Animation basics

The Key Framing

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What is Animation?

- It is the visual art of creating the illusion of motion through the successive display of still images with slightly perceptible changes in positioning of images.
- Animation is the illusion of movement.
- Animation = a motion picture made from a series of drawings simulating motion by means of slight progressive changes in the drawings
- The result of animation is a series of still images assembled together in time to give the appearance of motion

What is Animation?

- To animate means to give life to an inanimate object, image, or drawing
- Animation is the art of movement expressed with images that are not taken directly from reality
- In animation, the illusion of movement is achieved by rapidly displaying many still images or frames in sequence.

Basics of Animation

- Blender uses a certain method of making something appear to move on a computer screen, which may later be transformed into a movie file.
  - by creating a series of still images, each one slightly different from the next, which, when displayed one after the other in quick succession, create the illusion of movement. Each still image is a single frame of the animation.
  - Each frame (image) is rendered, which means the data you enter in the Blender program is correlated and turned into the digital image; this is usually in a JPEG format.
  - Finally, all the images are compiled into one movie file.

Basics of Animation

- After setting up the scene with the object that you wish to animate (**the actor**), consider what **the actor is required to do** and **how long** it should take to do it.
- How to make the **motions occur in an appropriate time**. Remember to look at the frames per second and relate it to time.
- For example, if you want a movement to take 3 seconds and you are running at 25 frames per second, then the animation has to occur in 75 frames.

Basics of Animation

- Set up **the movement of the actor in a given time**, such as move, change size, or rotate.
  - by inserting key frames
- Set up **the behavior of the actor during the transition** (moving, changing size, or rotating).

- **Key frames** are the key (or important) frames within a series of frames. a 10-second animation that, when running at 25 frames per second, would consist of 250 frames.

Basics of Animation

- To move the actor from point A to point B and then to point C within the 250-frame animation:
  - First insert a key frame at point A. locate the actor at position A.
  - At the next frame nominated, locate the actor at position B,
  - and so forth for position C.
- These are the key frames for the animation.
- Blender will work out all the in-between frames. The key frames also include the data for scaling and rotating the actor as well as other features.

Basics of Animation

Moving, Rotating, and Scaling

- Specify where and how to display the actor at specific frames in the animation.
- Blender will figure out all the data for the location, scale, and rotation at the in-between frames (interpolation).
- By default, Blender uses **Bezier type interpolation**, which gives a nice acceleration and deceleration between key frames.
  - A Bezier line or curve is a line that has **control points on it that allow the shape of the line to be altered or edited**.
  - The control points are located at the position of the key frames.

Basics of Animation
Moving, Rotating, and Scaling

- When an object moves from point A to point B in a given time, it is said to move at a certain velocity (speed).
- In theory, **the speed could be represented as a straight line graph**, but in practice an object at rest (motionless) **has to attain the velocity first**.
- The rate at which it attains the velocity is called **acceleration**.
- Blender's Bezier interpolation draws curves at **the beginning and end of the straight line** graph (acceleration and deceleration).
- You have the options to choose "**Constant**" **or** "**Linear**" type interpolation if appropriate.

Basics of Animation
Moving, Rotating, and Scaling

- Go to orthographic view
- Specify what the actor will do on a specific time.
- Control the frame rate to control the speed. (by default we use 25 fps – PAL).
- Start frame, End frame.
- Insert many Keyframes Using I key.
  - press the I key. In the selection list that displays, select "LocRotScale," which covers moving, rotating, and changing the size of the object.
- Try to move the actor (cube) on x-axis. And change its size.
- Scrubbing: manually playing the animation By moving the green line on the timeline.

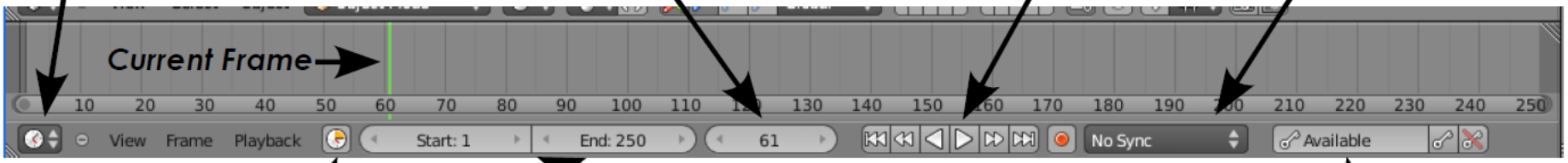
Basics of Animation
Moving, Rotating, and Scaling

Timeline *window type*

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.*

Playback Controls: *Just like any player, moves through time.*

Synchronization: *Used to match playback- sound & video.*

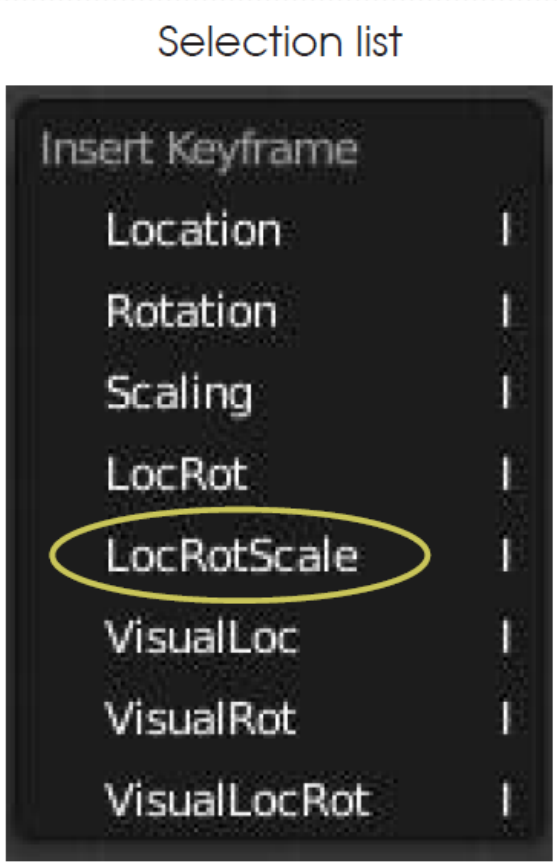


Alternate Playback: *If this is selected, you can set the play-back start and end frames here different then the actual scene frames.*

