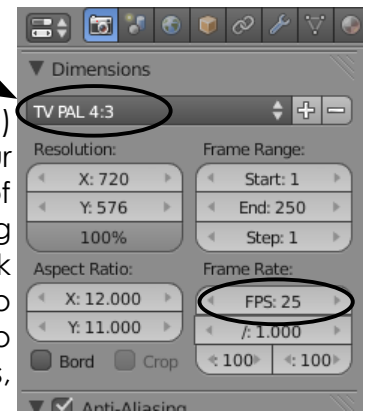


Basic Key-framing and Auto Key-framing

Now that we know how to make stuff and make it look good, it's time to figure out how to move it around in your scene. If you're familiar with older versions of Blender, this is a **HUGE** change from the past! What used to be called the **Action Editor** and **IPO(Interpolation)** windows are now called the **Dope Sheet** and **Graph Editor** windows. Basically, The Dope Sheet shows your animation keys as points that can be easily copied or moved on a line. The Graph Editor shows your animations as graph curves, where different things can be done with them. This is a big area with lots of things we can do and talk about. Many of the features available will become understandable with practice and by getting beyond the basics. This is a highly developed area in Blender where new features will more than likely be available before this document can ever be printed. For this reason, we will deal with the basics. The first thing we need to do is go back and re-read the section on **Rendering and Animation Basics (pages vi and vii)**.

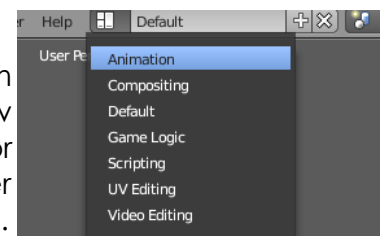
Selecting a preset format will set your frame rate correctly.



After you set up your scene and set the Frames/Second (FPS) in the render button area, consider what you want your "actors" to do and how long they should take to do it. One of the problems that beginner animators experience is making the motions occur in an appropriate time. Remember to look at your frames/second (FPS) when animating and relate it to time. For example, if you want something to take 3 seconds to get from point "A" to point"B" and you are running at 25 fps, you need to complete the animation in a total of 75 frames.

Moving Through Time:

In the picture below, you will find some controls at the bottom of the screen in the Timeline window. If the Timeline window isn't visible by default, you can select the Default or Animation screen in the top toolbar. There are several other ready-made screen layouts that we'll discuss in later chapters.

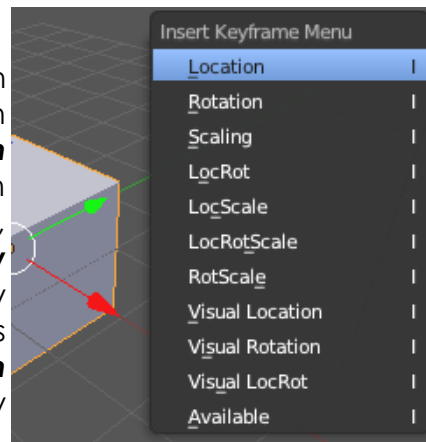


<p>Timeline window type</p>	<p>Current frame: This is your current frame. Can be controlled with the Arrow Keys- Up/Down will change 10 frames, Left/Right will change one frame at a time.</p>	<p>Playback Controls: Just like any player, moves through time.</p>	<p>Synchronization: Used to match playback- sound & video.</p>
<p>Alternate Playback: If this is selected, you can set the playback start and end frames here different then the actual scene frames.</p>	<p>Start and End Frames: Sets the movie length, unless the Alternate Playback button is press. The it will just display working frames.</p>	<p>Key-framing: Control for inserting/removing key frames/types.</p>	

Chapter 9- Animation Basics

Moving, Rotating and Scaling:

These are the 3 basic modifiers to use on an object in animation. When you create key-frames in Blender with these modifiers, Blender will figure out all the **in between** locations on the other frames. To insert a key on an object, go to the frame where you wish to place the key, move, rotate or scale the object, then press the **"I" key** to **"Insert Key"**. Make sure your cursor is in the 3D window when you push the "I" key. The menu to the right pops up. You have 3 main options for now- **Location, Rotation and Scaling** and combinations of these. Select the key option of what you've done to the object. Now, advance to the next frame where you want to put a key (i.e. frame 25 if you want a movement to occur after 1 second), move, rotate or size the object, then press **"I" to insert another key**. Remember, you can change frames quickly with the arrow keys.



Continue placing keys along your timeline to create your animation. For the most part, location and size keys work flawlessly, **but care needs to be given to rotation keys**. If you try to rotate an object too far in one set of keys, the object may not rotate in the exact direction you want it to. It may rotate oddly. Try small angular steps while animating rotation keys. There are ways to control this better and tools to simplify this process that will be discussed later.

