# COSC 3P98 Final Animation

Grant Ferrier

## Overview

For my final animation I started to think of different topics that I could do. The goal was to find something simple that I could do but also something complex enough that would be a challenge. I wanted to find something that would demonstrate the things I have learned about graphics from this course.

Like most people starting out with Blender, I started out with the Blender Guru's Donut tutorial. This left me with some basic modeling skills. Which turns out you really only need to know some very basic manipulation skills. However, it takes a lot of mastery to be able to make something good with those skills. After some debating, I settled on something that involved a lightsaber. A lightsaber is somewhat of a simple shape and it has the added benefit of having a glowing light that would be a fun thing to play around with graphically speaking. The final idea would be to have someone try to force pull a lightsaber and then turn it on. This would give me a good overall animation that touched on modeling, character animation, and lighting.

## Modeling

Now that I had figured out what my subject was going to be it was now time to start modeling. The first thing I modeled was the light saber. One important thing I learned in modeling is that having image references are very important. So, I went to google and lightsaber forums to look at what people have created. Due to being such a huge fandom surrounding Star Wars I was able to find a healthy number of references. These references ranged from 3D CAD models to DIY dimensions.



*Figure 1*

In Figure 1 there are several different lightsabers that helped me get inspiration for my own. I decided to go with a lightsaber similar the lightsaber that Luke Skywalker used as it was simpler in design. However, it does have button which would add to the complexity.

To model the light saber handle I started out with a cylinder. Then through extrusions and scales I was able to model the cylindrical handle. Using loop cuts I was able to create the buttons as well as the end handle extrusions. As you can see in Figure 2 there are different colours on the model.
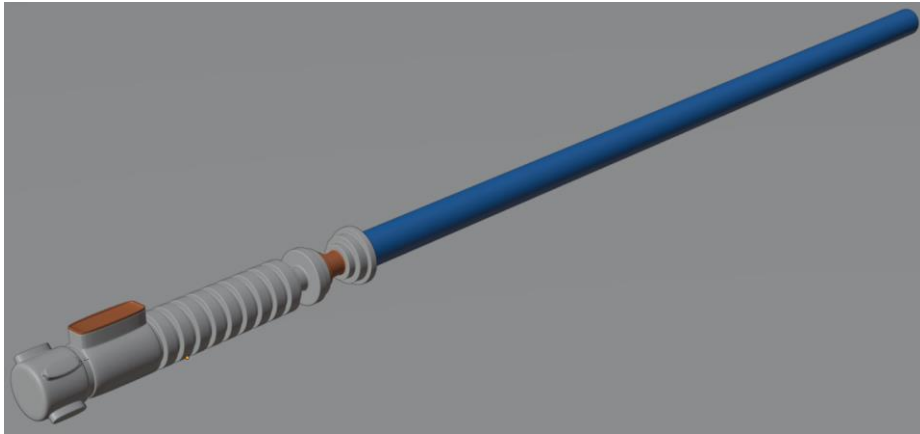