Start and End Frames: *Sets the movie length, unless the Alternate Playback button is press. The it will just display working frames.*

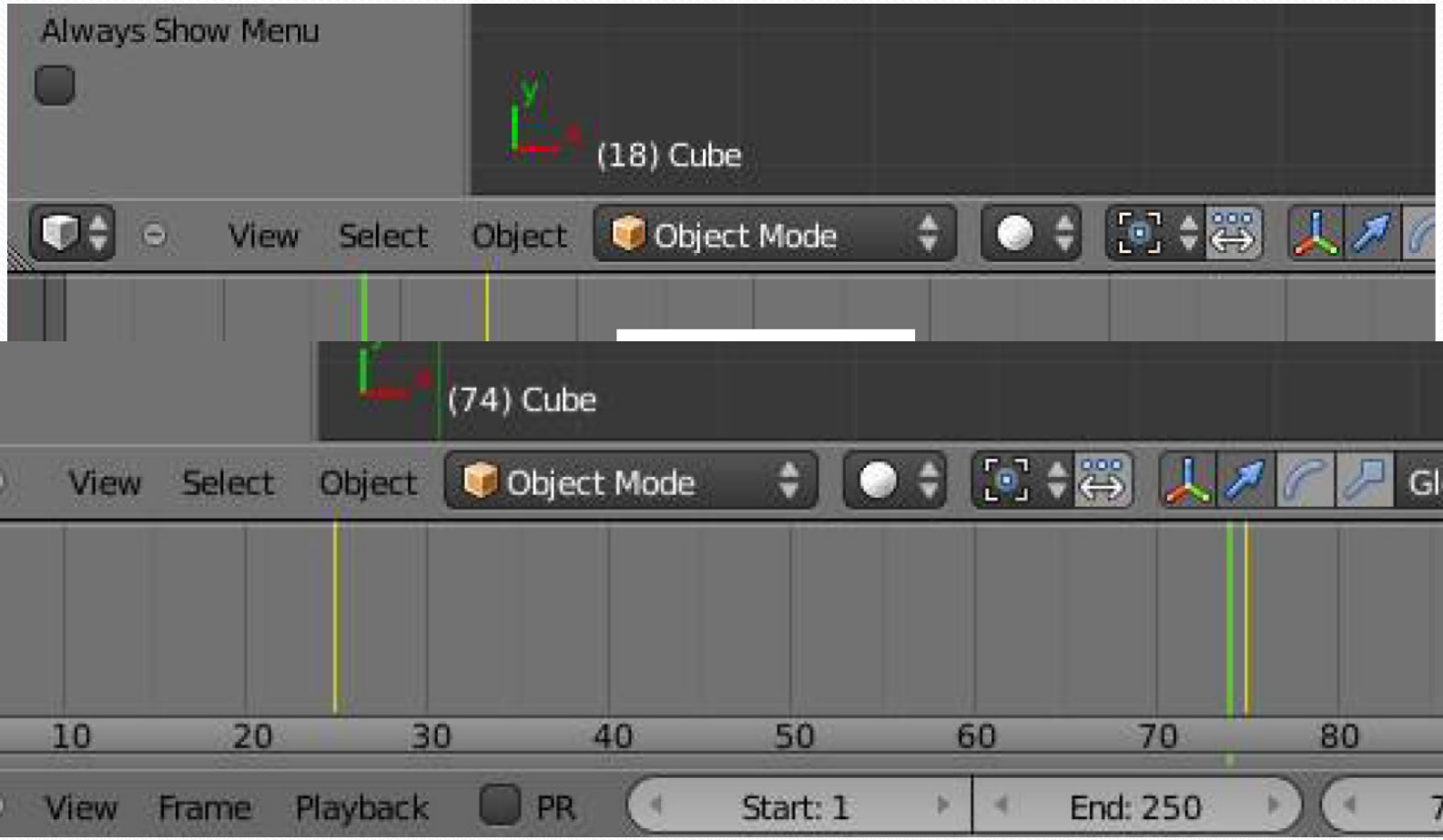
Key-framing: *Control for inserting/removing key frames/types.*

