A3 Documentation: Character Rigging & Animation

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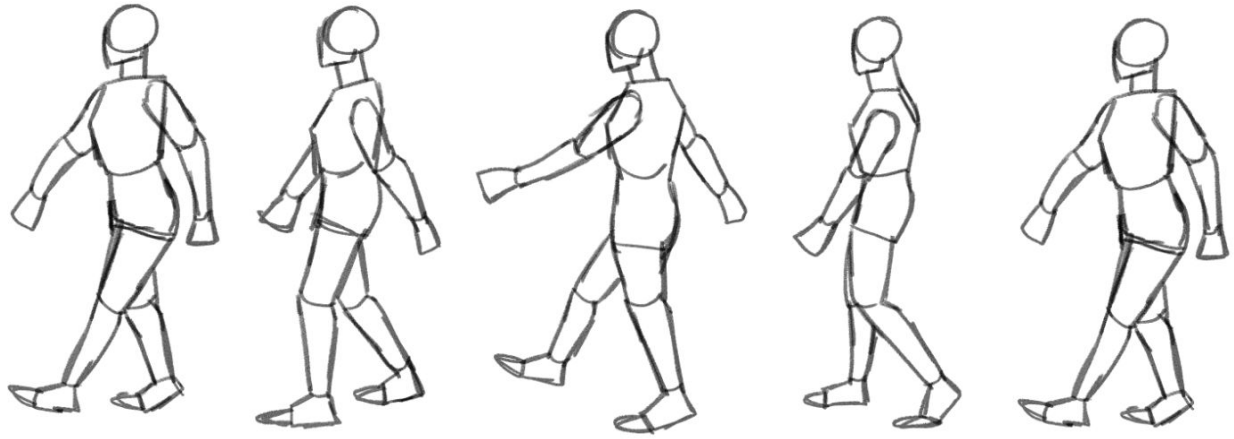
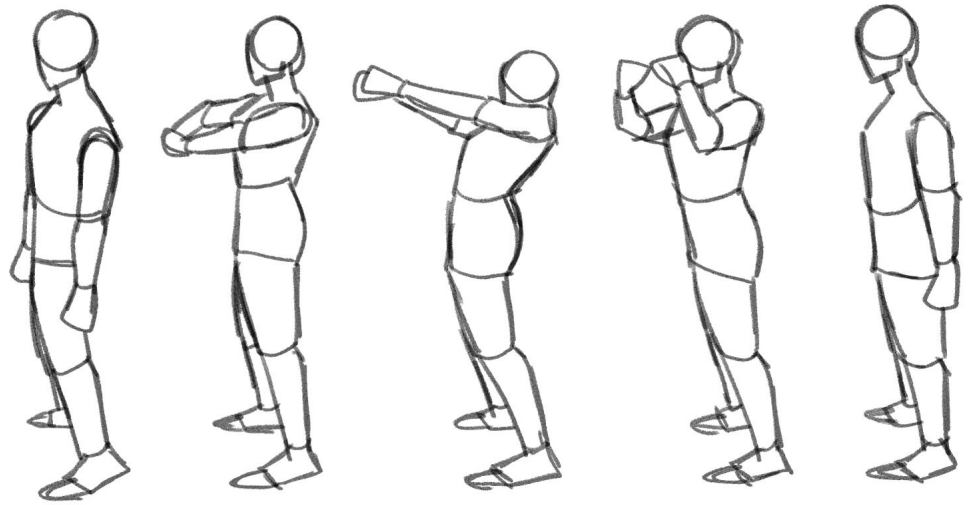
Concept Development

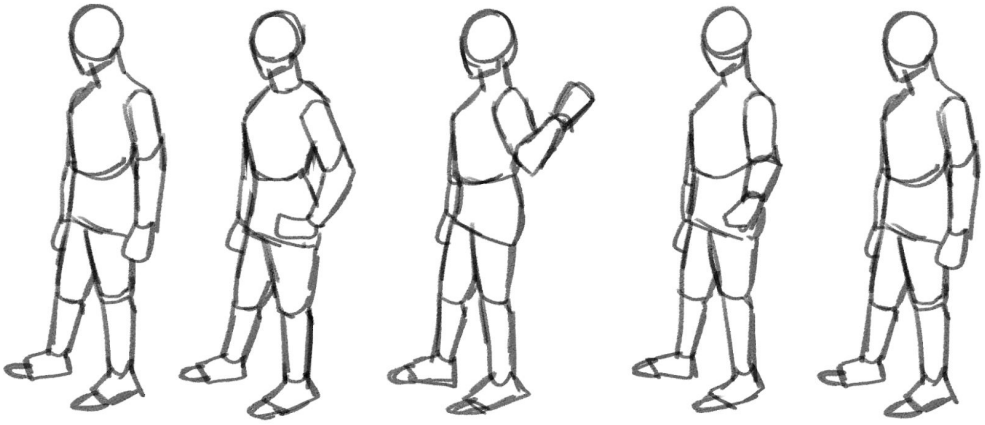
Based on the personality of my character, I thought he'd suit more 'snappy' and sudden movements compared to more sluggish ones.
I recorded a few reference videos, which I've divided into key poses below.



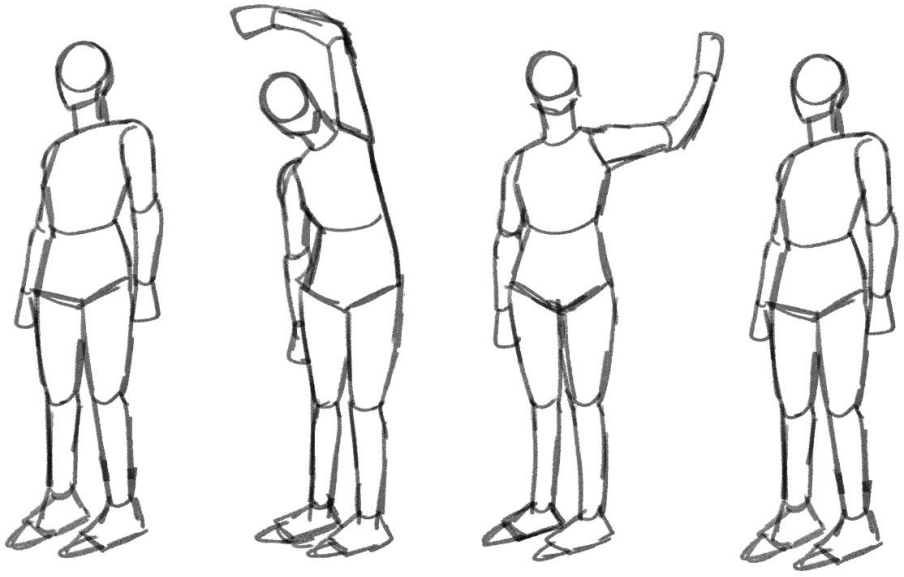
The key poses of my walk cycle. Though I recorded 5 walk cycle variations, I found that this one was the most fitting. The others I filmed felt too 'silly' or looked too structured for Feyn. (For example, one brought up my knees super high, and this felt too much like a march, compared to a strut).



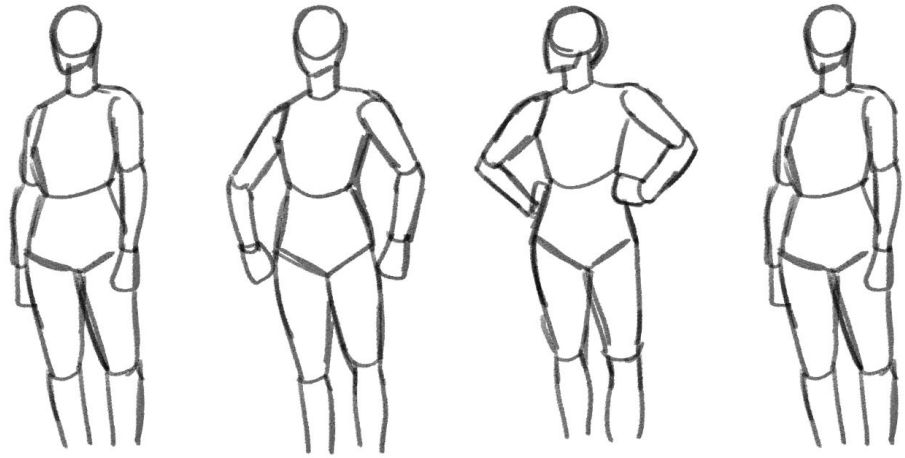
Stretching arms - Where the hands interlock, and are pushed forward into a stretch while the back arches forward.



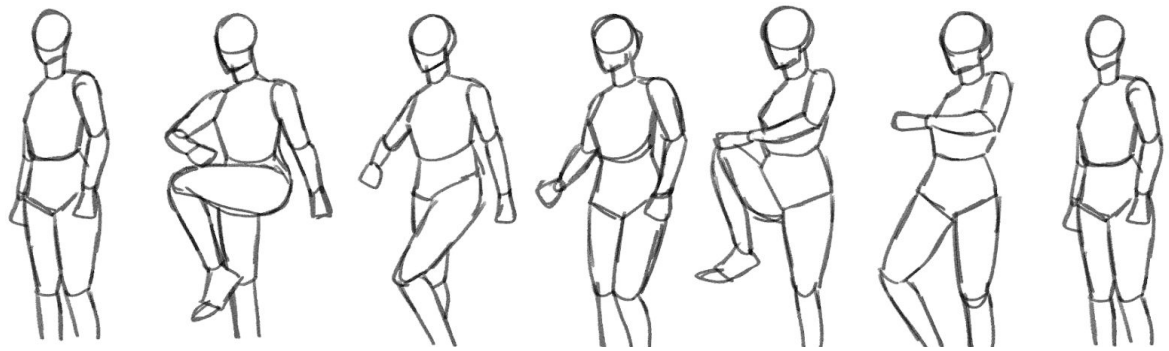
Hand flick - Originally meant to be Feyn flicking his scarf, but I decided I wanted his scarf to stay flowing behind him instead. I changed into more of a confident gesture instead.



Lean and stretch - Where Feyn raises his left arm to bring it bent above his head, while the body weight shifts onto the right side of the body.



Hands on hips - Feyn raises both his arms, for his hands to rest at his waist. This may be a bit harder to do without proper finger controllers.



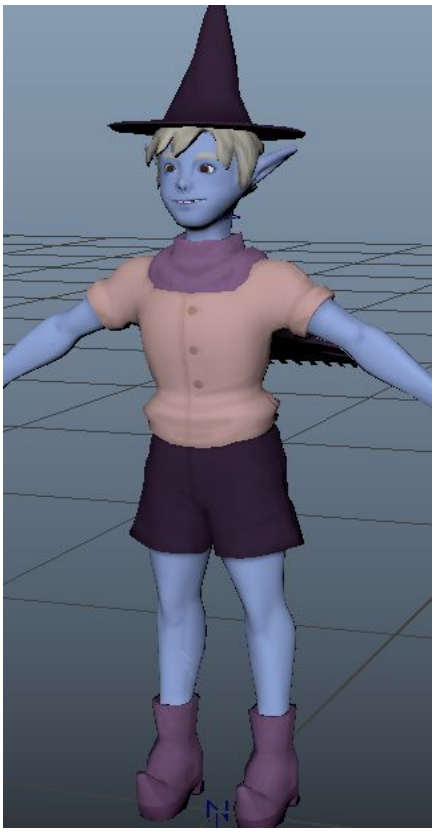
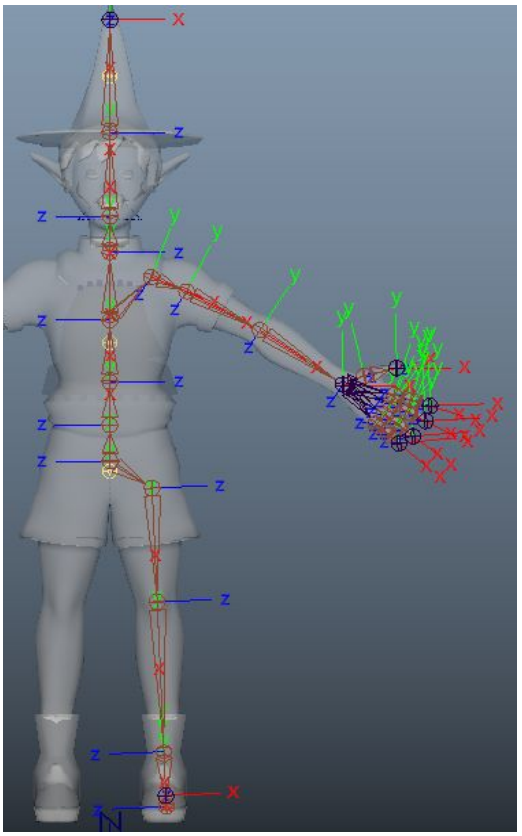
Touching knees - Similar to jogging on the spot, where Feyn raises a knee, and touches the opposite hand to his leg. Repeat for the opposite side.

I had a few more poses, but realised that they were very focused on hand/finger movement, and facial animation. For example, Feyn finger-gunning and grinning, or him winking at the viewer. I didn't draw up key poses for these as I thought these would be too hard to do.

