A picture containing green, indoor

Description automatically generated

Above is one of the pictures I used to lay out my scene. The objects in the scene are the tabletop, a bullet, a deck of cards, a six-sided die, and a four-sided die. The bullet was the complex object in this scene. It was made using a cylinder for the casing and a warped sphere for the projectile. For the other objects in the scene, the cards and the six-sided die were made using cubes, the table was made using a plane, and the four-sided die was made using a triangular pyramid. When texturing the objects, I had to pull from a limited number of images that were marked for use under the creative commons license. The table is textured using grass weave for a tablecloth. The cards were textured using a checkerboard card box pattern. The dice were textured using a patterned felt-like pattern that most closely mimicked the frosted, red plastic. Two spheres model the light sources in the scene. These lights come from the sun outside the window and an overhead light. A gray background shows the wall color in the above picture.

Camera control is provided by the use of the keyboard for movement in 3D space, the mouse movement for look-direction, the mouse wheel for movement speed, and the P key for the view mode. The WASD keys control forward, backward, and sideways movement. Q is used to move upwards, and E is used to move downwards. The direction the camera is pointing can be changed by moving the mouse. There is no way to roll the camera, but moving the mouse will control the pitch and yaw of the camera. Using the mouse wheel, the camera will move faster or slower through the scene using the movement keys. This does not affect the look speed. When the P key is pressed, the scene will change to either the perspective or orthographic modes, depending on which view mode is currently used.

Many functions were used to make this program modular and organized. From first to last, the flipImageVertically function is used to fix the orientation of images loaded into OpenGL. UInitialize is used to initialize the window and the event call backs that involve the window. UProcessInput processes are keyboard inputs like the movement keys, the view mode key, and the escape key. UResizeWindow changes the size of the window. UMousePositionCallback is called when the mouse is moved and changes the camera look direction. UMouseScrollCallback finds the mouse scroll and uses it to control movement speed. URender is used to build the objects, textures, colors, and lighting, and it renders the scene to the GPU. UCreateTexture and UDestroyTexture load textures in and destroy textures from memory when they are no longer needed. UCreateShaderProgram and UDestroyShaderProgram load and destroy the shader program.