



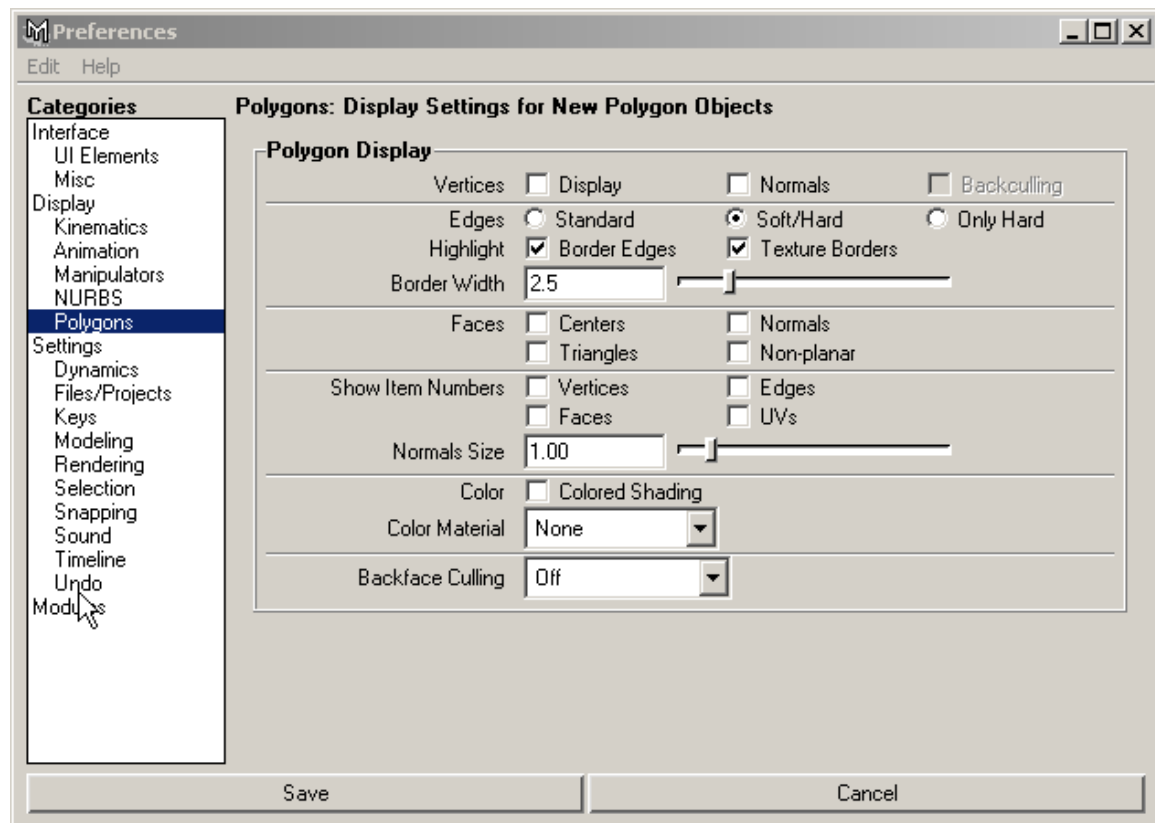
# Character Setup & Rigging

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**Title of Seminar:** Character Rigging and Setup  
**Presenter:** Jayme Wilkinson

## I. Some of the Basics

For the purposes of this document I should explain a few things that will help you understand what you are reading. Some of the defaults of how Maya displays things have been modified a bit. For example, SubD's or Subdivision Surfaces are colored a bright **red**, NURBS geometry is colored a bright **blue**, and polygon geometry is color coded a bright **green** with polygons you will also notice that the default setting Maya uses to display them is a bit different. These settings are available in the **Window->Settings/Preferences->Preferences** menu shown below. The reason these are set is so that we can tell if the edges and/or vertices of a particular polyset are merged or not by visual inspection of the polyset.



## II. Looking under the hood before you start the engine - what the model shop didn't tell you.

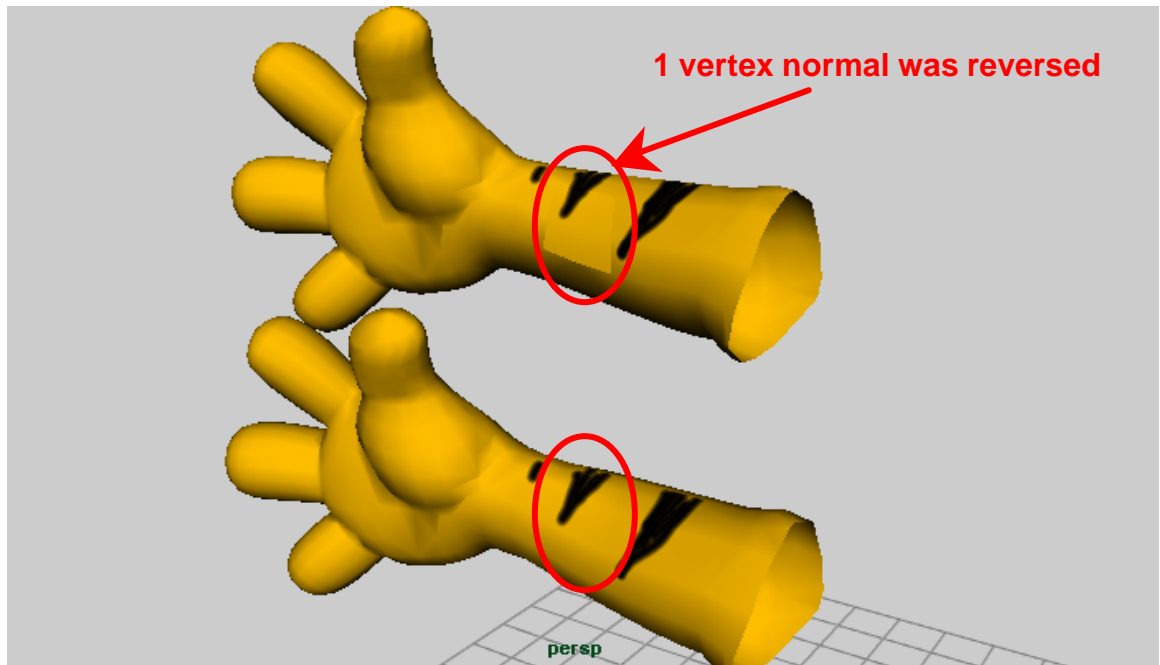
When you get the model for rigging from the modeler or model department, you should spend a little time looking at the model itself from several different angles and get familiar with the way it is built. While you do this keep a few things in mind.

