

Expressive and emotive and rigs

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Course Animation & VFX

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DECLARATION

I, Shaun Eurn Hancock declare that I am the sole author of this Project; that all references cited have been consulted; that I have conducted all work of which this is a record, and that the finished work lies within the prescribed word limits. This work has not previously been accepted as part of any other degree submission.

Date: 01/05/2026

FORM OF CONSENT

I Shaun Eurn Hancock hereby consent that my Project, submitted in candidature for the BA Animation and VFX degree, if successful, may be made available for inter-library loan or photocopying (subject to the law of copyright), and that the title and abstract may be made available to outside organisations.

Date: 01/05/2026

Contents:

1. Introduction

2. Reason behind the study
3. Modelling
4. Joints & orientation
5. Controls
6. Methodology
7. Set Driven keys
8. Blend Shapes
9. Conclusion
10. Bibliography

1: Introduction

This dissertation will cover the creation & uses of an expressive rig using two different methods and how they can be used in different applications, the aim of this project is for me to learn how to create advanced rigs & explore different ways we can create expressive rigs.

The aim for the end goal is to show off the finished product in an animation ranging from 10 to 30 seconds or through a series of short animations showing the extent of the rig and how to use it.

Cataloguing of work in order;

Modelling where we will be going over all my modelling, style choices, what we will be modelling for such as for a game, animation or a hybrid of both.

Joints & orientation where we will be explaining the creation of the skeleton that will drive the rig, any issues that appear and the importance of setting up a skeleton with the differences between game rigging, animation rigging, and hybrid.

When we drive the rig we will need controls so the control section of the work will cover the creation, placement, and usage of the controls throughout the rig.

Methodology will show the thought process of the entire project and act as a technical reflection and list of what went right and what did not, this acts as our list of problems and can be used for troubleshooting since in 3D software like Maya technical problems vary wildly and from rig to rig so if we were to hand off our rig to another user for animation or for them to rework pieces for their own uses we can provide them with a list of known issues that might occur and how to solve them.

Set driven keys is how we will drive the UV changed in one of our rigs, so the process of this will be documented here along how to add more sets of UV to this if someone wants to add more expressions to our rig.

Blend Shapes is where we will go through the creation of blend shapes for one of the rigs that allow us to create expressions and how many we will create or plan to create.

The conclusion section is where we will be compiling and reflecting on what we have done throughout this project.

2: Reason Behind Study

We can learn advanced rigging with extra features that allow us to make our models more expressive without using typical rigging such as eyes & mouth controls, we can work with any model for this that is humanoid since all of the principles of this work can be replicated on human models or even animal models with slight modifications to how we work.

In doing this we can add this to our skill set and build assests for a portfolio, since we plan to create a model along with rigging a model we can start from the basics of modelling to more complex modelling in understanding the need for good topology and edge flow.

3: Modelling

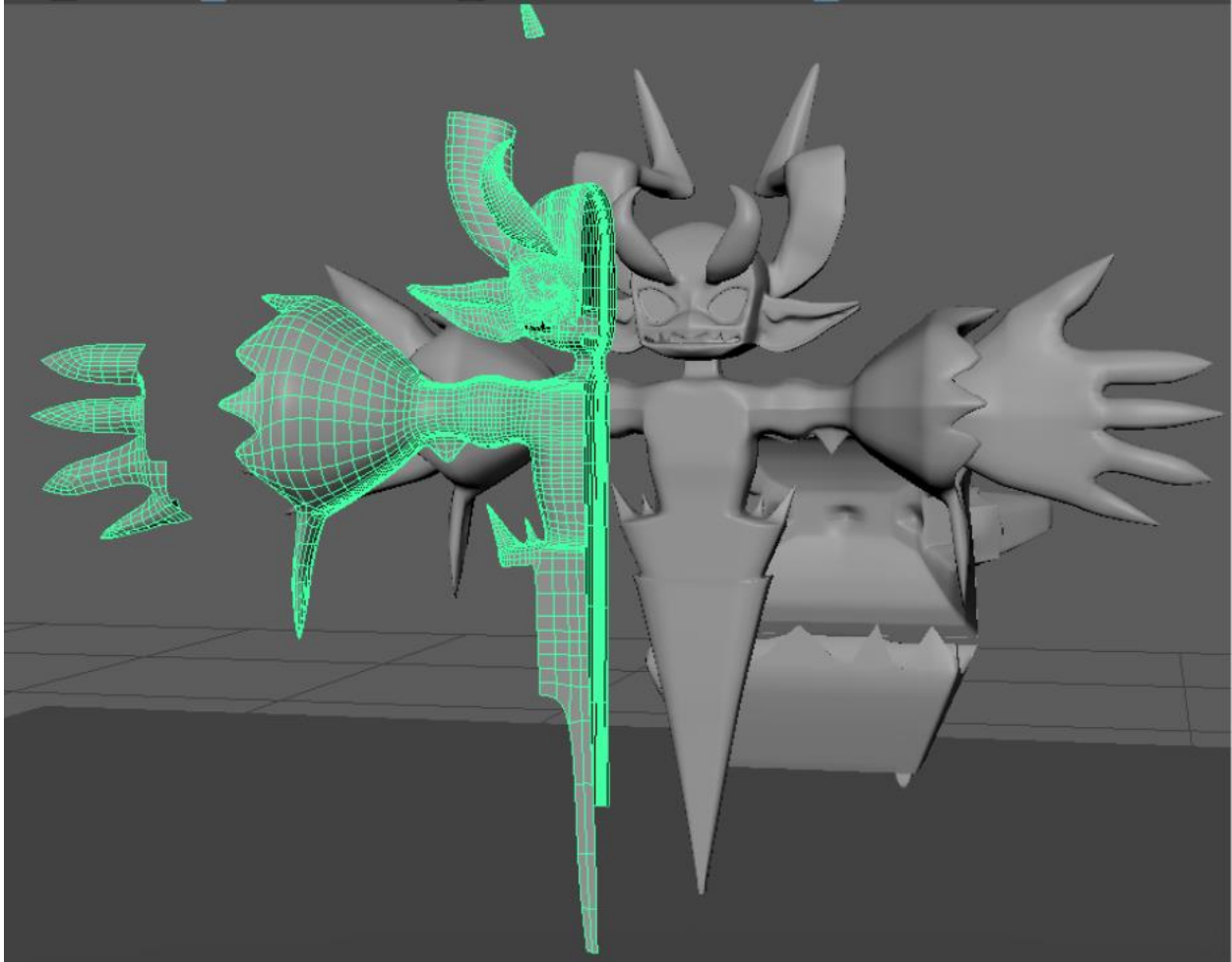
When modelling we need to think of what the model is being used for such as games vs animation, we need to consider the polygon count for games more than we do when creating a model for animation along with how the model is rigged since game engines do not like N-gons or non-manifold topology meaning models with said topology would either run poorly or be unable to be imported into the game engine.

For my model I am aiming for use in animation, the rigging will be done in game style so if anyone wanted to retopologise my model or import one of them into a game engine they wouldn't need to rig the model again since the rigging is universal.

Mimic

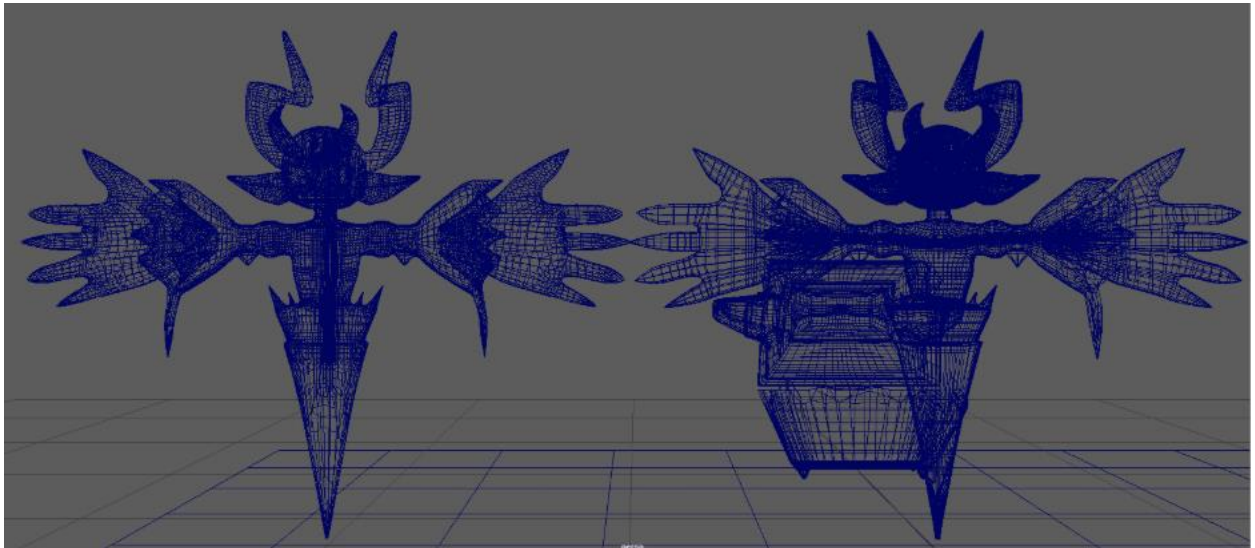
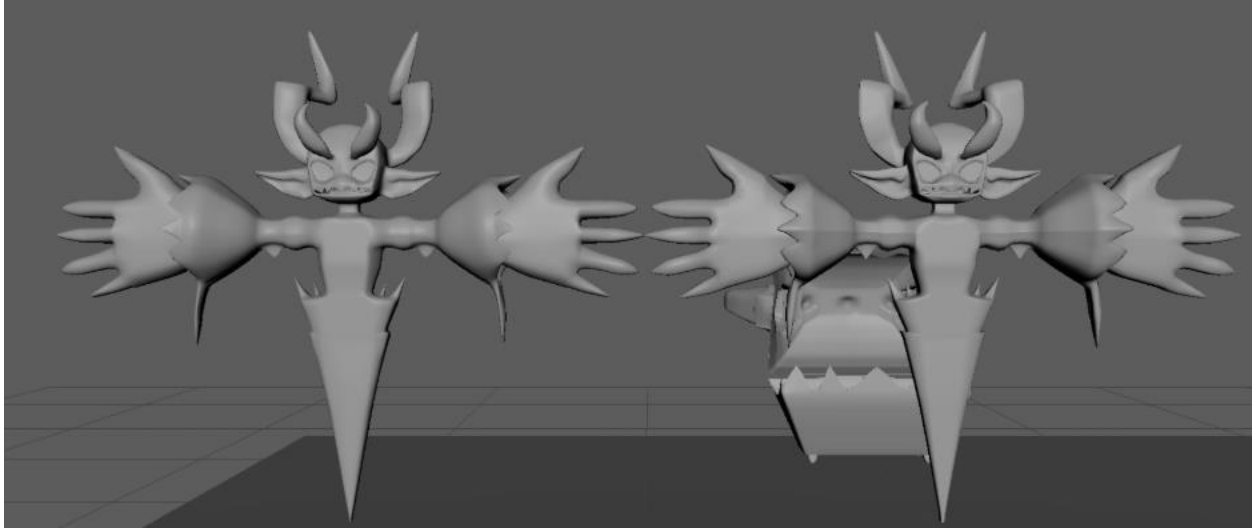


For the first model nick named “Mimic” we will be using this image of a Yu-Gi-Oh card concept art as reference for the work, this serves us as a good base of what a model should look like and how we can style the other models since we want both of the models to be of the same style.