*Figure 2*

The different colours indicate different materials. After the basic model was done, I wanted to increase the quality of the model by creating a detailed texture. This involved me learning how to UV map as well as learning how to use the node editor in blender. Figure 3 shows all the nodes that went into creating the metal texture.
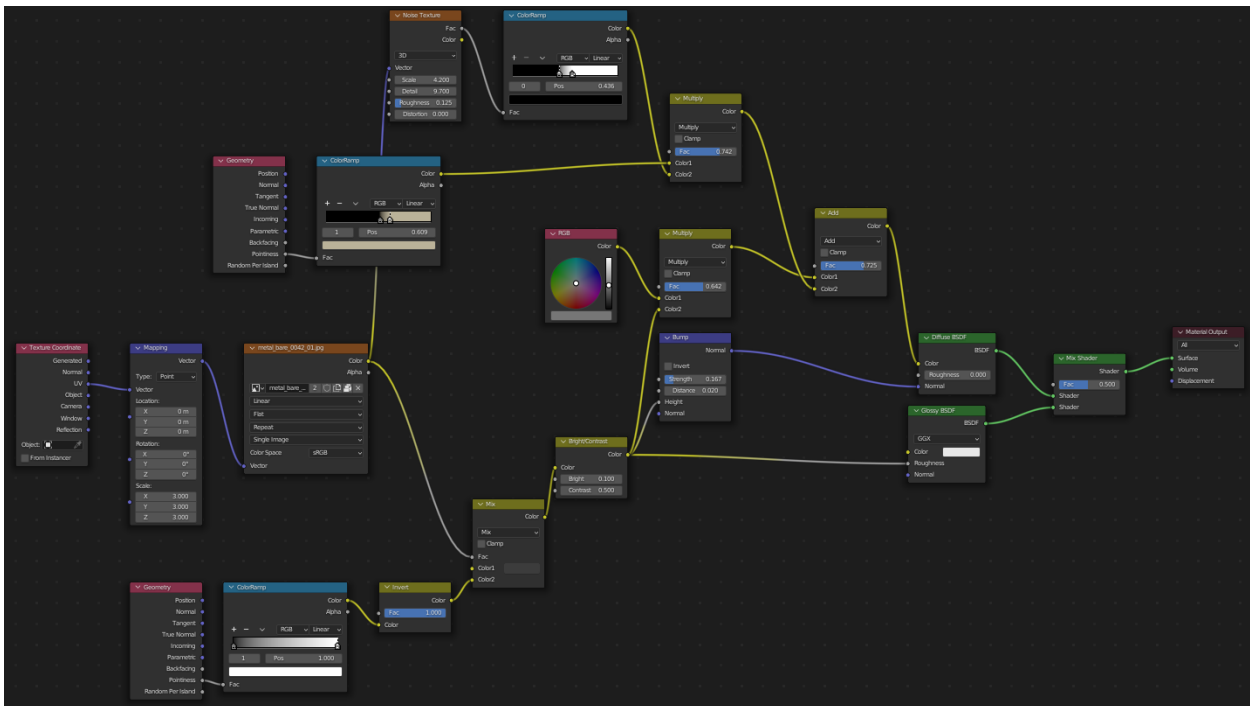