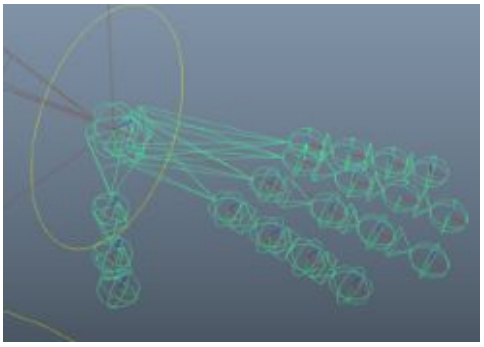
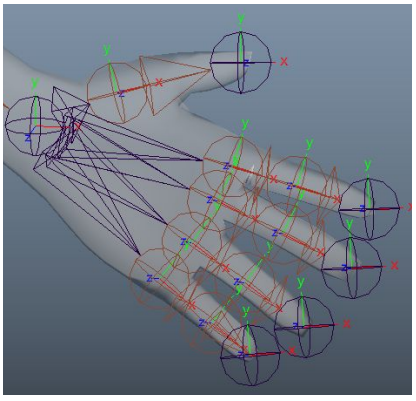
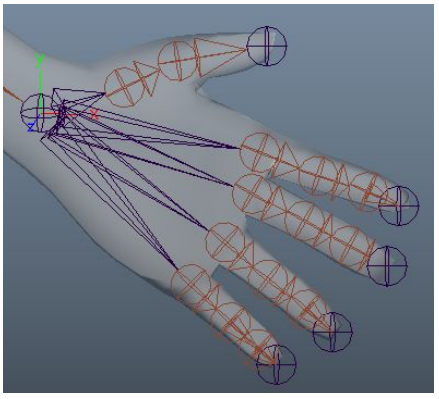
Out of these, I decided to choose:

- **First gesture**
    - Hand flick. I knew at this point that I wanted to use the "lean and stretch" motion for my second gesture, and a lot of my other gestures were kinda sporty. I wanted to avoid choosing two 'exercise' related poses (as it's not really related to Feyn), so I chose the hand flick pose as it feels more sassy.
- **Second gesture**
    - Lean and stretch. I thought this would be nice to do as I could exaggerate the leaning pose, and focus on hand rotation as he bends.
- **Idle animation**
    - For the idle animation I actually just decided to make up a pose, I wanted to animate the finger gun pose that previously thought would be too hard. I wanted him to bob at a slow pace, then lean onto one leg and raise an arm, to flick a finger gun with his left hand.

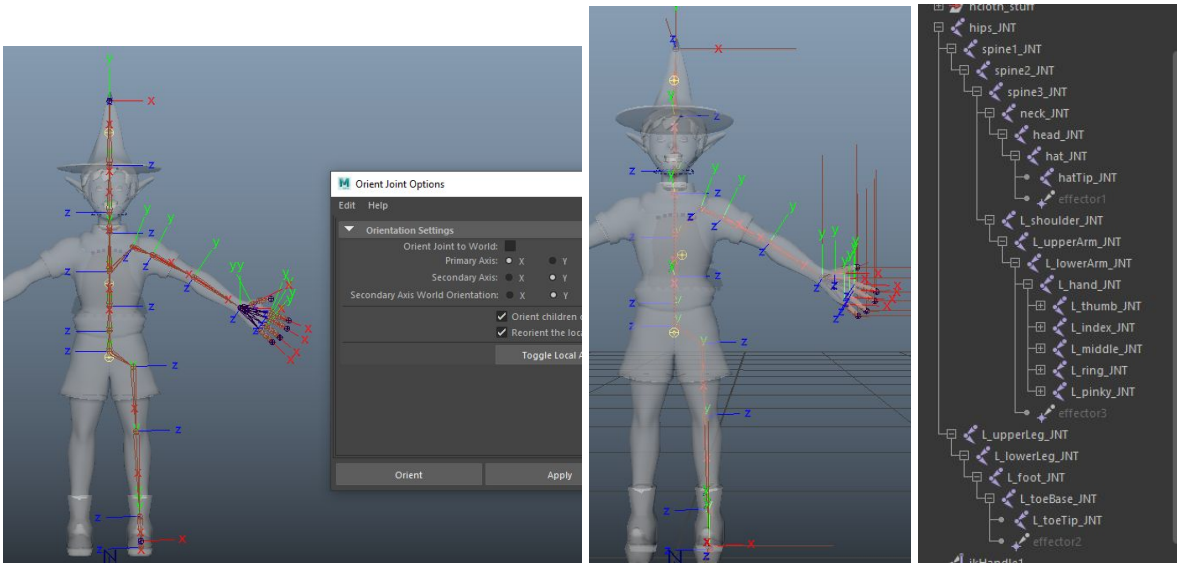
Rigging & Skinning

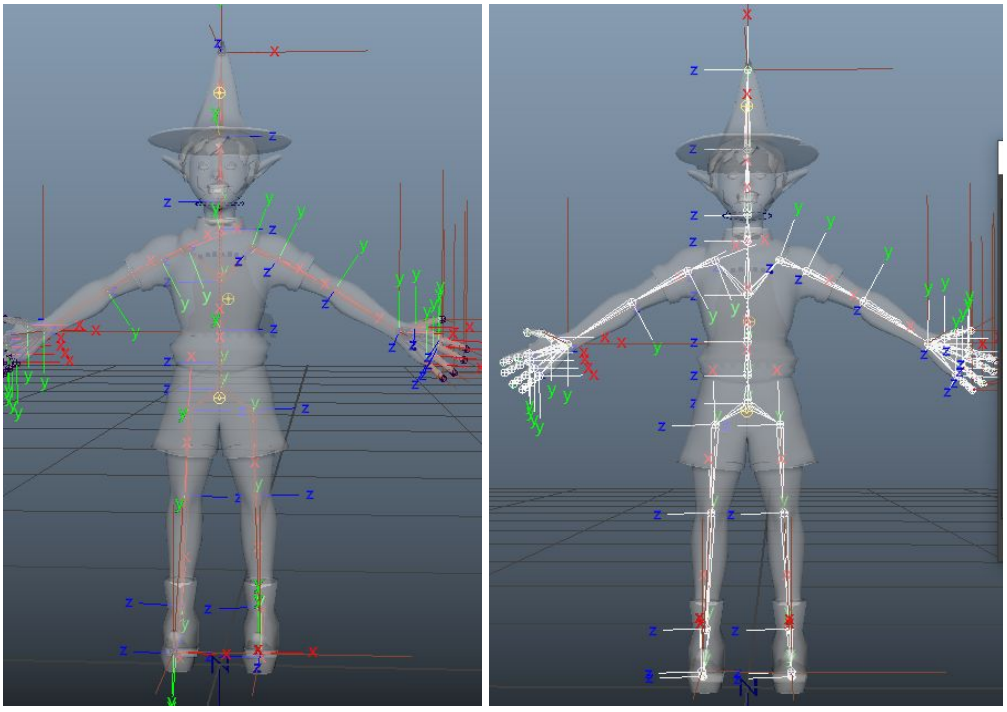
I started with the file of my character before any big posing choices were made. I deleted the HumanIK rig that was inside, which restored the A-pose of my character. I followed the week 10 tutorial notes, starting with the spine joints to the head, then creating the arm and the leg.

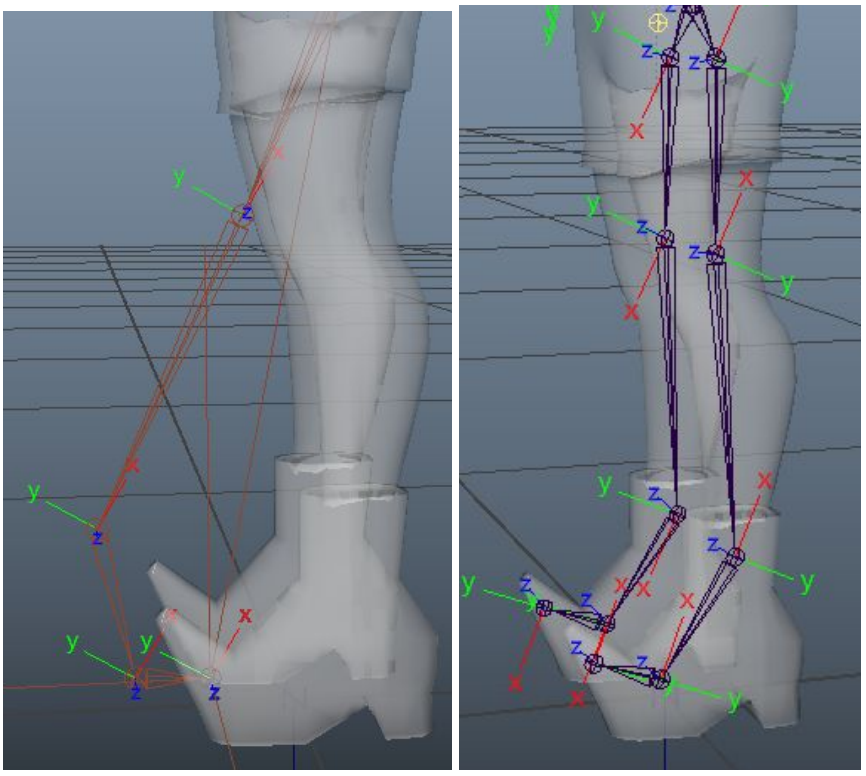
I used the first image above from the Week 11 tutorial as a reference to create the fingers, but it was at this point that I realised I had created one less joint than required, so I deleted the hand joints, and when fixed parented it on to the hand joint once again.



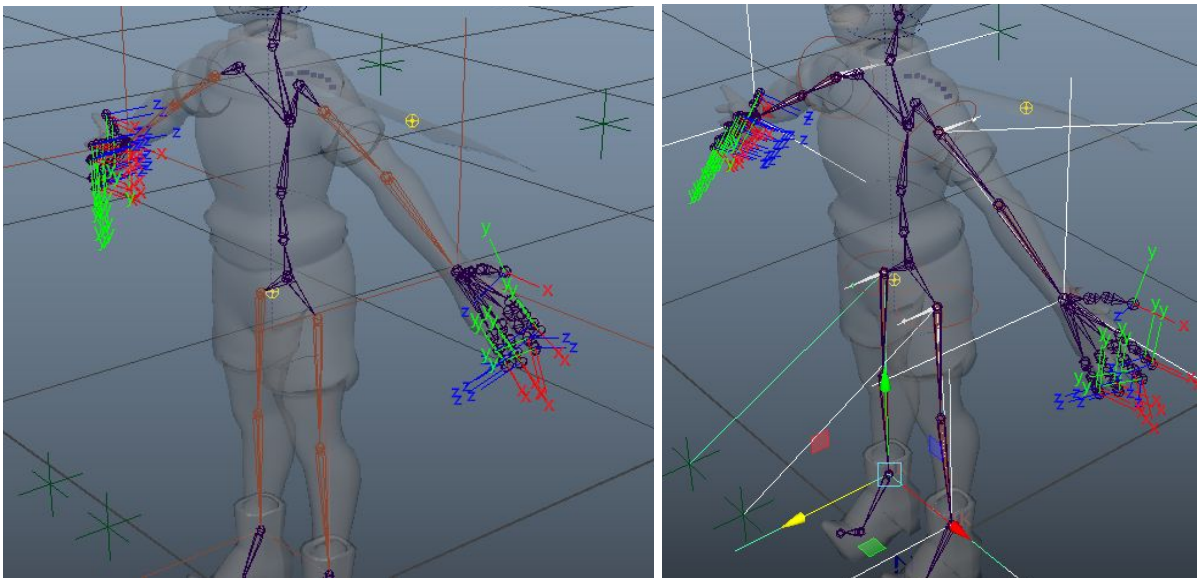
Once I fixed the hand joints I oriented the joints based on the tutorial notes. First it was oriented to the primary axis X, and then oriented to the world. I also renamed all the joints to make them easier to identify.



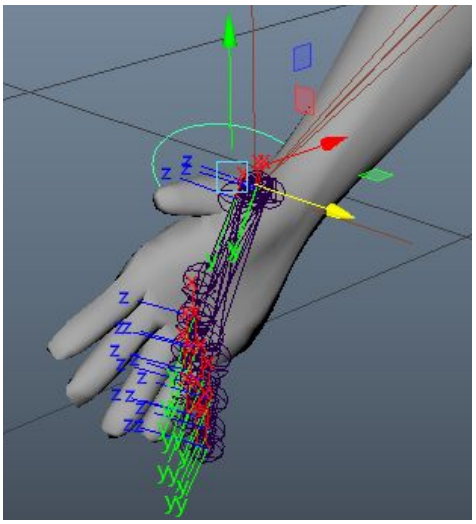
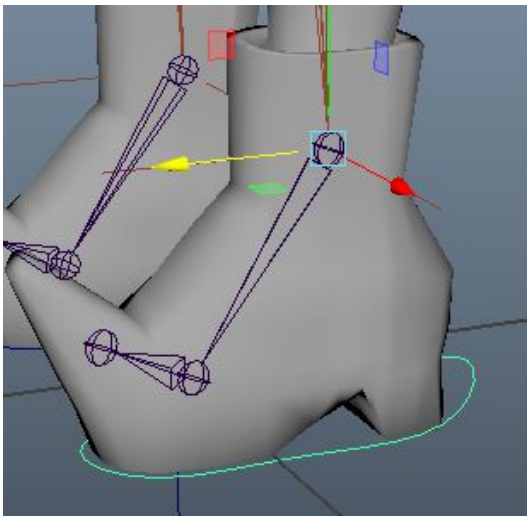
I then used the Skeleton > Mirror Joints option to mirror the arm and the leg. However when I mirrored the skeleton I felt that the joints didn't look correct, so I oriented the joints to the world again, which looks a lot more uniform.



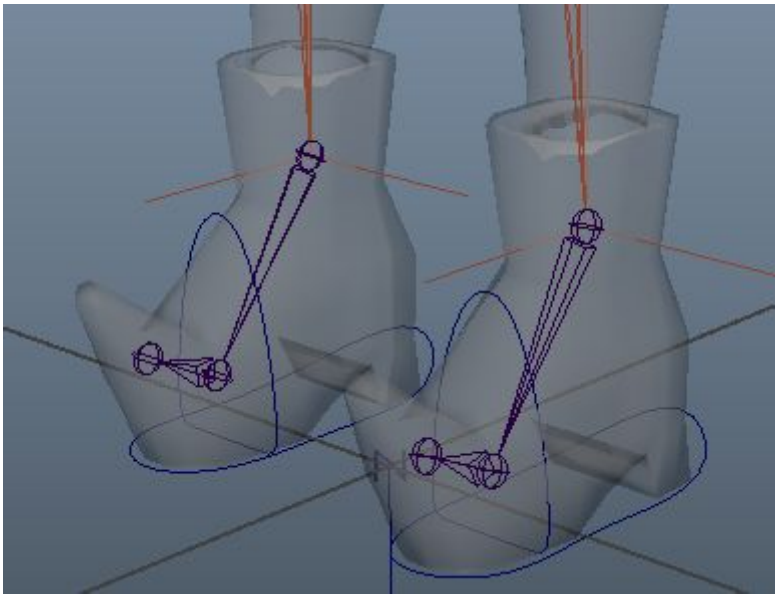
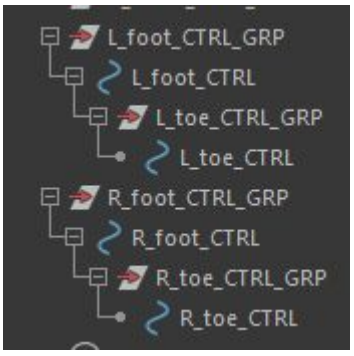
I realised at this point that my leg rigs were completely messed up, and I had many IK handles that were automatically created. Everytime I used the IK handle to try and fix the leg, it bent more, so I deleted all of the IK handles, fixed one leg, and deleted and mirrored the other. Once again I oriented the joints to the world again.