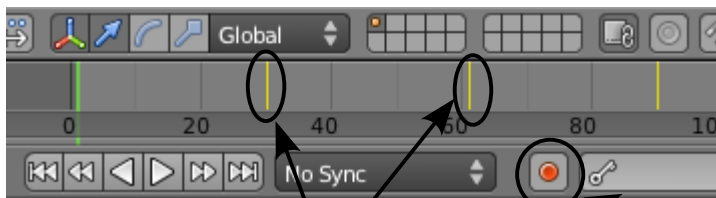


RoboDude Says:

If an object doesn't seem like it rotates properly with animation keys, try pressing Ctrl-A to reset the object's scale and rotation.

Automatic Key-Framing:

Typing "I" to insert keys is the traditional way of entering key frames, but it can become annoying when you have a lot of items to insert key frames for (for example, bones in a skeleton). This is where automatic key framing becomes a useful feature. To turn on automatic key framing, press the *small red circle button* in the playback buttons on the *time line window*. This will "record" any motion you do on a given frame and insert the necessary key frames needed. Don't forget to set a key on your initial frame. Auto key framing won't do that unless you change something on that frame.



Key Frames:

At any frame where you insert a key, a yellow line will display in the timeline.

Auto Key Frame Button:

Eliminates the need to press "I" to insert keys.



RoboDude Says:

Don't forget to turn off automatic key framing when not needed! You may end up animating things accidentally when you don't want to!

Chapter 9- Animation Basics

Viewing Your Animation:

There is a simple way to view your animation without having to render out a movie. Take the **current frame number** to the place where you want to start viewing the animation. Place your cursor in the 3D window you wish to view your animation and press the **“Alt” and “A”** keys together. The animation will play. Blender will attempt to display the movie at the correct *frames-per-second*, but may be unable to do so due to scene complexity, computer speed, or image settings (solid or wireframe -Z key).

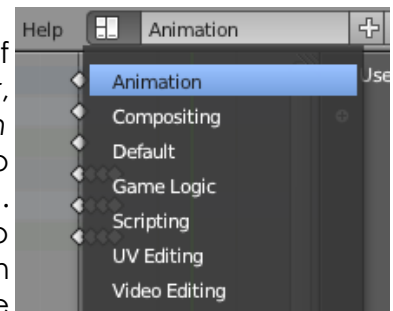
You can also see your animation by pressing the “play” button in the Timeline window. You can also play backwards.



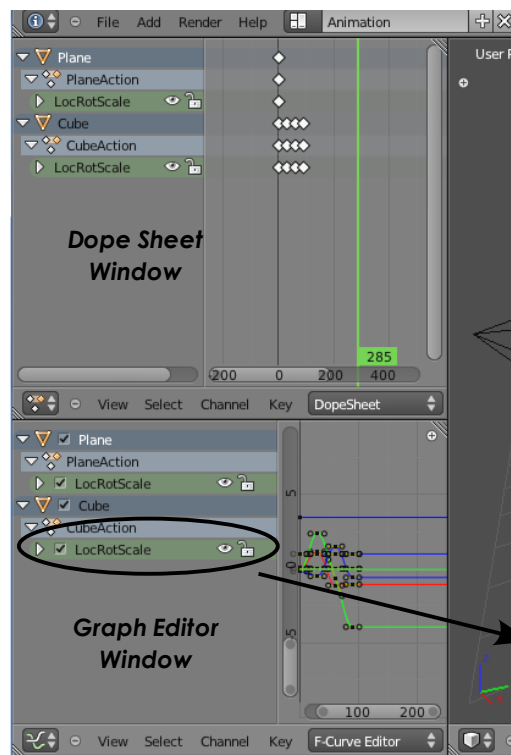
Movement may not be exactly how you planned it. Blender automatically defaults to trying to create a smooth flow through the keys you've place. This can be changed and will be discussed later.

Working with the Graph Editor and Dope Sheet

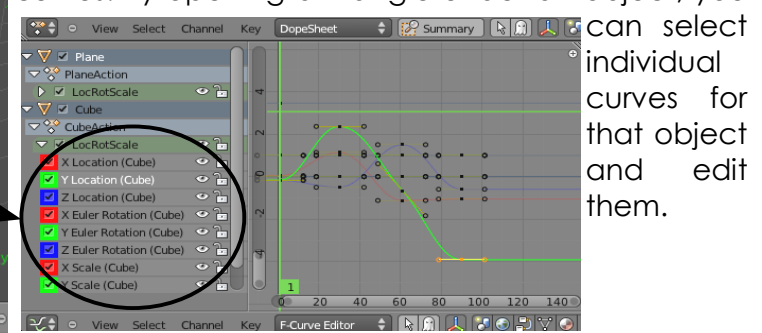
Animation is difficult to do without some basic knowledge of the **Graph Editor and Dope Sheet**. As mentioned earlier, these used to be called the *IPO (interpolation) and Action Editor* windows. The best way to access these windows is to change your screen layout from **“Default”** to **“Animation”**. You will see the 2 windows on the left and it may help to make those windows larger. All objects that have animation



keys on them will be



displayed in the windows and their data displayed to the right as diamonds (*Dope Sheet*) and curves (*Graph Editor*). You can zoom in/out and pan in this window with the center mouse wheel. Like actual objects, the curves can be edited in an edit and object mode. Older versions of Blender would only show you the curves of a selected object, but 2.6 can display all objects in the scene. At first glance, it can be rather confusing! To simplify your view, you can check/uncheck objects to hide/show their curves. By opening a triangle under an object, you

