EE 267 Final Project

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Abstract

For this project I designed and rendered a virtual scene inspired by the "The Legend of Zelda" video game franchise. I created the models for the Master Sword and Octorok using Solidworks by Dassault Systèmes which were then given material properties in Blender and exported as .dae files. A LeapMotion Controller was used to track hand position and render a virtual hand in the scene which was able to interact with the virtual objects and surrounding environment. The Unity game engine was used to render these models as imported assets and Unity Terrain Tools was used to create the surrounding environment. I also developed scripts to control the behavior of the models as they interact with each other and the user.

1. Introduction and Motivation

"It's dangerous to go alone! Take this."
-Unnamed old man, The Legend of Zelda (NES), 1986

The inspiration for this scene came from the upcoming 10th year anniversary and re-release of "The Legend of Zelda: Skyward Sword", the 16th game in the main series of the The Legend Zelda franchise. The Legend of Zelda main series has released 19 games over various Nintendo platforms since the 1st installment "The Legend of Zelda" released on the Nintendo Entertainment System (NES) in 1986. My goal was to render a "The Legend of Zelda"-themed scene using the Unity game engine and also import models that I created using inspiration from the franchise's artwork.

2. Game Design

The scene was inspired by a typical interaction in a The Legend of Zelda game: the protagonist walks into a room, gets locked in, and is ambushed by a monster or group of monsters. In this scene the monster I used is called an Octorok, a recurring hostile creature in the games. The goal is for the protagonist to survive the scene, so they must grab their weapon, the Master Sword, and then defeat the Octoroks that ambushed them.

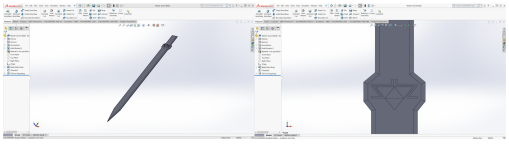

Figure 1. Master Sword blade Solidworks CAD model in isometric view and close up on "Tri-Force" symbol detail

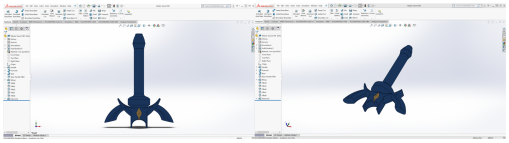

Figure 2. Master Sword hilt Solidworks CAD model in isometric view and front view

2.1. Hardware Equipment

The hardware required for this project was the VR headset and VRduino provided by the class and a LeapMotion Controller which was self-provided. The LeapMotion Controller was attached to the headset above the VRduino. This positioning was chosen since it led to the most intuitive mapping between the user's arm and the virtual arm rendered in Unity.

2.2. Interface Design Process

The core of this project was the development of the interface which I am defining as the Octorok and Master Sword virtual objects and the surrounding environment that the user visualizes through the headset.

I started the development by creating the Master Sword. I created this model in two parts: the blade and the hilt as shown in Figure 1 and Figure 2 respectively. I then mated the two models together as an assembly as shown in Figure 3 and exported that assembly as a .stl file.

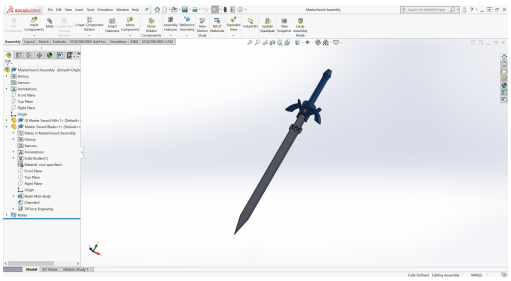

Figure 3. Completed Master Sword Solidworks CAD model

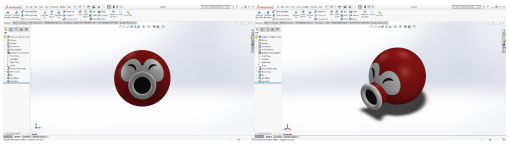

Figure 4. Figure of Octorok Solidworks CAD model

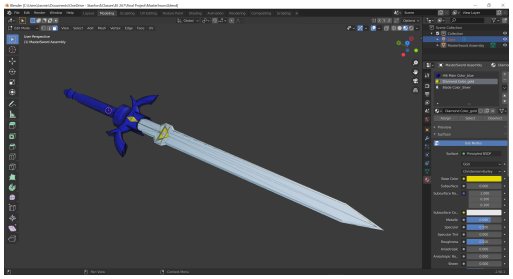

Figure 5. Master Sword material assignment in Blender

For the Octorok, I created the entire model shown in Figure 4 using only one part file which was also exported to a .stl file.

