions. This way rigs and limits are performed after the action changes. However occasionally a constraint needs done before the actions. The most common case for this is when in the action, the user needs to set offsets from a translate or orient like constraint. The software can't actually store this as an offset on the constraint, since the constraint is in a pose and shouldn't be changed. So instead, a new translate channel is added in the action. If the actions occur after the constraint then the action channel is added to the constraint results. This essentially creates an offset. This is used on the pelvis bone of the Hash 2001 Rigs.

Lock Offsets

Visible: Sometimes, Advanced, Default: OFF. Putting offsets on constraints is very common and easy to do. "Lock Offsets" prevents accidentally changing them, and is an option on every constraint that contains offsets. (Hiding the bone on which the constraint is applied has a similar effect, because if the bone can't be selected, it can't be offset). If offsets are already set they will remain, but it will lock out any further changes.

Lag

Visible: Sometimes, Default: 0sec, Min: -15907sec. Every constraint with a

target has its own lag, which allows it to be controlled by the target bone based on its position/orientation a few frames ago. The units are time. It will be displayed in frames or SMPTE depending on the global options dialog. This value is animatable, so it may change over time.

Target

Visible: Cache Only. This is the target bone for the constraint.

Scale To Reach

Default: OFF. This option allows the bone to stretch to reach a target. You have the option to limit the scale to the Z-axis only or all three axes. Interactive IK also has the ability to scale to reach. While dragging the end of a chain, hold down the [Shift] key: this will scale the Z-axis. To interactively scale all axes, hold down the [Alt] key while dragging.

Z Axis Only

Visible: Sometimes, Default: OFF. If on, the constrained bone will only scale along the Z-axis, otherwise it scales along all three axes.

Translate Offset

This option allows a hand to be constrained not exactly to the bone position of a steering wheel or other object. The offset can be set by typing in values or just moving the end of the constrained chain. It also may be set while adding the constraint, by using compensate mode. It specifies a translate offset vector in the target bone's space.

Support Limits/Damping

Advanced, Default: OFF. The kinematic constraint can be set to support angular limits on the bones within the chain. To do this turn on "Support limits and damping". When checked the software will enforce the limits at each step of the solving process. In this way if the goal may be reached with the limits enforced, it will succeed. If not checked the limits are only enforced after a solution that meets the goal is found. This often results in the goal not being reached even though a solution may be possible. Damping can be set on any angular limit. That includes "spherical limits" and the "euler limits". The normal way for the solver to operate is to prioritize the movement of the bones at the end of the chain first. This is normally the most natural way. However, sometimes it is preferred to have the last joint of a chain to behave rather stiffly, forcing the solver to prefer to move the next bone up. Damping allows this to be accomplished. By setting the damping on the last bone to a small number it will make the last joint stiffer. The damping value represents the number of degrees the bone is allowed to rotate in one iteration of the solver. So small values resist movement more, and large numbers resist movement less. By default damping is set to 180, which is totally free movement.

Compute Roll

Visible: Sometimes, Advanced, Default: OFF. When limits and damping are supported, the solver can also compute roll. Do this by turning on "Compute

Roll". Computing roll on a bone can help accomplish a kinematic solution that may not be possible without using the option or by setting the roll by hand. This can be useful in mechanisms such as the human elbow where it is preferable to roll the bicep rather than allowing the elbow to rotate sideways against the direction of the natural hinge joint of the elbow. This can be accomplished by placing angular limits on the forearm to restrict its movement naturally, then allow the kinematic solver to compute the roll on the chain, which can roll the bicep within its roll limits to accomplish the requested goal.

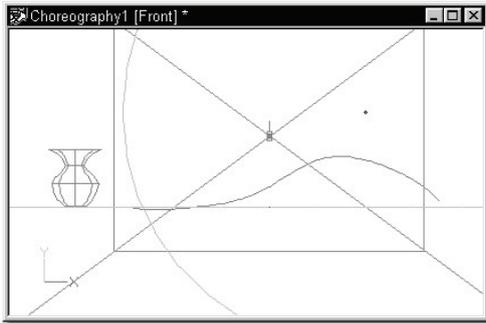
Store Hints

Advanced, Default: ON. When a target bone is translated in the interface, the Kinematic constraint arrives at a solution. If this option is on, then the rotational results on all of the members of this chain will be stored as keyframes as if the user rotated them. Now at future in between frames, these rotational channels act as hints for the IK as to which type of result is preferred. Having the hint channels improves the predictability of the results. Hence generally smoother animations that look meets the artists expectations. This is an advanced option, and generally does not need turned off.

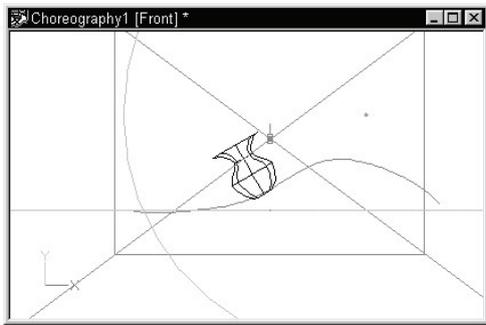
Path Constraint

Path Constraints are used to make a character follow along a spline path in choreography. Also, any character can follow any spline on any model.

Use the picker to select a path for the object to follow, or, if you need the object to follow a spline on another object (a car traveling along a hilly terrain), hold down the "Shift" key on the keyboard and use the picker to click the appropriate spline.

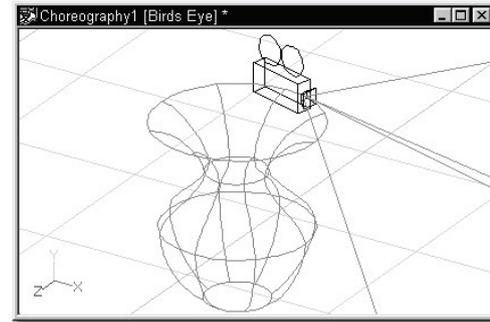


Generally, paths are used to describe where in a scene an object is to travel. In this example, there is a path, and vase.



When the vase is constrained to the path, and the Ease channel is set, the vase travels along the path.

To constrain an object to a spline on another object (in this case, the camera is constrained to a spline on the vase), after the constraint has been added, hold down the "Shift" key on the keyboard and click the spline that the object will be constrained to.



Path Constraint Options

Store Roll

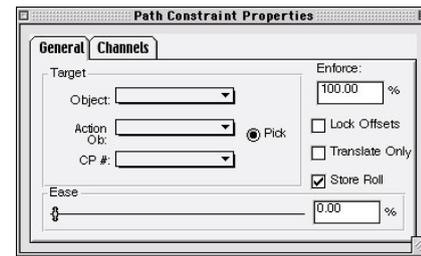
Normally the path constraint tries to keep the roll handle of the constrained object up, (pointing in the direction of the positive Y-axis in world coordinates). To have the roll left alone, or to control it by some other constraint, "Store Roll" may be turned off.

Ease Slider

The ease slider can be used to set the ease of the object on the path, which is simply a percentage of the length of the path. Sliding the slider is more visual than typing in percentages. Just slide the slider and watch your object slide along the path. When it is positioned where you want stop, there a percentage keyframe has been created at that frame.

Translate Only

Normally the path constraint positions the object to be on the path and aligns it in the direction of the path as well. To simply translate it to the path, but not orient it like the path, select the "Translate Only" option.



Path Constraint Menu

Delete

Removes the selected object from the project.

Properties

Edits the selected object's properties.

Path Constraint Properties

Enforcement

Default: 100%, Min: 0%, Max: 100%, Percentage. Enforcement controls whether a constraint is off or on. Constraints can be turned on or off during an animation, so a character can pick up a ball, then release it. Like all animation, channels specify the frames when things are to happen, but there is a subtle technicality - the ball is actually constrained to two bones: the table, and the hand. On frame "0", for example, the ball is "100%" constrained to the table, and "0%" constrained to the hand. Then on frame "75", it becomes "100%" constrained to the hand, and "0%" constrained to the table; then finally, on frame "150", it becomes "100%" constrained to the table again, and "0%" constrained to the hand. For the example to work, the "Translate To" table and "Translate To" hand constraints for a ball must be ordered one after the other in the ball's Constraint list. The constraints were enforced either 0% or 100%, but they could also be blended. For example, the ball could levitate to halfway between the hand and the table if both constraints were enforced "50%". Because it is more common for constraints to be turned only off or on, the default channel interpolation method is hold. This method holds the value of the keyframe exactly until the next keyframe. If you want normal blend-like interpolation, change the interpolation method to "Spline"

Apply Before Action

Visible: Sometimes, Advanced, Default: OFF. Constraints which are stored in poses can be applied before or after the actions are applied. Usually constraints are done after the actions. This way rigs and limits are performed after the action changes. However occasionally a constraint needs done before the actions. The most common case for this is when in the action, the user needs to set offsets from a translate or orient like constraint. The software can't actually store this as an offset on the constraint, since the constraint is in a pose and shouldn't be changed. So instead, a new translate channel is added in the action. If the actions occur after the constraint then the action channel is added to the constraint results. This essentially creates an offset. This is used on the pelvis bone of the Hash 2001 Rigs.

Lock Offsets

Visible: Sometimes, Advanced, Default: OFF. Putting offsets on constraints

is very common and easy to do. "Lock Offsets" prevents accidentally changing them, and is an option on every constraint that contains offsets. (Hiding the bone on which the constraint is applied has a similar effect, because if the bone can't be selected, it can't be offset). If offsets are already set they will remain, but it will lock out any further changes.

Lag

Default: 0sec. Every constraint with a target has its own lag, which allows it to be controlled by the target bone based on its position/orientation a few frames ago. The units are time. It will be displayed in frames or SMPTE depending on the global options dialog. This value is animatable, so it may change over time.

Target

Visible: Cache Only. This is the target spline to follow.

Translate Only

Default: OFF. Normally the path constraint positions the object to be on the path and aligns it in the direction of the path as well. To simply translate it to the path, but not orient it like the path, turn this property ON.

Store Roll

Default: ON. Normally the path constraint tries to keep the roll handle of the constrained object up, (pointing in the direction of the positive Y-axis in world coordinates). To have the roll left alone, or to control it by some other constraint, "Store Roll" may be turned off.

Ease

Default: 0%, Min: 0%, Max: 100%, Percentage. The ease slider can be used to set the ease of the object on the path, which is simply a percentage of the length of the path. Sliding the slider is more visual than typing in percentages. Just slide the slider and watch your object slide along the path. When it is positioned where you want stop, a percentage keyframe has been created at that frame.

Translate Offset

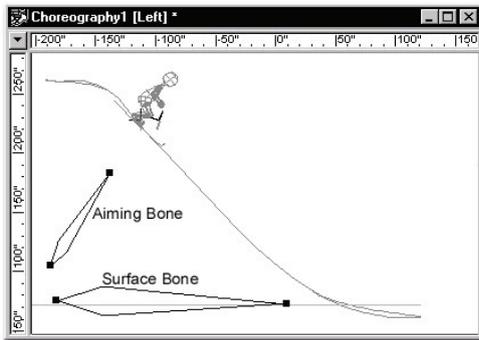
This option allows an object to be constrained not exactly to the path, but a bit away from the path. The offset can be set by typing in values or just moving the object off of the path with a translate manipulator. It also may be set while adding the constraint, by using compensate mode. It specifies a translate offset vector in the target path's space.

Rotate Offset

Usually the path constraint aligns the bone with the direction of the path. The rotate offset allows the constrained bone to be rotated to a new direction that is relative to the path. For example, a bone may be aimed to the right or left of the direction of the path.

Surface Constraint

The surface constraint is used to track a bone along the surface of a model. It has many potential uses. For example, it could keep a snowboarder traveling on the surface of a bumpy terrain, or slide pupils along the surface of an irregularly shaped eyeball. To add a surface constraint, right click on the bone you want to constrain, and select [New Constraint][Other][Surface] from the menu of the bone you wish to constrain. Two additional bones must be selected from the combo boxes on the surface constraint's properties for it to work correctly. The first is the surface to constrain to. In an action, this is the patches controlled by one particular bone, such as the "Terrain". The constrained bone will be positioned on this surface, and optionally can be oriented like the surface normal. The second bone is the aiming bone. This bone defines a ray that points at the surface. The pivot of the bone is the starting point of the ray, and the positive Z-axis of the bone is the direction of the ray. The place where this ray intersects the surface is where the constrained bone will be placed. In a choreography, an entire model may be chosen as the target surface, such as the "Snow Hill.mdl". The Surface constraint supports offsets, so the constrained bone can be slightly above or below the surface or oriented 90 degrees from the normal of the surface.



Surface Constraint

Surface Constraint Menu

Delete

Removes the selected object from the project.

Select Target

Choose the target this constraint is affected by

Properties

Edits the selected object's properties.

Surface Constraint Properties

Enforcement

Default: 100%, Min: 0%, Max: 100%, Percentage. Enforcement controls whether a constraint is off or on. Constraints can be turned on or off during an animation, so a character can pick up a ball, then release it. Like all animation, channels specify the frames when things are to happen, but there is a subtle technicality - the ball is actually constrained to two bones: the table, and the hand. On frame "0", for example, the ball is "100%" constrained to the table, and "0%" constrained to the hand. Then on frame "75", it becomes "100%" constrained to the hand, and "0%" constrained to the table; then finally, on frame "150", it becomes "100%" constrained to the table again, and "0%" constrained to the hand. For the example to work, the "Translate To" table and "Translate To" hand constraints for a ball must be ordered one after the other in the ball's Constraint list. The constraints were enforced either 0% or 100%, but they could also be blended. For example, the ball could levitate to halfway between the hand and the table if both constraints were enforced "50%". Because it is more common for constraints to be turned only off or on, the default channel interpolation method is hold. This method holds the value of the keyframe exactly until the next keyframe. If you want normal blend-like interpolation, change the interpolation method to "Spline"

Apply Before Action

Visible: Sometimes, Advanced, Default: OFF. Constraints which are stored in poses can be applied before or after the actions are applied. Usually constraints are done after the actions. This way rigs and limits are performed after the action changes. However occasionally a constraint needs done before the actions. The most common case for this is when in the action, the user needs to set offsets from a translate or orient like constraint. The software can't actually store this as an offset on the constraint, since the constraint is in a pose and shouldn't be changed. So instead, a new translate channel is added in the action. If the actions occur after the constraint then the action channel is added to the constraint results. This essentially creates an offset. This is used on the pelvis bone of the Hash 2001 Rigs.

Lock Offsets

Visible: Sometimes, Advanced, Default: OFF. Putting offsets on constraints is very common and easy to do. "Lock Offsets" prevents accidentally changing them, and is an option on every constraint that contains offsets. (Hiding the bone on which the constraint is applied has a similar effect, because if the bone can't be selected, it can't be offset). If offsets are already set they will remain, but it will lock out any further changes.

Lag

Visible: Sometimes, Default: 0sec, Min: -15907sec. Every constraint with a target has its own lag, which allows it to be controlled by the target bone based on its position/orientation a few frames ago. The units are time. It will be displayed in frames or SMPTE depending on the global options dialog. This value is animatable, so it may change over time.

Surface Target

Visible: Cache Only. This is the target bone that owns the surface.

Surface Aim Target

Visible: Cache Only. This is the target bone whose z-axis will point at where on the surface the constrained object should be.

Translate Only

Default: OFF. Normally the surface constraint positions the object to be on the surface and aligns it in the direction of the surface normal as well. To simply translate it to the surface, but not orient it on the surface, turn this property ON.

Translate Offset

This option allows an object to be constrained not exactly to the surface, but a bit away from the surface. The offset can be set by typing in values or just moving the object off of the surface with a translate manipulator. It also may be set while adding the constraint, by using compensate mode. It specifies a translate offset vector in the target surface's space.

Rotate Offset

Visible: Sometimes. Usually the surface constraint aligns the bone with the direction of the surface. The roll handle of the constrained bones points in the direction of the surface normal. The rotate offset allows the constrained bone to be rotated to a new direction that is relative to the surface. For example, a bone may be aimed up or down.

Rigid Body Constraints

The rigid body constraint is used to dynamically control a model shortcut as if it were a rigid object. Unlike most constraints it does not constrain the object to something else. It figures out where it should go next based on a physical simulation that includes gravity, forces and collisions with other objects.

Using the laws of physics to create keyframes for the animator is an attractive time saver. It results in very realistic looking physical motion. However the animator can only directly control the animation created by setting up initial conditions (positions and velocities) of the objects, by careful placement of collision objects, and by the few settings discussed below. Because of this rigid body dynamics is most well suited to somewhat random events that need a physically correct result, but no specific desired outcome. For instance using physics to shoot a basketball into the basket

would be much more difficult than just animating it. Good examples where the results are less critical are falling or tumbling objects, bowling pins, dominoes and similar semi-random scenarios.

Dynamics, the physics of nature like gravity, is used in several parts of Animation:Master – hair and particles for example. Rigid body dynamics are the kind that let dominoes fall into each other using Newton's equations of motion during discreet steps in time. Models can have a "Rigid Body" constraint applied to them just like any other constraint. The constraint can be turned on and off as needed during the animation.

Right-click (Control-click on Mac) a "Model Shortcut" in the Project Workspace tree, then pick "Rigid Body". The initial position and velocity of the body will be determined by the frames leading up to the time at which the constraint turns on since a rigid body constraint can be added in the middle of an animation (it will be turned off until that time). Once the constraint is added, start the simulation by right-clicking (Command-click on Mac) the Choreography icon and pick "Simulate Rigid Bodies".

Rigid Body Constraint Properties

Density specifies how dense the material should be. A setting of 100% represents the density of water (1gram/ml). The volume, mass distribution, total mass, and center of mass are computed automatically based on the shape of the model. Normal directions on the model are important for specifying what is to be considered the "outside" of the model. (Backward normals can yield a negative mass, and very strange results). A lathed vase with only an outside shell will be considered solid, and very massive. If a hollow vase is desired, a two walled vase needs to be created. The normals on the outside need to point out, and on the inside they need to point in.

Bounce is often referred to in Physics as the "coefficient of restitution". It represents the percentage of energy that should be conserved after a collision. 100% represents a "perfect" ball. It would not lose energy and would bounce forever if there were no drag. When two models strike each other, if both have bounce values they will be averaged. If an object collides with another model that is not dynamic then the bounce from the dynamic one will be used. 0% indicates that no bounce should occur at all, and that all energy should be lost. Neither 100%, nor 0% are realistic in real life.

Enforce is a time based setting that turns the constraint off or on. 0% represents off, and 100% on.

Channels are created during the simulation just like other keyframing techniques, and those channels can be hand-edited somewhat. However, if a simulation is not to your liking, it is simpler to modify the model's original direction and speed (initial conditions) and re-simulate. Repeat until what you get is acceptable to you.

Collision Detection

The core of a physical simulation is collision detection. It may seem to you that it should be simple to know when two computer models penetrate one another – it is not! Animation:Master's collision detection cleverly takes advantage of the exclusive Hash patch technology to be as fast and accurate as possible. Simulation speed has always been the bug-a-boo of collision detection because the instant in time when multiple objects in a scene collide must be exactly determined. This could mean dozens of simulation retries. And, of course, if models are initially placed in the scene by the animator ALREADY penetrating, the collision detection algorithms get totally confused. Luckily, much of the pathology of collision detection is the frustrating responsibility of the programmers, but you have your fair share of arcane knowledge to learn also.

Rigid Body Constraint Menu

Delete Removes the selected object from the project.
Properties Edits the selected object's properties.

Rigid Body Constraint Properties

Enforcement

Default: 100%, Min: 0%, Max: 100%, Percentage. Enforcement controls whether a constraint is off or on. Constraints can be turned on or off during an animation, so a character can pick up a ball, then release it. Like all animation, channels specify the frames when things are to happen, but there is a subtle technicality - the ball is actually constrained to two bones: the table, and the hand. On frame "0", for example, the ball is "100%" constrained to the table, and "0%" constrained to the hand. Then on frame "75", it becomes "100%" constrained to the hand, and "0%" constrained to the table; then finally, on frame "150", it becomes "100%" constrained to the table again, and "0%" constrained to the hand. For the example to work, the "Translate To" table and "Translate To" hand constraints for a ball must be ordered one after the other in the ball's Constraint list. The constraints were enforced either 0% or 100%, but they could also be blended. For example, the ball could levitate to halfway between the hand and the table if both constraints were enforced "50%". Because it is more common for constraints to be turned only off or on, the default channel interpolation method is hold. This method holds the value of the keyframe exactly until the next keyframe. If you want normal blend-like interpolation, change the interpolation method to "Spline"

Apply Before Action

Visible: Sometimes, Advanced, Default: OFF. Constraints which are stored in poses can be applied before or after the actions are applied. Usually constraints are done after the actions. This way rigs and limits are

performed after the action changes. However occasionally a constraint needs done before the actions. The most common case for this is when in the action, the user needs to set offsets from a translate or orient like constraint. The software can't actually store this as an offset on the constraint, since the constraint is in a pose and shouldn't be changed. So instead, a new translate channel is added in the action. If the actions occur after the constraint then the action channel is added to the constraint results. This essentially creates an offset. This is used on the pelvis bone of the Hash 2001 Rigs.

Lock Offsets

Visible: Sometimes, Advanced, Default: OFF. Putting offsets on constraints is very common and easy to do. "Lock Offsets" prevents accidentally changing them, and is an option on every constraint that contains offsets. (Hiding the bone on which the constraint is applied has a similar effect, because if the bone can't be selected, it can't be offset). If offsets are already set they will remain, but it will lock out any further changes.

Translate

This property stores the relative position of the Rigid Body. It is added to the position of the model.

Rotate

This property stores the relative orientation of the Rigid Body. It is added to the position of the model.

Density

Default: 100%, Min: 0%, Max: 1e+010%, Percentage. Density specifies how dense the material should be. A setting of 100% represents the density of water (1gram/ml) . The volume, mass distribution, total mass, and center of mass are computed automatically based on the shape of the model. Normal directions on the model are important for specifying what is to be considered the "outside" of the model. (Backward normals can yield a negative mass, and very strange results). A lathed vase with only an outside shell will be considered solid, and very massive. If a hollow vase is desired, a two walled vase needs to be created. The normals on the outside need to point out, and on the inside they need to point in.

Bounce

Default: 50%, Min: 0%, Max: 1e+010%, Percentage. Bounce is often referred to in Physics as the "coefficient of restitution". It represents the percentage of energy that should be conserved after a collision. 100% represents a "perfect" ball. It would not lose energy and would bounce forever if there were no drag. When two models strike each other, if both have bounce values they will be averaged. If an object collides with another model that is not dynamic then the bounce from the dynamic one will be used. 0% indicates that no bounce should occur at all, and that all energy should be lost. Neither 100%, nor 0% are realistic in real life.

Minimum Velocity

Default: 0.1cm, Min: 0cm, Max: 1e+008cm, Unit of Measurement. Minimum velocity is the speed (in cm/sec) at which the object is considered to be moving so slowly it is considered at rest.

Flock Surface Constraints

Animation:Master provides a special kind of constraint to go along with the "Crowd" flock to automatically position trees, shrubs, or people case called a "Flock Surface" constraint. To use a Flock Surface constraint, you must first create a "Crowd" flock, and you must also place an object that you want to constrain the flock to in the Choreography. Right-click (Control-click on a Mac) the "Shortcut to Crowd" flock in the Project Workspace, and pick [New Constraint][Other][Flock Surface]. When the properties for the Flock Surface constraint appear, select the object you want to constraint to in the "Surface Object" field. Now, to move the flock on the surface, move the crowd Influence shape above the surface (when looking from the front, back or side views).

To set or change the shape of the flock, click on the Flock icon in the "Objects" folder in the Project Workspace to make the Flock Effect properties panel appear. Click the "Attributes" tab and select the Influence shape: sphere, cylinder, cone or a box. All of the models should remain within the shape, but their movement within the shape is dependent on the particular flock plug-in.

Flock Surface Constraint Menu

Delete	Removes the selected object from the project.
Select Target	Choose the target this constraint is affected by
Properties	Edits the selected object's properties.

Flock Surface Constraint Properties

Enforcement

Default: 100%, Min: 0%, Max: 100%, Percentage. Enforcement controls whether a constraint is off or on. Constraints can be turned on or off during an animation, so a character can pick up a ball, then release it. Like all animation, channels specify the frames when things are to happen, but there is a subtle technicality - the ball is actually constrained to two bones: the table, and the hand. On frame "0", for example, the ball is "100%" constrained to the table, and "0%" constrained to the hand. Then on frame "75", it becomes "100%" constrained to the hand, and "0%" constrained to the table; then finally, on frame "150", it becomes "100%" constrained to the table again, and "0%" constrained to the hand. For the example to work, the "Translate To" table and "Translate To" hand constraints for a ball must be

ordered one after the other in the ball's Constraint list. The constraints were enforced either 0% or 100%, but they could also be blended. For example, the ball could levitate to halfway between the hand and the table if both constraints were enforced "50%". Because it is more common for constraints to be turned only off or on, the default channel interpolation method is hold. This method holds the value of the keyframe exactly until the next keyframe. If you want normal blend-like interpolation, change the interpolation method to "Spline"

Apply Before Action

Visible: Sometimes, Advanced, Default: OFF. Constraints which are stored in poses can be applied before or after the actions are applied. Usually constraints are done after the actions. This way rigs and limits are performed after the action changes. However occasionally a constraint needs done before the actions. The most common case for this is when in the action, the user needs to set offsets from a translate or orient like constraint. The software can't actually store this as an offset on the constraint, since the constraint is in a pose and shouldn't be changed. So instead, a new translate channel is added in the action. If the actions occur after the constraint then the action channel is added to the constraint results. This essentially creates an offset. This is used on the pelvis bone of the Hash 2001 Rigs.

Lock Offsets

Visible: Sometimes, Advanced, Default: OFF. Putting offsets on constraints is very common and easy to do. "Lock Offsets" prevents accidentally changing them, and is an option on every constraint that contains offsets. (Hiding the bone on which the constraint is applied has a similar effect, because if the bone can't be selected, it can't be offset). If offsets are already set they will remain, but it will lock out any further changes.

Lag

Visible: Sometimes, Default: 0sec, Min: -15907sec. Every constraint with a target has its own lag, which allows it to be controlled by the target bone based on its position/orientation a few frames ago. The units are time. It will be displayed in frames or SMPTE depending on the global options dialog. This value is animatable, so it may change over time.

Target

Visible: Cache Only. This is the target bone for the constraint.

Translate Only

Default: OFF. Normally the surface constraint positions the object to be on the surface and aligns it in the direction of the surface normal as well. To simply translate it to the surface, but not orient it on the surface, turn this property ON.

Translate Offset

This option allows an object to be constrained not exactly to the path, but a bit away from the path. The offset can be set by typing in values or just moving the object off of the path with a translate manipulator. It also may be set while adding the constraint, by using compensate mode. It specifies a translate offset vector in the target path's space.

Rotate Offset

Visible: Sometimes. Usually the path constraint aligns the bone with the direction of the path. The rotate offset allows the constrained bone to be rotated to a new direction that is relative to the path. For example, a bone may be aimed to the right or left of the direction of the path.

Bone To Spring Constraint

The Bone To Spring constraint constrains the direction and optionally the position of a bone to be aligned with a spring. The bone will then follow the dynamic motion specified by the spring.

Bone To Spring Constraint Menu

Delete

Removes the selected object from the project.

Properties

Edits the selected object's properties.

Bone To Spring Constraint Properties

Enforcement

Default: 100%, Min: 0%, Max: 100%, Percentage. Enforcement controls whether a constraint is off or on. Constraints can be turned on or off during an animation, so a character can pick up a ball, then release it. Like all animation, channels specify the frames when things are to happen, but there is a subtle technicality - the ball is actually constrained to two bones: the table, and the hand. On frame "0", for example, the ball is "100%" constrained to the table, and "0%" constrained to the hand. Then on frame "75", it becomes "100%" constrained to the hand, and "0%" constrained to the table; then finally, on frame "150", it becomes "100%" constrained to the table again, and "0%" constrained to the hand. For the example to work, the "Translate To" table and "Translate To" hand constraints for a ball must be ordered one after the other in the ball's Constraint list. The constraints were enforced either 0% or 100%, but they could also be blended. For example, the ball could levitate to halfway between the hand and the table if both constraints were enforced "50%". Because it is more common for constraints to be turned only off or on, the default channel interpolation method is hold. This method holds the value of the keyframe exactly until

the next keyframe. If you want normal blend-like interpolation, change the interpolation method to "Spline"

Apply Before Action

Visible: Sometimes, Advanced, Default: OFF. Constraints which are stored in poses can be applied before or after the actions are applied. Usually constraints are done after the actions. This way rigs and limits are performed after the action changes. However occasionally a constraint needs done before the actions. The most common case for this is when in the action, the user needs to set offsets from a translate or orient like constraint. The software can't actually store this as an offset on the constraint, since the constraint is in a pose and shouldn't be changed. So instead, a new translate channel is added in the action. If the actions occur after the constraint then the action channel is added to the constraint results. This essentially creates an offset. This is used on the pelvis bone of the Hash 2001 Rigs.

Lock Offsets

Visible: Sometimes, Advanced, Default: OFF. Putting offsets on constraints is very common and easy to do. "Lock Offsets" prevents accidentally changing them, and is an option on every constraint that contains offsets. (Hiding the bone on which the constraint is applied has a similar effect, because if the bone can't be selected, it can't be offset). If offsets are already set they will remain, but it will lock out any further changes.

Spring

Visible: Cache Only. This is the target spring to constrain the Bone to.

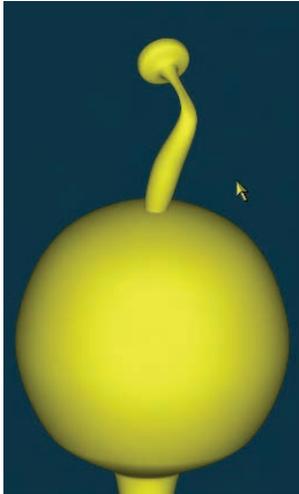
Aim Only

Default: ON. When ON the constraint only orients the bone like the spring. Turning it OFF also translates the bone to the spring.

Reverse Direction

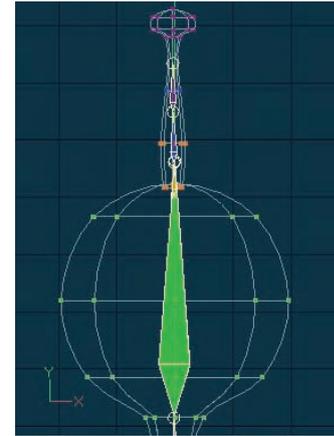
Default: OFF. By default the first mass controls the pivot of the bone and the second mass controls the end. Setting this option OFF reverses this.

Dynamic Constraints



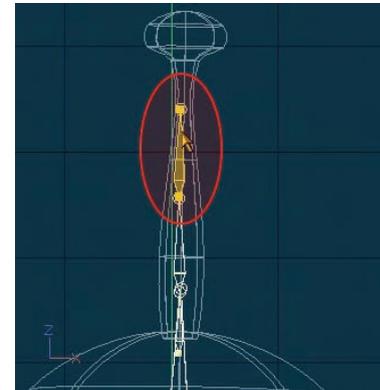
Dynamic Constraints

Dynamic Constraints allows a limb, or chain of bones to animate automatically using dynamic simulation.



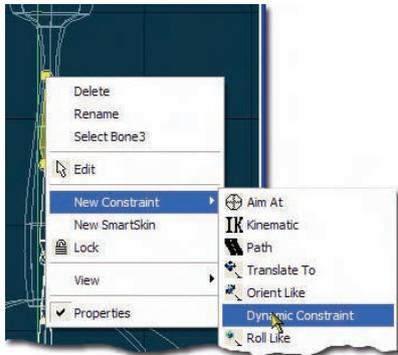
Add Bones for Dynamic Constraint

In this example, we added an antenna to the Thom model and created a chain of 3 bones that control the Control Points (CPs) of the antenna.



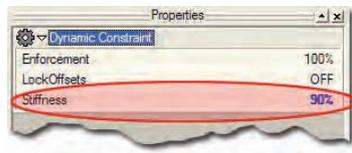
Select Last Bone in Chain

From the Action you are creating, select the last bone in the chain that you want to add the dynamic constraint to.



Add Dynamic Constraint

Right click (Ctrl click on the Mac) on the selected bone and pick [New Constraint] [Dynamic Constraint]. Now as the model animates the antenna will animate automatically.



Dynamic Constraint Properties

From the Dynamic Constraint's properties you can change the Stiffness of the dynamic chain. Stiffness controls how stiff the dynamic chain acts. At 100%, it is a completely stiff rod. It won't flex at all. At 0%, it does not resist bending at all. It is completely limp. As long as this value is not 0% then the chain will try to achieve its original position as modeled.

Dynamic Constraint Menu

- Delete** Removes the selected object from the project.
- Select Target** Choose the target this constraint is affected by
- Properties** Edits the selected object's properties.

Dynamic Constraint Properties

Enforcement

Default: 100%, Min: 0%, Max: 100%, Percentage. Enforcement controls whether a constraint is off or on. Constraints can be turned on or off during an animation, so a character can pick up a ball, then release it. Like all animation, channels specify the frames when things are to happen, but there is a subtle technicality - the ball is actually constrained to two bones: the table, and the hand. On frame "0", for example, the ball is "100%" constrained to the table, and "0%" constrained to the hand. Then on frame "75", it becomes "100%" constrained to the hand, and "0%" constrained to the table; then finally, on frame "150", it becomes "100%" constrained to the table again, and "0%" constrained to the hand. For the example to work, the "Translate To" table and "Translate To" hand constraints for a ball must be ordered one after the other in the ball's Constraint list. The constraints were enforced either 0% or 100%, but they could also be blended. For example, the ball could levitate to halfway between the hand and the table if both constraints were enforced "50%". Because it is more common for constraints to be turned only off or on, the default channel interpolation method is hold. This method holds the value of the keyframe exactly until the next keyframe. If you want normal blend-like interpolation, change the interpolation method to "Spline"

Apply Before Action

Visible: Sometimes, Advanced, Default: OFF. Constraints which are stored in poses can be applied before or after the actions are applied. Usually constraints are done after the actions. This way rigs and limits are performed after the action changes. However occasionally a constraint needs done before the actions. The most common case for this is when in the action, the user needs to set offsets from a translate or orient like constraint. The software can't actually store this as an offset on the constraint, since the constraint is in a pose and shouldn't be changed. So instead, a new translate channel is added in the action. If the actions occur after the constraint then the action channel is added to the constraint results. This essentially creates an offset. This is used on the pelvis bone of the Hash 2001 Rigs.

Lock Offsets

Visible: Sometimes, Advanced, Default: OFF. Putting offsets on constraints is very common and easy to do. "Lock Offsets" prevents accidentally changing them, and is an option on every constraint that contains offsets. (Hiding the bone on which the constraint is applied has a similar effect, because if the bone can't be selected, it can't be offset). If offsets are already set they will remain, but it will lock out any further changes.

Lag

Visible: Sometimes, Default: 0sec, Min: -15907sec. Every constraint with a

target has its own lag, which allows it to be controlled by the target bone based on its position/orientation a few frames ago. The units are time. It will be displayed in frames or SMPTE depending on the global options dialog. This value is animatable, so it may change over time.

Target

Visible: Cache Only. This is the target bone for the constraint.

Translate Offset

This option allows the chain to be constrained not to the pivot of the target bone, but rather away from it by this offset. The offset can be set by typing in values, or by using compensate mode when picking the target. It specifies a translate offset vector in the target bone's space.

Dynamic Options

Default: ON. This folder contains properties pertaining to the behavior of dynamic chains

Targeting

Default: Constraint. This option controls whether or not the dynamic chain tries to take the shape it was modeled or animated to.

None: No targeting will be performed.

Constraint: Constraints will be used to correct the bone towards the underlying modeled or animated position. The value represents is the amount it will move towards the target in one frame. It can range from 0% to 100%. Where 0% is the same as no targeting, and 100% is completely stiff.

Spring: This method uses a traditional damped spring using Hook's Spring Law to encourage the chain towards the modeled or animated goal position. Frequency and damping are used to control the behavior of the spring.

Stiffness

Visible: Sometimes, Default: 50%, Min: 0%, Max: 100%, Percentage Stiffness controls how stiff the dynamic chain acts. Higher stiffness makes the springs pull harder towards the target orientation.

Frequency

Visible: Sometimes, Advanced, Default: 1, Min: 0, Max: 1e+008. Natural Frequency is an alternative way of controlling how stiff the dynamic chain acts. When subjected to forces, this is how many times in one second, that the spring would tend to oscillate. Stiffer springs have higher natural frequency, while softer springs have lower.

Damping

Visible: Sometimes, Advanced, Default: 5, Min: 0, Max: 1e+008. Damping controls the motion of the chain. It damps the springs that force the chain towards its target. The faster the spring tries to pull, the more the damping resists the motion. A higher number slows the oscillations more. Stiffer springs require higher damping values.

Is Rod

Visible: Sometimes, Default: ON. This option makes the targeting act like a

fishing rod, the base of the rod influences the end of the rod. The end of the rod only tries to take on its intended shape and ignores the base. It tends to make whip like bends, and behaves the best if the bottom bones are either longer or stiffer than the ones at the ends.

Object Collisions

Visible: Sometimes, Default: OFF. Use this option to have the dynamic chain collide with other geometry.

Collision Radius

Visible: Sometimes, Default: 1cm, Min: 0cm, Unit of Measurement Radius specifies the radius of the sphere at the end of the bones, which will be used to collide off of the geometry.

Bounce

Visible: Sometimes, Default: 50%, Min: 0%, Max: 1e+010%, Percentage Bounce is often referred to in Physics as the "coefficient of restitution". It represents the percentage of energy that should be conserved after a collision. 100% represents a "perfect" ball. It would not lose energy and would bounce forever if there were no drag. 0% indicates that no bounce should occur at all, and that all energy should be lost in the direction of the impact. Neither 100%, nor 0% are realistic.

Friction

Visible: Sometimes, Default: 50%, Min: 0%, Max: 1e+010%, Percentage Friction is how much drag should be placed on the object as it passes sideways along a surface. 100% will stop all motion in the sideways direction, 0% will allow free sliding like ice.

Mass

Visible: Sometimes, Default: 1, Min: 0. This property specifies the mass of each of the nodes at the end of the bones.

Drag

Visible: Sometimes, Default: 1%, Min: 0%, Max: 100%, Percentage. Drag is like adding a bit of syrup to the air. It represents the amount of reduction in velocity that will happen in one second. It can be thought of as global damping

Use Gravity

Visible: Sometimes, Default: ON. This determines whether the chain uses the gravity specified in the chor.

Use Forces

Visible: Sometimes, Default: ON. This determines whether the chain uses the force objects in the chor.

Force

Visible: Sometimes. This property provides a force or gravity to be used by this dynamic chain only. It allows you to specify an X, Y, and Z gravity that will affect the speed, direction, and distance that bones travel. Typically this will be all zeros, because the forces like gravity in the choreography will also

take affect, causing the bones to fall.

Angle Limit

Visible: Sometimes, Default: 180°, Min: 0°, Max: 180°, Angle. This limits the maximum angle at which each bone of the chain can bend.

Simulate on the Fly

Visible: Sometimes, Default: ON. If ON, this constraint will compute its dynamics on the fly. The results are not accurate when going backwards or stepping forward by more than one frame. Use Simulate Spring Systems menu option from the Choreography or Action menu to store accurate results. The simulation will automatically turn this option OFF. The constraint must have simulated results in order to render accurately.

Mass To CP Constraint

Constrains a Mass from a Spring System to follow a Control Point.

Mass To CP Constraint Menu

Delete

Removes the selected object from the project.

Properties

Edits the selected object's properties.

Mass To CP Constraint Properties

Enforcement

Default: 100%, Min: 0%, Max: 100%, Percentage. Enforcement controls whether a constraint is off or on. Constraints can be turned on or off during an animation, so a character can pick up a ball, then release it. Like all animation, channels specify the frames when things are to happen, but there is a subtle technicality - the ball is actually constrained to two bones: the table, and the hand. On frame "0", for example, the ball is "100%" constrained to the table, and "0%" constrained to the hand. Then on frame "75", it becomes "100%" constrained to the hand, and "0%" constrained to the table; then finally, on frame "150", it becomes "100%" constrained to the table again, and "0%" constrained to the hand. For the example to work, the "Translate To" table and "Translate To" hand constraints for a ball must be ordered one after the other in the ball's Constraint list. The constraints were enforced either 0% or 100%, but they could also be blended. For example, the ball could levitate to halfway between the hand and the table if both constraints were enforced "50%". Because it is more common for constraints to be turned only off or on, the default channel interpolation method is hold. This method holds the value of the keyframe exactly until the next keyframe. If you want normal blend-like interpolation, change the interpolation method to "Spline"

Apply Before Action

Visible: Sometimes, Advanced, Default: OFF. Constraints which are stored in poses can be applied before or after the actions are applied. Usually constraints are done after the actions. This way rigs and limits are performed after the action changes. However occasionally a constraint needs done before the actions. The most common case for this is when in the action, the user needs to set offsets from a translate or orient like constraint. The software can't actually store this as an offset on the constraint, since the constraint is in a pose and shouldn't be changed. So instead, a new translate channel is added in the action. If the actions occur after the constraint then the action channel is added to the constraint results. This essentially creates an offset. This is used on the pelvis bone of the Hash 2001 Rigs.

Lock Offsets

Visible: Sometimes, Advanced, Default: OFF. Putting offsets on constraints is very common and easy to do. "Lock Offsets" prevents accidentally changing them, and is an option on every constraint that contains offsets. (Hiding the bone on which the constraint is applied has a similar effect, because if the bone can't be selected, it can't be offset). If offsets are already set they will remain, but it will lock out any further changes.

CP To Mass Constraints

The CP To Mass Constraint constrains a control point of a model to follow the motion specified by a mass. These constraints are usually added automatically by the Cloth Wizard.

CP To Mass Constraint Menu

Menu	Description
Delete	Removes the selected object from the project.
Properties	Edits the selected object's properties.

CP To Mass Constraint Properties

Enforcement

Default: 100%, Min: 0%, Max: 100%, Percentage. Enforcement controls whether a constraint is off or on. Constraints can be turned on or off during an animation, so a character can pick up a ball, then release it. Like all animation, channels specify the frames when things are to happen, but there is a subtle technicality - the ball is actually constrained to two bones: the table, and the hand. On frame "0", for example, the ball is "100%" constrained to the table, and "0%" constrained to the hand. Then on frame "75", it becomes "100%" constrained to the hand, and "0%" constrained to the table; then finally, on frame "150", it becomes "100%" constrained to the table; then finally, on frame "150", it becomes "100%" constrained to the

table again, and “0%” constrained to the hand. For the example to work, the “Translate To” table and “Translate To” hand constraints for a ball must be ordered one after the other in the ball’s Constraint list. The constraints were enforced either 0% or 100%, but they could also be blended. For example, the ball could levitate to halfway between the hand and the table if both constraints were enforced “50%”. Because it is more common for constraints to be turned only off or on, the default channel interpolation method is hold. This method holds the value of the keyframe exactly until the next keyframe. If you want normal blend-like interpolation, change the interpolation method to “Spline”

Apply Before Action

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Lock Offsets

Visible: Sometimes, Advanced, Default: OFF. Putting offsets on constraints is very common and easy to do. “Lock Offsets” prevents accidentally changing them, and is an option on every constraint that contains offsets. (Hiding the bone on which the constraint is applied has a similar effect, because if the bone can’t be selected, it can’t be offset). If offsets are already set they will remain, but it will lock out any further changes.

Target

Visible: Cache Only. This is the mass to constrain the CP to.

Mass Shortcuts

Mass Shortcuts contain the position drivers for a Mass instance.

Mass Shortcut Cache Menu

Delete	Removes the selected object from the project.
Rename	Rename the selected object
Select Cache ()	Highlights the object that this shortcut is to.
Properties	Edits the selected object’s properties.

Mass Shortcut Properties

Object’s Properties

Visible: Sometimes. Contains the properties of the object this shortcut is for.

Mass To Bone Constraints

Drivers are the channels, constraints, expressions, etc... that control the behavior of a model. Drivers are what makes an action actually do something. You can see all drivers beneath an action or choreography action by opening it in the Project Workspace. You can display which drivers currently control a property by choosing [Select][Driver] from any property’s context menu.

Mass To Bone Constraint Menu

Delete	Removes the selected object from the project.
Select Target	Choose the target this constraint is affected by
Properties	Edits the selected object’s properties.

Mass To Bone Constraint Properties

Enforcement

Default: 100%, Min: 0%, Max: 100%, Percentage. Enforcement controls whether a constraint is off or on. Constraints can be turned on or off during an animation, so a character can pick up a ball, then release it. Like all animation, channels specify the frames when things are to happen, but there is a subtle technicality - the ball is actually constrained to two bones: the table, and the hand. On frame “0”, for example, the ball is “100%” constrained to the table, and “0%” constrained to the hand. Then on frame “75”, it becomes “100%” constrained to the hand, and “0%” constrained to the table; then finally, on frame “150”, it becomes “100%” constrained to the table again, and “0%” constrained to the hand. For the example to work, the “Translate To” table and “Translate To” hand constraints for a ball must be ordered one after the other in the ball’s Constraint list. The constraints were enforced either 0% or 100%, but they could also be blended. For example, the ball could levitate to halfway between the hand and the table if both constraints were enforced “50%”. Because it is more common for constraints to be turned only off or on, the default channel interpolation method is hold. This method holds the value of the keyframe exactly until the next keyframe. If you want normal blend-like interpolation, change the interpolation method to “Spline”

Apply Before Action

Visible: Sometimes, Advanced, Default: OFF. Constraints which are stored in poses can be applied before or after the actions are applied. Usually

constraints are done after the actions. This way rigs and limits are performed after the action changes. However occasionally a constraint needs done before the actions. The most common case for this is when in the action, the user needs to set offsets from a translate or orient like constraint. The software can't actually store this as an offset on the constraint, since the constraint is in a pose and shouldn't be changed. So instead, a new translate channel is added in the action. If the actions occur after the constraint then the action channel is added to the constraint results. This essentially creates an offset. This is used on the pelvis bone of the Hash 2001 Rigs.

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Lag

Visible: Sometimes, Default: 0sec, Min: -15907sec. Every constraint with a target has its own lag, which allows it to be controlled by the target bone based on its position/orientation a few frames ago. The units are time. It will be displayed in frames or SMPTE depending on the global options dialog. This value is animatable, so it may change over time.

Target

Visible: Cache Only. This is the target bone for the constraint.

Translate Offset

This offset allows a mass to be constrained not exactly to the target bone, but a little up, down or to the side. The offset can be set by typing in values or just translating the constrained mass. It also may be set while adding the constraint, by using compensate mode. It specifies a translate offset vector in the target bone's space.

Expressions

Expressions allow you to control the value of a property via a user defined function. This expression can be as simple or complex as you want. It might be a function to make one camera's focal length equal that of another camera, or maybe a pulsing red light on a wall using a sine function.

To add an expression to a property of an object instance (either in a choreography or an action), right click (Control-click on the Mac) the property you wish to add the expression to, and choose Edit Expression. A new expression object will be created, and it will automatically be selected for editing. This is where you type your expression.

When editing an expression, you can use values of other properties within

your expression. You can do this by either typing the relative name of the property, or just selecting the other property from the tree. You can also choose from a list of functions by clicking the function button just to the right of the expression's name, or typing the function yourself.

The operators + - * / and ^ for power are available. Percent signs can be added after numbers where 50% is the same as 0.5. Comparison operators ' styles. C-style boolean operators && || ! can be used in placed of the spelled out functions And, Or and Not.

Here is a list of functions available when writing an expression:

Abs(n)

Returns the absolute value of n (n without its sign).

ACos(n0...1)

Returns the arccosine of n in the range of 0 to Pi radians. The arccosine is the angle whose cosine is n

ASin(n0...1)

Returns the arcsine of n in the range of -Pi/2 to Pi/2 radians.

ATan(n)

Returns the arctangent of n in the range of -Pi/2 to Pi/2 radians.

ATan2(y, x)

Returns the arctangent of the specified x and y coordinates, in the range of -Pi to Pi radians, excluding Pi.

Ceiling(n)

Rounds n up to the nearest whole number, where 1.2 becomes 2, and -1.2 becomes -1.

ChorTime()

Returns the current global time within the choreography. Rather than relative to the action via GetTime().

Color(r, g, b)

Creates a color by combining the three floating point values r, g, and b. These numbers should be from 0 to 1.

Cos(radians)

Returns the cosine of an angle specified in radians.

Cross(vec1, vec2)

Returns the cross product of the two vectors. The result is a vector.

Degrees(radians)

Converts radians to degrees.

Dot(vec1, vec2)

Returns the dot product of the two vectors. The result is a floating point number.