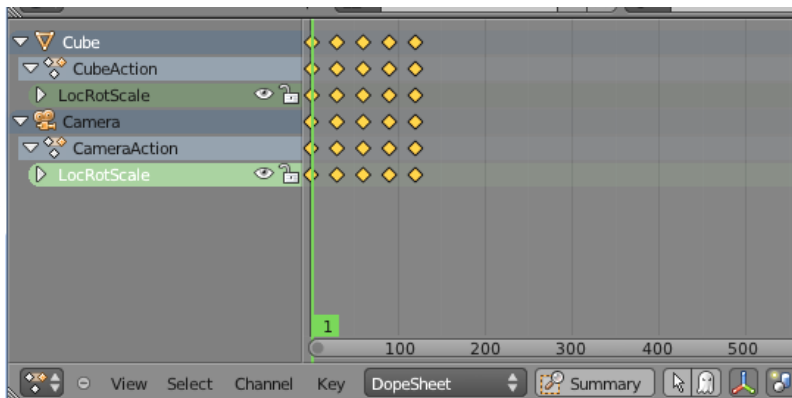


can select individual curves for that object and edit them.

Chapter 9- Animation Basics

More About the Dope Sheet:

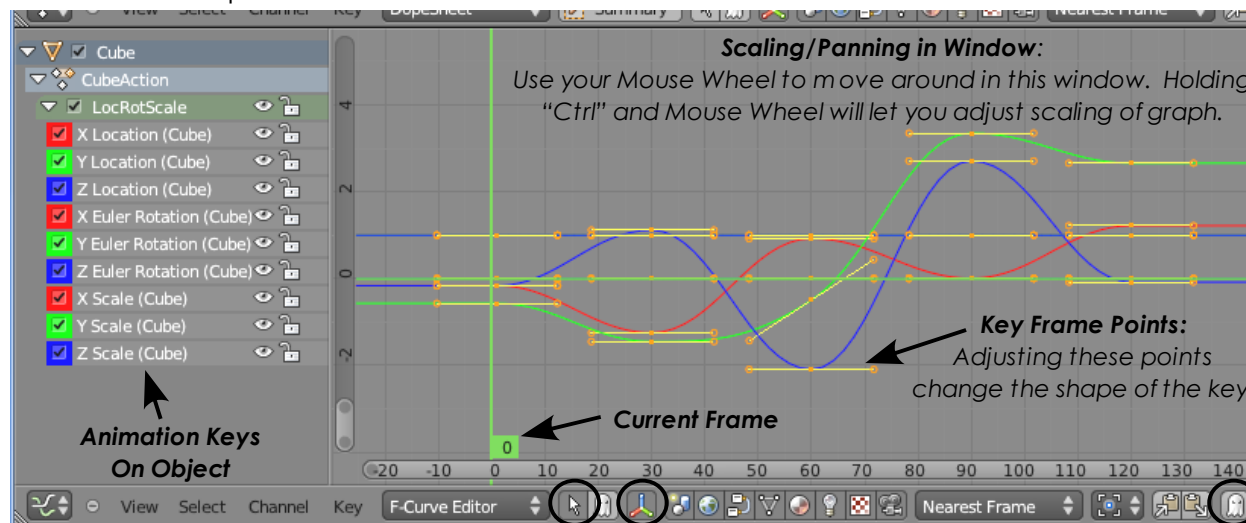
The Dope Sheet shows your animation keys as small diamonds along the timeline. This can be very useful when you want to copy keys to other points along the timeline or select multiple keys and scale them to slow down an animation. You can select keys the same way you select other



objects in Blender- by using the RMB while holding "Shift"; the "B" key to box select, or just RMB a single key. You will notice that when you select a key in the Dope Sheet, the same key is selected in the Graph Editor. You will see many of the same options that are available in the Graph Editor, discussed below.

More About the Graph Editor:

In older versions of Blender, you could animate many things, but not everything. The newest version boasts that everything can be animated and so far from what I've seen, this appears to be true. Everything can also be displayed in the Graph Editor, but trying to look at everything at one time is confusing. Below is a short description on how to control the Graph Editor window:



Menus for viewing and options for curves and keys.