Basics of Animation
Adding KeyFrame



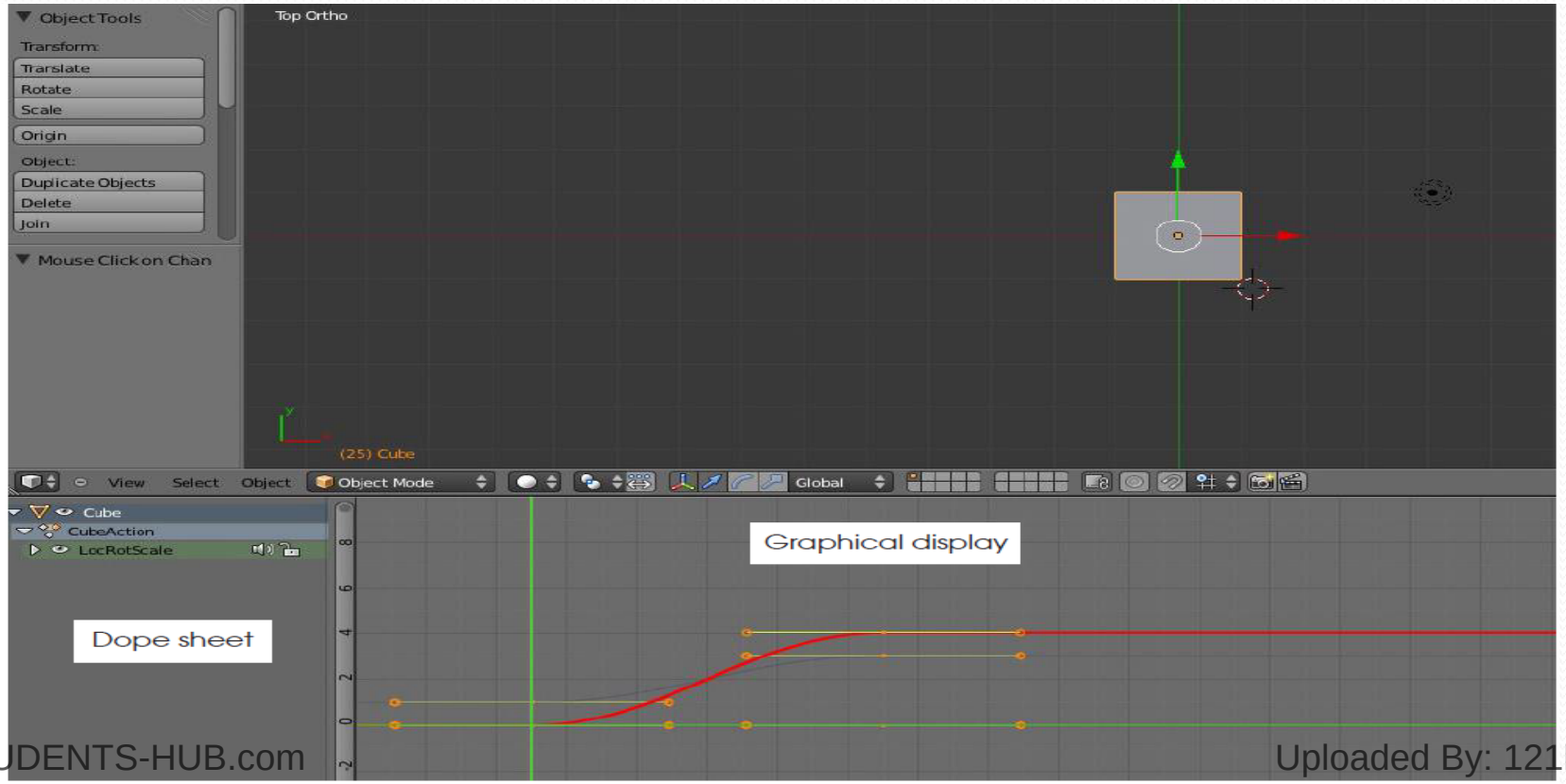
- Delete Keyframe: Select the key frame in the timeline, then in the 3D viewport : Alt+I. Or from the dop sheet: select the keyframes then delete using X

Basics of Animation
Viewing/Playing the animation



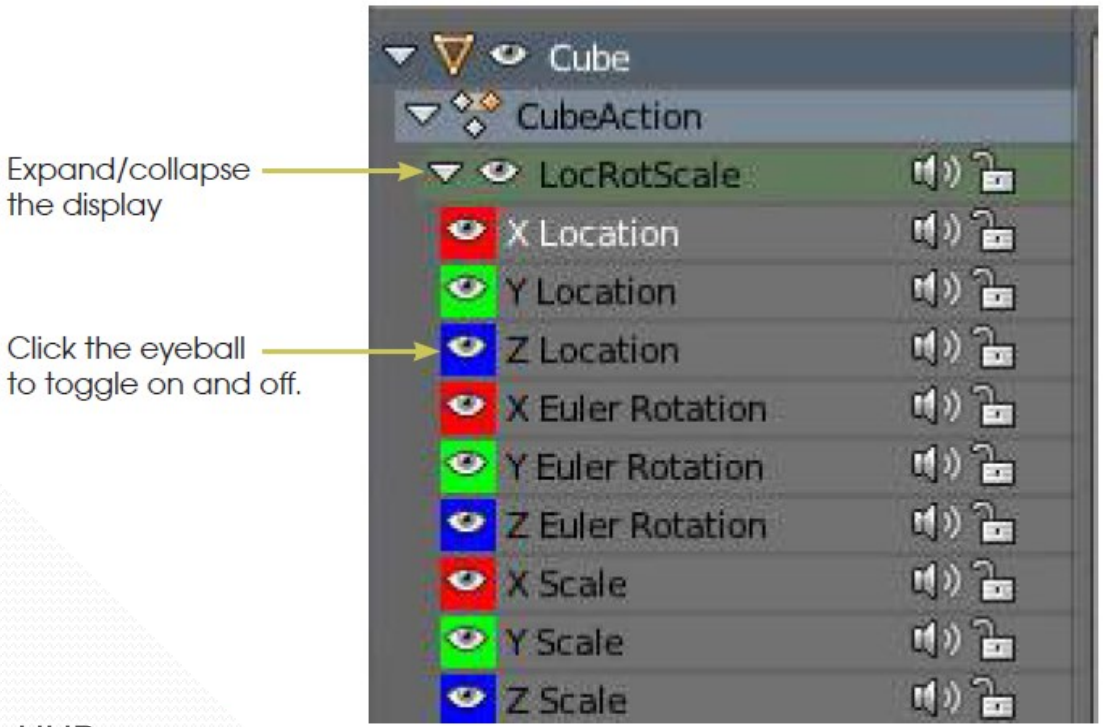
Basics of Animation
The Graph Editor Window

- The graph editor window shows a graphical display of the animation, and the graphs can be edited to refine and control the actions.

