### **Reflection: Development Choices**

**Development Choices Justification**

In developing this 3D scene, I focused on creating a functional and visually clear representation of basic 3D shapes, applying basic textures, and implementing fundamental lighting and navigation features. Here’s a breakdown of my development choices:

1. **Object Representation**: I chose to use basic shapes like a box, cylinder, and sphere to keep the implementation straightforward and to clearly demonstrate the fundamental concepts. The functions for drawing these shapes are designed to be reusable, which allows me to easily create and adjust these objects within the scene.
2. **Textures**: For texture mapping, I used stb\_image to load and apply textures to the cylinder and sphere. This approach was chosen to demonstrate basic texture application without diving into more complex texture management techniques. The textures used are simple, and I did not combine multiple textures or create advanced effects.
3. **Lighting**: I implemented multiple light sources to illuminate the scene and provide basic realism. The lighting setup includes ambient and diffuse lighting, which ensures the objects are visible and highlights fundamental lighting principles. I did not include more sophisticated techniques, such as Phong shading, due to the project's scope.
4. **Navigation**: I implemented basic camera movement controls using the keyboard and mouse. The controls allow movement along the X, Y, and Z axes and basic rotational adjustments. This setup provides essential interaction with the scene while keeping the implementation straightforward. More advanced features like smooth transitions or adjustable movement speed were not included.
5. **Projection**: I added the ability to switch between perspective and orthographic projections to showcase how different views affect the visualization of the scene. This feature is important for understanding the impact of different projections on the scene.

### **Reflection: Navigation**

**User Navigation Explanation**

The navigation system I developed allows users to move the camera around the 3D scene with the following controls:

* **W, A, S, D**: Move the camera forward, left, backward, and right, respectively, facilitating basic horizontal navigation.
* **Q, E**: Move the camera up and down, providing vertical movement options.
* **Mouse Movement**: Adjusts the camera’s yaw and pitch, enabling users to look around the scene by moving the mouse.

These controls make it possible to explore the scene effectively. While the current system covers the basics, adding features like smooth transitions or adjustable camera speeds could further enhance the user experience.

### **Reflection: Custom Functions**

**Custom Functions Explanation**

I created several custom functions to streamline and organize the rendering process:

* **drawBox**: This function draws a cube centered at a specified position with a given size. It demonstrates basic vertex drawing in OpenGL.
* **drawCylinder**: This function draws a textured cylinder using GLU quadric objects. It simplifies creating cylinder geometry and applying textures.
* **drawSphere**: Similar to drawCylinder, this function draws a textured sphere using GLU quadric objects.
* **loadTexture**: This function loads a texture from a file and applies it to the currently bound texture object. It abstracts the texture loading process and sets texture parameters.

These functions help organize my code by encapsulating specific rendering tasks, making it easier to manage and modify. I could improve by adding more detailed documentation and further encapsulating repetitive code to enhance clarity and reusability.

This reflection highlights my development choices, the navigation system, and the use of custom functions, offering insight into my implementation and areas where I could make improvements.