Isolate the window to just viewing of selected object (very useful).

Turn off object curves (helpful when looking at world, material, etc. curves).

Viewing options for different types of curves

Snapping, pivot and copy/paste commands.

Creates a background image of a curve-useful when working on an objects and need to see the curves for another object.

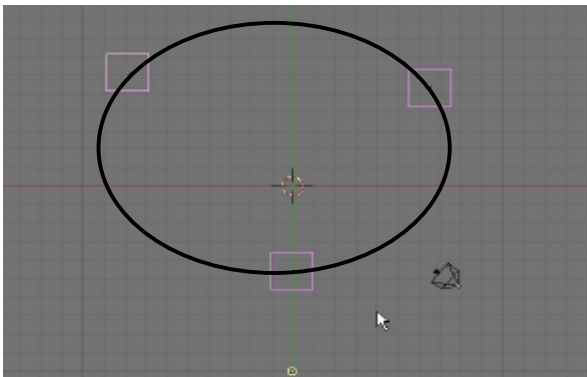
Chapter 9- Animation Basics

As mentioned before, when you create an animation for an object, Blender automatically tries to “smooth” the path of animation through your key points. You have ways of controlling the results of the path. One way is to click on the path(s) you want to modify in the Graph Editor window and, with the cursor in the Editor window, type “**Shift-T**” for type. You can also access these “*Interpolation Modes*” by going to the “**Key**” menu and select “**Interpolation Mode**”. You have 3 options:

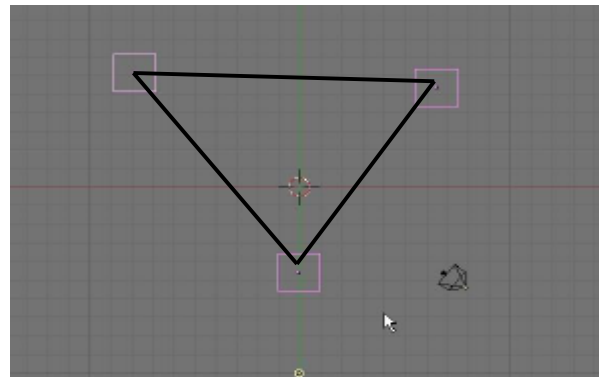


- Constant-** Gives a square waveform, like turning it on and off. No smooth flow.
- Linear-** Takes a straight path from point “A” to point “B”. Solves problems of animations swinging way out of where you want it to go, but jerky motion at key points
- Bezier-** The default type which tries to make the motion through the points smooth.

Every application may require a different type and can be frustrating to work with until you get some practice.

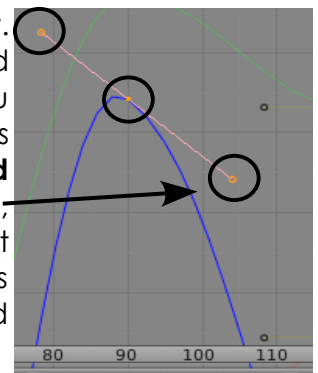


Animation path of a cube with 3 keys placed at shown locations with **Bezier** path type selected. Path is smooth, but curves way out.



Animation path of a cube with 3 keys placed at shown locations with **Linear** path type selected. Path is straight, but jerky at key points.

There is another way to keep the bezier type, but control the flow. It requires you to go into the track in **edit** mode (unlocked) and adjust vertices on the graph individually. First, select the track you wish to modify (Loc, Rot, Size- X, Y, or Z) and make sure the track is unlocked (Tab key). **When you do that, each key will be displayed as 3 points.** By grabbing (“**G**” key) an end of the “3-point spline”, you can move and size it to get a different flow through that point. This technique requires some skill and practice. Key points can also be moved to different locations using this method (change a key from one frame to another.)