Euler(x, y, z)

Creates a rotation by combining the three floating point euler angles x, y, and z. These numbers are expressed in degrees and are multiplied in yxz

order.

Exp(power)

Returns e raised to the power given.

Fact(n>1)

Returns the factorial of n, equal to 1*2*3*...*n.

Floor(n)

Rounds n down to the nearest whole number, where 1.2 becomes 1, and -1.2 becomes -2.

GetTime()

Returns the relative time within the action. When in a choreography, this is equal to the chor's time.

GetWorldPos(bone.transform)

Returns the world position of the bone, who's transform is supplied, as a 3D vector.

GetWorldDir(bone.transform)

Returns the world direction of the bone, who's transform is supplied, as a 3D vector.

If(test, true_value {, false_value})

Checks whether a condition is met, and returns one value if TRUE, and another if FALSE. The second value is optional, if omitted, the expression does not assign any value for the false case.

Ln(n>0)

Returns the natural logarithm of n.

Log(n>0, base>0)

Returns the logarithm of n to the base you specify.

LogTen(n>0)

Returns the base-10 logarithm of n.

Max(a, b)

Returns the larger of the two arguments.

Min(a, b)

Returns the smaller of the two arguments.

Mod(n, divisor0)

Returns the remainder after n is divided by the divisor.

Norm(vec)

Returns the length of the supplied vector as a floating point value.

Pi()

Returns the value of Pi, 3.14159265358979.

Quat(x, y, z, w)

Creates a rotation by combining the four floating point values x, y, z, and w into a quaternion.

Radians(degrees)

Converts degrees to radians.

Rand()

Returns a random number greater than or equal to 0 and less than 1, seeded off the choreography's current time.

RGB(r, g, b)

Creates a color by combining the three floating point values r, g, and b. These numbers should be expressed as 8 bit color, from 0 to 255.

Round(n, modulo0)

Round n to the nearest number specified by modulo.

Sign(n)

Returns the sign of n: 1 if the number is positive, 0 if the number is zero, and -1 if the number is negative.

Sin(radians)

Returns the sine of an angle specified in radians.

Sqrt(n>0)

Returns the square root of n. n must be greater than 0.

Tan(radians)

Returns the tangent of an angle specified in radians.

Trunc(n)

Truncates n to an integer by removing the decimal, or fractional, part of the number.

Vector(x, y, z)

Creates a vector by combining the three floating point values x, y, and z.

Expression Menu

Delete	Removes the selected object from the project.
Properties	Edits the selected object's properties.

Expression Properties

Enforcement

Default: ON. Enforcement controls whether an expression is off or on. Expressions can be turned on or off during an animation.

Apply Before Action

Visible: Sometimes, Advanced, Default: OFF. Expressions which are stored in poses can be applied before or after the actions are applied. Usually expressions are done after the actions. This way rigs and limits are performed after the action changes. However occasionally a constraint needs done before the actions. The most common case for this is when in the action, the user needs to set offsets from the expressions result. The software can't actually store this as an offset on the expression. So instead, a new translate channel is added in the action. If the actions occur after the expression then the action channel is added to the expression results. This essentially creates an offset.

Choreography Folder

Choreographies

All objects: models, lights, cameras, actions, come together in a choreography. You can think of it as a scene in your film. There can be multiple choreographies in a project.

Choreography Containers

This container includes all of the choreographies in the Project.

Choreography Container Instance Menu

Delete	Removes the selected object from the project.
Rename	Rename the selected object
Select Cache (Chor)	Highlights the object that this shortcut is to.
Properties	Edits the selected object's properties.

Choreography Properties

File Info

Visible: Cache Only. See File Info property.

Length

Default: 1sec. The total length of the choreography. This length is also used as the default length for objects that are constrained to a path.

Dynamics

Visible: Cache Only. The collection of dynamic properties for the choreography.

Force

Visible: Cache Only. The force direction vector that will globally affect particles and dynamics in the choreography. This is typically used to simulate gravity, and so it is specified as a percentage of gravity. The default is X:0%, Y:-100%, and Z:0%, which sends objects downward at the rate of Earth's gravity.

Rigid Subsamples

Visible: Sometimes, Default: 16. Specifies how many discreet steps in time the simulation should take for every frame of motion. This number is the maximum steps the simulation will take per frame. If no collisions are occurring, the simulation will step forward a full frame at a time regardless of this setting. A higher number of subsamples will yield more accurate results with less object penetration, however lower subsamples will simulate faster. In any case, the simulation only stores its result once per frame, so memory consumption and file size for the different subsamples is unaffected.

Rigid Drag

Visible: Cache Only, Default: 100, Min: 0. Performs general damping on the

rigid-body. It simply resists motion more for a model as it moves faster. It slows both linear and rotational motion. 0% means no drag, and 100% is similar to what we experience through air for most objects. 1000% would seem as if the object was suspended in water.

Display While Simulating

Default: ON. This option toggles whether to update the window when simulating soft and/or rigid body dynamics.

Reduction Error Tolerance

Visible: Cache Only, Default: 0.1, Min: 0. If this number is greater than zero, then after the simulation the resulting channels will be reduced. This number will represent the maximum error that will be permitted in the newly reduced channel.

Glow Radius

Default: 15, Min: 0, Max: 50. This value is used to determine the size of the halo that surrounds glowing objects in the choreography. Larger values will increase the size of the halo. Glowing will decrease with distance.

Glow Intensity

Default: 200%, Min: 0%, Max: 1000%, Percentage. This value controls the brightness of the glow effect.

Global Ambiance Type

Default: None. Selects the type of global ambiance illumination that is to be added to the scene lighting. This ambiance is a global effect. It acts as if the environment was casting lights from all around the objects in the scene in addition to the other explicitly positioned lights in the scene. None: No ambiance is added to the scene illumination. Global Color: A single color is added to the scene illumination. Image Based Lighting: An environment map is used to add ambiance to the scene illumination. Image Based Lighting gives better results when the environment map contains High Dynamic Range values.

Ambiance Color

Visible: Sometimes. You can select a global ambiance color by clicking the Color chip and picking one color from the palette. The ambiance color would be chosen to match the average colors present in the scene. For instance, in a scene where the surrounding walls are yellow, a suitable ambiance color would also be yellow to simulate the yellow color reflected from the walls. Ambiance color could also be chosen to cast a general mood to the scene.

Ambiance Intensity

Visible: Sometimes, Default: 100%, Min: 0%, Max: 1000%, Percentage



Ambiance intensity determines how much of the global ambience illumination is added to the scene. In a scene where the environment (walls, ceiling, surrounding objects, etc.) are very bright, global ambience intensity would be higher. A good scene lighting setup that uses ambience needs a good balance between the ambience intensity and the other lights intensities. In general, it will be necessary to lower the light intensities in a scene with high global ambience.

Ambiance Occlusion

Visible: Sometimes, Default: 0%, Min: 0%, Max: 200%, Percentage. Selecting this option will add shading on the ambience color. In normal environment, all surfaces don't receive the same amount of global ambience illumination. Surfaces in crevices, for example, will receive much less global ambience light than a wide open surface. Ambiance Occlusion computes the proportion of the environment that is visible to each surface in the scene. This can add substantial realism to the global ambience illumination which would otherwise look rather flat.

Environment Map

Visible: Sometimes. Select an image that is to be used as the environment illuminating the scene. Any image type can be used but an HDR image will give better results.

Repeat

Visible: Sometimes. The number of times this image is to repeat itself.

Seamless

Visible: Sometimes, Default: OFF. When the image repeats, the seamless property flips the image on every repeat. Causing the image to look "seamless". This is most useful on repetitive textures.

Frame

Visible: Sometimes, Default: 0sec. When the image is an animation (or sequence of images), this property sets which frame to use out of the original animation. If this property is marked as "-not set-", the current frame from the interface is used automatically. This will cause the animation to animate as it was originally intended. This property can also be keyframed to have the sequence play out of order. For instance, if the original animation is one second, and at frame 0 you set the Time property to be 1 second, and at 2 seconds you set it to be 0, the sequence will play

backwards at half speed.

Mapping Type

Visible: Sometimes, Default: Latitude-Longitude. Selects the environment image mapping type. The Latitude-Longitude or panorama is the preferred mapping type and the easiest to find, followed by the Light Probe. The Cube Map is slightly more efficient and is a good mapping type but is more difficult to find. Finally, the Mirrored Sphere Mirrored Spheres is the least preferred mapping as it produces severe distortions but it is convenient when only the original photograph of the sphere is available.

Latitude-Longitude: The Latitude-Longitude or panorama is a mapping where the azimuth direction is along the X axis of the image and the elevation direction is along the Y axis. The image width is usually twice as large as its height.

Light Probe: The Light Probe, also called angular map was developed by Paul Debevec. It looks like a Mirrored Sphere but the radial direction follows linear angles.

Mirrored Sphere: The Mirrored Sphere is a photograph of a mirrored sphere that has not been transformed otherwise.

Cube Map (Cross): The Cube Map (cross) is an environment format where each of the 6 faces of a cube are disposed like a cross.

Exposure

Visible: Sometimes, Default: 0, Min: -20, Max: 20. Select an exposure compensation for the selected HDRI environment map. Environment maps, especially High Dynamic Range maps, may need to have their exposure compensated. It is very difficult to get uniformly exposed HDRI environment files. There are no standards for exposure and HDRI environment files found on the Web had to be exposure compensated from -7 steps to +10 steps.

Azimuth

Visible: Sometimes, Default: 0, Min: 1, Max: 360. Reorients the environment map azimuth angle around the Y axis. The environment map is normally aligned so the center of the map is aligned with the world Z axis. If the scene is differently aligned relative to the environment map used, then it may be necessary to realign the environment.

Radiosity

Default: OFF. If Radiosity is On, photon maps are automatically created for each frame of an animation during Render To File. Radiosity often doubles (or more) the time it takes to render a picture.

Photons Cast

Default: 10000, Min: 1000, Max: 1000000. Determines how many photons to accumulate.

Sample Area

Visible: Sometimes, Default: 100, Min: 0.01, Max: 500000

The size of area to sample for contributing photons per pixel.

Photon Samples

Visible: Sometimes, Default: 100, Min: 10, Max: 500. The number of photon samples to take inside the sample area.

Intensity

Default: 100%, Min: 1%, Max: 10000%, Percentage. Determines how much of the photon energy is applied. This setting is the most critical to good looking radiosity: too high and the pixel with white out; too low and no radiosity is visible. To find an intensity setting for your scene, right-click (Command-click on a Mac) inside the Choreography window, and pick [Calculate Radiosity]. Then test different intensity settings with the raytracer before rendering the final image. When Radiosity is on, the camera's Global Ambiance setting is ignored, but the model's ambiance is still taken into account.

Max Bounces

Default: 15, Min: 2, Max: 50. Controls the number of bounces. It does not increase the time it takes to produce the photon map but does influence the quality of the indirect illumination estimation. Setting it from 15 to 20 seems to give the best results. Higher than that starts to wash out the indirect illumination and lower than that starts to darken the indirect illumination.

Caustics

Default: OFF. When enabled this option sets the photon mapping to shoot photons only toward refractive or reflective surfaces and stores the photon at the first non-reflective or refractive surface. Photon are not dispersed everywhere in the scene. Also, when rendering caustics, Final Gathering property is not used because it is the photon themselves which are used and "Precompute Irradiance" is not used either because the irradiance calculation is done at pixel sampling location and is filtered with a Gaussian filter. "Caustics" ON will render caustics only and not indirect illumination. "Caustics" OFF will render indirect illumination only and no caustics. When "Caustics" is ON, then "Final Gathering" and "Precompute Irradiance" are disabled. Conversely, when "Caustics" is OFF, then "Final Gathering" and "Precompute Irradiance" are enabled.

Final Gathering

Visible: Sometimes, Default: ON. Controls if Final Gathering is used or not. Final Gathering takes a lot of time but produces the most exact solution. It is the only workable solution for scenes where the indirect illumination is more important than direct illumination. In scene where indirect illumination is stronger, turning it off and tweaking the sample area and photon samples might give acceptable results. The choice is extremely scene dependent but for situation where render time budget is short, it might be appropriate.

Samples

Default: 100, Min: 50, Max: 500. This controls the quality of the final

gathering step. 50 rays is borderline because it produces strong banding artifacts so less than 50 rays is clearly unacceptable. 150 samples is a good compromise in most scenes but there are scenes where small objects with contrasting attributes from the background or other objects where 150 is not enough.

Jittering

Advanced, Default: 0%, Min: 0%, Max: 10000%, Percentage. Another way to get rid of the banding artifacts is to jitter the rays. This can introduce some noise though, but not much. There is definitely a tradeoff between noise and render time.

Precompute Irradiance

Visible: Sometimes, Default: ON. Controls if the irradiance is precomputed and stored in the photon map before starting the render. When rendering, the irradiance is then picked from the nearest photon instead of recomputing the same irradiance over and over. The speed gain is most noticeable during the Final Gathering step. The trade-off is that it takes RAM to store this irradiance (8 extra bytes per photon).

Plugin Properties Custom properties added by plugins

Directing Mode

Modeling and animation, as well as directing can be conducted in a Choreography window. The Directing Mode button on the Mode toolbar must be down to perform directing operations such as moving objects, and using choreography-only menus and buttons.

You can also model and animate in a Choreography window by clicking on the model in the Choreography window to select it, then click the appropriate mode button on the Mode toolbar.

Radiosity

See: Choreography Properties to set Radiosity options.

Removing Lights

To remove a light from a choreography, click on the light in a Choreography window (or click on the "shortcut to" light icon in the Project Workspace), and click the Delete button on the Standard toolbar (or press the <Delete> key on the keyboard). The light will be removed from the scene.

Import Choreography

This feature merges each object and its motion from another choreography into the current choreography. It is accessible by right-clicking (Control-click on a Mac) the choreography name under the Choreography folder in the Project Workspace.

Choreography Menu

Delete

Removes the selected object from the project.

Rename

Rename the selected object

Edit

Opens a Window for the selected object. This can also be achieved by double-clicking the object in the Project Workspace.

Save

Saves the selected object with its current name.

Save As...

Saves the selected object with a new name.

New Model

Inserts a Model.

New Camera

Inserts a Camera.

New Light

Inserts a Light.

Force

Inserts a Force.

Null

Inserts a Null Object.

Material Effect

Inserts a Material Effect.

Spring System

Inserts a Spring System.

Layer...

Inserts a Layer.

Rotoscope...

Imports an image file to be used as a rotoscope.

Folder

Creates a new folder that can be used to organize objects. Once created objects can be dragged into the folder

Motion Capture Device

Adds the chosen motion capture plugin.

Volumetric Effect

Adds the chosen volumetric plugin.

Flocking

Adds the chosen flock plugin.

Import Model Other...

Sometimes, when working on a model, it may be useful to incorporate another model within it. To import a saved model, right-click (Control-click on a Mac) on the model you want to add to, pick [Import][Model], and select

the ".MDL" file to import.

Import Prop...

Imports a third party Prop.

Import Light Other...

Import a Light file.

Import Choreography (*.cho)...

Merges a Choreography file into the selected choreography.

Import Camera

Import Camera

Export Model (*.mdl)...

An entire choreography can be saved as a single model. The geometry and bones of each model will be inserted into the new model. The model's positions due to translations, rotations, skeletal motion and constraints will all be reflected in the position of the control point's in the new model. Right-click (Control-click on a Mac) the Choreography in the Project Workspace, pick [Export][Model (*.mdl)...].

Export Light Maps...

See Also Export Lighting Maps Dialog

Bake All Actions...

Bakes All Actions into Chor Action

This feature collects all of the actions, reusable or not, on an object and bakes them into just one simple choreography action. This choreography action can be saved out by right-clicking (Control-click on a Mac) a choreography name in the Project Workspace tree (this will save actions for all objects in the choreography), a model shortcut in a choreography, or within an object's manipulator in a choreography window. Then choose "Export Action As..." from the menu.

Calculate Radiosity...

Calculate lighting obtained from lighted surfaces.

Calculate IBL...

Calculate lighting obtained from an environment map.

Simulate Rigid Bodies

Starts a dynamics simulation on objects with Rigid body constraints.

Simulate Spring Systems

Simulate all Spring Systems.

Remove Simulation Data

Removes the simulated data from this choreography.

Insert Light Buffer

Insert a new Light Buffer.

Plug-ins

Extension Plugins (.hxt) may be available for this object.

Properties

Edits the selected object's properties.

Animating In A Choreography Window

Select the model in the Choreography window that is to be animated by clicking on it in the window, or click the "Shortcut to" Model icon in the Project Workspace. Any animation done in a Choreography window will create "Chor Action" frame ranges in the timeline. To animate in Muscle mode, click the Muscle Mode button on the Mode toolbar (the tools and menus change for muscle motion). To animate in Skeletal mode, click the Skeletal Mode button on the Mode toolbar (the tools and menus change for skeletal motion). The bones will show up. Now keyframes can be created for the model.

Consider a sequence of actions as follows:

- Action Frame
- walk 0-45
- draw gun 50-65
- fire 65-75

In this example, the "fire" action is designed to directly follow the "draw gun" action. However, the last frame of the "walk" cycle does not match the "draw gun" action that is a neutral stance. One solution would be to create a "walk to stance transition" reusable action, but most transitions don't merit a custom reusable action. In this case, you can have the computer build an automatic transition by selecting "Transition to next action" on the "walk" action shortcut's Blend property tab. In the timeline this will appear as a blend region between frame 45 and 50 on the line of the walk shortcut. The transition will be a simple linear blend from one action to the next. If the time span of this transition is short, this simple transition is usually adequate.

If the above transition doesn't look good enough, turn off "Transition to next action" and build a transition by hand in the choreography as follows. The transition needs to occur between frames 45 and 50. Go to frame "44.9". Copy (make sure the key modes are correctly set: Key Model, Key Translate, Rotate, Scale, Constraints and Muscle). Now change to frame "45" and paste. The start of the transition matches the end of the walk cycle. Go to frame "50" and copy. Change to frame "49.9" and paste. Now the end of the transition matches the start of the "draw gun" action. Now select the choreography and action and set its range to start to "45" and end to "50". Use the scrub slider on the Frame toolbar (or <+> key on the keyboard to see how the new transition looks. Any frame in the middle of the transition that looks awkward can be easily touched up; just reposition the bones.

Modeling In A Choreography Window

Modeling in a Choreography window is the same as modeling in a Model window. You can edit an existing model by clicking on it to select it (or click its "Shortcut to" Model icon in the Project Workspace), then click the Model

Mode button on the Mode toolbar (the tools and menus change for modeling). An existing model will be modeled in the location and orientation it has in Directing mode. If other "Shortcut to" models exist in the choreography; they will be updated as the model changes.

You can start a new model by right-clicking (Control-click on a Mac) the Choreography icon in the Project Workspace tree and pick [New Model]. New models start at the origin. Begin modeling there, then once you have some geometry built, click the Directing mode button on the Mode toolbar, and move the object to another part of the scene if you wish. Return to Modeling mode to do more modeling in the new location.

Bones can also be added and adjusted in a Choreography window. Select a model to work on, and click the Bones Mode button on the Mode toolbar. Now the Bones mode tools are available in the Choreography window.

Modeling For Animation

Animation: Master emphasizes animation, therefore its modeling philosophy is totally driven by the needs of a moving character. Hash patch models have the unique advantage of being able to put a control point just about anywhere. Naturally, you would put control points at the corners of a character's eyes (to blink), and at the corners of the mouth (to talk). With a little more thought you can minimize patch intersection as splines change during an animation - this is called "modeling for animation".

Any model can look good as a still image, but can the mouth open and the legs bend without weird artifacts? Did you even leave a hole for the mouth? Is there an extra patch for the eyelids to blink with? Sometimes novice modelers let the rotoscope dictate the model's shape, explaining that they are going to also use the rotoscope to decal, but in the rotoscope the tiger's paw may be bent in such a fashion that when the model straightens out, all the geometry will collapse into itself. It only takes a few awkward learning experiences to learn what "modeling for animation" means.

Shortcuts

Animation: Master supports the concept of shortcuts, where one copy of an object can be used many times (the copies of the model are called "Shortcut to" object). Shortcuts make it easier for the animator to control certain aspects of a large number of objects. For example, to fill a greenhouse with plants, you would only need to make a single model of each variety of plant, then simply drag each type of model into the greenhouse many times. Now, suppose the plants' were colored too dark; since each plant refers to the same plant model in the "Objects" folder, only the plant model in the "Objects" folder needs to be changed (not the "Shortcut to" model). This works just as well for lights, materials, sounds, images, actions, as well as

all other objects in the "Objects" folder of the Project Workspace tree. Shortcuts have small Shortcut arrows superimposed over their icon. Shortcuts can be renamed to be more descriptive. For example "Ball on Floor" and "Ball on Desk" are probably easier to differentiate than "Shortcut to Ball", and "Shortcut to Ball (2)".

Model Shortcuts

When a model is dropped into a Choreography, a "Shortcut to" the model is created. You can have many "Shortcuts to" of any given model, and each can have its own settings.

Proxy

Sometimes you would like to change which model is being used in a project after the project is completed. This is especially useful when you are using low-density versions of models, as proxies during choreography and animation, then want the final rendering to use the real model. Or sometimes you simply wish to change what model is used for artistic reasons. To change a particular instance of a model in a choreography to a different model select the shortcut to the model and choose a new model from the "Shortcut To" combo box on the property page. Note the new model must already be loaded into the Objects folder. To change all instances of a particular model to a different model, right click (Control-click on Mac) the model name under the objects folder in the Project Workspace and pick [Change Shortcuts...]. This will bring up a list of models to choose from.

Spline Shortcuts

Spline Shortcuts contain CP Shortcuts which contain position, bias, and other information about a CP that is specific to an instance of an object with CPs.

Spline Shortcut Cache Menu

- Delete** Removes the selected object from the project.
- Rename** Rename the selected object
- Select Cache (Spline #0)** Highlights the object that this shortcut is to.
- Properties** Edits the selected object's properties.

Spline Shortcut Properties

- Object's Properties** Visible: Sometimes. Contains the properties of the object this shortcut is for.

CP Shortcuts

CP Shortcuts contain position, bias, and other information about a CP that is specific to an instance of an object with CPs.

CP Shortcut Cache Menu

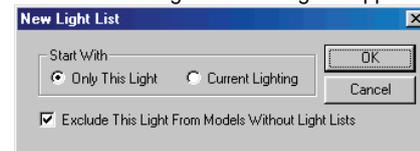
- Delete** Removes the selected object from the project.
- Rename** Rename the selected object
- Select Cache ()** Highlights the object that this shortcut is to.
- Properties** Edits the selected object's properties.

CP Shortcut Properties

- Object's Properties** Visible: Sometimes. Contains the properties of the object this shortcut is for.

Light Lists

Light Lists allow you to have isolated lighting for specified models in a choreography. This allows you to exclude lights from characters or props. If you want the model to be lit by specific lights in the scene, create a light list in the model with only the lights that you want. Lights can be set to light all models, or only models with that light in its light list by changing the "Light All Models" property of the light. By default, a model has no light list, and therefore is lit by all lights in the scene that have "Light All Models" set. To create a new light list for a model, in the Project Workspace, drag the Light Shortcut icon you want to add and drop it onto the Model Shortcut icon you want to add to. The "New Light List" dialog will appear.



The "Start With" option determines whether you just add the single light, or all of the lights in the choreography with "Light All Models" set. If you are adding just a few lights, select "Only This Light", and drag each light onto the model. The New Light List dialog will only appear the first time when the list is created. If you select "Current Lighting", all of the lights that have the "Light All Models" property set will be added to the light list. You can then delete unwanted lights from the list in the Project Workspace. Check "Exclude The Light From Models Without Light Lists" if you do not want this light affect other models in the scene that do not have light lists. This is most useful when you create a light that only lights this specific model.

Light List Nodes

This is a Light Shortcut associated with a Light List for a model in a Choreography.

Light List Node Menu

Delete Removes the selected object from the project.
Properties Edits the selected object's properties.

Light Buffer Lights

Drag and drop Light List Nodes from to or from other Light Buffers to control which lights will be in which buffers.

Light Buffer Lights Menu

Delete Removes the selected object from the project.
Rename Rename the selected object
Properties Edits the selected object's properties.

Buffer Shortcuts

Buffer Shortcuts are as a shortcut to a buffer in an image or animation for use as a Post Effect input in a Composite.

Buffer Shortcut Instance Menu

Delete Removes the selected object from the project.
Rename Rename the selected object
Select Cache (Empty Buffer Shortcut)
Highlights the object that this shortcut is to.
Insert Post Effect
Installed Post Effects will be listed here.
Properties
Edits the selected object's properties.

Buffer Shortcut Properties

Key Color

Visible: Sometimes. When an image does not have an alpha channel for transparency, a key color can be set to tell the software which color is transparent. If the key color is not set, the whole image is opaque.

Camera Navigation

When viewing through a camera, the traditional Move, Turn, and Zoom commands can additionally actually change the camera settings, as if you were the cameraman looking through the viewfinder to adjust the shot. To make the Move and Zoom commands change the camera settings, you use modifier keys (a traditional Turn is not available when looking through the camera but a modified Turn is). The modifiers are the <Shift> or <Ctrl> keys on the keyboard that you must hold down while dragging the mouse in the appropriate window.

	No Key	Shift Key	Ctrl Key
Move	Standard Move	Dolly: Mouse Up = Camera Forward Mouse Down = Camera Back	Pan: Mouse Up/down/left/right = Camera Camera Up/down/left/right
Zoom	Standard Zoom	Focal Length: Mouse Up = Zoom In Mouse Down = Zoom Out	N/A
Turn	Switches to perspective view	Aim: Mouse Up/down/left/right = Camera Up/down/left/right	Roll: Left/right = Roll Camera

Move adjusts the camera in one of the six directions. Zoom changes the focal length of your camera like a zoom lens. Turn adjusts the camera to look in a different direction, like swiveling it on a tripod.

Motion Capture

The most common method of animation is "keyframing", where the artist carefully positions the character's limbs on strategic frames. "Motion Capture" is an alternative animation technique that uses sensors attached to a real actor's body: as the real actor moves, the sensors send the data to the computer so that the computer character mimics the movements. For some situations, motion capture is ideal, especially with computer characters having realistic proportions that are supposed to move in a realistic manner.

The disadvantage of motion capture is that it requires very expensive equipment and a high degree of sophistication to use. Also, many animated characters are not intended to move realistically (that's part of their charm), nor do they have anywhere near real human proportions. However, with enough preparation, motion capture can be successfully used almost anywhere.

Animation:Master directly supports real-time motion capture from systems

designed by “Polhemus” and “Ascension”, the most popular of the magnetic technologies, and others. With these systems, your real actor could be moving as you direct them and you can simultaneously watch their movements on your computer.

An alternative motion capture technology, “optical”, uses cleverly positioned video cameras to determine what the real actor is doing. Optical motion capture files need to be preprocessed before they can be used in the computer so they are not real-time. Also, optical motion capture requires an extensive set-up procedure, not usually something you can do at home. Normally, you go to an optical motion capture company and purchase time. The company gives you a disk full of files when you leave, which you then import into Animation:Master.

You do not have to own your own motion capture system or even go to a company, you can simply use some of the thousands of motion capture files that already exist on the Internet. Animation:Master supports “.BVA”, “.BVH”, and “Acclaim” file formats.

Motion Capture Devices

Motion Capture Devices are a special kind of Null object that is created by importing Motion Capture data. The data can come either from a live input device like Polhemus hardware or from a data file. Once the data is imported a pose is created for a character that the motion is to be applied to that constrains the character to these objects. This pose can then be reused for any similar motion captures.

Motion Capture Device Instance Menu

Delete	Removes the selected object from the project.
Rename	Rename the selected object
Select Cache ()	Highlights the object that this shortcut is to.
Capture Sequence	Captures a sequence of frames from a motion capture device or file.
Capture Frame	Captures a single frame from a motion capture device or file.
Properties	Edits the selected object’s properties.

Motion Capture Device Properties

Bone Position

Visible: Sometimes. Position of bone with out motion. See Bone Position properties.

Transform

Read-Only on Cache. Stores any motion for this bone, includes translate, scale and rotate. and cannot be set on the cache, but is visible so that

relationships can be created that are controlled by it.

Roll-Method

Advanced, Default: Y-Poles-Singularity. Default Roll Behavior There are several situations in which a bone is given clues about where to aim, but no further information about what should happen with the roll handle. In a sense only two of the three degrees of freedom are clearly defined: an Aim At constraint, inverse kinematics, and grabbing the end of the simple bone manipulator are a few examples. When this occurs, a bone’s roll is determined by what is known as its “default roll behavior”: it tells the bone how it should be rolled at any given aim direction, and is intended to be the best in most situations. Occasionally you may rotate a bone and find this default behavior undesirable. To remedy it, simultaneously press the [Ctrl] key on the keyboard ([Cmd] key on the Mac) to automatically compute a minimal visible roll, or use the Rotate manipulator, which defines all three degrees of freedom, or choose a different roll method. These roll behaviors do not occur between keyframes when using quaternion interpolation.

Z-Singularity: This is the default roll method for all geometry driving bones; the default roll behavior is to try not to roll at all if in the same hemisphere as the bone was defined. This gives the bone a kind of “sweet spot” in the shape of a hemisphere around the bones original creation direction.

Y-Poles-Singularity: This roll method is used for all bones except geometry driving bones, such as lights, cameras, nulls, forces or models. Its behavior is not to roll unless pointed in the same or opposite direction as the roll handle. This creates the behavior of a camera that is mounted above a basketball court. It always tries to keep the top of the players heads up in the frame of the camera. This is clearly defined everywhere except directly underneath (or on top) of the camera. That is why it is called Y-Poles. This behavior is good for lights and cameras.

Roll-History: This method determines the roll direction based on where the roll was before the bone was rotated. It essentially uses the history of the roll handle to determine where it should be. One downfall of this method is that given a certain direction for the bone, there is no definitive location that the roll handle will be. It depends on where it was before. However this technique has no singularities or odd rotating gimbal locations.

Euler Order

Advanced, Default: Automatic. This property controls the order which is used to convert a rotation into three euler angles (x,y,z). This property will rarely ever need to be changed from its default. The euler angles are used for 1-D smartskin, roll-like constraints, as well as expressions based on just one of the three components of a rotation. Animation Master internally stores and calculates rotations as quaternions. However if the angle came from a Euler rotation driver, it keeps the euler angles as well. It stores these unconverted raw euler angles for future use, and marks a flag that says the

euler angles are valid. This serves two purposes; one is speed, why convert to an euler again, if we already have that answer. The second is to preserve large euler angles, so that they may be scaled up or down accurately by roll-like constraints or expressions. Many operations in AM can mess up this pre-computed euler angle state though. Any other kind of rotate driver, like a quaternion driver, or a vector driver, as well as all types of rotate constraints will store a quaternion, and tump the carefully stored eulers. Even an additional Euler driver can mess it up, if the two are blended with add, since it is the quaternions which are added. The result is converted back to euler when needed. Rotation compensation applied by actions used on models whose bones are oriented differently than the one for which it was created will also invalidate the euler angles. When any of these invalidations occur, the euler angles are not available, so new euler angles are computed from the quaternion. This property controls how those euler angles are computed. The default is automatic. Occasionally this automatic behavior produces discontinuities in the resulting euler angle when the decision switches states. In this case, choosing one of the fixed euler orders is recommended.

XYZ: This is the same order used by the Euler Rotation Driver. It is the primary order used by Animation Master. Z rotations are king, and can range from -180 to 180 degrees. X rotations are next and can also range from -180 to 180 degrees. Y is last, and can only range from 0 to 180 degrees.

XYZ: This is an alternative order, and usually would only be desired when the returned Y rotation should have a broader range. Z rotations are still king, and can range from -180 to 180 degrees. Y rotations are next and can also range from -180 to 180 degrees. In this case X is last, and can only range from 0 to 180 degrees.

Automatic: This order analyzes the rotation, in an attempt to determine which angle rotates more X or Y. It then chooses the XYZ or YXZ order depending on the result. This is the default way which Animation Master uses to determine Euler angles.

Attached to parent

Visible: Sometimes, Default: OFF. Set if this bone should form an IK chain with its parent.

Hidden

Visible: Sometimes, Default: OFF. Hides this bone.

Manipulator Options

Visible: Sometimes, Advanced. See Manipulator Options property.

Lock IK

Visible: Sometimes, Default: OFF. Locks the joint so Inverse Kinematic chain is broken in half at this bone's pivot.

Shortcut to

Visible: Sometimes. Sets which object under the Project's Objects folder this object is an instance of. This can be useful when animation has been made for an object in a choreography, but now you need to switch the object to a different one. If you were to delete the instance and put the new one in the choreography, all the animation would be lost. Switching which object the shortcut is an instance of using this property saves you from having to redo all that work. This can also be useful when using a low-density version of a model during the animation phase, and switching to the final high-density version once it is ready to render. This low-res version of a model is often called a "proxy model". You will only find this property on instances.

Active

Visible: Instance Only, Default: ON. This option is for objects that need to appear and/or disappear during the course of an animation. Inactive objects are not seen in real time or final renderings. You can use this to speed up scenes when this object is off screen, or temporarily not needed.

Ignore Fog

Default: OFF. Turn this on if fog shouldn't be applied to this object.

Animate Mode

Default: ON. This property specifies whether keyframes should be created or not when the object is manipulated.

Object Shortcuts

Object Shortcuts are place holders used to match drivers up with the object.

Object Shortcut Cache Menu

Delete	Removes the selected object from the project.
Rename	Rename the selected object
Select Cache ()	Highlights the object that this shortcut is to.
Properties	Edits the selected object's properties.

Object Shortcut Properties

Object's Properties

Visible: Sometimes. Contains the properties of the object this shortcut is for.

Spring Systems

Spring Container Cache Menu

Delete	Removes the selected object from the project.
Select Cache()	Highlights the object that this shortcut is to.
Properties	Edits the selected object's properties.

Soft Body Dynamics

The Soft Body dynamics available in Animation:Master are based on systems of Springs and Masses. There are currently two ways to create a new Spring System.

- The Cloth Wizard.
- Right-click (Control-click on Mac) [New Spring System] on an Action or Choreography icon in the Project Workspace tree.

Springs are used to exert forces on two masses. They have a resting length that they try to maintain. They have parameters to control how stiff they are as well as their damping.

After adding a new Spring System to an Action or Choreography, you will be placed in Dynamics mode: springs and masses are drawn in the window. This mode has a set of construction tools: you can add a single mass, add a single spring, select a mass and move it, delete masses or springs, constrain masses to bones, and constrain bones to springs. The setups can be saved as single frame poses, for later application to the model.

Soft Body structures react to keyframed motion and supply secondary motion to specific parts of a model: pony tails, locks of hair, loose jowl skin, ear-rings, bouncy noses, ear lobes, tubby bellies, etc.

Spring System Editing

Add Mode

Click on the Add Mode button on the tool bar to begin adding springs and masses. Click anywhere away from an existing mass to add a new mass. A new spring will follow your mouse. Click on an existing mass to connect the spring to, or click away from an existing mass to add a new one to end this spring with. If you do not want a spring to continue from the current mass hold the shift key to create a new unconnected mass. Press the <Esc> key, right-click the mouse, or select the Edit Mode button on the toolbar to return to Modify mode.

Attaching Masses

When dragging a mass you can attach it and its springs to another mass by right clicking (or simultaneously pressing the <-> key and clicking on the Mac) just as you would attach two control points together. When attaching masses, one will be removed. If you attach two masses that have a spring between them the spring will be removed.

Spring System Instance Menu

- Delete** Removes the selected object from the project.
- Rename** Rename the selected object
- Select Cache ()** Highlights the object that this shortcut is to.

Simulate Opens a text entry dialog where you can enter a sentence of written dialog. Text will be inserted at the current position of the timeline indicator.

New Constraint

- Aim At** Creates a new Aim At Constraint for this object.
- Kinematic** Creates a new Kinematic Constraint for this object.
- Path** Creates a new Path Constraint for this object.
- Translate To** Creates a new Translate To Constraint for this object.
- Orient Like** Creates a new Orient Like Constraint for this object.
- Roll Like** Creates a new Roll Like Constraint for this object.
- Aim Roll At** Creates a new Aim Roll At Constraint for this object.
- Spherical Limits** Creates a new Spherical Limits Constraint for this object.
- Euler Limits** Creates a new Euler Limits Constraint for this object.
- Translate Limits** Creates a new Translate Limits Constraint for this object.
- Surface** Creates a new Surface Constraint for this object.
- Scale Like** Creates a new Scale Like Constraint for this object.
- Aim Like Two** Creates a new Aim Like Two Constraint for this object.
- Aim Roll Like Two** Creates a new Aim Roll Like Two Constraint for this object.

Properties Edits the selected object's properties.

Spring System Properties

Bone Position

Visible: Sometimes. Position of bone with out motion.

Transform

Read-Only on Cache. Stores any motion for this bone, includes translate, scale and rotate. and cannot be set on the cache, but is visible so that relationships can be created that are controlled by it.

Roll-Method

Advanced, Default: Y-Poles-Singularity. Default Roll Behavior There are several situations in which a bone is given clues about where to aim, but no further information about what should happen with the roll handle. In a sense only two of the three degrees of freedom are clearly defined: an Aim At constraint, inverse kinematics, and grabbing the end of the simple bone manipulator are a few examples. When this occurs, a bone's roll is determined by what is known as its "default roll behavior": it tells the bone how it should be rolled at any given aim direction, and is intended to be the best in most situations. Occasionally you may rotate a bone and find this default behavior undesirable. To remedy it, simultaneously press [Ctrl] key on the keyboard ([Cmd] key on the Mac) to automatically compute a minimal visible roll, or use the Rotate manipulator, which defines all three degrees of freedom, or choose a different roll method. These roll behaviors do not occur between keyframes when using quaternion interpolation.

Z-Singularity: This is the default roll method for all geometry driving bones, the default roll behavior is to try not to roll at all if in the same hemisphere as the bone was defined. This gives the bone a kind of "sweet spot" in the shape of a hemisphere around the bone's original creation direction.

Y-Poles-Singularity: This roll method is used for all bones except geometry driving bones, such as lights, cameras, nulls, forces or models. Its behavior is not to roll unless pointed in the same or opposite direction as the roll handle. This creates the behavior of a camera that is mounted above a basketball court. It always tries to keep the top of the players heads up in the frame of the camera. This is clearly defined everywhere except directly underneath (or on top) of the camera. That is why it is called Y-Poles. This behavior is good for lights and cameras.

Roll-History: This method determines the roll direction based on where the roll was before the bone was rotated. It essentially uses the history of the roll handle to determine where it should be. One downfall of this method is that given a certain direction for the bone, there is no definitive location that the roll handle will be. It depends on where it was before. However this technique has no singularities or odd rotating gimbal locations.

Euler Order

Advanced, Default: Automatic. This property controls the order which is used to convert a rotation into three euler angles (x,y,z). This property will rarely ever need to be changed from its default. The euler angles are used for 1-D smartskin, roll-like constraints, as well as expressions based on just one of the three components of a rotation. Animation Master internally stores and calculates rotations as quaternions. However if the angle came from a Euler rotation driver, it keeps the euler angles as well. It stores these unconverted raw euler angles for future use, and marks a flag that says the euler angles are valid. This serves two purposes; one is speed, why convert to an euler again, if we already have that answer. The second is to preserve large euler angles, so that they may be scaled up or down accurately by roll-like constraints or expressions. Many operations in AM can mess up this pre-computed euler angle state though. Any other kind of rotate driver, like a quaternion driver, or a vector driver, as well as all types of rotate constraints will store a quaternion, and tump the carefully stored eulers. Even an additional Euler driver can mess it up, if the two are blended with add, since it is the quaternions which are added. The result is converted back to euler when needed. Rotation compensation applied by actions used on models whose bones are oriented differently than the one for which it was created will also invalidate the euler angles. When any of these invalidations occur, the euler angles are not available, so new euler angles are computed from the quaternion. This property controls how those euler angles are computed. The default is automatic. Occasionally this automatic behavior produces discontinuities in the resulting euler angle when the decision

switches states. In this case, choosing one of the fixed euler orders is recommended.

YXZ: This is the same order used by the Euler Rotation Driver. It is the primary order used by Animation Master. Z rotations are king, and can range from -180 to 180 degrees. X rotations are next and can also range from -180 to 180 degrees. Y is last, and can only range from 0 to 180 degrees.

XYZ: This is an alternative order, and usually would only be desired when the returned Y rotation should have a broader range. Z rotations are still king, and can range from -180 to 180 degrees. Y rotations are next and can also range from -180 to 180 degrees. In this case X is last, and can only range from 0 to 180 degrees.

Automatic: This order analyzes the rotation, in an attempt to determine which angle rotates more X or Y. It then chooses the YXZ or XYZ order depending on the result. This is the default way which Animation Master uses to determine Euler angles.

Attached to parent

Visible: Sometimes, Default: OFF. Set if this bone should form an IK chain with its parent.

Hidden

Visible: Sometimes, Default: OFF. Hides this bone.

Manipulator Options

Visible: Sometimes, Advanced. See Manipulator Options property.

Lock IK

Visible: Sometimes, Default: OFF. Locks the joint so Inverse Kinematic chain is broken in half at this bone's pivot.

Shortcut to

Visible: Sometimes. Sets which object under the Project's Objects folder this object is an instance of. This can be useful when animation has been made for an object in a choreography, but now you need to switch the object to a different one. If you were to delete the instance and put the new one in the choreography, all the animation would be lost. Switching which object the shortcut is an instance of using this property saves you from having to redo all that work. This can also be useful when using a low-density version of a model during the animation phase, and switching to the final high-density version once it is ready to render. This low-res version of a model is often called a "proxy model". You will only find this property on instances.

Active

Visible: Instance Only, Default: ON. This option is for objects that need to appear and/or disappear during the course of an animation. Inactive objects are not seen in real time or final renderings. You can use this to speed up scenes when this object is off screen, or temporarily not needed.

Ignore Fog

Default: OFF. Turn this on if fog shouldn't be applied to this object.

Animate Mode

Default: ON. This property specifies whether keyframes should be created or not when the object is manipulated.

Mass Settings

Contains the default mass settings for this system.

Mass

Default: 0.05, Min: 0. The mass used for all mass objects in this system, unless they override this default value.

Mass Drag

Default: 0.02, Min: 0. Every mass in the system is affected by this drag. It is the general resistance against motion. Faster motions always have more resistance. High drag values will seem as if the objects are moving through syrup. Low or zero drag will seem like the objects never really settle to complete rest.

Collision Radius

Default: 0.5, Min: 0. The collision radius used for all mass objects in this system, unless they override this default value. Cloth masses use their own collision radius technique.

Spring Settings

Contains the default spring settings for the system.

Stiffness

Default: 50, Min: 0. The spring stiffness used for all springs in this system, unless they override this default value.

Damping

Default: 10, Min: 0. The spring damping used for all springs in this system, unless they override this default value.

Cloth Settings

Contains the default cloth settings for the system.

Cloth Drag

Default: 0.04, Min: 0. Cloth drag is the drag applied when the cloth tries to move through the air. It resists motion much more when the cloth's surface normal faces the same way as the direction of movement, and less when the cloth is in line with the movement. This kind of drag is what makes cloth billow, sails on boats fill, and flags wave. Higher numbers mean the cloth has more resistance to moving through the air.

Cloth Collision Radius

Default: 25%, Min: 0%, Max: 1e+010%, Percentage. Cloth uses an automatic collision radius that is computed as a percentage of the average resting length of the attached springs. This permits denser areas of cloth to have a smaller collision radius, while less dense areas have larger collision radius. This is generally what is required to prevent the centers of patches

from passing through each other. So 25% means that the collision radius for each mass will be 25% of the average length of the attached springs.

Struct Settings

Contains the default settings for the structural springs in the system.

Structural Stiffness

Default: 1000, Min: 0. There are three different types of springs created by the cloth wizard. The structural springs control the overall ability for the cloth to stretch along its length. Higher stiffness stretches less. They connect one mass to its nearest neighbor along the same direction as the spline. Stiffness represents the desire for the spring to return to its resting length. The higher the stiffness the more strongly the spring will pull or push to try to reach its resting length. The combination of stiffer springs and lighter masses makes for systems which are more unstable. To maintain stability the solver must progress more slowly, so simulation times will be longer.

Structural Damping

Default: 20, Min: 0. There are three different types of springs created by the cloth wizard. The structural springs control the overall ability for the cloth to stretch along its length. Higher stiffness stretches less. They connect one mass to its nearest neighbor along the same direction as the spline. Damping is the part of the spring that resists fast motion. It is like the shock absorber on a car. Without damping the spring would continue to oscillate back and forth forever. Just the way a car does with no shocks. The faster the spring attempts to move, the stronger the damping will resist that motion. Larger damping numbers are like sturdier shocks. When increasing the stiffness of a spring it is usually necessary to also increase the damping.

Shear Settings

Contains the default settings for the shear springs in the system.

Shear Stiffness

Default: 5, Min: 0. The shear springs connect the masses that are diagonally across a patch from one another. They resist the cloth's attempts to shear in the same plane as the cloth itself.

Shear Damping

Default: 0.25, Min: 0. The shear springs connect the masses that are diagonally across a patch from one another. They resist the cloth's attempts to shear in the same plane as the cloth itself.

Fold Settings

Contains the default settings for the fold springs in the system.

Fold Stiffness

Default: 5, Min: 0. The fold springs connect two masses that are separated by one mass in between. They resist the folding of the cloth.

Fold Damping

Default: 0.25, Min: 0. The fold springs connect two masses that are separated by one mass in between. They resist the folding of the cloth.

Springs

Springs are used to exert forces on two masses. They have a resting length that they try to maintain. They have parameters to control how stiff they are as well as their damping.

Spring Instance Menu

Delete Removes the selected object from the project.
Select Cache(Spring To) Highlights the object that this shortcut is to.
Reset Rest-Length Resets the Rest-Length of the spring.
Properties Edits the selected object's properties.

Spring Properties

RestLength

Default: 10, Min: 0. This is the length the spring had when it was first created. It can be changed by typing in a value here, or adjusting the positions of the masses on either end of the spring. In the interface if you wish to move a mass without changing the resting length of the attached springs, hold down the shift key while you move the mouse. Resting length can be recomputed by selecting the spring and selecting "Reset Rest Length".

Type

Default: System. This indicates the type of spring. Springs automatically added by the cloth wizard will be automatically set to the appropriate type. It controls where the spring gets its stiffness and damping. Custom: This type of spring has properties for its own stiffness and damping.

System: This type of spring gets its stiffness and damping from the spring system.

Structural: This type of spring uses the structural stiffness and damping from the cloth parameters of the spring system.

Fold: This type of spring uses the fold stiffness and damping from the cloth parameters of the spring system.

Shear: This type of spring uses the shear stiffness and damping from the cloth parameters of the spring system.

Stiffness

Visible: Sometimes, Default: 50, Min: 0. Stiffness represents the desire for the spring to return to its resting length. The higher the stiffness the more strongly the spring will pull or push to try to reach its resting length. The combination of stiffer springs and lighter masses makes for systems which are more unstable. To maintain stability the solver must progress more slowly, so simulation times will be longer.

Damping

Visible: Sometimes, Default: 10, Min: 0. Damping is the part of the spring that resists fast motion. It is like the shock absorber on a car. Without damping the spring would continue to oscillate back and forth forever. Just the way a car does with no shocks. The faster the spring attempts to move, the stronger the damping will resist that motion. Larger damping numbers are like sturdier shocks. When increasing the stiffness of a spring it is usually necessary to also increase the damping.

Masses

This container includes all of the masses used in this spring system. The Mass object is like a particle. It is a child of a spring system. Springs can be attached to masses to control their behavior. Masses are subject to physical forces like gravity and wind. Masses can be constrained to Control Points, and Control Points can be constrained to Masses.

Mass Container Cache Menu

Delete Removes the selected object from the project.
Select Cache (Masses) Highlights the object that this shortcut is to.
Properties Edits the selected object's properties.

Mass Instance Menu

Delete Removes the selected object from the project.
Select Cache (Mass0) Highlights the object that this shortcut is to.
Edit Channel
Opens a Window for the selected object. This can also be achieved by double-clicking the object in the Project Workspace.
Reduce Channel...
Reduces the Channel Driver. This removes unnecessary control points from the Channel curve.
New Constraint
Mass To Bone
Constrains a Mass to a Bone.
Properties
Edits the selected object's properties.

Mass Properties

Translate

This represents the position of the mass in world space.

Fixed

Default: OFF. A fixed mass does not move with respect to the spring system it belongs to. This will also be checked if the mass is constrained to another object. A mass that is fixed is not effected by outside forces like gravity or attached springs.

Override System

Default: OFF. Controls whether this mass uses the default values as set in the system, or overrides these value with its own settings

Mass

Visible: Sometimes, Default: 100, Min: 0. This is the mass of the mass object. The mass object is like a particle. Higher mass is heavier, and will try harder to stay in motion.