Retopology half

Here we have a split of our model to show how our retopology of our model is going, this is to see our edge flow and overall topology to avoid harsh lines and creating a blocky model since we are aiming to create a high-quality model which isn't needed for this type of rigging but it does help with deformation since we have more vertices.



After & before images of the retopology of the model

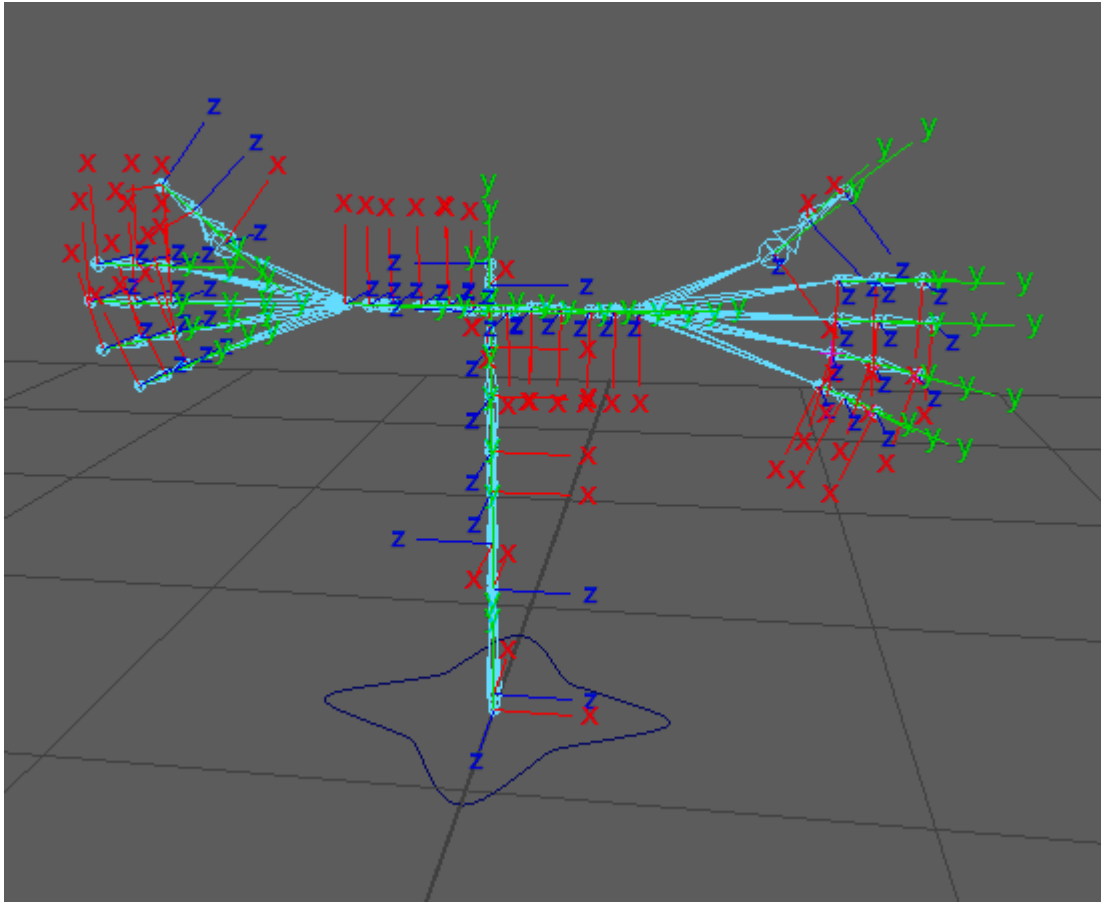
This model had to go through multiple rounds of retopology for better deformation when fully rigged and for better appeal that will look smoother and high quality, through the remodel we have achieved a greater quality of deformation when rigging.

Hero



Using the prior model as reference for height and style we can see how tall we want our hero model to be; in doing so we can avoid needless scaling issues later down the line when it comes to animating these models together since we already have the models at the correct scale from the start.

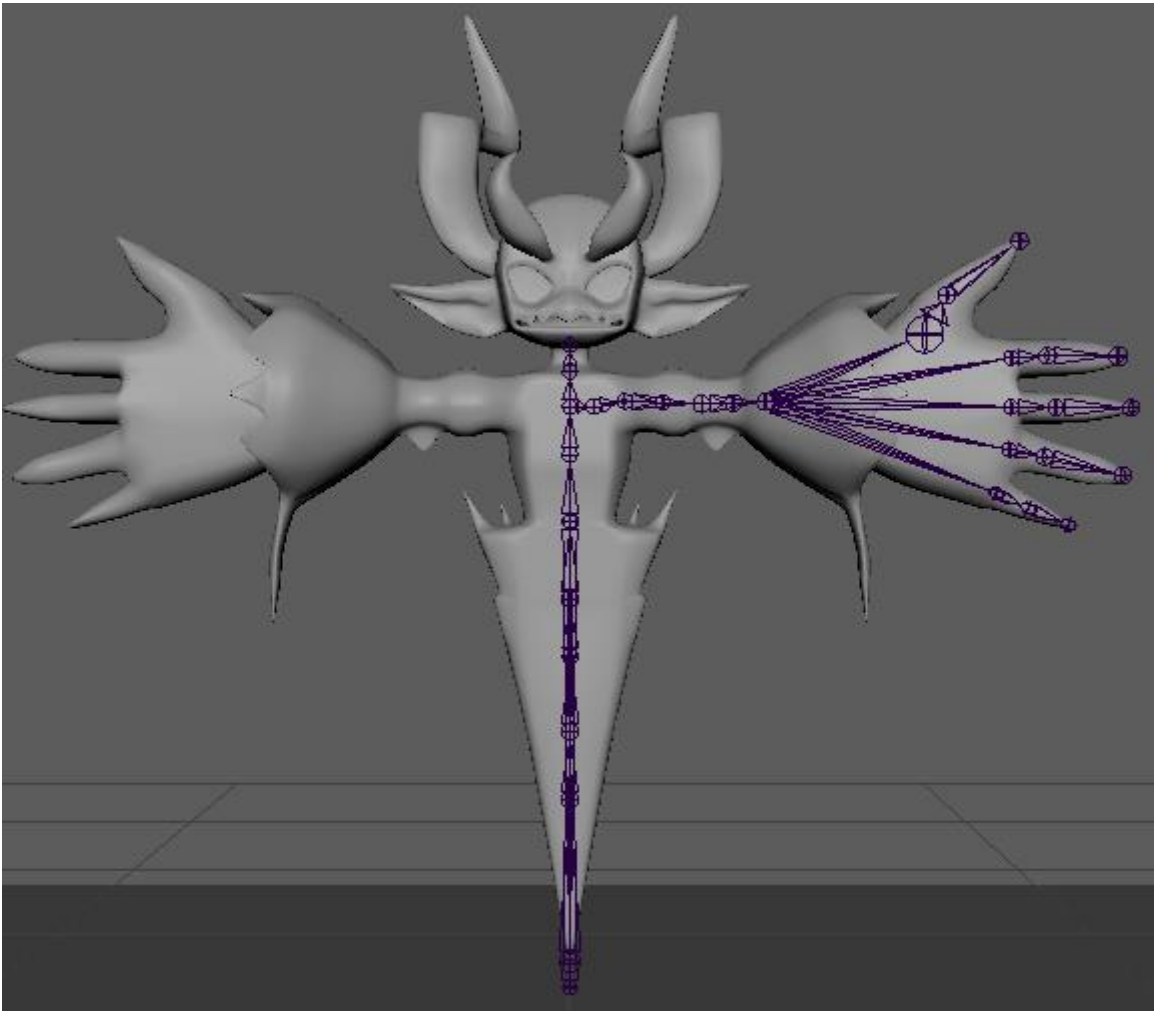
4: Joints & orientation



Skeleton rig rotation

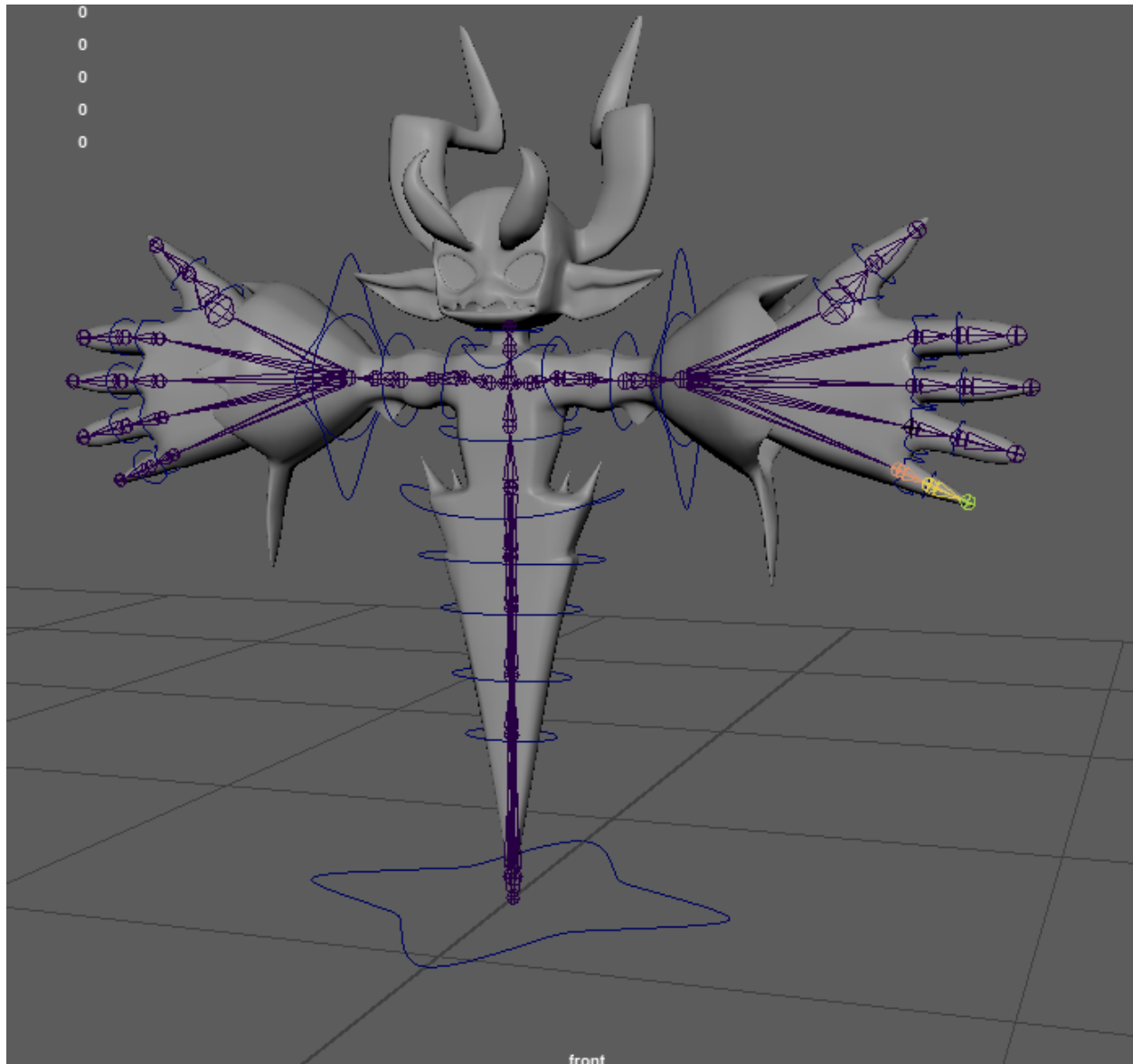
When making a rig the rotations of the bones for ease of movement and animation for the user of the rig is something we need to do first before we create the IK & FK bones, this is for ease of animation and helps us avoid any unwanted problems down the line. If the rotation order or what rotation axis (X,Y,Z) comes first in the order is wrong or mismatched it can cause major problems such as if a control and bone have a rotation of XYZ and YZX when connected they will rotate in different directions since the axis of both are not aligned.

