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Computer Graphics Final Project Report

The final project of this class was assigned to me during the week in which two cinematic events occurred: Avengers: Endgame, the final piece of a 22 movie saga created by Marvel, and the Battle of Winterfell, in which the Nightking was finally arriving at our favorite characters' doorsteps. So, I decided to find some meshes involving some of my favorite characters and combine the two universes in one scene.

I retrieved Thanos, the villain from the Avengers, and the helicopter from TurboSquid. Iron Man and Dragon, Daenerys' dragon from Game of Thrones, from SketchFab. Lastly, I downloaded the valley 3D model and the Night King from Free3D.com. The Thanos model was over 200 MB, so using blender, I reduced the polygon account so that I could get the model to below 50 MB to be able to convert it to json format.

In terms of my design, I stored all my models in a 2D array, the first dimension contains the actual model, the second dimension containing an array of the meshes of the model.

What was most difficult about creating these 3D models was getting them in the proper JSON format to be read from my parser. Most came in fbx format, some of which I had to convert to .obj files before converting to .json file format. On top of this, once converted to json, none of the json files had the textures incorporated in them. So I had to go through several attempts of trial and error, mesh by mesh, to see which texture matched with which mesh, changing the code in the json files accordingly. This was especially difficult with the helicopter, which had 70 meshes and 13 textures.

The textures appeared to attach to the meshes properly for all the models except for Iron Man and the Night King. After several attempts, confirming that the correct textures were with their texture coordinates, I still could not get an appealing output.

Since these models were so detailed, the scene itself is pretty slow. There is a lot of lag since there is so much going on, and also because I scaled the valley to a very large size to make the scene look more realistic.

I used two instances of motion in this scene. One: I translated Iron Man to be on top of the dragon, and then I rotated both models around a fixed point, where Thanos and the Night King stand facing each other. Doing this was easy and similar to how I figured out how to rotate the robots arm around a specific joint. What was very difficult was rotating the individual meshes of the helicopters front and back rotors, along with each individual propeller. This consisted of, once again, a lot fo trial and error figuring out where exactly the rotors center of mass was so that I could translate it to the center, set its rotation, and then translate it back to its original position.

Lighting did not seem to have that much of an effect on these models. Most diffuse coordinates were the same, and I believe shininess and specular were zero for all meshes.

If I had more time, I would have liked to explore how to blend textures to make objects look more realistic. Every model came with images accompanying each texture that involved roughness, metallic, and something called AO. I would have also liked to work more on my lighting.

This was a very cool class. I really wish I could have taken it earlier in my college career. We were just getting into the really interesting components of Computer Graphics, and I would have liked to go further to see what I could create using third-party softwares such as Three.js now that I understand the groundwork of the technology on which it operated on. The final project was a good experience to understand the tradeoffs between model size and model quality.