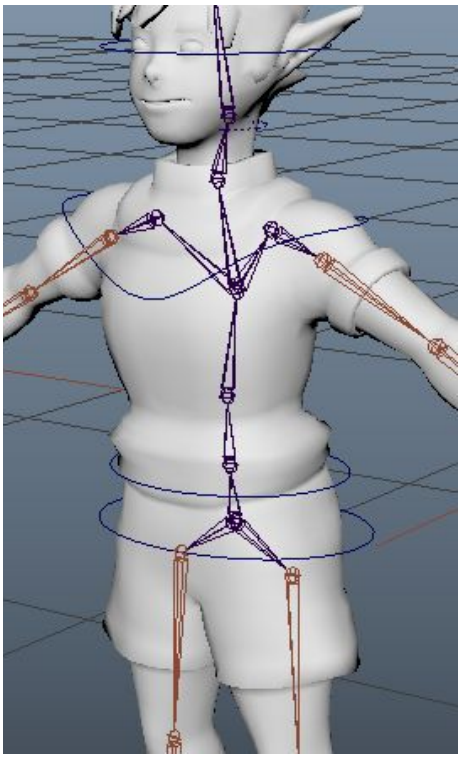
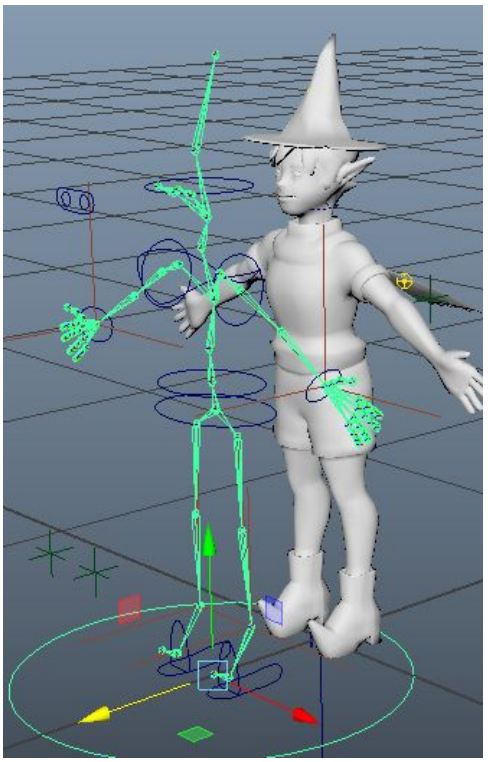
I created locators, 2 aligned with the elbow joint of the arm, and the other 2 aligned with the knee joints. These locators were connected to the IK handle, and made into a Pole Vector

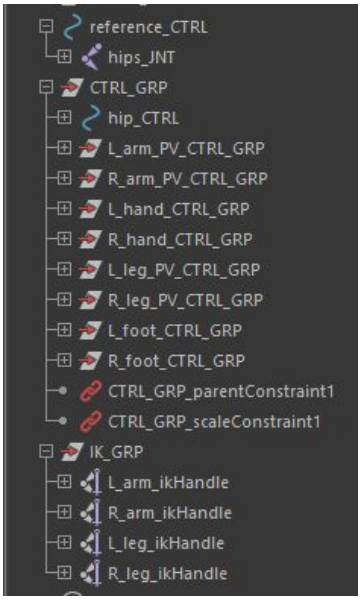
I followed the tutorial notes and created a NURBS Circle, and adjusted it around the wrist. I realised at this point that my hand rig had messed up, somewhere along me following the tutorial the finger rigs were no longer sitting on the fingers. If I readjusted them, as soon as I clicked the controller around the wrists, they would break again. I initially tried to freeze transformations after adjusting the hands, but after this didn't work I deleted the Orient Constraint and redid it, which worked. I did this on both sides as the left hand's controller didn't move the arm when dragged.

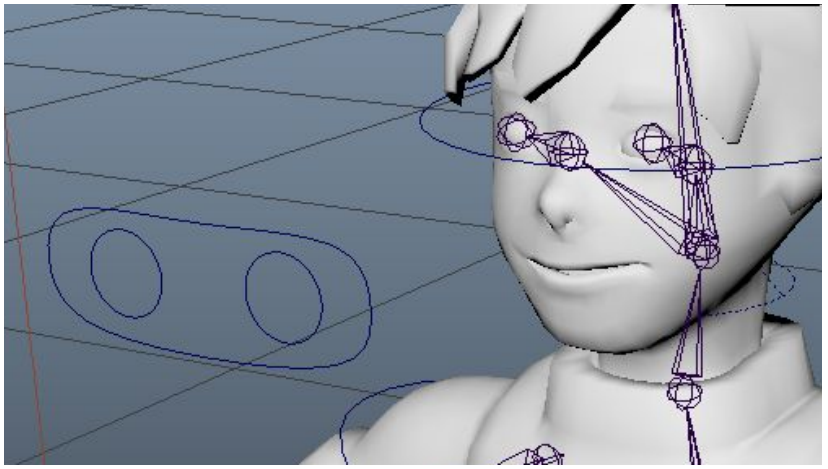



I used a NURBS circle to create tall semi circles for the toe controllers. I parented it to the foot controller, and parent constrained the leg PV group to the foot controller.

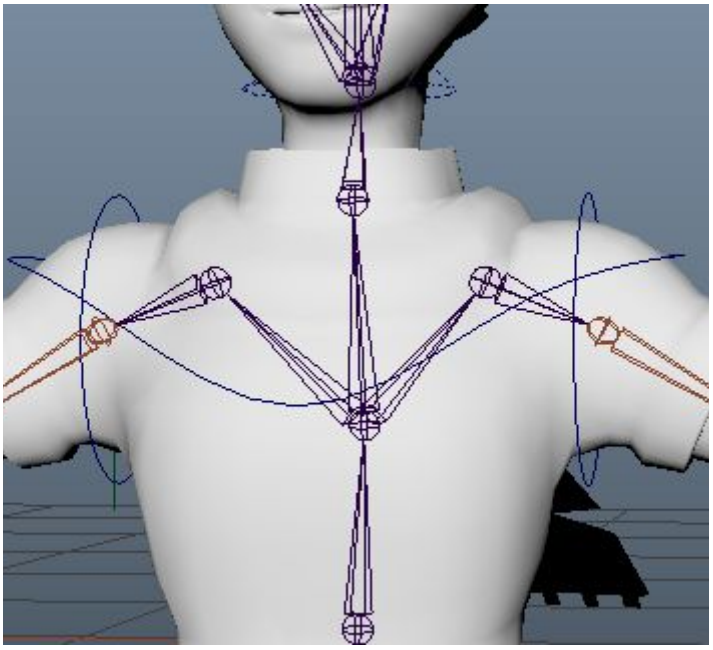



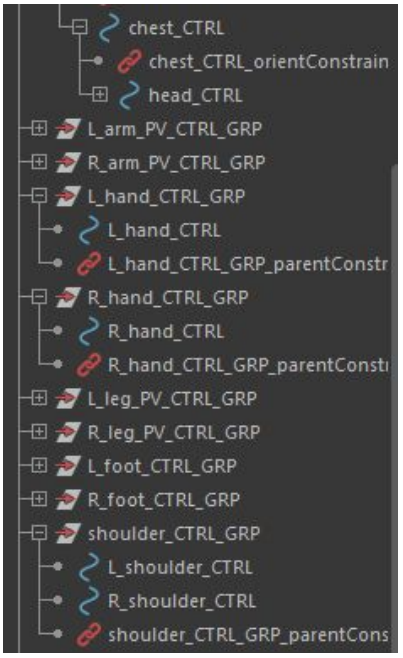
I created 4 more controllers, one around the hip, the waist, the shoulders, and the head.I followed the tutorial notes to add parent and orient constraints, and parented the head controllers > shoulders, shoulders > waist, and waist > hip. Lastly I created a reference controller by grouping all the controllers together, parenting the hips to the reference controller, then applying parent and scale constraints to the reference controller.





Then I grouped all the IK handles together, and organised them by hierarchy. Next I made the eye controllers by lining up two NURBS circles with the eyes, and parenting them within a larger shape. I used two joints to create the eye joints, and parented these to the joint of the head. I then selected the very outer joint of each eye, the corresponding eye control, and added an aim constraint.

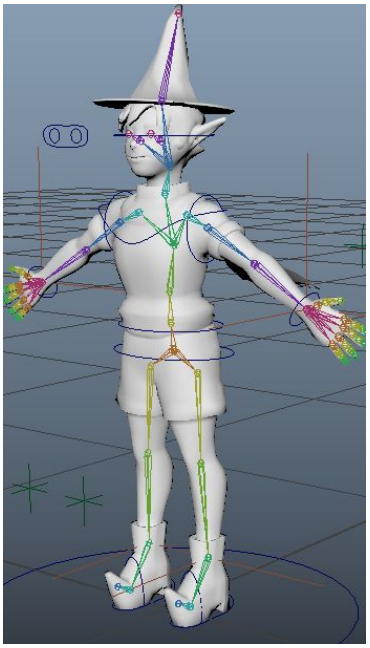


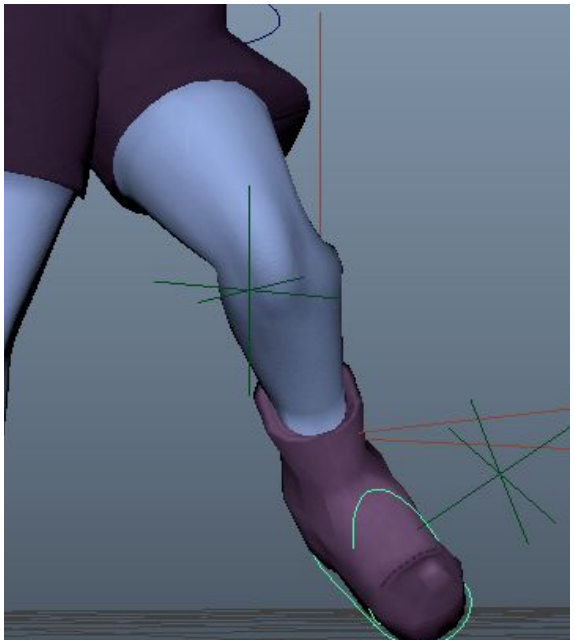


I started by using a NURBS circle, and aligning the pivot to the shoulder joint. Following the week 11 tutorial notes I first renamed the shoulders_CTRL > chest_CTRL, then:

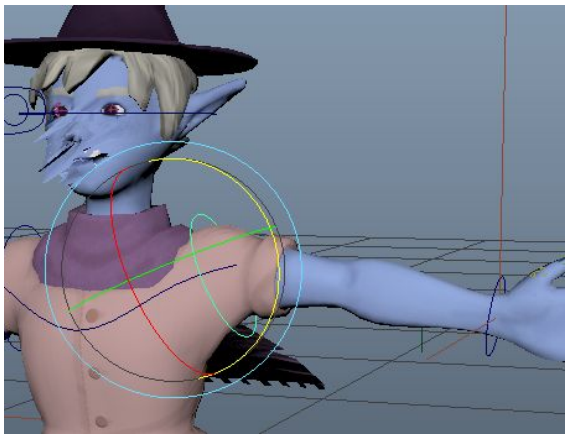
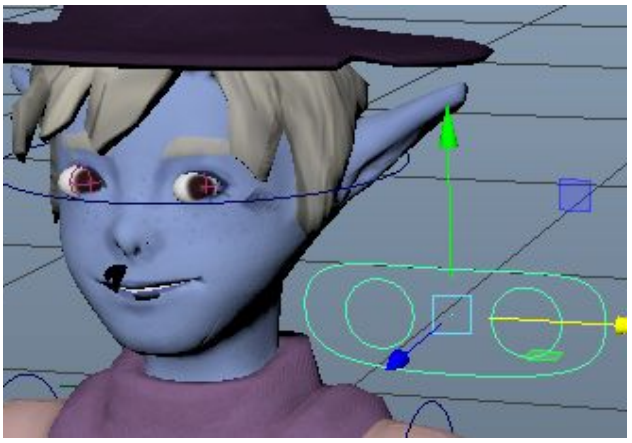
- Parent constrained the chest CTRL > shoulder CTRL GRP
- Parent constrained the shoulder CTRL > shoulder JNT
- Parent constrained shoulder CTRL > hand CTRL GRP

Lastly I repeated this process on the other arm.