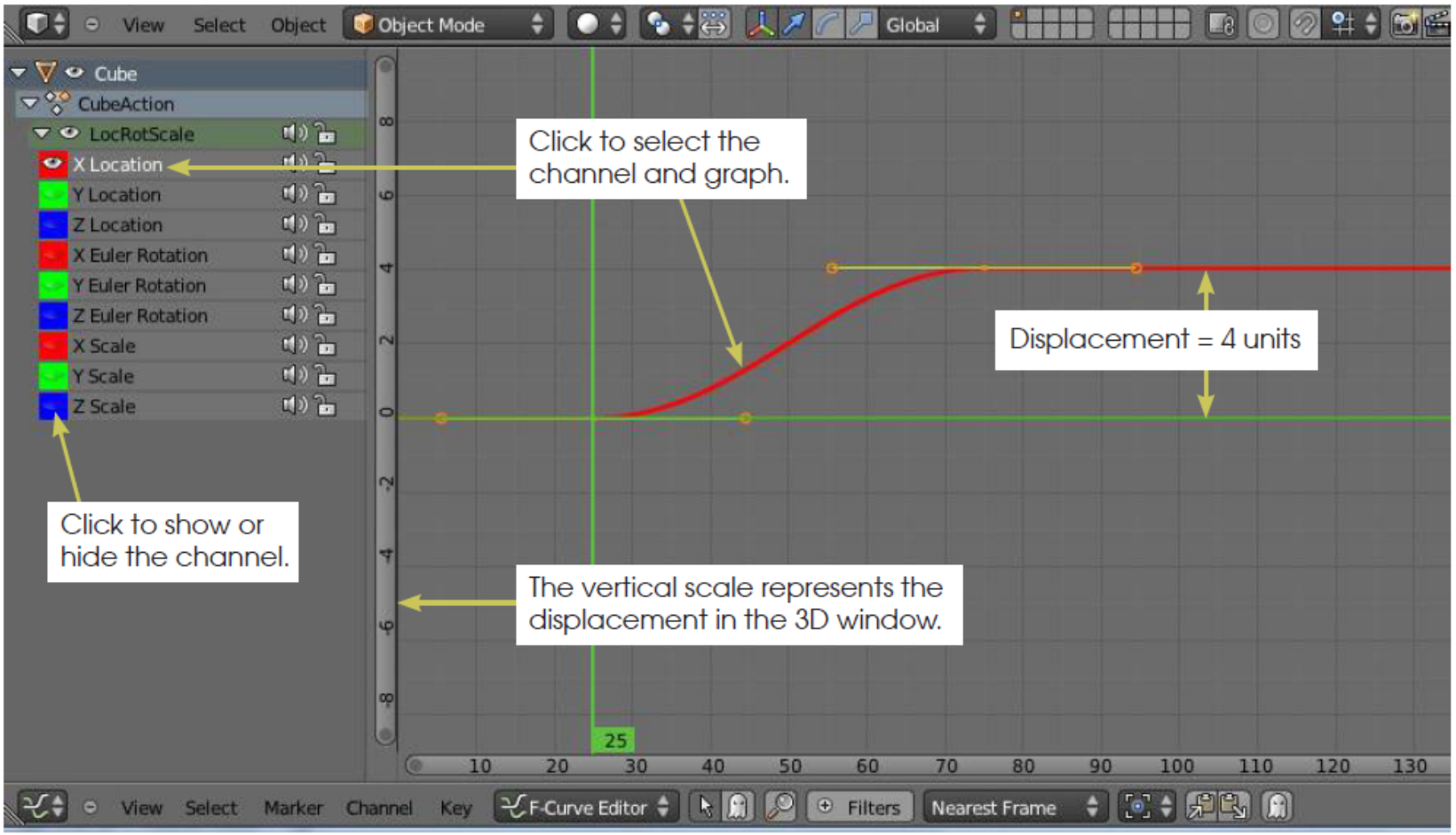


Basics of Animation
The dope sheet panel

- The dope sheet panel shows a file tree with headings for object, object action, and keyframe. In this case : "Cube," "CubeAction," and "LocRotScale.