*Figure 3*

To quickly explain the texture. It uses a bare metal texture from the Texture Library website by Dmitriy Chugai http://texturelib.com/texture/?path=/Textures/metal/bare/metal_bare_0042. This bare metal texture really helps to bring out the scratches. On top of that metal texture, I used a mix of colour ramps to pick out specific spots where I want to use more of the texture. This means that in certain spots it will reveal more of the scratched texture. This was applied to the corners of the model where it makes sense there would be more wear and tare on the saber. I also, applied some "rust" colour to the same areas to help sell the worn-out look.  Figure 4 shows a good example of the detail that this metal material adds. One thing to note is that some spots seem a bit too smooth. This is due to the render being denoised.
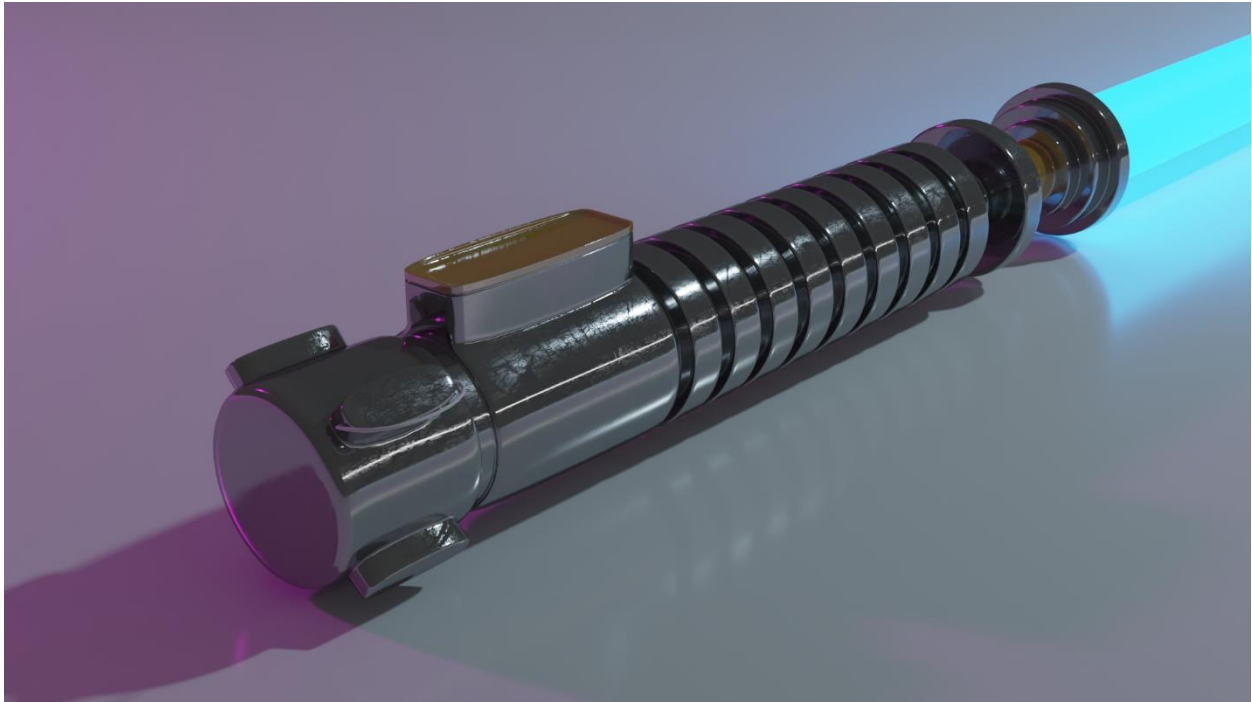


*Figure 4*

This metal material is the same for the bronze spots, just I started off with a different base colour. One thing that is a little hard to tell but I also linked the texture up to a bump map to add even more details to the scratches. However, it is very hard to notice.

Lastly, as shown in Figure 5, for the beam I set up a material to produce a blue light emission. Surprisingly, the beam texture was the easier material to create.
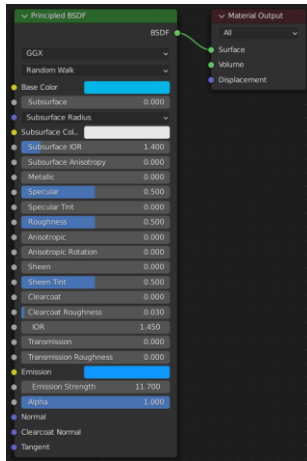
*Figure 5*