Roots & Twist



Rig half front view

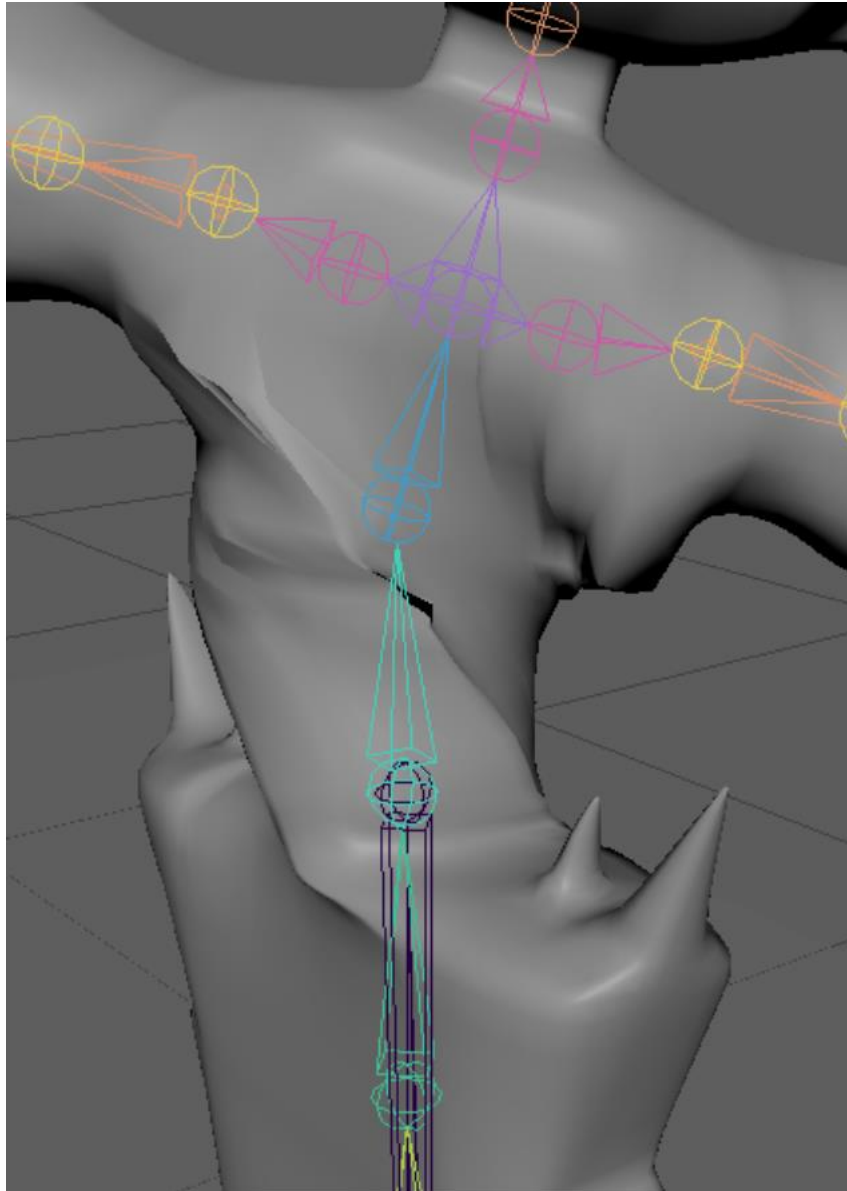
Now that we have a skeleton build and corrected rotations, we can investigate what some of the extra bones we've added do, we can see very faintly the root/twist bones mid-way through we have created; these are to help with the rotation of the rig. These are not needed in all rigs but do help increase the quality of the rig when animating to avoid odd twisting deformations but do not eliminate deformation problems entirely.



Basic Controls

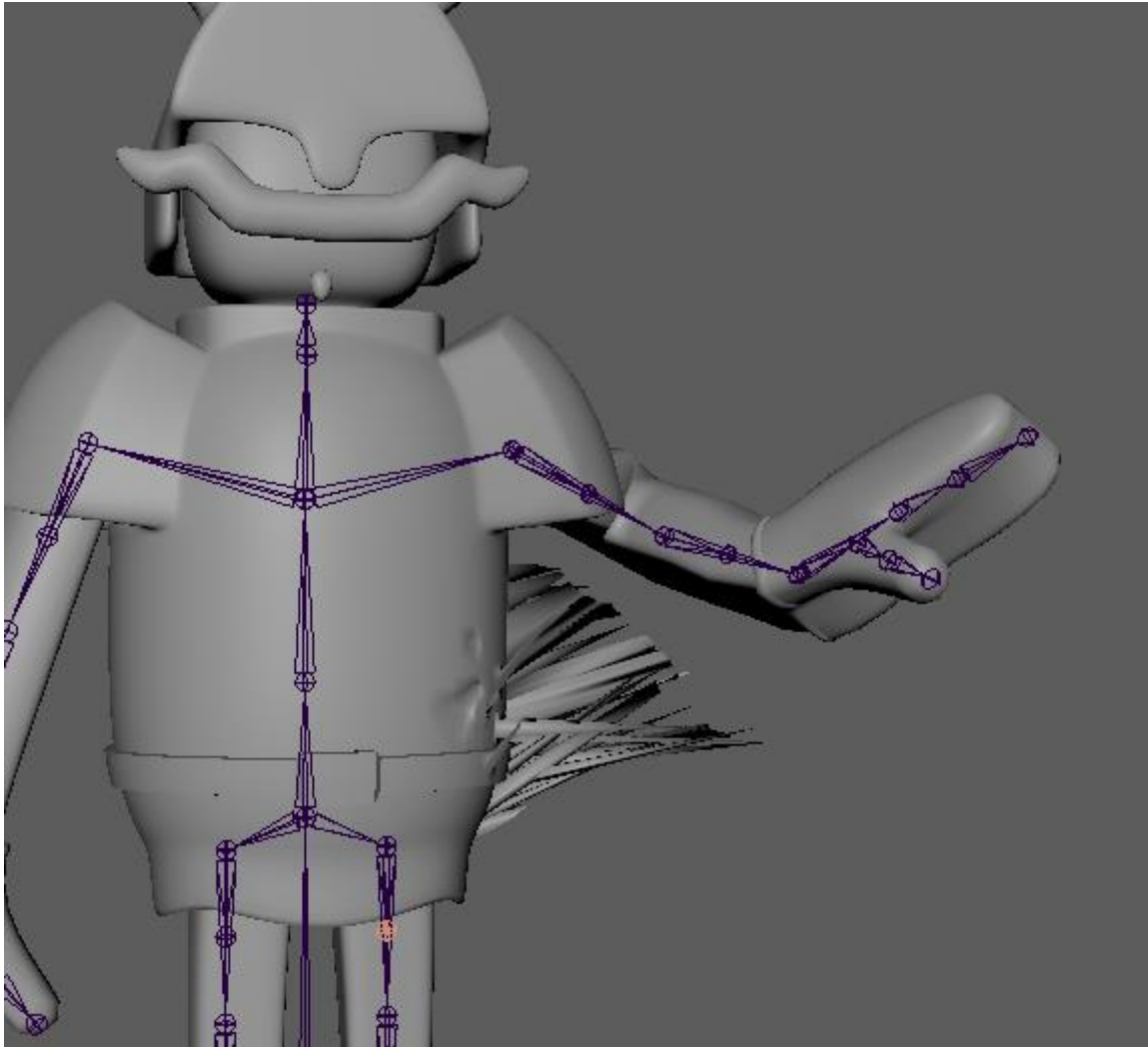
To create a rig we first need to start with the placement of the bones and their orientation, this allows easier animation since we should place the bones in the centre & then the rotation should follow the controls.

Weight painting



Mimic model Skin

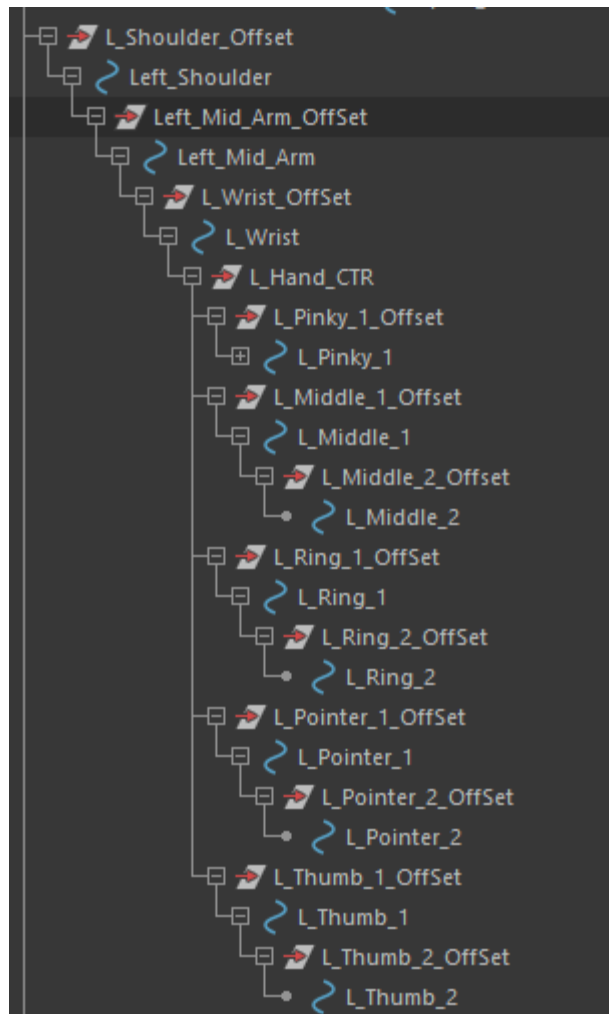
Here we can see we have minor weight problems, nothing we can't fix with smoothing to lower the weight values on some of the bones in the spine to even out the stretching we are seeing here.



Weight Painting Issues

Here we have the result of a major weight painting issue, this is a problem since it's not one big chunk that's affected but multiple small parts that require more work to settle and since we need to remove so many different weight values we need to be careful it doesn't shift the values of the weights onto the another bone.