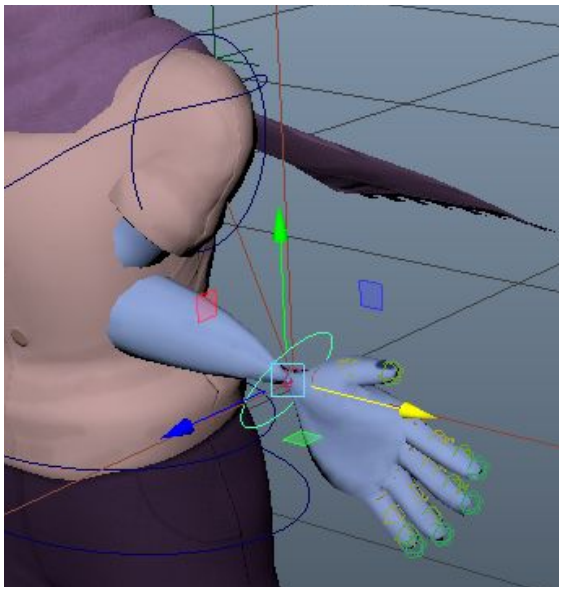
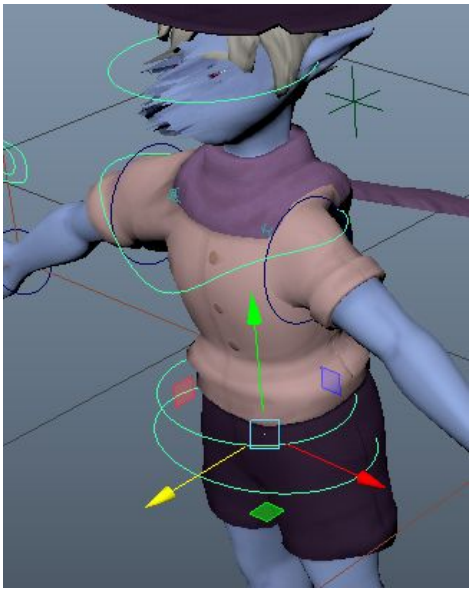




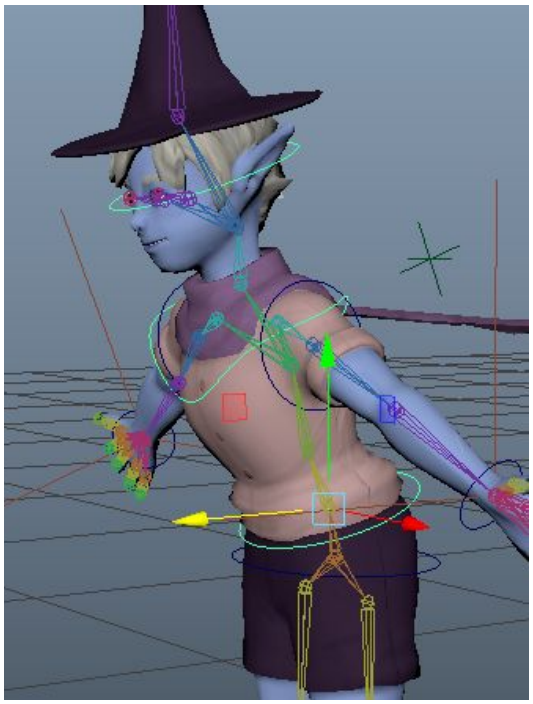
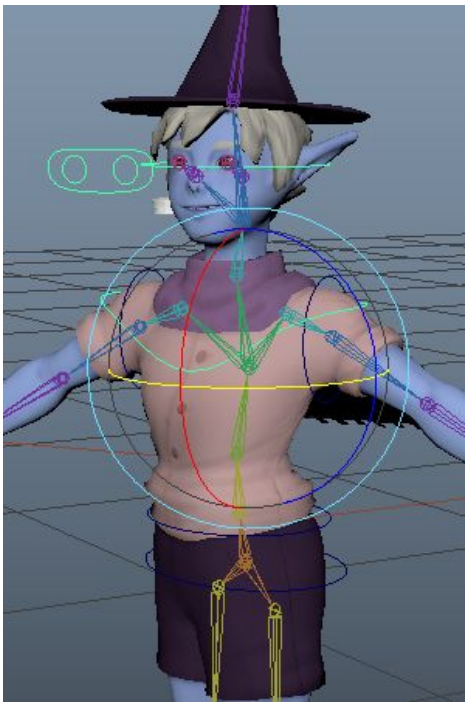
I binded my skeleton to the body, and began testing all my controllers. The foot controller was completely fine, but I wasn't satisfied with the shoulder controller so I began using the paint skin weights tool, going through each joint.

However when I changed the weighing of the shoulders, face, and neck, a lot of problems began to pop up. The shoulder controller (thus by extension the hand controller too) had a weird influence on parts of the face, as did the eye controller.

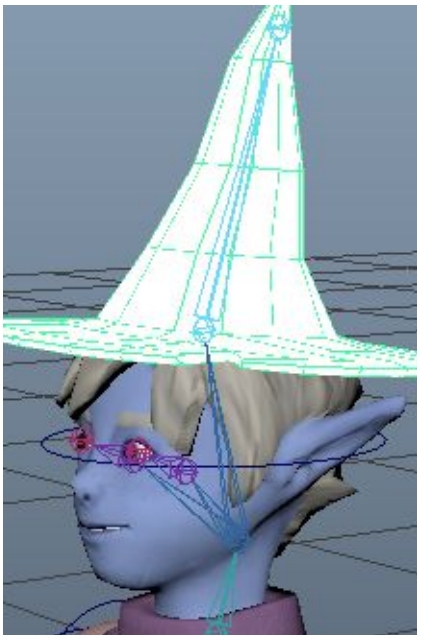
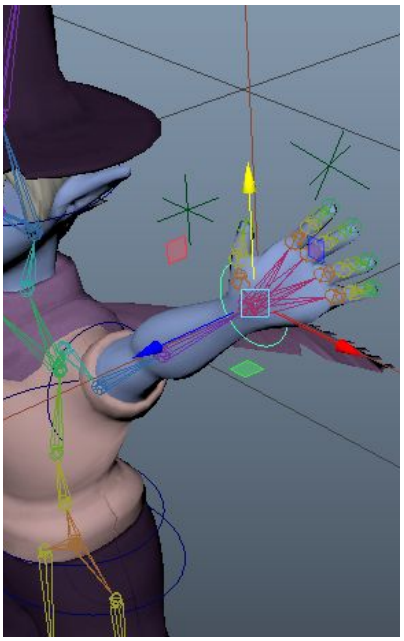
The hand controller, when brought in towards the body, snapped forward through the body, and the wrist became weirdly small. The hip controller (thus the waist, chest, and face controller), all had an influence on the face, and dragged the entire arms.

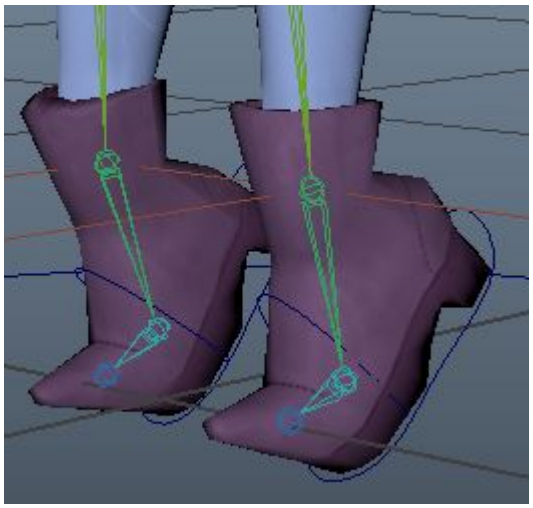
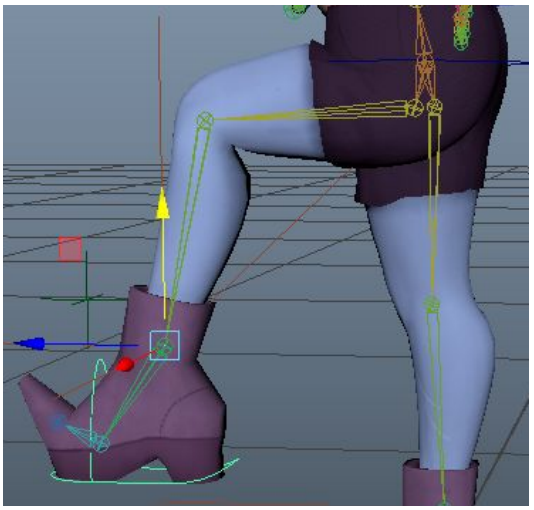
Thus I received some help from my tutor, who noticed that:

- The R hand CTRL wasn't properly constrained to its IK handle.
- The chest CTRL only rotated the head CTRL because of its orient constraint
- The hip and waist CTRL weren't set correctly to their bones.

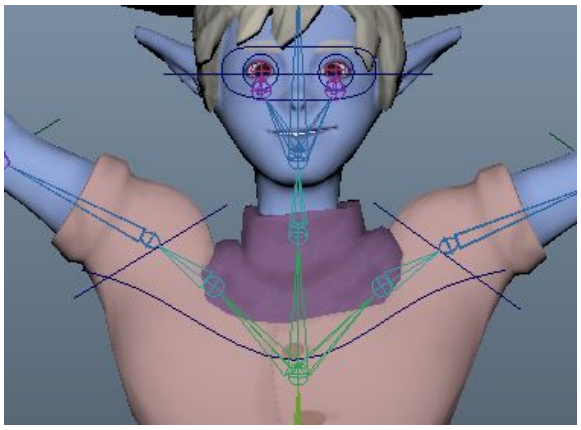
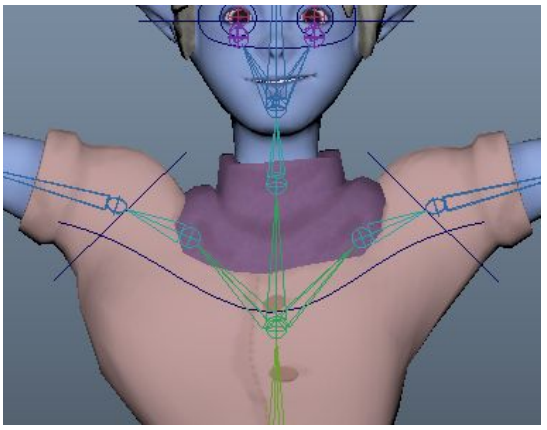
He helped me immensely to fix these issues, by properly constraining the R hand CTRL, using a parent constraint on the chest CTRL to properly rotate the head/neck, and by setting the hip and waist CTRL correctly to their bones.

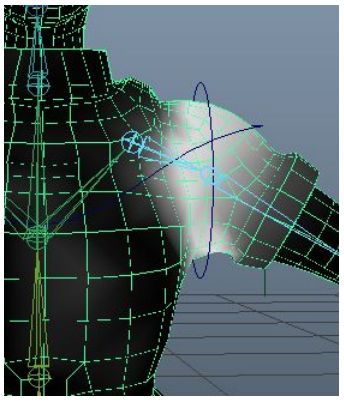
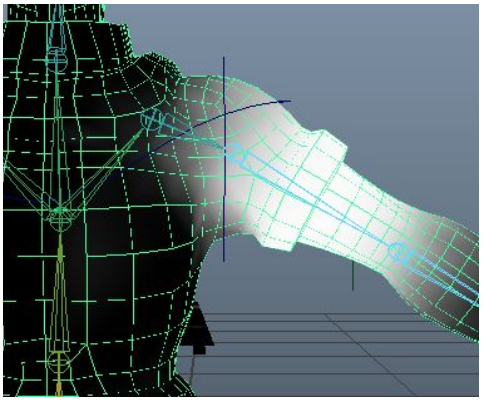
He helped me understand how to use flooding properly, and removed the influence of the hat from the body mesh of the character, instead putting all its weight on the hat JNT.
Lastly to help with the snapping of the elbow, he suggested I parent constrained the wrist CTRL to the elbow PV, so now the PV follows the movement of the wrist.

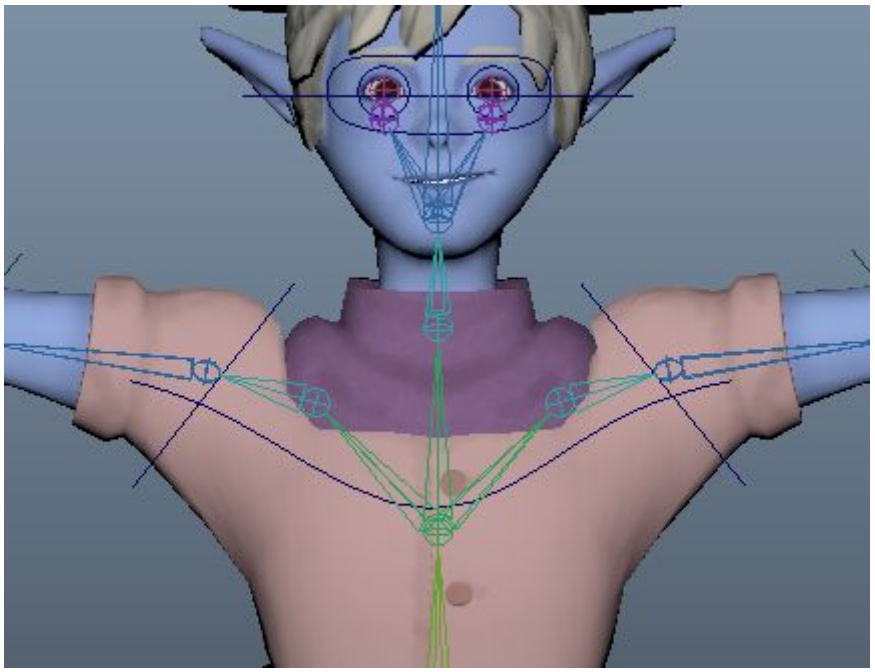
With the fixed rig I started by fixing the ankles, as when the foot CTRL was moved it would bend and deform the boot with the foot. The first image has a fixed L foot and the unfixed R foot, where you can see the top of the boot deforming to the bend of the foot.
I tried to use Skin > Mirror Skin Weights, but this didn't work so I manually weighted the right foot to match the left.
Next I reduced the weight of the upper leg, so his pelvis/hip area wouldn't move so much when the upper leg was bent.

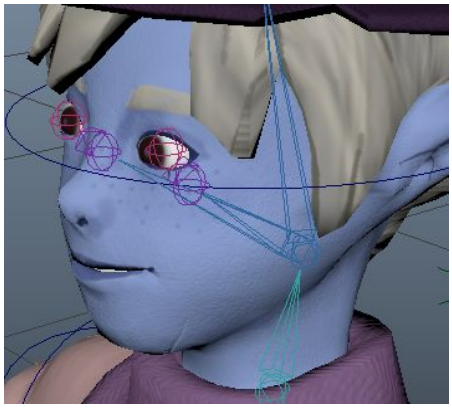
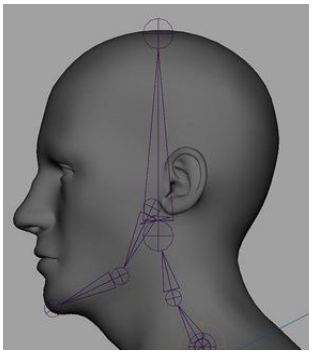
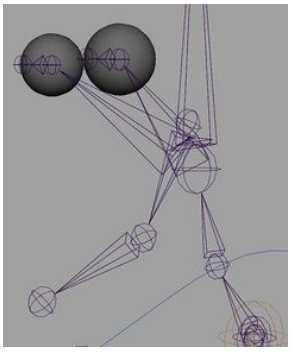
Another big issue was the stretching of the torso under the armpits when the arms were raised. The left is before I fixed the weighting, and the right image is after I fixed the left shoulder and upper arm weighting.