- a. What surface types is the character is made up of?
- b. Is it all Polys, NURBS, or SubD surfaces? Maybe the character is made up of a little of everything (i.e. A Hybrid model).
- c. In the case of NURBS surfaces is the topology clean and evenly spaced, and does it support what you will need to do to it?
- d. For NURBS are there any multi-knotted isoparms?
- e. Do the normals all point in the same direction?
- f. For Polys are the vertices/edges all merged together?
- g. Is there enough geometric data in the areas you need to bend/deform geometry at?
- h. For Polys and SubD's, are UV's clean, not overlapping and evenly spaced?
- i. Look at the Hypergraph and/or Outliner. Is the DAG logically grouped and descriptively named?
- j. Make sure any unwanted construction history is removed from the model before you begin to work.

Each surface type has advantages and disadvantages over the others. Your modelers have hopefully gone through and determined which surface type meets the requirement for other departments in your pipeline. For instance an advantage of NURBS over Polygons and SubD Surfaces is that NURB geometry does not have to have texture UV's created or maintained for the geometry. SubD's have the advantage of adding surface detail where you want/need it, but doesn't lend itself to hard modeling practices very well as in creating tables, chairs, non-organic props.

In a production environment you normally do not have the luxury of modifying the model to fit your needs. The same model that was delivered to you was also probably also delivered to 2 to 3 other process steps or departments to save time in production. Making a change at the rigging stage will definitely cause things not to match up at the finishing stages of your production. Be varying wary of making any model changes without talking to your modeler. If you are also doing the modeling, notify all downstream departments as soon as possible. Let them know that you intend to make a change to the model that could cause data they are generating to be obsolete or incorrect.

An example of a model change that could have repercussions downstream in your production pipeline could be a simple thing like changing the direction of a surface normal. This could have consequences to the Look Development team who are painting the textures for the same character you are rigging. If you change the directions of the model normals or reorganize the vertices of a polyset then the textures your texture painters created will no longer fit and match the character.

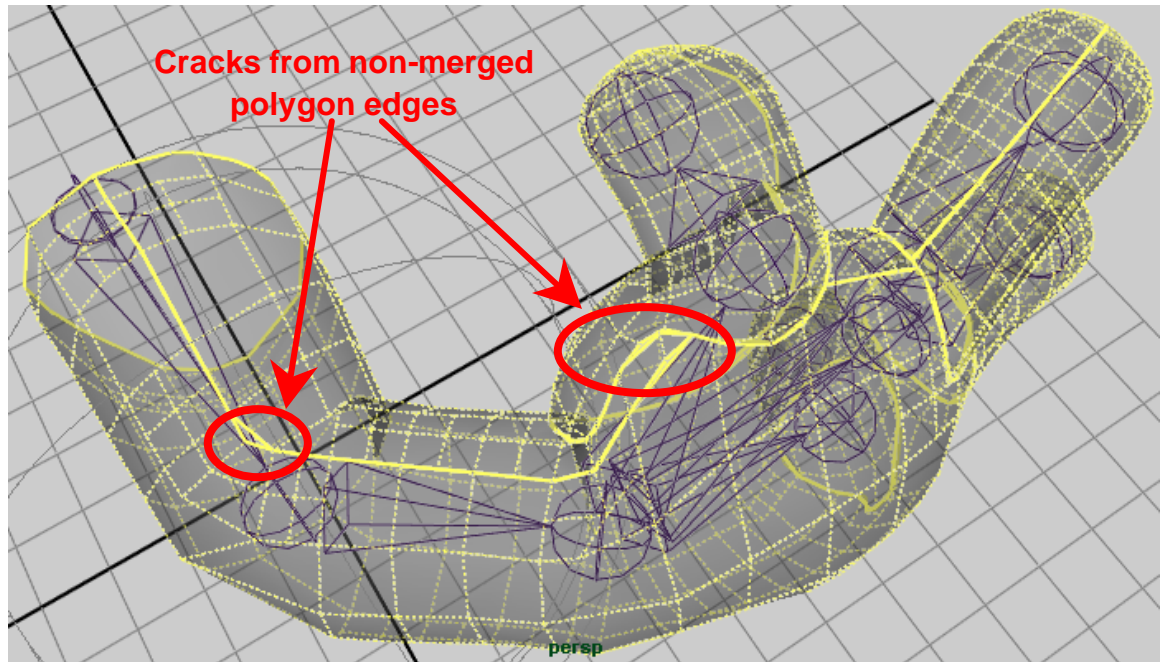


### III. Don't be afraid to bend the rules ... a lot.

During this process put some deformers on the geometry to test it out. Trying out different ideas at this point will help you in determining what you can and can't do with the model that was given to you. Notice how just putting a skeleton on this arm shows some problems in the geometry that will have to be fixed typically by the modeler.

#### **Use all the deformers you want.**

The good thing about deformers

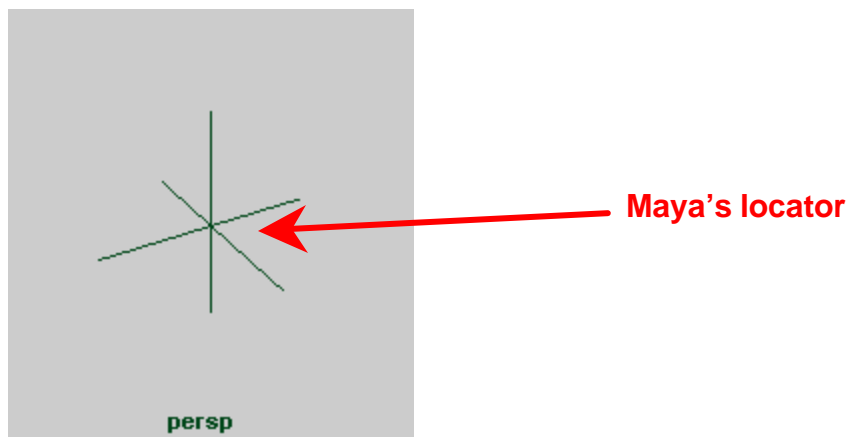


#### IV. Batteries included and strings attached - Putting controllers on your character.

##### **Create controllers that mean something to your animators.**

You should have conversations with your Animation Supervisor or the Animation Lead for the character you are rigging. Discuss with them how they expect to interact with and pose the character. Don't waste your time creating controllers for stuff that will not get used.