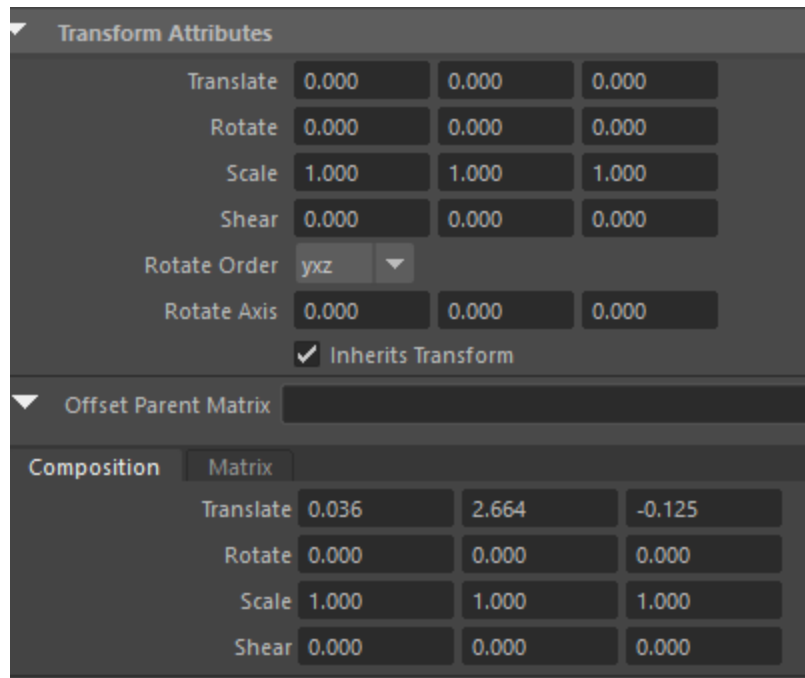
We can work with the smoothing tool for the weight here to better distribute the weight if we do get other issues like this, it's always best practice to move joints around to test the weights such as in the image above since it will pull all the weights attached towards it and we can see the deformation along with the weights we don't attached to the joints.



Offset groups

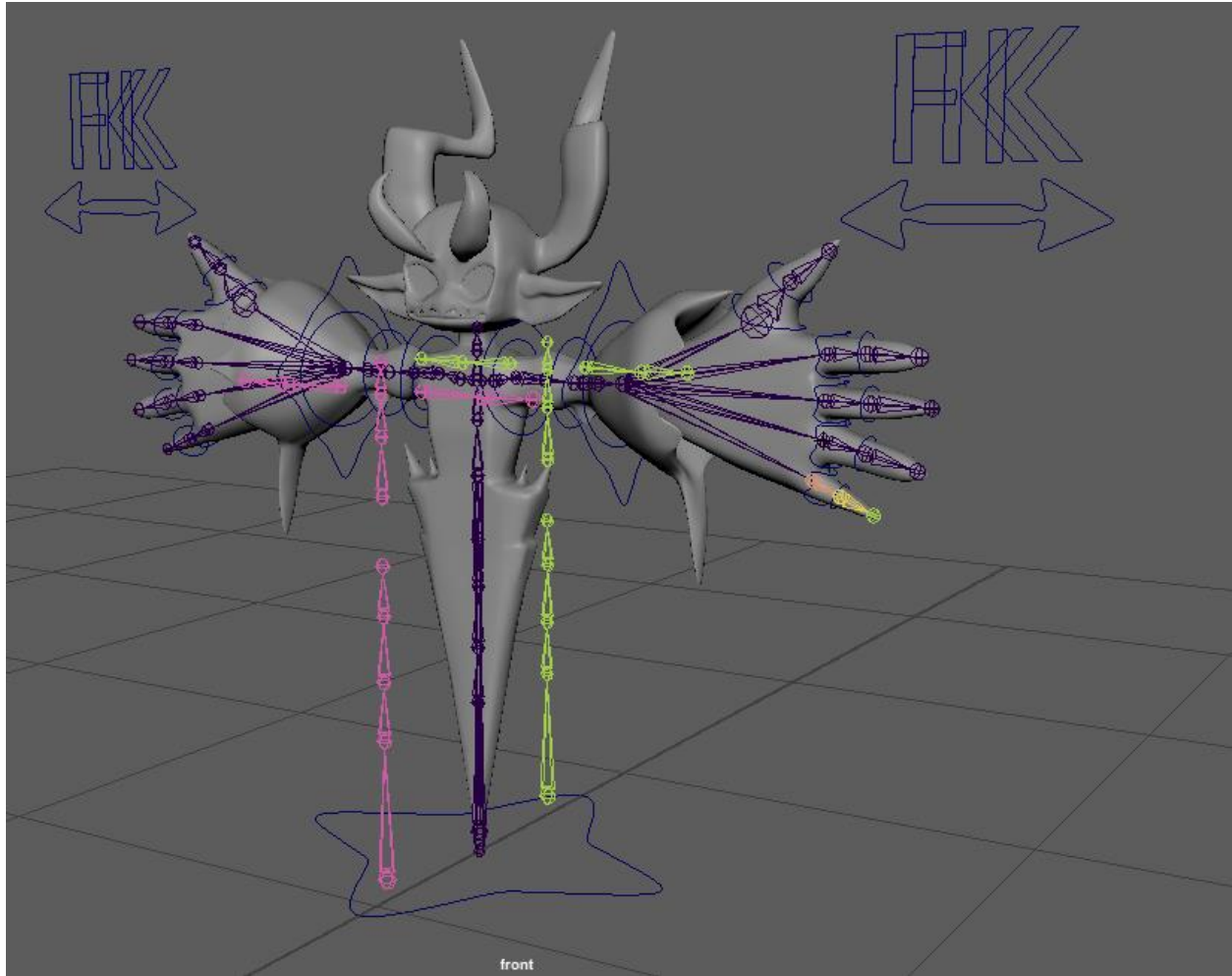
For rigging we need clean values on the various parts of the rig from the bones to the joints they all gain values from moving and being changed in size we need to set back to zero, but setting something back to zero causes all the work we have done to be erased as well so we instead can create an offset groups.

There are problems with offset groups since we are adding more variables Maya must read when driving the rig, so we can work with an offset parent matrix instead.



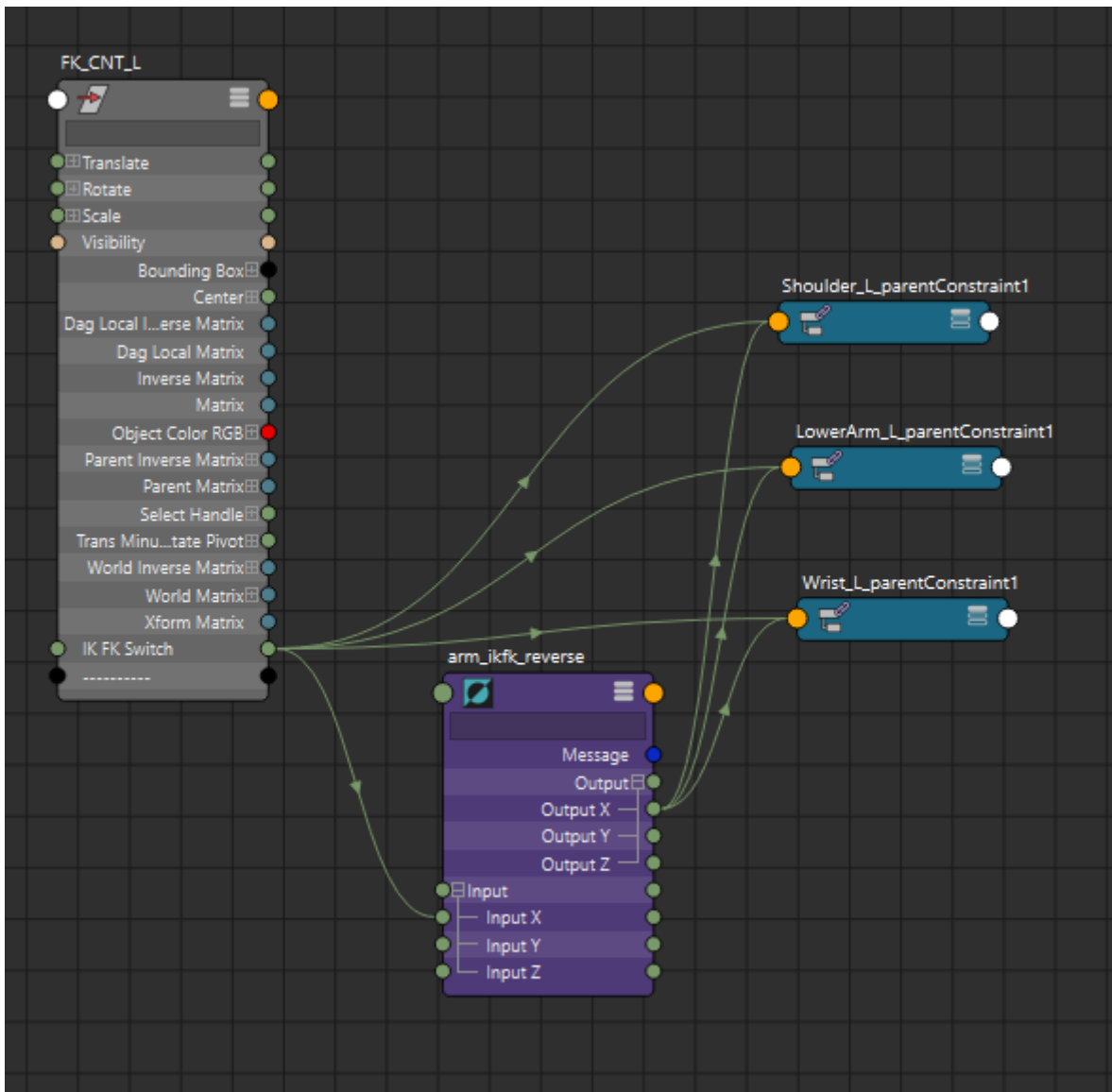
Offset Parent Matrix

Using an offset parent matrix we can avoid having to create an offset group for every joint but instead give our translation information to the offset parent matrix and make the values in the transformation attributes tab 0 since the offset parent matrix is keeping our object in the same place but the joint has a value of 0 in the channel menu so if we assume this is an arm control that's been moved and we want to return the arm back to the original space we can set the values back to zero and it will assume the default point. This helps in animation and when we connect the world zero matrix of joints to bones since if we didn't have the values of both as zero the values would be added together and may cause double transformations or stretch the model.