The next step was to import the .stl files to Blender. I used Blender to color the surfaces of each of the models and add lighting, metallic, roughness, and specular highlight effects as appropriate for the intent of each model. For the Master Sword, shown in Figure 5, I focused on adding different metallic properties to the different colored meshes to convey the multiple types of metals that the sword would be made of. Similarly, for the Octorok shown in Figure 6, since it is supposed to be organic creature I focused on finding a balance of roughness and specular material purposes to convey this. Besides the aesthetic purposes, this step was necessary in order to convert the Solidworks model into a file format that Unity would accept as an imported asset as shown in Figure 7.

After importing the custom models as Unity GameObjects, I setup the LeapMotion Interaction Engine and assigned interactable behavior to the Master Sword and Octorok models.

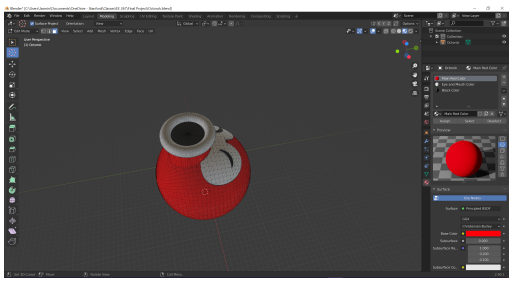

Figure 6. Octorok material assignment in Blender

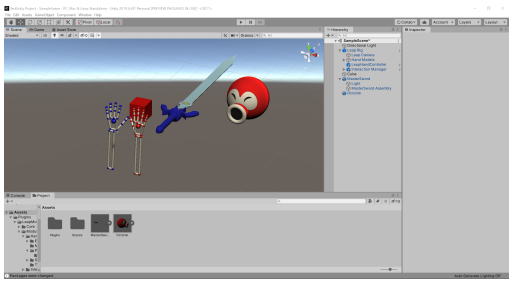

Figure 7. Models imported to Unity, including the Master Sword, Octorok, and LeapMotion interactable hand models

I also wrote two scripts called GameController and SwordCollision. The GameController script managed the creation of the Master Sword and five Octorok GameObjects and assigned their physics properties including collision detection and interaction with the LeapMotion-rendered hand. The SwordCollision script handled the behavior to occur when the Master Sword contacts an Octorok. When the Master Sword contacts an Octorok model, the Ocotrok is defeated which is shown by the model turning upside down and the material becoming greyscaled.

Finally, I added Terrain as shown in Figure 8 using Unity Terrain Tools and Unity Standard Assets by Unity Technologies and used the Raise/Lower terrain tool to create the mountains shown in the scene [1]. I changed the sky color using Skybox Series Free by Avionx asset package [2].

3. Conclusions

The scene has been successfully implemented with its own interactable custom-made models. The stereo view as shown in Figure 9 shows the scene that is rendered to the headset's display.

4. Future Work

Future work can include developing a hand model that would be more representative of a complete human hand

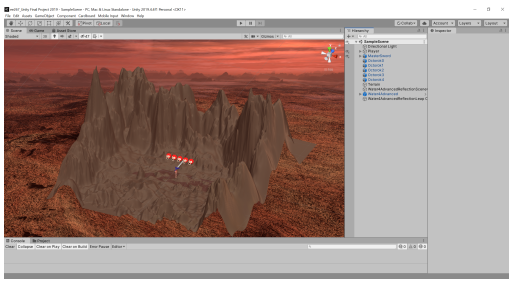

Figure 8. Terrain created using Unity Terrain Tools

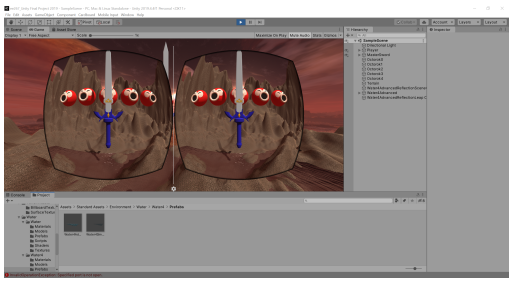

Figure 9. Scene with stereo rendering

rather than the skeletal model alone. The game could also be expanded to include larger scenes that the user can walk around in rather than remain stationary and change orientation. Additionally, I would investigate developing more complex models such that they are animated in the virtual environment and can perform movements such as walking gait.

5. References

[1] Unity Technologies. Standard Assets. [Online]. Available. https://assetstore.unity.com/packages/essentials/asset-packs/standard-assets-for-unity-2018-4-32351

[2] Avionx. Skybox Series Free. [Online]. Available. https://assetstore.unity.com/packages/2d/textures-materials/sky/skybox-series-free-103633