Collision Radius

Visible: Sometimes, Default: 0.5, Min: 0. This is the length of the radius of an imaginary sphere that exists around the mass object. This imaginary sphere is what collides with other geometry.

Paths

A path is a spline that defines the position an object takes over time in a choreography. It provides a more visual method of animating a character's position than just positioning the character at different locations at different frames.

Adding a Path

Since a path is a spline, it is composed of control points. To start a path, click the Add Mode button on the Choreography toolbar and click inside the Choreography window, (the software will automatically switch to Modeling mode), then move the mouse while keeping the mouse button pressed. The first control point that is added establishes the path's starting position. To continue the path, again click the Add Mode button (or press the <a> key on the keyboard), and click near the end of the previously added spline. Drag the mouse with the mouse button pressed to continue the path.

After you have completed adding a path, clicking any object in the Choreography window (or select the Choreography Mode button) will switch back to Choreography mode.

To move any control point on a path, you must be in Modeling Mode. Click the Modeling Mode button on the Mode panel, then simply point at the control point you wish to move, press and hold the mouse button, and reposition.

Selecting a Path

In complex choreographies, many different paths may be needed. Paths can be selected either by clicking on them in the Choreography window, or by clicking on their icon in the Project Workspace tree.

Renaming a Path

Each path must have a unique name. The path name is shown in the

Project Workspace tree. Initially, the default path name is "Path1". Multiple default path names will have sequentially higher numbers appended. You may replace the default name with a more descriptive name. First the path must be selected (by clicking on it in the Choreography window (or clicking on its icon in the Project Workspace tree), then click a second time and an edit box will appear that you can type in. If you enter in a name that already exists, a warning message will appear, "Name Already Used", and you will be given the opportunity to enter a different name.

Editing a Path

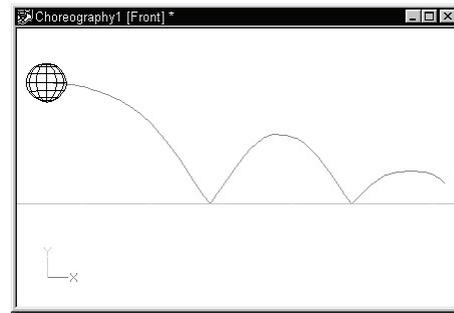
To remove a control point from a path, select the path by clicking it, and then click the Modeling Mode button on the Mode toolbar. Click the point you wish to remove, then click the Delete button on the Standard toolbar (or press the <Delete> key on the keyboard or pick [Edit][Delete]). If you have grouped control points, all will be deleted.

Constraining an Object to a Path

To add an object to a path, select the object by clicking on it in the Choreography window then right-click (command-click on a Mac) over the object's manipulator box, (alternately, you can right-click (command-click on a Mac) the object's icon in the Project Workspace tree). Pick [New][Constraint][Other][Path]. The cursor will change to a picker tool with which you can choose a path for the model to follow.

The Path constraint's Target Property will change to reflect the selection that you make. (You can also manually select the path the object is to follow from those listed in the Path constraints "Target" list).

Smooth and Peaked Paths



Paths are initially smooth, which is convenient since most objects in life move along gradually, without abrupt changes in direction. But consider the sharp point in the path that forms the location where a ball hits the floor and rebounds; this is called a peak. To create a peak, first select the path by clicking on it, then click the Modeling Mode button on the Mode Toolbar.

Select the control point you wish to alter by clicking it, and then click the Peak button on the Modeling toolbar. To smooth a control point, use the same procedure, but click the Smooth button on the Modeling toolbar. (The Smooth or Peak buttons on the Modeling toolbar show the state of the selected control point).

Path Instance Menu

Menu Description

Delete Removes the selected object from the project.

Rename Rename the selected object

Edit Model

Opens a Window for the selected object. This can also be achieved by double-clicking the object in the Project Workspace.

Select Cache (Shortcut to)

Highlights the object that this shortcut is to.

New Choreography Action

Creates a new Choreography Action.

New Action

Adds a new action to the selected script.

New Pose

Percentage

Add a new percentage property, and relationship to this model.

On/Off

Add a new On/Off property, and relationship to this model.

New Constraint

Aim At

Creates a new Aim At Constraint for this object.

Kinematic

Creates a new Kinematic Constraint for this object.

Path

Creates a new Path Constraint for this object.

Translate To

Creates a new Translate To Constraint for this object.

Orient Like

Creates a new Orient Like Constraint for this object.

Roll Like

Creates a new Roll Like Constraint for this object.

Aim Roll At

Creates a new Aim Roll At Constraint for this object.

Spherical Limits

Creates a new Spherical Limits Constraint for this object.

Euler Limits

Creates a new Euler Limits Constraint for this object.

Translate Limits

Creates a new Translate Limits Constraint for this object.

Surface

Creates a new Surface Constraint for this object.

Scale Like

Creates a new Scale Like Constraint for this object.

Aim Like Two

Creates a new Aim Like Two Constraint for this object.

Aim Roll Like Two

Creates a new Aim Roll Like Two Constraint for this object.

Bone To Spring

Creates a new Bone To Spring Constraint for this object.

Rigid Body

Creates a new Rigid Body Constraint for this object.

Import

Action...

Imports a saved action and adds it to the selected object.

Bake All Actions...

Bake All Actions into Chor Action

This feature collects all of the actions, reusable or not, on an object and bakes them into just one simple choreography action. This choreography action can be saved out by right-clicking (Control-click on a Mac) a choreography name in the Project Workspace tree (this will save actions for all objects in the choreography), a model shortcut in a choreography, or within an object's manipulator in a choreography window. Then choose "Export Action As..." from the menu.

Draw Mode

Bound, Vector, Curved

Render Mode

Hidden, Wireframe, Shaded, Shaded and Wireframe

Pickable

Object Pickable/Unpickable

Add Polygon Modifier

Adds PolyModifier to a Model or Group. Choose the type of polymodifier you desire from the list of plugins installed. To remove a polymodifier from a model or group, click the PolyModifier icon under the action in the Project Workspace and press on the keyboard.

Plug-ins

Extension Plugins (.hxt) may be available for this object.

Properties

Edits the selected object's properties.

Path Properties

Bone Position

Visible: Sometimes. Position of bone with out motion.

Transform

Read-Only on Cache. Stores any motion for this bone, includes translate, scale and rotate. and cannot be set on the cache, but is visible so that relationships can be created that are controlled by it.

Roll-Method

Advanced, Default: Y-Poles-Singularity. Default Roll Behavior There are several situations in which a bone is given clues about where to aim, but no further information about what should happen with the roll handle. In a sense only two of the three degrees of freedom are clearly defined: an Aim At constraint, inverse kinematics, and grabbing the end of the simple bone manipulator are a few examples. When this occurs, a bone's roll is determined by what is known as its "default roll behavior": it tells the bone how it should be rolled at any given aim direction, and is intended to be the best in most situations. Occasionally you may rotate a bone and find this default behavior undesirable. To remedy it, simultaneously press the [Ctrl] key on the keyboard ([Cmd] key on the Mac) to automatically compute a minimal visible roll, or use the Rotate manipulator, which defines all three degrees of freedom, or choose a different roll method. These roll behaviors do not occur between keyframes when using quaternion interpolation.

Z-Singularity: This is the default roll method for all geometry driving bones; the default roll behavior is to try not to roll at all if in the same hemisphere as the bone was defined. This gives the bone a kind of "sweet spot" in the shape of a hemisphere around the bone's original creation direction.

Y-Poles-Singularity: This roll method is used for all bones except geometry driving bones, such as lights, cameras, nulls, forces or models. Its behavior is not to roll unless pointed in the same or opposite direction as the roll handle. This creates the behavior of a camera that is mounted above a basketball court. It always tries to keep the top of the player's heads up in the frame of the camera. This is clearly defined everywhere except directly underneath (or on top) of the camera. That is why it is called Y-Poles. This behavior is good for lights and cameras.

Roll-History: This method determines the roll direction based on where the roll was before the bone was rotated. It essentially uses the history of the roll handle to determine where it should be. One downfall of this method is that given a certain direction for the bone, there is no definitive location that the roll handle will be. It depends on where it was before. However this technique has no singularities or odd rotating gimbal locations.

Euler Order

Advanced, Default: Automatic. This property controls the order which is used to convert a rotation into three euler angles (x,y,z). This property will

rarely ever need to be changed from its default. The euler angles are used for 1-D smartskin, roll-like constraints, as well as expressions based on just one of the three components of a rotation. Animation Master internally stores and calculates rotations as quaternions. However if the angle came from a Euler rotation driver, it keeps the euler angles as well. It stores these unconverted raw euler angles for future use, and marks a flag that says the euler angles are valid. This serves two purposes; one is speed, why convert to an euler again, if we already have that answer. The second is to preserve large euler angles, so that they may be scaled up or down accurately by roll-like constraints or expressions. Many operations in AM can mess up this pre-computed euler angle state though. Any other kind of rotate driver, like a quaternion driver, or a vector driver, as well as all types of rotate constraints will store a quaternion, and trump the carefully stored eulers. Even an additional Euler driver can mess it up, if the two are blended with add, since it is the quaternions which are added. The result is converted back to euler when needed. Rotation compensation applied by actions used on models whose bones are oriented differently than the one for which it was created will also invalidate the euler angles. When any of these invalidations occur, the euler angles are not available, so new euler angles are computed from the quaternion. This property controls how those euler angles are computed. The default is automatic. Occasionally this automatic behavior produces discontinuities in the resulting euler angle when the decision switches states. In this case, choosing one of the fixed euler orders is recommended.

YXZ: This is the same order used by the Euler Rotation Driver. It is the primary order used by Animation Master. Z rotations are king, and can range from -180 to 180 degrees. X rotations are next and can also range from -180 to 180 degrees. Y is last, and can only range from 0 to 180 degrees.

XYZ: This is an alternative order, and usually would only be desired when the returned Y rotation should have a broader range. Z rotations are still king, and can range from -180 to 180 degrees. Y rotations are next and can also range from -180 to 180 degrees. In this case X is last, and can only range from 0 to 180 degrees.

Automatic: This order analyzes the rotation, in an attempt to determine which angle rotates more X or Y. It then chooses the YXZ or XYZ order depending on the result. This is the default way which Animation Master uses to determine Euler angles.

Attached to parent

Visible: Sometimes, Default: OFF. Set if this bone should form an IK chain with its parent.

Hidden

Visible: Sometimes, Default: OFF. Hides this bone.

Manipulator Options

Visible: Sometimes, Advanced. See Manipulator Options property.

Lock IK

Visible: Sometimes, Default: OFF. Locks the joint so Inverse Kinematic chain is broken in half at this bone's pivot.

Shortcut to

Visible: Sometimes. Sets which object under the Project's Objects folder this object is an instance of. This can be useful when animation has been made for an object in a choreography, but now you need to switch the object to a different one. If you were to delete the instance and put the new one in the choreography, all the animation would be lost. Switching which object the shortcut is an instance of using this property saves you from having to redo all that work. This can also be useful when using a low-density version of a model during the animation phase, and switching to the final high-density version once it is ready to render. This low-res version of a model is often called a "proxy model". You will only find this property on instances.

Active

Visible: Instance Only, Default: ON. This option is for objects that need to appear and/or disappear during the course of an animation. Inactive objects are not seen in real-time or final renderings. You can use this to speed up scenes when this object is off screen, or temporarily not needed.

Ignore Fog

Default: OFF. Turn this on if fog shouldn't be applied to this object.

Animate Mode

Default: ON. This property specifies whether keyframes should be created or not when the object is manipulated.

File Info

Visible: Sometimes. See File Info property.

Surface

Visible: Sometimes. These settings can be overridden by Decals, Materials and Groups. Contains all of the surface attributes for this object.

Options

Visible: Sometimes. The Model's options.

Front Projection Target

Default: OFF. This option specifies that this model is to receive a projection of the Camera's Rotoscope image map.

Flat Shaded

Default: OFF. Causes the model to render without shading.

Cast Reflections

Default: ON. Allows the model to be seen in any other model in the scene that has a surface reflectivity greater than zero. In most cases this option should be on.

Cast Shadows

Default: ON. Causes the model to cast shadows on itself and other objects in the choreography that have receive shadows turned on. Shadows will only be cast from Lights that have their Cast Shadows option turned on.

Receive Shadows

Default: ON. Causes the model to receive shadows from any objects (including itself) in the choreography that are set to cast shadows.

Shadow Only

Visible: Sometimes, Default: OFF. This property is only available when Receive Shadows is turned on. When this option is set, only the shadows that land on the model will be rendered, and not the model itself. This is useful when you wish to composite the shadows on in software outside of Animation:Master. The model will not render, but the shadows that are cast on the model will be stored in the Alpha channel of the rendered image.

Bone Falloff Curve

Visible: Cache Only, Advanced, Default: 0%, Min: 0%, Max: 100%, Percentage. This property is used to store a channel. This channel can be used to control the falloff of a bone. This falloff is used for computing CP weights. This channel is only used if the bone's Falloff Type is set to Channel.

Choreography Actions

A Choreography Action is similar to a regular action except that is not reusable. When you animate a character or object directly in the choreography window, it creates a choreography action. They can also be used to tweak reusable action in a choreography. Choreography actions are saved within the choreography. Multiple choreography actions can be created by selecting [New][Choreography Action] from the Model or the Action shortcut container.

Choreography Action Menu

Delete Removes the selected object from the project.

Rename Rename the selected object

Export As Action...

This feature is used to save the motion created in the choreography as a reusable action. This is useful when the motion is most easily created in choreography, but will be reused again in a different shot or on a different model. It does not replace or change the choreography motion to reusable. Right-click (Control-click on a Mac) the Choreography icon Action icon in the Project Workspace tree, then pick [Export Action As...], then delete the choreography action, then import the reusable action that you just saved. This only saves the choreography action, not the other underlying reusable actions. (To save everything as a single action, first bake them into the

choreography action). “Export Action As...” can also be used to layer motion where a different time interval between the keyframes is required. You can make your low frequency motion first, then save it out, delete it and bring it back in as an action, then using “Add to Underlying Motion” selected on the Choreography Action Properties panel, add the high frequency motion. This could be an arm that swings, but twitches while it swings. This layering technique can be used for layering facial motion, secondary clothes motion etc...

Properties Edits the selected object's properties.

Choreography Action Properties

Chor Range

These Start and End values represent the range of time that this choreography action will be active.

Hold Last Frame

Default: ON. Select this option to keep the model posed with the last frame of the action after the end of the action frames have been reached.

Transition to next action

Default: OFF. In the Time Line, actions commonly appear one following another. If you leave a time gap between them, the software will try and interpolate between the last frame of the preceding action and the first frame of the next action if you select the "Transition to Next Action" option on the action's "Blend" Properties panel. This creates a simple but smooth transition between the two actions. (The actions that are being blended need to use compatible constraint setups).

Blend Method

Default: Replace. In a choreography's Action List, actions are listed in order of precedence. The default behavior for an action later in the list is to replace whatever motion was before it. However, two additional choices are available: “Add” and “Cross Blend”.

Replace: This option simply replaces the motion of one action when it overlaps a preceding action.

Add: Add makes the motion in later actions add to the existing motion, (like muscle motion). This is useful for adding hip sway to a previously designed walk cycle, or you can add some extra bounce or head bob. Add is also useful for modifying a complex or motion captured action. For instance, a tennis swing that swings a bit too low for the shot can be quickly modified with only simple additive changes in the choreography. Since this is stored as an additional rotate offset, it will be carried on to subsequent keyframes. Now the entire swing will be higher with any built-in nuances in the underlying swing motion left intact. If the arm isn't quite in the correct position at later frame, small changes can be made to the offset at that frame. The frames chosen for the offset action's keyframes don't need to

match the keyframes of the original action.

Blend: Motion Cross Blend is useful for averaging between actions in the Action list. For example, a wave; can be averaged with a walk, (this technique does not make sense for choreography actions). The wave action can be created with no knowledge of the walk action.

Blend Ratio

Visible: Sometimes, Default: 100%, Min: 0%, Max: 500%, Percentage
The blend ratio determines how much of this action to include. When using cross blend, this action will be applied at this percent, and the next action in the list will get 100 minus this value. When using add, this is a percent scalar that can be used to add more or less than the full action.

Model Bone Folder

Used in Choreography Actions to contain drivers of a Model's properties.

Model Bone Folder Cache Menu

Delete Removes the selected object from the project.
Rename Rename the selected object
Select Cache (Model Bone) Highlights the object that this shortcut is to.
Properties Edits the selected object's properties.

Model Bone Folder Properties

Object's Properties *Visible: Sometimes.* Contains the properties of the object this shortcut is for.

User Interface and Environment

Hierarchy

Hierarchy describes the relationships among the parts that make up a computer animation."Poses", "Decals", "Bones", "Groups", and "Attributes" can be found on a "Model". Bones themselves are hierarchical. "Decals" are "Images" and have "Stamps" (each time the decal is applied). "Actions" can be overloaded (meaning that two actions can occur at the same time for one object, the action lower in the hierarchy will take control, but only on the parts of the object it was made for). Lights and cameras can even be attached to bones anywhere in the hierarchy.

The Advantage Of Patches

A computer animation program is primarily defined by its modeling. Without getting too technical, modeling technologies are divided into two camps:

Polygons are prevailing, but patches are the future. Polygonal programs represent models, such as a vase, a gear, or a human head, as large numbers of tiny flat surfaces. At close inspection, the polygonal models appear to be made out of crystal, for example with many tiny facets forming the curvature of an eye. A polygon model that is composed of hundreds of thousands of polygons is not uncommon.

Polygons have a long history, they are easy for programmers to understand and implement (most computer hardware use polygons for this reason), and have a large installed base of existing models and tools to manipulate them. However, building the model in the first place is extremely difficult, and manipulating the thousands of polygons that make up a character's mouth for lip-syncing is virtually impossible for a human. Consequently, polygon programs must provide an endless variety of tools to help move the large amounts of polygons indirectly. For example, you would associate the dozens of polygons that form the upper corner of the top lip of a character's mouth with a bone, do this with all other parts of the mouth, then manipulate the dozens of bones to make the model talk. This explanation glosses over the difficulty in identifying the polygons that go with each bone, and the model distortion that occurs at the junction between the bones. Whatever the difficulties, many fine animations have been created with this technology by animators who sweat blood on every frame to make it look just right. Certainly, this is not something you want to do.

Patch models, on the other hand, are of much lower density than polygon models, on the order of one fiftieth the density of objects with similar fidelity (edge facet detail). Therefore, a mere dozen or so patches replace the thousands of polygons that would make up the character's mouth. The animator manipulates it directly instead of using tools to manipulate the model for them, providing much more tactile feeling and throughput. Equally important patches stretch so that there are no distortions during the animation. Low density and stretching also facilitate in the original construction of the model. Humans and animals can be fully and quickly constructed entirely on the computer with patch models, (though talent is an important ingredient).

Animation:Master stands alone in its ability to use patches entirely throughout the animation process. So much so that the patches used by Animation:Master have become known as "Hash patches". Some complain that Hash patches are incompatible with polygonal programs. This is untrue: Hash patches can be exported as polygonal models for use in other applications such as game engines, high-count polygon models cannot be turned into low-count patch models, (you can't turn a sow's ear into a silk purse).

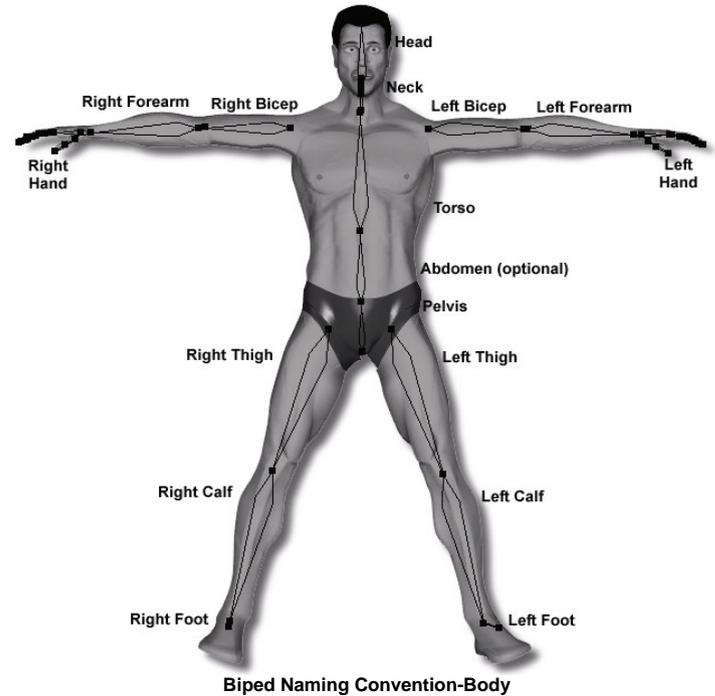
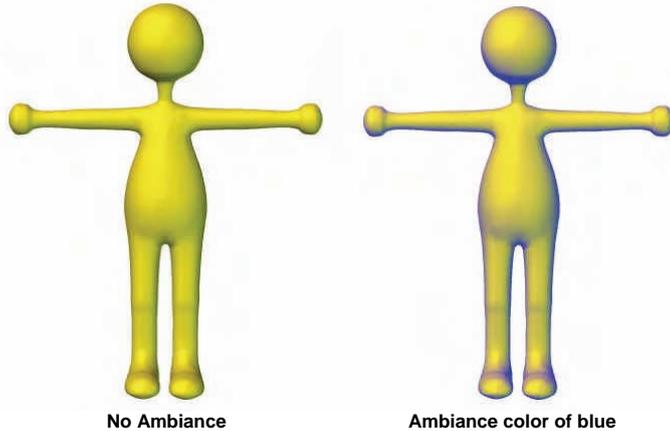
Ambiance Shader



The Ambiance Shader plugin is very similar in function to the Ambiance Color property in the Surface properties. Like the Ambiance Color property, it can be applied to Models, Groups, and Materials. But, it can also be applied to rendering. By applying the Ambiance Shader to the camera property, or in the Render settings, every object in the scene use the selected color for its areas that are in shadow. It is recommended that you use the Ambiance Color property in the Surface properties for cases when you do not want to use it for the whole scene.

To use the Ambiance Shader, Plugin Shaders must be turned on in the Tools:Options:Rendering tab. Expand the Plugin Shaders to see the Ambiance Render Shader property. Select Ambiance from the popup. Now you may expand it to set the Ambiance Color property.

You can select an ambient color by clicking the color chip and picking one from the palette. The ambient color along with ambient intensity determines the color of an object even when no light is hitting it. If the ambient color is the same as the diffuse color, then when a new diffuse color is chosen the ambient color will be set to match the diffuse color. This is handy because it is most common to have diffuse color and ambient color match. If ambient intensity is 0 then ambient color will have no effect. If ambient color and diffuse color are the same then the ambient color will not show up over decals, rather the decal color will be used with the ambient intensity



Ambiance Color

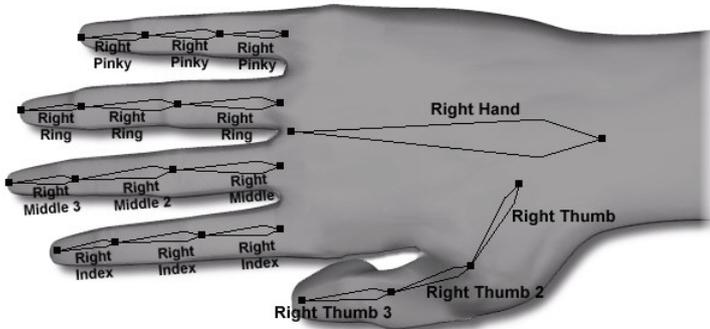
You can select an ambient color by clicking the color chip and picking one from the palette. The ambient color along with ambient intensity determines the color of an object even when no light is hitting it. If the ambient color is the same as the diffuse color, then when a new diffuse color is chosen the ambient color will be set to match the diffuse color. This is handy because it is most common to have diffuse color and ambient color match. If ambient intensity is 0 then ambient color will have no effect. If ambient color and diffuse color are the same then the ambient color will not show up over decals, rather the decal color will be used with the ambient intensity

In real life, humans and animals have a skeleton that supports the body's soft tissue. The skeletal structure determines range of motion and how it will move. In Animation:Master, "bones" serve the same purpose. The general placement and angle of each bone is intuitive since it so closely resembles nature's layout. And by following the default naming convention, your characters can use libraries of reusable actions.

Naming Conventions

The reuse of valuable artistic talent is one of the primary advantages of computer animation. Reusable actions are especially useful. Animation:Master implements action reusability with "name matching", meaning that the "Left Bicep" bone actions try to match to other "Left Bicep" bones.

To standardize names, a naming convention has been established for bipedal characters, (though four-legged characters can use the same names and even try to use the same actions). You don't have to use the suggested naming conventions; you can establish one of your own, especially for unique characters. But, if you want to take advantage of the action libraries already available, it is recommended that you use the biped naming convention for your biped characters. See the beginning of his section for a chart of the bone names in the body; below is a chart of the bone names in a hand.



Replace "Right" with "Left" for the left hand.
Biped Naming Convention-Hand

Bone Hierarchy

When adding bones, you are defining the hierarchy (called a skeleton), indicating which connections should be kinematics chains, and specifying the local space of each bone.

Before adding a bone, you first select its parent (if no bone is selected, the new bone is added at the root). The skeleton can be adjusted later by using drag drop in the Project Workspace tree. A parent bone passes its translation, rotation, and scale on to its children. A good skeleton building technique is to place the pelvis at the root, make the abdomen and thighs children of the pelvis, then make the torso a child of the abdomen, then make the biceps and neck children of the torso, and so on.

For inverse kinematics, add nulls at the root of the hierarchy for use with hand and feet constraints. The nulls can have a hierarchy of their own to ease in moving them together. For example, you can have a null that is the parent of all nulls, one that is the parent of the lower body nulls, the left leg nulls, etc...

Reordering the bones in the Project Workspace tree with drag and drop can easily modify the skeleton. Rearranging the skeleton also changes the inverse kinematics.

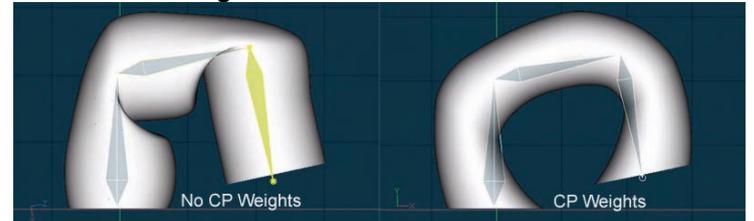
Bone Orientation

The orientation of a bone defines its local frame of reference. Along the length of the bone defines the local Z-axis; the roll handle is the bone's local Y-axis, and the local X-axis is perpendicular to both the bone and the roll handle. This is the coordinate system that scale, rotate and translates use when animating. Two models that are to share actions require the bones to have the same names and same basic hierarchical relationship. In addition, the bones and the roll handles should be placed into the model in the same way. If the roll handle points to the back on one model, then it should point the same way on the other model. However, one character can be modeled with its arms out, and another with its arms down, and the actions can still be shared.

Moving Bones and Geometry Simultaneously

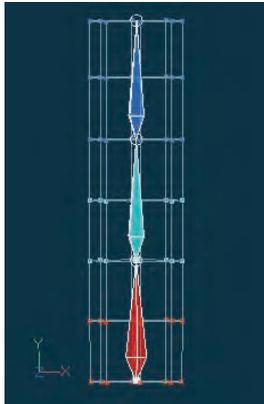
At times, it is convenient to be able to move an entire bone hierarchy and the geometry related to it. To do this, select the patriarch bone in the model's hierarchy, then click the Translate manipulator button. While holding the <Ctrl> key (<Command> key on the Mac) on the keyboard down, drag the patriarch bone to its new location. As you are dragging the mouse, the skeleton will move appropriately. When the mouse button is released, the geometry will be redrawn in the new position. This also works using the Scale and Rotate manipulators.

Control Point Weights



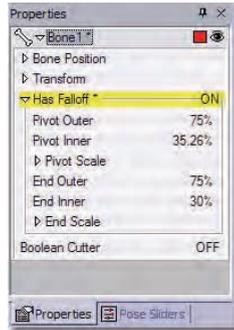
Many times when a bone has sole ownership of a Control Point (CP) there is an undesired effect when the bones are rotated to extreme angles as shown above. It is even possible for the geometry to collapse on top of

itself. There are several solutions to fix this problem including repositioning the bones, Smart Skin, and now CP Weights.



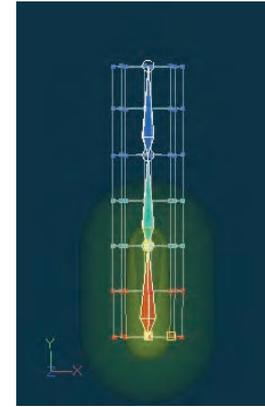
Original Bone Positions and Ownership

The image above shows a common way to bone a model. Using CP weights each CP's position can be controlled by multiple bones, minimizing skin folds and allowing the geometry to blend along the bones and remain smooth.



Has Falloff

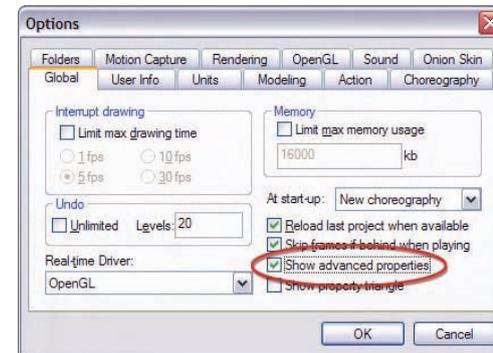
Click on a bone and then select Has Falloff on the Property Panel to turn on CP weighting for this bone.



Bone Weighting Falloff

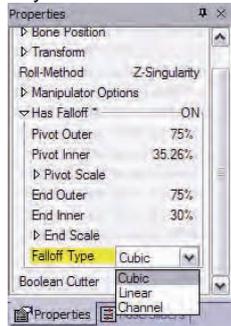
Notice the bone now as two capsules drawn around it. Any CP that falls within the inner capsule will be controlled 100% by this bone. Any CP that falls within the outer capsule will be partially controlled by this bone. The closer to the edge of the outer capsule the CP lies the less the bone will control it.

Use the Pivot Outer, Pivot Inner, Pivot Scale properties to adjust the falloff of the pivot end of the bone and End Outer, End Inner, End Scale to adjust the falloff of the end (tip) of the bone.



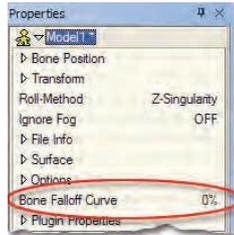
Show Advanced

If show advanced properties is enabled in the [Tools][Options] dialog on the global tab then there will be one additional property called Falloff Type under the Has Falloff property .



Falloff Type

Cubic, Linear, and Channel are the three available falloff types. Falloff is the span between the inner capsule and the outer capsule. The Falloff Type property is the method you would like to use to calculate the CP's weight if it falls within this region. Cubic will weigh the CP using a curve falloff between the two capsules. Linear will weigh the CP using a straight line falloff. Channel will use the curve defined by you. To define the curve use the timeline panel and the "Bone Falloff Curve" property on the model. Define a curve from 0% to 100% on the timeline.

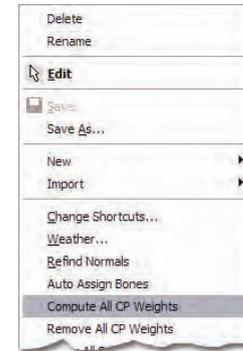


Bone Falloff Curve Property



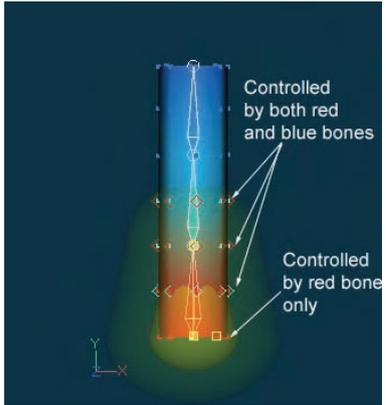
Bone Falloff Property Channel

Once you have adjusted the falloffs of all desired bones, right click (Control click on a Mac) in the Modeling window and select [Compute All CP Weights]. This will calculate each CP's weight for each bone based on all the bone's falloff settings.



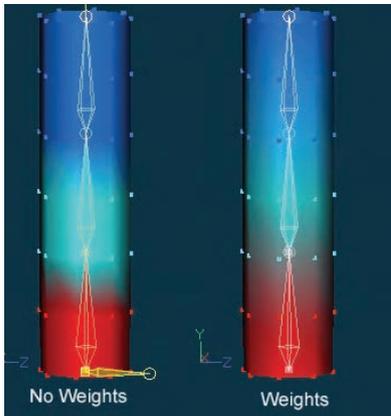
Compute all CP Weights

When a bone is selected all CPs it fully controls will be drawn in the bone color. If the CP is partially controlled by any other bone the CP will have circles around it in the color of the other influencing bones. The order to which color circle is drawn around which is irrelevant and has nothing to do with who has the strongest control of the CP.



Weight Circles

When the model is in Shaded and Bones mode the surface will be shaded in a blended color of the bones that influences it. Notice in the following picture that the model that has had CP weights applied to it has a much smoother transition between the colors.

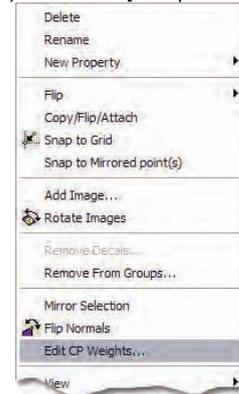


Weight Gradients

Animating the model with extreme rotations should have a better result now as shown in the first illustration in this document.

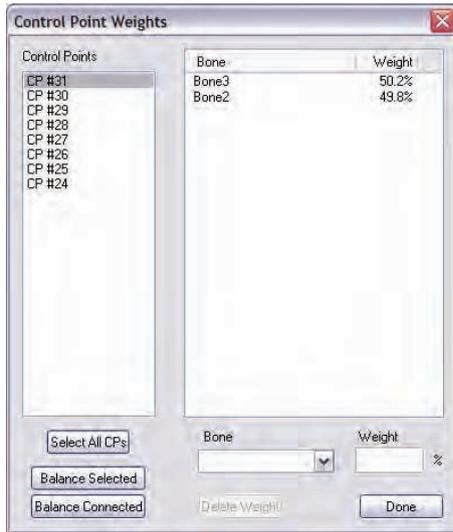
Note anytime the influence falloffs are adjusted the CP weights must be recomputed by right clicking (Control clicking on the Mac) and selecting [Compute All CP Weights].

To just calculate the weights of all CPs owned by one bone simply right click (Control click on the Mac) and select [Compute CP Weights].

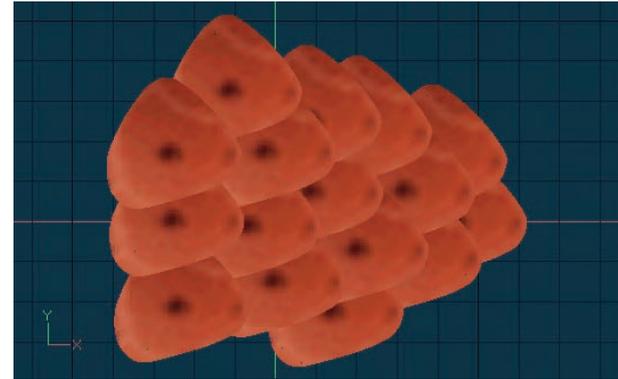


Edit CP Weights.

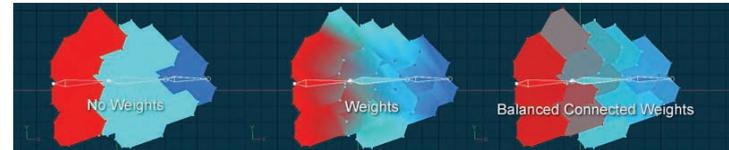
To manually adjust CP weights simply group the CPs you wish to adjust while in Modeling mode and then right click (Control click on the Mac) on the group and select [Edit CP Weights...].



Control Point Weights Dialog



Scales



Weights

From the Control Point Weights dialog any CP that was selected in the group when the dialog was invoked can have its weights adjusted here. Click on the CP to have each bone that influences its position appear in the Bones and Weight list. Select a bone from this list to have the Bone combo box and Weight % edit box populated with its values where they can be edited. If no bone is selected in the Bones list and a bone from the Bone combo box is selected then that bone will be added to all selected CPs in the list. This allows you to add new influences to CPs.

Select multiple CPs and click "Balance Selected" to have the weights of all CP's that are selected averaged together. When the CP's are all balanced they will all have the same Bone List with the same weights. Balance Connected has a couple specific uses. When Balance Connected is applied it will balance only CP's selected in the list with other CP's selected in the list whose geometry is connected to one another. One powerful use of this feature is scales on a fish.

In the above images the scales of a fish are shown with weights computed three ways. The first is no weights at all. The scales are 100 percent assigned to one bone. The problem with this is when the fish animates the scales will move in three groups since there are three bones. The second image shows the weights computed using falloff. This gives smooth blending when animated but the scales stretch and shrink and change sizes unlike real scales. The last image shows Balanced Connected Weights. To do this the weight falloff was calculated exactly as before and then all the scales were grouped together and edited using the Control Point Weight dialog. From within the dialog all the CP's were selected and then the Balance Connected button was pressed. This operation averages all the weights within each scale. Each scale now will retain its shape and then will be controlled by different percentages by the bones. Notice how much color variation are in the scales showing the influences of the bones.

Lock Control Points

Sometimes when you are adjusting specific areas of your model, you would

like to see all of the other splines and control points but not accidentally select or move them. Control points can be made un-selectable by grouping them and clicking the Lock button on the Modeling toolbar. Like the Hide tool, NON SELECTED control points will be affected. Locked control points and splines will be drawn half-bright. Unlock simply by clicking the Lock button again.



Snap Manipulator to Grid can be used to move control points in grid increments. It is located on the manipulator toolbar and any time this button is selected ALL manipulators will move in grid increments when manipulating control points. (This includes creating paths in Choreography and Muscle Mode in Action).

This should not be confused with snap to grid, which is available after selecting a group of control points and right-clicking (Control-click on a Mac) in the manipulator to access the menu, then choosing "snap to grid". This will snap the selected points to the nearest grid location and is only available in Modeling Mode.

Mirror All Smartskin

Found under a model's context menu, this feature walks through all Bone Rotate Relationships (Smartskins) on the model, that contain the word "left" or "right" and looks for a matching one on the other side. If it does not exist, it creates it, and mirrors all muscle motion within that relationship. It creates each mirrored key at the matching mirrored position for that bone. If both left and right relationships already exist then it examines whether they have been modified since the last save. If only one has been modified since the last save, then it copies the modified relationship over the top of the non-modified one, mirroring as it copies.

Biased Normals

"Biased Normals", which exhibit better smooth shading, are now the default spline technique, but old models will still load and animate the same.

Modeling Tools

The desktop publishing paradigm permeates all document-based programs, including Animation:Master. Even though the documents do not contain text, you can still use Cut/Copy/Paste in a familiar way. Many of the tools presented to you here will be used in much the same way as in other parts of the software such as in Bones mode, and in a choreography.



Cut

Remove any grouped control points and place a copy of them in the Paste buffer. The "Cut" item can also be accessed from the "Edit" menu. The default keyboard equivalent for cut is <Ctrl>+<X>



Copy

Copy of the grouped control points in the Paste buffer without removing them. Please note that when this button is clicked nothing will visibly happen. The "Copy" item can also be accessed from the "Edit" menu. The default keyboard equivalent for copy is <Ctrl>+<C>



Paste

Put whatever is in the Paste buffer into the active window. The new points will remain grouped and can be dragged with the mouse down. The "Paste" item can also be accessed from the "Edit" menu. The default keyboard equivalent for paste is <Ctrl>+<V>



Undo

If you realize you have made a mistake, you can undo by clicking this button. The number of undo levels can be set in the [Tools][Options] dialog on the "Global" tab. The "Undo" item can also be accessed from the "Edit" menu. The default keyboard equivalent for Undo is <Ctrl>+<Z>



Redo

If after clicking Undo you want to change back, you can Redo the change. The "Redo" item can also be accessed from the "Edit" menu. The default keyboard equivalent for Redo is <Ctrl>+<Y>

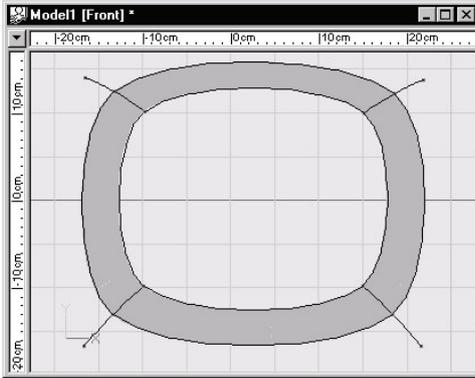
Modeling Without Creases

For inexperienced modelers, one of the most difficult tasks to perform is creating a model that is relatively crease free. When starting out, it seems like any modeling function that is performed will cause a crease. This is simply due to a lack of understanding of spline direction and how the software interprets legal (rendering) patches. Even professionals occasionally run into creasing on the surface of a model, they just have the experience and knowledge required to eliminate them with minimal effort.

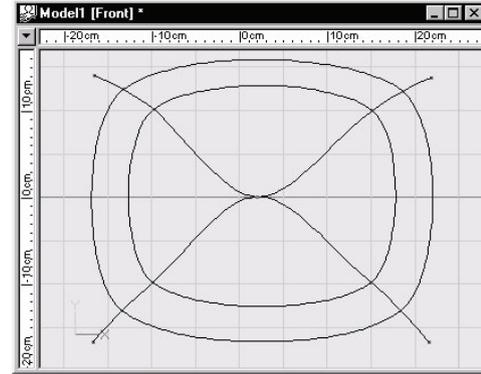
For most models, a few creases are acceptable; they just need to be placed properly so that they accent the modeling, rather than detract from it. Creases that occur along the back of a knee or inside an elbow joint can be used to add realism to a model, while creases that occur on the side of a head can be hidden with ears or hair if necessary.

Ultimately, the best way to avoid creasing is experience. The more you practice modeling, the fewer creases you will have to deal with. In addition, try to pay attention to spline direction while you're working. You'll have to concentrate to be aware of spline directions at first, but it will soon become second nature, and you will avoid modeling creases without even thinking about it.

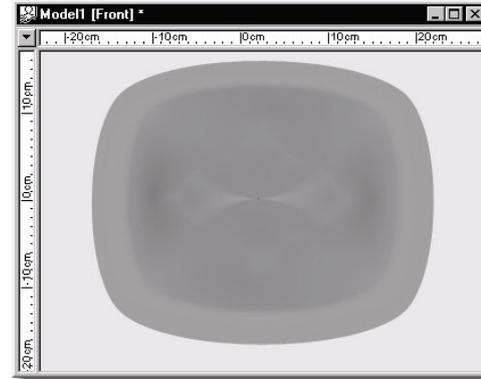
A common problem that occurs in modeling is when a non rendering four point patch needs to be closed (so that it renders). For example, assume the model shown in the following image needed to have the center patch closed.



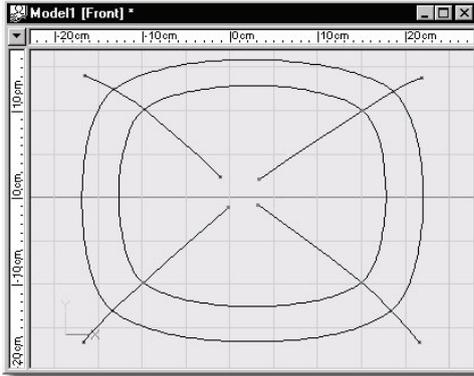
A common mistake made in this situation is to create two "U" shaped splines and attach them to the corners, and then to each other in the center of the patch, as shown in the following image:



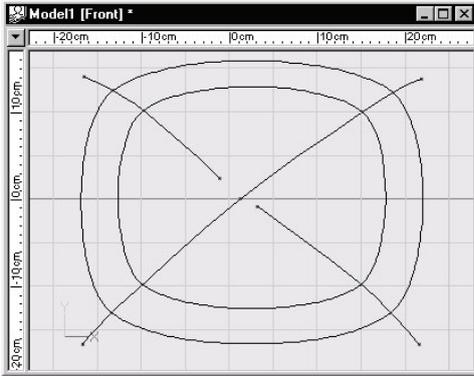
Were this on a flat section of a model (such as part of a ground plane), the effects of such modeling would hardly be noticeable. However, on a curved surface, creasing becomes evident when the model is rendered, as shown in the following image.



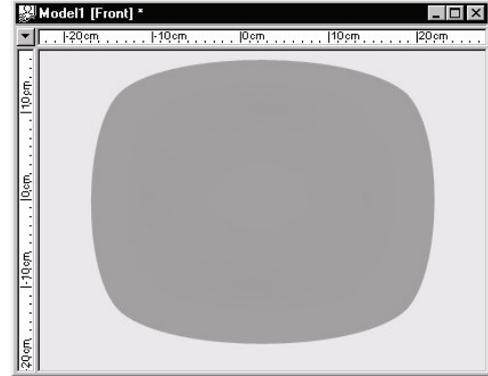
The creasing on the surface of this model is caused by the lack of continuity in the splines that close the center patch. These splines do not continue across the patch to create a smooth surface. Instead, they create a sharp edge where they double back on themselves. To fix this problem, the continuity of the center splines needs to be fixed. To do this, the center splines are first broken, as shown.



The splines can now be attached to form an "X" shape, so that the splines run from one corner of the model to the opposite corner, rather than doubling back upon themselves. The first two control points that are connected to form a continuous spline are connected as shown in the following image.



Next, the remaining two control points are connected to each other, then to the center control point. The resulting render no longer has any artifacts caused by the sharp curves of discontinuous splines.

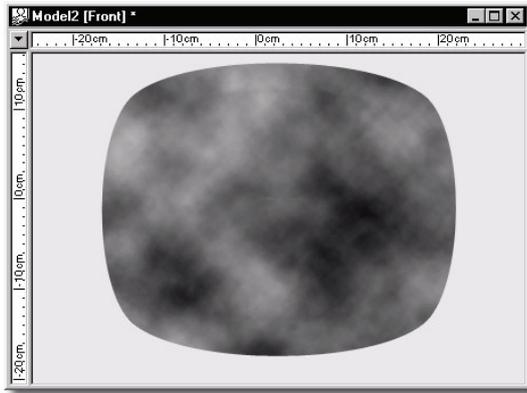


In addition to good modeling practices, a well textured model will not show creases as readily as a single color shaded one. Keep this in mind when you are viewing your models before you have applied textures. Many people become frustrated by "not being able to get all the creases out" when ultimately, it won't matter.

Take the model from the previous example under consideration. The following image once again shows the creasing caused by the use of improper modeling technique.



But once a color map with a varied surface has been applied, the rendering artifacts become much less obvious.



This is not to say that trying to cover up creases to hide them is always a good idea. Poor modeling leads to characters that are difficult to animate or do not animate well.

Your best bet to avoid creases is to practice with the modeler until you become proficient with it. This will minimize the number of creases you experience to begin with, and give you enough knowledge to easily fix any that do appear

Modeling Wizards

Modeling wizards provide a way to generate models and model elements algorithmically, allowing the computer to perform repetitive operations for you. Think of them as tools that perform multiple modeling operations. You use them when working in a modeling window, either from the model in the Project Workspace, or from a group. Some modeling wizards create geometry from scratch, and some start with a group of points that you have already created. After the wizard has created the new geometry, all of the new points will be selected in a new untitled group. If the results are not to your liking, you can either delete the new group, or pick Undo from the Edit menu, and try again with different settings. After the wizard has created the new geometry, you can edit the new points just as you would with any model you created yourself. It's just as if you created the points yourself, except that the computer did it for you.

To access modeling wizards that create geometry from scratch, right-click (Control-click on the Mac) the model in the Objects folder in the Project Workspace, and select the modeling wizard of your choice from the "Wizards" menu item. A dialog will appear with the setting options. Enter

the appropriate values and click the OK button. It may take a few tries to get what you want. You can undo the wizard operation, and try again. The previous settings will appear in the dialog so you can tweak the settings until you are satisfied with the results. Some modeling wizards can take a group that you have already created and perform various operations on it. These wizards can be accessed either by right clicking (Control-clicking on the Mac) the group in the model on the Project Workspace, and selecting the "Wizards" menu item, or by right-clicking (Control clicking on the Mac) the group itself in the modeling window, and selecting the "Wizards" menu item.