The next hurdle that I had to overcome was creating the scenery that this animation was going to take place in. For my first scenery I learned about a Blender plug-in called ANT (Another Noise Tool) Landscape. Basically, it uses noise to generate a landscape. Figure 6 shows the first landscape that I generated.
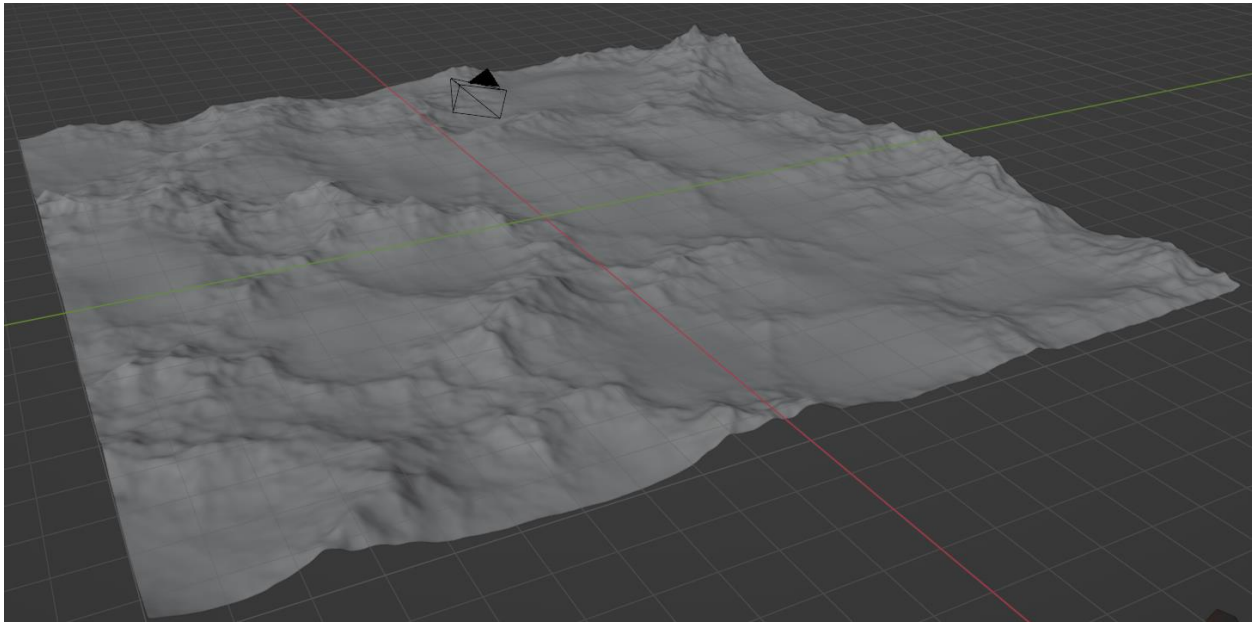


*Figure 6*

This was a quick way to get up and running. Later, I would create my landscapes by hand.

The next step to creating a lively landscape was to texture the ground with grass. Figure 7 shows the node layout for the grass material that I created.
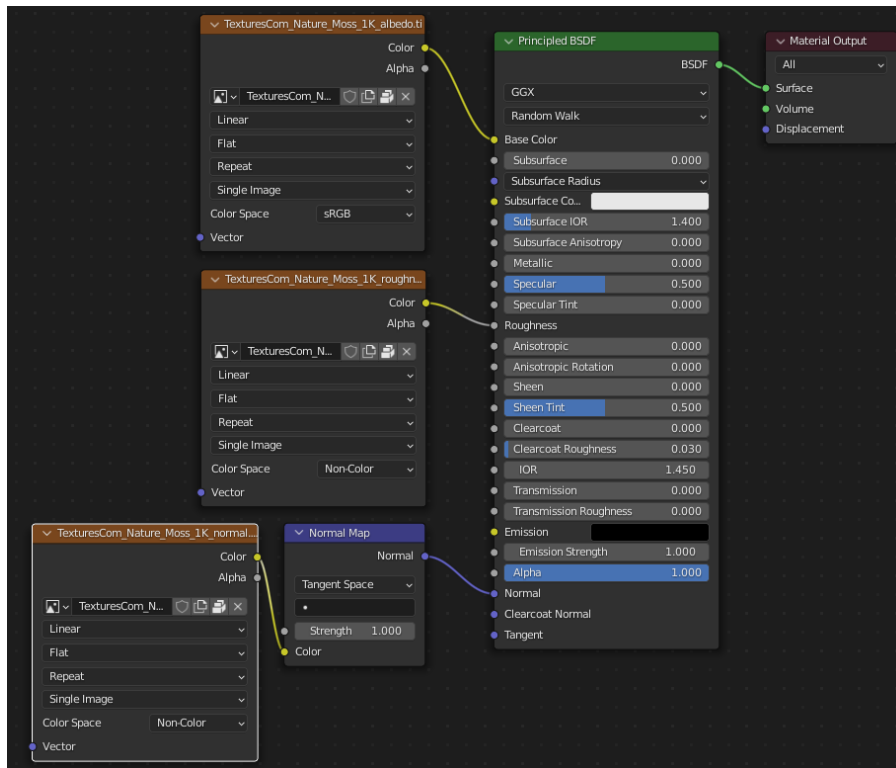
*Figure 7*

