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CS-330: Comp Graphic Visualization

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Final Project Reflection

When choosing what scene I wanted to create, I wanted it to be one that I could interact with in person so that I could examine the scene from multiple perspectives and handle the objects. I also wanted the objects to be simple enough so that they did not need to be greatly simplified when recreating them for the project. I decided to recreate my shelf of hot sauces.

The bottles of hot sauce break down into the same simple shapes. Generally, there is a cylinder for the base of the bottle and a tapered cylinder for the neck. An additional cylinder can be used for the lid if it is the type of bottle that has a flat lid. There were several types of bottles identified in the scene. Though there is nuance to every bottle in the real-life scene, I grouped the bottles into three broad categories. The first is a generic bottle that has a flat lid. The second uses the base of the generic bottle with the ring which at one point fastened the lid to the bottle hanging around the neck. Finally, a bottle was identified that has a nozzle for dispensing sauces. Each of these bottles were molded using cylinders, tapered cylinders, and, in one case, a torus.

As is the case in the real-life scene, a table forms the base of the scene which is represented with a plane. The kitchen wall is also represented with a plane. The small shelf from the real-life scene was recreated to hold the bottles of hot sauce. The placement of the bottles was motivated by their actual placement in the real-life scene.

As is often the case when recreating three-dimensional scenes, some simplifications were made. The three broad categories of bottles represent one such simplification. Additionally, in the real-life scene, each sauce has a unique color and texture. When recreating the scene a few textures were selected to add variance to the scene. These varied textures were used instead of trying to directly replicate each sauce. Furthermore, each real-life sauce has a label with detailed images. These textures are not available online. Therefore, a decision was made to recreate the scene with unlabeled bottles.

To recreate the scene, the provided resources were used. This includes predefined simple shapes. Therefore, no new meshes were defined for this project. Additionally, provided resources were used to load textures, define materials, and define light sources. Generally, a decent amount of specular lighting was used to capture the shininess of the glass bottles and the finished wood texture of the table and shelf. Material attributes were set accordingly to take advantage of the specular light. To add colored light to the scene, I imagined red curtains that we previously had which would cause sunlight that entered the room to have a red hue. To capture this feeling, I modified the directional light source to have a red tint to it.

To traverse the scene, the camera position vector was updated using the glfwGetKey method from the provided resources. When the ‘W’ key is pressed, the camera moves forward into the scene. When the ‘A’ key is pressed, a left strafe effect is created. Analogously, when the ‘D’ key is pressed, a right strafe effect is created. When the ‘S’ key is pressed, the camara moves backwards away from the scene. The mouse is captured in the display window so that mouse movement is processed correctly. The yaw is adjusted by the horizontal mouse displacement, and the pitch is adjusted via vertical mouse displacement. Additionally, when the ‘Q’ key is pressed, the camera moves up, and when the ‘E’ key is pressed, the camera moves down. The scroll wheel is used to adjust the speed of the camera. The ProcessMouseScroll method is used to adjust the speed of camera movement. Finally, the bOrthographicProjection Boolean value is set to true when the ‘O’ key is pressed. This creates an orthographic projection matrix when the frame is updated. When the Boolean is false, a perspective projection matrix is used.

To make the code reuseable and organized, the code was modularized. The LoadSceneTextures function was created to load the required textures. This makes it simple to add additional textures to memory with the addition of a statement in the function. Similarly, the DefineObjectMaterials function defines object materials which determine how light interacts with scene objects. The light features are configured in their own method called SetupSceneLights. Separating this functionality into separate methods ensures that the code remains organized.

The RenderScene method contains the logic for creating three-dimensional objects. Code for simple planes was included in this function's body as these objects consist of a single basic shape. Individual functions were created for complex objects. The three types of hot sauce bottle were each created using a dedicated method. These methods take x, y, and z coordinates for position, and a float value for scaling. Furthermore, a string with the texture label is passed to the method so that the sauce can take on different textures. These methods can be used to create bottles at different locations and scales. They are reused when creating the scene to ensure consistency and organized code. A specific method for the hot sauce shelf was also created. While this code is not reused, it was separated into its own method as it is a complex object that requires several lines of code to create.