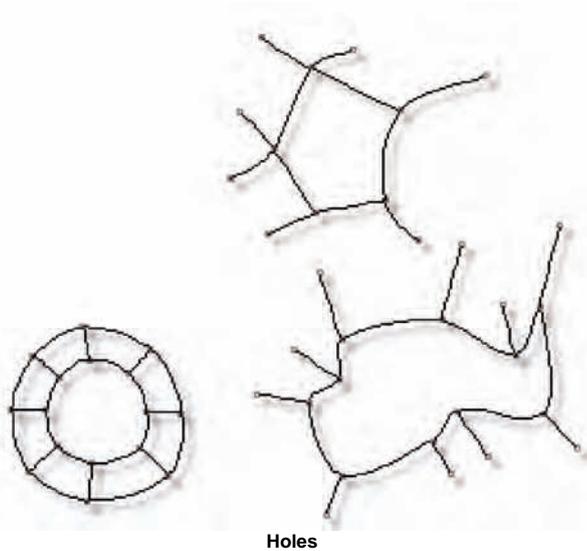
Moving Bones and Geometry Simultaneously

At times, it is convenient to be able to move an entire bone hierarchy and the geometry related to it. To do this, select the patriarch bone in the model's hierarchy, then click the Translate manipulator button. While holding the <Ctrl> key on the keyboard down, drag the patriarch bone to its new location. As you are dragging the mouse, the skeleton will move appropriately. When the mouse button is released, the geometry will be redrawn in the new position. This also works using the Scale and Rotate manipulators.

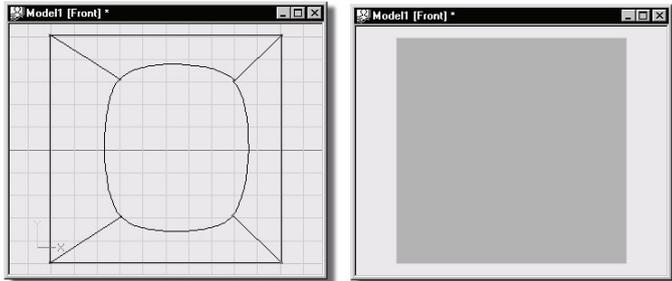
Next and Previous Control Point keys < }> and < {>

Useful for selecting obscured control points in shaded wireframe mode. Use the Next and Prev keystrokes to select the next or previous control point in a spline. If there is a group with more than one control point that is selected it will only move to the next or previous grouped points so that the group will not be modified. If you have a "Untitled" group with only one control point it will change the group to be the next or previous control point.

Patch Holes



The most common way of making a hole is to first draw a looped spline in the shape of the hole, then connect other splines between existing control points and the new “hole” control points. Make sure when using this technique not to set this hole within a valid patch, because the patch will still draw, covering the hole as illustrated below.



Patch Rules

These rules determine what is and is not a legal patch. Follow them carefully while modeling.

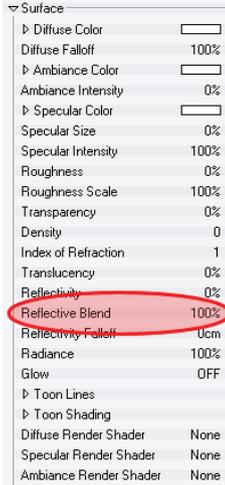
- All open and closed splines when extruded have patches on the extruded sides.
- All open and closed splines when lathed have patches on the lathed sides.
- Any closed combination of three or four control points define a patch, UNLESS all three or four control points are in the same spline. (This is to minimize unwanted interior patches).
- Patches composed of five splines can be individually identified.
- When three or four control points that are not in the same spline define a patch, that area is always rendered. Therefore, if you want to cause a hole into the interior of a segment, simply add another control point around the perimeter of the area, because five control points are too many to define a patch. While doing this, you will probably affect adjoining patches, so think ahead.

Primitives

When modeling in polygonal programs, all models start out as some kind of primitive, such as a sphere or cylinder, which is deformed through a series of tool-based steps into something approximating what the artist had in mind. Subsequently, new Animation:Master users who have past experience with polygon programs are always asking, “Where are the primitives?”

Hash patch modeling is a different process entirely. Starting from a primitive is actually counter-intuitive and probably won't result in a character that can animate anyway. However, starting with an existing model that is similar in shape and look to what you ultimately want is acceptable.

Reflective Blend



This property allows you to adjust the percentage of reflection blending. At 0%, reflections are simply added to the diffuse and specular components. At 100%, reflections are completely blended with the diffuse and specular components. Blended reflections more closely mimics how reflections are perceived in reality. Additive reflections are how reflections are generally handled in computer graphics. Handling reflection in computer graphics is a tricky business. In the real world, everything is reflection. The diffuse color of a surface is the result of reflection from a perfectly rough surface. The specular highlight is the result of reflection from a relatively smooth surface. The mirror type of reflections are the result of reflection from a perfectly smooth surface. But in computer graphics, both the diffuse and the specular shaders are clever hacks designed to fool the eye. They are based on a very abstract illumination model. Clearly, a surface cannot be perfectly rough and perfectly smooth at the same time. But in computer graphic, it is very common to set a diffuse color and a reflection on the same surface because simulating the reality would otherwise be way too expensive. Another real world law is that a surface cannot emit more light than it receives. For this reason, the correct way to handle reflectivity would be to blend it with the diffuse color. That is reduce the diffuse color in proportion to the reflectivity. This is called blended reflectivity.

However, the common way to handle reflectivity is to simply add it to the diffuse component. This is because, in the real world, the reflected image takes on the color of the reflective surface and this effect is better simulated by adding the reflectivity component to the diffuse part. This is called additive reflectivity. The drawback of this method is that without care and manual compensation, a reflective surface can look much brighter than it should.

Without the Fresnel term, the blending can be handled by manually decreasing the intensity of the diffuse color. But with the Fresnel term, which varies the reflectivity, it is not possible to manually handle the blending this way. So a mathematical blending is included in the reflection processing.



Additive reflectivity

Reflective surfaces appear brighter than they should. For instance, the door frame reflection on the floor is brighter than the actual door frame. And because the floor is brighter than it should be, it masks the yellow car reflection on the floor and it cuts short the reflection of the door frame. On the other hand, the robot, because it is brighter than it should be, is more prominently visible in the scene.



Blended reflectivity

All objects share a well balanced brightness. The door frame reflection is no more brighter than the actual door frame and the reflections from the car and the door frame are more visible. On the other hand, the robot could be brighter because it is designed to be the center of attention. For this reason, the reflection blend property is a surface property and can be adjusted as required for each surface. The floor is reflective. The reflection appears way too bright with additive reflections. Even the wall, which is rather dark appears bright in the reflection.



Additive reflection on the left and blended reflection on the right

The block is reflective, all objects are white and the light have 80% intensity. With additive reflection, the block appears completely saturated. With blended reflection, the block appears well illuminated given that it is a specular surface. However, for artistic reason, it could probably benefit from a little blending adjustment.

Reflective filter

Surface	
Diffuse Color	
Diffuse Falloff	200%
Ambiance Color	
Ambiance Intensity	20%
Specular Color	
Specular Size	0%
Specular Intensity	100%
Roughness	0%
Roughness Scale	100%
Transparency	0%
Density	0
Index of Refraction	1
Translucency	0%
Reflectivity	50%
Reflection Filter	100%
Reflective Blend	0%
Reflectivity-Falloff	0cm
Radiance	100%
Glow	OFF
Toon Lines	
Toon Shading	
Diffuse Render Shader	None
Specular Render Shader	None
Ambiance Render Shader	None

This property allows you to adjust the percentage of color filtering applied to reflected images. At 0%, reflections obey the normal blended or additive reflections. At 100%, reflection colors are fully filtered by the surface color.

Reflection filtering means that the reflected images are filtered by the reflecting object surface color. Some consequence of applying a filter to reflection is that some part of the reflected image may not get reflected at all. For instance trying to reflect a pure blue object off a pure red object will result in no reflection at all. That is because in order to be able to reflect the blue component, an object surface color needs to have some blue component in it. The extreme example would be the impossibility to reflect any image off a black object surface because any reflected image filtered with black will result in black.

The normal handling of reflected images takes into account the reflectivity. That is surface color filter is applied in inverse proportion to the reflectivity. When reflectivity is set to 100%, then no filtering occurs. If reflectivity is set to 70% then a 30% filtering is applied to the reflected image. This is particularly important when considering the Fresnel reflectivity where at full grazing angle, reflectivity becomes 100%. In the real world, when reflectivity is 100%, it is 100% for all wave length thus no filtering at all should occur. Furthermore, this allows reflection to occur even on very dark or black

surfaces.

With reflection filter, it is possible to adjust the amount of filtering that gets applied to reflected images. The range of filtering goes from 0% to 100% but it actually goes from the inverse of reflectivity up to 100%. For instance, on a 70% reflective surface, setting filter to 0% will result in the normal 30% filtering to be applied. A filter of 100% will result in 100% filtering and any values between 0% and 100% will result in filtering between 30% and 100%. Note that reflection filter directly affect the Fresnel term. At 100% filtering, the Fresnel term is completely cancelled out.

The color used for filtering reflection comes from the specular color chip unless the specular color chip is the same color as the diffuse color chip. In which case, the reflection color comes from the resolved surface diffuse color which may depend on color decals or materials.

*Reflectivity = 100% Reflection filter = 0% **Resulting effective filter = 0%***
*Reflectivity = 100% Reflection filter = 50% **Resulting effective filter = 50%***
*Reflectivity = 100% Reflection filter=100% **Resulting effective filter = 100%***
 Reflection filtering has the most impact when reflectivity is high.

*Reflectivity = 75% Reflection filter = 0% **Resulting effective filter = 25%***
*Reflectivity = 75% Reflection filter = 50% **Resulting effective filter = 62.5%***
*Reflectivity = 75% Reflection filter = 100% **Resulting effective filter = 100%***
 Reflectivity of around 75% allows a nice range of reflection filtering. Comparing with real gold photographs, a good setting for gold would be with around 75% reflectivity and a reflection filtering of a little less than 50%.

*Reflectivity = 50% Reflection filter = 0% **Resulting effective filter = 50%***
*Reflectivity = 50% Reflection filter = 50% **Resulting effective filter = 75%***
*Reflectivity = 50% Reflection filter = 100% **Resulting effective filter = 100%***
 Reflection filtering effect becomes almost unnoticeable with reflectivity below 50%.

Restricting Movement

When moving with a single selected control point or a group of points, it is sometimes useful to restrict the control point's movement. Simply holding down the <1>, <2>, <3> keys on the keyboard will allow the control points movement in the X, Y, or Z-axis, respectively, but restrict the other axes. For example, pressing the <2> key will only allow Y-Axis movement. Holding down more than one of the keys will allow multiple axes movement.

Key to hold	Movement is limited to:
<1>	The X-Axis
<2>	The Y-Axis
<3>	The Z-Axis
<1> and <2>	The X-Y plane
<1> and <3>	The X-Z plane
<2> and <3>	The Y-Z plane

When in modeling or muscle mode, you can restrict the movement of control points to move in a fashion that is related to the control point itself and the surface defined by the control point by using the <4>, <5> and <6> keys as follows.

Key to hold	Movement is limited to:
<4>	The line in the direction of the focus cp.
<5>	The line 90 degrees to the focus cp.
<6>	The direction of the surface normal.
<4> and <5>	The two lines from <4>, <5>, which form a plane tangent to the surface.
<4> and <6>	The two lines from <4>, <6>, which form a plane containing the selected spline direction and the surface normal.
<5> and <6>	The two lines from <5>, <6>, which form a plane 90 degrees to the spline direction and through the surface normal.

If you are in a non-orthogonal view (Bird's Eye, Camera, Light), translation is usually restricted to the ground plane (the X-Z plane). It is restricted to the ground so long as the ground plane is not orthogonal. You can override this behavior by holding down the <1>, <2>, and <3> keys simultaneously. The status message will change from "Translate in Ground Plane" to "Translate in Screen Plane". This translate option can be used even if the mouse is not over the manipulator, making it very useful when viewing through the camera, while adjusting the position of a light that is behind the camera. Even though the light can not be seen, the effect of its lighting appears on the shaded objects in the scene. Just select the light from the Project Workspace tree, then hold down the <1>, <2>, and <3> keys simultaneously. Now click the mouse somewhere in the Choreography window, and drag to translate the light. The light will translate in the screen direction that you drag.

The Rotate Manipulator also supports restrictions using the <1>, <2>, and <3> keys, for skewing along the X, Y, and Z axes. See the "Rotate Manipulator" section in this manual for a complete discussion on this topic.

Selecting Splines

Many splines can share the same visible control point. When a control point is selected by clicking on it, the selected spline will highlight. Pressing the <Tab> key on the keyboard can change the selected spline).

Using Attach Control Point on non-US keyboards

Attaching two control points on a Macintosh is normally done using the ~ (tilde) key. However, on keyboards outside of the United States this key may not be available. You can assign the Attach Control Point command to any available key by using the Customize dialog.

- Pick [Tools][Customize] and click the Appearance tab.
- Click "Attach Control Point" in "Commands".
- The current key assignment will appear in "Current Keys". It should appear as a backwards apostrophe (`) since that's the key that tilde is on.
- Click the Create Shortcut button. Type the key you would like to assign the command to, and click the OK button.

Now, when you want to attach two control points, drag one over the other, and press the new key that you assigned while the mouse is still pressed.

What Are Control Points?

Control points are points you can click to move or adjust a spline.



Examples of Control Points and their associated splines

A control point can be moved by pointing at it with the mouse, pressing and

holding the mouse button, and dragging the control point. (The control point you last clicked on is always the selected control point).

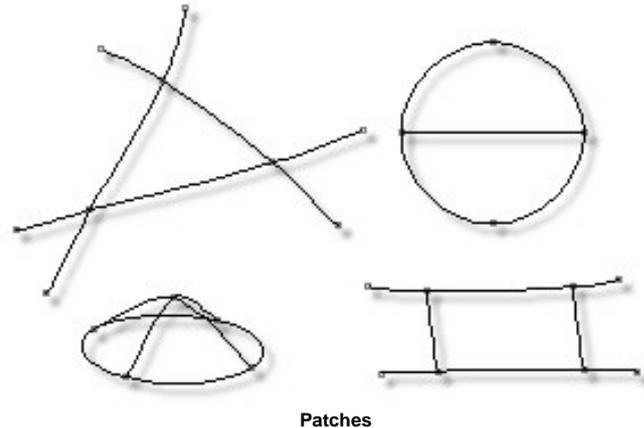
When multiple splines share the same control point, the spline closest to where you click on the control point will become selected. Moving a control point with several splines passing through it will cause all of the splines to move at once.

What Are Splines?

Splines are smoothly curved lines that you adjust with control points. Splines differ from the vectors used in polygon modelers in that moving one spline is equivalent of moving dozens or even hundreds of polygons simultaneously. The ease of finely adjusting smooth, curved, three-dimensional splines is what makes patch modelers so powerful and easy to use.

What Defines A Surface?

As you create and attach splines, an object will take form, and as the complexity increases, so will surface ambiguities. Surface ambiguities occur when connected control points can be either filled by a patch or left open. For simplicity and convenience, the computer will decide which connected control points define patches consistent with the rules for creating patches.



Patches

When you have an area that you wish to cover with patches, you may have to add additional splines to form closed areas. Simply add a new spline,

then attach each end to existing control points in the area to be covered. The curvature of the new spline may need to be adjusted to accommodate the shape of the surface.

Weighted Control Points

Hash Inc. has resisted embracing weighted CP's for a very long time. There are several reasons for this. The technology is fairly good at softening hard joints especially when the geometry is dense. However, it has serious limitations. Weighted vertices have a tendency to reduce the volume of the joint as it blends. The technology feels vague and uncontrollable to the artist. There are a wide variety of tools out there, each one trying to give the artists some level of control. Some use paint tools to paint the weights. Some have falloff tools and curve editors for the falloff. Some have manual weight editing dialogs. Now that the technology is in AM it would seem to the artist that they could get the weights set correctly if they just had the tool like brand X. This pursuit of weight setting nirvana is, unfortunately, often not achievable. I am sure tools to adjust the weights will be added on as demand warrants it.

Here is the crux of the problem:

Take the simple, but extreme worst case example of a simple tube like an arm. Consider a single point that is at the outside of the elbow joint. It is equally close to both the bicep and forearm. So most would consider 50% - 50% to be a good choice of weights. Now, an elbow cannot twist, but for simplicity, suppose this is a joint that can. Now consider the worst case, a roll of 180 degrees on the forearm. The bicep hasn't rolled, so according to it, the point should be placed on the outside of the elbow where it was modeled. The forearm however thinks it should be rotated 180 degrees, which would place it at the inside of the elbow. Now comes the blending. The 50/50 that we chose would result in the point being halfway between these two places. That is right at the center of the elbow joint. Oops, this is what causes the collapse. If all of the points around the elbow were subject to the same 50/50 blending, they would all end up at the center. This results in an elbow that has pinched down to nothing. Now let us adjust the weights. Consider our point on the outside of the elbow again. Our only control is to do a linear blend of the inside and the outside result. That means no matter what we set these weights to (even if we had ultimate, perfect control) the resulting answer would have to lie on the line that connects the inside and outside of the elbow. None of these choices are the correct one. So no matter what the tool, or how fancy, or how gee-whiz it is you will not be able to get that point on the elbow to go where you really want. This is frustrating.

Hash Solution 1 - Version 5.0:

Blended bones by using an additional bone and constraints on the other

hand, set at 50/50 would come up with a new true transform that is only rotated 90 degrees on the roll axis. Now this point on the outside of the elbow is rotated to the front or the back of the elbow by 90 degrees. It is just as far from the center of the arm as it was modeled. Hence, no collapsing. Nice preservation of the volume of the arm. The only problem is it is rather technical, and prohibitively more and more complex to setup if the geometry becomes quite dense. Since it then requires many bones each with different weights. Fortunately our geometry is usually not that dense, so this technology got us by for a long time.

Hash Solution 2 - Version 7.1:

Smartskin. This is much more hands on and visual. The artist gets to remodel to specify exactly what he/she wants at a given angle. We can model to give the same results as solution 1 above. Or we have the flexibility to sculpt anything we want, like bulging muscles or whatever. The downfall of this solution, is that is tedious and adds to the initial model creation time. Additionally, in version 7.1 to 8.5 the artist was restricted to creating keys only along the primary three axes. Version 9.0 improves on this by allowing arbitrary rotations to have keyframes set.

Hash Solution 3 - Version 9.0:

Finally give in. Now that weighted vertices are supported directly in hardware by many video cards, it is hard to keep saying no to the gamers. So, do an initial release allowing weighted vertices, primarily to give the game developers a way to still build models in AM, and get reasonable joints fairly quickly and simply. Add tools for more control on a by demand basis in future releases. Smartskin can be used in conjunction with weighted vertices, it requires that you remodel out the natural collapsing that occurs with weighted vertices. For characters that demand perfection it may be just as easy to smartskin without using weighted vertices first.

I hope this gives you some hints into the decision making process revolving around this technology.

A:M SimCloth

SimCloth is a material texture plugin. You need to apply this texture to all the objects in the scene that take part in the cloth simulation. That includes not only the cloth objects themselves, but also all collision objects.

SimCloth Properties

Object type

This property lets you choose the role of the object in the simulation.

Deflector: Deflectors are not affected by the SimCloth modifier, but they influence dynamic (cloth and rigid body) objects. SimCloth tries to keep all dynamic objects outside of any deflectors.

Cloth: cloth objects are flexible objects which can change their shape.

Rigid body: rigid body objects can't change their shape, only their position and orientation. Currently they are approximated using a simple spring model.

Particle mass

This controls the mass of each particle in the object. This is taken in consideration only when two objects collide - the heavier object will push the lighter object aside.

Smooth result

This option allows you to smooth the result. Smoothing is done with a simple Loop subdivision scheme.

Iterations

This is the number of smoothing iterations that will be applied to the object.

Choreography properties

These properties are global for all SimCloth modifiers. Changing these in one modifier changes them for all other modifiers as well.

Simulation extent: controls the start and end frame of the simulation.

Active time segment: uses the active time segment.

Start frame: the starting simulation frame. This is ignored if Active time segment is on.

End frame: the end simulation frame. This is ignored if Active time segment is on.

Substeps: SimCloth divides a single frame in a number of intervals and computes the cloth position for each of these substeps. More substeps mean a more precise result.

Gravity: the strength of the gravitational force acting on the objects. Gravity always acts along the world Y-axis.

Collision tolerance: the minimal distance that SimCloth will try to enforce between colliding objects. Smaller values mean that object will be kept closer to each other, but increase the chance of intersections.

Check for intersections: when this is turned on, SimCloth will check if any objects are interpenetrating at the end of each frame. If an intersection is found, SimCloth will double the number of frame substeps and will try to simulate the frame again.

Adaptive subdivs: this controls the maximum number of times the substeps can be doubled if an intersection is found.

Solver precision: controls the target precision for the non-linear conjugate gradient solver. Lower values mean a more precise, but slower, simulation. Values lower than 1.0 are preferable.

Forces properties

These properties control the behavior of the cloth objects. Note that all

these values depend on the scale of your scene!

Stretch forces: these properties control the behavior of the cloth with regards to stretching.

Springs: selecting this option will cause SimCloth to create a simple spring force. Each elementary spring force acts on the two vertices at the ends of an edge.

Stiffness: the resistance of each spring to stretching.

Damping: the resistance of each spring to velocity difference of the two ends of the spring. Lower values will make cloth more "springy" and oscillating. Higher values will reduce oscillation.

Stretch/Shear: this force model is slower than the springs; however it tries to model more accurately the internal structure of woven clothes. It considers the cloth as made of perpendicular strings. Each elementary force acts on three vertices of a triangle.

Stretch: the resistance of the cloth to stretching in the "string" direction.

Shear: the resistance of the cloth to shearing (changing the angle between the two string directions).

Damping: resistance of the cloth to changes in velocity between the vertices of a triangle. Lower values will make cloth more "springy" and oscillating. Higher values will reduce oscillation.

Bend forces: these properties control the behavior of the cloth with regards to bending. An elementary bend force is based on closed (internal) object edges.

Enable bend forces: this turns bend forces on and off. Using bend forces produces a more realistic cloth.

Springs: this option will use simple springs for bend forces. While this option is fast, it does not model bending forces in a very realistic way.

Stiffness: the resistance of the cloth to bending.

Damping: the resistance of the cloth to changes in the bend configuration.

Face angle: this option will use a more realistic bend model, based on the angle between neighboring faces.

Stiffness: the resistance of the cloth to bending.

Damping: the resistance of the cloth to changes in the bend configuration.

Air drag: controls the effect of air on the cloth.

Amount: the effect of surrounding air. Lower values mean less effect. Higher values make the cloth appear denser and moving slower through the air.

Collision properties

Self-collisions: this has effect only on cloth objects; enables/disables collisions between parts of the same object.

Friction: this controls the roughness of the cloth. Lower values will cause the cloth to slide over other objects.

SimCloth Modifier on groups

This can be used to assign different properties to groups within an object. To add a new Polygon Modifier to a group, turn on 'show more than drivers' next to the object's shortcut in the choreography (in the Project Workspace), from the popup menu, choose Add Polygon modifier->SimCloth.

Add Group: right-click on the newly created Polygon Modifier and choose 'add group' allows a group to be chosen from the Custom Group list box.

Group list: the list box contains all the groups.

Attached: this allows you to attach the control points of a group to another object or group. Turning this ON will mean the control points in the group or object will NOT be affected by the simulation, but will move based on the motion of the object.

Collisions: enables/disables collisions for the vertices in the group.

Self-collisions: enables/disables collisions for the vertices in the group.

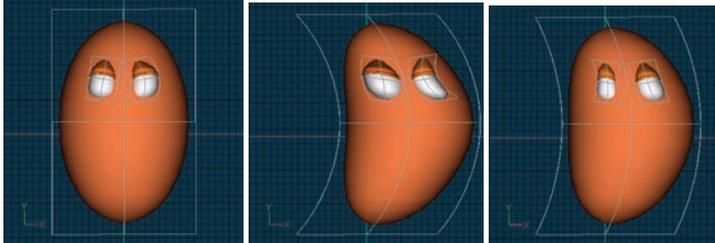
Check for intersections: enables/disables intersection checks for vertices in the group.

Scale: this controls the cloth scale for the vertices of the group relative to the original cloth position. You can animate this to "shrink" the cloth around a given object.

SimCloth is created by Vladimir Koylazov (Vlado). Original source code was released as 'Open Source (Lesser General Public License)' SimCloth was ported to Animation:Master by Bob Croucher at Hash, Inc.

Animated Distortion

Distortion boxes are often used to model, but using them to stretch and squash a character during animation is even more powerful. A Distortion box is simply a special kind of model and can be selected and manipulated to animate the underlying model.



Bones

Bones can be added to Distortion boxes to make them easier to animate.

Poses

Poses may be added to Distortion boxes. This can make animating a fairly dense distortion model less tedious, especially when the motion is used repetitively

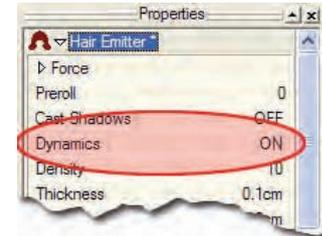
Instances

A single Distortion box can be used multiple times (instanced) on different parts of the model. This is particularly useful when work and time have already been invested into bones and poses for an existing Distortion box.

Nesting

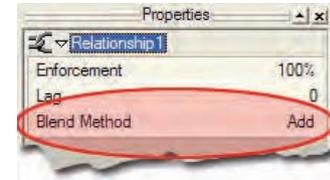
Distortion boxes can also be nested. A Distortion box affects all geometry from its target bone on down, including the target's children bones. If one of these child bones is controlled by another Distortion box, then the outer Distortion box will control the points of the child Distortion box also.

Dynamics on Hair



Hair now has the ability to turn off costly dynamic calculations. This will greatly improve hair placement calculations when changing frame numbers. Many times the hair on your model is so short or so minor that dynamic calculations are not even desired. This option defaults to "ON" but can be turned "OFF" on the Hair Emitter material.

Relationship Blend Method



Two methods now exist for blending Control Point (CP) motion in a relationship with CP motion in another relationship.

The first method is "Add" which is default. Add implies that the CP motion in this relationship will be added to the CP motion in other relationships.

The second method is "Blend," which allows all CP motion to be blended with the motion in other relationships like one big multi-dimensional smartskin.

Multi-Selected Bones and Keyframe Operations

Bones can now be multi-selected and used in any of the keyframe operations like Make Keyframe and Delete Keyframe.

Muscle Mode Keyframed Control Point Highlighting



CP Keyframes are Highlighted

When editing an action in muscle mode, you can see the Control Points (CPs) that have keyframes on the current frame highlighted in blue. This makes it easier to keep track of which points are moving during muscle motion. Note that they are only highlighted on the keyframe, not the in-between frames.

Default Roll Behavior

There are several situations in which a bone is given clues about where to aim, but no further information about what should happen with the roll handle. In a sense only two of the three degrees of freedom are clearly defined: an Aim At constraint, inverse kinematics, and grabbing the end of the simple bone manipulator are a few examples. When this occurs, a bone's roll is determined by what is known as its "default roll behavior": it

tells the bone how it should be rolled at any given aim direction, and is intended to be the best in most situations. Occasionally you may rotate a bone and find this default behavior undesirable. To remedy it, simultaneously press the [Ctrl] key on the keyboard ([Cmd] on the Mac) to automatically compute a minimal visible roll, or use the Rotate manipulator, which defines all three degrees of freedom. The default roll behavior of the object falls into two categories: first, for all geometry driving bones, the default roll behavior is to try not to roll at all if in the same hemisphere as the bone was defined. This gives the bone a kind of "sweet spot" in the shape of a hemisphere around the bones original creation direction. The second kind of roll behavior is used for all other bones, such as lights, cameras, nulls, forces or models, which is not to roll unless pointed in the same or opposite direction as the roll handle. This creates the behavior of a camera that is mounted above a basketball court. It always tries to keep the top of the players heads up in the frame of the camera. This is clearly defined everywhere except directly underneath (or on top) of the camera. This behavior is good for lights and cameras. These two behaviors do not occur between keyframes when using quaternion interpolation, so by using the [Ctrl] key or the Rotate manipulator, your objects should rotate intuitively.

Ease

The acceleration and deceleration associated with motion is known as ease. All Path constraints have an Ease channel associated with them. They control how the character moves along the path. All Actions also have an ease channel associated with them. Because of their spline nature, channels provide excellent and controllable ease for very realistic, natural movement.

Inverse Kinematics

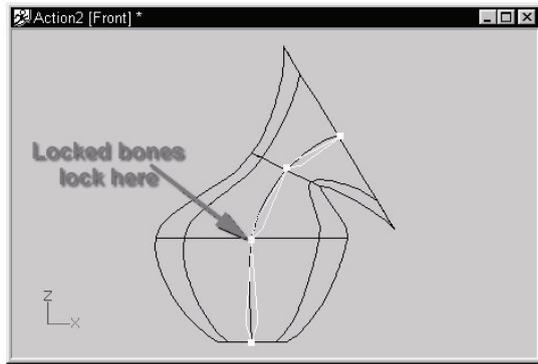
Inverse Kinematics is a powerful feature, which allows you to pull on one bone and cause bones that are connected to be pulled too. Thus grabbing the foot of a character and pulling will cause the calf bone and thighbone to move depending on how far you pull the foot. Anytime you translate a bone in an action, inverse kinematics is always being used on all bones that have been assigned as attached to parent on the bone's Properties panel of the model.

Lock Bone



You can lock a bone in a skeleton hierarchy to prevent it from moving during inverse kinematics by selecting the bone, then clicking the Lock Bone icon on the Skeletal toolbar. (On the Lock Bone button, the icon is a lock that is closed for “locked” and a lock that is open for “not locked”.)

The Lock Bone button is not available for bones not inside a hierarchy, (single bones, not “Attached To Parent” bones).



Locked Bone

Mouse Motion Capture

To perform mouse motion capture, click the play button to play a range. While the range is playing, manipulate some animatable part of your scene or action. The motion will be stored at the current playing frame, in a sense recording your every movement in real time. As hardware continues to become faster, this quick method of creating animation will become more and more popular. Generally, it is a good idea to have skip frames enabled, and reduce the draw time of your scene through the use of faster draw modes and hide mode.

Targets

Your most useful constraint combinations consist of “Translate To”, “Aim

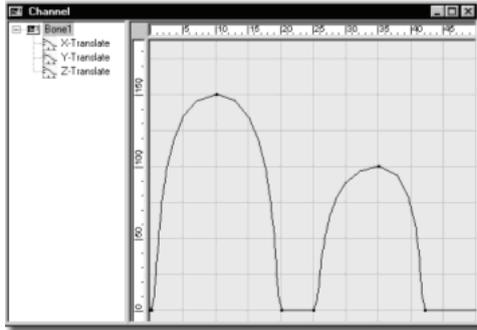
At”, and “Orient Like”, which often use target bones. Targets usually don't render, instead they are only used to help you in creating actions. Targets can be cameras, lights, bones, nulls, other objects or paths. Targets can be in the choreography's hierarchy at the root level, making them independent of the movement of any other bone, (or they can be in the hierarchy at a different level). Therefore the “Left Hand Target” can “Translate To” a waving tree branch in a choreography, then the “Left Hand” can “Aim At” the target. As the character walks towards the tree branch, the left hand will look to be grabbing for the tree branch, eventually touching it if the character gets close enough, (the target is not part of the character's hierarchy so it stays with the tree branch).

Most character hierarchies include feet, and knee targets, that may or may not be used during the animation, but are used enough to be convenient. Feet targets are located at the root level of the model's hierarchy, and can have the calf bone “Kinematically” constrained to them, (when used). In this manner, wherever the feet targets go, the legs will bend appropriately to meet (via inverse kinematics). Therefore feet can remain fixed firmly to the floor. The knee targets are located at the pelvis level of the hierarchy, and remain in front of the character so that the thighs can “Aim At” them, thereby influencing the kinematics for more natural motion.

Since constraints maintain relationships between frames as well as on frames, a character can be made to perform any kind of convoluted, interactive action without feet or hands slipping. The constraints using targets can be turned on and off with the enforce percentage channel so that any kind of animation could be performed: keyframed, kinematic or constrained, during the action.

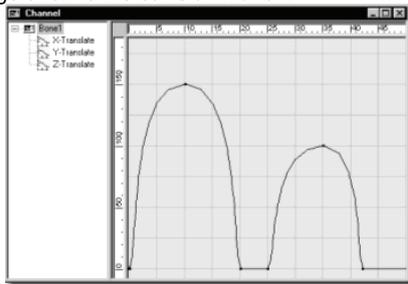
Time Based Drivers

Every motion has channels associated with it. A channel is represented as a graph showing a value changing over time. It is displayed in the Timeline view. This is not the most natural way for an artist to see animation, but it is how the computer sees it. Channel graphs use splines and control points, the same kind you use for modeling, to control values such as color, rotation, and scale during the animation. As you add new keyframes, new channel control points will be automatically created inside the appropriate channels. The curved nature of splines gives you an easy way to introduce natural “motion ease” to the animation. This is subtle acceleration/deceleration, also known as “ease in/ease out,” that we see in the motion of everyday objects. It is the control of these curves that can make a substantial difference in your final animation and allow you to finesse the performance you are striving for.



Channel for Bouncing Ball

A bouncing ball has a very easy to understand Y-axis channel. Assume you drop the ball; it accelerates downward, creating an elliptical arc in the channel as distance versus time increases. Then it impacts the floor and leaves a horizontal line in the channel because the ball remains stationary for a moment while it squashes. Then the ball bounces back up quickly but soon slows, creating a mirror of the previous elliptical arc in the channel, until the ball reaches its full bounce height. Then it repeats the motion again. The channel's graph plots this phenomena, and allows you to change the graph's curvature with the curvature handles. This allows you to add subtle detail and exaggeration to the ball's animation.



Ball Hanging in the Air

You can keep the ball hanging in the air for a much longer time than is physically possible simply by adding a horizontal plateau in the channel at the top of the ball's arc.

Once you learn how to read and understand channels, their primary purpose is quickly apparent - tweaking! Suppose some part of an action has a "glitch"; open the channel and adjust it until things look okay. Do you need

to delete a bad keyframe? No problem; channels have a full set of editing tools. Channels are the master animator's best friend.

When a channel is opened for the first time, the location and size is chosen by the software and any available data is zoomed to fit in the window. The Channel window can be manipulated with the Zoom, Move, and Scale tools, (which are retained, so if you close and re-open the window, it won't reset itself). However, zoom operates a little differently in the Channel window. In a normal view window, zoom will change the vertical and horizontal with the same proportion, but, in channels you may need to view a range of data and see where the key frames are set. So zoom allows you to change the vertical, horizontal, or both. To enter Zoom mode, click the Zoom button in the Navigation toolbar. Now click and drag the mouse in the Channel window. With the mouse button down, drag left and right to change the horizontal zoom, up and down to change the vertical zoom, and diagonal to change both. To edit a channel, open the Timeline window by picking [View][Timeline] and click the property you want to edit in the Project Workspace.

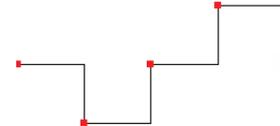
Interpolation

Default

The interpolation method used by all control points in the channel that have their interpolation method set to default.

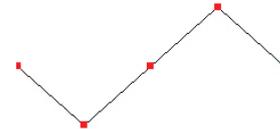
Hold

Use Hold to change the channel's value only at the control point. The changes will be abrupt and immediate.



Linear

Use Linear to create transitions with straight lines between control points and no ease. This works well for mechanical motion.



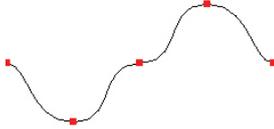
Spline

Use Spline for most common transitions. The natural ease of the spline curve adds smoothness to motions.



Zero Slope

Zero Slope interpolation allows you to specify that the splines in channels do not have a slope when they pass through a control point, which prevents overshoot. Overshoot is when the curve of the spline arcs beyond the value of the control point. It is normally desired to make fluid motion, but sometimes causes a foot to pass through the floor on the upswing of a walk.



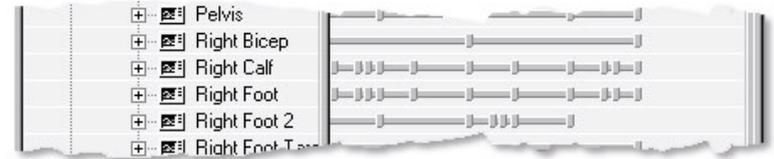
Timeline Editing

The toolbar along the bottom of the timeline window allows you to edit the information that is available in the timeline. The toolbar contains several tools to assist in editing the timeline:



Edit

When Edit mode is active, individual keyframes can be selected and moved, action ranges can be modified, and the current frame marker can be dragged to preview frames or move to a particular frame. Edit mode can also be used to edit several keyframes at once by dragging a bounding box around the desired keyframes or holding down the <shift> key and selecting them individually.



Keyframe markers in the Timeline.



Move

The Move button allows you to click and drag within the Timeline Window to see a different range of frames.

From the CD-ROM open “Data\Models\Actors\Thom\Thom.md” and “Data\Actions\Walk.act”. There is a keyframe in the walk action at frame number 6 (cel 7), and another at frame 9. Suppose you now want to insert 2 frames after frame 6. Click the “+” icon next to the “walk.act” icon in the Project Workspace tree so the channels are visible. Resize or zoom the timeline so you can see the keyframes 0-29. To zoom, give the timeline focus by clicking in it, then choose Zoom mode on the navigation toolbar or press “Z”, then click in the window around frame 29 and drag to the right until the 29 is near the right edge of the timeline. Now group by dragging a selection rectangle in the timeline. Select all of the keyframes from 7 to 29, and from the first channel to the last. If you can’t see the first channel, you can pan up and down by using the project workspace scroll bar or by selecting “Move” mode, then dragging the mouse up and down. A rectangle will surround the selected keyframes and they will highlight. Drag them to the right 2 frames by grabbing somewhere in the middle of the box and dragging to the right. The keyframes will snap by integer frames. To undo this change select undo from the edit menu or use the keyboard shortcut before placing focus on another window.



Zoom

Clicking the Zoom button then clicking and dragging within the timeline window will show you more or less of the timeline. If you want to increase the resolution in a particular range on the timeline, click the Zoom button then right-click (Command-click on a Mac) and drag a bounding box around the keyframes, then release the mouse button.

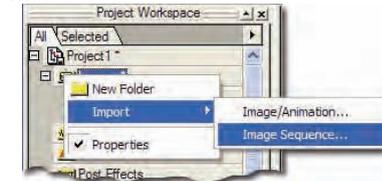
Animation Window RAM Player



Animation Window

Many times it is useful to play back a sequence of image files in real-time to view your animation. For instance, it is common to render out your animation as individual image files and later when all files have been rendered convert them to a format like AVI or QuickTime. The Animation Window allows sequence of files, AVI, and QuickTime files to be loaded and viewed in real-time and even converted to different file formats.

Import image files



To import the image files into the project, left click (Ctrl click on the Mac) on the Images folder in the Project Workspace and pick [Import][Image Sequence].



Group

The Group button allows you to drag a bounding box around several keyframe markers within the timeline editor. When you release the mouse button, the keyframes within the bounding box will become selected.

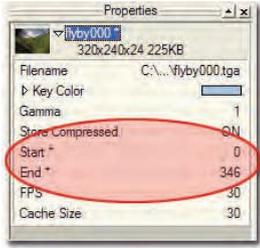
The scroll bar along the bottom of the timeline will appear when the length of a displayed item in the timeline is larger than the visible range. The scroll bar can be dragged to move along the timeline, or the arrows at either end can be clicked to move along the timeline in increments.

Any selected keyframe or group of keyframes can be deleted by pressing the <delete> key on the keyboard.

Frame Rate

Keyframes are associated with an exact time, measured in seconds. The time depends on two things: when the keyframe was created and the frame rate set for the project. With frame rate set at 30 frames per second (fps), frame "15" represents 0.5 seconds into the animation. If the frame rate is set at 24 fps, the same frame "15" represents 15/24 second, which equals 0.625 seconds, which causes the keyframe to occur significantly later in the animation. Because of this, setting the project frame rate BEFORE animating is EXTREMELY important. The default is 30 fps.

However, after the animating is complete, changing the frame allows you to render different numbers of frames per second. This means you can create a 2 hour movie, render it out at 24 fps for film with the time mode rate set at "24", then set the frame rate to 30 fps and render for video, and you will see the same 2 hours of animation with the same timing, just more frames were rendered.



Crop Start and End

The images will be loaded in sequence until a frame is missing. For example:

- Test0000.tga
- Test0001.tga
- Test0002.tga
- Test0003.tga
- Test0004.tga

Test0006.tga

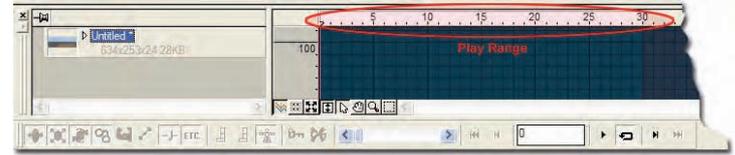
Test0000.tga through Test0004.tga will be loaded and the Crop Start and Crop End will be set to represent the frame range.



Frame Toolbar

The images can be viewed using the + or - key to change the current frame or use the Frame Toolbar. The images will be stored in memory as long as the Animation Window is open allowing for quick playback of the animation, but using a lot of the system memory. This process is called a RAM PLAYER. Click the play button on the Frame Toolbar to watch the rendered animation.

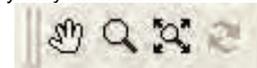
Note: The animation window will use the Skip frames if behind when playing option from the [Tools][Options] dialog's Global tab. If "ON", this feature will skip frames to play back the animation at the current Frames Per Second if it can not play back all the frames quick enough. The first time a frame gets shown it will be loaded into memory.



Play Range

Also when using the play button it will play back only the selected play range from the Timeline. The play range will be set automatically to the length of the animation or the maximum number of frames in can hold in memory. The play range can be changed by using any of the standard methods described in the user manual.

Note: If the play range is set larger than the amount of memory the system has then the playback can become very slow because it will store the images in virtual memory on your hard-drive.



Move, Zoom and Zoom-Fit

When an Animation Window is active you can use the Move <m> and Zoom <z> buttons to navigate around the image. The Zoom-fit button will set the zoom back to 100%. To make the image fit the Animation Window ctrl click the Zoom-fit button and the zoom percentage will be adjusted to a value that allows the entire image to be show.

When sizing an Animation Window the zoom percentage will remain constant. To have the image scale with the Animation Window hold down the Alt (Option on the Mac) key when sizing the Animation Window.

Save Animation As

To Save the animation as a different name or format, right-click ([ctrl]click on the mac) on the image sequence in the images folder, and choose "Save Animation"...



Save Animation

Click the ... button to select a filename, path, and file format for the animation. Click the Compression button to change the compression type for AVI and QuickTime files.

Continuous Play

Play is useful for previewing your motion. The frame bar contains the play button.



When the play button is pressed, it begins playing the highlighted range displayed in the ruler area of the timeline.



This range can be adjusted by grabbing the ends of the highlighted range and sliding them to different positions, or while the mouse is over the Time Line ruler, right-click (Control-click on a Mac). The "Play Range Settings" dialog allows you to type in the start and end time of the range. The Set Range Start and End options set the range to start or end at the mouse position. The Set Range Extents option sets the range start to "0" and the range end to the length of the action in the current window.



If the loop button is down, playing will continue looping until the play button is depressed again to stop.

On the Tools/Options/Global dialog, there is an option to have play skip frames if behind. When this option is enabled, motion will be played at the project's current frame rate. If Skip Frames is disabled, play displays every frame as fast as it can up to the project's current frame rate.

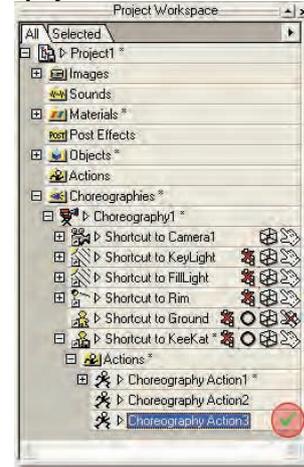
Ignore Fog

Ignore Fog

Turn "ON" Ignore Fog if fog shouldn't be applied to this object. This is handy in some scenes when the surface of the object is the exact color you want it regardless if it is submersed in fog.

Back

Current Choreography Action



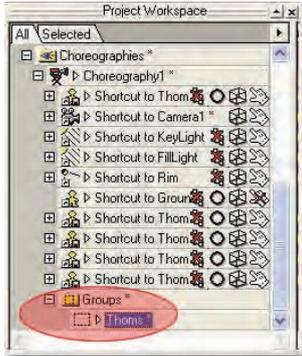
Multiple choreography actions can be layered on a character that is in a scene. If you are editing a character's motion in the choreography it is important to know which chor action you are editing. The current choreography action is marked with a green check mark in the Project Workspace. If you want your changes to affect a different chor action, select it in the Project Workspace so that it has a green checkmark next to it.

Grouped Objects

Starting with Animation:Master v11.0, you can group multiple models and objects in the choreography and use the manipulation tools on the group, rather than manipulate them one at a time. This works not only with models, but also lights, cameras, forces,

You can do this the same way you would group multiple control points in a modeling window. You can click and drag around the objects you wish to

group, making sure you are not selecting an object when you click. When a group is selected, you can name the group in the Project Workspace. When you have a group selected, a "Groups" folder will appear in the Choreography. The default name is "Untitled". Click on the name in the Project Workspace to rename it.

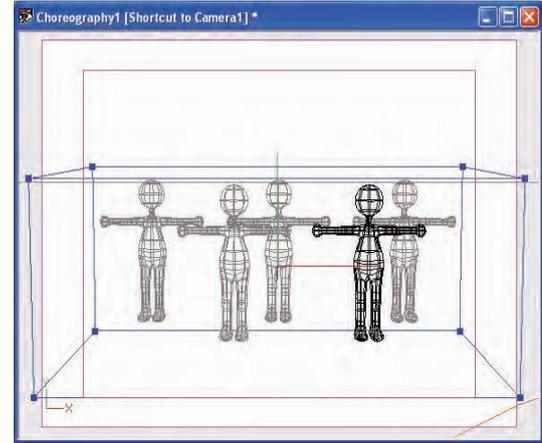
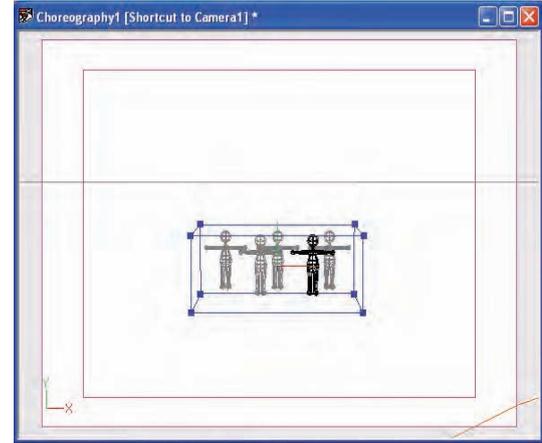


As with grouped control points, you can use the Translate, Scale, and Rotate manipulators on grouped objects.

Click the Translate button to activate the Translate manipulator for the group of objects. You can use this when you want to move a group of objects in the scene, but not change their position relative to each other.



Click the Scale button to activate the Scale manipulator. When you resize a group of objects, you are also scaling their distance from each other.

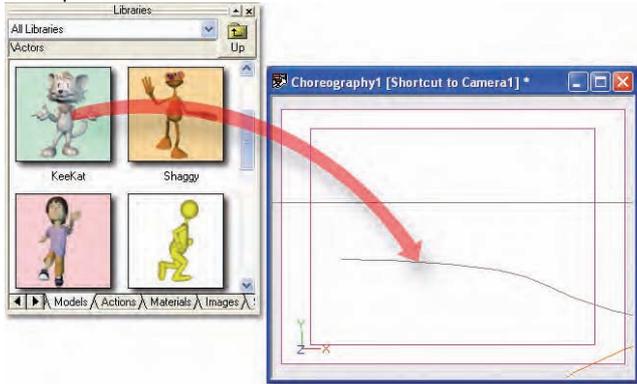


Click on the Rotate button to rotate the entire selected group. The selected objects will rotate around the pivot of the Rotate manipulator.