The skin weighting of the shoulders and upper arm are much more condensed, and have much less influence on the torso.



The shoulders no longer expand the torso when rotated!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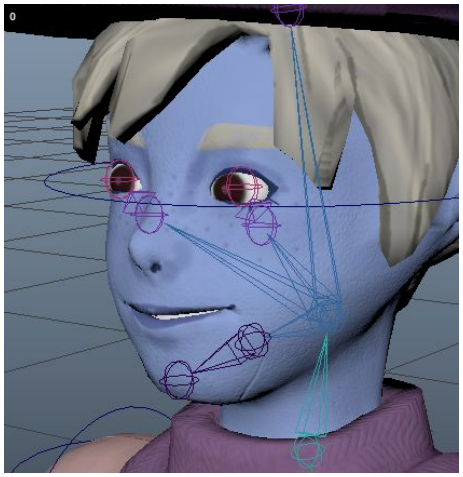
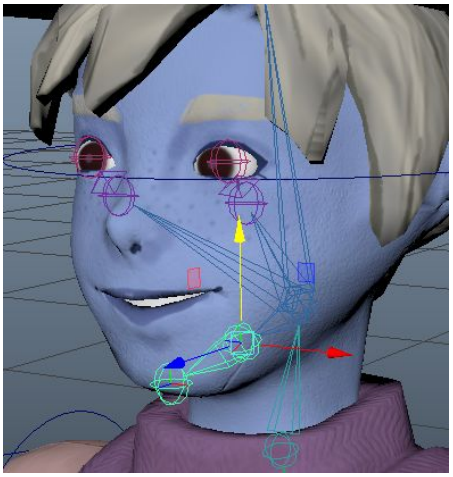
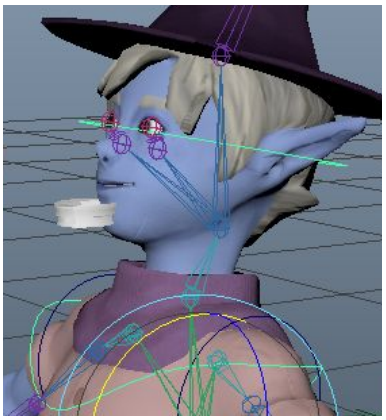
Next I brought the eye joints closer together, to try and reduce the rotation of the eyeballs. I used the above images as a reference to make the jaw joint, and check the placement of my eye joints.

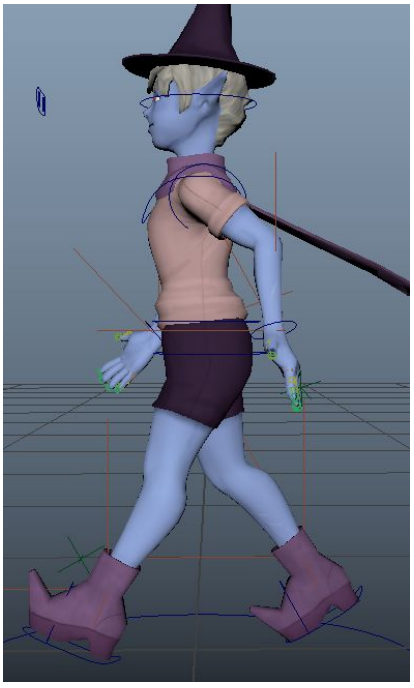
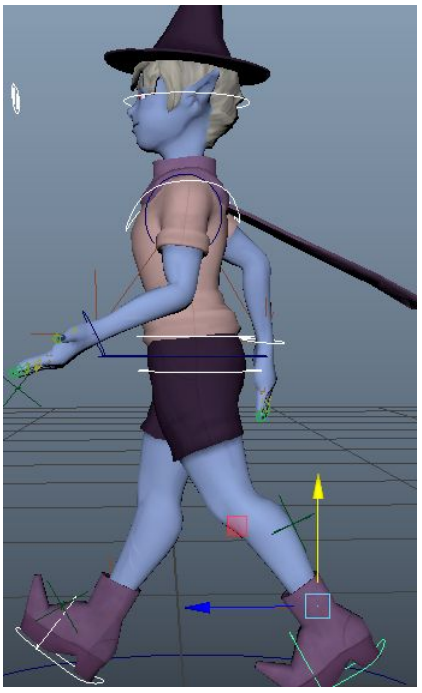
I attempted to make a jaw controller, though ran into a lot of problems with weighting. The lips also warped in shape, so I was recommended to just not add a jaw joint, since I didn't plan to open his mouth anyway.



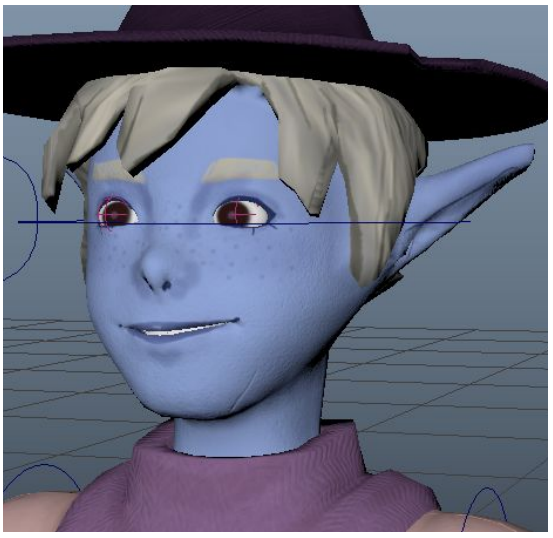
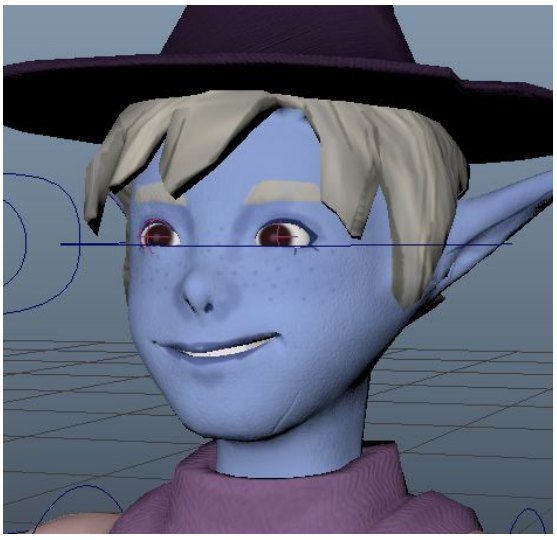

However next I ran into one of the biggest issues. No matter what I did, I couldn't get the teeth to move with my character. I tried to reskin the character, parent constraints to either the joints or controllers, merging the geometry, parenting the objects, and lastly Skin > Add Influence. When I did this nothing showed up in the influences tab, and merging the geometry caused the teeth to get deleted.
I asked a tutor for help with this, as well as searching for any answers, but neither knew what to do, so I ended up unfortunately just deleting the teeth. :(

Animation

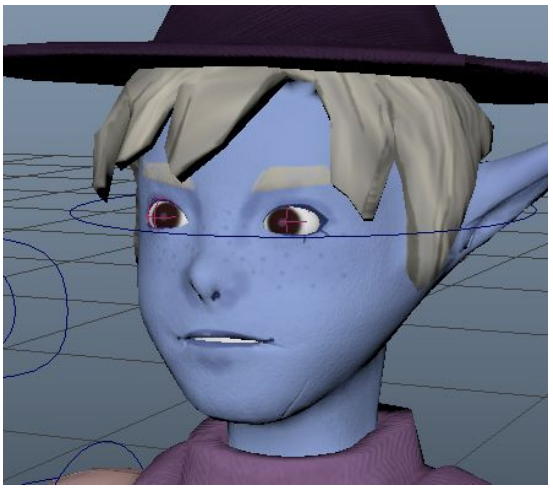
WALK CYCLE

I began by creating the key poses of a walk cycle, using the Week 9 tutorial notes, combined with my own reference videos to try and add a bit of 'spring' in his step. It was at this stage that I noticed that his walk cycle looks a bit odd, because the hands face forward while he walks. However because of how I modelled him, with the hands facing forward rather than to the ground, this was really hard to change without warping the rest of the body.

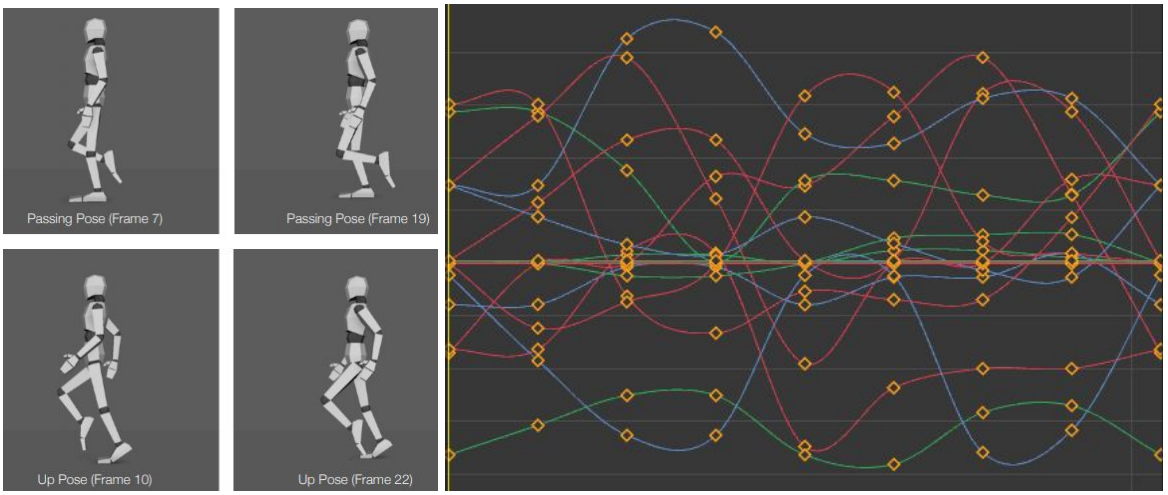



After I keyframed all the key poses, I went back to use blend shapes to create expressions. I followed the week 11 tutorial, and duplicated the body geometry twice. I used soft select and the move tool to make two expressions I named ‘happy’ and ‘neutral’.

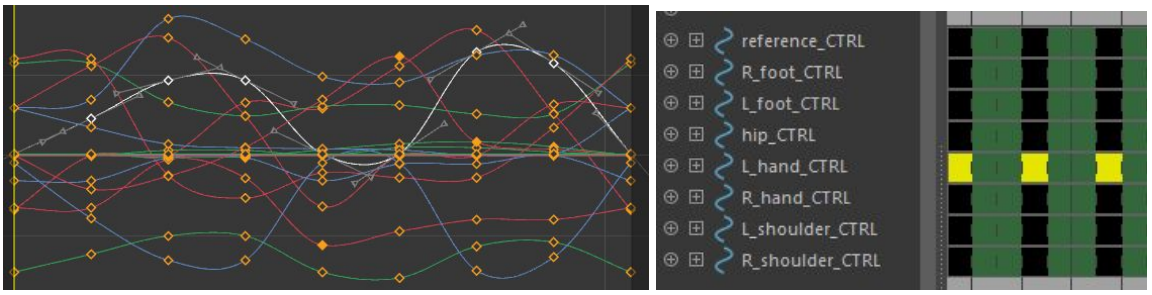


	Min		Current		Max	
Rot Limit X	-45.00	<	0.00	>	45.00	
Rot Limit Y	-45.00	<	0.00	>	45.00	
Rot Limit Z	-45.00	<	0.00	>	45.00	✓

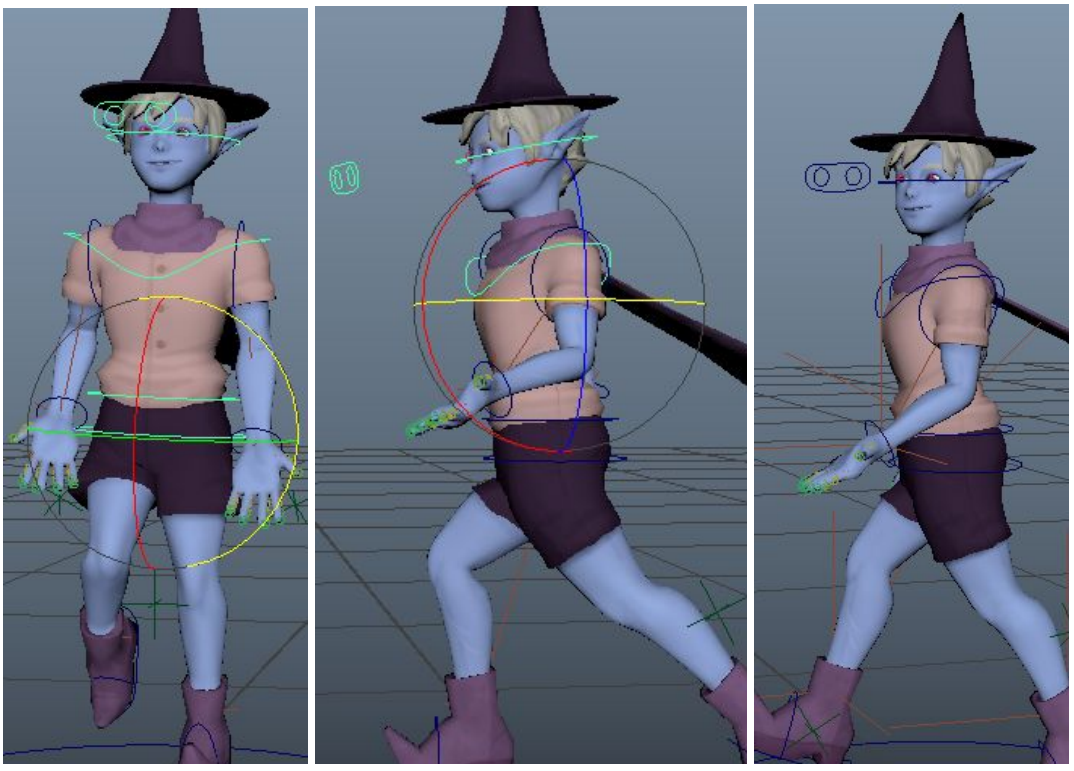
Next I used Deform > Blend shape, and hid the blendshapes group. I then deleted the group, as the objects were still in the scene. Next I locked some attributes such as scale in each controller, and limited the rotation of each joint.