Chapter 9- Animation Basics



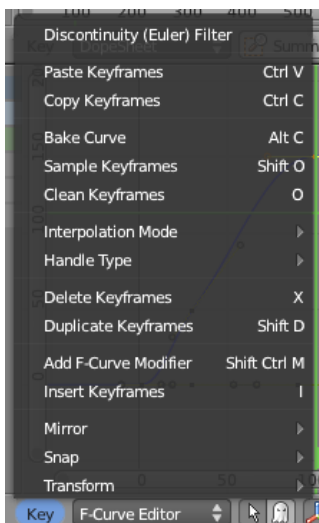
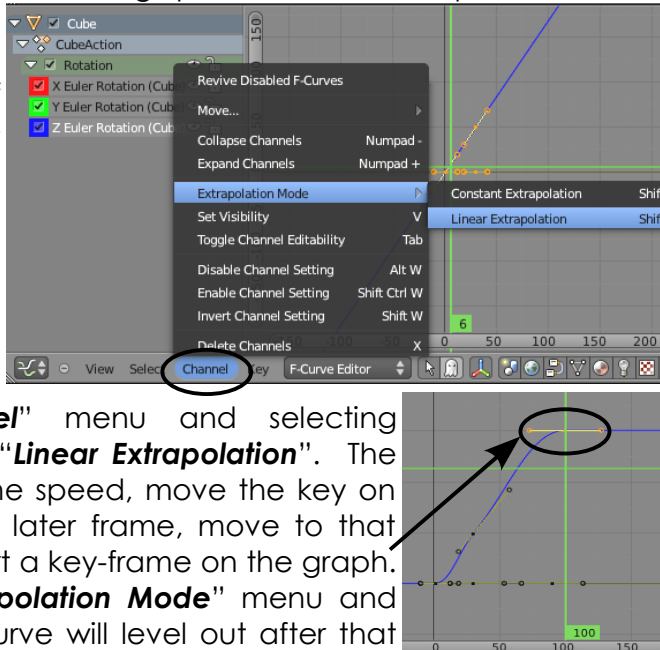
RoboDude Asks: I messed up my animation. How do I start over?

If you ever need to start over with an animation, you can erase all the animation tracks in the Graph Editor window and start over. To select all tracks, hit the “A” key once or twice, then the “Delete” key. Be careful that you only have the keys for the selected object!

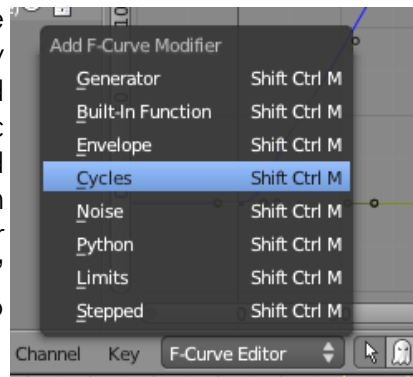
Modifying Curves in the Graph Editor:

What else can you do in the Graph Editor? There are some simple features that will allow you to set a constant motion or rotation, mirror a curve, apply noise, and set something to cycle through an animation like walking. These are all features that, with a little practice, will save you a lot of work.

Let's first look at an example of making something spin at a constant speed. You first need to set 2 key frames at frame 1 and something like frame 30. Rotate the object 90 degrees between the 2 keys. If you are running at 30 frames-per-second, this would give you a full revolution in 4 seconds, but right now, your animation would stop after 1 second and only spin 90 degrees. In the Graph Editor window, find the rotation track that shows the rotation curve and select it. In my case, it is the Z Rotation curve. By going into the “**Channel**” menu and selecting “**Extrapolation Mode**” you can choose “**Linear Extrapolation**”. The curve will extend infinitely. To change the speed, move the key on frame 30. To stop it from spinning at a later frame, move to that frame (say, frame 100) and hit “I” to insert a key-frame on the graph. You can now go back into the “**Extrapolation Mode**” menu and choose “**Constant Extrapolation**”. The curve will level out after that frame.



Under the “**Key**” menu, you will find some other useful tools to shape your animations. There is a useful “**Mirror**” option that can flip a curve. This would be useful for objects such as gears and wheels where you need to match the animation of an object, but need to turn in the opposite direction. You will also see a new option in the Key menu called “**Add F-Curve Modifier**”. The classic “**Cycles**” option can be found there (useful for repetitive motion like swinging) along with other useful modifies such as “**Noise**” which will give a “jitter” effect to something's motion.

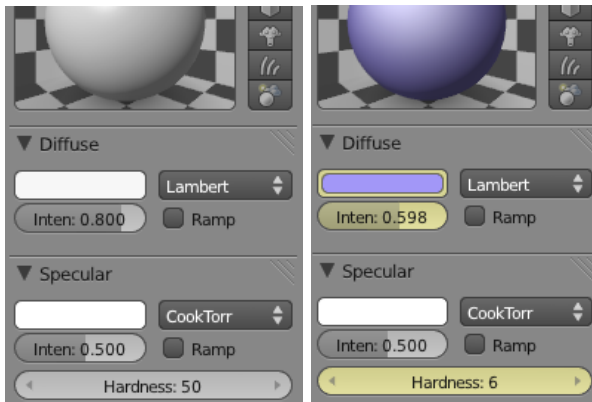


Chapter 9- Animation Basics

The previous section dealt with basic object animation. Deforming meshes, following paths, creating bone structures (armatures) and creating child-parent relationships will be discussed later. Animation can be a frustrating thing to perfect. Practice is the best way to learn it and by asking questions.

Animating Materials, Lamps and World Settings (and more)

Earlier we mentioned that everything can be animated in Blender and those animation tracks can be viewed in the Graph Editor. *If you can change a number or a color in a box, it can be animated.* Let's spend some time looking at some of these things.



Above: No Material Keys.