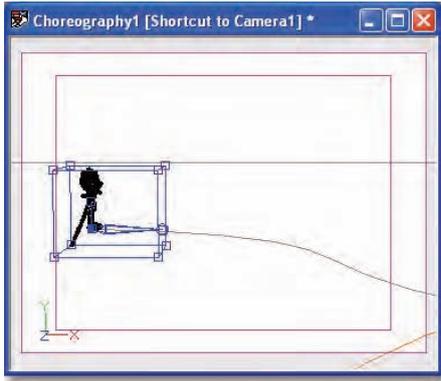


Drop Object Directly onto Path

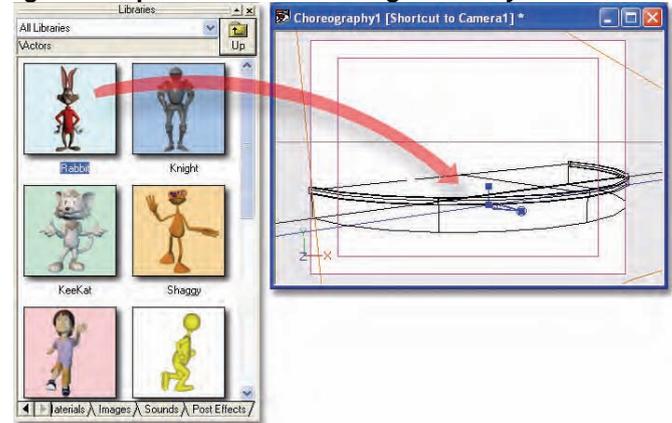
Putting models and objects into a scene is a simple matter of drag and drop, either from the Library panel, or from the Project Workspace. But, as of Animation:Master v11.0, you can drop the object directly onto a path. This will automatically add a Path Constraint to the model and orient the model to follow the path.



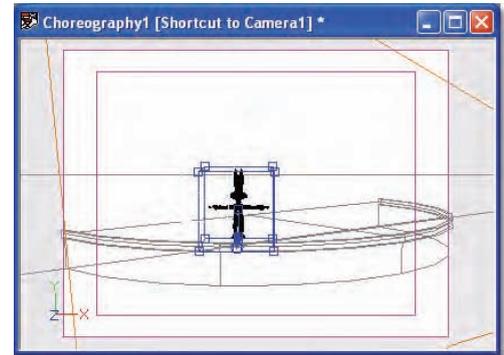
To do this, simply drag the model, and drop it so that the cursor is directly on the path line. The model is now constrained to the path using a Path Constraint.



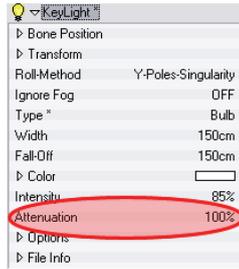
Drag and Drop Models onto Existing Geometry



When you drag and drop a model or object from the Library or Project Workspace, you can drop it open another model like a ground terrain, stage or wall, and it will automatically be positioned on it. Previously, the model would be positioned on the world's flag ground plane. This works, not only with ground oriented objects, but vertical objects like walls. The model you are dragging will be positioned against the surface of the model you are dropping onto. Unlike dragging onto a Path, a constraint is not created. The model is merely positioned to a location where it is just touching the surface of the other model.



Light Attenuation



Light attenuation determines how fast the light intensity decreases with distance from objects. 100% is the default and corresponds to the traditional A:M light attenuation. The traditional A:M light attenuation is quadratic, meaning that the light intensity decreases proportionally to the square of the distance increase. Other useful attenuations are common such as linear where light intensity decreases at the same rate as the distance increases and constant where light intensity never decreases. By setting the attenuation to 50%, the attenuation is linear and at 0% the light attenuation is constant. Values between 0% and 50% will result in attenuations between constants and linear and values between 50% and 100% will result in attenuation faster than linear but slower than quadratic.

100% Attenuation (quadratic) - This is traditional A:M light attenuation. At 100% attenuation, light intensity decreases quadratic with distance from objects. Double the distance results in 1/4 light intensity.

50% attenuation (linear) - At 50% attenuation, light intensity decreases linearly with distance from objects. Double the distance results in half the light intensity.

0% attenuation (constant) - Light intensity is constant. It does not decrease with distance to objects.

A:M Composite

Using 2D image operations is a fast and powerful way to adjust and combine your rendered images. Compositing is currently directed towards adjusting lighting without having to re-render.

Higher precision colors

Animation:Master's internal color format has been expanded to be able to save and load higher precision colors. In earlier versions the renderer used

high precision colors for internal calculations but those colors were converted to 32bit images, or 8bits per component Red, Green, Blue, Alpha. Now the renderer's output is 16bits floats (called Half or Half Float format) per component. The new format provides higher color resolution and higher color dynamic range.

Higher color resolution

8bits of color resolution per component image only allows for 256 different levels of luminosity between black and white per component. The new format, with its 10 bits of color resolution, can store 1024 different levels of luminosity per component. And now, with High Dynamic Range, black and white doesn't mean much anymore.

High dynamic range (HDR)

The new format can represent any segment or 1024 levels of luminosity within the whole practical spectrum of luminosity going from very dark moonless night scenes to a white room directly illuminated by the sun at full noon. It is actually as if we used a 40bits per component image representation.

This new representation is especially important for rendered images because rendered images need to represent a much wider dynamic range of luminosity than what the traditional image format can allow. For instance, it is not uncommon to miss some details in shadowed areas of rendered images because they become completely black or to miss some details in a very brightly illuminated part of a rendered image because it become saturated to white. With the new format, all the details are preserved.

Advantages of higher resolution and dynamic range

Here are some examples of how higher precision helps during compositing. You can brighten an image without getting banding. You could reduce an image contrast without getting flat dark grays and flat light grays. You can recover details hidden in dark shadowed areas or in brightly lit part of the image. Colors can also be stored brighter than monitor white so that colors that go above this are not lost and can be recovered in subsequent image operations.

Multiple buffers per image

Besides higher precision and higher dynamic range, V12 also brings the ability to support more than one buffer per image.

Image Input/Output plugins

Color and alpha image data can be saved and loaded with our new Image Input/Output Plugins. A:M's new Image plugins can save and load from

8bits per component up to 32bits per component if the image file format supports it.

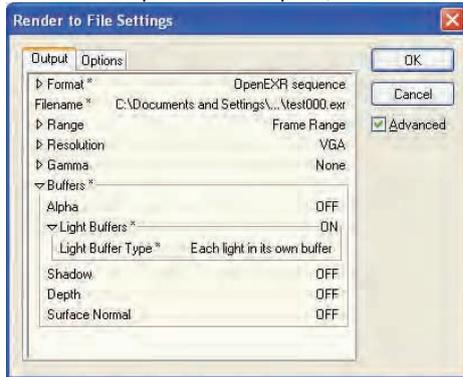
OpenEXR file format

The OpenEXR format (.exr) is one of the few formats that can save the higher precision data and multiple buffers, and is versatile enough to store any additional information that can help use its buffers without requiring explicit file format extensions. For this reason, the OpenEXR file format was chosen to support the additional functionality required by A:M Composite.

Light Buffers

By default the render only outputs the standard color-alpha buffer. If you turn on light buffers in the output options, one or more light buffers will be rendered also. These multi buffer images can be saved with the OpenEXR plugin which also supports the higher precision data.

To get started render out an interesting choreography with at least 3 lights. The Toys.prj from the Extras DVD is a good one. Render from frame 98 to 108, saving to an .exr sequence, with light buffers on and each light in its own buffer. Set the render options to multi pass, no reflections.



By default light buffers are off. If you turn them on they default to "Light Buffer Objects", which means that all lights will be in a single buffer unless you pick "Insert Light Buffer" from the choreography's context menu.

Start a new project. Load the image sequence you just rendered.

Notice that there is a plus sign in the Project Workspace (PWS) on this animation. If you crack open that plus sign you will see all of the buffers rendered.

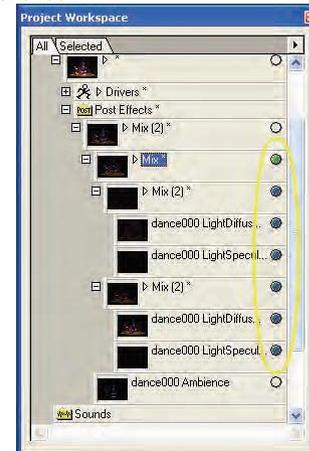
Making your first Composite Object

Now we'll show how to use these new buffers. Right-click on the image sequence in the PWS and choose Build Composite. This will build a composite based on the names of the buffers. The composite will contain buffer shortcuts to the light buffers, and the post effects needed to combine them.

Using Composite views

Now let's see how we can adjust the lighting. Double click on the composite to open a window for it.

Notice that in the PWS there is a dot on the left side of each post effect and buffer shortcut under the composite. Clicking a dot will make that element of the composite what is drawn in the composite window. The color of the dot tells you if the element is what is drawn in the composite window (green), or if it is an input of what is drawn (blue), or if it is not an input of what is drawn (grey). If you click a green dot or the composite's dot the whole composite will be the drawn element. You can use this dot to see what the effect of a post effect's property has on a certain step of the composite, or to view the input of a certain post effect.



Only the circled elements will be displayed in this composite's window.

Working with the properties of Mix Post Effects

Select one of the "Mix" post effects and examine its properties.

The Input1 and 2 Percents allow you to control how each input image contributes to the output of the post effect. Between 0% and 100% will lessen an inputs effect. Greater than 100% will enhance its effect. Less than

0% can be used to subtract the effect of one buffer from another. -100% can be used to difference two buffers. For now the Active property isn't implemented.

Adding Post Effects to Composites

Right-click on one of the lights buffer shortcuts and choose Insert Post Effect, Hash Inc, Tint. This Adds a tint post effect with this buffer shortcut or post effect as its input.

Making a composite from scratch

Right-click on the Images Folder and choose New Composite. Drag in a buffer, right click on it to insert a post effect. Drag in a buffer. Repeat....

Anime and Toon Rendering



Toon Example
"Slim & Tubs" image © 1999 Steph Greenberg

Traditional anime uses two-tone colors to separate the lighted-side and dark-side of objects in a scene. However, your art direction may lead you to more colors, including "toon lines" between the colors. Animation:Master has a robust multi-color anime solution that may provide a look never before seen in animation.

Anime color is a rendering option and can be controlled on many levels. You can set it for the camera object, in the rendering tab of the [Tools][Options] dialog, or on Render To File. You can also set anime color

on an object's surface properties, a group's surface properties, or on a material's surface properties.

To access the toon shading controls, first turn on Toon Renderer by picking [Tools][Options] and selecting Toon Render on the Rendering tab. Now set the Override Shading option to "ON", just under the Toon Renderer option. This will activate the Shading properties on the dialog.

In the Shading properties you can select the shading method as Standard, Flat, Toon, and Toon w/falloff. Standard is the regular non-toon shaded 3D look. Flat will use the objects color only and not add shading, making look like traditional cels. Toon will use the shading transitions that you set in the panel. Toon with Falloff will use the distance from the light to determine the overall brightness of the object. Meaning that objects further from the light will be darker.

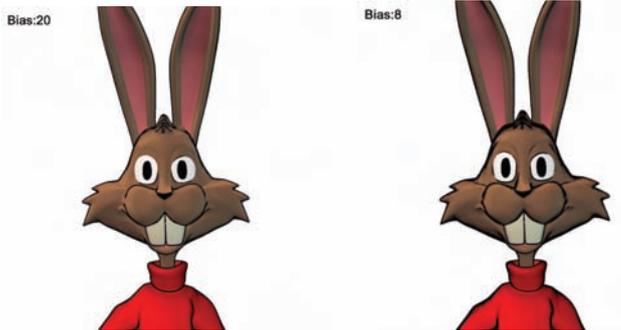
Multi-color anime uses a spectrum called a Gradient to determine the color transitions. Markers can be set by clicking on the spectrum bar. You can move a marker by moving the mouse directly over it and dragging it. Remove a marker by dragging it off of the spectrum bar. Each marker along the spectrum indicates a color boundary. Markers on the left side affect the shaded areas, while markers on the right side affect the lighted areas.

Animation:Master comes with several toon shading presets that you can load by right-clicking (Control-click) on the Gradient bar and picking [Presets] and the preset gradient you want to use. These include a hard Three-tone, a Two-tone(soft), a Two-tone(with line), Two-tone(hard), and Thermo which looks like a thermographic image.

Difference Between "Flat" And "Toon" Shading

"Flat" shading and "Toon" shading are often confused. "Flat" shading means that all lighting is ignored and the models are exactly the colors assigned to them. As a render option, this is useful for interacting with a paint program during decaling to see only the actual colors of the decals. "Flat" shading can also be set for a model that is going to be used as a Front Projection target because it is supposed to be exactly the same as the Front Projection map (except the shadows from "Shadow Only" lights). "Toon" shading, on the other hand, only ignores diffuse lighting and lighting falloff, but recognizes the direction of the light so that part of the surface remains unlit. Toon shading shows specular highlights, and Toon shading can be made to include light falloff. Toon shading also implies that "lines" will be drawn around the models.

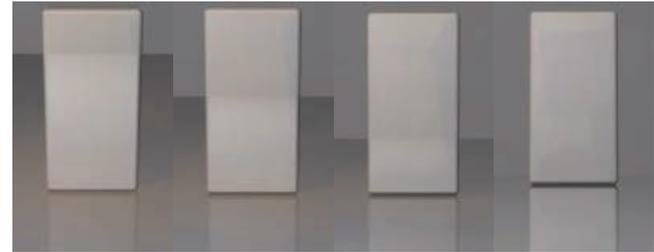
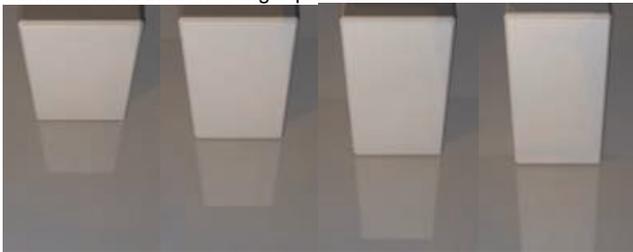
Cartoon Bias



Cartoon lines are very dependent on “Bias”. Changing Bias will subtly change the line thickness and amount of detail. Different characters can benefit from having different Bias values. The “Bias” setting under the “Toon Render” item applies for every character. (Remember, turning “Override Lines” on will ignore these settings). Traditional cartoon shading uses the “Cartoon” gradient, (this is default). The “Anime” gradient adds another color that depends on the light’s location. The above images show the bias set to 20 and 8. Notice how a bias value of 8 shows more detail in the toon lines than the bias value 20.

Fresnel Term in Reflections

Reflective surfaces become more and more reflective as the angle of view approaches a grazing angle. Even a partially reflective surface theoretically becomes 100% reflective when the angle of view is parallel to the surface. This is called the Fresnel term. Reflections, either soft or sharp now include the Fresnel term in the rendering equation.



The floor has a reflectivity of 30% but as the angle of view approaches a grazing angle, reflectivity approaches 100%. In the last image, the block reflection on the floor is almost as clear and bright as the block itself and the floor also better reflects the wall behind the block.

The Fresnel term gradually affects the reflectivity of the surface as the angle of view changes. But it really starts to be noticeable at less than 10° from the surface.

Multi-Pass Rendering



By default, “Final”, render preset uses an A-buffer renderer. The A-buffer incurs some initial overhead for edge quality and adaptive computations, but generates images much faster than its “Multi-Pass” render preset equivalent, and can be efficiently used with global illumination solutions like radiosity or skylight-rigs. “Multi-Pass” rendering means that multiple render passes of the complete scene will be individually computed and averaged with each other. Multi-Pass is used for selected scenes where the light and camera jittering that happens on each pass can improve the quality of the shading. The number of passes determine the level of antialiasing: 4X4, or

16 passes, is the minimum acceptable if a "Blur" post effect is not applied.

Advantages of A-Buffer Rendering

- Much faster for the same Multi-Pass equivalent of antialiasing.
- Practical for global illumination, like radiosity or light rigs.
- Better bitmap fidelity.

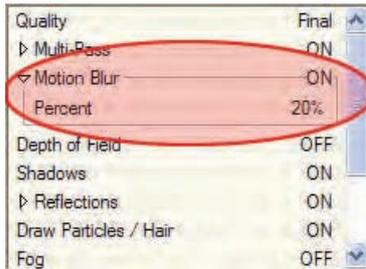
Advantages of Multi-Pass Rendering

- Light jittering adds some global illumination, including penumbral shadows. (The A-buffer has "penumbral" klieg lights for a similar effect, and light rigs also provide this look).
- Physically correct motion blur, (A-buffer motion blur is adequate in most cases).
- Camera jittering blurs crisp geometry. Camera jittering can also be used for physically correct depth-of-field if enough passes (64) are used, (A-buffer depth-of-field is adequate in most cases).

Methods to Take Advantage of Multi-Pass Rendering

Since the entire scene is being rendered multiple times (1 time per pass) in Multi-Pass rendering, it is important to take as much advantage of this computationally expensive rendering method as much as possible. Here are a few tricks to giving you a higher quality rendered image at no extra cost.

Motion Blur



Use the motion blur option when rendering animations. With each rendered pass, time will be advanced slightly based on the motion blur "Percent" property. The Motion Blur percent actually represents the camera's shutter and symbolizes how long the shutter is open exposing the image during rendered. The default motion blur is 20%.



4 Pass with Motion Blur



16 Pass with Motion Blur

As seen in the above rendered images, it may take a substantial number of passes to remove the strobe looking motion blur caused by inadequate number of passes.

Depth of Field

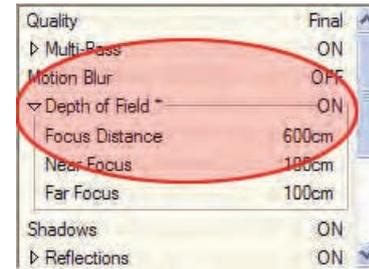
Focusing the camera on objects of importance and allowing the foreground and background objects to be out of focus can be a very desired filming technique. Multi-Pass rendering depth of field adds no render time expense, but the same applies true with inadequate number of passes using depth of field as does with motion blur. With each pass the camera is slightly moved to render the scene from a different angle causing near and far objects to become blurry.



Depth of Field (DOF)



No Depth of Field



Depth of Field Property

To render your scene using depth of field, turn on the Depth of Field render settings on the camera or in the Options Dialog Rendering tab.



Depth of Field manipulators

When the Depth of Field property is set to "ON", the camera will display the Depth of Field manipulators when selected. Use the Focus Distance manipulator to set the focal point, and the Near and Far Focus manipulators to set where the out of focus starts.

Light Width

When multi-pass rendering the light width can be used to simulate area lighting, global illumination, and penumbral shadows. For each pass the light will jitter inside the area defined by the light's width property giving a different lighting angle. The benefits from this are endless. Shadows will have crisp edges closer to the object casting them and fall off as the distance increases. Surfaces will be lit from multiple angles giving more accurate specular highlights.



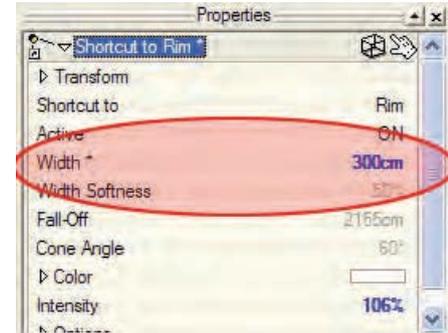
Light Width of 0



Light Width of 80



Light Width of 300



Light Width Property

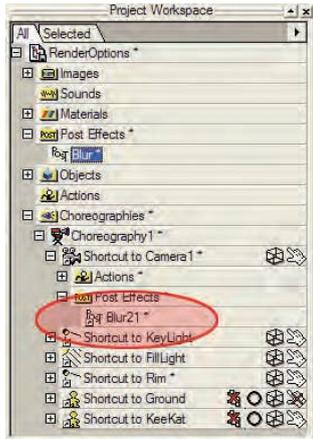
4. Soft Antialiasing - The multi-pass render can be set up to have a different averaging mechanism used for combining each pass. This averaging technique slightly softens the image but gives the appearance of smoother antialiasing especially at lower passes. To invoke this softening effect use the Blur post effect on the camera with a softness value of 0. Note any softness value larger than 0 will invoke a true blur on the rendered image.



4 Pass

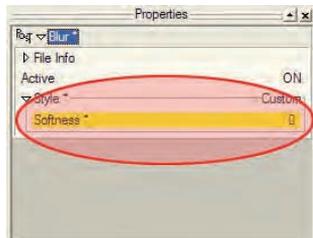


4 Pass with Blur Post Effect



Blur Post Effect

See Post Effects for information on how to use them.



Blur Softness

Turn Softness ON to invoke the Multi-Pass softening pass averaging technique.

Photorealism

As Computer graphics has evolved and matured, it has been faced with the challenge of reproducing real-life, called "photo-realism". Telling a story has always been our goal but this priority has often run smack into the photo-realism juggernaut. There are many people in the computer graphics

industry that dismiss any attempts at something less than absolute physical reproduction as somehow flawed. Therefore, Animation:Master has a lot of work put into it to make it photo-realistic capable.

Stated simply, "Photo-realism is the lack of clues that the 3D rendering is not a photograph." A simple vase on a table gives many, many clues to the viewer that the picture is not "real". For example, the raytraced shadows may have too prominent of edges; the vase's profile may be aliased. The decal on the vase may be aliased, or the lighting on the vase may be too harsh. The list seems endless but if you are careful you can overcome each clue one-by-one until the lack of clues prompts to viewer to state, "it looks real!"

There are other things that make the image more appealing, such as a rough surface on the vase or an algorithmic wood grain on the table, but these items DO NOT impact photo-realism unless they look incorrect.

Photo-realism requires endless fine-tuning, one picture may take weeks to perfect. Photo-realism is so difficult because everybody is an expert on what looks "real"; there is no "almost realism". Luckily, there is no such requirement for storytelling. Like film, stories make their own reality.

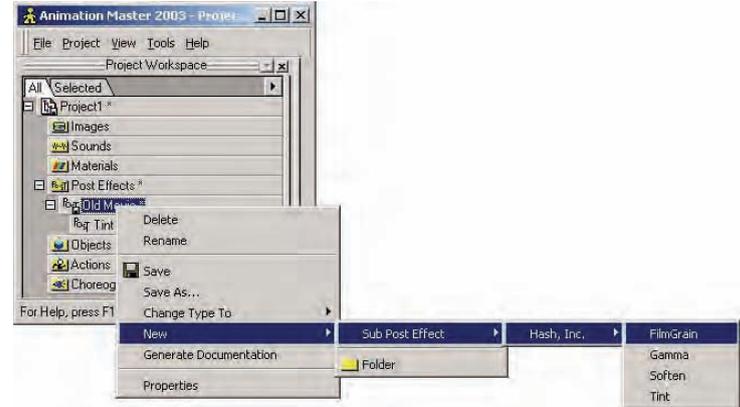
If you choose not to attempt photorealism, but instead focus on telling stories, our animator's hearts go with you.

Post Effects

Post Effects are used to modify the output of a camera, or image objects. For example a Tint Post Effect can be used to make your renderings black and white, or sepia toned etc.



If used on a camera they are applied when a Choreography is rendered from the camera's point of view. To use a Post Effect, just drag the ones you want onto the camera or image you want to adjust. A Post Effect Container will appear with the Post Effects listed in the order that they will be applied.

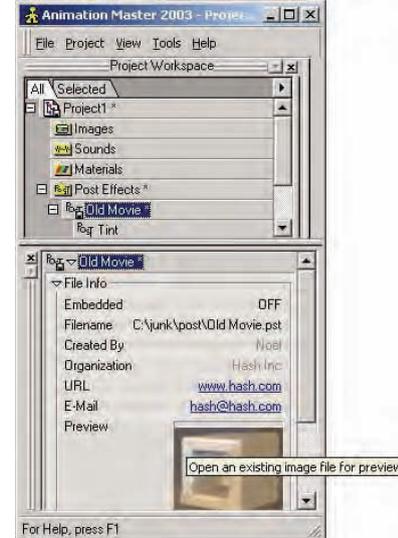


Library Panel

If you make your own Post Effects they can be saved, with a preview image under its File Info property, and added to the Library panel for easy reuse.

Re-using Post Effects

If you wish to reuse a sequence of Post Effects, you can create a new Post Effect by right clicking (Ctrl-clicking on Mac) on the Post Effect Container in the Project Workspace, and picking [New][Post Effect]. You can then add a series of Post Effects that will happen with this Post Effect, by right clicking (Ctrl-clicking on Mac) on the Post Effect and picking [New][Sub Post Effect] and picking one from the list. You can also save a single Post Effect with specific settings that you want to reuse between projects.



Render Issues

Still Images Verses Animation

Animation:Master, of course, focuses on the creation of animated pictures - moving pictures. Images that animate, one to the next, with only slight variations, and watched for content, have different requirements than images intended to be viewed as stills on posters and press shots. For still images, draftsmanship and fidelity are paramount, but the quality of the animation is what's important for moving images. These two differing needs have different rendering requirements. Still images demand crisp lines that hold up to close scrutiny. Animated images need some blur to minimize the strobing caused when things move. Still images can contain radiosity, or some other computationally expensive environment, while animated images cannot be burdened by the render times or possible temporal aliasing of global illumination.

Material Pre-Antialiasing Verses Adaptive Sampling

In the A-buffer, materials are pre-antialiased for better efficiency during raytracing or global illumination. In contrast, if the materials were adaptively sampled at render time, extra, high-cost shading calculations would have to occur simply to antialias the material. For example, a red/white checkerboard material may need as many as nine samples per pixel to properly antialias, yet each adaptive sample might also incur photon-map and/or raytrace calculations. So the trade-off is to do, as few as four to as many as nine, material samples before shading, thereby keeping expensive shading calculations at a minimum. However, in some obscure cases, the extra material samples might actually take more time than the shading, but overall pre-antialiasing materials is a time saver.

Bitmap Scanning Verses MIP-Mapping

The A-buffer also has the advantage that it truly antialiases bitmaps, called scanning, which is crisp at all orientations. Multipass uses MIP-mapping for speed, since the bitmap must be accessed on every pass, (the A-buffer uses MIP-mapping for pixelwidths larger than 5, and bump maps). However, a problem with MIP-maps is, due to perspective, the amount of bitmap covered by a pixel, called its "pixelwidth" that is used to determine the MIP level, may be distorted. For example, the horizontal pixelwidth may be less than 1, while the vertical pixelwidth may be greater than 3. If the smaller pixelwidth were used, the image would alias, both spatial and temporal, and using the larger pixelwidth would cause abnormal blurriness. Therefore, Multipass will use bitmap scanning for perspective distorted pixels, (a common example of perspective distorted pixels is a checkerboard ground receding into the horizon).

Render Speed

A typical image rendered in Animation:Master is very fast, one of the fastest in the industry. However, it is easy to choke the renderer to a standstill. The common culprits are, (in order of frequency):

- Raytracing operations like:
 - Mirrors
 - Raytrace shadows (especially multi-ray soft shadows)
 - Transparency from a "complex" material, or with "density" or "refraction" (but not plain transparency)
 - Boolean operations
- Complicated "complex" materials (with many combiner nodes)
- Roughness (because it requires a lot of antialiasing)
- Hair! (especially for the A-buffer because thin geometry, like hair, has little inner-pixel coherence)
- Image size
 - A 2000 X 2000 image takes 64 times longer to render than a 512 X 512 image. When using the A-buffer, images larger than 2000 X 2000 are never required.
- Volumetrics (with small step sizes)
- Complex light rigs
- Radiosity (sometimes, a single image can take many, many hours – but acceptable radiosity times are possible)
- Multi-pass (for 3 or more passes)
- Particle systems
- There is no recommendation of when to use particular render settings – art is subjective. Just be aware of the time penalties involved and set your expectations accordingly.

Render Shader Plugins

Animation:Master allows you a great deal of control over the look of your final rendered images and animations. You can control the physical attributes of models, the lighting, and setting the toon lines and toon shader.

But, you can affect rendering at a much lower level with Render Shader plug-ins. You can substitute new render shaders to override the default rendering algorithms.

Rendering a three-dimensional scene is a very complex process, but it all boils down to how light illuminates surfaces. Each visible point of a surface goes through a separate diffuse and specular calculation that determines its appearance. Over the years, a number of algorithms have been developed to calculate the diffuse and specular components of lights on a model that usually depend on the light's position in the scene and its intensity, each having differing characteristics that may be appropriate for the "look" you want.

When defaulted, Animation:Master's renderer uses the "Lambert" algorithm for the diffuse component, and the "Phong" algorithm for the specular component. Most users will want to use the default renderer because it is fast and familiar.

A render shader can be applied to an entire scene as a Camera setting, on a whole model as a model attribute, on a group as a group attribute, or on a material. (That material can also be applied to a group, or a whole model). All of the attribute precedence rules that are used for materials and model settings are in effect here, so you have unprecedented control over how objects and scenes are rendered.

*** **CAUTION** ***

Render shaders are not currently supported as a render option, or as a NetRender render override. This means that you must set the render shaders in the Camera's properties rather than on the render panel. You want to make sure that the Render tab settings do not override the camera settings. To do this select "Render Shaders" on the Camera Properties "Final Options". Make sure the "Just non-camera views" option is selected on the [Options][Rendering] tab, otherwise the shaders selected in the camera will not work.

Deciding to Use Render Shader Plug-ins

Rendering with a plug-in shader can cause a dramatic slow-down in rendering depending on the algorithm used, and since the render shaders can be embedded in materials and object properties, you must actively decide to use shaders by selecting the "Render Shaders" option either on the [Options][Rendering] tab, or in the Camera Properties "Final Options". If this option is not selected, the default renderer will be used. (They will also be used if the shader plug-in cannot be found or opened).

Using Render Shaders

There are two kinds of render shader plug-ins; Diffuse and Specular. Diffuse shaders are likely to be more useful: they control how light affects the shading and/or color of the model. By using a diffuse render shader plug-in, you could make a scene, a model, or group, appear softer, or

perhaps drawn or sketched. Specular shaders control the look of the highlight part of a model. You could write your own custom shader plug-ins for special needs.

After selecting "Render Shaders" in the Rendering tab, or the Camera Properties dialog, you can select the diffuse shader, the specular shader, or both. You will select these options, either on the Camera Properties, Model Properties, Group Properties (after selecting "Group has color"), or on the Material Properties dialogs. Select the "Shaders" tab. When either the "Diffuse Shader" or "Specular Shader" options are selected, you can select the shader you wish to use from the appropriate list. A shader plug-in can contain either or both diffuse and specular functions. Only the appropriate shaders will appear in the list. The default diffuse shader will be used if the "Render Shaders" option is not selected, the "Diffuse Shader" option is not selected, or the selected shader can't be found or loaded. The same is true for the default specular shader. However, you can mix the default shader with a plug-in shader. When you activate and select a shader, its Properties tab will appear on the dialog, (if it has one).

Diffuse Shaders

Gradient

Animation:Master uses this for its default anime shading. (Even though there is a plug-in available, it is only a programming example for aspiring plug-in authors).

Oren-Nayar

This shader simulates surfaces that have rough diffuse qualities like plaster, sand, clay, and cloth. The effect is a softer look that is less dark in the shaded areas. There are two settings on the Oren-Nayar tab. "Roughness" controls the amount of micro-facets from 0 to 100. A value of 0 will make it completely smooth and the shading will look the same as Lambert shading, and 100 will reduce the contrast between shaded and bright areas. "Brightness" controls the overall brightness of the model. You can use values from 0 to 300 to control the intensity of the light bounced back to the camera from lights off the model.

Ambiance

This shader allows you to select a color to use on areas of objects that are in shadow. It can be used for back-lighting effects.

Specular Shaders

Anisotropic

This shader creates the illusion of brushed metal. By setting the specular color of the model to something other than the base color, you can create interesting effects. The Anisotropic tab allows you to control the Grain

Direction, and the X and Y Roughness. The Grain Direction type-ins range from 0 to 100 and are oriented relative to the object's pivot. The X and Y Roughness are also values from 0 to 100, and control the amount of specular highlight. A higher value will cause a stronger highlight.

Render Preview



Render Preview Button and Window to Render

Many times during animating you want to test render your scene but don't really care whether the test render is saved or what size it is. To create this test or preview render click the Render Preview button on the render toolbar, then left click in the window you would like to create the preview render of. To render only a section of your window right click (Ctrl click on the Mac) and drag a bounding rectangle around the desired area of your scene instead of left clicking in the previous step.



Animation Window

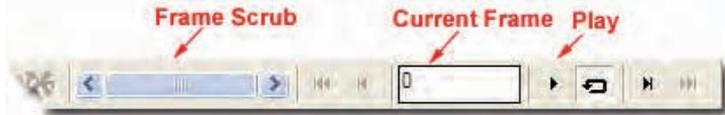
After selecting the window to preview render, an Animation Window will appear to display the rendered frames as they are completed. The preview render will use the render settings from the [Tools][Options] dialog on the Rendering tab or possibly the current camera if the window to be rendered is in camera view and the "Non Camera Views" option is "ON" in the [Tools][Options] dialog on the Rendering tab. The size of the rendered images will be the exact same size as the window you clicked in to create the preview or the bounding rectangle you created to render a portion of the window. The rendered animation will start at the current frame of the window being rendered and will render to the end of the animation unless aborted.

Abort

While the animation is rendering you can click the Abort button on the Animation Window to quit rendering. A small icon animation next to the abort button will play showing that the animation is currently rendering.

Save As

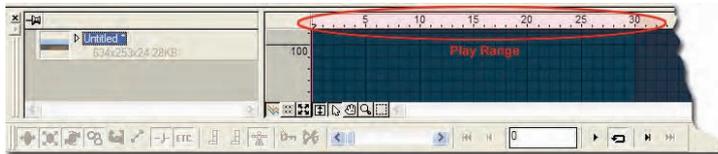
Once the render has completed or has been aborted, the Abort button will be replaced by a Save As button in case you would like to save your results. Notice how the small icon animation next to the button is no longer playing because the rendering has stopped. Preview renders are temporary images and will be permanently deleted when the animation window is closed unless you click the Save As button or [File] [Save As...] menu first and save it to your hard drive.



Frame Bar

After the animation has completed rendering or has been aborted you can view the rendered frames by using the + or - key to change the current frame or use the Frame Toolbar. The images will be stored in memory as long as the Animation Window is open allowing for quick playback of the animation, but using a lot of the system memory. This process is called a RAM PLAYER. Click the play button on the Frame bar to watch the rendered animation.

Note: The animation window will use the Skip frames if behind when playing option from the [Tools][Options] dialog's Global tab. If "ON", this feature will skip frames to play back the animation at the current Frames Per Second if it can not play back all the frames quick enough.



Play Range

Also when using the play button it will play back only the selected play range from the Time Line. The play range will be set automatically to the length of the rendered animation or the maximum number of frames in can hold in memory. The play range can be changed by using any of the standard methods described in the user manual.



Render Status and Render Options

While the animation is being rendered the rendering status values like percent complete, current frame, and time remaining can be viewed on the status tab of the Animation Window.

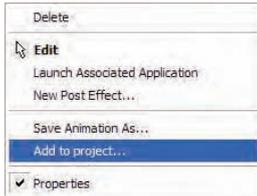
The render size and render options used to render the animation can be viewed on the Options tab of the Animation Window.



Temporary Animation

While the Animation Window is open the rendered animation will show up under the Images folder in the Project Workspace. Notice the animation's name and file size information are grayed out, showing that this animation is

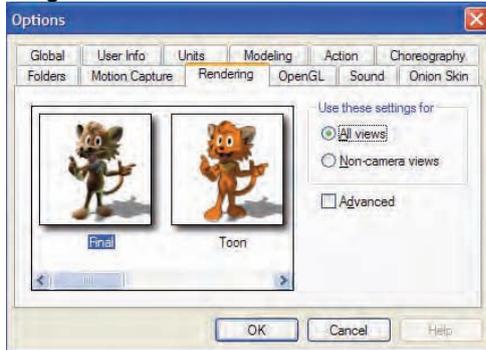
not part of this project and is temporary. If the project is saved this animation will not be part of it because it is a temporary object. When the Animation Window is closed the animation will be removed from under the Images folder, and if the animation was never saved by clicking the Save As button or Save As menu then it will also be permanently lost.



Add to Project

If you would like to add the temporary animation to your project so it could be used by other objects in the scene, or so it will be saved and loaded with the project, then right click (Ctrl click on the Mac) on the animation under the Images folder in the Project Workspace and pick [Add to project]. If the animation has never been saved you will be prompted at this time to save it. Many times you might want to add temporary renders to your project that might have different render options so you can review them later while deciding which render options to use when rendering your final animation.

Render Settings



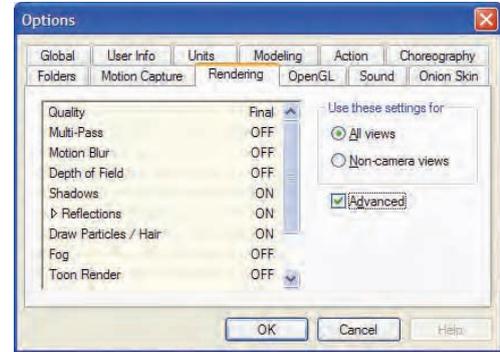
Non Advanced Mode

The Rendering Tab in the Options dialog now can be displayed in standard or advanced mode. The standard mode displays presets that have common

configurations of the most frequently used rendering options. Simply click the preset that represents the rendering style you would like to use when you next render.

All views / Non-camera views:

When the "All views" option is set, the rendering options you choose will be used when rendering any window. If "Non-camera views" option is set, then the selected options will be used only when rendering a window that isn't in camera view, the camera views render options will be used instead.



Advanced Mode

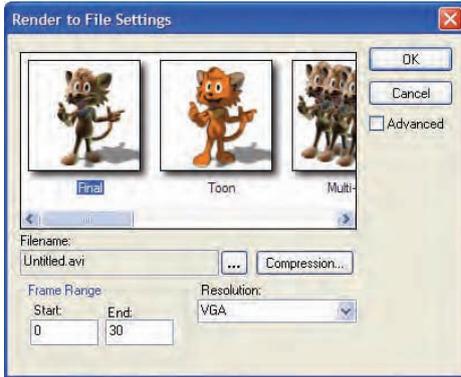
When the Advanced mode option is checked, the presets window is replaced by the actual render options. This allows for more specific control over the render options. Changing these options has no effect on presets, it is just another way of selecting the current render options.

Render to File

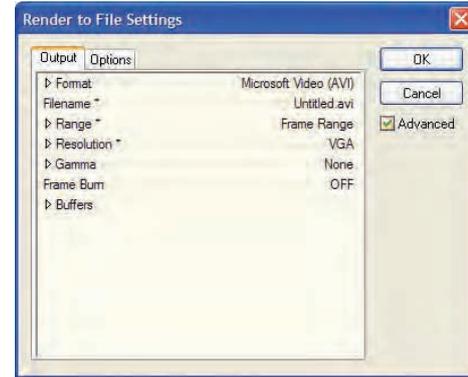


Render to File

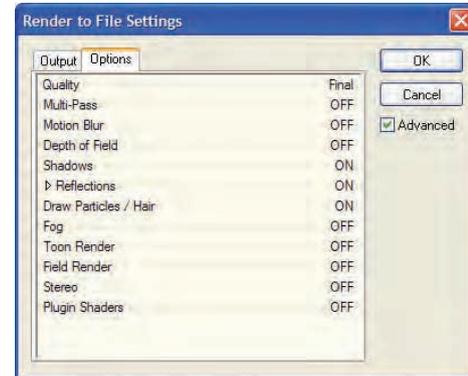
To render the current window to a file click the Render to File button on the Render Toolbar. The Render to File settings dialog will open for you to select the render and output options.



Non Advanced Mode



Advanced Mode : Output tab



Advanced Mode : Option tab

Presets

The Render to File settings can be displayed in standard or advanced mode. The standard mode displays presets that have common configurations of the most frequently used rendering options. Simply click the preset that represents the rendering style you would like to use.

Filename

Select a filename, location, and file format for the rendered animation. If a movie format like AVI or QuickTime is chosen then the compression settings button will be available.

Frame Range

Frames to be rendered.

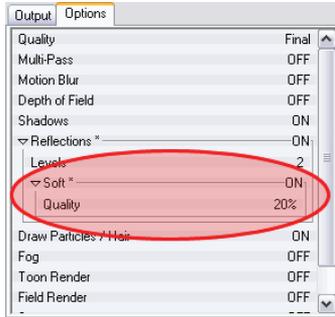
Resolution

The resolution presets control the width, height, and aspect of the rendered animation.

Advanced

When the Advanced mode option is checked, the Presets Window is replaced by the actual rendering output and option settings. This allows for more specific control over the options. Changing these options has no effect on presets; it is just another way of selecting the current rendering options.

Soft Reflections



Soft Reflections settings

You can enable soft reflection by setting ON the "Soft" property of the render options panel. The "Quality" property determines the number of samples used to compute the soft reflections. The higher quality requirement is more critical for surfaces with very wide soft reflections. The soft reflection works by sending out multiple reflection rays so this can be CPU expensive especially for large specular sizes which requires more reflection rays than small specular sizes. Soft reflections are limited to one level. This basically means that any secondary soft reflective surface will be treated as sharply reflective. This is to prevent exponential render times.

The sharpness to softness of each surface reflection is determined by the surface "Specularity size" property. A small specularity size will produce tight soft reflections and sharper reflected images while a large specularity size will produce wide soft reflections and blurrier reflected images.



soft reflection, 10% specular size

soft reflection, 50% specular size



soft reflection, 200% specular size

soft reflection, 400% specular size



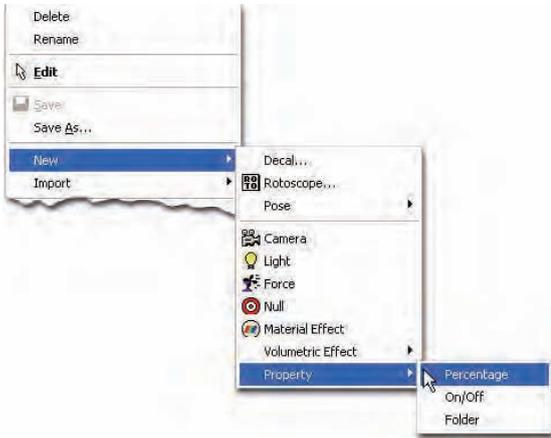
Reflective sphere without soft reflection

soft reflection, 5% specular size

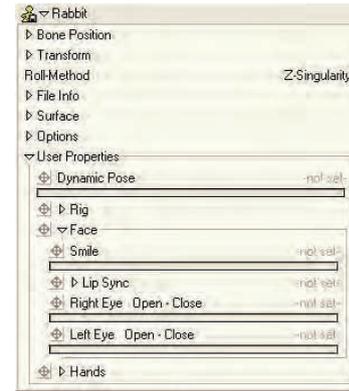


soft reflection, 10000% specular size

User Properties



Almost all objects with in Animation Master can have custom user properties added to it. To add a user property simply right click (Control click on the Mac) on the object and choose [New][Property][Property Type]. User properties are used as a controlling property for a Relationship. For instance you could add a Percentage property to a model and then create a relationship for this property that would move bones and CPs based on different values of the percentage. This is known in previous versions of Animation Master as Poses, but in Animation Master 9.0 and newer poses simply became a Percentage property that drives CPs and bones through a relationship.



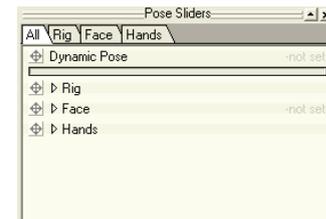
Rabbit Models User Properties

When a user property is added to a model it will appear under User Properties in the model's property list. Notice how the Rabbit's user properties are categorized into different folders (Rig, Face, and Hands). This was done by adding Folder Properties. To add a Folder Property right click on the model (Control click on the Mac) and select [New][Property][Folder].



Reordering Properties

To reorder a property click and drag on the four arrow icon just to the left of the property's name and drop it to its new location.



User Properties will also show up on the Pose Panel when the Model is selected in a Choreography or Action View. Each Folder (Rig, Face,

Hands) that we added will appear on the All tab, along with its own tab as shown above.

User Containers (Folders)

A User Container is a folder in the Project Workspace tree that you can create to organize your data. Create a User Container by right clicking (Control-click on the Mac) and picking [New][Folder]. The new container will take on the characteristics of its parent container. Therefore, if you create a new folder in a model's Groups container, you will only be able to drag other Groups into it. User Containers can be used to organize any kind of data.

Draw Modes

With the mouse pointer over any window, right-click (Control-click on a Mac) and pick [View][Render Mode] and select one of the options to change the interface Draw Mode.

You want all of the work you do with the software to have a tactile and responsive feel. On a slow Machine, maybe only wireframes are possible for real-time operation. Your choices are "Default" which will use the option you have chosen on the model properties panel, "Wireframe", "Shaded", or "Shaded/Wireframe". In addition, each object can be "Bound" (shows a box only), "Vector" (straight lines), or "Curved".

If drawing is still too slow, you can also use a feature called "Interrupt Drawing" which allows the speed of the interface to be set at a minimum quality. This can be set on the "Global" tab of the Options panel by picking [Tools][Options].

You can also speed up drawing while in Shaded mode by lowering your "Polygons per patch" on the "Rendering" tab on the Options Panel.

Perspective Draw Mode allows you to view an object or scene in much the same way you would through a camera except <shift> turn and <Ctrl> move and zoom functions are not available. (See camera navigation for more details.) This option is available in addition to shaded or wireframe modes.

Quick Options

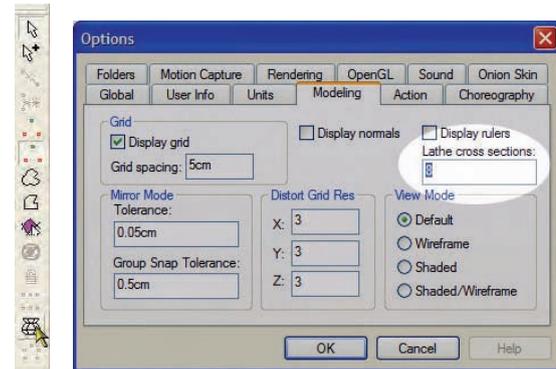


Many of the buttons have options that have always been assigned to them. For instance, when you render there are render options that correlate with it. Now if you Shift click many of the buttons that have options, the Options dialog will come up with the correlating tab selected for the options for that button.



Render Options

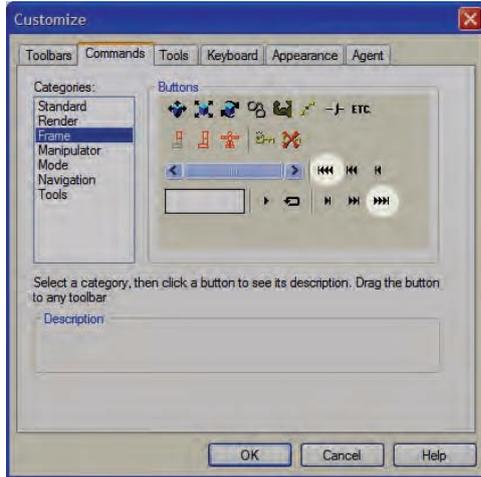
Shift clicking the Render Mode button will bring up the Rendering Options.



Lathe Options

Another example would be shift clicking the Lathe button to bring up the Modeling Options, which contains the Lathe Cross Section option.

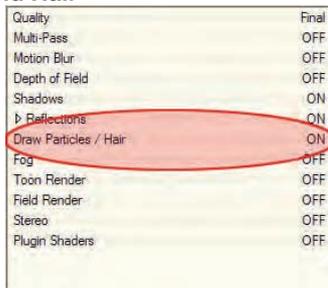
First and Last Frame Buttons can be added from Customize Dialog



First and Last Frame Buttons

First frame and last frame buttons have been added to the list of buttons that can be added to a toolbar. Simply drag the buttons from the Customize dialog to the desired toolbar if you wish to use them.

Draw Particles and Hair



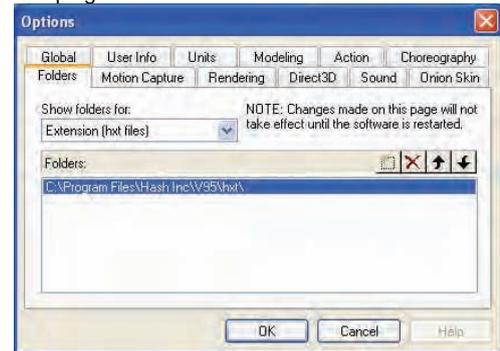
Draw Particles / Hair

Particles and Hair can now be turned "ON" and "OFF" in the Render Options. This is useful for doing render tests and you don't want the added expense of calculating the particles or hair on your model.

Plug-In Folder Locations

Animation:Master needs to know where plug-ins are located. Extension, Flocking, Shader, Turbulence, Volumetric, Motion Capture, and Texture plug-ins along with Library and Tutorial files will then be loaded when Animation:Master starts. Normally, plug-ins are put on your computer by Animation:Master's installer, but if you should write your own, or get a plug-in from some other source, you will have to point Animation:Master to where the new plug-in is located or install your new plug-in in the same directory as your other plug-ins. Pick the "Options" item from the "Tools" menu, and then pick the "Folders" tab from the "Options" panel. Click the New button to the right of the "Folders" list.

A file dialog will appear for you to specify the new path for Animation:Master to look in for the plug-ins.