Basics of Animation
The dope sheet panel

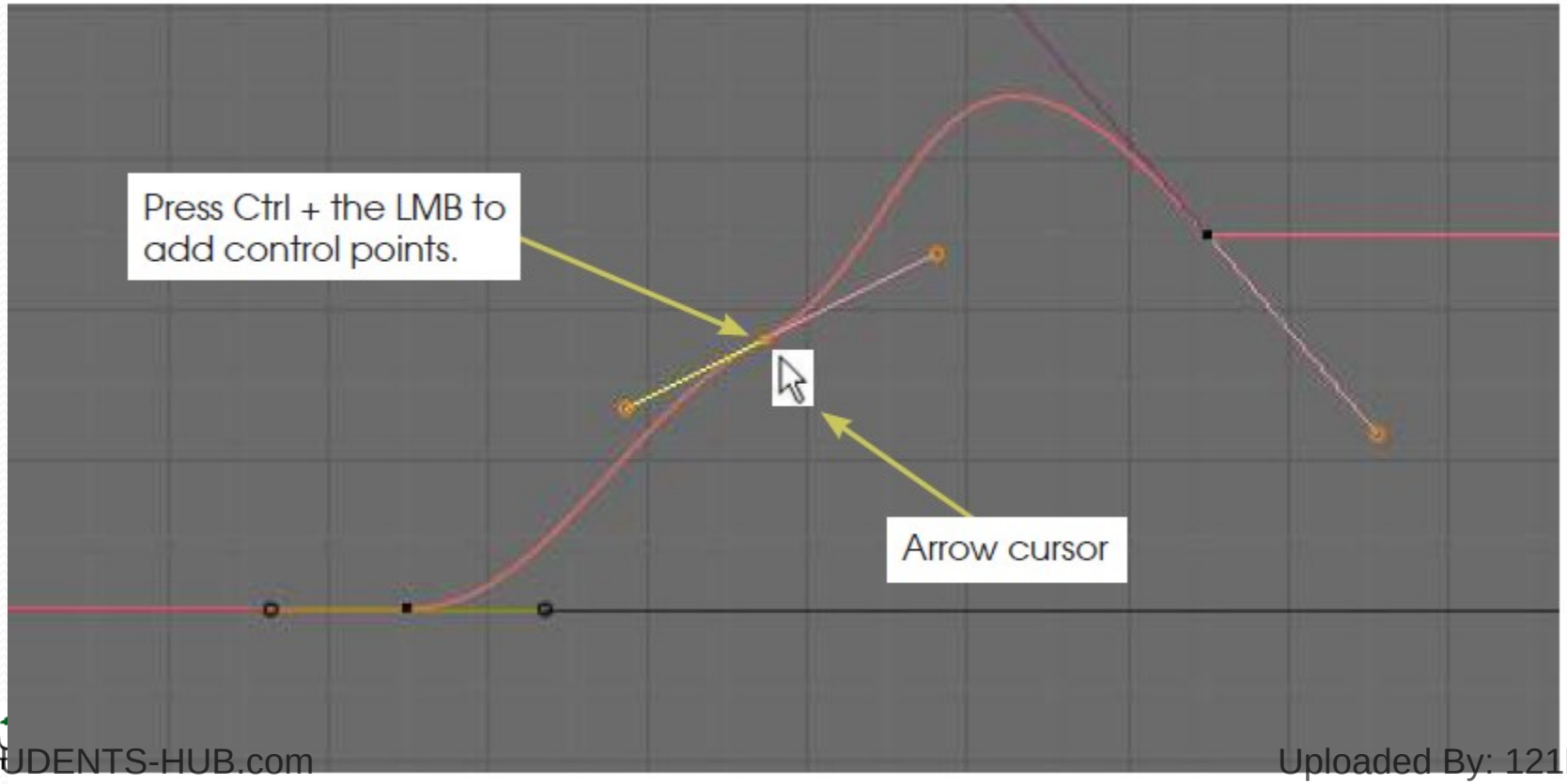


Basics of Animation: The dope sheet panel

- The **vertical green line** is the same as the cursor in the timeline window.
- The **horizontal green line** cursor provides a visual location for the vertical scale at the LHS, This scale represents the value for the action.
- The **"X Location" channel displayed** (because X-Location is toggled), the values represent the displacement along the *x*-axis of the 3D window.
- The red line has two short yellow lines attached to it. Each yellow line has a dot at the center and a dot at each end; these yellow lines are called **handles**. We are looking at a Bezier curve and the yellow lines are called control handles—the control handles are used to change the shape of the curve.
- The **red line** shows that from frame 1 to frame 25, there is no displacement of the actor from the midpoint. From frame 25 to frame 75, the actor moves from the midpoint of the 3D window to 4 Blender units along the *x*-axis. From frame 75 to frame 250, the actor remains displaced from the midpoint by 4 Blender units (the change we made on x axis of the object position).
- We can open the eyeball for any one of the "Scale" channels in the dope sheet, to see The three lines represent the *x*, *y*, and *z* axes.

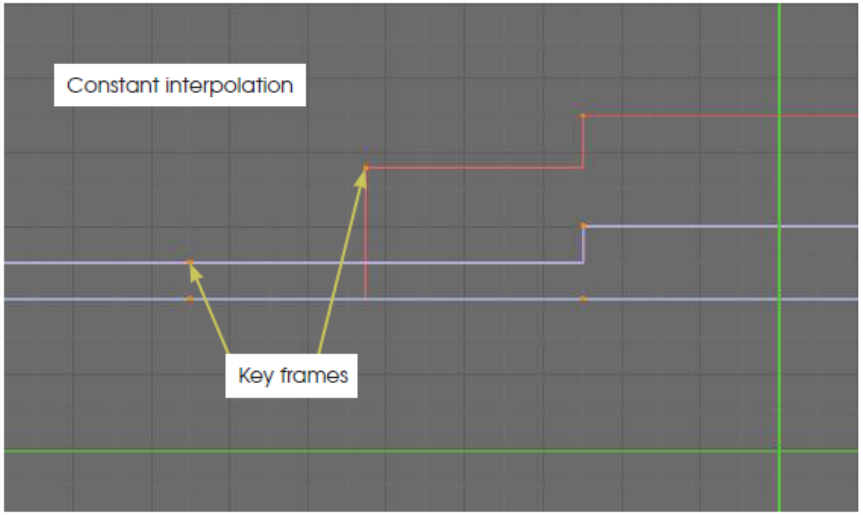
Basics of Animation
Editing the Curve

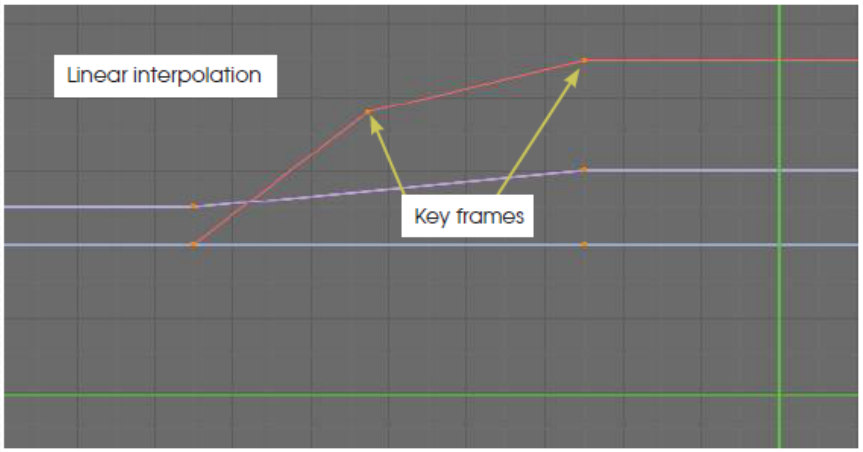
- Alter the behavior of our actor by altering the shape of the curve representing that action.



Basics of Animation
Other types of Curves

Go to the graph editor window header – "Key" button – "**Interpolation Mode**" (TKEY) and you will see the option to select "**Constant**," "**Linear**," **or** "**Bezier**."