Top Right: Keys applied to Diffuse Color and Intensity and Specular Hardness. Key frames displayed in yellow.

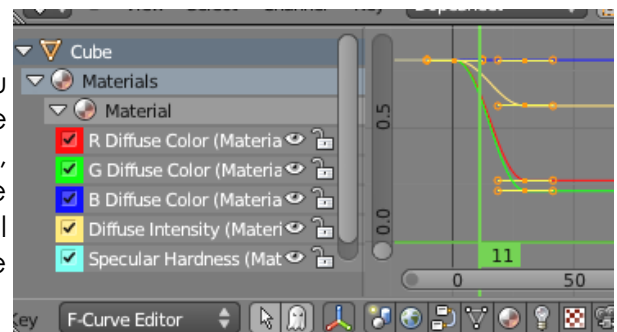
Right: Animated features are displayed in green on non-key frames.



For my example, I'm changing the material settings on a cube. At frame 1, I'm setting a key frame on the *Diffuse Color* and *Intensity* and *Specular Hardness*. In order to put a key frame on any data block, simply place your cursor over the block and hit "I". You will notice the block will turn yellow, indicating that a key frame is present on that setting at that frame number. The block will remain green for all other frames, indicating that the setting is animated. This will even work for check mark boxes.

To see the animated effects, you will need to place your cursor in the buttons window and press "Alt-A". The numbers will scroll showing the setting has been animated. You may not be able to see the final effects until a movie is rendered out. This process will work for any window setting.

Notice the Graph Editor to the right. You can open the Material graphs for the cube and see all the settings you applied, provided you have set the buttons at the bottom of the window to display material keys. These keys can be edited the same way discussed on the previous pages.



These techniques are useful for animating items such as changing spot lamp size, intensity and color, rolling fog and clouds in the *World* settings, and waves in the *Texture* settings.

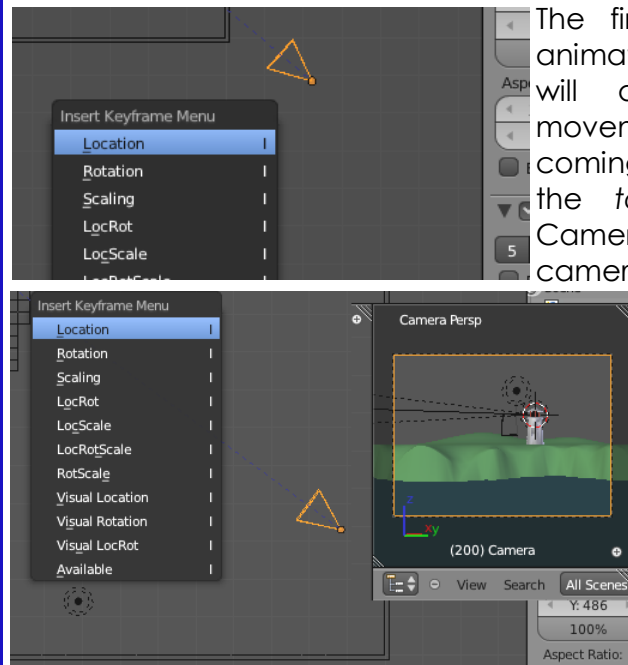
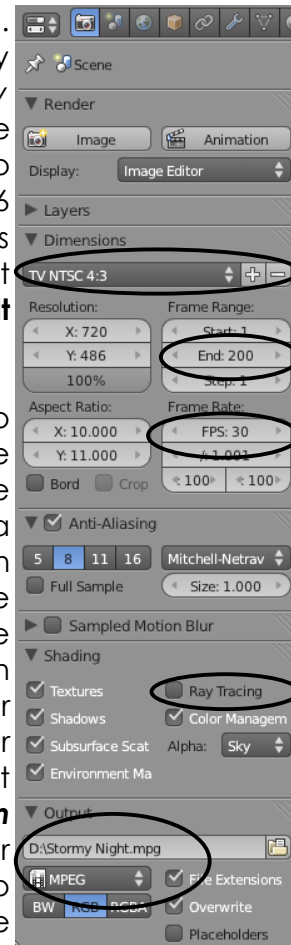
RoboDude Says:

Remember that you can always undo a bad animation key by using "Ctrl"-Z !