Maya provides a locator that is useful as a constraint, object selection, and controllers.

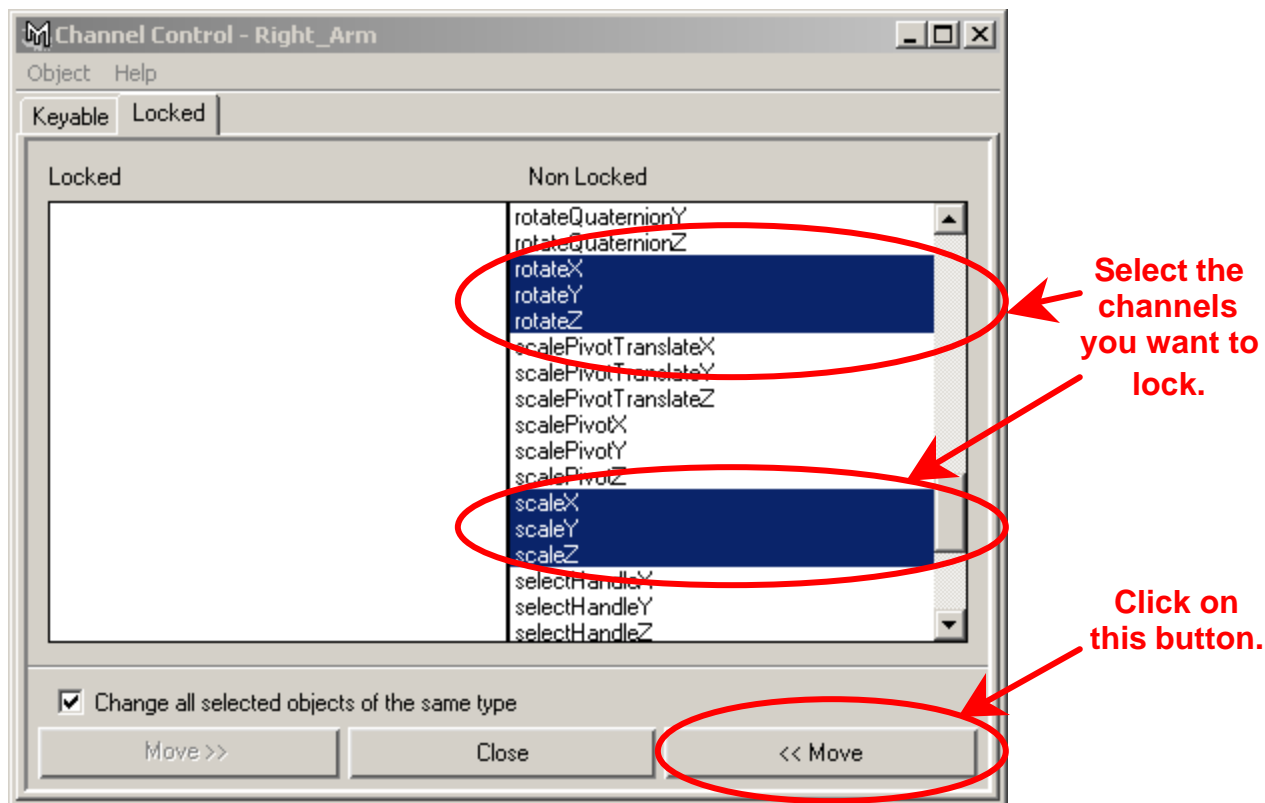


Unless you want all of your control elements to look the same, it would be wise to use the curve tool to create some of your own that have a visual meaning associated to them. When creating your own controllers make sure you only use the curve generation tools. You don't want these things inadvertently showing up in a render, and except for curves that have Paint Effects strokes applied to them curves do not render in the software renderer.

**The character rig should be intelligible for another rigger to debug and troubleshoot.**

This is very important, in case you are not around (i.e. on vacation in Rio, or you hit the lottery and are now independently wealthy.) The rig you create should be understandable by another character rigger in case he/she needs to edit your rig while you are out of the office. If there are parts of your rig that are very esoteric then document the things you are doing, and leave your notes in a place where someone can get to them.