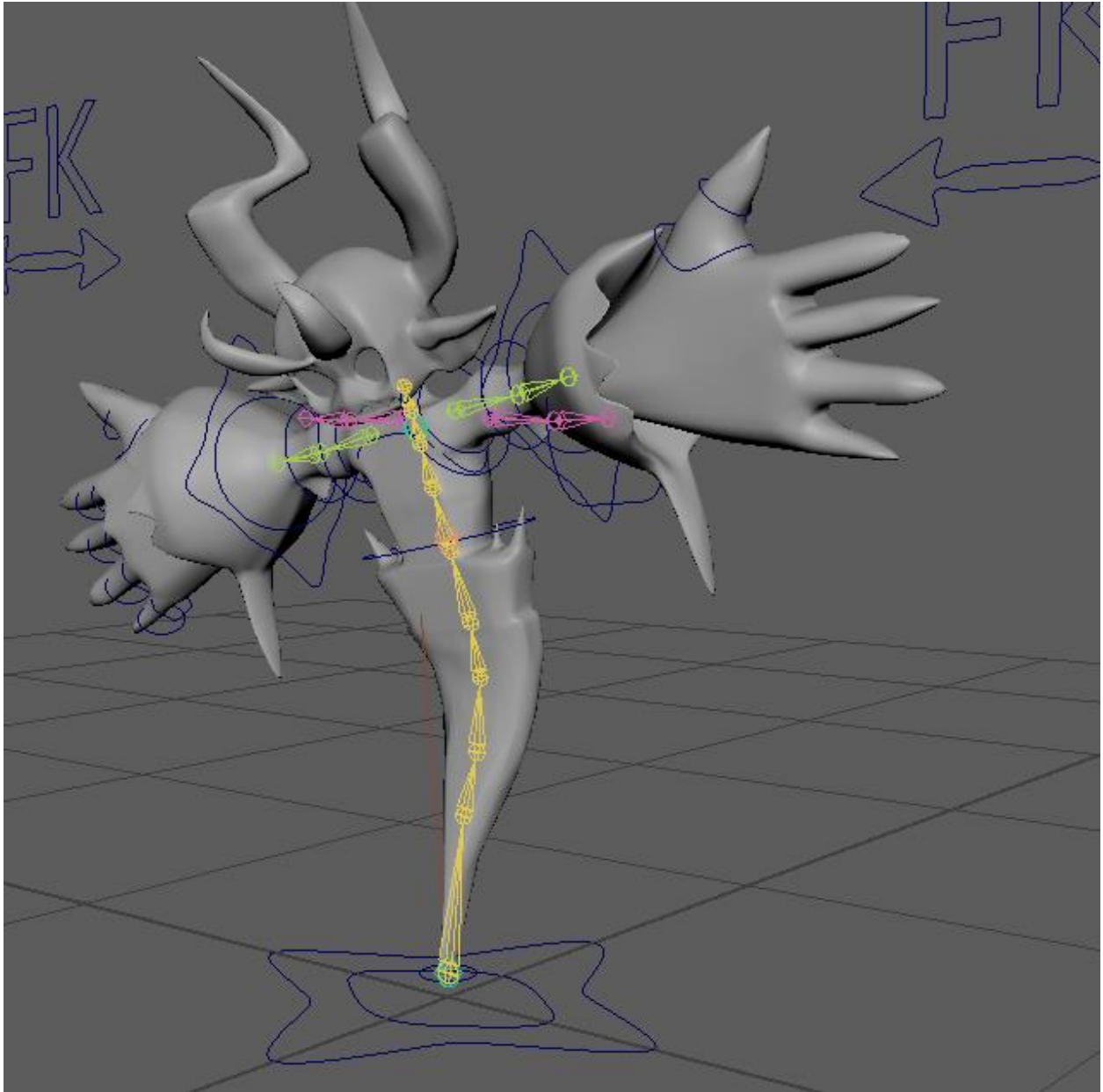
IK & FK Bones

We need to parent contrariant the IK & FK bones to the main skeleton so when we move the IK & FK bones the skeleton move with it, this is how we drive the rig and how we can enable a swap between them further down the line using nodes.



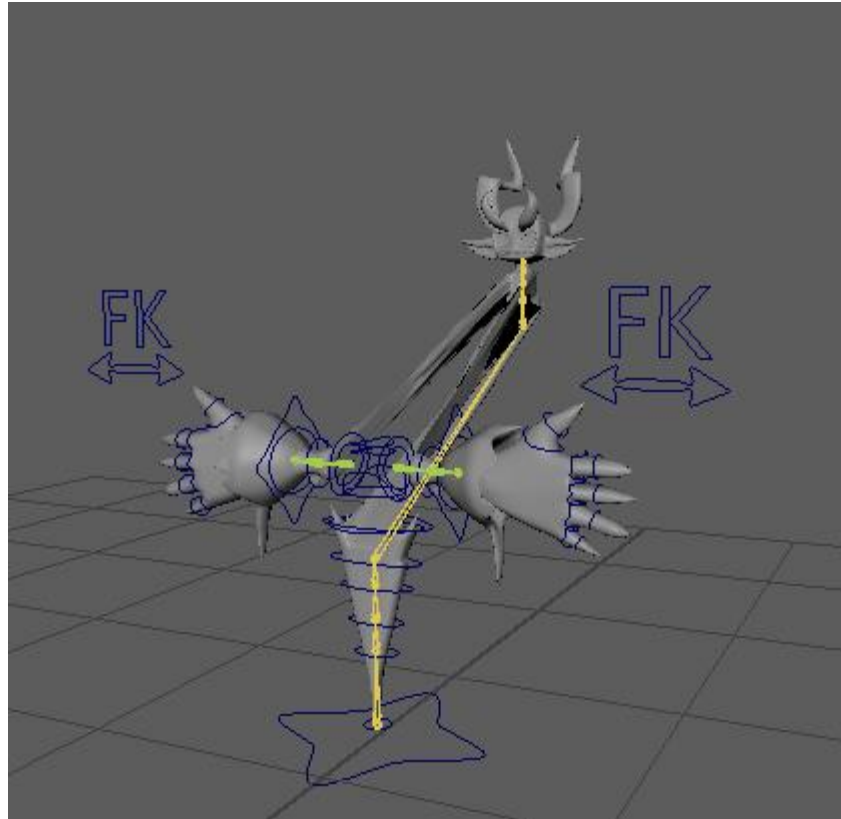
IKFK Nodes

This is one of the many nodes trees on how we swap our controls, this tells us what joints are in use so that we are not pulling both IK & FK and causing them to fight over what is driving the model since we need to make sure they can switch between the two.



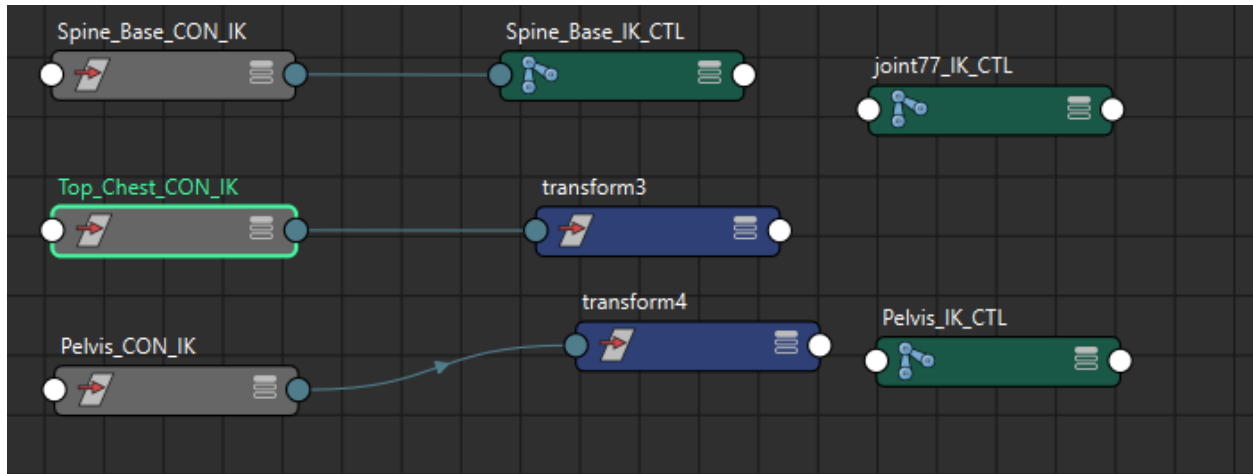
IK Spine Example

We can see now we have the spine working but with some problems, these are most likely due to offsets and parenting issues but since the IK spine works we will leave it be and work on other parts, but when we have time we can work on the spine IK again to fix any problems we have with it.



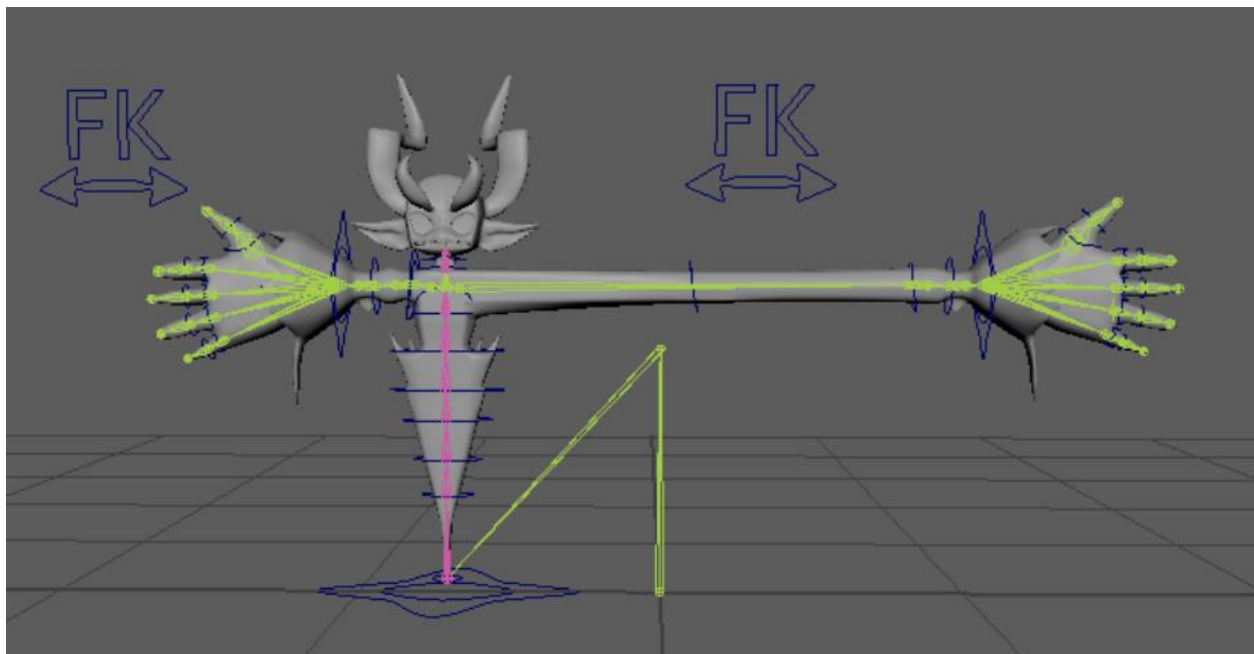
World matrix 0 problems

Some of the bones and controls that have been created do not have their origin set to the world 0 meaning when applying an offset using the world 0 we have slight to massive misalignment with the joints connected, this makes the offset unusable. To fix this we first need to clear all values including any offsets or zeroing we have done and holding X on the keyboard move the object to the world origin and when it is at the correct position, we can freeze all the transforms and place it back where it was before. With this many bones, joints, and controls already created along with the connections this is a time-consuming process depending on how many of them need correcting.