Multiple paths can be specified for the same kind of plug-ins. For example, texture plug-ins may exist in two locations; the standard one Animation:Master creates and a development area where you are working on your own plug-in. The Move-up and Move-down buttons allow you to change the precedence of which location is checked first for the plug-ins. Each kind of plug-in can have its own location. For example, volumetric lighting and motion capture plug-ins may be in different development areas. Existing plug-in paths can be removed from the Path list by clicking on them to select, then clicking the Delete button next to the New button. If any plug-in paths have been changed, Animation:Master must be exited and reentered for the new plug-in paths to take effect. If plug-ins become outdated, they will no longer be included as part of Animation:Master, and will be removed from projects, models, choreographies, etc. the next time those files are opened. Similarly, if your computer does not have a plug-in

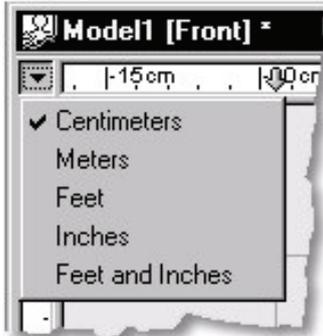
installed that is part of a file you are opening; the plug-in will be removed from the file after querying you. If you subsequently save the file with the plug-in removed, the file will no longer contain a reference to the plug-in and the plug-in will no longer appear the next time the file is opened, not even on computers that have the plug-in.

Plug-in textures may not be available for both Mac and Windows, and they may not be available from computer to computer, and they may not be available with different versions of Animation:Master. So, if you are working on a large project with other animators or a large render farm, you might use plug-ins sparingly.

Rulers

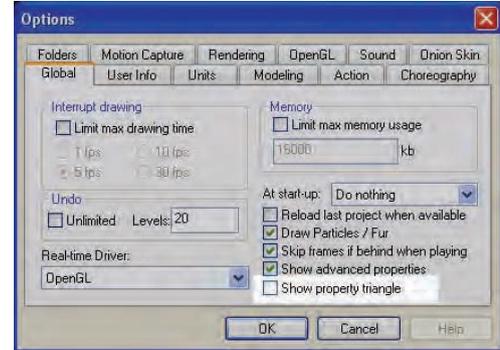


Rulers can be made visible on any window for use in keeping objects to scale. To make rulers visible on an active window, click the Show Rulers button on the Manipulator toolbar. To change the units that a ruler is displayed in, click the down arrow in the upper left-hand corner of the active window and select the units you wish to use from the available menu items.



Timeline and Project Workspace Tree Enhancements

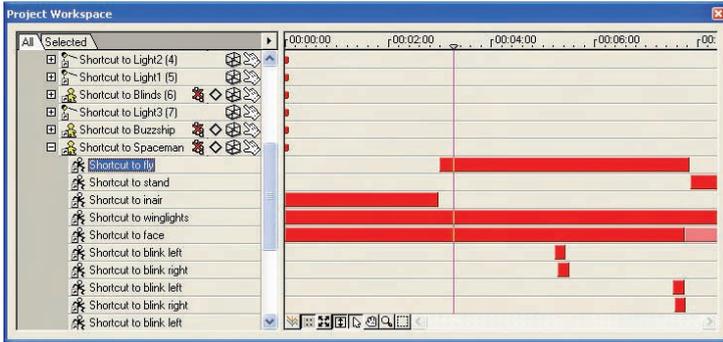
The Timeline and the Project Workspace have been simplified to work in a more efficient and self-evident manner.



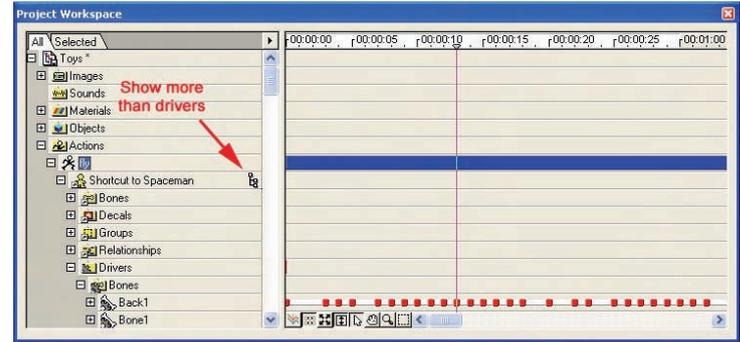
Properties of objects are no longer shown in the Project Workspace Tree by default. They can be turned on in the Options dialog.



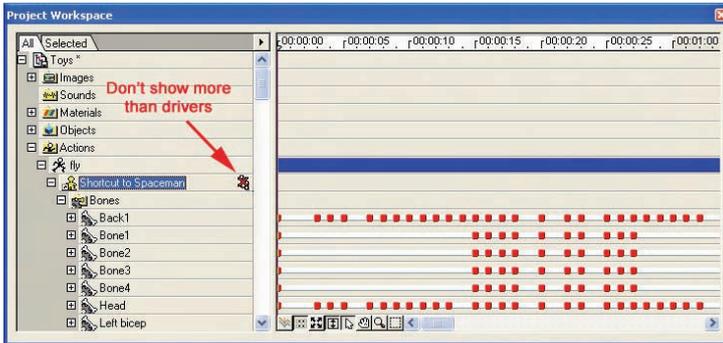
The above images illustrate the "Show Properties Triangle" option turned off in the left image and on in the right image. The selected object's properties will always show in the Timeline and Properties panel.



The tree control also has an attached timeline in addition to the timeline panel. This simplifies non linear editing greatly, and allows the animator to clearly see the timing relations of the actions.



When the option "Show more than drivers" is on then all the object's children will be shown. This is useful for animating objects which don't have an interface manipulator. For instant if you want to animate a sequence of images on a decal, or change group color, material properties, or any other object property over time.



By default the option "Show more than drivers" is off. This option is on all shortcuts of objects in a choreography or reusable action. When this option is off only drivers (Channels with keyframes) will be shown under the object. This is useful for many reasons. The drivers are shown non-hierarchical, making it easy to see objects like bones which might have a very complicated hierarchy. Also it is easy to identify and edit your motion since only the objects with motion appear.



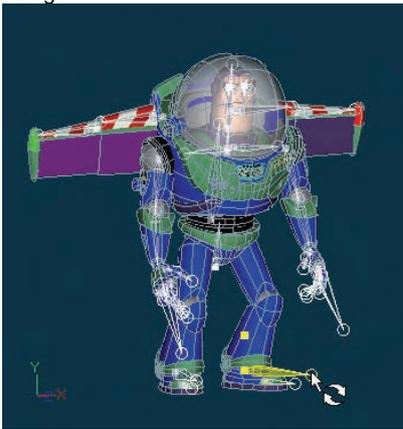
The timeline now shows the selected objects hierarchy along with it's properties.



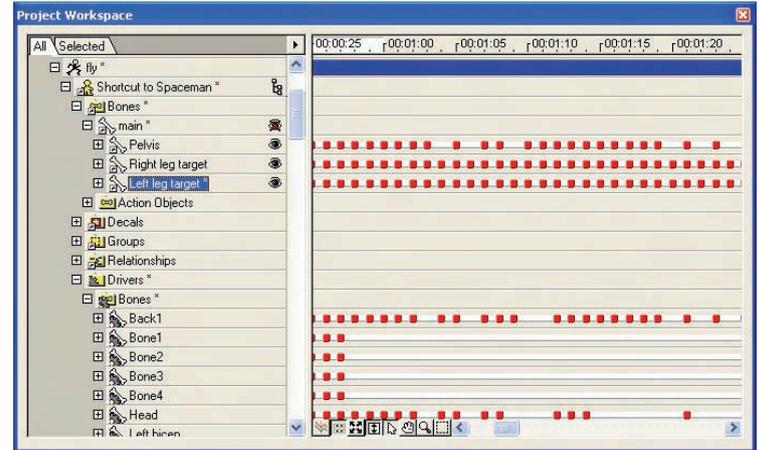
The Tack feature has been greatly simplified from earlier versions. What ever property is selected in the timeline when the Tack is enabled will always remain in the timeline regardless of what object is selected later.



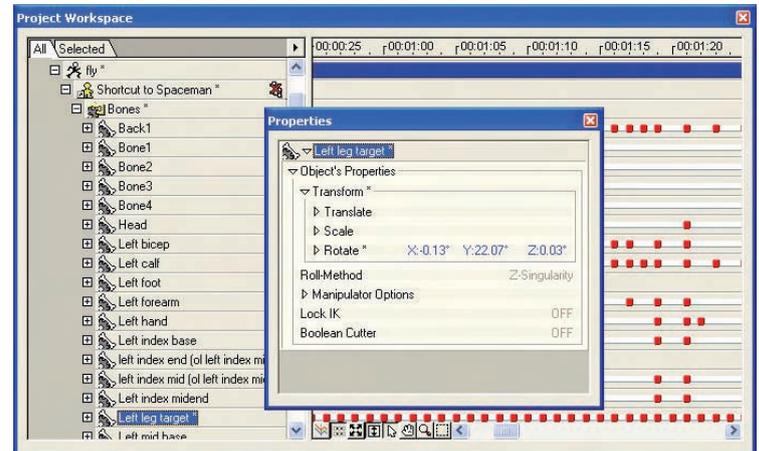
By default if you select a bone in an action or choreography window the driver will be selected which contains the keyframes. If you would like the shortcut of the bone in the hierarchy to be selected instead you may change it in the Options dialog.



Selected the left leg target in an action window.

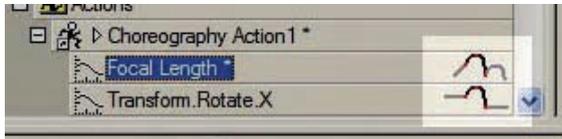


The bone shortcut was selected here because the "Select Bone" option was enabled.



The Left leg target driver was selected in the above image because the option "Select Driver" was enabled. Also notice that when a driver is selected it now contains the object that it drives property's also. This will

greatly speed up the animating process having both the driver and object properties combined.

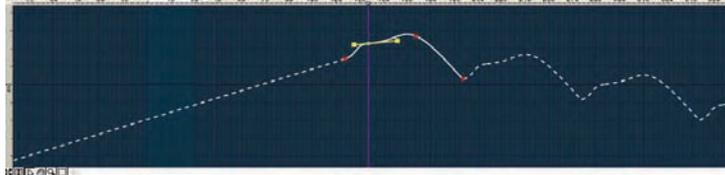


Pre and Post Extrapolation method

Channels in the timeline no longer have to have a keyframe at frame 0, thus the first keyframe could be frame 100 or even a negative frame. This allows the entire channel curve to be slide around within the channel editor, or maybe have something not start animating until frame 100, then animate for 10 frames, then repeat those 10 frames forever.

Extrapolation methods are used for evaluating a channel before the first keyframe and after the last keyframe. The extrapolation methods are set on the driver in the Project Workspace Tree or Timeline as shown above. The extrapolated frames are drawn with dashed lines in the timeline window.

A new extrapolation method "Linear" was also added. Linear will just continue the slope of the channel infinitely before or after the first or last keyframe respectively.



The above example shows both pre and post extrapolation. The pre-extrapolation method is Linear, and the post-extrapolation method is Accumulate.

Angle Representation

People and animals move so gracefully, its as if the parts of the body are independent, even though every part is connected in some fashion to every other part. What is important is that you can ultimately get the bone to do what you want. With this in mind, when the programmers were challenged with one of the more esoteric parts of computer animation, angle

representation, they had quite a convoluted choice to make. On the one hand, one angle representation method (Euler) was easy to understand but was cumbersome to animate with, while other angle representation method was difficult to describe but had very good animating properties. The programmers decided to utilize both angle representation methods, and let each object default to the most suitable method for a given situation (with the option to change it). Each angle representation technique will be fully discussed, but a quick summary might be enough for you to skip it.

Euler (pronounced "oiler") angles work great for mechanically designed animations that first rotate this way then rotate that way around common axes. They can also rotate repeatedly like wheels or airplane propellers. Cameras and lights use Euler angles. However, Euler angles do not interpolate through the kinds of motion people and animals make.

Vector representation of angles has been replaced by quaternion interpolation and it remains only for backward compatibility with older action files. Vector interpolation is unique to Hash software. It was created when inverse kinematics were first introduced in Version 2.0 in 1993. It contains four components X-Aim, Y-Aim, Z-Aim and Roll. The X, Y, and Z components define the direction the end of the bone will aim. The roll is an angle of rotation about the Z-axis.

Quaternion Interpolation achieves the smoothest possible interpolation between any possible keyframes. However, a human does not easily decipher the values stored in the channels. The channels can be used to adjust the magnitude, timing, softness and ease of the rotational transitions. Understanding the values in the channels should not be necessary to make those adjustments. Quaternion interpolation achieves the smoothest interpolation, hence it is the default. In nearly all cases it is the best choice. However in some cases, when an object needs to rotate many degrees, like a tumbling object that needs to rotate 720 degrees, quaternion is not always the best choice. Since quaternion always chooses the shortest and smoothest path, you need to manually keyframe several times each possibly 120 degrees apart to lead the object around so that it will rotate around and around. In this case euler would be the better choice.

Spherical Coordinates are simply a more visual way to express angle representation. They try to draw on your knowledge of our own earth's latitude and longitude layout, but if you don't know those either then spherical coordinates may not be helpful.

Quaternion Details

Understanding the values in the quaternion channels should not be necessary to make magnitude adjustments. For those of you that just must know, the four values in the channels consist of x-quat, y-quat, and z-quat, which hold a vector that represents the axis of rotation. So (80,0,0) would indicate that the bone is being rotated around the x-axis. The w-quat value

holds a number that represents how much it was rotated. However this number is not in degrees, rather it is the cosine of half of the angle, scaled up by 100 for easier viewing in the channels. These numbers range from -100 to 100, 100 means no rotation, and -100 which represents 360 degrees. A w-quat value of 0 represents a 180 degree rotation about the axis specified in x-quat, y-quat, and z-quat.

Euler Details

Euler angles are very common in computer graphics. Orientations of an object are represented by rotations around the local X, Y, and Z-axes of the bone. These angles are fairly easy to understand especially when only one is changed at time. Compound rotations get a little more complicated to predict. Since each rotation must be done to the data one after another, and the axes stay put as the object is rotated, Euler angles are order dependent. There are actually six variations of ordering XYZ, XZY, YXZ, YZX, ZYX, and ZXY. Animation:Master uses ZXY. Since Z rotations are done first they have the ultimate control. You can always rotate your object around the Z-Axis and know that it will roll around the length of the bone. X rotation is done before Y so that the gimbal lock location would be in the positive and negative Y directions. This location is needed less often for typical Animation:Master rotations, so gimbal lock is not all that common.

Gimbal lock is what happens when an object is first rotated in such a way that one axis of freedom lies directly on another. For example, the rotation X=90, Y=0, and Z=0, rotates the object that was facing forward to straight up. Now since the Z rotation is performed first, it rotates along the bone axis, and since Y is performed last, it is done after the X rotate, which means it also rotates along the bone axis. This alignment of the Z and the Y axes is referred to gimbal lock: it is not stuck, just limited in its possible movements since one degree of freedom has been lost. The object can be rotated around the vertical axis or the horizontal axis, but not the Z-axis that points towards us. To get to some places, one of the other angles will need to be changed first. Any orientation can be expressed using Euler, however gimbal lock causes certain areas to be trickier than others to reach.

Euler is good for multiple rotations and rotations that need constant angular speeds. This makes it a good choice for simple cases. However, Euler doesn't always interpolate the way you would expect between one keyframe and another if the rotation is complex.

Spherical Coordinates Details

The spherical coordinate system is similar to the system that sailors and pilots use to navigate around the earth, and are a useful way to describe angular limits for a bone's range. (They are never used for interpolation in Animation:Master.) A spherical orientation consists of three parts: latitude, longitude, and roll. The first two tell the bone which way to point. The roll

gives the third degree of freedom, by rolling the bone. A spherical coordinate is like a special kind of Euler angle that rotates ZXZ. Roll is like the first Z, it always rolls the bone along the length of the bone, and Latitude is like the Euler X rotation. For Spherical Coordinates, the bone starts facing the South Pole. Imagine a globe placed with its center at the pivot end of the bone, with the South Pole in the direction of the bone. The latitude is an X rotate that rotates the bone up higher on the earth (hence the name latitude). Then the longitude is like another Z rotate that rotates the raised bone horizontally around the earth to the proper time zone. Spherical is also a convenient way to express typed in rotations.

Edit Angle As

This option only affects how orientations are displayed and input. It does not affect how they are stored internally, or interpolated between keyframes. You may edit angles as Vector, Euler or Quaternion. If the edit mode is different than the interpolation mode, then a conversion will take place. Because of this conversion, what you type in may not be the same thing that is displayed when you come back to that frame. However it will be equivalent. For example -60 degrees is synonymous with 300 degrees. This option is only a global user preference and is saved in the registry. Once chosen, this will be the display method for viewing all subsequent rotations on all channels until a different method is chosen.

Interpolate As

This option affects whether the rotations are stored in the channels as Quaternion, Vector or Euler. How they are stored in the channels determines how in-between frames will be interpolated. However, it should not affect how the keyframes themselves look. When switching this parameter, if channel data already exists, all existing keyframes will be converted to the new storage mode. It warns that in-between frames may look different. Newly created keyframes use the interpolation as set in the [Tools][Options][Action] tab. Default interpolation may be set for objects (such as cameras, lights, nulls, and forces), bones, and bones at the root of a model. Interpolation is discussed in more detail in the Channels section of this manual.

Local/Global Axis

This option is most useful for vector mode. Local is the standard way to edit rotations and is what is stored in the channels. However, it is sometimes easier on a bone such as a finger to just type "0", "100", "0" in Global rather than have to take into consideration what the local space of the finger is. This will ensure that the finger aims straight up in the space of the world rather than the finger.

More on Expressions

Mathematical expressions can be used in relationships. For example, a light's intensity can be set to increase as the light's width gets larger, or the cartoon line bias can decrease as a model scales smaller. Character rigging can also benefit greatly from expressions: an angular limit may be two times the elbow's roll angle. When editing an expression, you can use values of other properties within the expression. You can do this by either typing the relative name of the property, or simply selecting the other property from the Project Workspace. You can also choose from a list of functions by clicking the function button (just to the right of the expression's name), or typing the function yourself.

Here is a list of functions available when writing an expression:

Abs(n)	Returns the absolute value of n (n without its sign).
ACos(n0...1)	Returns the arccosine of n in the range of 0 to Pi radians. The arccosine is the angle whose cosine is n.
ASin(n0...1)	Returns the arcsine of n in the range of -Pi/2 to Pi/2 radians.
ATan(n)	Returns the arctangent of n in the range of -Pi/2 to Pi/2 radians.
ATan2(y, x)	Returns the arctangent of the specified x and y coordinates, in the range of -Pi to Pi radians, excluding Pi.
Ceiling(n)	Rounds n up to the nearest whole number, where 1.2 becomes 2, and -1.2 becomes -1.
ChorTime()	Returns the current global time within the choreography. Rather than relative to the action via GetTime().
Cos(radians)	Returns the cosine of an angle specified in radians.
Cross(vec1, vec2)	Returns the cross product of the two vectors. The result is a vector.
Degrees(radians)	Converts radians to degrees.
Dot(vec1, vec2)	Returns the dot product of the two vectors. The result is a floating point number.
Exp(power)	Returns e raised to the power given.
Fact(n>1)	Returns the factorial of n, equal to 1*2*3*...*n.
Floor(n)	Rounds n down to the nearest whole number, where 1.2 becomes 1, and -1.2 becomes -2.
GetTime()	Returns the relative time within the action. When in a choreography, this is equal to the chor's time.
GetWorldPos(Returns the world position of the bone, who's

bone.transform)	transform is supplied, as a 3D vector.
If(test, true_value {, false_value})	Checks whether a condition is met, and returns one value if TRUE, and another if FALSE. The second value is optional, if omitted, the expression does not assign any value for the false case.
Ln(n>0)	Returns the natural logarithm of n.
Log(n>0, base>0)	Returns the logarithm of n to the base you specify.
LogTen(n>0)	Returns the base-10 logarithm of n.
Max(a, b)	Returns the larger of the two arguments.
Min(a, b)	Returns the smaller of the two arguments.
Mod(n, divisor0)	Returns the remainder after n is divided by the divisor.
Norm(vec)	Returns the length of the supplied vector as a floating point value.
Pi()	Returns the value of Pi, 3.14159265358979.
Radians(degrees)	Converts degrees to radians.
Rand()	Returns a random number greater than or equal to 0 and less than 1, seeded off the choreography's current time.
Round(n, modulo0)	Round n to the nearest number specified by modulo.
Sign(n)	Returns the sign of n: 1 if the number is positive, 0 if the number is zero, and -1 if the number is negative.
Sin(radians)	Returns the sine of an angle specified in radians.
Sqrt(n>0)	Returns the square root of n. n must be greater than 0.
Tan(radians)	Returns the tangent of an angle specified in radians.
Trunc(n)	Truncates n to an integer by removing the decimal, or fractional, part of the number.

The example images below demonstrate the use of expressions to maintain the volume of a character. In this case, there is a simple channel controlling the Scale.X of the model but the Scale.Y and Scale.Z are computed with an expression to keep the volume constant.

Volume is maintained when: $\text{Scale.X} * \text{Scale.Y} * \text{Scale.Z} = 1$

Therefore, add the following expressions:

$$\text{Scale.X} = \text{Sqrt}(1 / \dots | Y)$$

$$\text{Scale.Z} = \text{Sqrt}(1 / \dots | Y)$$

To maintain volume on a non-model bone, it would be more common to use Scale.Z as the controlling property, since the Z axis runs along the length of the bone. The following expressions illustrate this:

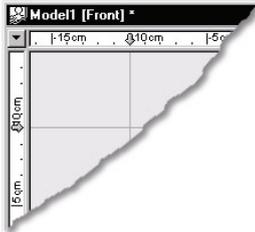
$$\text{Scale.X} = \text{Sqrt}(1 / \dots | Z)$$

$$\text{Scale.Y} = \text{Sqrt}(1 / \dots |Z|)$$



Markers

Markers are merely lines that can be placed on any window for your own use. Whether it be to line many objects up, to keep a character's hand positioned in one place in Action, or to see what pixel a particular item will be at when rendered from camera view.



Adding a Marker

To add a new marker to a window, click somewhere in the top or left ruler. This will add a vertical or horizontal marker respectively.

Moving a Marker

To move a marker, click on the marker pointer within the top or left margin. Then, while keeping the mouse button down, drag the marker to the desired location.



To precisely position a selected marker, right-click (Control-click on a Mac) the marker and pick Marker Settings from the menu. You will be able to type in a positioning value for the marker.



Removing a Marker

To remove a marker, simply right-click (Control-click on a Mac) the marker pointer within the margin and pick Clear from the menu.



Removing all Markers

To remove all the markers that have been added to the active window, simply right-click a marker pointer within the margin and pick Clear All from the menu.

There is a different set of markers for every view on every object, and each of these sets of markers will be saved with the respective file.

Reusing an Existing Skeleton

Because using established naming conventions and bone hierarchies is so important to reusability, it seems appropriate to describe how to put an existing skeleton in your own characters. Because skeleton and constraint setups are still a developing area of animation, different animators may use different skeletons, so you must choose the kind of skeleton you want (Animation:Master has the suggested skeleton "Models\Actors\2001 skeleton\2001 skeleton.mdl" located on the CD). This is important because action reusability, a big advantage of Animation:Master, requires similar skeleton and constraint setups. First, build your model. Usually you will be using some reference materials that suggest a natural skeletal layout. When finished, just import the existing skeleton (sans geometry) into your model.

Adjust the position and length of the bones to fit your model, then add or delete any bones you need to. For example, you may need to add bones for tails, long ears, hair, or whatever. If your model calls for three fingers instead of four, get rid of the ring finger, leaving the index, middle, and pinkie. One helpful thing to do is to only capitalize the first letter in the names of bones that will be visible and animatable most of the time. You will need to hide all the appropriate bones before the model is finished. Very importantly, to ensure that actions and constraints are reusable, make sure that all of the Roll handles are pointing straight back along the length of the bone, (for bones that are pointing straight forward or straight back, the Roll handles should be pointing straight up). Lastly, go through the laborious task of assigning control points from the model to bones in the skeleton using the extensive grouping tools. The Art of Animation:Master manual has a tutorial covering this.

Talent Libraries

Animation:Master embraces the concept of a “talent library”. The computer can’t supply the talent for you but it can allow you to put your talent into a library for later, or more importantly, use the talent that is already in the library. As you work on an animation, you will recognize a lot of repetition in your character’s facial expressions, gestures, locomotion, and a thousand other activities, just like we do in real-life. By taking similar actions out of the talent library, you can get a great head start, speeding the animation process and increasing the number of stories you can tell during your career. Reusable motion is one of the most important concepts of the “talent library”. One might animate a walk on one character and apply it to a different character, or animate a character singing a song and use that lip sync with other characters so they can sing in a chorus. This reusability is one of the foundational backbones of Animation:Master.

The Paste Buffer

When a paste buffer is created, it stores the values for the current frame for the hierarchy indicated by the Key Mode buttons. The bone name is also stored. The Paste function applies data based on the item name. Therefore, if the object being pasted to has matching item names, whether or not it is the same kind of object the data came from, the Paste buffer will apply to that item. However there is an exception. If you have Key Bone on when you copy, and Key Bone on when you paste the result can be pasted onto a bone of a different name, or even different type. For instance you can copy the translation values from a light and paste them on a camera. This is primarily useful when pasting values like light colors, onto multiple lights, each with a different name.

Copy Branch, Paste Branch

If you copied with the “right forearm” bone selected with Key Branch on, the Paste buffer would contain data for the partial hierarchy: arm, wrist and five fingers. If you then pasted to another character that had only three fingers with Key Branch on, all similarly named bones will have their data copied.

Copy Branch, Paste Bone

If you copied with the “right forearm” bone selected with Key Branch on, the Paste buffer would contain data for the partial hierarchy: arm, wrist and five fingers. If you then pasted with the “right forearm” selected with Key Bone on, only the data for the “right forearm” bone will be applied, not the wrist or fingers.

Copy Bone, Paste Bone

An important exception to the name-matching rule is one-to-one copy/paste. (Key Branch can be on if the selected bone to receive the paste has no children). For example, if the “right forearm” bone is selected and you copied, only the data for the “right forearm” bone will be kept. If you then advanced frames, and pasted with the “left forearm” bone selected, the “left forearm” bone would receive the data even though it has a different name.

Time Display Modes

There are three time display modes.

SMPTE time is shown as minutes:seconds:frames (the frames portion of this display is dependent on the frame rate). The frames portion of the SMPTE display begins at 0 and represents the instance in time at which the frame begins.

Frames display mode works just like SMPTE time but time is shown as frames. Starting at “0” means that an animation that ends on frame “30” is actually 31 frames long. This is because frames are treated as continuous time so that action stretching for reusability, sub-frame sampling for particles, and animation fps mode changes are possible. It is recommended that new animator get used to this time display mode since it is the simplest to use while offering the most advantages.

Cels display mode, the frames displayed represents the cel number. So the first cel is cel #1. Keyframes can be thought of as actual cels that are held for one frame in time. Therefore, an animation that starts on cel “1” and ends on cel “30” is 30 cels long, just like a traditional cel animator would expect it to be. Unfortunately, action stretching for reusability, sub-frame sampling for particles, and animation fps mode changes require special handling.

The Cel display mode not only modifies the way time is displayed, it also affects how actions placed on a mode are interpreted. The difference stems

from the fact that if a cel animator creates 3 cels numbered 1, 2, and 3, it is assumed that this would last for 3 frames. In other words, each frame would be recorded or filmed and shown for the duration of 1 frame, including the last frame. This results in an animation that covers 3 frames in the choreography. If another animation was created to go after this one, its first frame should not look just like frame 3, but instead be a continuation of the movement so there is no pause while the same frame is displayed twice.

In contrast, the SMPTE and Frames display modes begin their frame numbering at 0. So if you define the same 3 keyframes, they would be numbered 0, 1, and 2. This is considered to be only a 2-frame action. The frames defined are the time ranges [0-1] and [1-2]. The frame 2 is posed and placed there not to be viewed, but rather to define the motion that occurs between frames 1 and 2. If another action is to be designed to go after this one, its first frame should be exactly like frame 2 of the previous action to cause it to be a continuation of the movement. Reusable actions that need to butt ends together without concern for what the previous action is doing can take advantage of this frame 0 overlapping phenomenon. This makes it much easier to join actions together in a sequence, since you can copy the last frame of the previous action when creating the next.

Changing the time display mode will not change the animation. Therefore, someone that prefers SMPTE or Frame can look at another animator's work that uses Cel mode. All modes will animate, look, and render identically (except for the sub-frame quirks of the cel display mode already described). The difference is one of interpretation.

Cel Mode Quirks

The assumption in cel mode is that the animator prefers NOT to create overlapping actions. Traditional cel animators would not paint the last cel of one sequence to look exactly like the first cel of the next. So, in cel mode you create exactly as many cels in your actions as you would in traditional animation. Suppose you had two sequences: one was 3 cels long and the next was 5 cels long. Call them "Action1" and "Action2". The frames of Action1 are numbered 1, 2, and 3, and those from Action2 are numbered 1, 2, 3, 4, 5 (of course these need not all be keyframes). When placed in the choreography, the first will cover cels 1-3, and the second 4-8. Inspecting the range numbers, there appears to be a gap between the Action1 and Action2 in the choreography. What happens between cel 3 and cel 4? In this case, the motion here is actually just a hold of the last cel of Action1. This holding is the default behavior for Cel mode and is the part that causes the quirks of action scaling.

Overriding Cel Mode Quirks

In the previous example, we noted that the motion between cels 3 and 4 in the choreography was held still. Under most circumstances, this is fine. Do you actually render frame 3.5 anyway? Well actually sometimes you do. Suppose you created all of your animation to go out to 16mm film at 24 fps. It was well received, and now you need to go out to video. You would like to just re-render the animation at 30 fps. The actions are smoothly stretched, however that gap left between each action just holds there for 1/24 of a second, which is several consecutive video fields. Now your very smooth animation has some stutters in it where your actions meet. The solution is as follows: if your actions are already defined, the first thing to do is add an extra frame to the end of each. This frame should be nothing more than a copy of the first frame of the action that follows it. In our case, copy cel number "1" out of Action2 and paste it as cel number "4" in Action1. Now make sure Action1 is as follows:

Name	Crop	Frames	Use	Length
Action1	1-3	4	1-3	3
Action2	1-5	5	4-8	5

We are still only rendering the first 3 cels, even though there are now 4 in the action, (the 4th cel is just to give Action1 a clue about what motion occurs between frames 3 and 4).

Video Game Creation

If you are creating sprites for video game art, you could create the actions in cel mode (still not recommended because you lose reusability), or you could make the following adjustments. Animation sprites for videogame art need to render each and every keyframe defined in the action. SMPTE or frame mode would use two actions in a choreography as below.

Name	Crop	Use	Length
Action1	0-3	0-3	3
Action2	0-5	3-8	5

When rendering this you would get frames 0-8, just nine frames (not the 10 you expected): 3 from the Action1 and 6 from Action2. Make the following changes.

Name	Crop	Use	Length
Action1	0-4	0-4	4
Action2	0-6	4-10	6

There is no need to change the actions themselves. Simply change the crop range to include up to frame 4, and use it in the choreography for 4 frames. Since we are taking 4 frames and using it for 4 frames, no undesirable scaling of the action occurs. Using frames up to frame 4 out of an action

which only has keyframes up to frame 3 just holds the last value for one more frame. This holding behavior is not desirable for sub-frame sampling but for this use it is appropriate.

Using Libraries

Libraries provide an easy way of organizing and accessing projects, models, actions, choreographies, materials, sounds, and images. Several libraries are provided for you with a wide variety of useful objects. However, you can create and populate your own libraries. This will help you optimize your work flow, and allow you to spend more time animating, and less time navigating directories.

Adding Objects and Folders to the Library

Before adding objects to the library, you should first select the library tab appropriate for the kind of object you want to add (e.g. Models, Actions, etc.). You may want to add a folder to group your objects together. To do this, right-click (Control-click on the Mac) in the Library panel and pick [New][Folder]. You will see a folder appear in the library with the name "New Folder". Click on the name and hit the <F2> key to edit the name. Rename it to whatever you want (e.g. Christmas Ornaments).

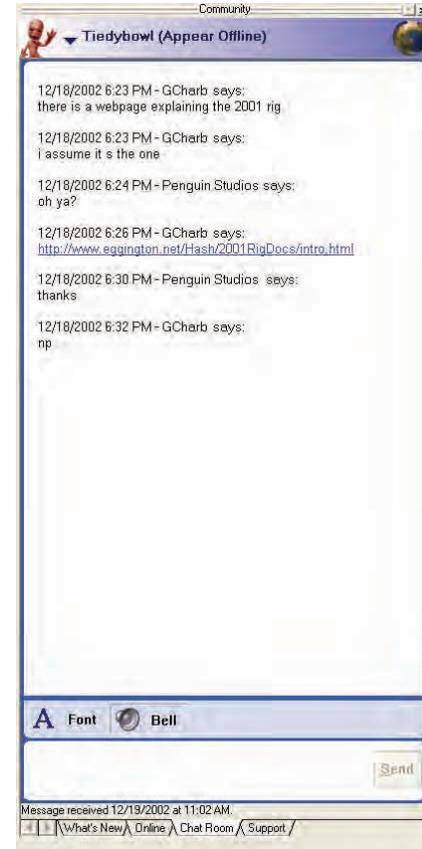
Adding an object to the library can be done a couple of ways. One way is to right-click (Control-click on the Mac) in the Library panel and select [New][Shortcut]. This will bring up a file dialog and allow you to select the object's file (e.g. MyModel.mdl). You can also drag and drop a linked model (not an embedded model) from the Objects list in the Project Workspace directly into the Library.

Creating a Preview Image for a Library Object

If you create a new object, you can associate a preview image with that object and have it appear in the Library. Otherwise, a default icon will appear for the object. To create the image, you can render a single image of the object to a file. The preview will be scaled to a 100x100 pixel square, so a larger image would be overkill. Make sure the image is square. It is a good idea to save the image in the same folder as the model so it is easier to distribute. Make sure the object is listed under Objects in the Project Workspace. Open the Properties for that model, and crack open "File Info". Right-click (Control-click on the Mac) the "Preview" field and pick [Assign Preview Image]. Select the image that you created using the file dialog. Now save the object.

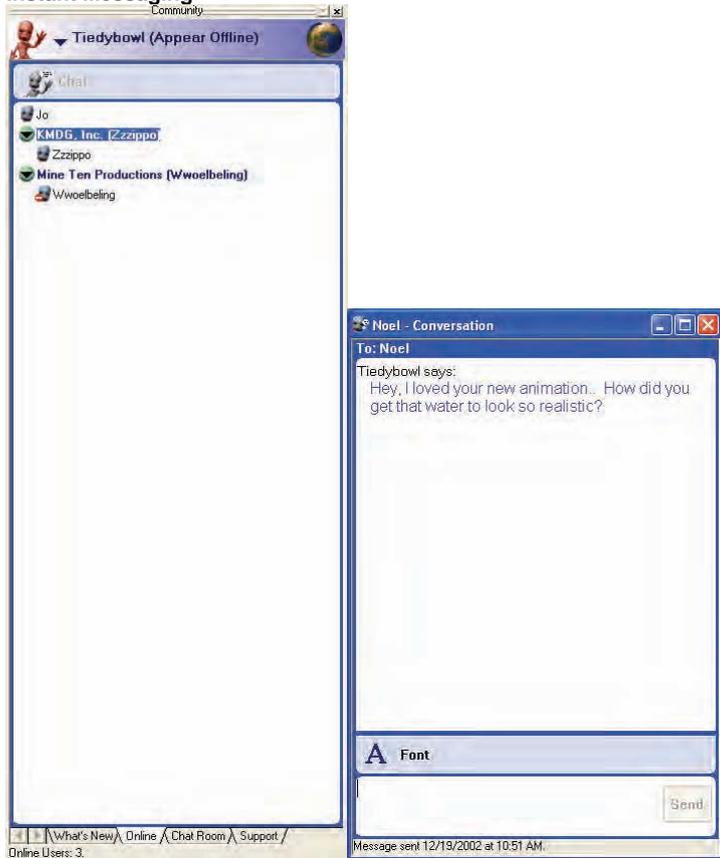
Now when you add this object to the Library, the image you selected will be used in the Library panel.

A:M Community Chat Room



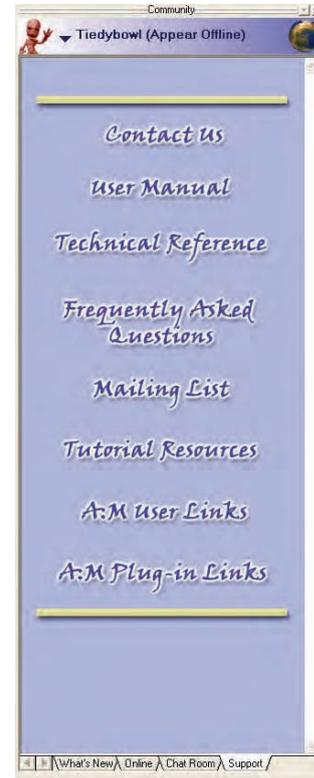
Now you can chat with A:M users from all over the world, chiming in whenever you want. It is a great way to meet other creative people and ask advice from the experts. The open chat room is found on the chat room tab of the Community window.

Instant Messaging



The online tab of the Community window will display the current people that have chosen to appear online when signed into community. If the user is not away or busy you may click the chat button or double click their name to open an instant message window that allows you to chat with them personally. When a chat window is open you may drag other people into the conversation.

Support



The support tab of the Community window allows direct access to online manuals, reference, tutorials, mailing list, links of other users like you, and a growing list of useful plug-ins. It also has a link for contacting us for support. It is always kept up-to-date so you will always have the newest information available.

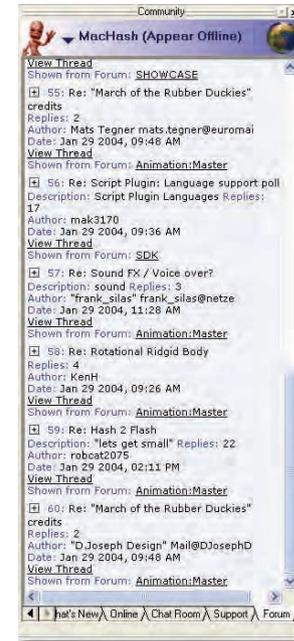
What's New



Weekly updated hyperlinks to outstanding customer's websites, free models, and other interesting items are provided in the A:M Community "What's New" window. Look here for contest voting or results and other news flashes.

When new versions of the software you are running are available for download they will appear here along with free trials for alpha and beta versions. Just click the link and the correct version will download, be it Windows, Mac or NetRender.

Forum



The Forum page allows you to browse the online Hash Animation:Master Forum. This is a great way to keep up to date with other A:M users, see finished animation and works in progress. The Forum page allows you to view threads, and bring up the full Forum site in your browser.

Each topic shows the title, the number of replies, the author, and the date it was posted. To see the message with all of the replies together, click on "View Thread". If you wish to reply to a message, click the link after "Show from Forum". This load the forum page into your browser and allow you to post a reply.

If you wish to post a new message to the Forum, use your web browser to load <http://www.hash.com/forums>.

Project Workspace Panel

Consistency has become the buzzword for well-designed interfaces, and for good reason. Even if a new user should be confronted with an unexplained

feature, if the interface consistently operates in the same fashion, most users can figure out how to use the feature without help. The universal paradigm for most commands in Animation:Master is the Project Workspace tree. It is called a tree because it branches out into ever more detailed relationships. Every item in the software has a representation in the tree.

A “project” is the main trunk of the tree. Projects contain models, actions, materials, images, and choreographies: each of these is a branch off of the trunk, (represented by an appropriate icon). When you click on an object, it highlights and the Property panel changes to display all of the information about it. For example, a light’s “type”, “intensity”, “color”, etc. are changeable via the Light Property panel. To open a window for any object, simply double-click its icon in the tree. Commands that can be performed on these objects can be viewed by right-clicking on the item’s icon, (Control-click on a Mac).

The last bit of understanding you need about the Project Workspace tree is that if you right-click (Control-click on a Mac) on any icon in the hierarchy, the commands that icon contains pop up in a Context menu. For example: models can be edited, saved, or have decals added to them; you can “Apply” decals, or “Delete” them etc. Whenever you don’t know what to do, there is always a hint by looking at the tree icons’ Context menus.

Properties Panel

There are many settings associated with every object in a project: models, choreographies, actions, etc. These settings can be viewed and changed on the object’s Properties panel. Sometimes you will want to turn off the Properties panel to save screen space, then turn it on again when you need it.

Timeline Panel

Animation is based on timing so the timeline is a helpful tool for reviewing where and how each kind of animation relates to each other.

The timeline displays time in accordance with the kind of object the time graph represents. For example, actions show frame ranges, while channels show keyframes, and sounds show waveforms.

Action

“Shortcut to” actions show a range of frames/time in the time graph. The order that “Shortcut to” Action icons are in the list under the “Shortcut to” Model icon determines overload precedence but the action time graph shows how long and when the action occurs.

Channel

The channel time graph is a composite of all the time graphs of the channel items it contains.

Channel Item

Channel items show where each keyframe is located on the time graph.

Choreography Action Channel

Choreography action channels display a range of frames in the time graph overlaid with the keyframes of the channel. Choreography actions have the highest precedence and overload any other actions that may overlap the same frame range.

Cloth Wizard Dialog

Cloth

One of the most difficult areas of computer character animation involves the use of cloth. Many impressive films have been made where the characters clothing is animated on each keyframe by the animator, but it is labor intensive. Animation:Master provides a mechanism for the computer to animate the motion of cloth through the use of dynamic simulation. Because it is a simulation, it will require a good deal of practice and fine tuning on your part. (There may still be times when it is actually easier to brute-force, hand animate it).

The computer will simulate each frame in the choreography or action, and store the resulting locations in the channels of each mass.

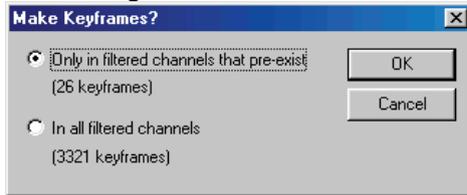
Cloth Notes

It is important to start the model off in the choreography with a resting pose in which you are certain that the cloth is positioned in a way that no cloth touches or comes within “Radius” of touching the body of the model. This is called the “dressing pose”. Every scene must begin with the model in a legal state such as this. Then the model must move to some beginning pose over a short period of time. (This is like pre-roll for particles).

Cloth, by default, uses an automatic collision radius that is computed as a percentage of the average resting length of the attached springs. The reason is that denser areas of cloth are more able to handle smaller values for the collision radius. This paradigm handles this automatically, so 25% means that the collision radius for each mass will be 25% of the average length of the attached springs.

When simulating cloth, there may be times when the underlying surfaces penetrate through. The masses themselves should not penetrate the geometry, but between the masses is not tested for collisions, and it may penetrate. To solve this problem, either make the geometry more dense, or you can increase the collision radius. Unfortunately increasing the collision radius also means the clothes need to also start farther away from the body as well.

Force Keyframe Dialog



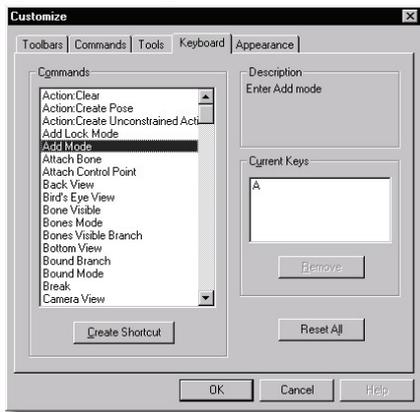
Only in filtered channels that pre-exist

Use this option when you wish to store keyframes for properties that already have keyframes stored in them. You may be animating the rotation, but not the scale, and do not want to save the scale keyframes since they are not changing.

In all filtered channels

Use this option if you want to force the keyframe to be saved in all properties that are selected with the Key Mode. This is important when you want something like the scale to stay the same till a certain keyframe, and then change. Make a keyframe on the frame before the one where you want to change to begin occurring. By using this option, you are making sure the pose interpolation does not begin too early in the action.

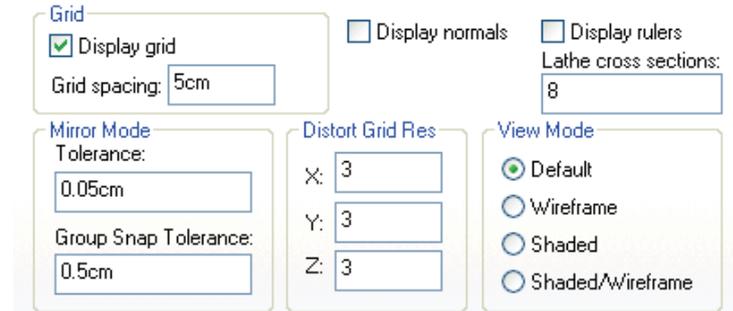
Customize Keyboard Dialog



Though a graphical interface is convenient and intuitive, once you are familiar with the operations of each command, it is much more convenient to

invoke the command with a “hot” key. For example, the default Zoom command hot key is <Z> on the keyboard, Move is <M>, and Turn is <T>. Hot keys are formally known as “keyboard shortcuts”. If you would prefer to make your own keyboard shortcuts, pick [Tools][Customize] and use the “Keyboard” tab on the “Customize” dialog.

Options:Modeling



Grid Spacing sets the distance between vertical and horizontal grid lines.

Modeling Mode

Display normals toggles whether lines indicating the direction the surface is facing are visible.

Lathe cross sections sets the number of times a group is duplicated and extruded during a lathe operation. This will control the patch resolution when used with the Lathe tool.

Display rulers sets whether rulers along the top and left of the modeling windows are visible.

Mirror Mode Tolerance allows you to use mirror mode on slightly asymmetrical models. The value represents the units away from the modified points.

Group Snap Tolerance is the tolerance to look for mirrored points from the selected points for the [Snap to Mirrored Point(s)] menu item.

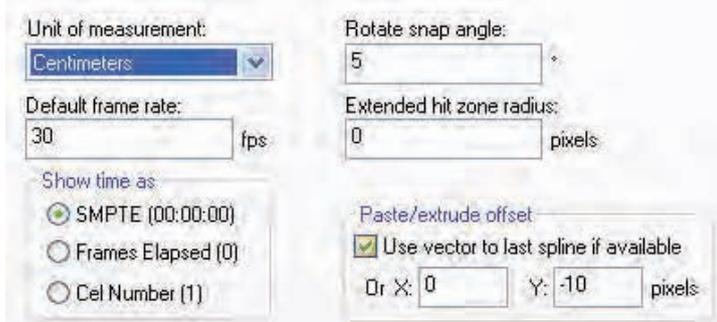
If parts of your model are meant to be perfectly symmetrical, and are not, you can snap them to the control points on the other side of the mirror by Right-Clicking (Control-clicking on the Mac) on the group of control points you want to be symmetrical and pick [Snap to Mirrored Point(s)].

Warning: Either tolerance should not be set to be larger than the minimum distance between any two points in the group you are modifying or snapping to mirrored points.

Distort Box Grid Resolution sets the subdivision of the Distort tool. Setting

the values higher will allow more control over specific areas of the distortion.

Options:Units



Unit of measurement: Centimeters

Default frame rate: 30 fps

Show time as:
 SMPTE (00:00:00)
 Frames Elapsed (0)
 Cel Number (1)

Rotate snap angle: 5

Extended hit zone radius: 0 pixels

Paste/extrude offset
 Use vector to last spline if available
 Or X: 0 Y: -10 pixels

The Units tab allows you to specify various **Units of Measurement** used throughout the software. Your choices are Centimeters, Meters, Feet, Inches and Feet and Inches combined.

Show time as determines how frame counts are displayed throughout the software. Your choices are SMPTE, Frames Elapsed and Cel Number.

Rotate snap angle allows you to set the increment the degrees that the rotate manipulator will move as you move it.

Extended hit zone radius allows you to set, in pixels, a range around control points that determines the precision which is required while selecting control points.

Paste/extrude offset determines the position of the newly created selection in relation to the original when using paste or extrude operations. Use vector to last spline if available should be checked if you wish to extrude in the direction of your last extrusion. This is useful if you are making a number of extrusions in the same direction.

Options:User Info



Name: Your Name

Organization: Hash, Inc.

URL: http://www.hash.com

E-Mail: you@name.com

The information in these fields will be saved in models, materials, actions, and choreographies you create in Animation:Master.