Animating Your Lighthouse

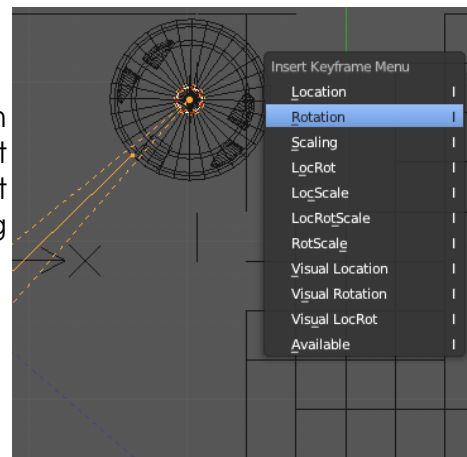
Open your "**Landscape Scene**" file and go to your scene buttons. It's time to animate our "dark and stormy night". We will start by making the correct setting to do a movie. First, review the "7 Easy Steps to Create an MPEG Movie" found on page 7-3. Follow those steps and name the output movie file as "**Stormy Night.mpg**". Also set the **End** frame to **200**. Our movie will be 200 frames long, or 6.6 seconds at 30 fps. You will also want to make sure Ray Tracing is turned **OFF**. Ray Tracing will slow down your renders and is not necessary for this scene. Change your screen layout from **Default** to **Animation**. Remember, this is found at the top of your screen.



The first thing we plan to animate is the camera. We will do a short, simple movement of the camera coming closer to the shore. In the top view, select the Camera. Make sure the camera is at a good location and does not render any edges of your planes. At **frame 1**, hit "I" to insert a **Location** key. Now use your arrow keys to move to **frame 200**. Move the camera closer to shore, hit "I" to insert another location key.

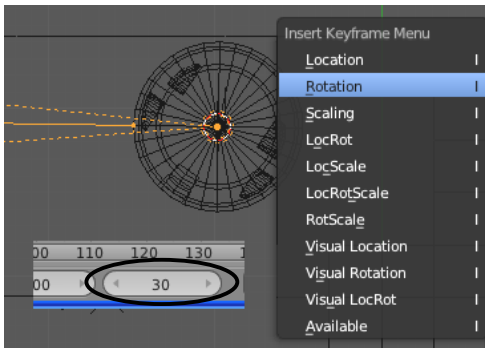
The motion doesn't need to be much. we don't want the boat moving too fast! Go back to frame 1 and hit **Alt-A** to see your animation. You should see the camera animated. Press **Esc** to stop playing the animation. Save your file.

Now we're going to animate the spotlight rotating in the lighthouse. In the top view, select the spotlight. At **frame 1**, press "I" to insert a **Rot** (rotation) key. It doesn't matter at what angle the spotlight is starting at in the animation.



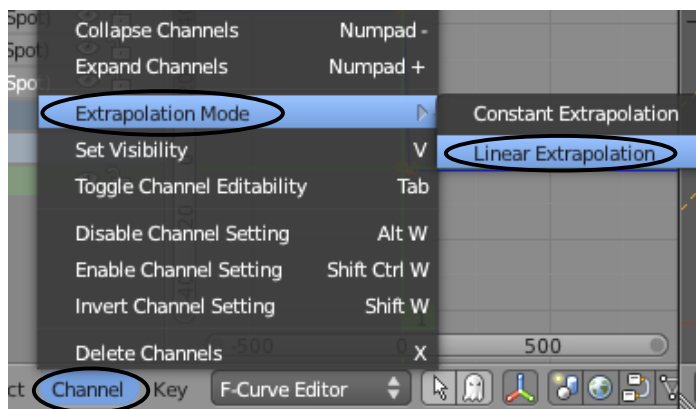
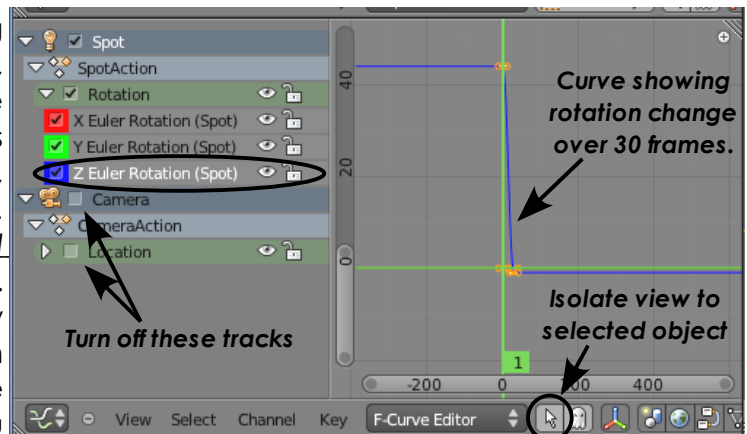
PRACTICE EXERCISE

Animating Your Lighthouse



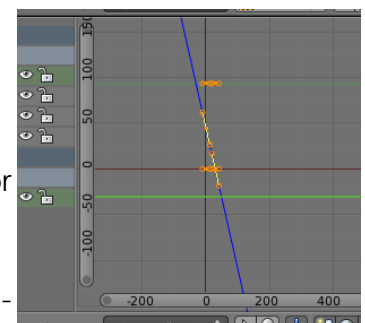
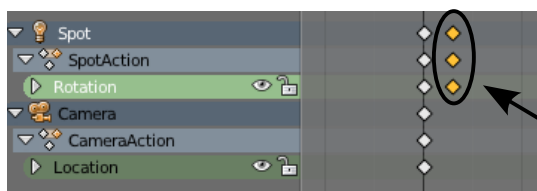
Go to frame **30** (one second) and *rotate* the spotlight **45 degrees**. To do this, type “**R**” to rotate, then type **45** on the keyboard. Press “**Enter**” or **LMB** click. The lamp will have rotated exactly 45 degrees. If you want the lamp to spin the *opposite* direction, type “-” after the 45. Press “**I**” to insert another Rotation key. Use your left arrow key to go back to frame 1. You should see the lamp spin back to its original position.