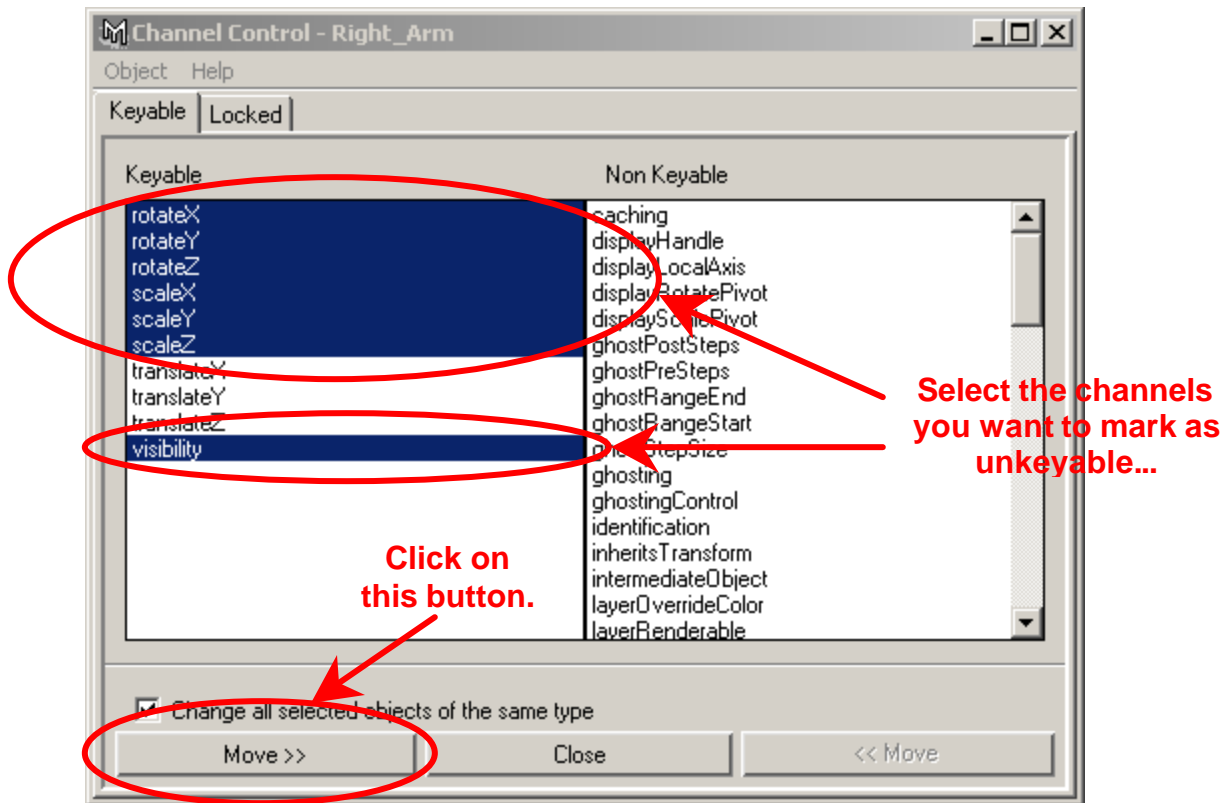
- V. Only allow your animators to select and move what you want them to.** As you begin creating controls you should lock off the attributes that you do not want anyone modifying. Use Maya's built in attribute locking mechanism to accomplish this. This functionality is available in the Channel Control Window among other places. First, select the node/object you want to lock attributes for. Select "**Window->General Editors->Channel Control...**" to open up the Channel Control Window. Select the channels you want to lock. Then click on the "**<< Move**" button to lock the attributes.



**NOTE:** While you are locking away the ability to modify an attribute of a node/object you should note that this is by no means secure. Maya does not provide a mechanism to password protect the locking mechanism at all. What that means is that anyone who knows how to lock and unlock attributes in Maya will still be able to do so. What locking really prevents is the accidental movement of an attribute without the user's knowledge. That is because the user will have to consciously unlock the attribute, modify its value, and lock it back again. This requires a conscience effort on the artist's part.

**Only allow your animators to keyframe what you want them to.**

Much like the process you used to lock attributes so that an artist can't move things that they shouldn't, you should also change the keyable aspect of attributes you don't want them to keyframe. This can be done through the Channel Control Window also.



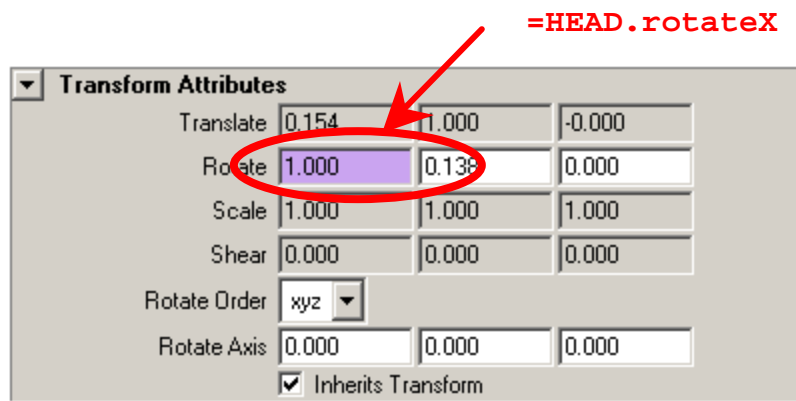
**NOTE:** Yeah you guessed it. This mechanism suffers from the same security faults that attribute locking does. Setting attributes to be keyable or unkeyable is also by no means secure. What that means to you is that anyone who knows how to modify the keyability (if that's a word) of an attribute in Maya will still be able to do so. What this really prevents is the accidental keyframing of an attribute without the user's knowledge.

### Using expressions to drive your character.

Expressions are a very powerful toolset within Maya, but there are a few things you will need to be aware of.

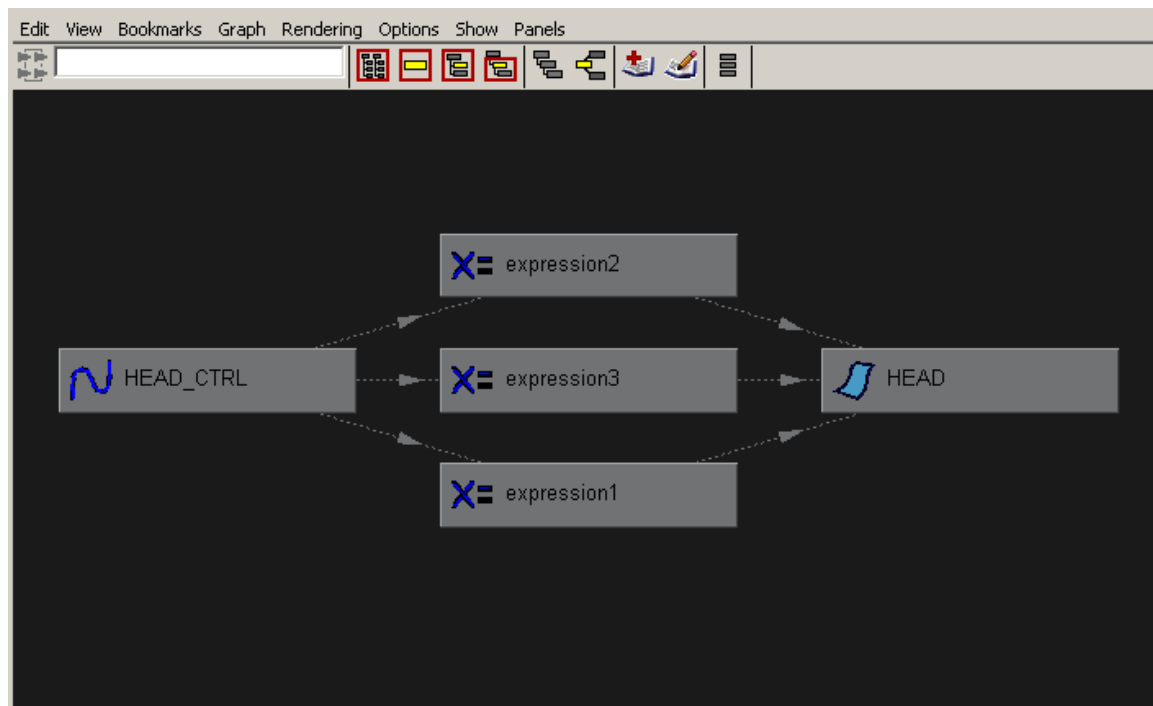
- a. Expressions execute whenever the current time or frame changes (i.e. When you move the time slider).
- b. Expressions execute when your interaction with Maya makes use of an attribute in the expression (i.e. when you xform/rotate/scale an object who has an attribute that is used in an expression node.)