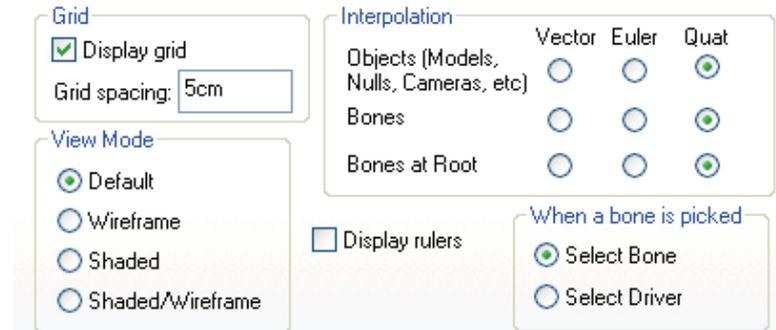
Name: enter your full name here.

Organization: enter your company name.

URL: enter your web page address.

E-Mail: enter your electronic mail address.

Options:Action



Grid
 Display grid
 Grid spacing: 5cm

View Mode
 Default
 Wireframe
 Shaded
 Shaded/Wireframe

Interpolation

	Vector	Euler	Quat
Objects (Models, Nulls, Cameras, etc)	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Bones	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Bones at Root	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>

Display rulers

When a bone is picked
 Select Bone
 Select Driver

The options available on the Action tab are **“Display Grid”** and **“Display Rulers”**. They determine whether or not those items are visible when using an Action window. You can also set the **“Grid Spacing”**. There is also a section the lets you set the default **“Interpolation”** method for objects and

bones, as well as a section to choose what is selected when you click on a bone.

Options:Choreography

Grid

Display grid

Grid spacing:

Display rulers

View Mode

Default

Wireframe

Shaded

Shaded/Wireframe

The options available on the Choreography tab are **“Display Grid”** and **“Display Rulers”**. They determine whether or not those items are visible when using a Choreography window. You can also set the **“Grid Spacing”**

Options:OpenGL or Direct3D

Version: 1.4.0

Vendor: NVIDIA Corporation

Renderer: GeForce2 MX/AGP/SSE/3DNow!

Extensions:

GL_KTX_buffer_region

WGL_ARB_pbuffer

WGL_ARB_pixel_format

WGL_EXT_pbuffer

WGL_EXT_pixel_format

Antialiased Lines

Bi-Linear Filtered Textures

Adapter:

Device:

Multisample Type:

Bi-Linear Filtering

Dither

Direct3D/OpenGL(Windows only) tab

All of these settings only affect how the model is drawn in the interface for real-time viewing. They do not affect the quality of the Final rendered image.

Bi-Linear Filtering: This option will keep a decal from looking pixelated and blocky when zooming in closely. The decal will actually blur. This makes the decal's appearance look better at the cost of the render speed slowing down in the interface.

Antialiased Lines If your video card supports antialiased lines, each line will be antialiased to give your scene a cleaner look.

Dither If your video card is set to a 16 bit color mode rather than a 24 or 32 bit color mode you can turn on dither to help remove any color banding that will occur because of the insufficient number of colors available to represent the image properly.

Options:Folders

Show folders for:

NOTE: Changes made on this page will not take effect until the software is restarted.

Folders:

The Folders tab allows you to specify the path to folders containing plugins and libraries. If you are unable to access any of the plugins from within the software or the library panel is empty, it is a good idea to check this tab and verify that the folder paths are correct.

Options:Global

“Interrupt drawing” allows you to increase the responsiveness of the interface if you are on a particularly slow computer. Lowering the FPS will “interrupt” the drawing of objects and redraw them in the current position.

“Undo” allows you to set the levels of undo. This value is universal and will be used throughout the software, wherever undo functions can be performed. You can choose “Unlimited” or the specific number of levels that you type in.

The **“Memory”** section should only be used on computers with less than optimal amounts of memory. (Hash recommends 64 MB, more is always better.) This option will limit the amount of memory used by Animation:Master to save memory for other system functions.

“Reload last project at start-up” will reload the project you were working on when you last closed Animation:Master. Otherwise the “At Startup” options of “Do Nothing”, “Show Catalog”, or “New Choreography” will occur. The “Draw Particles/Fur” option determines whether or not they will be drawn in the interface or rendered. (Even final render will not draw particles/fur if this option is de-selected).

The **“Skip frames if behind when playing”** option can be used in conjunction with the Play button on the Frame toolbar to smooth playback of an action.

The **“Show Advanced Properties”** shows or hides properties that advanced users may want to set.

The **“Show Property Triangle”** shows or hides the small triangle icon next

to objects in the Project Workspace. When the triangle is visible, you can click on it to expand the object to see its properties within the Project Workspace, without opening the Properties panel.

Options:Rendering

The Rendering tab on the Tools, Options panel allows you to make changes to the render settings used within the software. Any time a window is rendered in the software, these settings are used. Pay particular attention to the “Use these settings for:” item. “All Views” will cause these render options to be used in all views, overriding any changes you may have made to individual cameras within a project. “Just non-camera views” will only use these render options in non-camera views, preserving any changes you may have made to a particular camera within a project.

Options:Sound

All of these settings only affect how the sound is played and saved with an AVI or Quicktime.

Options:Onion Skin



Onion skin mode draws more than one frame at a time. It is useful to see how the current frame compares to the surrounding frames. It will draw simple bones on a set of frames you choose around the current frame. It can also draw the wire frame for these frames.

The **Onion Skin check box** turns on and off onion skin drawing.

There are two styles of onionskin, **Frame based**, and **Keyframe based**.

Frame based onion skin lets you see the timing of your motion. You have the choice of the steps being from the current frame, or the start frame.

Keyframe based onion skin lets you see your motion regardless of time. With Show in-betweens you have the option to show a certain number of frames between each keyframe.

With the **Draw wireframe** check box off on the right side of the dialog and the Draw wireframe check box under the keyframes section on, you will see the wireframes of just the keyframes drawn.

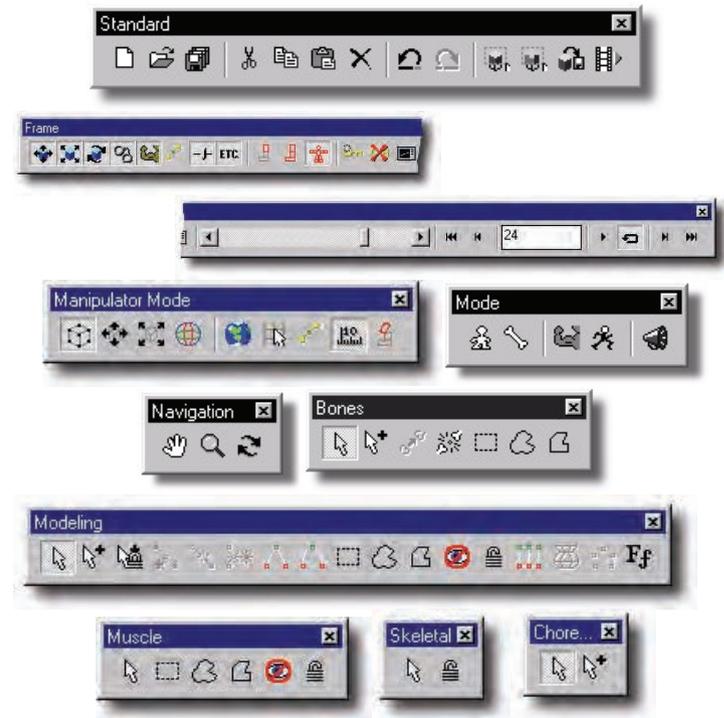
Before and After; On the right side of the dialog you can set how many frames or keyframes to see before and after the current frame. If for example you don't want to see any frames before the current frame the set Before to "0", and After to the number you wish to see.

Step controls how many frames or keyframes to skip over between each one that is drawn.

Draw wireframe draws wireframes as well as simple bones on each key.

Toolbars

Throughout the manual, the Animation:Master commands, menus, and toolbars are identified by name. When the toolbars are undocked their name is visible in their title. Refer to these images when a tool is specified in a toolbar you can't identify.



Bones Toolbar

Bones mode can be entered from a Modeling window, or from a Choreography window when a model is selected.



Edit

To change an existing bone's position or orientation in a model, simply click and drag it.



Add

To add a bone to a model, click the Add button on the Bones toolbar, then point inside the appropriate place in the model, press the mouse button, and while holding the button down, move the mouse.

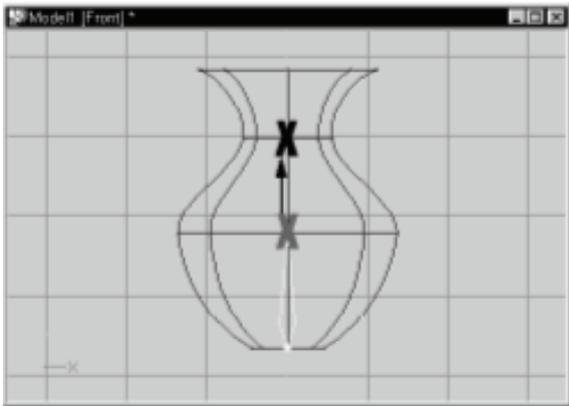
Where you click determines where a new bone is added. If you click near an existing bone, a new bone will be added to the existing one (the two bones will be "attached"). Each bone will have a different color from the previously added bone, so that you can easily identify them.

Exact placement of the bone's wider end (where the bone will rotate from) sometimes requires you to experiment to ensure the model bends properly.

Each time you wish to add another bone, click the Add button.

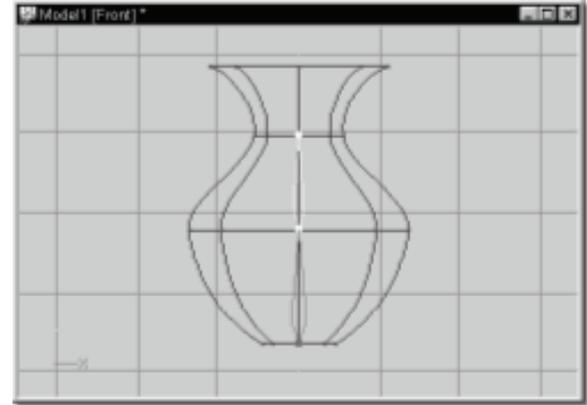
The default keyboard shortcut key for Add is <A>.

Example:



Click the Add Mode button on the Bones toolbar, and then click inside the Bones window. With the mouse button down, drag the mouse, releasing the button where the end of the bone should be placed. If necessary, the bone

can be repositioned at any time by clicking and dragging it with the mouse to the new location.



Repeat this process for each bone to be added to the model.

The Model Properties Position tab allows you to enter precise positioning information for the selected bone. If no bone is selected, changes to these fields control the position of the default model bone. The fields on this tab allow changes to be made to the X, Y, and Z Start and End position of a bone, as well as the Roll value



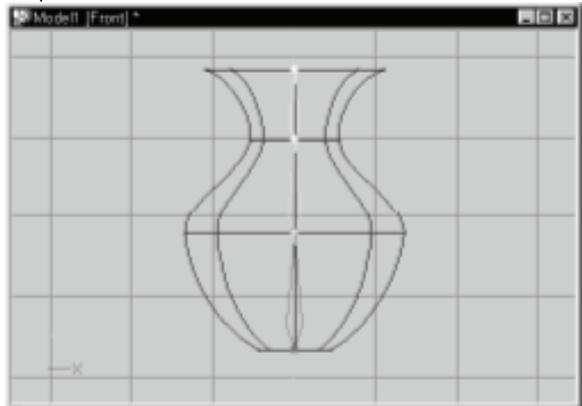
Attach Bone

Creating an inverse kinematic chain (a "when you pull the finger the arm straightens" connection) requires that multiple bones be connected end to end, forming a hierarchical chain. To attach two bones, (the beginning of the "child" bone connects to the end of the "parent" bone), select the child bone by clicking on it in the Bone window (or click on its icon in the Project Workspace), then click the Attach Bone button on the Bones toolbar. (or select the "Attached To Parent" option on the bone's properties panel). While adding bones, they are attached automatically if the child bone is added starting on the small end of a Parent bone.

Example:



To attach two bones, select the bone to be attached by clicking on it in the Bones window, (or click the bone's icon in the Project Workspace). The bone's handles will highlight. Click the Attach Bone button on the Bones toolbar. The "Attached to Parent" option on the "Bone" tab of the Bone Properties panel will indicate whether or not it is attached.



Detach Bone

Breaking the connection between two bones is sometimes necessary in redefining hierarchies. To detach two bones, select the child bone by clicking on it with the mouse, then click the Detach button on the Bones toolbar, or deselect the "Attached to Parent" option on the Bone tab of the Bone Properties panel. There are no visible changes, but the two bones are now disconnected, and can be moved freely of each other.



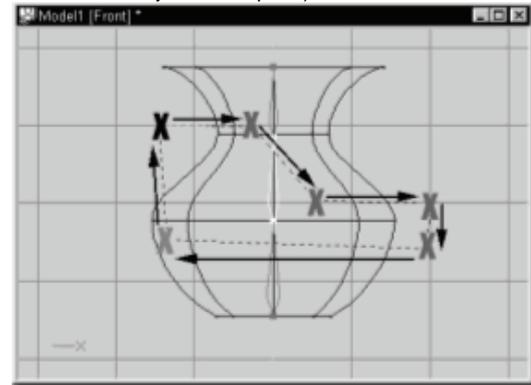
Assigning Control Points

After adding bones to model, it is necessary to identify which control points of the model should be assigned to which bones.

Any of the bound group techniques (discussed in "Modeling") can be used to assign control points to the selected bone.

Example:

To associate a group of control points with a bone, first select the bone by clicking on it in the Bone window, (or To associate a group of control points with a bone, first select the bone by clicking on it in the Bone window, (or click on its icon in the Project Workspace).



Click the Lasso Line Mode button on the Bone's toolbar, then point in the window near one of the bone's intended control points and click the mouse. Once the lasso contains all of the bone's intended control points, click the beginning point of the lasso. The grouped control points will turn the color of the selected bone and begin to flash.

Frame Toolbar

Scrub Bar



The “Scrub Bar” is an easy way to quickly preview the animation. Drag the Scrub Bar slider to get from one end of your animation to another. It is located on the Frame toolbar.

Animation can be measured in time (referred to as SMPTE time code), or frames. To change the display between frames and time code, choose the “Units” tab on the Options dialog.

Traditionally, master animators only drew the “key” frames of a character’s movement, and then journeyman animators would fill the “in-between” frames. The term survives in computer animation programs because they can also work in much the same fashion. For example, you place a vase here on frame “1”, then there on frame “10”, then over here on frame “20”, and the computer will approximate where the vase should be on the other in-between frames.

Creating Keyframes

Once in Skeletal mode, type a keyframe number in the Frame field on the Frame toolbar, then simply point at the bone. The mouse pointer will change to a Translate cursor or Rotate cursor depending on what will happen if you push the mouse button. Press and hold the mouse button, and move. The bone will rotate or translate (depending on what the mouse cursor was indicating) when you move the mouse. A keyframe will automatically be created for you.

Key Modes



Frame toolbar, key mode buttons

The Frame toolbar contains Key Mode buttons that are used during any keyframing operation (for example, moving a bone in Skeletal Mode is a keyframing operation). A keyframing operation either retrieves or applies Keyframe data, such as: Cut, Copy, Paste, Create Pose, Drop Pose onto an Action, Make Keyframe, Delete Keyframe, Next Keyframe, Previous Keyframe, and Move Frames. For example, if while animating, you picked [Edit][Copy], these key mode states would dictate what items of the selected object would be copied. If you then selected a different object and picked [Edit][Paste], the states of the Key Mode buttons would dictate which of those items stored in the Paste buffer would actually be applied to the

selected object.

The names of the Key Mode buttons are usually self-explanatory. They are:



Key Skeletal Translations



Key Skeletal Scale



Key Skeletal Rotation.



The **Key Constraints** button affects all constraints. For example, if you had a camera which had an “Aim At” constraint applied that you copied, then you selected a light and pasted, the light could receive the “Aim At” constraint if it did not already have one. In addition, all other constraint items like Enforcement values from the original constraint would also be applied.



If the **Key Muscle** button is down during a keying operation, muscle motion will be retrieved or applied during a keying operation.



If the **Key Bias** button is down during a keying operation, muscle bias will be retrieved or applied during a keying operation.



If the **Key Pose** button is down during a keying operation, pose motion is included during a keyframe operation.



If the **Key Other** button is down, any other items that an object contains will also be keyed. For Example, if you copied the selected light and pasted to a different light, the Red, Green, Blue, Intensity, Width, Fall Off, Cone Angle, and Softness items would be applied on the new light.

Hierarchy Keys

Often, you want the Key operations to apply to only parts of a skeleton. The buttons can be mixed and matched during keyframing operations.



The **Key Bone** button only allows keying operations on the selected bone.



Key Branch allows keying operations for the selected bone and all of its hierarchy.



Key Model allows keying operations to be performed on the entire model. For example, if you did a copy, every bone in the model will have its data included.



Selecting the **Force Key** button automatically creates a keyframe on the frame you are on using the designated key modes. This will store keys only where they already exist. If the key constraints button is down it forces keyframes on all keyed constraint properties like enforcement and offsets. It also stores constraint results so that constraints may then be turned off. If you hold down the <Shift> key when pressing this button brings up the advanced dialog, which includes the option whether to store constraint results.



Selecting the **Delete Key** button will delete the current keyframe information for the designated key modes.



Frame toolbar, frame controls



Frame Scrub

The Frame Scrubber allows you to preview your animation with a slider. Point at the slider knob with the mouse and press the mouse button; while keeping it pressed, move the mouse towards either end of the slider.



You can go forward in the animation one frame at a time with the **Next Frame button**, or go backwards with the **Previous Frame button**.



Previous Keyframe/Next Keyframe

These buttons search for the keyframes as dictated by the state of the Key Mode buttons. For example, if the Key Mode buttons only had Skeletal selected, only skeletal motion keyframes would be searched for, and any other keyframes, such as muscle motion, would be ignored. If both Skeletal and Muscle keys were selected, then the first keyframe from either of these two motion types would be found.

It is convenient to search for the next keyframe of your animation to make changes to because generally the fewer keyframes that are defined in an action, the smoother the motion and the more reusable it will be. This does not lessen the requirement that a minimum number of keyframes are required to get exactly the display of emotion your character needs, you simply should be aware that putting keyframes on every frame should be avoided.



Frame

The current frame number is displayed in this field, and can be typed in to change frames. All examples in this manual, whether it refers to SMPTE

time, frames, or cels, implies that you are using this Frame field as reference and control. **WARNING:** if the Frame toolbar is not displayed, or if it is docked vertically, the Frame field will not be visible, which would make it very difficult to animate (you can still model).

Continuous Play

Play is useful for previewing your motion. The frame bar contains the play button.



When the **play button** is pressed, it begins playing the highlighted range displayed in the ruler area of the timeline

This range can be adjusted by grabbing the ends of the highlighted range and sliding them to different positions, or while the mouse is over the Time Line ruler, right-click (Command-click on a Mac). The “Play Range Settings” dialog allows you to type in the start and end time of the range. The Set Range Start and End options set the range to start or end at the mouse position. The Set Range Extents option sets the range start to “0” and the range end to the length of the action in the current window.



If the **loop button** is down, playing will continue looping until the play button is depressed again to stop.

On the Tools/Options/Global dialog, there is an option to have play skip frames if behind. When this option is enabled, motion will be played at the project’s current frame rate. If Skip Frames is disabled, play displays every frame as fast as it can up to the project’s current frame rate.

Manipulator Toolbar



Snap Manipulator to Grid can be used to move control points in grid increments. It is located on the manipulator toolbar and any time this button is selected ALL manipulators will move in grid increments when manipulating control points. (This includes creating paths in Choreography and Muscle Mode in Action).

This should not be confused with snap to grid, which is available after selecting a group of control points and right-clicking (Control-click on a Mac) in the manipulator to access the menu, then choosing “snap to grid”. This will snap the selected points to the nearest grid location and is only available in Modeling Mode.

Enhanced Manipulators

Whenever groups or objects are selected they are enclosed inside the Standard manipulator. When the mouse pointer is over the manipulator it changes to let you know what operation will be performed if you press the mouse button, (translating or scaling). Sometimes you only want to translate or scale along only one axis, or do a rotate. The three Enhanced manipulators: Translate, Scale, and Rotate include features the Standard manipulator does not have.

Magnet Mode

Patch models are inherently low density but there are still plenty of control points to move about. Magnet mode makes control points in a group move depending on how far away they are from the selected control point, which is very convenient for the smooth, flowing curves of organic surfaces. Be aware that control points not in the group will also be affected while in Magnet mode. In fact, all control points originally inside the influence radius of any grouped control point will be affected.

The Magnet mode button is located on the Mode toolbar for all the windows that support Modeling or Muscle action. It can be turned on or off anytime, however new control point movement proportions within the influence sphere will be calculated every time Magnet mode is reentered.

The Magnet Influence manipulator only appears on the selected control point. It has four handles that allow you to resize until it encompasses all of the desired control points. (Even though the Magnet Influence manipulator may seem to encompass a control point, the circle really represents a sphere and may not contain control points deep in the screen).

Mirror Modeling Mode

Many times models are symmetrical, and modifications need to be done on both sides to keep the model symmetrical. To do this, Mirror Modeling mode duplicates translation, rotation, and scale changes made to control points on the opposite side of the model.

Mirror Modeling is designed to work when the portion of the model being modified is symmetrical along the X-axis and centered on the X-axis. For example a symmetrical human character facing forward and centered along the X-axis is mirrored across the Y-axis, and therefore is a good use of Mirror Modeling mode.

Mirror Mode Tolerances

On the Options panel there are two tolerances for Mirror mode.

Grouping In Mirror Mode

If you group mirrored control points on either side of the mirror, only one of the mirrored points will be selected otherwise the operations on them both would cancel out.



Show Bias Handles

The default curve of a spline can be adjusted as part of a model or muscle action. Muscle uses the same magnitude and bias controls as modeling Mode Toolbar

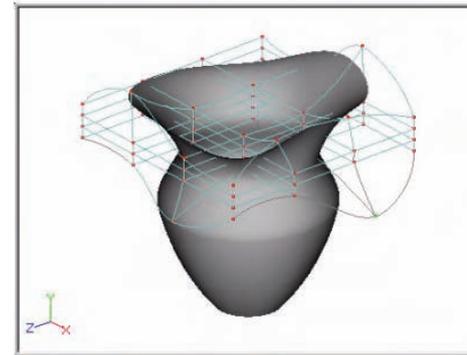


Distortion Mode

The modeling technology used by Animation:Master lends itself to graceful, organic shapes and movement. There are several enhanced manipulators to change the translation, scale, and rotation of groups of control points, however, these are very mechanical operations. Another mode, "Distortion", allows very global, organic manipulation.

Group the control points you wish to modify. Click the Distortion mode button on the Mode toolbar: a control grid surrounding the group will appear (the underlying model will redraw as "inactive"). Moving control points in the control grid will distort the shape of the original grouped control points. The grouping tools and manipulator now operate on the control grid, which ultimately distorts the original group. Adding or deleting control points is not allowed while in Distortion mode. To exit Distortion mode, choose another mode, such as Model or Muscle.

The Distortion grid represents the cubic 3D forces affecting the original group of control points within. Moving a point on the grid distorts the internal forces within this volume, pulling and pushing the original control points as if they were surrounded by soft, pliable body of material. To change the grid resolution, pick [Tools][Options][Modeling], then select the desired "X", "Y", and "Z" values.



Modeling Toolbar



Edit

Editing is the default mode. Clicking this button (or pressing the <Esc> on the keyboard) will always abort the current mode and return to editing.

Delete

You can delete the selected control point or group of control point by pressing the <delete> key on the keyboard.

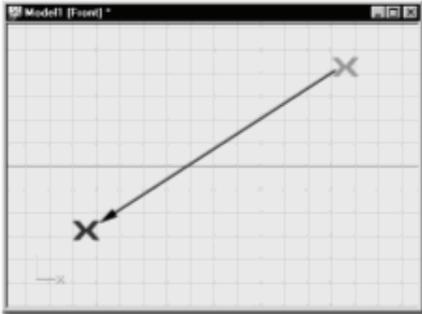


Add

Control points are on either end of a spline. Control points indicate where you can click to move or adjust a spline. To add a spline, click the Add button on the Modeling toolbar, then point inside the appropriate window, press the mouse button, and while holding the button down, move the mouse. You can add a control point on an existing spline simply by clicking the Add button on the Modeling then click on the spline where you want the new control point to be. Where you click determines where a new spline will be added. If you click near an existing control point, a new spline will be added to the existing one. The side of the existing control point that you click near determines which side the new control point will be added to. When you want to add to an existing spline, you must point very near an

existing control point, otherwise, you will start a new spline. The default keyboard shortcut key for adding control points is <Shift><A>.

Example: Click the “Add” button on the Modeling toolbar, then click in a Modeling window, and hold the mouse button and drag.



Add Lock

This is for adding a series of control points, such as a cross section for a lathe, without stopping. After clicking the Add Lock button on the Modeling toolbar, a new control point is added each time you click the mouse button. To discontinue, press the <esc> key on the keyboard or right-click (Control-click on a Mac) in the modeling window. The default keyboard shortcut key for Add Lock is <A>.

Example: Click the Add Lock button, then click in a Modeling window, release the mouse button. Move the mouse to the new locations and click repeatedly. After clicking the final control point, right-click (Control-click on a Mac) or press the <Esc> key on the keyboard or press the Edit button on the modeling toolbar.



Insert

Usually, you use Add to put new control points into a spline or to the end of a spline, but sometimes when there is a jumble of splines together, it is difficult to get the correct one selected. In these cases, once you have selected the appropriate spline, then click the Insert button on the Modeling

toolbar to add the new control point. The default keyboard shortcut key for Insert is <Y>.

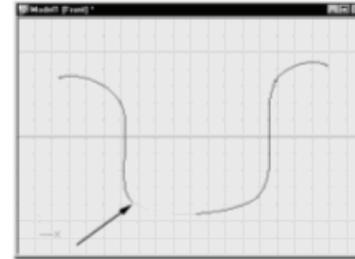


Break

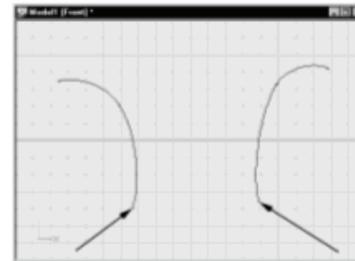
While modeling, it is sometimes necessary to break a continuous spline. Click a control point to choose the spline on which the break should be made (the selected spline will highlight), then click the Break button on the Modeling toolbar. The highlighted spline you selected will be removed.

The Break button will only become active when it is legal to break the selected spline. A spline that is legal to break will have at least one control point remaining on either side after the break. The default keyboard shortcut key for Break is <K>.

Example: Click a control point where the spline is to be broken. The selected control point and associated spline will highlight.



Pre Break



Post Break

Click the Break button on the Modeling toolbar. The spline will be broken to the next adjoining control point.



Detach

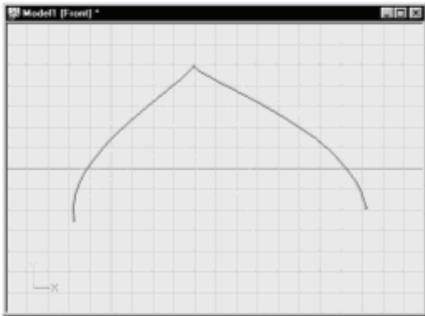
To separate splines sharing the same control point, for example at the junction of a cross, select the spline you want to detach by clicking on it, then click the Detach button on the Modeling toolbar. The spline will be separated (though there is no visible change), and can be moved by dragging the control point. The default keyboard shortcut key for Detach is <Shift><K>.



Peak

Initially, control points on a spline are smooth, meaning that the spline remains continuous as it enters and leaves a control point, but they can also be peaked. Peaks are abrupt corners, useful for constructing mechanical models. The magnitude and bias of a spline can be adjusted separately on each side of the peaked control point. All grouped control points are affected when the Peak button is clicked. The state of a selected control point is indicated by the state of the Peak and Smooth buttons on the Modeling Toolbar. The default keyboard shortcut key for Peak is <P>.

Example: To change a smooth control point into a peaked one, select the point by clicking on it with the mouse. (The selected control point and associated spline will highlight). Click the Peak button on the Modeling toolbar.



Peaked Control Point



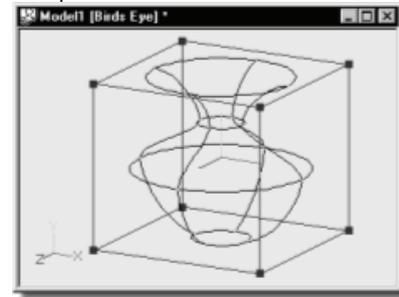
Smooth

Usually, control points on a spline are smooth; meaning that the spline remains continuous as it enters and leaves a control point. All grouped control points are affected when the Smooth button is clicked. The state of a selected control point is indicated by the state of the Peak or Smooth buttons on the Modeling Toolbar. The default keyboard shortcut key for Smooth is <O>.



Group

It is often necessary to manipulate more than a single control point at a time, called a group. To work with a group, find a viewing angle and zoom so that you can isolate the control points you are interested in, then point in the appropriate window near the corner of the targeted control points and press and hold the mouse button. As you move, a bounding rectangle will drag behind the mouse. Once the bounding box contains all of the targeted control points, release the mouse button. The bounding rectangle will disappear and all the bounded control points will highlight and become surrounded by a manipulator box.

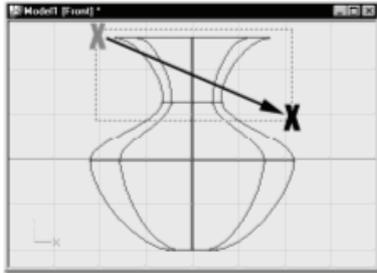


Standard Manipulator

Hold down the <Shift> key while grouping to add the bound control points to the current group. (Holding down the <Shift> key and clicking individual control points will include them in the group). Bounding around control points while holding down the <Ctrl> key will remove the bound points from the current group. (Holding down the <Ctrl> key and clicking individual control points will remove them from the group). The default keyboard

shortcut key for Group is <G>.

Example: To group control points, point in the appropriate window near the corner of the targeted control points. Press and hold the mouse button while dragging the mouse. Once the bounding box contains all of the targeted control points, release the mouse button.



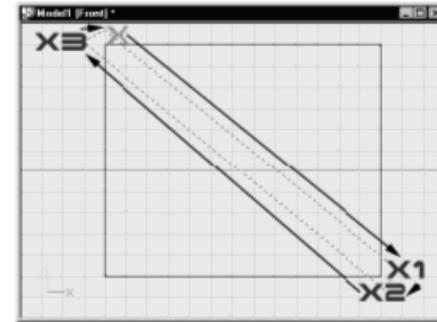
Lasso Draw Mode

The Lasso Draw Mode lets you define a group by drawing a freehand outline around the control points. To start the lasso, click the Lasso Draw Mode button on the Modeling toolbar. Click inside the appropriate window and with the mouse button still down, move the mouse - a dashed line will follow the mouse. Enclose the control points to be added to the group, then release the mouse button over the start of the lasso. All interior control points will highlight (indicating that they are selected), and a manipulator box will appear around the group. The default keyboard shortcut key for Lasso Draw Mode is <Shift><G>.



Lasso Line Mode

The Lasso Line method is useful for exactly splitting control points that might be difficult to separate with the Lasso Draw method. Click the Lasso Line Mode button on the Modeling toolbar, then click and release the mouse button inside the appropriate window. A line will follow the mouse from the last click, and every time the mouse is clicked again, a new line appears. Enclose the control points to be added to the group, then click the mouse over the start of the lasso. All interior control points will highlight (indicating that they are selected), and a manipulator box will appear around the group.



Lasso Line Mode



Hide

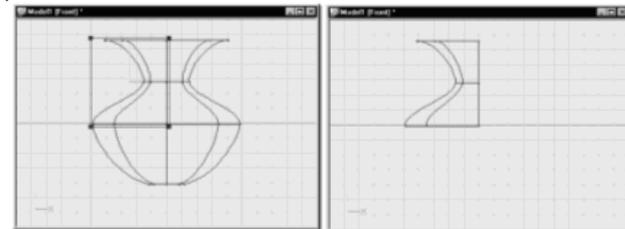
The number of splines that make up a model can become confusing, making it difficult to distinguish one spline from another.

To hide the nonessential splines, group the ones you are interested in, then click the Hide button on the Modeling toolbar. The Hide button will remain down while any splines are hidden.

More control points can be hidden by grouping them and pressing the <Shift> key while clicking the Hide button.

To turn off Hide and make all splines visible, simply click the Hide button off. The default keyboard shortcut key for Hide is <H>.

Example: Use one of the grouping methods to group the essential control points you are interested in. Remember that the control points that are grouped are the ones that will remain visible



Before Hiding

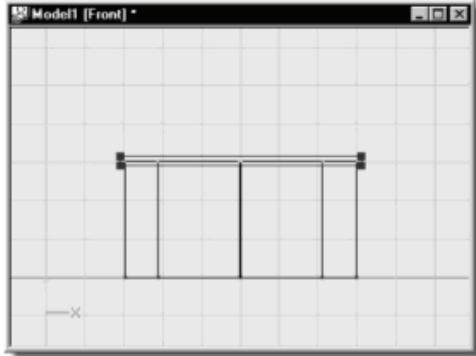
After Hiding



Extrude

Extruding is performed on a group of control points. Once a group has been selected, click the Extrude button on the Modeling toolbar, then press and hold the mouse button over the manipulator (the cursor changes when positioned over the manipulator). Drag the mouse to where the extrusion is to be placed then release the mouse button. Note that the newly created extrusion is offset by the amount you have specified in Tools/Options menu, on the units tab. The default keyboard shortcut key for Extrude is <E>.

Example: Group the spline to be extruded. Click the Extrude button on the Modeling toolbar, then press and hold the mouse button over the Group manipulator (the mouse cursor change indicates when the mouse is over the manipulator). Move the mouse to where the extrusion is to be placed then release the mouse button.

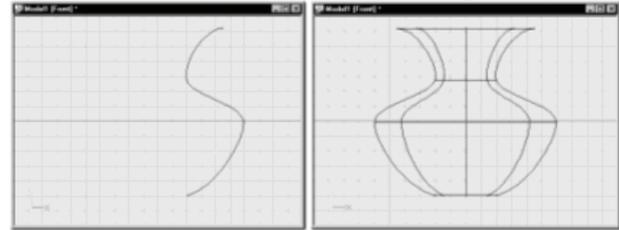


Lathe

Lathing is justly named after the spinning table used to make pottery since lathed objects are symmetrical and often resemble vases. To lathe, first draw a silhouette spline vertically in the front view. (Both smooth and peaked control points can be used in this spline). Select this spline by clicking on any control point then clicking the Lathe button on the Modeling toolbar. The default number of lathe cross sections is "8", however this can be changed in [Tools][Options] dialog on the "Modeling" tab. The default

keyboard shortcut key for Lathe is <L>.

Example: Create a silhouette spline vertically in the front view. Click any control point of the spline then click the Lathe button on the Modeling toolbar. The Pivot's Y-Axis (usually green) is the center of revolution. (The Pivot can be moved or rotated to lathe around differing centers).

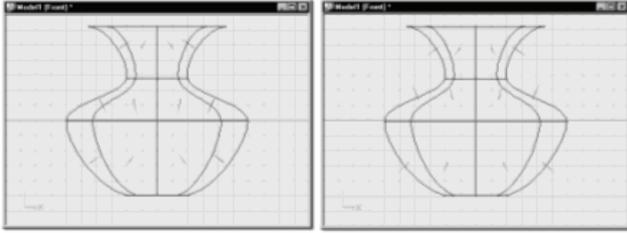


Flip Normals

As models are built, the software will automatically try to make connected patches orient uniformly. The direction that a patch faces is called the "normal" direction. You will usually want the normals to point outward. Sometimes the normals will be pointing inward, depending on how the model was constructed. The normal direction becomes important for things like hair, emitting particles, and exporting objects as polygons.

To see patch normals, select the "Display Normals" option from the [Tools][Options] dialog on the "Modeling" tab. For each legal patch, a short line will appear pointing in the direction of the surface's normal. If the normals are pointing inwardly, you can switch their direction by first grouping the control points that form the patches that need to be flipped, then right-click (Control-click on a Mac). Within the group manipulator and choose "flip normals" from the menu. The default keyboard shortcut key for flip normals is <F>.

Example: With Display Normals turned on in Tools/Options menu, modeling tab.



Flipping Normals Using Patch Selecting

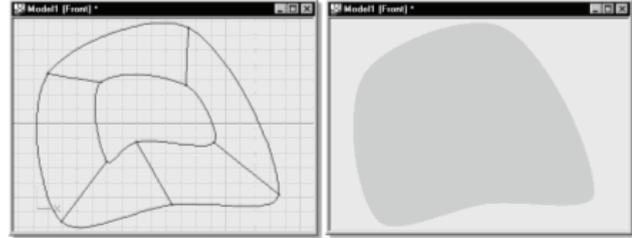
The direction a surface is facing is of paramount importance to ing, fur, and real-time export. To see surfaces, put the window in "Shaded/Wireframe" with "Two-Sided" off (also turn off decals while flipping normals so that you do not have to wait for rebuilding of maps). Click the Group Patch button on the Modeling toolbar (or simultaneously press the <Shift><p> keys on the keyboard), put the cursor over the patch you want to flip (it may not be visible because the normal is pointing away from you), and click the mouse button. Repeat to add more patches to the group, then right-click (Command-click on the Mac) and pick "Flip Normals". The model should immediately redraw showing the change.



Make Five Point Patch

When modeling, it may become necessary to finish closing a surface that ends in a five-point patch. As a general rule, five points will not render as a patch, however, because certain modeling situations will cause the need for such a tool, the Make Five Point Patch button allows you to specify five points to render as a closed patch. Use this option sparingly. To use this tool, select only the five control points you wish to close as a patch, and when the Make Five Point Patch button un ghosts, click it to create a rendering patch. To revert a rendering five point patch back to a hole, simply add and remove a point or spline to one of the existing five points.

Example: Use one of the previously described grouping methods to select the five points you wish to render as a patch. In this example, this would be the inside "loop" of this model.



Once selected, the Make Five Point Patch button will un ghost, allowing you to click it. The mesh will not change in appearance, but the renderer will render the selected five control points as a legal surface.



Lock Control Points

Sometimes when you are adjusting specific areas of your model, you would like to see all of the other splines and control points but not accidentally select or move them. Control points can be made non selectable by grouping them and clicking the Lock button on the Modeling toolbar. Like the Hide tool, NON SELECTED control points will be affected. Locked control points and splines will be drawn half-bright. Unlock simply by clicking the Lock button again.

Muscle Toolbar



Edit Mode

Anytime you click on a control point you can move it.



Group Mode

Muscle uses the same grouping tools as modeling. After you have grouped control points in muscle mode, any changes you make to the group (translate, scale, and rotate) will be saved to every control point in the group. Be very careful not to get carried away; you want to be selective when creating muscle motion.



Hide

Muscle uses the same hide tool as modeling. This can be very useful for preventing accidental muscle motion on control points that are not part of an action (e.g. points on the back of the head when creating facial animation).



Lock Control Points

Control points can be made un-selectable by grouping them and clicking the Lock button on the Muscle toolbar. Like the Hide tool, NON SELECTED control points will be affected. Locked control points and splines will be drawn half-bright. Unlock simply by clicking the Lock button again.

Navigation



Use the **“Move”** tool within a window to slide the visible part of the scene to expose what’s just off screen.

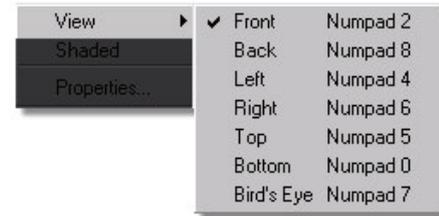


“Zoom” makes more or less of the scene visible by changing the size of it relative to your window. When in the Zoom mode, you can also right-click (command-click on a Mac) and drag a rectangle around the area you want to zoom into (also known as “bound zoom”) - this region will then fill the window. Two often used zoom options are “zoom to fit” and “zoom to fit selected”, both of which require keyboard modification. Zoom to fit automatically finds a zoom that will entirely fit inside the active window. Hold down the <Shift> key on the keyboard simultaneously before clicking the Zoom button on the Navigation toolbar, or press the <Shift><Z> keys on the keyboard simultaneously. Zoom to fit selected finds a zoom that will entirely fit only the selected object inside the active window (be it model or group). Hold down the <Shift> and <Ctrl> keys on the keyboard simultaneously before clicking the Zoom button on the Navigation toolbar, or press the <Shift><Ctrl><Z> keys on the keyboard simultaneously.



“Turn” lets you find a perfect vantage point, but the computer needs to know what you are turning around, so the last selected object’s position is used. Therefore, a model will turn around the selected control point, a character will turn around the selected bone, and a choreography will turn around the selected character.

View Menu



With the mouse pointer over any window, right-click (Control-click on a Mac) to change the interface View: “Front”, “Back”, “Left”, “Right”, “Top”, “Bottom”, etc.

Standard Toolbar



Render Mode

When using this render mode inside the Animation:Master interface, the image is rendered at the quality settings you specify under the [Tools][Options] dialog. There is a progress indicator that will advance across the bottom of the program window as the render is being performed. After the render is complete, the image will appear in the window.



Progressive Render Mode

When using this render mode inside the Animation:Master interface, the image is rendered in multiple passes; progressively getting more detailed each pass. This allows you abort the rendering process once you have seen what you are looking for. No anti-aliasing is done.



Render To File

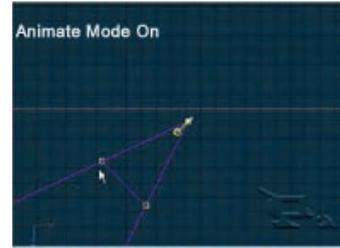
When you click the Render To File button on the Standard toolbar the Render Panel will appear. The options on the various tabs control the output of the image or animation from Animation:Master

Modes

Animate Mode



Animate mode is on by default. When animate mode is on, values are inserted at the current frame. Turning animate mode off instead alters all existing keys to create the desired change. This is handy for positioning lights at time 5:12, but you don't want the light to animate from where it was positioned at time 0:00 to where you moved it at frame 5:12. Rather you want to modify the 0:00 keyframe so that the light just moves over at all frames from 0:00 to 5:12. It does this by altering the keyframe that was already set at 0:00. The following example shows the top down view of a camera. The camera is primarily aiming to the left and slowly translating to the right. As the camera translates to the right it also oscillates up and down but stay aiming primarily to the left. In the first example with "Animate Mode" on, I changed the frame to frame 7 which did not have any keyframes and rotated the camera to point upwards which created a keyframe. When played back the camera has now incorporated the key made on frame 7 and will briefly point upward and then back to primarily pointed to the left. The second animation demonstrates the same procedure but this time with "Animate Mode" off. Instead of making a key frame at frame 7 it adjusted all other keyframes so that the camera will point exactly straight up as desired on frame 7. When the animation plays back notice that the camera primarily points in the up direction rather than the left, but all the motion is preserved, just aiming in a new direction. This process can be done to any property.



Bones Mode



The Bones Mode button on the Mode toolbar is enabled whenever a model is selected in a Choreography window, or from a Modeling window. Click the Bones Mode button on the Mode toolbar to add or modify a model's bones.

Muscle Mode

To enter Muscle mode, click the Muscle mode button on the Mode toolbar. If you are adding muscle motion to a Choreography action, first select a model, and then click the Muscle mode button.

Muscle Motion

Muscle actions allow you to animate the actual surface contour of a model by altering the control points at keyframes. This is important when using techniques like squash and stretch, and when doing precise movements like those needed in lip-sync.

When you build a model, every control point is assigned a unique identity number called the "CP#". Once a model is saved, every control point will always retain its CP#, even if other control points are added to or deleted from the model later. This means that muscle motions created for the model will still be valid even if you change the model, of course, muscle movements assigned to a control point that has been deleted will be ignored, and new control points will have no muscle movement associated with them. But, because muscle actions refer to specific control points, they are model specific and cannot be reused for multiple models like skeletal actions can.

Like skeletal motion, muscle motion is based on keyframes. You will move control points on the model on keyframes, and the computer will interpolate the motion of those control points between keyframes. Once in Muscle mode, select a keyframe by setting the current frame in the Frame toolbar,

then simply point at the control point you wish to modify, press and hold the mouse button, and move. Move all the points you want to change for this keyframe.

Muscle information is stored in channels as X, Y, Z delta offsets on every moved control point, as measured from where the point was in the original model. The delta is stored relative to the bone. Therefore, muscle motion can be combined with skeletal motion.

When to Use Muscle

Muscle motion is very powerful and gives you the finest level of control over your animation. It is best used for creating poses for facial animation, and controlling objects that are intended to be soft or fleshy. You can also use muscle motion for making tweaks after you have applied skeletal and pose actions. Use it when manipulating individual control points rather than groups. It's best to use it mainly in your final animation pass.

When Not to Use Muscle

The power of muscles comes at a price; they generate a large amount of information that takes up a lot of memory, disk space and render time. Many times you can get the motion you want by using skeletal motion and/or pose actions. It is very important that you consider using the other methods first, because muscle actions are harder to edit and modify. Remember that you can build a bone that is linked to any group of control points. Therefore, you could scale sets of bones to control the squash and stretch of a model rather than making large muscle actions to do the same thing. If you are manipulating groups of control points, it's best to use skeletal or poses than muscles.

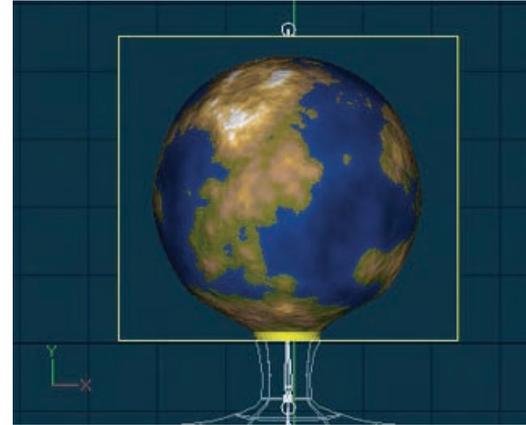
Progressive Render Mode

When using this render mode inside the Animation:Master interface, the image is rendered in multiple passes; progressively getting more detailed each pass. This allows you abort the rendering process once you have seen what you are looking for. No anti-aliasing is done.



Render Lock

When adjusting materials, lighting, or scene composition, it is often convenient to preview render (fast raytrace) the changes before a final render. The preview render mode now remains locked on so you make these adjustments in real-time: as you move, modify, or change material settings, the preview render will automatically show the results. Click the Preview Render button again to turn off.



Render Mode

When using this render mode inside the Animation:Master interface, the image is rendered at the quality settings you specify under the [Tools][Options] dialog. There is a progress indicator that will advance across the bottom of the program window as the render is being performed. After the render is complete, the image will appear in the window.



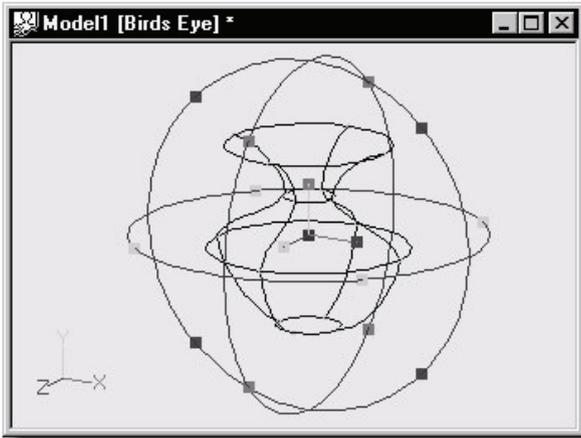
Skeletal Mode

Skeletal motion is movement of a character's bones. In puppet or clay animation, this is called "armature" motion. It includes the rotational movement that occurs at the joints (such as bending an elbow or knee), translation (juggled balls), and scaling (a balloon filling up). All the control points assigned to the bone have the motion applied to them. Skeletal motions are reusable from character to character due to name matching of the bones. Skeletal mode is available in Action and Choreography windows. Enter Skeletal mode by clicking the Skeletal Mode button on the Mode toolbar (or press the <F8> key on the keyboard).

Manipulators

Rotate Manipulator

To rotate a selected group of control points, click the Rotate Manipulator button. The Rotate manipulator is a sphere represented by three rings with colored handles around the edges. Each of the handles correspond in color to the X, Y, and Z-Axis, so dragging the handle matching the color of the axis you wish to rotate the selected group around will allow the selected points to rotate only in that axis.



Rotate Manipulator

Dragging the handles on either side of the manipulator sphere would rotate the selected control points around the X-Axis only, while dragging the handles at the top or bottom of the sphere would rotate the selected control points around the Y-Axis. Notice the lack of handles that share two axes color codes. This is because the manipulator sphere can actually be dragged from any point on the sphere... just point at it with the mouse, hold down the button, and drag to rotate.