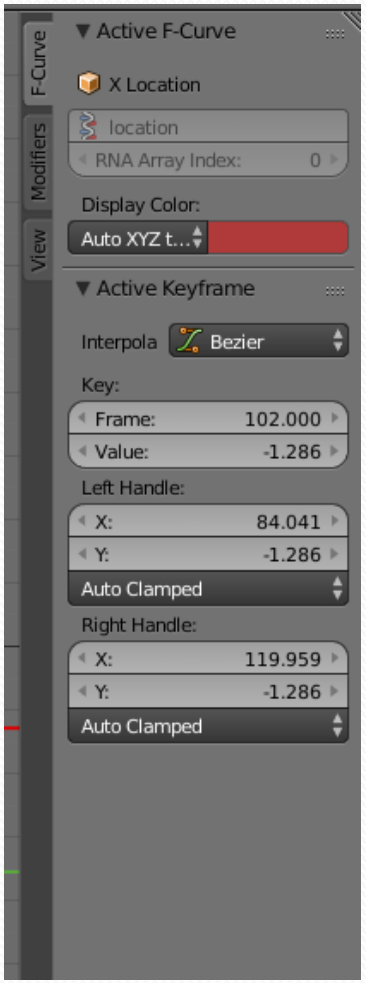
The animation before the first key frame and after the last key frame, is called "**extrapolation**". Two extrapolation options: "Constant" and "Linear."

- By default, Blender selects "Constant.".

Basics of Animation
Modifying Curves

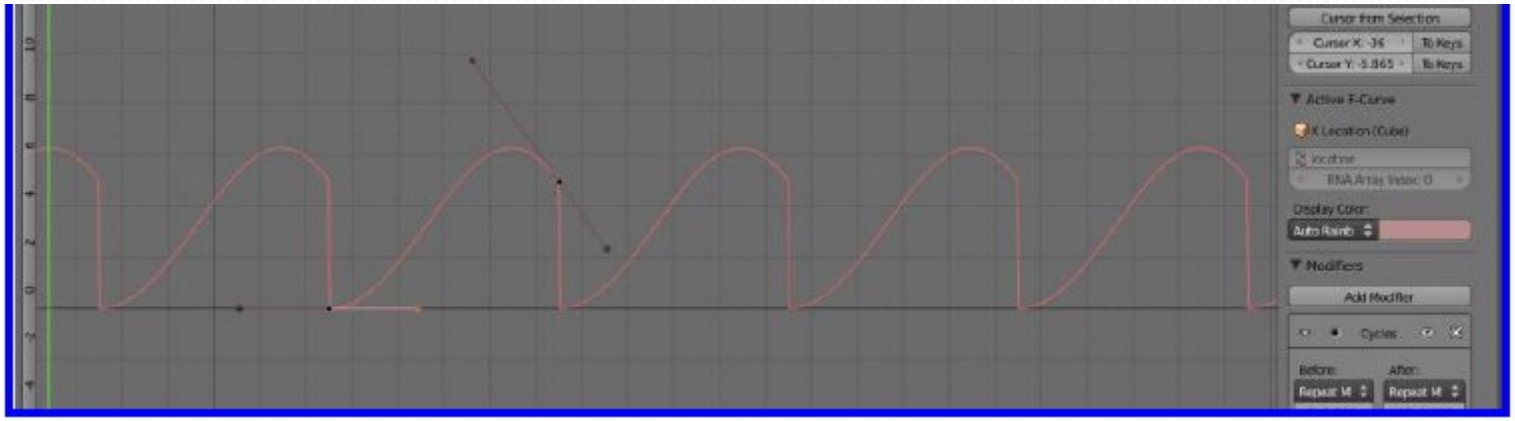
Color
Modifiers:
- Noise
- Cycles
- Built In Function

Etc.

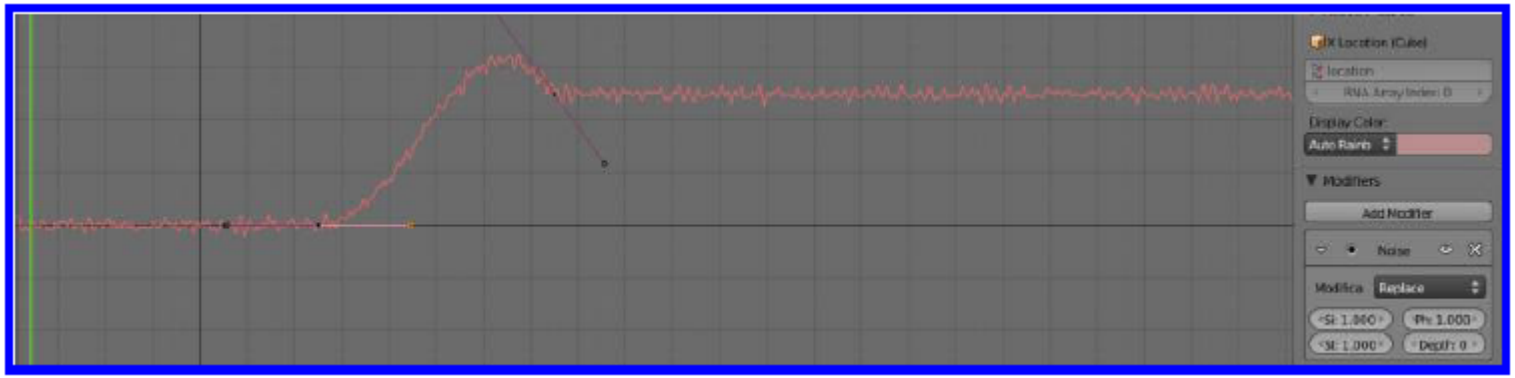


Basics of Animation
Modifying Curves

Cycles Modifier



Noise Modifier



Basics of Animation: Modifying Curves

The new panel will now display four tabs: "**View Properties**," "**Active F-Curve,**" "**Active Keyframe**," and "**Modifiers**".
The "**Active F-Curve**" tab shows that the "X Location" curve is selected and that it is displayed in an "Auto XYZ to RGB" color. This color may be changed by clicking on the drop down menu under "Display Color." It could be advantageous to change the color of a curve if it is required to distinguish the curve from another one channel curve selected in the graph editor panel.
Now click on "**Add Modifier**" and select a modifier, for instant "Cycles".