You also want to remember that Maya is a node based system, and will evaluate nodes it determines have inputs that have changed. This is where Maya gets some of its speed. It doesn't have to evaluate every node in the entire dependency graph if none of the input attributes to a node have changed. Yeah, I know you already know that, but I bring it up because if you like to type in expressions in the attribute field of the Attribute Editor,



or if you use the right mouse button on the channel box to add expressions to an attribute, Maya will automatically create a new expression node for the expression you are about to write. Like I said earlier, Maya is a node based system, so the more nodes that there are in your scene the longer it could take to evaluate your rig when you make a change to an attribute.

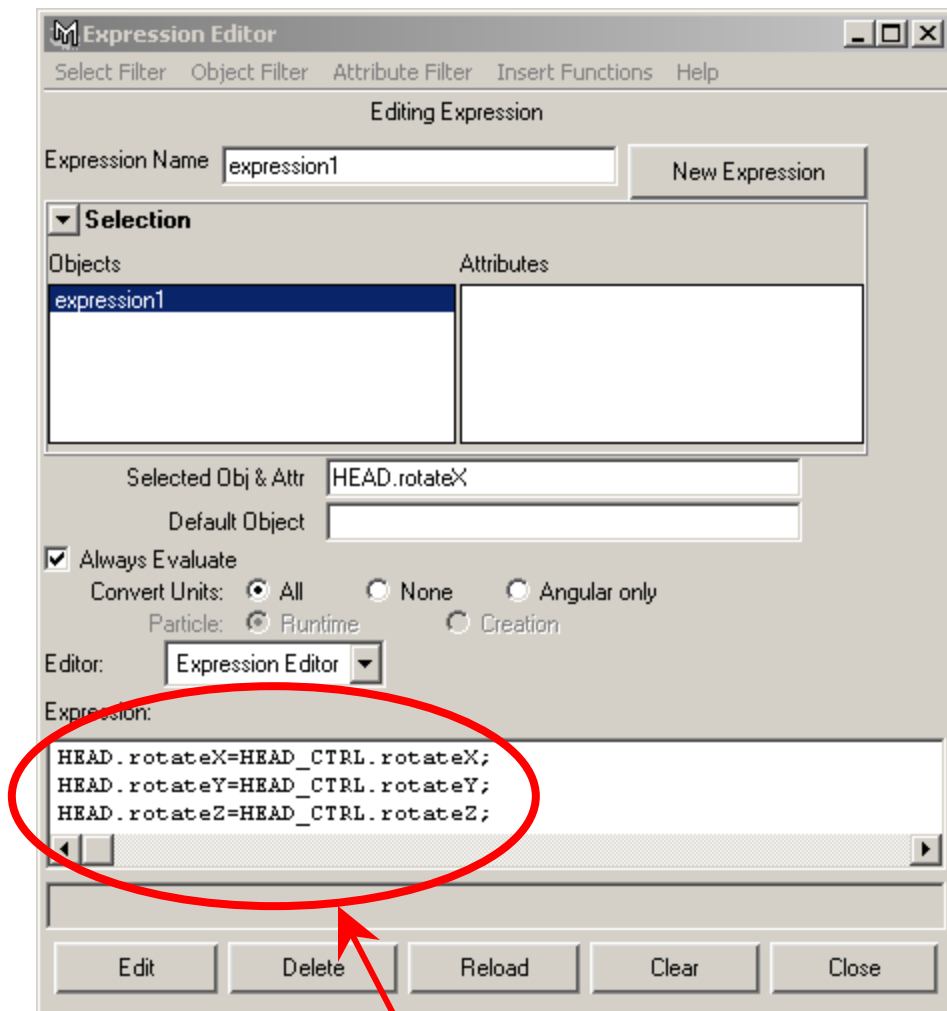
Consolidate all of your expressions into as few expression nodes as possible. This will help to optimize the evaluation of your character rig. It will also help in the readability of the rig setup. Take for instance what the expressions look like in the Hypergraph. You will see that for each expression, you get an expression node in the Dependency Graph.