Node editor for IK spine

Through creating new bones for my IK spine there is a problem with maya creating new offset groups automatically for my controls, there is not a clear fix for this problem so we must take advantage of this by using these new offset groups as our connections to our controls via hooking them up to the world matrix 0 attribute.

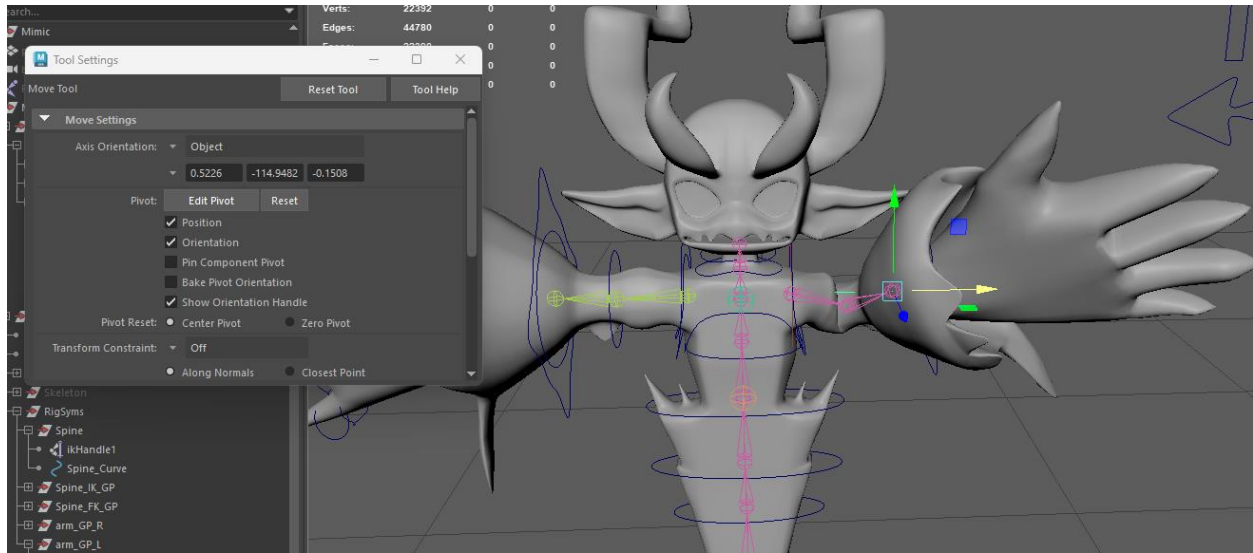


Connection problems

We can see very clearly that something isn't right, this is because we have yet to parent and place the arm controls back into the main rig group since we moved them out to zero some attributes, but there is still more problems found such as the cog and root joints not

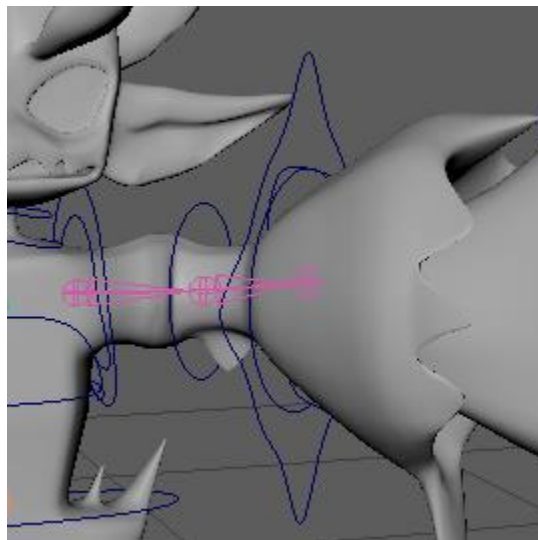
These nodes are what are connecting the left arm into the spine and world space allowing us to switch between both and follow them, we will do the same to the right so that when we move the root or spine joints we don't get double translates on the joints.

IK/FK



IK controls

We are working on IK and FK controls and here we can see the start of the IK controls; this allows us to move the whole arm using the wrist only since it was created using the IK handle which is using most of the same processes we used creating the IK spine.

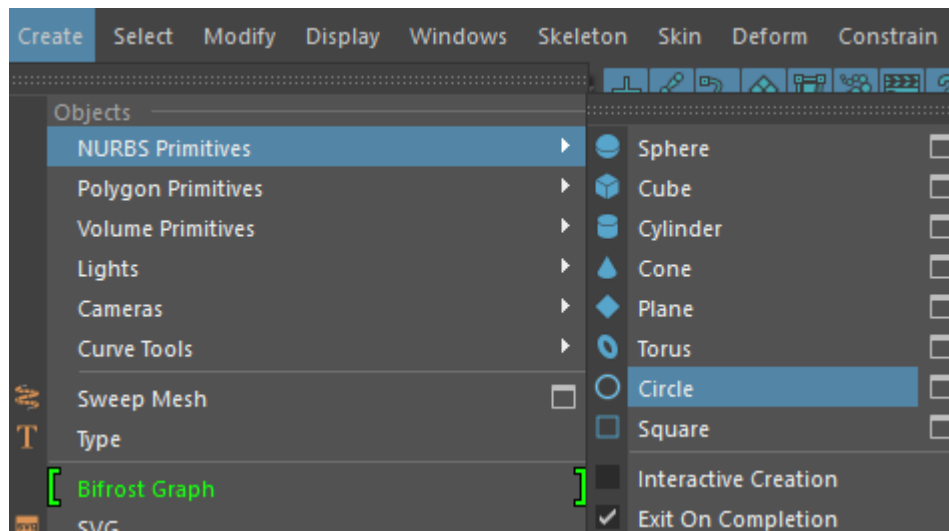


FK controls

The FK controls are more precise but take more time to move so we can switch between them while animating.

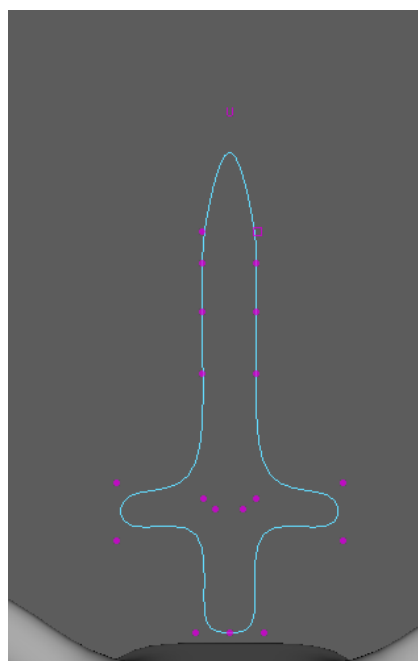
5: Controls

How we create controls



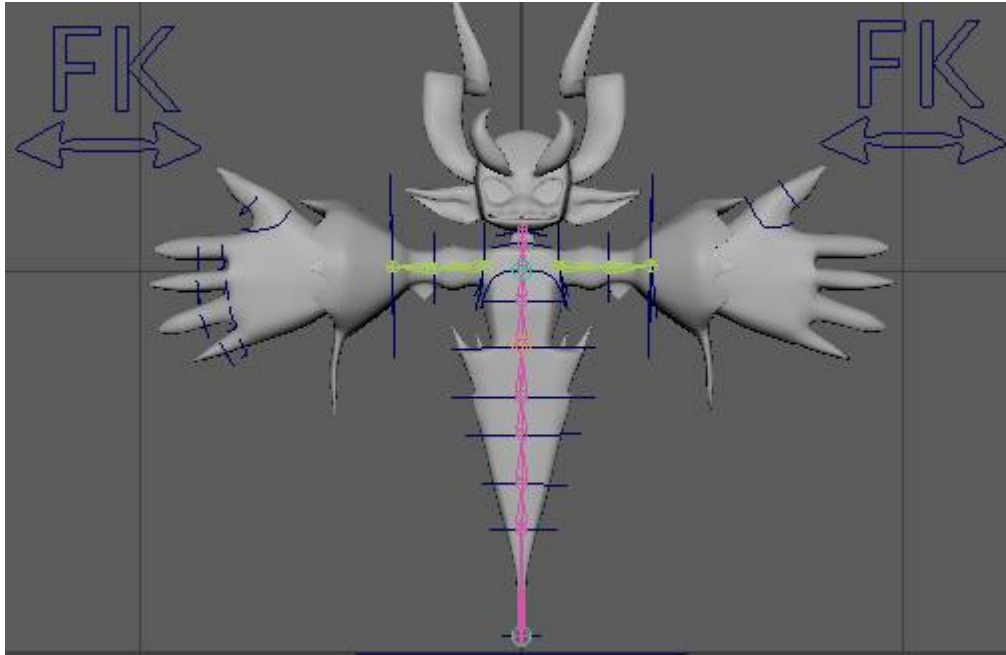
Create menu and NURBS Primitives menu

In the create window we can navigate to the NURBS Primitive menu to the circle or square sections since we want a flat control that does not take up too much space or get in the way of animating the model, this means when we set up a control we need to change the shape and scale to match the bone we want it to drive after we have matched it with the joints transforms.



Sword Shaped Control

Here we have the creation of a control joint by taking a simple circle curve and making the shape of a sword, this is more for style but this shows we can create a control in the same of whatever we want as long as we have enough verts added to the curve.

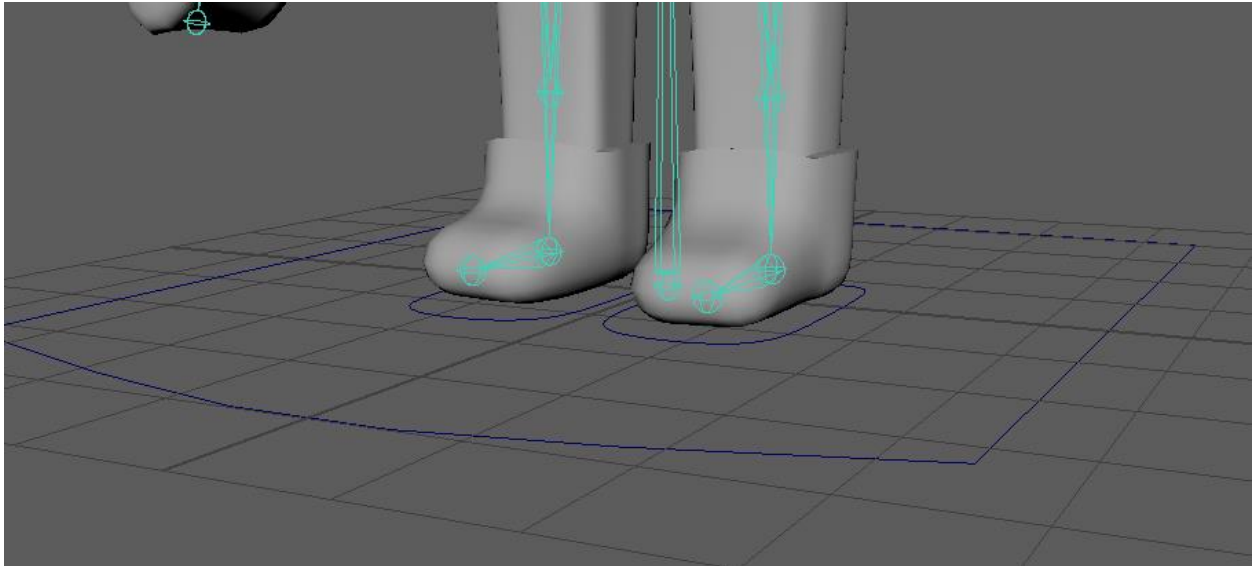


Mimic Controls

Here we have the final controls for the Mimic rig, this isn't too far off from the controls we need for any other model except the legs since in this rig we don't have legs.

