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Final Project

For the client Triangle & Cube studios, I was tasked with delivering a 3D approximation of a 2D picture provided by them. The provided picture showed a landscaped garden with several trees and bushes throughout. Because this was just an approximation, basic shapes were chosen to represent the garden in 3D. Using OpenGL and C++ I was able to provide a suitable approximation using the primary shapes cylinders, pyramids, squares, and planes. Because this was an approximation, the triangle count was kept to a minimum to keep the program lightweight, quick, and easily adjustable. Further towards this cause was the decision to implement functions to keep a lot of the program modular. The program can be navigated with an implemented camera, that helps to view and navigate the scene. The following paragraphs will explain how and why each of these decisions were made.

Starting off with the visual model itself, to simulate the floor, a large plane was made from two large triangles for all the other objects to sit on. I paired this with a sandy, rock like texture to try to mirror the provided picture. There are several trimmed bushes throughout that I chose to represent with squares consisting of twelve triangles each (two per side). With modifications to the vertex positions, I was able to change the size and shape of the square to represent the bush more accurately. This was paired with both a lighter colored leafy texture and a darker leafy texture. Because triangle count was being kept to a minimum, the textures were stretched to fit the larger triangles. All the trees on the left side and the middle, were represented by rotated pyramids matched with a darker tree leaf texture. On the right side of the scene the larger trees were represented with a cylinder, which consisted of about ten triangles to smooth out the roundness of the cylinder. Due to the deadline, and more complex nature of rendering cylinders, the textures appear very stretched and unrecognizable. The decision to stay with this despite the poor texture was made to demonstrate a more structurally accurate model as well as introduce variety into the scene.

In order to properly view this scene, a camera object was implemented that allows for custom views and navigations through the model. The camera object utilizes several callback functions that gives functionality that is mapped to the standard keyboard. The option to toggle from orthographic point of view toggle back to a 3D point of view was added to help give different perspectives of the model. The keys Q, W, E, A, S, and D are all used for movement, while P controls the orthographic toggle. In order to more quickly navigate through the scene, the scroll wheel was also modified to increase and decrease the camera movement speed based on the direction scrolled.

To keep the program more lightweight, on top of the low triangle count, several functions were made modular. The camera object, the shader functions and the cylinder rendering was kept separate from the main function and could easily be implemented in future programs. Also, rather than generating many different vertices and indices, transformations were used in combination with loops to render many different shapes from a few base shapes. All trees on the left were generated from one set of pyramid vertices and all bushes from one set of bush vertices and transformations. These design decisions all add up to this 3D model of a landscaped garden.

Works Cited

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