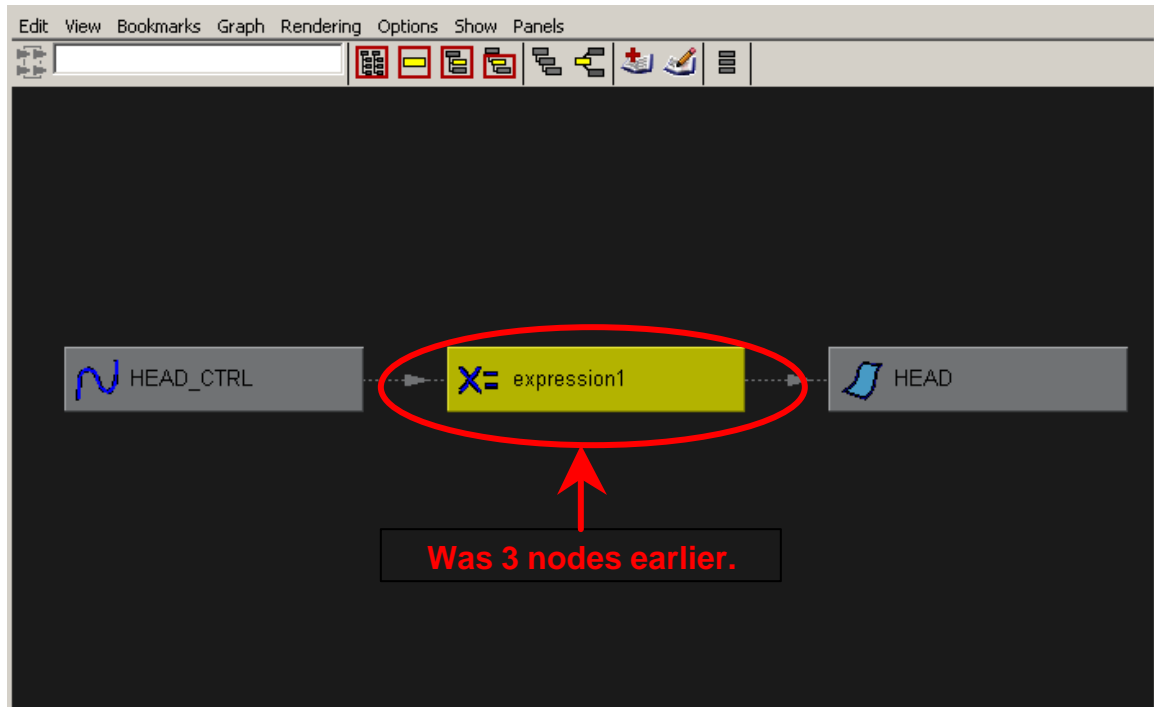
As you can see from the above Dependency Graph, if the user changes all three rotation values of the HEAD\_CTRL node, then Maya will re-evaluate

three expression nodes. After the expression nodes get evaluated then the HEAD geometry node will get evaluated or updated.

Instead of having multiple expression nodes in your Dependency Graph use the Expression Editor to consolidate the three expression nodes into one. You can do this by using the copy and paste functionality of the Expression Editor.



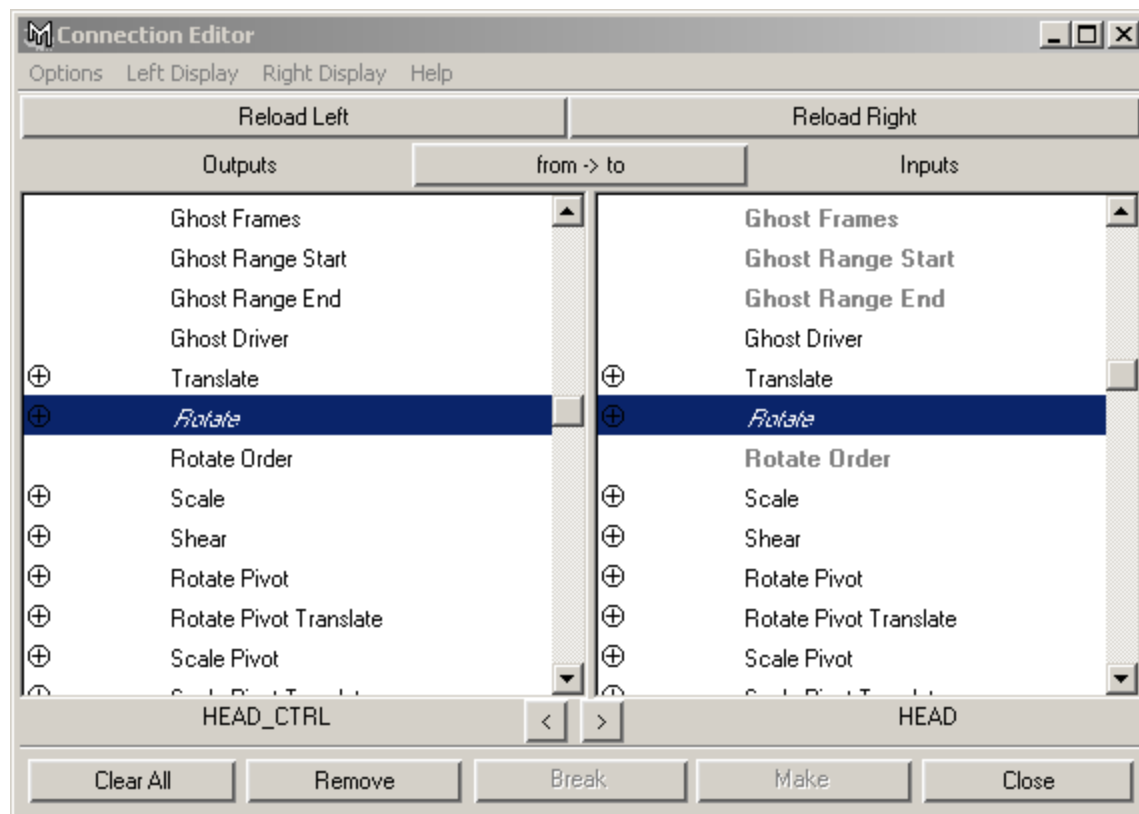
**The 3 expressions in a single expression node.**



If your expression is just equating two attributes together, it would be better if you were to use Maya's Connection Editor to connect the two attributes together. This way Maya doesn't need to evaluate an expression, it will automatically equate the two attributes with the same value. So, instead of writing the following expression:

```
Head.rotateX=Head_Ctrl.rotateX;
```

Your character rig will evaluate more efficiently if you were to connect the two attributes together in the Connection Editor.