The Pivot controls the orientation of the axis of rotation, and it determines around which center the sphere will rotate.

The "Group" tab on the Properties panel also allows direct entry of rotation values. Rotation is listed in degrees from -180 to 180, with 0 being equal to the original position of the control points when rotation first started. When the mouse button is released after rotating, the rotation value will snap back to 0, as the grouped control points have assumed a new rotation.

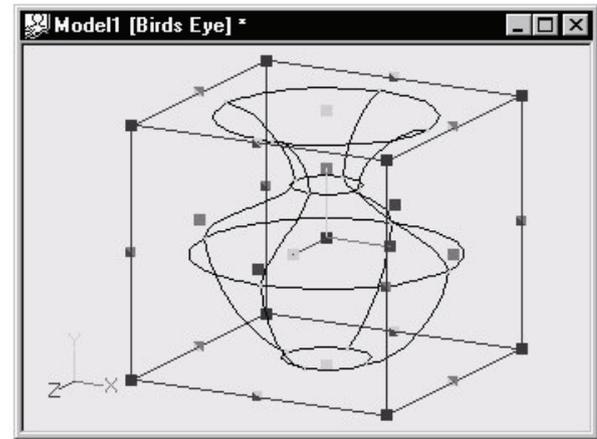
The default keyboard shortcut key for the Rotate manipulator is <R>. Pressing <R> a second time (or pressing the <Esc> key) will switch back to the Standard manipulator.

Skewing With The Rotate Manipulator

The <1>, <2>, and <3> keys can be used in conjunction with the rotate manipulator to restrict the rotation to the X, Y and Z axes. This feature can be used to skew a group of control points. For example, holding down the 1 key down while rotating a group around the Z axis will restrict the control points to only move along the X axis. The resulting effect is a skewing or leaning over of the selected group.

Scale Manipulator

While designing a model, you will often find that you would like to shrink or enlarge some of the parts. Of course, each control point could be adjusted individually, but this would be tedious and time consuming. It is much easier to group control points and use the Scale manipulator.



Scale Manipulator

Each of the handles along the edges of the manipulator box correspond in color to the X, Y, and Z-Axis, so dragging the handle matching the color of the axis you wish to scale in will allow the control points to scale only in that axis. Those handles with more than one color will scale the selected control

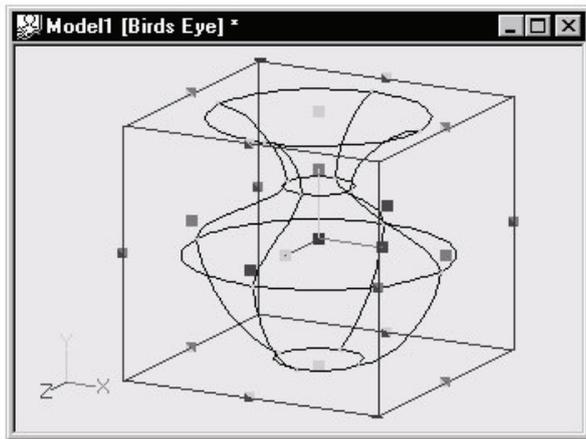
points in both axes that match the color code of the handle. The axis that the object will scale along is also shown on the Status toolbar.

Once the control points to be scaled are grouped, click the Enhanced Scale Manipulator button on the Manipulator Mode toolbar, and then drag the appropriate manipulator box handles. Holding down the <shift> key on the keyboard while dragging these handles will keep the aspect of the selected group of control points while scaling.

The Group tab on the Properties panel also allows you to enter precise scale values by manually typing them. Scale is listed as a percentage, with 100% being equal to the original position of the control points when scaling first started. When the mouse button is released after scaling, the scale value will snap back to 100% as the grouped control points have assumed a new location. Keep in mind that the pivot is very important for using this tool because it determines in which direction the control points will move. For example, to shrink a circle uniformly, you would need to position the pivot in the center of the circle. The default keyboard shortcut key for the Scale manipulator is <S>. Pressing <S> a second time (or pressing the <esc> key) will switch back to the Standard manipulator.

Translate Manipulator

Click the Translate Manipulator button on the Manipulator Mode toolbar. The enhanced manipulator has colored handles, matching the axes colors that allow translation only along that axis or axes.



Translate Manipulator

Each of the handles along the edges of the manipulator box correspond in color to the X, Y, and Z-Axis, so dragging the handle matching the color of the axis you wish to translate in will allow the grouped points to move only in that axis. Those handles with more than one color will move the group in both axes that match the color code of the handle. The axis that the handle will move along is also on the Status bar.

In the "Translate:" section on the Group Properties panel, the coordinates will be printed in their appropriate fields. Values can also be typed in.

The default keyboard shortcut key for the Translate manipulator is <N>. Pressing <N> a second time (or pressing the <Esc> key) will switch back to the Standard manipulator.



The **Show Manipulators in World Space** button on the Manipulator toolbar allows you to change the orientation of the translate manipulator so you can move an object based on the axes of the window instead of the axes of the object. It can be used in both Choreography and Action windows.

Views

Action Views

Animation:Master is a character animation tool, so it seems likely that you should spend the majority of your time animating characters. Unfortunately, animation is difficult - fortunately, Animation:Master takes much of the drudgery out of it. Luckily, all of the animation philosophies over the years are still applicable to computer tools. The concepts of action/reaction, anticipation, and exaggeration apply equally well to what you will be doing here. In fact, traditional character animation books make great references, both for modeling and animation.

Action View Menu

Clear resets the action to be empty. This is a good way to start over if you are unhappy with how the action is working.

Create Pose saves the current frame as a Pose for the selected model. Create Pose includes both Skeletal and Muscle motion when it creates a Pose. The Pose is part of the model, so you must save the model to save the Pose.

Bake makes a copy of the current action with no constraints. New channels will be created to replace and duplicate the behavior with constraints. When this option is selected, a dialog will prompt you for a reduction tolerance. A tolerance of "0" will create a new action that looks identical to the action that

had constraints, except the new action has all keyframes and no constraints. A larger reduction number will remove keyframes that are within the reduction number tolerance. This will make fewer keyframes, but the resulting action may be slightly different. Only the new channels will be reduced; existing channels will be left alone. For example, if you had a constraint that made your eyes always aim at your right hand, this command would add a keyframe to your eyes on every frame to aim them at your right hand. Now, if you were to make a change to where your right hand was located, the eyes would not follow because they are keyframed to look at a particular angle, not object.

Stamp Views

Choosing Edit from a Stamp or Decal brings up a window that shows how patches are distributed across the "Image Shown" property of the decal. The corners of the patches can then be repositioned in relation to the image. This is typically used for preparing your models for export into a game engine.

Still Image Views

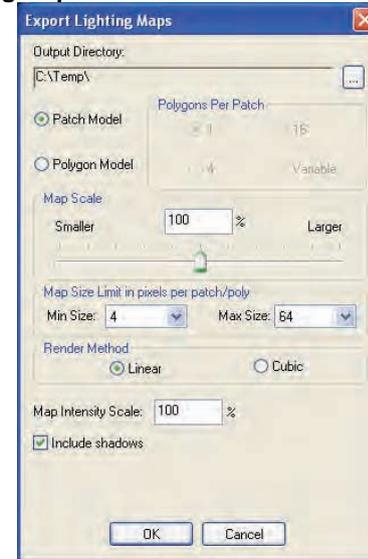


The Still Image Window allows the viewing of a Still image. You can use the Navigation tools to move and zoom around the image.

Relationship Views

A relationship view is exactly like an Action View. It automatically comes up in edit relationship mode. While in this mode, any changes made to the model will become driven by the property that controls the relationship. The property that controls the relationship is indicated in all panels by a red background. Changing this controlling property allows testing of the relationship. The keyframes made can be seen as well as the in betweens. Choreography Toolbar

Export Lighting Maps



This option provides power to game developers who wish to use texture maps to simulate the effect of lighting operations on a patch or polygon.

To create a lighting map for every patch or polygon in a choreography, right click (Control-Click on the Mac) on the Choreography and select [Export Lighting Maps...]. This will open up the "Export Lighting Maps" Option Dialog.

Output Directory: Choose a Directory Folder for all the light maps to be saved in. A Directory for each instance of a model in your scene will be created under the selected output directory. The lighting maps for each instance will then be saved in the directory matching the instances name. For Example if your choreography has two models in it, ModelA, and ModelB, and you chose c:\MyMaps as the Output Directory Folder, then a folder called ModelA, and a folder called ModelB will be created under the c:\MyMaps folder. Each of the model folders will then have a BMP image file for each Patch\Polygon in the model. The image maps will be labeled Map0.bmp, Map1.bmp, Map2.bmp... where the number indicated the patch/polygon number from the exported model file. Also a LogFile.txt file will be saved in each folder with information pertaining to the model from the choreography.

Patch Model: If the models exported were exported as patch models, then the light maps should also be exported as a patch model so the correct number of maps gets created.

Polygon Model: If the models exported were exported as polygon models, then the light maps should be exported as polygon models with the same subdivision rate (Polygons Per Patch)

Map Scale: The size of each map is determined by the size of the actual geometry within the choreography. The map scale value can then scale the size of the map so that you can universally make the maps smaller or larger. A value of 200% would make the maps twice as big, whereas a value of 50% would make the maps twice as small.

Map Size Limit: Used to set a min and max size for the lighting maps.

Render Method: Only valid for patch model export. The render method specifies how the lighting map are created. If linear is chosen then the maps are created by linearly walking across the map. If Cubic is chosen then the maps will be created by truly walking the curvature of the patch.

Include Shadows: If this option is enabled, lighting will be eliminated from areas of the patch that are not visible from the light causing a shadow.

Render To File



When you click the Render To File button on the Standard toolbar the Render Panel will appear. The options on the various tabs control the output of the image or animation from Animation:Master. To Render a particular camera's point of view, open the choreography and change your view to the desired camera before you click the Render To File button.

Apply changes to camera The "Render to File" panels contain many of the same setting as a Camera Properties panel. The "Apply changes to camera" option will automatically transfer these settings to the selected camera so there is no confusion about which settings are currently being used. (Otherwise, you would have to change the Camera's Properties panel independently each time before doing a final render from it's point of view.)

Perceived Resolution

For technical reasons, computer monitors display around 1 million pixels. Print media, such as an ad in a magazine, display the equivalent of 244 million pixels (photographs have similar fidelity). Empirically, 90,000 pixels per square inch (called 300 dots/inch) appear crisp, but computer monitors can only show 1,000 pixels per square inch. The result is that images displayed on computer monitors are either aliased or soft. They are aliased if each pixel can only represent one object at a time, like a mural made of tiny colored tiles. If instead (like is usually the case), each pixel is a

combination of all of the objects it covers (called "antialiasing"), the image is soft. The same image would appear crisp if it was printed on paper at 300 dots/inch (but it would only be about an inch wide where before it filled the entire computer monitor). 1000 pixel wide images appear crisp on 35mm slides because the slides are also only about an inch wide, but if you project the slide on a big screen, it appears soft again. 35mm film can actually hold as many as 16 million pixels, so if you rendered an image at 4000 X 4000 it would look crisp projected on a big screen but it certainly would not fit on a computer monitor unless it was shrunk 16 times (which is similar to antialiasing) - then it would appear soft. Until computer monitor's can display 300 dots/inch, antialiased images will appear soft when displayed on them.

This brings us to Animation:Master's hybrid a-buffer renderer. Remember, it takes approximately 16 million non-antialiased pixels to represent the kind of crisp picture you would like to see projected on a big screen. The render time for a non-antialias rendered 16 million pixel movie is exorbitant, certainly hindering you from making a feature film on your home computer, but Animation:Master employs an "a" buffer that significantly increases the perceived resolution, so a 1000 X 1000 image rendered with Animation:Master will be perceived with the same crispness as a 4000 X 4000 non-antialiased projected image. This reduces render time by a factor of 16, meaning a frame that took 10 hours to render without an a-buffer would now take only 38 minutes (about the render time limit to getting a movie finished).

Status Tab

The "Status" tab contains useful information that keeps track of the progress of the current render. (If you do not select this tab before the render, the software will switch to it automatically).

All Frames %

This status bar will display the percent of the entire job that has been rendered.

Current Frame %

This status bar displays the percent of the current frame that has been completed.

Current Frame

The "Current Frame" field displays the frame of the animation that the software is in the process of rendering.

Average Time

This field is recalculated after each frame is rendered and displays the average time that it is taking to render each individual frame of the animation.

Elapsed Time

Displays the entire time that has elapsed during the current render.

Estimated Time Left

This field displays the estimated time left for the entire render job. This should just be used as a guide, since the estimate is based on the average render time of the rendered frames and the number of frames left.

Edit Render Presets



Context Menu

When in "Non-Advanced" mode in the Render Options, you can right click (Ctrl click on a Mac) on a preset or in the preset window for a menu that contains options for modifying presets.



Edit: Select this option to open the "Edit Preset" dialog to customize the selected preset. Double clicking on the preset will also open the "Edit Preset" dialog. From the "Edit Preset" dialog all the rendering options can be customized along with the preset name and image. To change the image, click on the picture to bring up a File Open Dialog to choose your new image.

Duplicate: Creates a duplicate copy of the selected preset. Usually you will pick this menu item to create a new preset that you can customize.

Delete: Permanently deletes the selected preset from Animation:Master.

Rename: Allows you to just rename the selected preset. Also a slow double click on the preset name or selecting the preset and then pressing the F2 key will allow the preset to be renamed.

About Bone Container Objects

The Bone Container is a folder that contains all of the bones for the model.

Bone Container Cache Menu

- Delete** Removes the selected object from the project.
- Select Cache (Bones)** Highlights the object that this shortcut is to.
- Properties** Edits the selected object's properties.

About Channel Objects

Every motion has a channels associated with it. A channel is represented as a graph showing a value changing over time. This is not the most natural way for an artist to see animation, but it is how the computer sees it. Channel graphs use splines and control points, the same kind you use for modeling, to control values such as color, rotation, and scale during the animation. As you add new keyframes, new channel control points will be automatically created inside the appropriate channels. The curved nature of splines gives you an easy way to introduce natural "Motion Ease" to the animation. This is subtle acceleration/deceleration, also known as "ease in/ease out," that we see in the motion of everyday objects. It is the control of these curves that can make a substantial difference in your final animation and allow you to finesse the performance you are striving for.

To edit a channel, select the property you wish to edit in the action or choreography. The channel graph will appear in the Timeline panel (if the Timeline panel is closed, open it by picking [View][Timeline]).

Channel Menu

- Delete** Removes the selected object from the project.
- Rename** Rename the selected object
- Properties** Edits the selected object's properties.

Constant Drivers

Stores a single value for a property.

Constant Driver Menu

- Menu** Description
- Delete** Removes the selected object from the project.
- Properties** Edits the selected object's properties.

Containers

A container acts as a folder to store objects of the same type.

Container Menu

Menu	Description
Delete	Removes the selected object from the project.
Properties	Edits the selected object's properties.

Group Container Instance Menu

Delete	Removes the selected object from the project.
Select Cache (Groups)	Highlights the object that this shortcut is to.
New Folder	Creates a new folder that can be used to organize objects. Once created objects can be dragged into the folder.
Properties	Edits the selected object's properties.

Muscle Channel Containers

This container includes all of the Muscle Channels used for this action.

Muscle Channel Container Menu

Delete	Removes the selected object from the project.
Rename	Rename the selected object
Properties	Edits the selected object's properties.

Object Containers

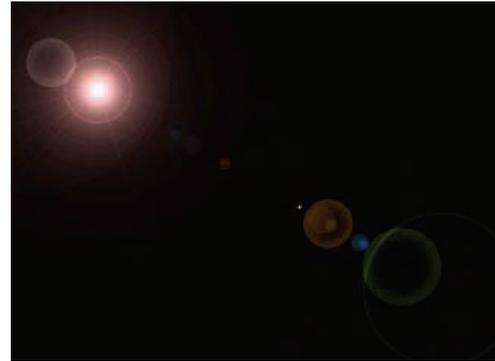
This container includes all of the objects used for this Project. These include Models, Cameras, Lights, etc.

Object Container Instance Menu

Delete	Removes the selected object from the project.
Rename	Rename the selected object
Select Cache ()	Highlights the object that this shortcut is to.
Properties	Edits the selected object's properties.

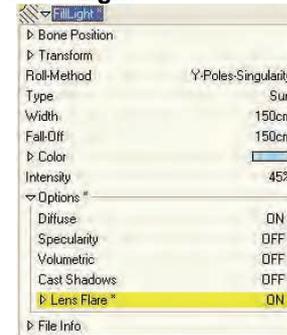
Lens Flares

Since computer rendered images are nearly perfect, that in itself is a subtle hint that can cause the audience to not believe the image is real. One way to add realism to an image is to add camera lens artifacts. These artifacts are referred to as lens flares. Lens flares are caused by light reflecting in the lens of a camera. These artifacts are added over the original image because the artifacts are created in the lens of the camera. It is very easy for lens flares to wash out the image, so use them sparingly.



50mm Zoom lens flare

Adding a lens Flare to a Light



Any light in a choreography can possibly flare in the lens, depending on their angle to the camera. Select a light by clicking on its icon in the Project Workspace tree, and then turn on the "Lens Flare" property under the "Options" property. Once the lens flare property is turned on, new properties will appear under it. These properties contain all the settings available to alter your lens flare. There are three basic flare elements: Glows, Beams and Reflections. Any number of flare elements can be added to a light. (By default, the 50mm zoom flare presets are added to your light). For Specifics see "Lens Flare Properties" later in this text.

Beam 1 Properties

Color

Color of the flare element. By default the light color is used for the flare element. Once a color has been selected, the light's color will be ignored. To reset the color back to using the light's color, right click (Control-Click on Mac) the property and select [Mark As Not Set].

Scale

Scale of the flare element. This allows distortion of individual elements.

Intensity

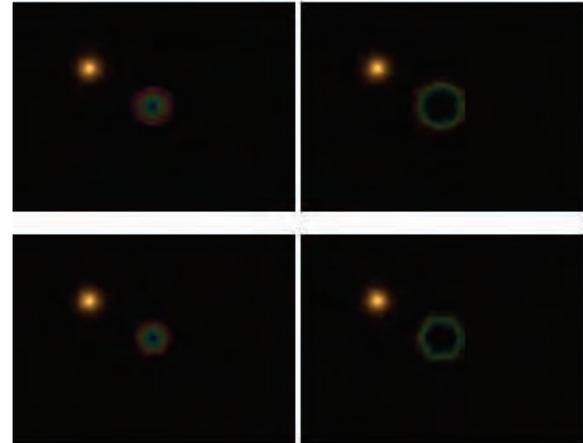
Default: 100%, Min: 0%, Percentage. Intensity of the flare element. If the flare element is a Glow Element than the value not only depicts how bright the glow element is, but also how large it is.

Spectrum

Default: 0%, Min: 0%, Percentage. A percentage value between 0 and 100. A value of 0 means the flare element will be completely the color you have chosen. A value of 100 means that the glow element will be colors of the color spectrum, and the flare's chosen color will be completely ignored. Any number between 0 and 100 will be a blend between the color spectrum and the element's chosen color.



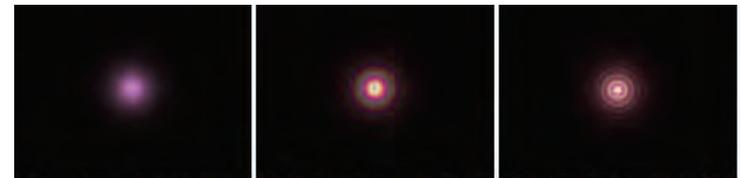
Glow Element with 100% spectrum



4 different Reflection Element types with 100% spectrum

Spectrum Count

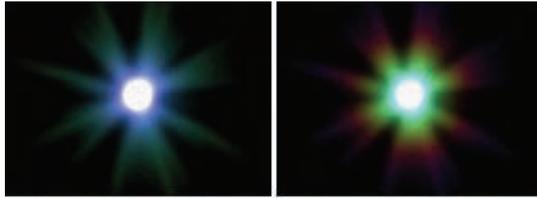
Default: 2, Min: 0. This is a number greater than 0. It represents how many times the flare element will repeat the color spectrum.



Spectrum Repeats = .3

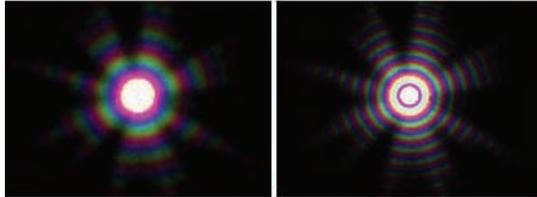
Spectrum Repeats = 5

Spectrum Repeats = 10



Spectrum Repeats = .7

Spectrum Repeats = 2

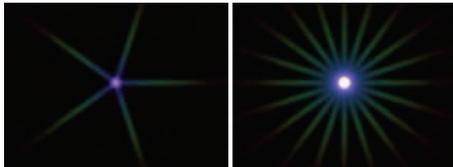


Spectrum Repeats = 7

Spectrum Repeats = 15

Count

Default: 25, Min: 0. Number of beams in the beam element.



5 Beams

20 Beams



50 Beams

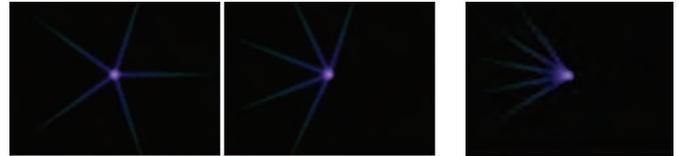
Zones

Default: 1, Min: 1. By default, there is only 1 zone with a zone coverage of

100%. A zone is an area in which a beam can be emitted from the light. Think of it as a pie that is cut up into 3 pieces. This pie would represent 3 zones. The number of beams you have specified in the Count Property will be emitted from each zone. For example, if you have a beams count of 5, and 3 zones, there will be a total of 15 beams. This feature really only comes into play if you change the zone coverage, See below.

Zone Coverage

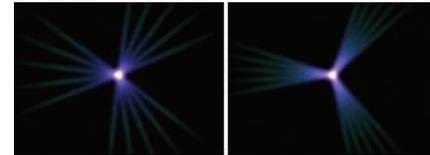
Default: 100%, Min: 0%, Max: 100%, Percentage. This property is used in conjunction with the Zones Property above. If you change the zone coverage from 100% to 50%, then the beams can only be emitted from within 50% of each zone.



1 Zone 100% Coverage

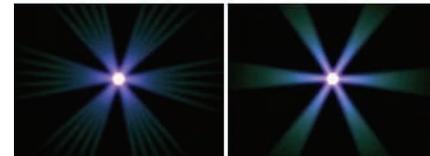
1 Zone 60% Coverage

1 Zone 30% Coverage



3 Zones 60% coverage

3 Zones 30% coverage



6 Zones 60% coverage

6 Zones 30% coverage

Angle

Default: 0°, Angle. A number that represents the angle in degrees to rotate all beams in the beam element.

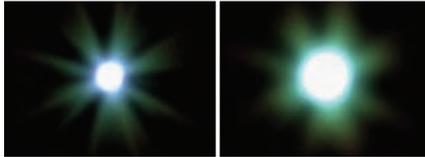
Softness

Default: 5, Min: 0. This value controls how thick each beam of a beam element is. The larger the softness value, the thicker each beam becomes. Thick beams have a soft appearance.



Softness = 1

Softness = 10

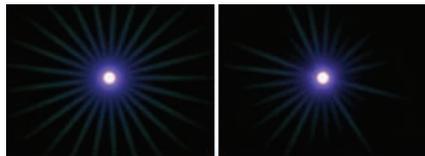


Softness = 30

Softness = 60

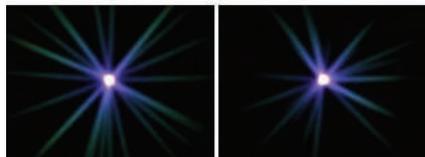
Random Length

Default: ON. With this property turned on each beam will have a random length between the Min and Max Length Property values. If this option is turned off, each beam will have a length of the Length Property value.



Nothing Random

Random Length



Random Distribution

Random Length and Dist

Random Distribution

Default: ON. To randomize the location where the beams emit from the light, turn this property on.

Min Length

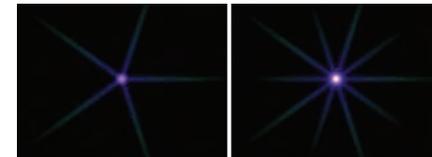
Visible: Sometimes, Default: 30%, Min: 0%, Percentage. The minimum length of a beam. The length is a percentage of the height of the rendered image. This option is only enabled when Random Length is enabled.

Max Length

Visible: Sometimes, Default: 80%, Min: 0%, Percentage. The maximum length of a beam. The length is a percentage of the height of the rendered image. This property is only available if Random Length is enabled.

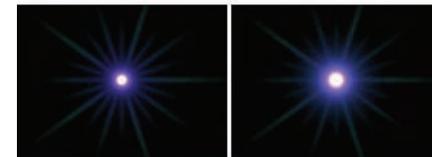
Octaves

Visible: Sometimes, Default: 0, Min: 0. The octaves field is only enabled when neither the Random Distribution nor Random Length options are on. An octave adds new beams between all existing beams at a percentage of the existing beams length.



0 Octaves

1 Octave



2 Octaves

3 Octaves

Octave Length

Visible: Sometimes, Default: 75%, Min: 0%, Percentage. The percentage of the length of the previous added beams due to adding an octave. For Example if your octave length is 75%, then each octave will add new beams at 75% the length of the last beams added. Each new octave doubles the number of beams of the previous octave.

Glow 1 Menu

New Relationship

Create a new relationship for this property.

Select Relationship

Select this properties Relationship if any.

Edit Relationship

Brings this property's Relationship up in its own private editing window.

Set To Default Value

Set this property to its default value.

Not Set

Remove any local or current choreography drivers from this property and mark it as not set.

Use Cache's Value

Remove any local or current choreography action drivers off of this property and use the value from another action or the cache.

Constant

Set this property to be Constant.

Time Based

Set this property to be able to change over time.

Edit Expression

Properties

Edits the selected object's properties.

Glow 1 Properties

Color

Color of the flare element. By default the light color is used for the flare element. Once a color has been selected, the light's color will be ignored. To reset the color back to using the light's color, right click (Control-Click on Mac) the property and select [Mark As Not Set].

Scale

Scale of the flare element. This allows distortion of individual elements.

Intensity

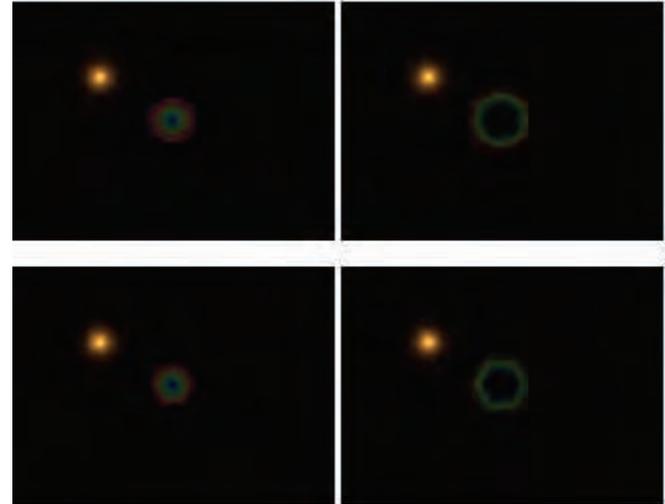
Default: 100%, Min: 0%, Percentage. Intensity of the flare element. If the flare element is a Glow Element than the value not only depicts how bright the glow element is, but also how large it is.

Spectrum

Default: 0%, Min: 0%, Percentage. A percentage value between 0 and 100. A value of 0 means the flare element will be completely the color you have chosen. A value of 100 means that the glow element will be colors of the color spectrum, and the flare's chosen color will be completely ignored. Any number between 0 and 100 will be a blend between the color spectrum and the element's chosen color.



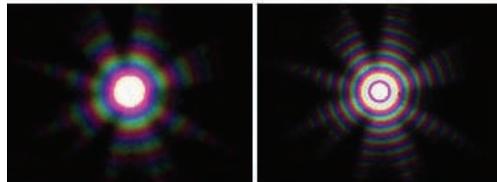
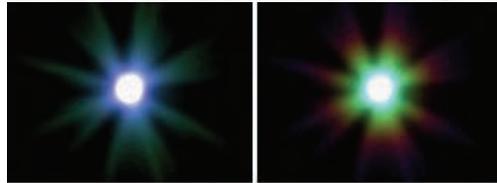
Glow Element with 100% spectrum



4 different Reflection Element types with 100% spectrum

Spectrum Count

Default: 2, Min: 0. This is a number greater than 0. It represents how many times the flare element will repeat the color spectrum.



Lens Flare Menu

New Relationship

Create a new relationship for this property.

Select Relationship

Select this properties Relationship if any.

Edit Relationship

Brings this property's Relationship up in its own private editing window.

Set To Default Value

Set this property to its default value.

Not Set

Remove any local or current choreography drivers from this property and mark it as not set.

Use Cache's Value

Remove any local or current choreography action drivers off of this property

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and use the value from another action or the cache.

Constant

Set this property to be Constant.

Time Based

Set this property to be able to change over time.

Edit Expression

Properties

Edits the selected object's properties.

Lens Flare Properties

Scale

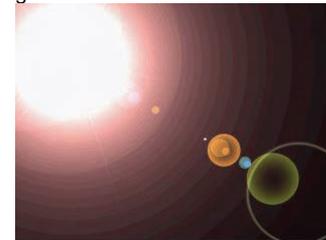
This will stretch and distort all flare elements. 100% is default and does not distort the flare in any way.



X scale of 50, Y scale of 100

Intensity

Default: 10%, Min: 0%, Percentage. The global intensity will increase the brightness of all flare elements. The global intensity will also increase the size of any lens flare glow elements.



Global Intensity of 150

Fade With Distance

Default: OFF. Enables the flare to become less intense as the light moves farther away from the camera.

Fade Distance

Visible: Sometimes, Default: 1000cm, Unit of Measurement. *With Fade With Distance* option enabled, the intensity of the flare will change based on the light's distance from the camera. For Example, if the intensity is 100% at 1000 cm, then the intensity will be 200% at 500 cm, and 50% at 2000 cm.

Fade When Leaving View

Default: ON. The Lens flare intensity will fade when the light leaves the camera's view.

Fade When Behind Objects

Default: ON. Many times you might use a lens flare to emulate a visible sun or star. With this option enabled, the intensity will decrease when the light becomes obstructed by another object.



Fade Behind Objects

Fade When Aiming Away

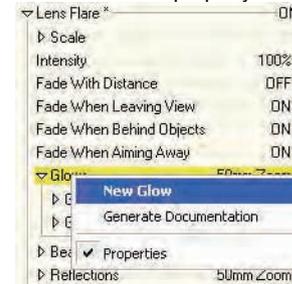
Default: ON. This will decrease the flare's intensity when the light is not aiming at the camera.

Glows

Read-Only on Instance, Default: None



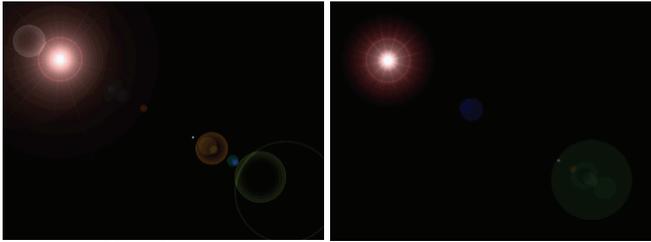
These presets allow you to add pre-built flare elements to your light. Any of the presets can be added and modified. By choosing a preset, new flare element properties will be added to your light. For example, after selecting "50mm Zoom" from the "Glows Property" list, two new "Glow Element Properties" will be added to the "Glows property."



To add your own Glow Element Property, right click (Control-Click on the Mac) on the Glows Property and choose [New Glow]. The number of Glow Element properties is unlimited. If the key is held down while selecting a preset, the new Glow Element will be appended to the existing Element rather than replacing them.

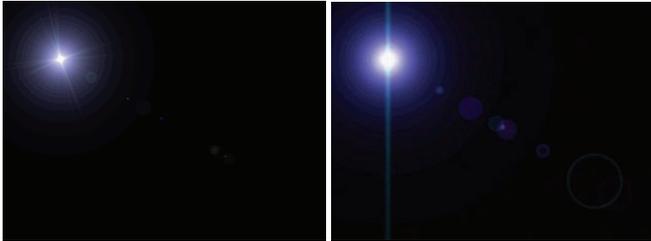
Presets

None: No Glow elements will be present.



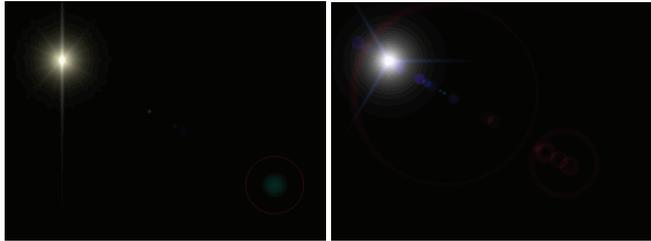
50mm Zoom

35mm Prime



105mm Prime

Hi8



Camcorder

Search Light



Spot Light

Custom: Create your own Glow Elements.

Beams

Read-Only on Instance, Default: None

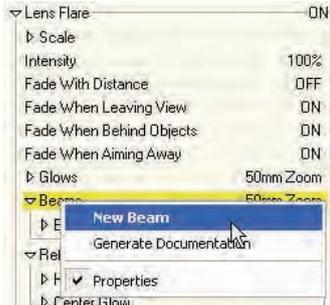


Beam Element

Beam Elements shoot outwards from the center of the light source. This artifact is commonly seen when driving a car at night: headlights from on-coming cars produce this effect when viewed through your windshield. Many times beam elements are used in conjunction with glow elements.



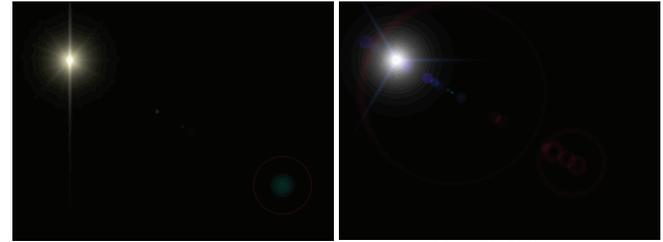
These presets allow you to add pre-built flare elements to your light. Any of the presets can be added and modified. By choosing a preset, new flare element properties will be added to your light. For example, after selecting "50mm Zoom" from the "Beams Property" list, one new "Beam Element Properties" will be added to the "Beams property."



To add your own Beam Element Property, right click (Control-Click on the Mac) on the Beams Property and choose [New Beam]. The number of Beam Element properties is unlimited. If the key is held down while selecting a preset, the new Beam Element will be appended to the existing Elements rather than replacing them.

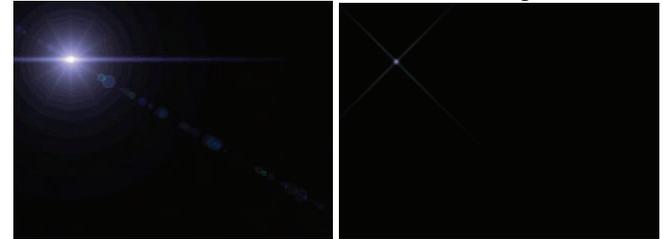
Presets

None: No Beam elements will be present.



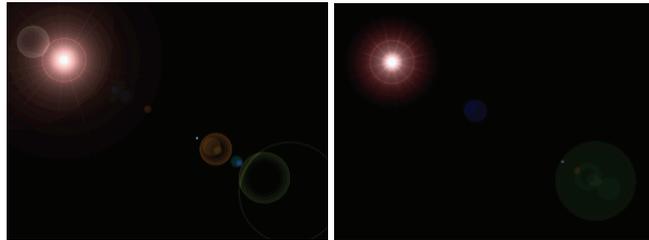
Camcorder

Search Light



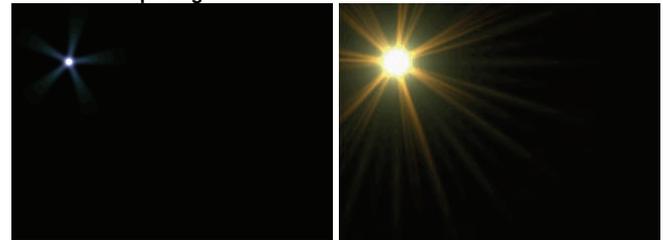
Spot Light

Stadium



50mm Zoom

35mm Prime



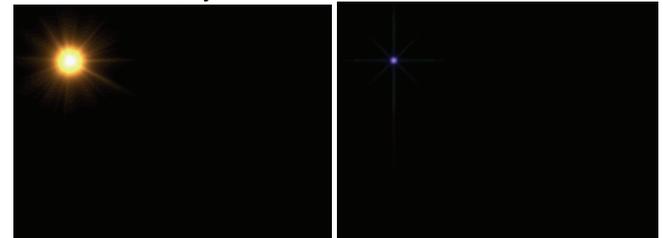
Academy

Sun1



105mm Prime

Hi8



Sun2

North Star



Star1

Custom: Create your own Beam Elements.

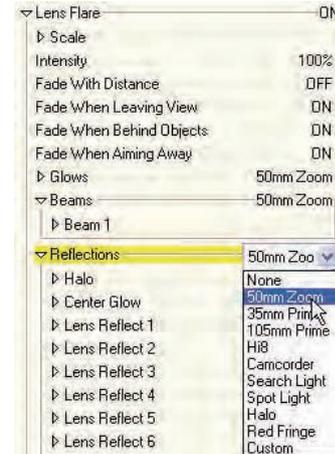
Reflections

Read-Only on Instance, Default: None

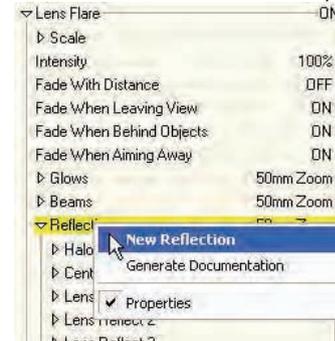


50mm Lens Reflection Preset

A Lens Reflection Element represents a lens artifact that is caused by light bouncing between all the internal lenses in a camera. These are the only lens flare artifacts that are not directly located on the light source. The reflections will always be on a direct line from the light through the center of the camera. Thus as the light moves around the camera's view, all the lens reflections will move accordingly. Each lens artifact can consist of rings, disks, polygons, rainbows, and many other shapes and forms.



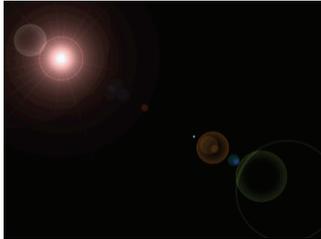
These presets allow you to add pre-built flare elements to your light. Any of the presets can be added and modified. By choosing a preset, new flare element properties will be added to your light. For example, after selecting "50mm Zoom" from the "Reflections Property" list, 18 new "Reflection Element Properties" will be added to the "Reflections property."



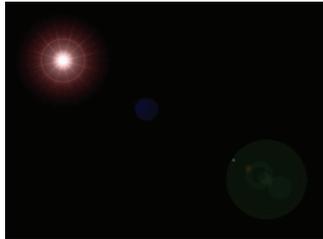
To add your own Reflection Element Property, right click (Control-Click on the Mac) on the Reflections Property and choose [New Reflection]. The number of Reflection Element properties is unlimited. If the key is held down while selecting a preset, the new Reflection Elements will be appended to the existing Elements rather than replacing them.

Presets

None: No Reflection elements will be present.



50mm Zoom



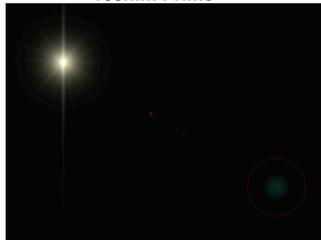
35mm Prime



105mm Prime



Hi8



Camcorder



Search Light



Spot Light

Halo: Creates a red halo around the light.

Red Fringe: Creates a Red glowing fringe around the light.

Custom: Create your own Reflection Elements.

Reflection 1 Menu

New Relationship

Create a new relationship for this property.

Select Relationship

Select this properties Relationship if any.

Edit Relationship

Brings this property's Relationship up in its own private editing window.

Set To Default Value

Set this property to its default value.

Not Set

Remove any local or current choreography drivers from this property and mark it as not set.

Use Cache's Value

Remove any local or current choreography action drivers off of this property and use the value from another action or the cache.

Constant

Set this property to be Constant.

Time Based

Set this property to be able to change over time.

Edit Expression

Properties

Edits the selected object's properties.

Reflection 1 Properties

Color

Color of the flare element. By default the light color is used for the flare element. Once a color has been selected, the light's color will be ignored.

To reset the color back to using the light's color, right click (Control-Click on Mac) the property and select [Mark As Not Set].

Scale

Scale of the flare element. This allows distortion of individual elements.

Intensity

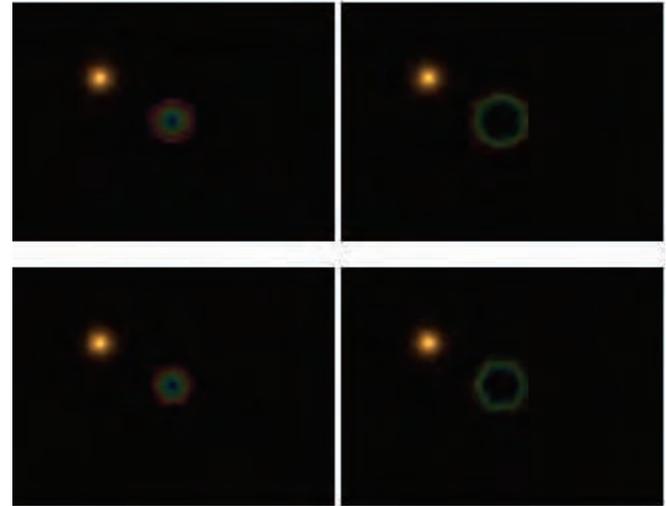
Default: 100%, Min: 0%, Percentage. Intensity of the flare element. If the flare element is a Glow Element then the value not only depicts how bright the glow element is, but also how large it is.

Spectrum

Default: 0%, Min: 0%, Percentage. A percentage value between 0 and 100. A value of 0 means the flare element will be completely the color you have chosen. A value of 100 means that the glow element will be colors of the color spectrum, and the flare's chosen color will be completely ignored. Any number between 0 and 100 will be a blend between the color spectrum and the element's chosen color.



Glow Element with 100% spectrum

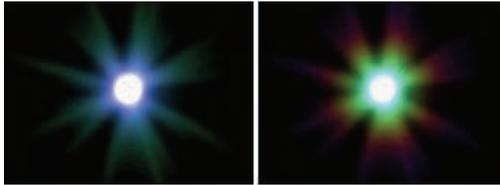


4 different Reflection Element types with 100% spectrum

Spectrum Count

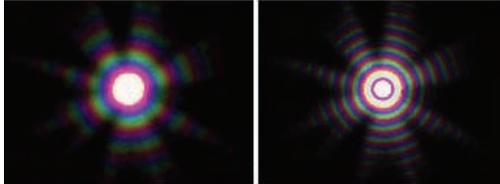
Default: 2, Min: 0. This is a number greater than 0. It represents how many times the flare element will repeat the color spectrum.





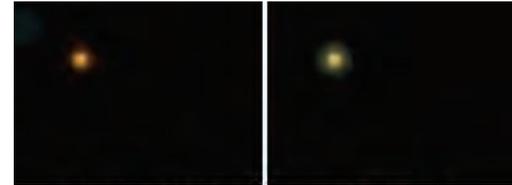
Spectrum Repeats = .7

Spectrum Repeats = 2



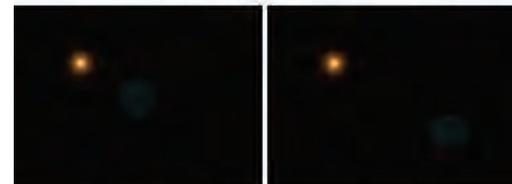
Spectrum Repeats = 7

Spectrum Repeats = 15



Position = -100

Position = 0



Position = 100

Position = 200

Position

Visible: Sometimes, Default: 0%, Percentage. The Position Property represents where the lens reflection is in comparison to the light. The position is a percentage value of how far between the light and the center of the camera lens the reflection will be.

A value of 0 puts the reflection directly over the light.

A value of 100 puts the reflection in the center of the camera view.

A value of -100 puts the reflections even farther away from the center of the view than the light is (exactly twice the distance).

A Value of 200 puts the reflection the same distance the light is away from the center of the screen, but on the other side of the center.

Radius

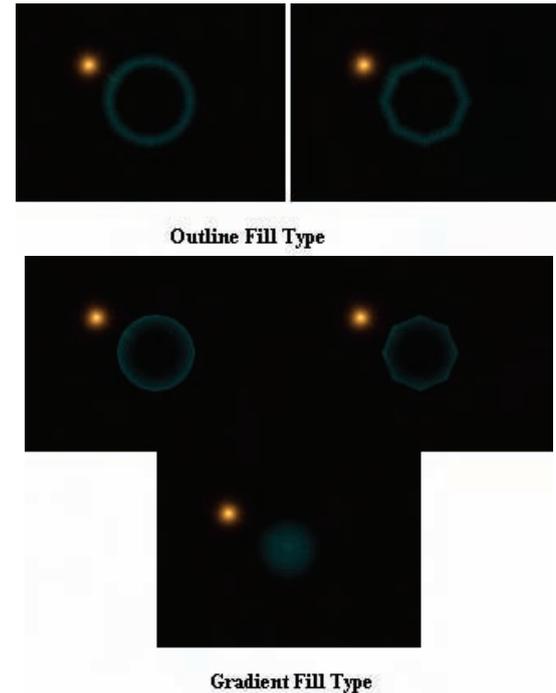
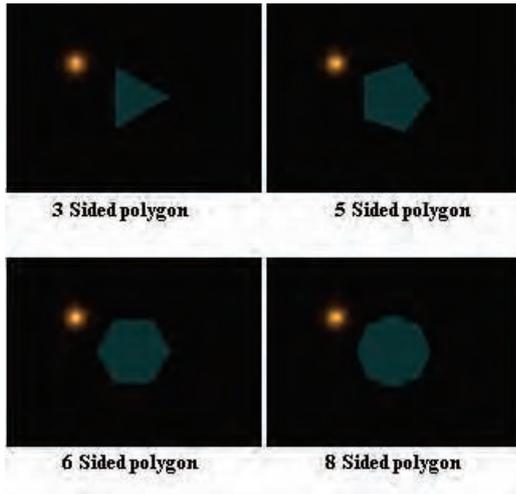
Visible: Sometimes, Default: 20cm, Unit of Measurement. The radius of the lens reflection. (The larger the number the bigger the reflection).

Polygonal

Visible: Sometimes, Default: OFF. Enable this property if you wish your reflection to not be circular.

Faces

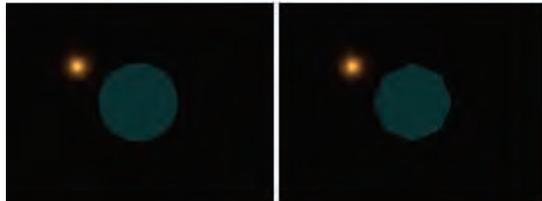
Visible: Sometimes, Default: 6, Min: 3, Max: 256. This property is only available when the Polygon Property is turned ON. A number greater or equal to 3 is required.



Angle
Visible: Sometimes, Default: 0°, Angle. A number that represents the angle in degrees to rotate the lens reflection element.

Fill Type
Visible: Cache Only, Default: Solid. Each lens reflection can be filled in three different ways.

Solid: The entire lens reflection element will be one color.



Solid Fill Type

Outline: This will create a lens reflection, which is hollow in the center (ring). With this fill type you may change the Outline Thickness, to increase/decrease the thickness of the outline.

Gradient: With this fill type you may set the Inside and Outside intensity Properties of the lens reflection, giving a gradient look.

Thickness

Visible: Sometimes, Default: 1cm, Unit of Measurement. This Property determines the thickness of the reflection outline when Outline is chosen from the Fill Type Property.

Inside Gradient

Visible: Sometimes, Default: 0%, Min: 0%, Max: 100%, Percentage
 This property is only available when "Gradient" is chosen from the Fill Type Property. This allows you to adjust the inner intensity of the Gradient Reflection Element.

Outside Gradient

Visible: Sometimes, Default: 100%, Min: 0%, Max: 100%, Percentage
 This property is only available when "Gradient" is chosen from the Fill Type Property. This allows you to adjust the outer intensity of the Gradient Reflection Element.

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