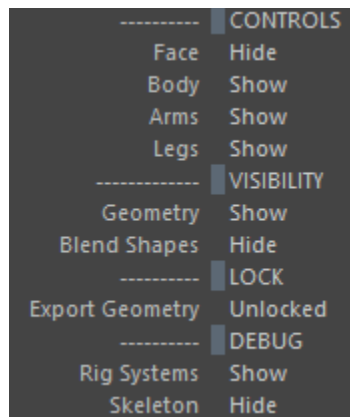
Adding attributes to controls

As we can see here, we can add attributes to our rig that let us control certain aspects of the rig using the node editor connect them to other parts of our rig such as the IK & FK joints visibility allowing us to drive these aspects of the rig with an easily accessible menu.



Root joint

Here we have the root control, this is the control that will drive the whole body, and we join a majority of the nodes to this joint for our rotation, world 0, and other aspects to tell Maya how our joints and controls interact with each other.



Rig Attributes

Here we can add onto the rig by adding options to hide certain aspects allowing us to and a user a cleaner and easier view of the rig or other controls since we can control which controls to hide along with locking the geometry of the model so a user cannot interact with the model itself and just use the controls, we don't want it locked all the time since we plan to add blend shapes and if we hand this off to someone who wants to change aspects we want it to be as easy to edit as possible.

6: Methodology

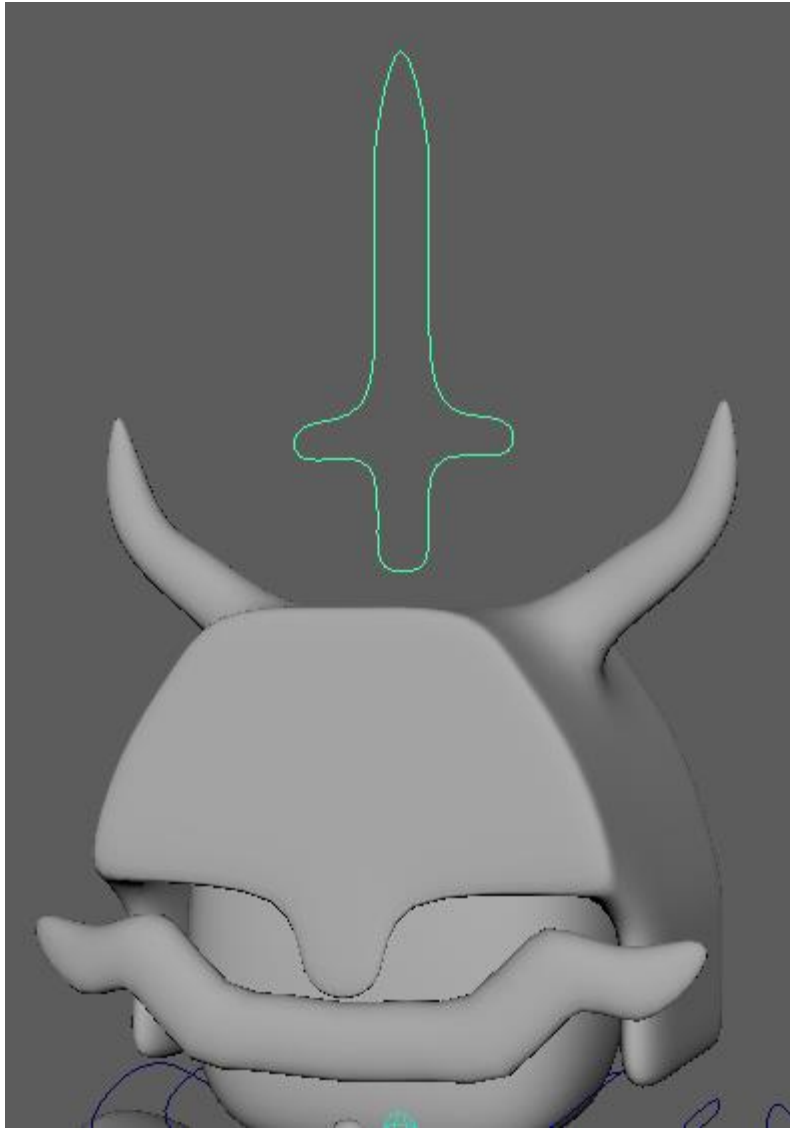
The methodology is to create to learn, rigging is a hand on and technical process so to create and learn what to and not to do.

Creating a model and rigging it all from scratch is how we start this process, after the model is created, we can start with the skeleton, continue through to weight painting, fixing rotations, creating controls, constraints, and attributes.

Going through each piece and seeing what went wrong for example helps us see since both rigs have the same basic principles and from what we have already gone through we can see that setting up the model incorrectly can have problems down the road such as freezing the transformations can drag it away from the world root meaning when we attach a world 0 attribute to an offset parent matrix we get a major off set that can result in wasted time fixing a problem that is very avoidable by only freezing certain attributes such as scale that won't change it's world root.

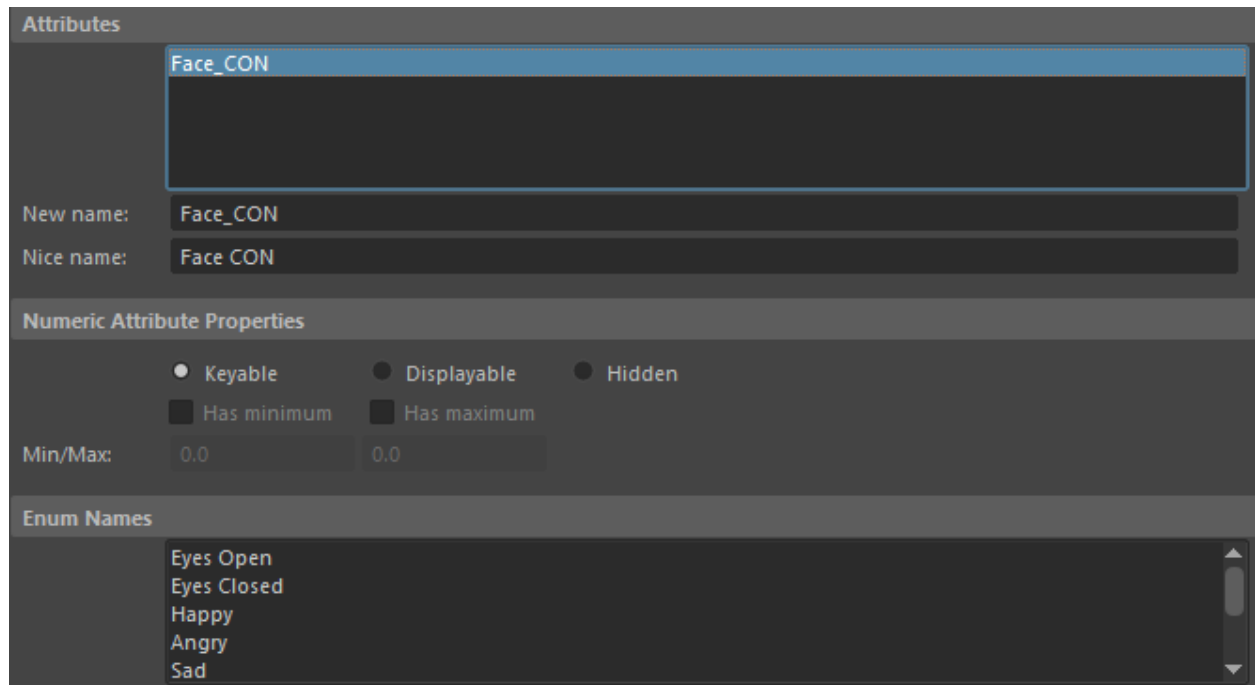
7: Set Driven keys

How to create it



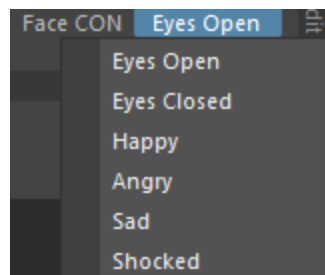
Control for set driven keys

First, we need to create a control and parent it to the head control, but we don't have to place this on the head, but it is just easier to have the controls in an easy to see and use place. Make sure to keep good housekeeping and zero out the control and keep it clear of all animations since we will be using animations to drive the UV changes and the control itself will not need to be animated outside the set driven keys.



Attribute control in edit view

We need to create an enum attribute attached to the control with names relating to what type of UV they will be linking to, this is how we access and change the UVs.



Attribute control

After we have created our face control, we get a drop-down attribute that allows us to easily click on our control and access it. This means it will be easier to use and animate since we or another user doesn't need to scour through our model to find these controls.

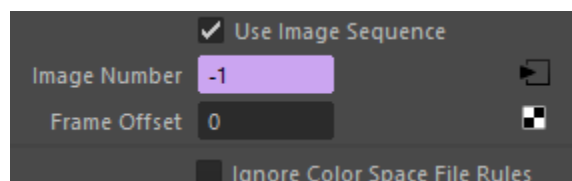
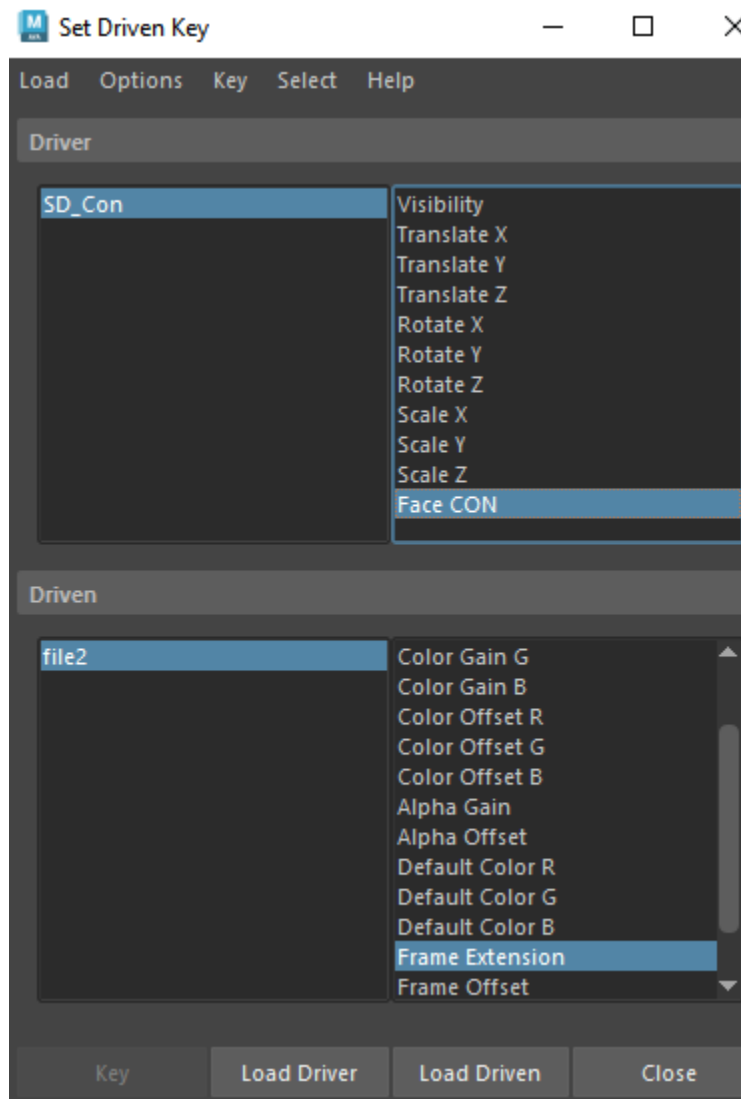


Image sequence

Now that we have all our controls set up ready, we can move onto importing our UV sets into the rig, we need to create a set of UV's that are numbered for example UV.01 and then keep a number to the name from 1 to whatever you need depending on the number of UV's you want to add, this lets Maya know where to place these on the timeline since we need to make our UV's an image sequence.

