Design Decisions

1. Justify development choices for your 3D scene.  
   From my reference image, I chose to replicate the following objects from the Tesla Model 3 interior:  
   1. Dashboard: I used a curved cylinder to represent the streamlined design that Tesla is known for
   2. Touchscreen: I used two vertical boxes placed on top of each other, with the display box being slightly smaller than the actual screen to mimic the screen bezel.
   3. Steering Wheel: To make it seem realistic, I used the torus shape to form the round steering wheel and used a small box to represent the central area for the airbag. I also used a cylinder to connect the steering wheel to the dashboard.
   4. Seats: I used two boxes joined together with a leather texture to make the seats. The box that represented the back of the seat was slightly angled to give an ergonomic touch to the seat.
   5. Center Console: I used one long box and one small one to represent the center console that also divides the car’s interior into two separate areas. The smaller box was used to replicate the cup holder.

I used the specific objects because they define the brand identity of Tesla with its clean and minimalistic interiors. Also, the objects could be replicated with low-poly basic shapes and could be differentiated through the use of different textures and materials.   
  
For the textures, I used high-resolution royalty-free textures that represented materials like leather, plastic, as well as the screen display. All this was handled by the CreateGLTexture() method, which loads the textures consistently. As for the lighting, I used a Directional light to simulate the sunlight and a point light to mimic the interior cabin lighting of a Tesla. I used the phone shading with properties like ambient, diffuse, and specular to highlight the materials used in the objects.

1. Scene Navigation:  
   For the navigation, I used code to implement the following functionalities:
   1. W Key to move forward and S key to move backward
   2. A Key to strafe left and the D key to strafe left
   3. Q Key to move down and E Key to move up
   4. The cursor is used to control camera orientation, and the mouse scroll is used to adjust the movement speed.
   5. Users can also toggle between perspective and orthographic views by pressing the P and O keys, respectively.
2. Explain the custom functions in your program that you are using to make your code more modular and organized.  
     
     
     
     
   CreateGLTexture(std::string tag, const char\* filename)

It loads and sets up OpenGL textures.

Reusability: Creates mipmaps, handles any picture format, and tags images for convenient access.

CreateGLTexture("textures/leather.jpg", "dash") is how to use it.

SetTransformations(position, scale, rotX, rotY, and rotZ)

Uses model matrix manipulations for this purpose.

It combines transformations in the best possible order (translation → rotation → scale) and is reusable.

Use: Consistently positions every object.

Use the std::string tag to set the shader material.

Applying predetermined materials (diffuse, specular, and shiny) is the goal.

Reusability: Consistent item appearance is made possible by material databases.

Use: For the touchscreen, setShaderMaterial("glassscreen")

SceneLightsSetup()

Its goal is to configure every light source.

Reusability: Adding or removing lights is simple with centralized light management.

Qualities: Point and directional lights with color controls

The advantages of structure:

Concerns are divided into separate sections for rendering (RenderScene), preparation (PrepareScene), and resources (textures/materials).

Reusable Parts: ShapeMeshes mesh classes enable single-load/multiple-use

Shader Manager: Rendering code abstraction for uniform value handling

Tag-Based System: Materials and textures that are referred by tags rather than hardcoded IDs

Because this architecture reused existing texture/material systems, it was possible to iterate efficiently; for example, adding the steering wheel only took 10 lines in RenderScene().