This was the first time that I was using a more professional texture system. I got the texture from Texture.com (https://www.textures.com/download/PBR0426/137222) This allowed me to get three files that were professionally captured. That way I could link an image to the colour, roughness, and normal map. This allowed for a more realistic grass texture that had extra depth provided by the roughness and normal links. Figure 8 shows a detailed example of how the normal map allows for shadows to be created.



*Figure 8*

The next thing that my scenery needed was plants. I knew I was not going to be able to create the best realistic trees or bushes as trying to mimic organic material would be really tough. Thus, I opted to create some low poly / cartoony looking plants.
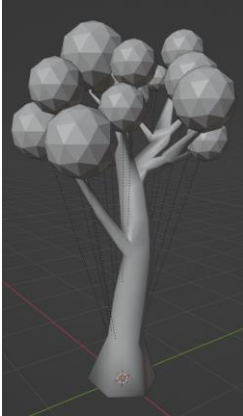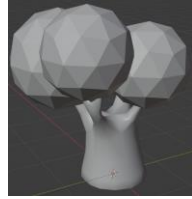
Figure 10



Figure 9

To create the leaves texture, I just created a green material with a tiny bit of emission to simulate light passing through the leaves. For the bark texture I used a seamless texture from Textures.com (https://www.textures.com/download/BarkDecidious0194/51115) I tried to UV map it to the trees, but it did not turn out that great, so it is hardly noticeable in the final renders.

Once I had created some plants it was time to create a hair particle system for my landscape. This hair particle system is used to place the plants on the plane. This would cut down the time it would take to place each plant manually. One feature of using a particle system is that I could use heat maps to distribute my trees in certain areas. Figure 11 shows a great example at how I used the weight painting to place the trees on the top of the valley while only placing a couple plants in the center. Notice, how I also used the weight painting to keep the trees in the view of the camera. The corners that were not in the camera view I left lighter so as not to take up valuable processing power.
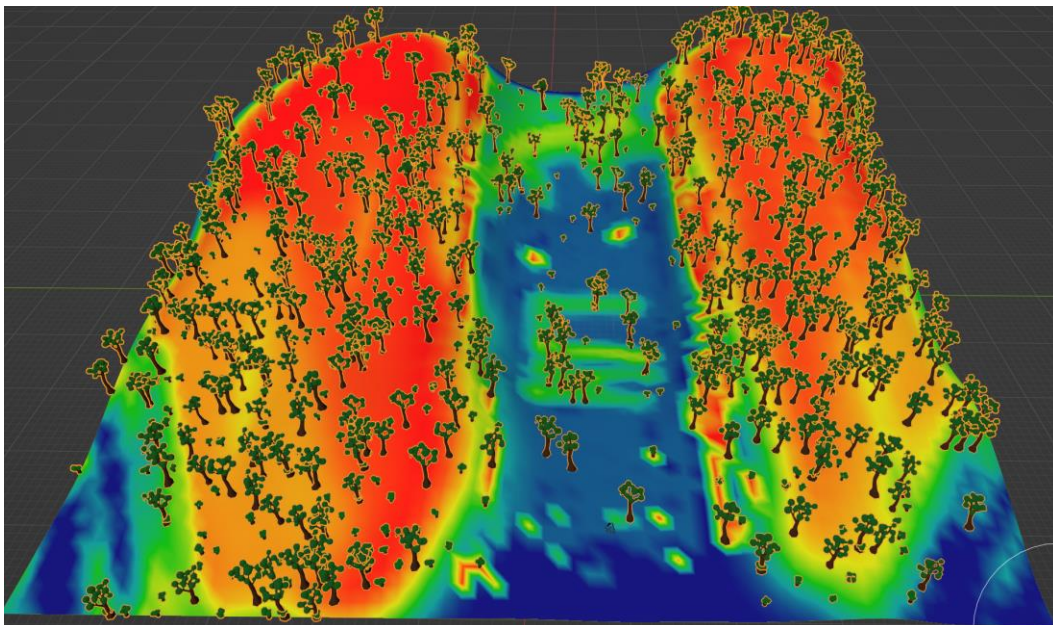