In order to keep the lamp spinning consistently the entire animation, we could attempt to continue along the time line, inserting keys every 45 degrees and 30 frames, but that would get boring very fast. Instead, we will use an Extend mode in the Curve Editor window. Enlarge the Curve Editor window large enough to work with and turn off the animation tracks for the camera to simplify your view. You could also press the small arrow button at the bottom of the window to isolate viewing to only the selected object as well. Expand the tracks displaying the rotation keys for the Spotlight. Isolate the track that shows change over time by clicking on it, representing the animation of the lamp over the 30 frames. It will probably be the “**Z Euler Rotation (Spot)**”, the blue curve.



With the curve selected, go to the “**Channel**” menu, “**Extrapolation Mode**”, and “**Linear Extrapolation**”. The curve should now extend infinitely in both directions. Test your animation by pressing the “**Play**” button in the Timeline, or hitting “**Ctrl-A**”. The lamp should spin the entire animation.

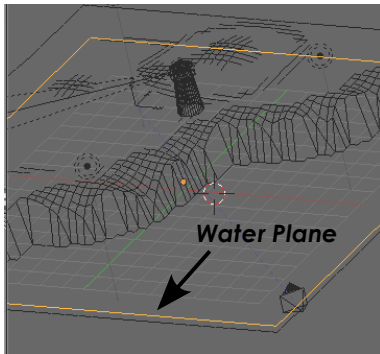
The lamp speed should be fine, but if you wish to speed it up or slow it down, you could select the rotation keys at frame 30 in the Dope Sheet and move them to a different location. The curve will adjust.



Animating Your Lighthouse

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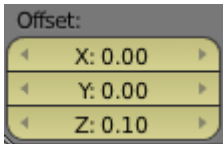
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Now it's time to animate the water. We want to create some rolling waves, not too fast or slow. This is a little trial-and-error. I've tried to take some guess work out of the process. To begin, select the **Water Plane** and go to your **Texture** buttons and find the **Offset** settings in the **Mapping** panel. We will animate the **Offset Z** number.

Because we used a 3D texture and not an image to create the water effect, it can be animated to give the illusion of motion. Remember that we added 2 textures to the water. Right now, we are only animating the 1st texture.

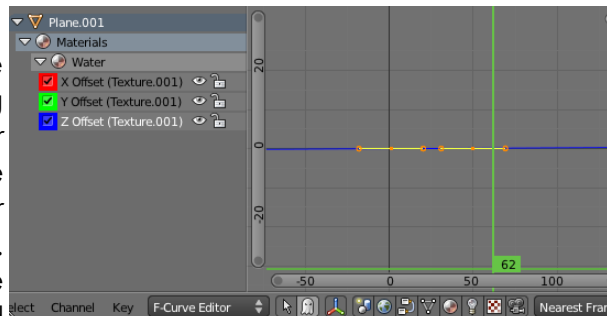
At **frame 1**, place your cursor over the **Offset Z** number and press the "I" key to inset a key frame. The Offset blocks will turn yellow, indicating that a key has been placed on them.



Now advance to **frame 50** and change the **Offset Z** number to **0.1**. This will cause the water to "roll" up slightly. Again, with your cursor over the Offset Z button, press "I" to insert a key frame. This will cause the texture offset to roll from frame 1 to 50.

Since we can't really hit **Alt-A** to see the animated texture in the window, we have to wait until we animate a movie to see the speed and effect. If you place your cursor in the properties window area and hit "Alt-A" you will see the number changing in the Offset Z block.

It's now time to extend the curve for the texture setting just like we did for the spinning lamp. First, go over to your Graph Editor window and find the material tracks for the plane. Remember that you can isolate your view to just the plane with the arrow button. Select the "Z Offset" curve, go to the "Channel" menu, "Extrapolation Mode", and "Linear Extrapolation". Don't worry if you do not see much of a curve due to the small change we placed on the setting.



That's it for animation for now. We have animated the camera moving, the lamp spinning and the waves rolling. Later, we will add some rain using particles. You can always change your resolution percentage size to animate faster and check your wave effects. Check your movie setting and press **Animate** in the Scene buttons. Sit back and wait for your movie to animate.

** Call the instructor when finished**