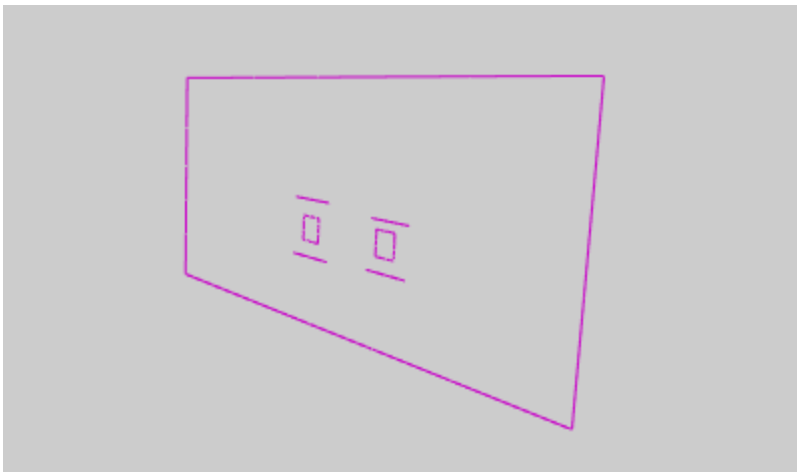


### Constraints.

Everything has a cost associated with it. Each type of control you add to your rig will cause it to (re) evaluate at different rates. Basically, constraints are probably some of the most flexible controls you can put on a rig. By the same token they can take the most amount of time to evaluate.

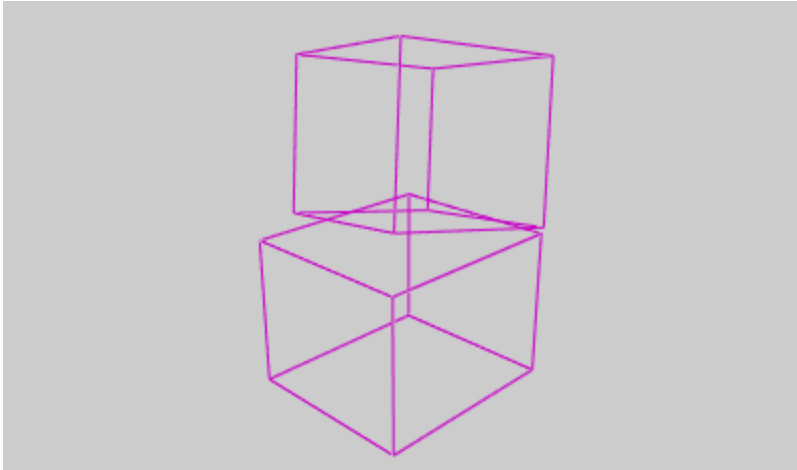


In the above image there are a few different methods of controls setup to pose the character.

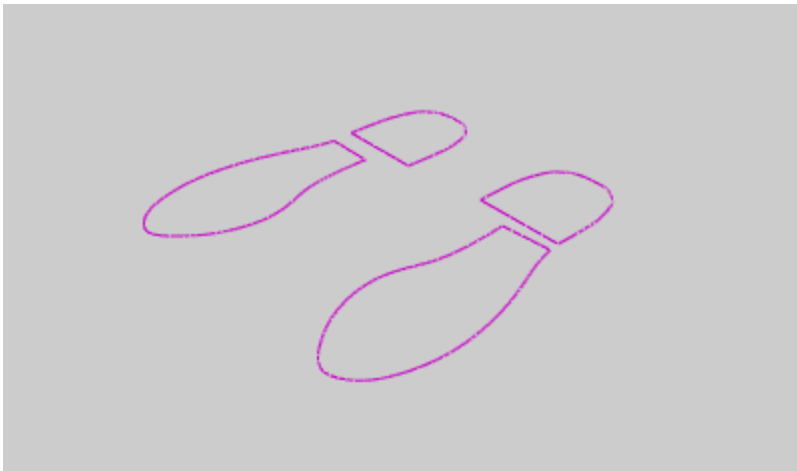


The mask show below uses mainly constraints to control the position and orientation of the eyes for the character. The horizontal lines on top of the smaller squares control the upper and lower eyelids of the left and right eyes. The small squares inside the large rectangle control the eyeball look at point itself. Each of the controls is hierarchically group to each other so that when you select and move the large rectangle you are modifying the pupils and eyelids of both eyes. You can select individual components of

the mask and control them by modifying its position within this setup.



The 2 cubes you see are used for orienting and posing the body and head of the character. When selected as a pair you are allowed to move the character within its world.

