Design Decisions

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Design Decisions for the Final Project

For the OpenGL graphics final project, I designed and implemented a complete 3D scene that represented my workspace on a wooden table. The idea is inspired by my real desktop setup. A while ago I spent a lot of money and time to get a better desk, better personal computer setup, with notebook and pen along with monitors/iPad to make my setup. That actual real-life setup was the inspiration to make the same project in graphic CMD.

The main purpose of the final project was to focus on demonstrating my understanding of a real time rendering system by combining different elements such as lighting, materials, textures, and the camera movement in a simple cohesive scene. I really wanted the result to look realistic like my own personal setup.

Therefore, I started by using a modular camera system which will allow free movement through the scene/space. The camera can move in all directions and even rotate with the mouse which gives it a first-person navigation feel how games like War frame and Call of Duty implement the movement to give realistic feel. I also added the ability to switch perspective and orthographic projects using the keyboard. In this manner, the same scene could be viewed from different angles and styles. It made it easier for me to position objects accurately during the development phase and gave the scene some flexibility for the exploration.

One of the hardest parts of this project was correctly implementing lighting. Lighting was an important part of making the scene very believable. Therefore, I installed a rectangle board, showing that some switch streamers have better lighting for their room from a huge square/rectangle LED light. For this LED light I established assorted colors with natural and artificial lighting such as a warm white light coming from the left, a soft blue tint from directional to give the objects more depth, followed by a highlight for orange point for backlight and a neutral fill light. In this way, there were not any scenes that were left gray, shadowy, or dark.

Lastly, I had to design the actual scene with materials. The materials were defined to provide physically plausible properties of the surface so that each material can include parameters such as ambient strength, the diffusion, and lastly specular colors with shininess. For example, the table I created uses the texture of rustic wood with a medium gloss material to give off the varnished surface design. The same way the laptop was designed on the table using two boxes meshes. One which represents the keyboard as the base and the second which functioned as the tilted mesh for the screen. Both objects have the same metallic looking texture as knife handle file to improve realism.

All the geometric functions in the scene were made and constructed from simple mesh primitives managed by the reusable shape mesh class. Transformations consisted of translation, rotation, scaling which were all functions combined into a model matrix to pass to the vertex shader. More textures were loaded with the subimago file to support multiple texturing for multiple items.

The project architecture design was built and constructed around modular object-oriented classes. The scene manager managed all scene composition and the object rendering. In this way it was easier to add animations, advanced materials, and even interactive components.

Some of the biggest challenges I faced with the final project were lighting balance and material contrast. Especially since originally, I had so that the laptop and the table are sharing the same texture and materials but then it made it exceedingly difficult for the shader to distinguish between the two. I managed to resolve this issue by reassigning a different texture and material parameters to the table and laptop to differ. Another issue I had was object alignment. The table legs which for some reason outgrow the table and appear from the other corner.

Overall, even regardless of some minor issues that were fixed the scene does satisfy my curiosity of experimenting with OpenGL and making my own personal scene in it with materials, textures, shapes, and lighting. The result is a scene that accurately reflects design decisions and code structure with effective use of the platform.

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