Next I added the passing and up poses, again using my reference videos to make it more personalised. I then went into the graph editor and used Tangent > Splint to make the motion more smooth.

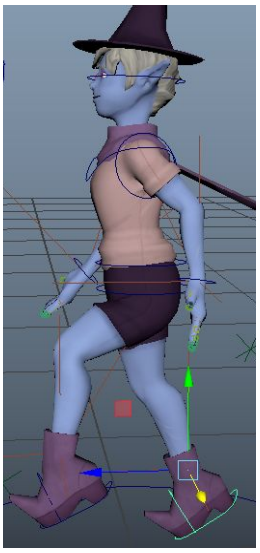
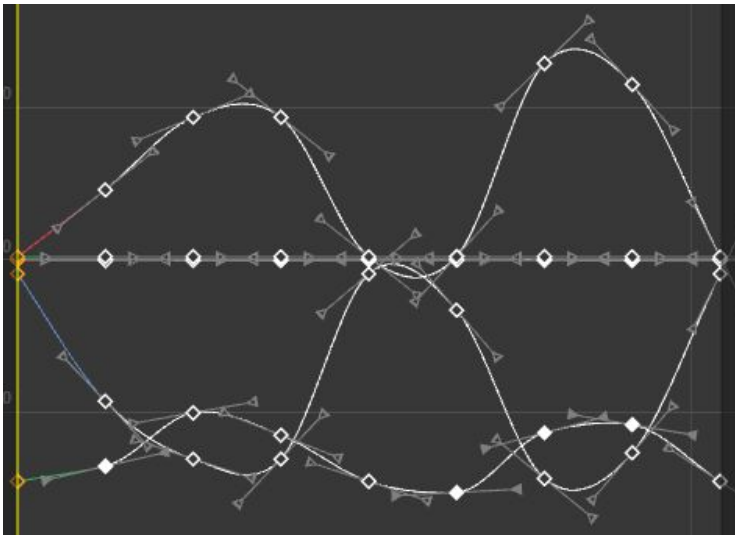


I then spent a lot of time editing each controller, and going through each attribute to either change it's curve, or exaggerate/lessen each attribute. After this I attempted to add follow-through to my walk cycle, starting with the rotation of the hands.



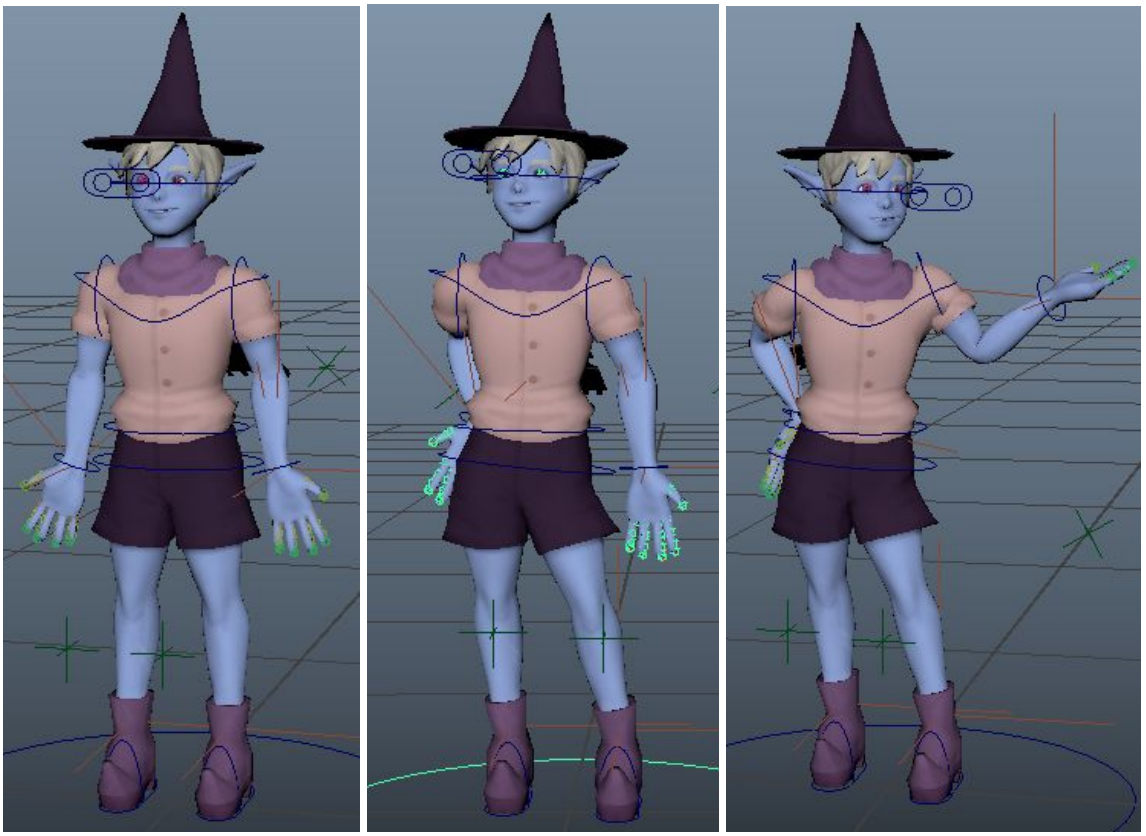
Then I went through each controller to see what I could edit to add more character or exaggerate the motion of. I started with the hips, and moved the hips to one side during the up poses. I also rotated the hips towards the foot in contact with the ground.
Then I rotated the chest controller away from the forward foot, and did the same for the opposite leg for a slight chest rotation.
Lastly I added a slight head turn animation, by adding more rotation in the head, to try and give him a little bit more character.

However there's a slight issue where the animation loops again, and with how raised the elbow is on the down pose (frame 4) causes the arm to 'jitter'.

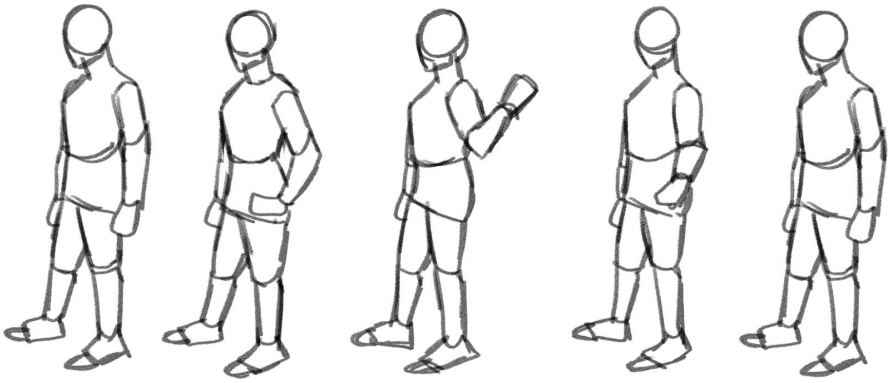



I tried to solve this by bringing the arm closer to the body in the up pose close to the end of the animation (on frame 22). Though this looks better, I noticed that the rotation of the hand was a bit jittery, so I went into each controller to move the arms of each keyframe, to make the curves a lot more smooth.

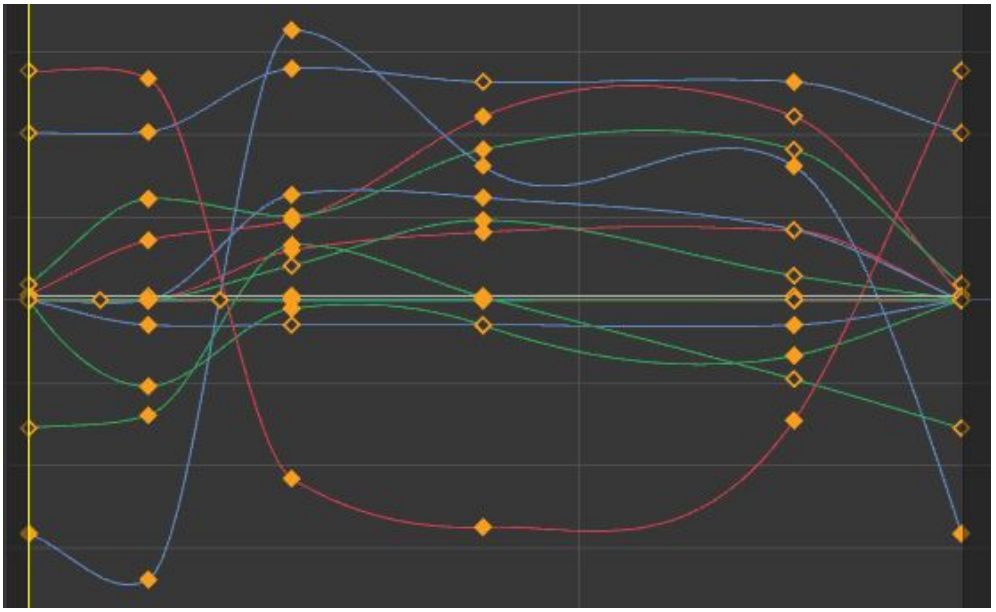
GESTURE 1



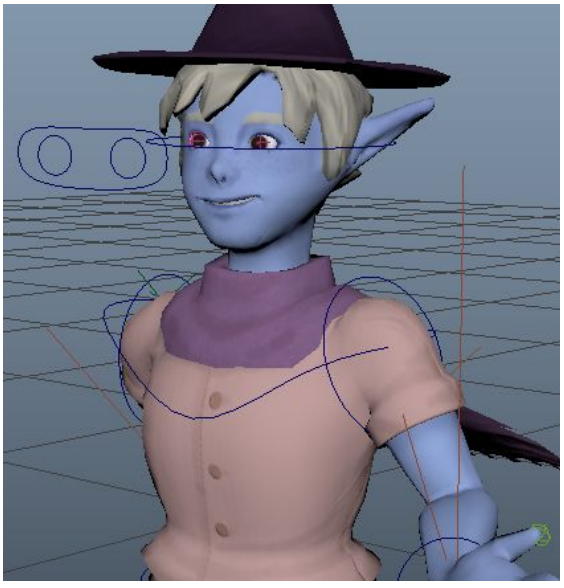
I started by mapping out each key pose. I kept the first and last frames as a ‘neutral’ pose (the first image above), as I thought that when I brought all the animations together, they would blend better with a neutral pose in between each different gesture.

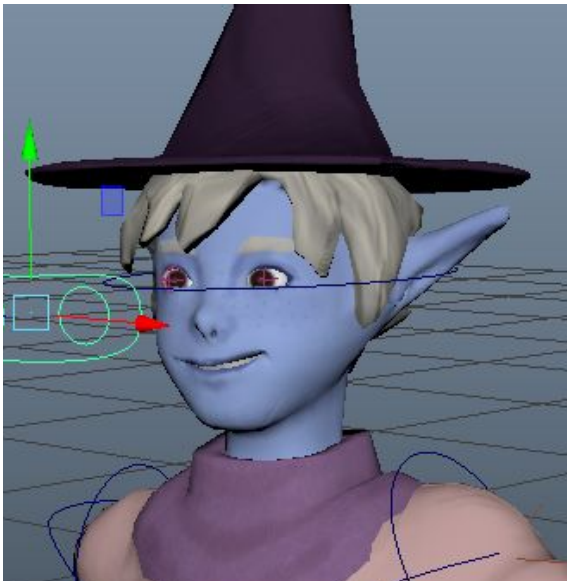


The key poses I referenced it on. I added more ‘weight’ onto the right leg for more personality. I also removed the impact of the 4th key pose as I wanted less of a delay between the hand going up and down.

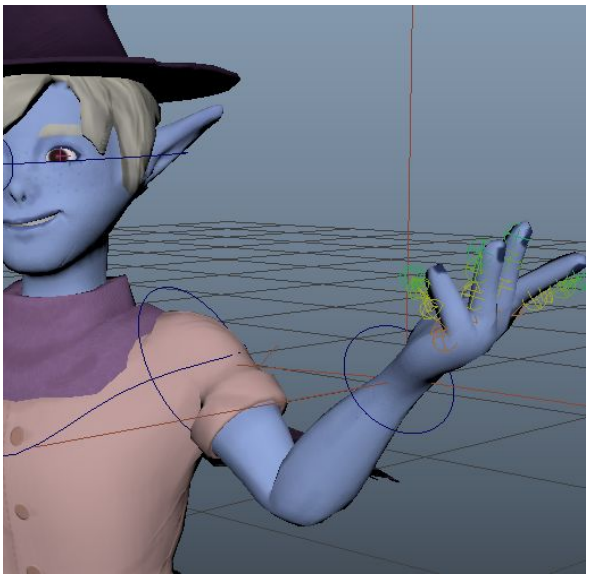
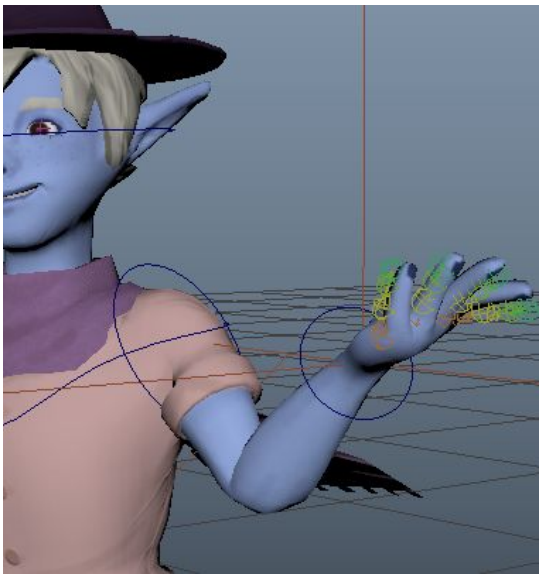


I then went through each controller, and each attribute, to either smoothen the curves of each keyframe, or to strengthen or weaken the attributes of each keyframe.
I tried to make the hand flick very sudden and fast, and slowly lower the arm.