After we have imported our first texture and made it an image sequence in the materials tab we can move on to deleting the expressions on the image sequence otherwise Maya will play out all the images as an animation which we don't want.



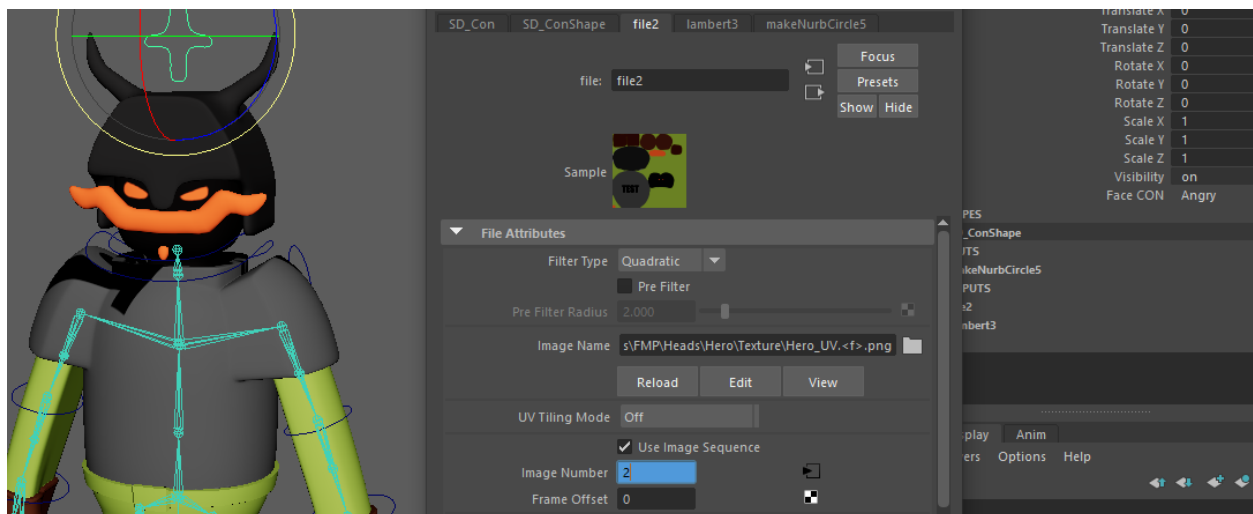
Set Driven Key Image Swapping Set Up

Here we have how we drive our image, we start on materials tab and click set driven keys on the image sequence which brings up this tab. In doing this we can then grab our control

and load it as the driver and making sure to select our Face CON or whatever you have named the attribute that holds the expression list and the texture should have frame extension selected.

After we have these set up, we need to stay at frame 0 for good housekeeping since we are not actually adding animation but if we mess anything up it will be easier to see by scrubbing through our timeline. Select the expression in our face control and a number you want to assign it to in our image sequence and press key in the set driven key tab which will now assign that UV to that number. We can repeat this but making sure that no numbers or names overlap so go through it with expression 1 to key 1 and expression 2 to key 2 and so on to avoid clashing.

With this done we now have completed everything and if we want to add extra expressions we can always go back into the set driven keys attribute tab to add more expressions.



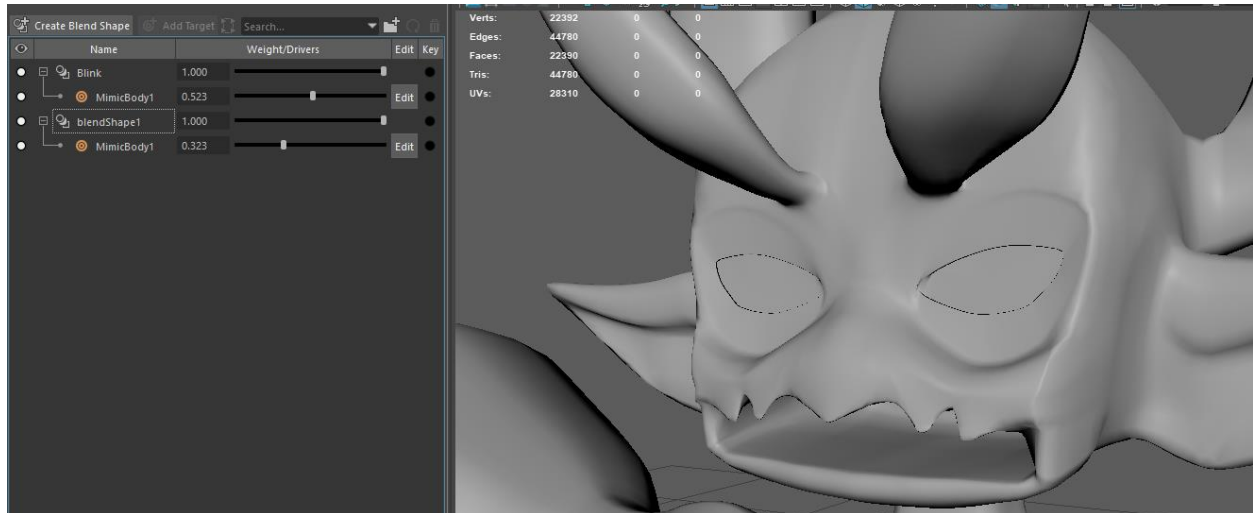
Angry test expression

Uses

Using set driven keys for changing the UV's allows us to animate the expressions and if anyone wants to add more expressions to the character, they can create a UV using the already created UV as a base and add it onto the model using the same way we added UV's into the face control. We can also do more with this then with blend shapes and standard face controls since we can change the entire or parts of the UV meaning if we wanted to, we could add damaged to the UV's or different looks for the armour, gloves, boots, and other parts meaning we could create an entire customised character UV but that would mean we would need to add more attributes to control that switch without over complicating our rig.

This can be used in games and animation for example since it is already applied in games due to it being low impact on the engine, it just changes the texture and doesn't involve movement and since it just uses UV's it can be used on low poly models saving on polygon count while adding expressions that doesn't require extra polygons.

8: Blend Shapes



Blend Shape example

Creating blend shapes by moving the model's geometry is a time-consuming process since it's almost if we are creating premade animations for a user to use but it's very different since we are not interacting with skin weights or bones but the geometry itself, this allows us to totally change the whole look of the model or just create small changes that wouldn't normally be possible with standered animation controls but it has its limits since we are stretching the geometry and deforming it.

We can also save all of these and add them into our controls for easier access for a user and these blend shapes can also carry over into game engines, so if the game engines animation controls are poor, we can skip over it with blend shapes.

We can see that some of the model is starting to look deformed as well and the geometry is sharp, that is because we have some issues with the topology of this model and some of the edges might be crossed inside the mesh when changing the blend shapes, this is an issue but we can go back into the blend shape editor to change and fix this. The main key point of this is that having good geometry and edge flow allows us to create better blend shapes, while our model is decent and high poly some of the topology is messy so when

creating these blend shapes we might have to work a little bit more to get the desired outcome.

9: Conclusion

With what we have gone through we should now have working understanding of the basic of how we can create the models and how we can fix or avoid problems found throughout this process, and as we can see the process of rigging is a very step by step process since we need to create it one joint, constraint, node, and control at a time before we can begin connecting them together.

The key points we can take away is that setup of a model comes before the rest of these steps since improper set up causes problems down the line such as double transforms and joints being moved double their values due to freezing joints or controls far from the world root, after we have done the proper set up we can slowly work with the other parts of our rig.

The models themselves at this point can be handed off to someone for animation or put into a game engine without problem and with this piece of work as a guide for bug fixes along the way we can be confident in saying it serves as a usable guide.

We have achieved our starting goal of creating models fit for use in animation or even in a portfolio.

10: Bibliography

[1]

Skitty Animates, "Animate Textures With Set Driven Keys - Maya Tutorial," Youtu.be, Mar. 11, 2024.https://youtu.be/e_ki4l9t9oU?si=mUF2ri6xe_AlnTjc (accessed Jan. 15, 2026).

[2]

A. Balodi, "Creating BlendShapes in Maya," [www.youtube.com](https://www.youtube.com/watch?v=8tbFH4D66Sc), Oct. 05, 2020.
<https://www.youtube.com/watch?v=8tbFH4D66Sc>

[3]

Interactive Media High Tech High School, "Creating 2D Animated Textures in Maya," Youtu.be, Feb. 02, 2021.<https://youtu.be/2QVI8HbWRA8?si=7T3iYQqEBWVJE8Sq> (accessed Jan. 15, 2026).

[4]

Amazon.co.uk, 2026. <https://www.amazon.co.uk/Pokemon-Center-Original-Plush-Smoliv/dp/B0BMK9WLY9> (accessed Jan. 15, 2026).

[5]

ONE PIECE Official YouTube Channel, "CHOPPER's | Official Music Video | Tony Tony Tony Chopper | momosumomosu," Youtu.be, Dec.23, 2025.
<https://youtu.be/dMt5f8VWxaU?si=rz1HTAlGVbshy8-q> (accessed Jan. 15, 2026).

[6]

Maya Learning Channel, "Facial rigging with Multi-Skin Cluster (Maya 2024 New Feature!)," Youtu.be, Apr. 19, 2023.<https://youtu.be/yR81lKEbmDg?si=sTSAact3n23T3RaV> (accessed Jan. 15, 2026).

[7]

The Gnomon Workshop, "Creating Stylized Facial Rigs in Maya With Hector Abraham Torres," Youtu.be, May 11, 2021.https://youtu.be/MAjQ_9V_VkU?si=fMCajGrLWNt9zLFe (accessed Jan. 15, 2026).

[8] Ness, "[Reference Art] Mimighoul Archfiend," *YGOrganization*, Aug. 10, 2024.
<https://ygorganization.com/reference-art-mimighoul-archfiend/> (accessed May 01, 2026).

[9] "3D Modeling for Games: Complete Guide to Mastering the Art and Workflow," *Brave Zebra*, Dec. 13, 2024. <https://www.bravezebra.com/blog/3d-modeling-for-games/>