Student notes 007 – Modifiers

Modifiers change an object (or more accurately all the meshes that make up that object) either by adding detail or by distorting the shape of the object. Modifiers are *non-destructive* – in other words, they can be removed from the object at any time and the original mesh reappears. Many of their properties can also be animated – just right click on the relevant property value box to see if the option *Insert keyframe* appears. Generate type modifiers often reduce the size of a file: a file containing objects that have active subdivision and mirror modifiers is much smaller than one that has the same object with those modifiers applied to create one made up of simple meshes.

Note that this word is confusing – applying a modifier does not mean adding it to an object. In fact it means removing that modifier and applying its changes to the object permanently as geometry. Many times you will want to keep a copy of the object with the modifier still active and put it on another layer.

Modifiers change objects’ appearance. Constraints limit objects’ movement. This is the reason the icon for Modifiers is a wrench and the icon for Constraints is a chain.

When more than one modifier is active for an object the list of modifiers is called the **stack**. The order of modifiers in a stack is important. You can move the individual modifiers up and down the stack by using the Up and Down arrows immediately to the left of the X (Remove) icon. The modifier stack is evaluated from the top down. Changing the order of the stack can have dramatic consequences on the resulting mesh.

If an object’s scale is not **normalized** it will make a difference to the way a modifier operates. An inconsistent scale across all three axes happens when a non-uniform scaling operation is done in Object mode. When you look at the Scale values at the top of the right fly-in you see that not all values are 1.000. When this is the case modifiers, constraints, and other operations do not work predictably. Either do all your scaling in Edit mode or, when you’re done with non-uniform scaling in Object mode, hit Control-A, and choose Apply Scale. All values should now be normalized to 1.000 without any change in the object’s appearance in the 3D Window.

There is a good series of videos on Blender’s modifiers at [https://youtu.be/8ggCT4ScsDQ?list=PLE8021F9820C6FB9C](https://youtu.be/8ggCT4ScsDQ?list=PLE8021F9820C6FB9C), though it dates from 2012 and does not include recent additions and improvements. If there is a particular one you’re interested in, go to YouTube and search for Blender and the modifier name you want. In general, avoid Blender tutorial videos more than two years old unless they describe general procedures such as modeling a figure.
To collapse all modifiers without having to go into the Properties panel and apply them individually, use the Alt_C Convert command and choose Mesh from Curve/Meta/Surf/Text.

An excellent introduction to the Boolean by Andrew Price is at https://youtu.be/WxMwa0njGSM. The whole modeling series is worth watching.

Object origins
When you select an object in Object mode you’ll see a small orange dot, generally at the object’s geometric center. Moving the object will also move that dot, which will maintain its position in relation to the mesh. In Edit mode, however, the object origin stays in place no matter how you move all or part of the mesh. This is one way to change the relative position of object and origin.

To snap the 3D cursor to a vertex on an object, select that vertex. Then use Shift_S to move Cursor to Selected. You can’t move the cursor directly with G (though you can use an Empty object, move that, and then snap the 3D cursor to it) but you can change its location precisely using the numeric values in the right fly-in.

Useful key shortcuts

Control_A  Apply a transformation

Alt_C  Convert a curve to a mesh, or a mesh to a curve

Shift_S  Snap menu

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