Brandon Graham

CS330 Comp Graphic and Visualization

Instructor – Gholam Shaykhian

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For the milestone projects with the final project in mind, I created a 3D car model. My goal here was to replicate a 2d image into a 3D scene while using techniques such as modeling, texturing, lighting, and camera navigation. I’ll break it down into sections below.

**3D Object Creation**

In order for me to build the car, I used shapes that best represented the different components. For the body of the car, a box was used as the main frame to give it a simple structure. For the wheels, I used four cylinders and added them to the bottom corners to represent tires. For the roof, a box shape was used and added on top of the body of the car. Each shape was then transformed using scaling, translation, and rotation functions.

**Textures and Materials**

To bring out its realism of the car, I then applied textures and materials. The body of the car was given a blue texture (my favorite color) to make it stand out against the background. I gave the tires a standard tire color to resemble rubber. The ground texture was added to as a showcase area for the car and represented a grassy field. The materials were set using Phong shading, which allows for ambient, diffuse, and specular lighting effects.

**Lighting Implementation**

Next, we added lightning to make the car stand out more and give it a polished look. I did this by adding a white point light positioned above the car to simulate an overhead light source. Along with a light source coming from the front to add depth and make it look more realistic. These lights were defined in my SceneManager::SetupSceneLights() function and then had to be passed to the shader.

**Camera Navigation**

In order to interact with the scene, I implemented camera movement and controls. In my project, the WASD keys will move the camera forward, backward, left, and right. The QE keys allow for vertical movement. The mouse movement will allow you to adjust the camera’s rotation. And the scroll wheel allows you to control the zoom speed. This type of setup is a standardized and intuitive way to explore the 3D car from multiple angles.

**Some of my challenges & solutions**

1. Lighting Issues – this is where I ran into the most issues with my scene. I had to spend a lot of time as my scene was too dark at first. I had to change the light intensities multiple times to ensure the objects were within the light range. I also troubleshot this by changing the color to red light to ensure my code was functioning and verified it this way.
2. Camera positioning – at first when setting up camera functions I struggled using the mouse to view my scene. This once I got these functions added it was much easier but still had to fine tune it as the starting view would cut off parts of the car.
3. Shaders – When setting this up in the final milestone for shadows in the fragmentshader.glsl. This was a bit of a learning curve for me when making adjustments to ensure the correct GLSL uniform handling for lighting and materials was correct.

Overall, this was a very fun project, and I was excited to take on each new challenge. It helped demonstrate how to build 3D models while applying textures, lighting, and interactive camera movement. It was exciting to see that my final scene successfully replicated the image I started with while incorporating best practices in an OpenGL environment.