The graph changes rather dramatically, Blender has duplicated this curve.
Note the **"Before" and "After"** options that give options for how the cycles are to be repeated before and after the frame block.
"Add Modifier" again and this time **select "Noise"** . We now have our original graph with the jitters, select sub options to alter values for the options. You now have plenty to play with modifier and select the **"Built In Function":** modifier. This produces a straight sinusoidal graph. Has options to select graphs based on various mathematical functions.

Note: be sure that the modifiers is enabled from beside the channel name in the list of graph editor or dope sheet.

Basics of Animation: Automatic Key Framing

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.

In the timeline window header, you will see a **red button** next to the play control buttons.

Clicking on this button toggles automatic key framing on and off .

With auto **on**, whenever you move, scale, or rotate your actor object in the 3D window, a key frame will be inserted at whatever frame you have selected. Remember to turn this off after you're done using it.

Basics of Animation
Animating Other Features

Most options can be keyframed – animated.

Material animation options

- Material RGB values. **Color** can be animated to change.
- Alpha. **The transparency** of an object can be animated.
- **Halo size**. A halo can grow or shrink in an animation. Setting a halo to zero will make it disappear.
- **Texture** offset. Texture applied to an object can be animated. It can move across the face or change in size.

Lamp animation options

- **Lamp RGB values**. The color of light can be animated to change.
- **Energy.** The intensity of light can vary.
- **Spotlight size.** The angle of the beam can be animated to change.
- **Texture**. Texture can be applied to a lamp and animated.

Basics of Animation
Animating Other Features

World animation options

- **Zenith RGB**. Color of the zenith (top) can be animated. This is great for sunsets or sunrises.
- **Horizon RGB.** Color of the horizon (bottom) can be animated.
- **Mist**. Fog can be animated for interesting effects.
- Stars. Stars can be made to move (no more stars!).
- **Texture** offset and size: Texture applied to a world can be made to move.

Camera Animation

Basics of Animation
Animating Other Features

Color animation

For animating Diffuse Color:
Instead of clicking with the LMB on the diffuse color button, click with the RMB and in the menu that displays click on "Insert Keyframes." You have inserted a key frame at frame x on the timeline.

Spot Light Animation

Right click on the "Spot Shape Size" button and select "Insert Keyframes" from the menu that displays. The "Size" button will turn yellow indicating that you have inserted a key frame in the timeline.

Basics of Animation
Animating Other Features

Color animation Example:

Insert a diffuse color key frames in frame number 1 for all objects.
set the first frame – chose color – insert keyframe
Insert a new diffuse color key frames in the new position (100 for example) for each object.
Set the frame – change color – insert keyframe

Basics of Animation : Keying Sets

To **add multiple properties** to a group called a keying set. Blender will add keyframes for all the properties in the active keying set.
Start by **defining a keying set**.
Example: Moving an object and change color at the same time.
Do the property changes then hit a button to add all the key frames in one.
Right click on a **property** (for example "X: 0.000"), click "**Add Single to Keying Set.**" If you look at the timeline window header, you will see a button labeled "ButtonsKeyingSet".
To add a color: Right click on the "Diffuse color" button then click on "**Add All to KeyingSet.**"
Click on the first of the key icons to insert the key frame
The properties window "Object" tab. Right click the new value and click "**Add Single to Keying Set.**" Do the same thing for the "Material" – "Diffuse color" value, but make sure you click on "**Add All to Keying Set.**"
Click on the first of the key icons again

Basics of Animation

Animation Following Curves

It could be used for complex camera traveling, a train on his rails and most other vehicles can also use "invisible" tracks, the links of a bicycle chain, etc.

Two ways to have an object follow a predetermined path.

- One method: by setting a child/parent relationship between the object and the path;
- Second Method: By placing a "Follow Path" constraint on the object.

Basics of Animation

Animation Following Curves

Following a Path: The Child/Parent Relationship Method

In Orthographic view

Add a path – curve

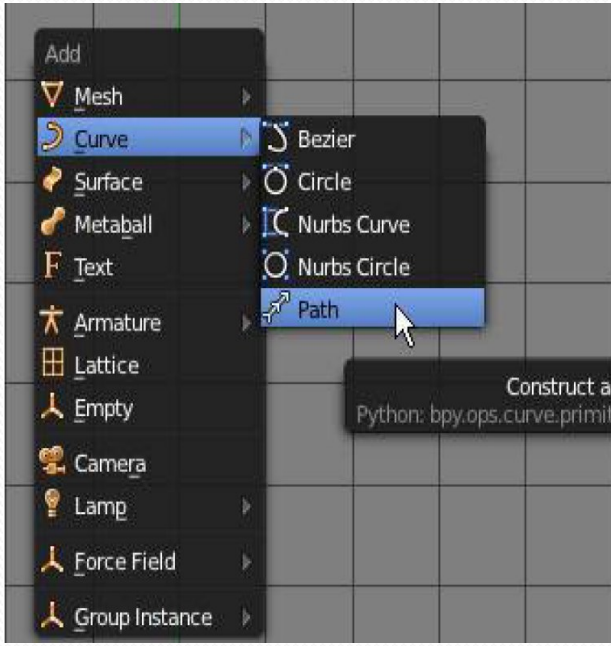
Make a child/parent relationship

Between cube and path:

- Select the cube then the path
- Then press Ctrl + the P key
- and select “Follow Path”.

Play the animation

We can modify the speed, acceleration, and direction of movement.