Figure 11

Also, using the particle system I was also able to configure the ratio of trees to bushes that where displayed. I tuned the system to match my preference.

Lastly, to complete the scene I needed to add lighting. Through my research about blender I learned about HDR images. HDR stands for High Dynamic Range. This means that blender is able to compute the light spots and dark spots of this image. For all my scenes I used the Table Mountain HDR (https://polyhaven.com/a/table_mountain_1) created by Greg Zaal. The main benefit to using an HDR is that it provides a more realistic lighting solution. Instead of using a point light or a sun light which calculates light rays. In this use case, Blender will use a 3D HDR and create a more realistic lighting system. This is due to blender using the HDR to calculate different light values for different areas on the scene. These different values are the results of clouds and real-world factors that were in place when the HDR was captured.

A side benefit of using an HDR was that I was able to use the sky from the HDR in my animation which meant I had a more realistic sky. Figure 12 shows how the light is calculated from the real sun. Look at the how the shadows are cast from the HDR.
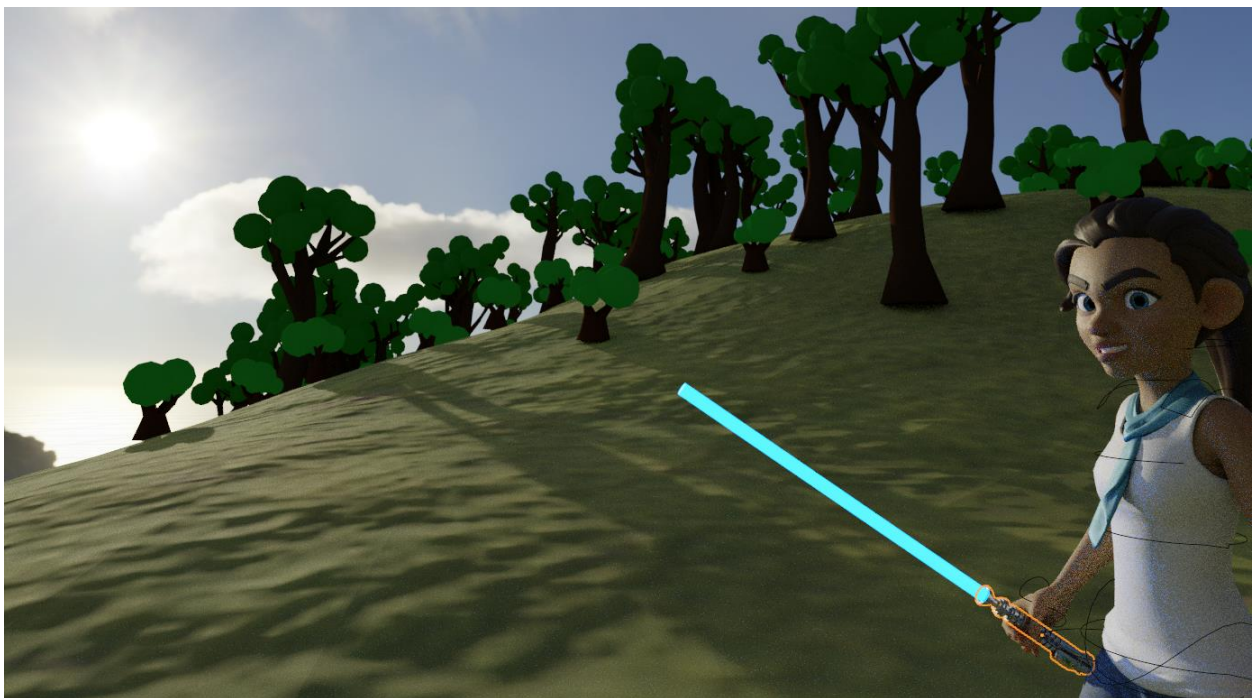