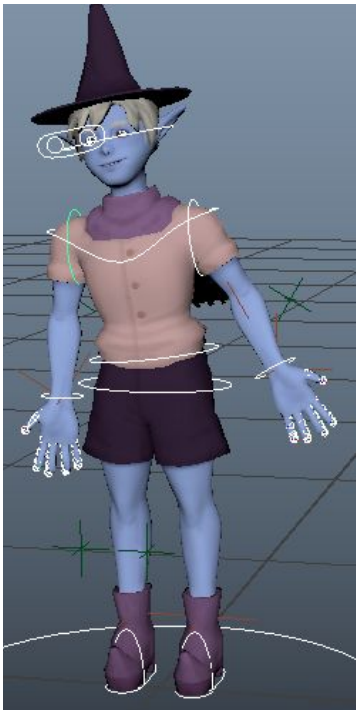


I used the happy expression I had made to make him smile slightly as his arm raised, and moved the eye controllers slightly towards his left arm. I decided to only tweak the eye controllers very slightly because the rotation of the eye controllers aren't perfect.

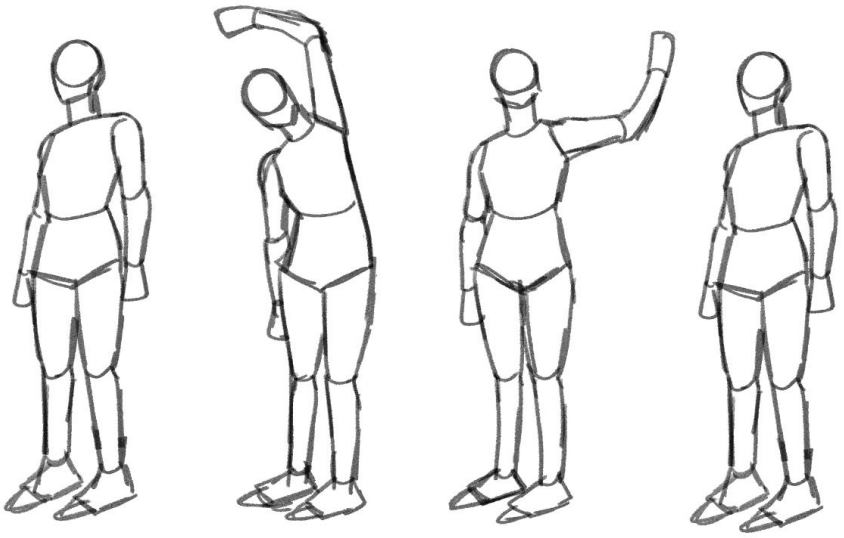



I then went back to add slight finger animations in both key poses when his arm raises. I added keyframes for the knuckle of each finger, and rotated them all towards the palm, except for the index finger which I rotated away from the palm.
I also tweaked the thumb joint of the right hand to 'grip' his hip better.

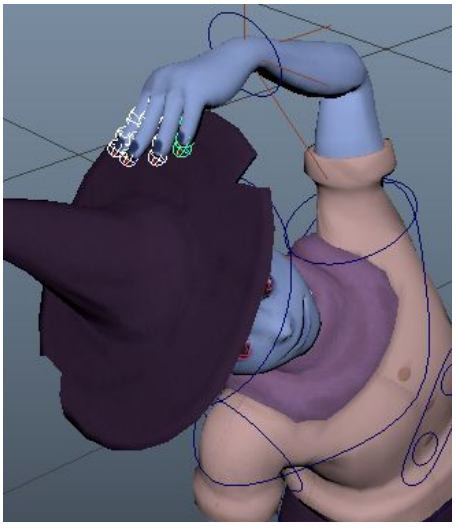
GESTURE 2

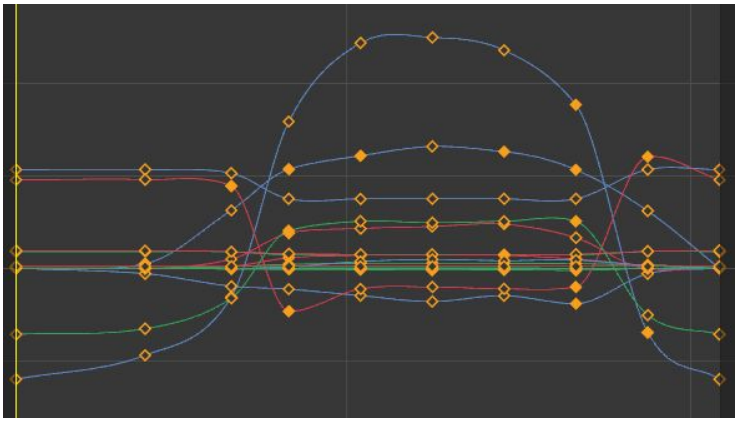


Again I started by creating a neutral pose to put at the start and end, and then copied all the key poses of my reference video. I added a few more key poses (image 3) to 'deepen' his stretch. I shifted a lot more weight onto the right leg, and rotated the hips and shoulders more than the videos.



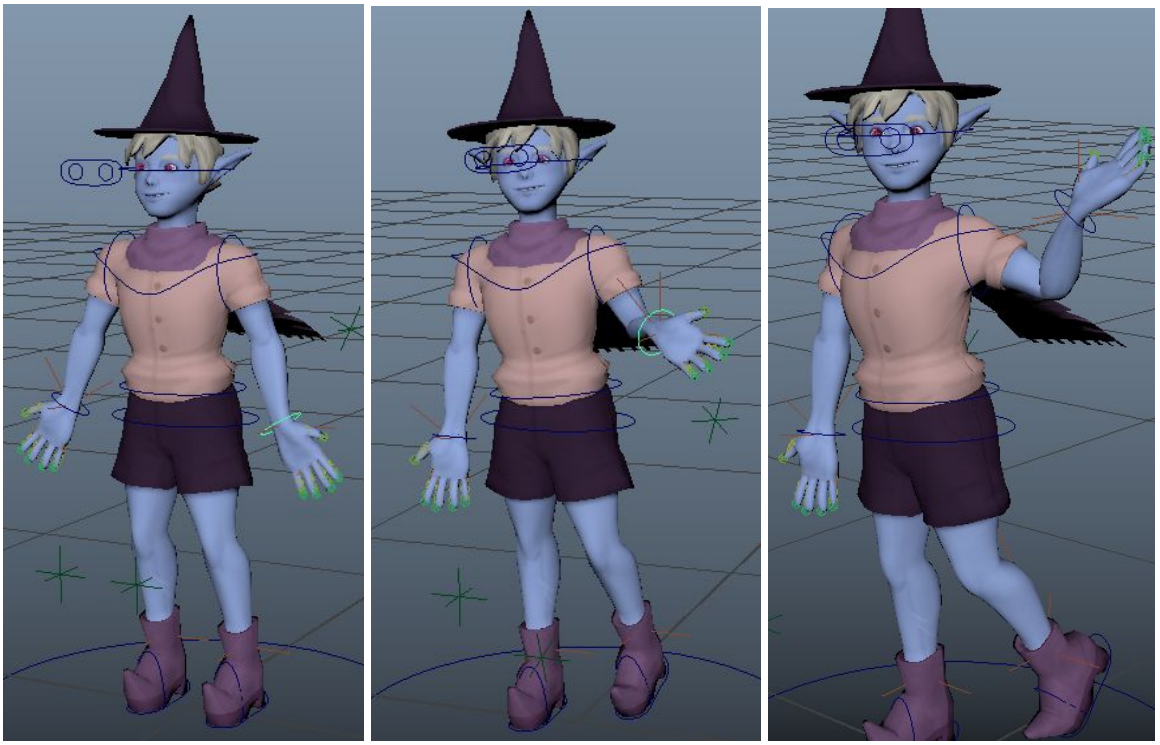
The reference videos I referenced, but exaggerated it immensely.



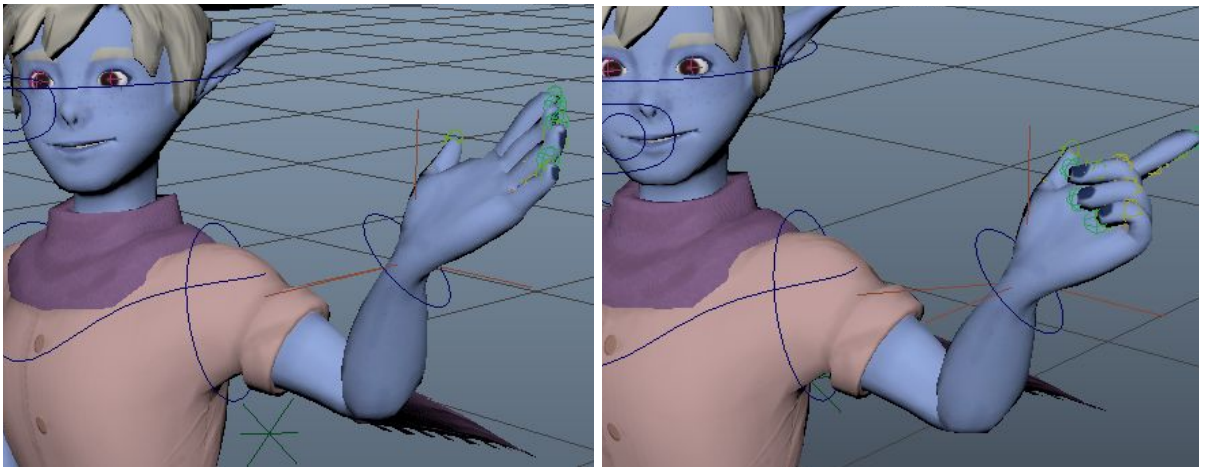


After adding small adjustments in each controller, I rotated the knuckle joints of the fingers towards his hat during the deepest part of his lean. Lastly I went into every controller to smoothen the motions, and increase or decrease all the controller attributes.

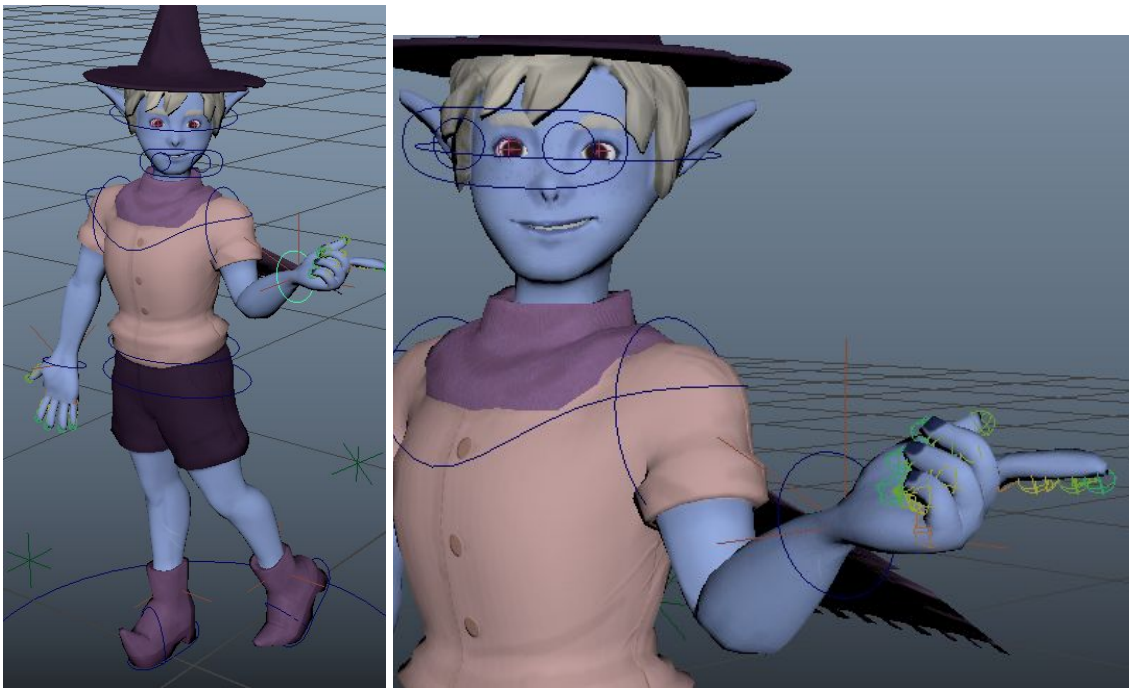
IDLE



For the idle I started by keying the up and down ‘bob’ of a character, typically seen in video games. I spread them pretty far apart, as I wanted him to bob more slowly, more of a sway compared to a jumpy bob. Next I started by keying out a sudden arm raise, and flick down of the left arm. Because I didn’t have a reference video for this, it took a lot of trial and error, and using a mirror to watch the motion of the arm and wrist.
Because of the slow bobbing, this ended up being my longest animation at 140 frames, to fit in a few bobs before Feyn finger guns.