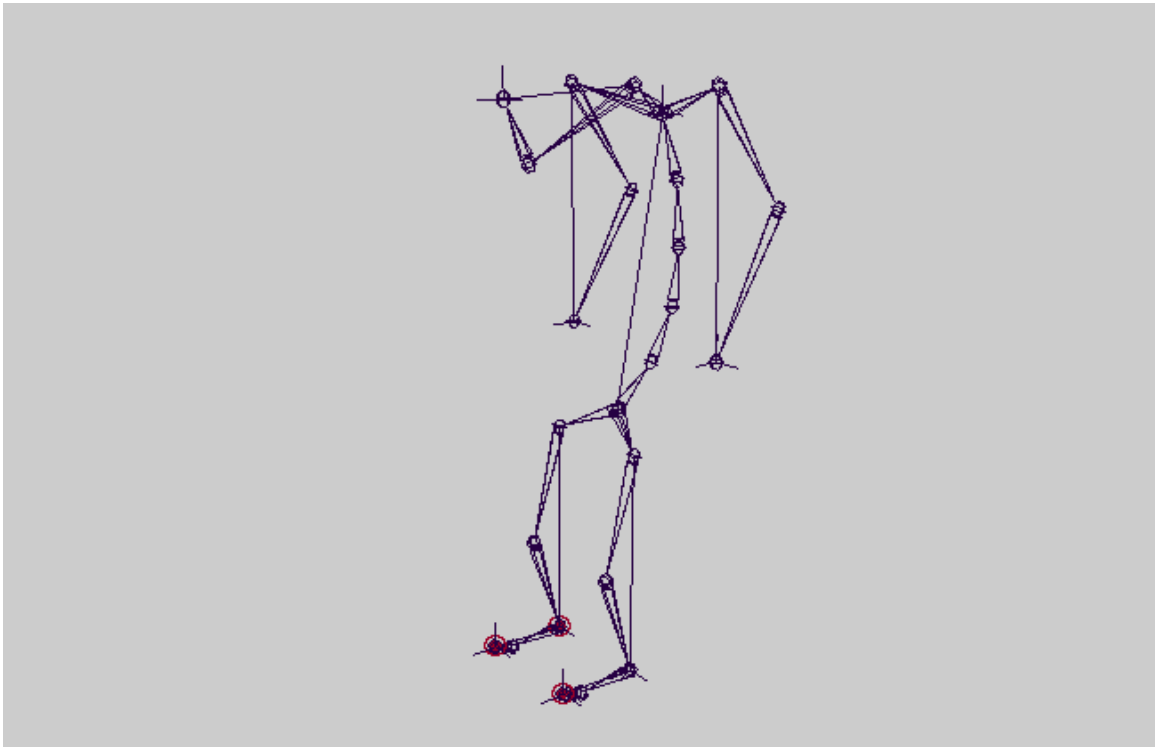


At the feet you will see 2 controllers that allow the user to position the heel and toe of the character by positioning them.

## VI. Different types of rigs.

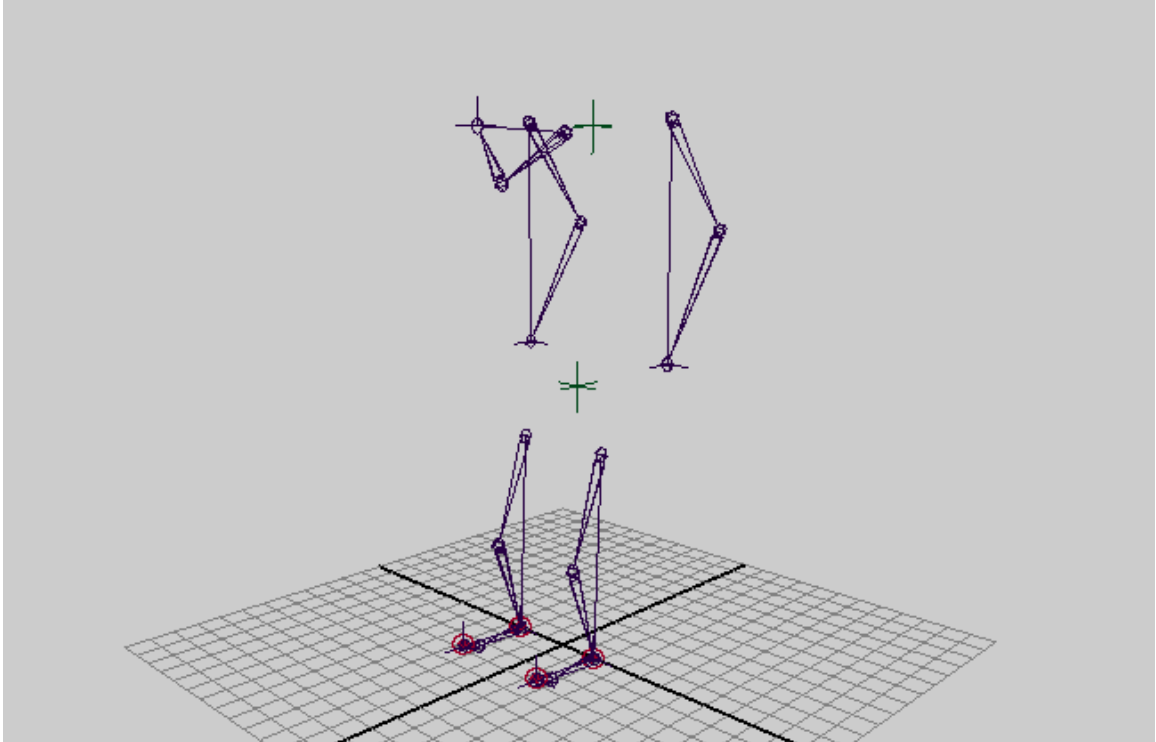
### Broken / Detatched rigs.

Typically when creating characters rigs with IK/FK the skeleton will be all one piece as in the image below. With the



A “Broken or Detatched” rig refers to a character rig that is more segmented in its construction. This method is used to avoid single skeleton systems from fighting itself while solving for its joint rotation. Depending on the complexity of your character rig you may still end up with parts of the rig fighting itself to solve, but the use of a detatched rig can be very useful.

The previous character with the top hat and tea cup is an example of this type of rigging concept.



With the limbs of the character unattached from the root we can use the locators (A and B) to control different parts of the character.

### **Layered / Assembled rigs**

Many times in production you will have many people working on rigging up the same character. This method is more of a procedure than anything else. It refers to the ability of dividing up rigging work among many artists.

For example: the finished model may be given to 3 rigging artists at the same time, and the work divided up as follows.

- a. Artist 1 will work on the Body and Head rig
- b. Artist 2 will do work on the Facial parts of the rig.
- c. Artist 3 works on Cloth parts of the rig.

In this way each artist can work somewhat independently from the others and when their work is complete it is just a matter of assembling their work into a final rig file that should match up and work correctly.

This method can be scaled to use on a smaller team of riggers. There is nothing to say that in the example above Artist 1, Artist 2, and Artist 3 are the same person. The only difference is that the work will take longer to execute, and you will not realize the full potential of this working procedure.

## VII. Breaking your character. 'Cause if you don't your animators will.

**A couple of thoughts after you think you may be ready to hand off your work.**

- a.** Test out range of motion range of motion of all limbs to make sure that they meet the requirements of what needs to be animated.
- b.** Take a last look at the Dependency Graph of your rig. Remember you don't want to end up with a self perpetuating rig
- c.** Never loose site of the fact that ~~it was all started by a mouse.~~ Huh, wait a minute, I meant never loose site of the fact that an artist will need to use what you create.
- d.** Store all the poses and animations of your character for future reference. Trax is an excellent way to create a library of this information. This way you can retrieve them and recheck newer versions of the rig.