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CS330

04/17/2024

Final Project

**Justify development choices for your 3D scene. Think about why you chose your selected objects. Also consider how you were able to program for the required functionality.**

I chose to replicate an image of a desk with a keyboard, notebook, mouse, and pen because it represents a common workplace setting, making it easily recognizable and relatable to users. The objects are simple in shape, which allows for low-polygon representations while still maintaining the essential details.

To program the functionality for creating and rendering these objects, I used OpenGL's primitive shapes such as cubes, cylinders, cones, and spheres. For the pen, I constructed it using a cylinder for the body, a cone for the tip, and another cylinder for the cap. This approach allowed me to accurately replicate the shapes of the objects in the image while keeping the polygon count under 1,000 for each object.

**Explain how a user can navigate your 3D scene. Explain how you set up to control the virtual camera for your 3D scene using different input devices.**

Users can navigate the 3D scene using a combination of keyboard and mouse controls. The WASD keys control the forward, backward, left, and right movement of the camera, while the QE keys control the upward and downward movement. This setup allows users to explore the scene from different angles and perspectives.

I implemented nuanced camera controls using the mouse cursor to change the orientation of the camera, allowing users to look up, down, left, and right. The mouse scroll is used to adjust the speed of the camera's movement, giving users more control over their exploration of the scene.

Additionally, users can switch between perspective and orthographic views of the 3D world by tapping the 'o' key for orthographic view and the 'p' key for perspective view. This functionality changes the viewport display of all objects in the scene, switching between 2D and 3D views while keeping the camera in the same orientation. This feature enhances the user experience by allowing them to choose the most suitable view for their needs.

**Explain the custom functions in your program that you are using to make your code more modular and organized. Ask yourself, what does the function you developed do and how is it reusable?**

I created the Pen() function to encapsulate the logic for constructing the pen object. This function uses tip(), and cap() functions to create the different parts of the pen. The Pen() function constructs a cylinder for the body of the pen, the tip() function creates a cone for the tip of the pen, and the cap() function generates another cylinder for the cap of the pen. By breaking down the creation process into smaller, reusable functions, I can easily adjust the size, shape, and position of each part of the pen independently.

Additionally, I implemented the texture function to apply textures to specific objects in the scene. This function takes an object and a texture as parameters, allowing me to easily apply textures to different objects as needed. By separating the texture application logic into its own function, I can apply textures to objects in a modular and organized manner, enhancing the readability and maintainability of my code.

I implemented the SetupSceneLights() method to configure the light sources for the 3D scene. This method is crucial for enabling custom lighting in the shaders and setting up the properties of up to four light sources. Each light source is defined by its position, ambient, diffuse, and specular colors, as well as its strength and intensity.

I used this method to ensure that the 3D scene is well-lit and visually appealing, enhancing the realism of the rendered objects. The method also contributes to the modularity of my code, as it allows me to easily adjust the lighting settings and add more light sources if needed in the future.

Overall, these custom functions enhance the modularity and organization of my code, making it easier to maintain and expand the functionality of the 3D scene in the future.