*Figure 12*

In total I created 3 different sceneries that are used in the final animation. The first scenery is for the title scene and was created with the ANT Landscape generator. The other two landscapes were created by hand using the sculpting tools. I set up the same particle system for each of the scenes to generate the plants.

Once the landscapes were created and I had my props it was time to create a character to call the lightsaber. After many failed attempts to create my own, I resorted to using the Blender Studio character Rain, which came pre rigged. (https://studio.blender.org/characters/5f1ed640e9115ed35ea4b3fb/v2/ )  This is a very professional character rig that Blender provides to help aid in learning character animation in blender.

# Animation

Once I had my scenes created it was time to start animating. I had a rough idea in my head how the animation was going to play out. The first scene I animated only had camera movement which I used for the title scene. This helped me practice my camera movement skills.

The second Scene I animated was the lightsaber being picked up from the ground and then being pulled away. I animated in a nice camera swoop. One of my stylistic choices was to always have the camera moving even if it was slowly. This helps give the camera a more natural feel. Almost like it is being handheld on a gimbal. In this first scene I tried to keep the motion very simple. I was in the process of learning the animation controls. One thing to point out was that I was able to use the dope sheet controls to add a noise node to make the lightsaber shake as it was being force pulled as shown in Figure 13.
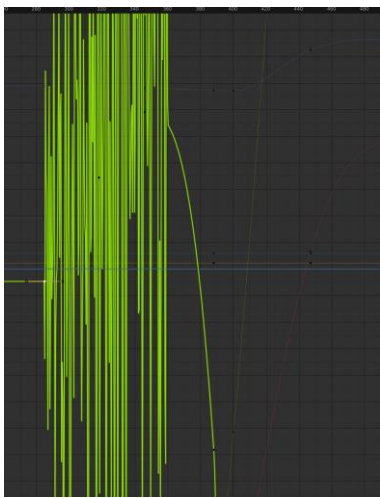


*Figure 13*

In the next scene I took what I had learned from the first two scenes and put it all together. I was able to animate the character to force pull and catch the lightsaber. This provided a challenge of animating the catch of the lightsaber. When she pulls the lightsaber to her side, I had to juggle keeping the lightsaber mimicking her hand movements. I also tried to mimic human movements like her eyes and head movement. To aid in the character animation I mimed out a version of catching a lightsaber to try and get the move down or at least make it seam somewhat realistic.

The key to make it feel more realistic was to animate multiple movements at once. When someone does the robot dance the key is to move one piece like an arm at a time. That is how you get a "robotic" feel. Thus, to feel more organic I tried to animate multiple subtle movements into the character. As the camera gets closer to her holding the lightsaber, I animated her to tighten her grip on the saber just slightly. It is a small movement, but it helps sell the animation.

I work in the production field, so camera settings are not foreign to me. In the third scene I also animated the F-Stop to help produce a more cinematic field. As you can see in Figure 14 I used the dope sheet to manually adjust the F-Stop as the camera got closer to the lightsaber. I had to do this as I set the camera focus to be on the character's arms. The lower the F-Stop the lower the depth of field which gives a more cinematic looks as well as drawing the viewer's attention to what is in focus. Which for