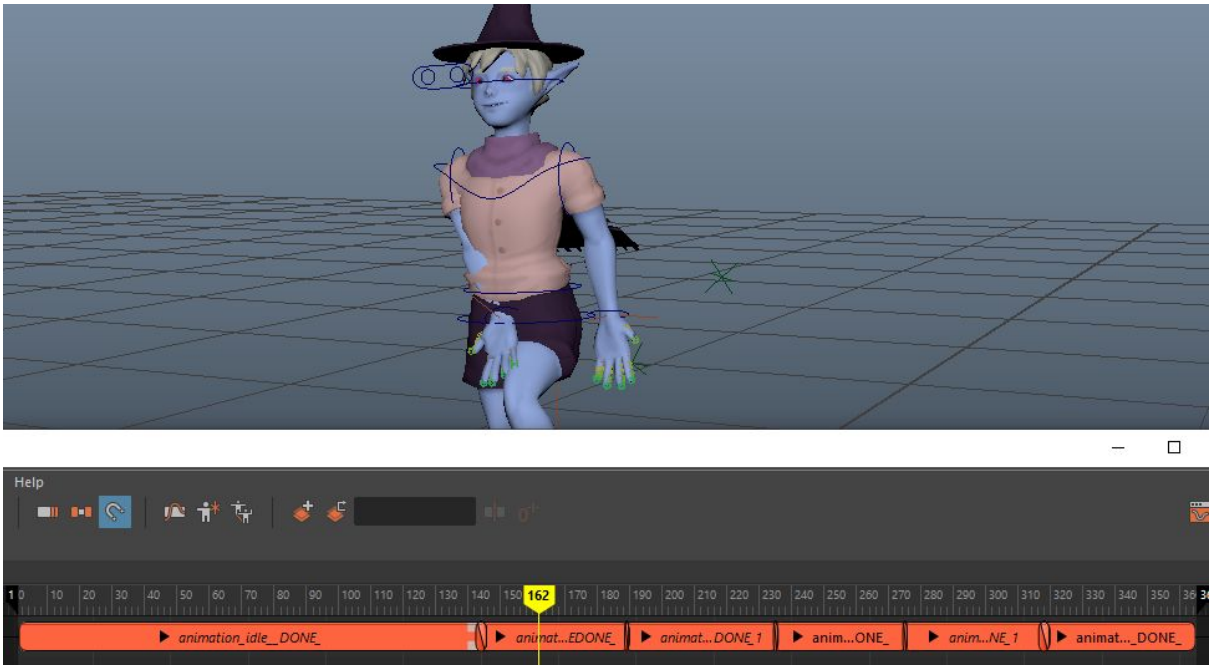


When I had tweaked the general motion of the base, I keyframed the bending of the fingers, in three different joints. I rotated the index finger further away from the palm for more contrast.
After adding these finger keyframes, I went back into the graph editor to perfect the motion of everything. I added more rotation in the wrists and shoulders as he bobbed down, to make the arms look more flowy.

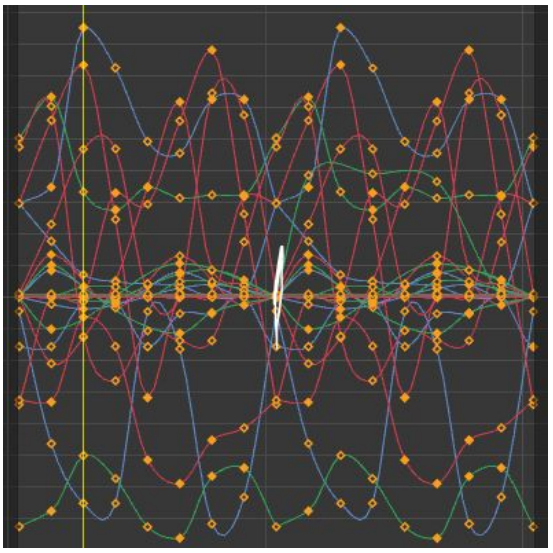
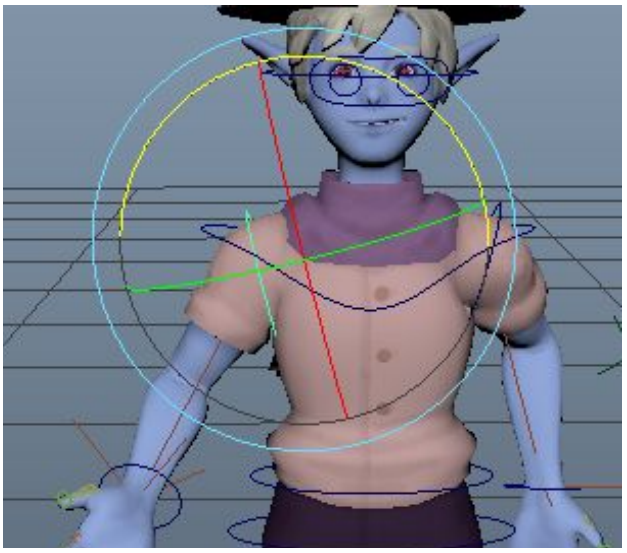


Lastly I added some facial animation as Feyn finger guns, and rotated the eyes very slightly.

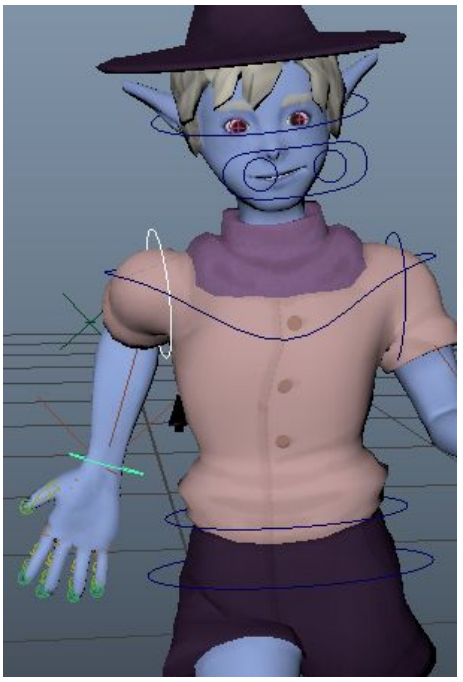
Unity Scene Assembly



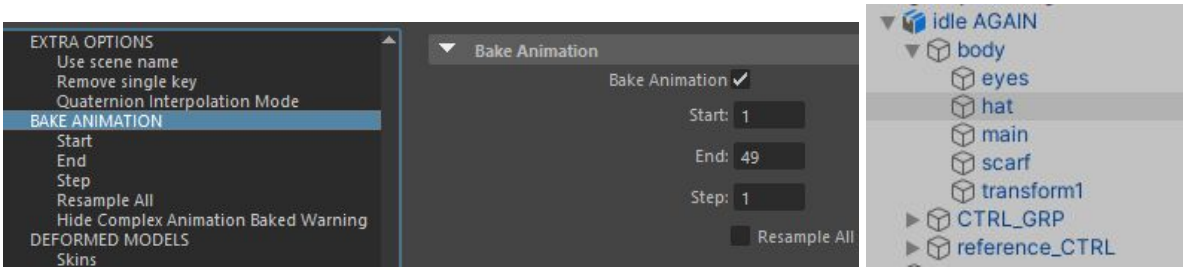
Next with all the animation clips assembled I brought them together in a new scene, using the Time Editor to put them together. I noticed in this step that my walk cycle looked weird, because the head turn occurs in such a short loop. Also, the arm in the walk cycle goes through the body for some reason, which I tried to fix but setting all the keyframes again, but this didn't work.

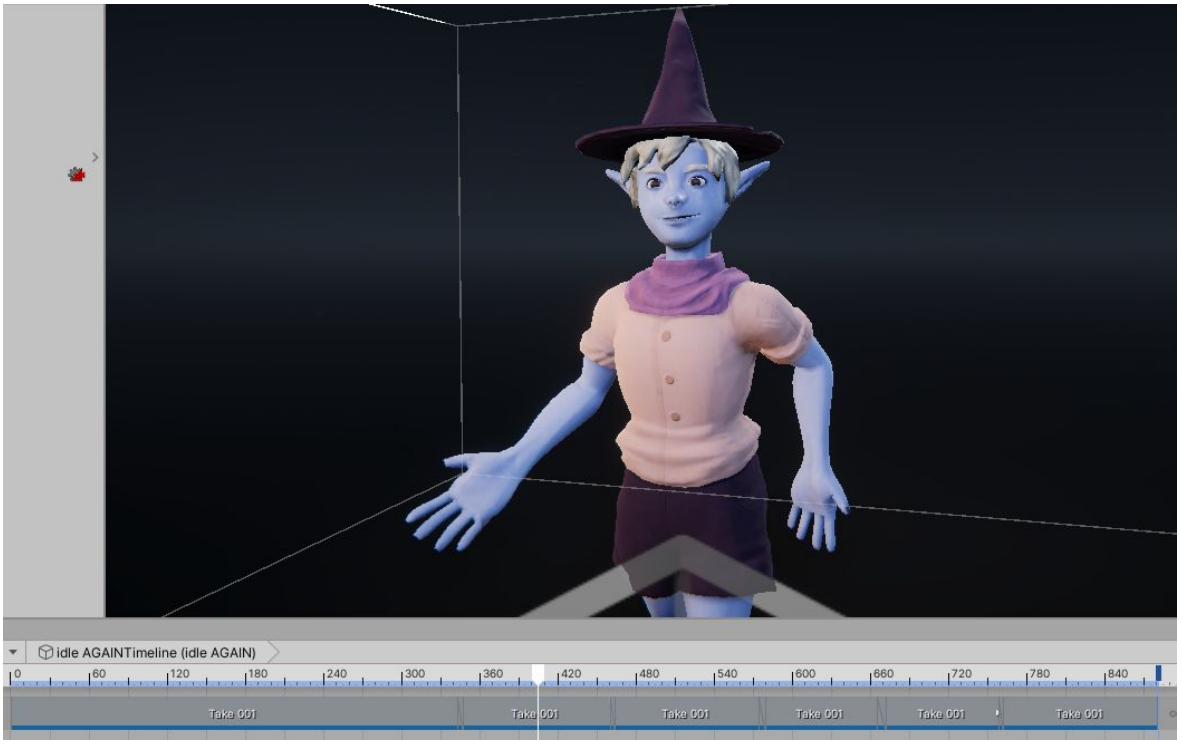
So firstly I fixed the walk cycle but duplicating all the frames and looping it on the 25th frame. In the first loop, I went back to remove any head rotation, so he walks a bit before his head turns to look at the camera. I also tried to rotate the shoulder further away from the torso on the 1st frame to try and fix the arm going through the body, but this didn't work.

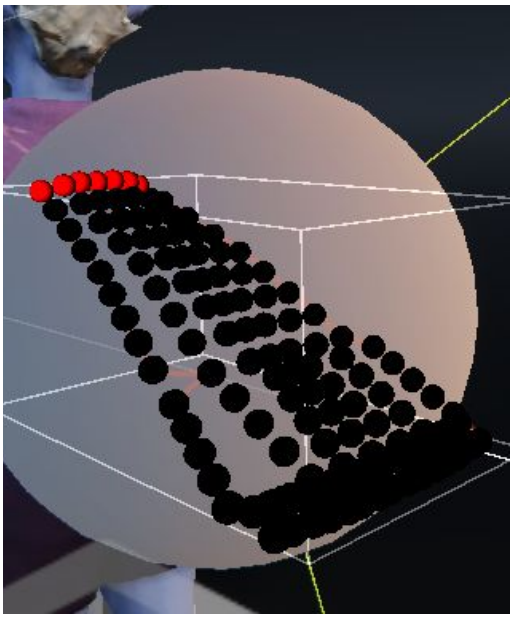
I received advice from my tutor to export each animation clip separately as an fbx file, and import these into the FIT2087 Character Stage. I used my Maya file of my rigged and skinned character as a base to put the animations on top of, as I thought this was the 'mesh' mentioned in the notes. When I did this, none of the animations worked, so I went back into my Maya file with all the animation clips assembled together, and tried to manually set all the keyframes of the hand and shoulder controllers to move it out of the body. However this didn't work either.



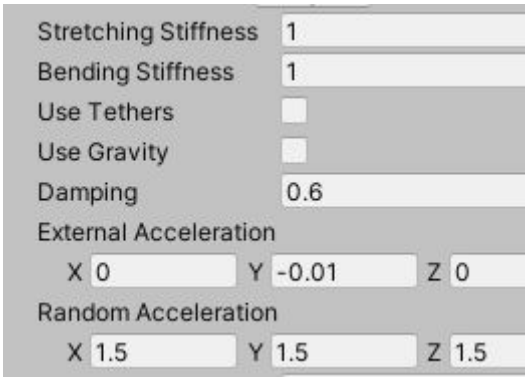
I asked a friend for help, to see what else I could try, and she told me that I had missed an important step in exporting, to tick the ‘Bake Animation’ option under the preset options. She also told me not to use the Maya file as a base for the Unity scene, so I used my idle animation as a base. I noticed at this point that I forgot to untick ‘Convert Units’ for both my gestures, as they previously weren’t working.



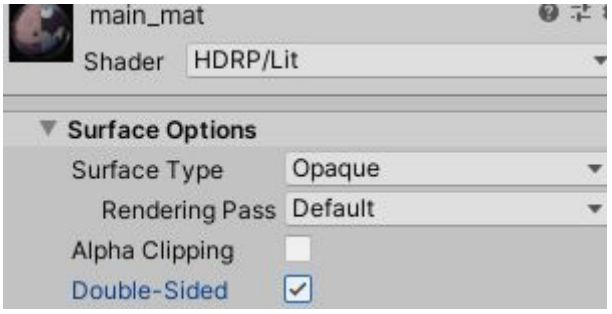
I assembled my clips into Unity’s timeline, similarly to how I did in Maya. I decided to start with the idle animation, then to the walk cycle, played twice as it is quite a short animation. Then into gesture 1 (the hand flick), a short clip of the bobbing animation in the idle, and lastly gesture 2 (lean and stretch).




I used the Edit Cloth Constraints button to pin it at the tip of the scarf, and fiddled with the external acceleration, random acceleration, and stretching/bending stiffness until it looked a bit better. I initially tried to find out how to make colliders, as the cloth wouldn't go through the back. I wanted the scarf to float midair, but couldn't figure out how.



I fiddled with the external and random acceleration to try and make it float, but when it wasn't working I turned off the gravity, which worked! I set the external/random acceleration to very low values, so the scarf lowered very slightly but waved slightly with movement.



Lastly I wanted to fix the scarf, as it only displayed the backside. On the materials I ticked the double-sided option, and now everything is pretty much completed!



After I exported the build I went to double check, and found that my scarf had disappeared. After checking on some forums (the advice from this one was the most relevant!) I enabled read/write in the import settings, and now the scarf appears in my scene!

Unity Build Screenshots