Basics of Animation: Animation Following Curves

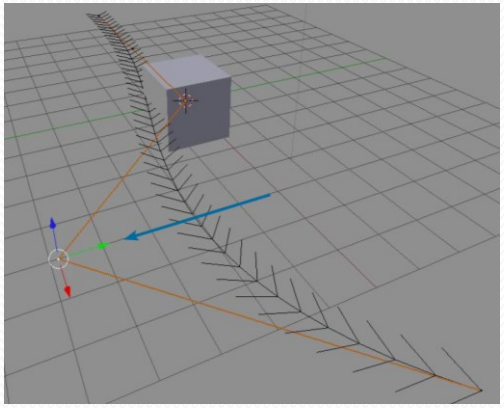
Following a Path: The Follow Path Constraint Method Orthographic view

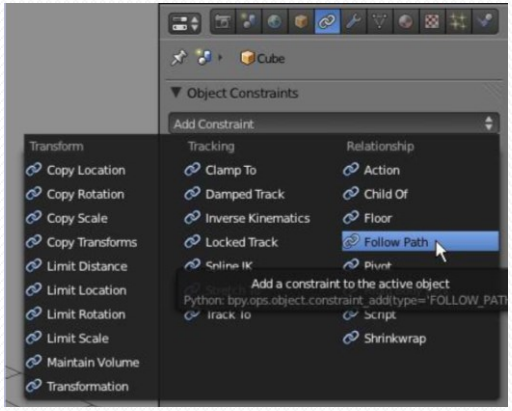
add a curve path

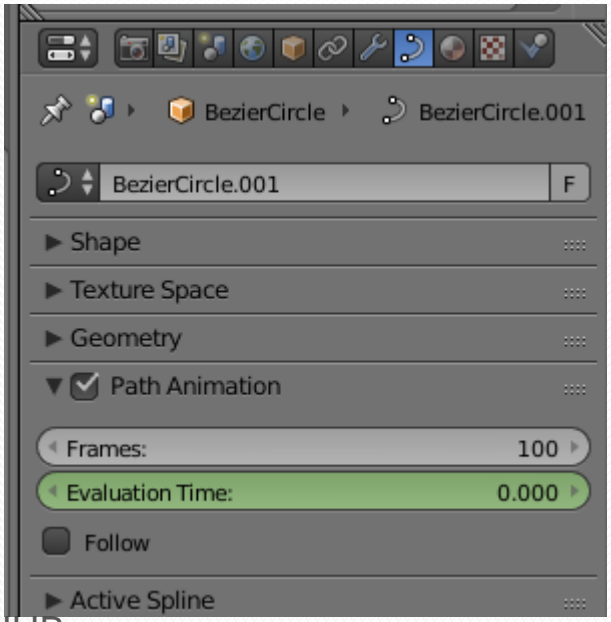
Edit and shape the path in edit mode

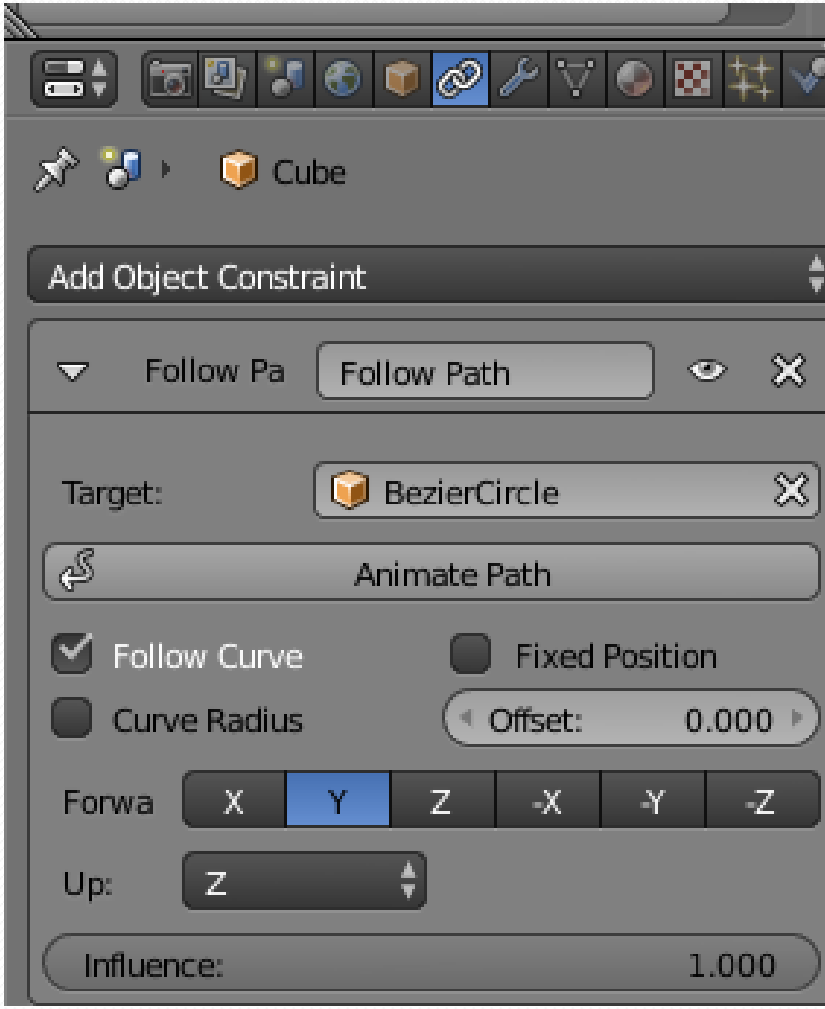
- With object selected; "**Add Constraint**" and select "**Follow Path**". In the "Object Constraints" tab, enter the **target** as "NurbsPath" and tick "Follow Curve".
- Select the path. In the properties window – "Object Data" button – In the "Path Animation" tab,
  - Set number of frames to 250 (number of frames needed to travers the path).
  - Right click on the "Evaluation Time" (0.00) and select "Insert Keyframe." at first frame.
  - Locate the timeline cursor at frame 250.
  - change the "Evaluation Time" value to 250, which positions the cube at the end of the path in the 3D window. Right click on the "Evaluation Time" button and select "Insert Keyframe".

Basics of Animation
Animation Following Curves









Basics of Animation
Animation Following Curves