most of this scene was that character and the lightsaber. As you can also see in Figure 14 the background is blurry.
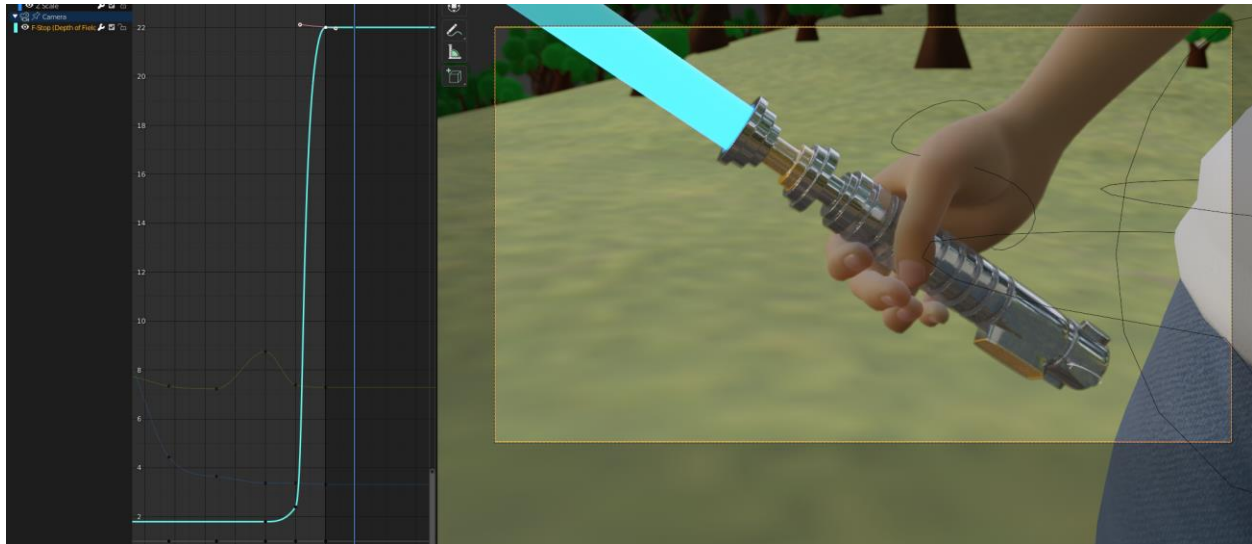


*Figure 14*

The last scene I created just to show off all the details of the lightsaber that I had worked on. Again, I always tried to keep some camera movement to help with the flow of the film. It also provided a nice spot to put some credits.

## Sound Design

I produce music as a hobby. Thus, all music used in the animation was written and produced by me. Since I am not entirely foreign to sound design, I was able to create the lightsaber sound using some oscillators. I actually looked into how the original sound was created. It turns out that the lightsaber sound was created by combining a humming sound with some electrical feedback from a TV.

The lightsaber turning on sound was a bit more difficult to reproduce effectively so I used this sound from https://www.soundboard.com/sb/sound/930991. It was released under personal rights which allows for non-commercial use such as school assignments.

To also help sell the animation I wanted to add some atmospheric forest sound. I used, Birds Signing in a Forest Scotland: https://www.chosic.com/download-audio/27950/ which was released under the public domain.

## Final Film

Once the renders were completed which worked out to over 30+ hours in rendering time, I edited together the final animation in Davinci Resolve. This is where I added the music, sound effects, and text.

# References

Larson, Kyle, and Tim Levers (Rebo). "Editorial: Lightsabers, Their Users and Their Uses." *Star Wars News Net*, 4 Nov. 2021, https://www.starwarsnewsnet.com/2020/07/editorial-lightsabers-their-users-and-their-uses.html.

Textures were from Textures.com and Texturelib.com. Specific links are mentioned in the report.

HDR was from Polyhaven and was created by Greg Zaal: https://polyhaven.com/a/table_mountain_1

Character: Rain Rig © Blender Foundation | cloud.blender.org
https://studio.blender.org/characters/5f1ed640e9115ed35ea4b3fb/v2/

Atmospheric sounds: https://www.chosic.com/free-music/all/