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EECS 672- Project 2 Report

Idea

With the necessary skills to create a 3D scene, I really wanted to model a real-life outdoor view. I love nature, trees and spending time outdoors, which is why I chose the scene of a park bench under some trees on a spread of lush green grass. There is a bench in potter lake that I often visit, which is a simple concrete bench with a flat seat, which I thought would be achievable to simulate using blocks. I thought the conical look of a tetrahedron would be a good model for the trees along with a cylinder for the trunk. I generated many little tetrahedrons as the blades of grass, which ended up looking pretty close to how I visualized it.

Generation of the Model

Grass

- I used the code from tetrahedron in the M and M example which I thought would be a good life-like model of one blade of grass— each class object is one blade of grass.
- To simplify understanding and creating the geometry:
 - I used a circle around the three points of the base of the blade of grass with the vertices at 0, 120 and 240 degrees to be equally positioned and the height vertex to be positioned in the center of the circle.
 - The trunk is 3/8th of the height passed in, which is the total height of the tree
 - I added a random offset when I added each model to make it look more natural, rather than a uniform looking rows and columns of a carpet-like grass.
- The ground is on the XZ plane, which is where I generated the patch of grass. I started out with 100x100 points but spaced it out 5*x which was too much. I tried a 20x20 loop instead 100x100 turned out to be better for a denser patch of grass.

Tree

- The tree's constructor takes in the height, the center coordinate of the bottom of the tree's trunk, and is made of a cylinder for the trunk and tetrahedron leaves.
- I set the height of the trunk to be 3/8th of the total height of the tree, and had to change the orientation to vertical from the original horizontal.
- I added eight trees close together to create a realistic scene of a natural park. With an average height of 20-30 ft., there are 4 of them on z=0 and 4 on z=15.

Bench

- Something I did different from tree and grass is that I borrowed the block class after implementing it in the M and M example. I then created 5 objects of the block class and rendered a bench. I realized halfway through the project, after I had implemented grass and trees, that I could have done this earlier to create modularity. However, the functionality worked, so I decided to continue that way with Dr Miller's approval.
- I set constant dimensions of the height, length, width, thickness of the seat, and a concrete grey color for the rgb values. I used those to pass in parameters to the block constructor by adding and subtracting lengths and heights as necessary. I modelled the leg as a cuboidal structure with a square cross section which is denoted by 'legDimension'. I had to subtract it when adding length to calculate the other leg on the same side ($x_{min} + \text{length} - \text{legDimension}$). This made sure that the leg was contained within the perimeter of the seat instead of being right outside.

Meeting Project Specifications

- I used three concrete model view subclasses- tree, bench and grass using code from the block, cylinder and tetrahedron from the M and M example.
- The MC bounding box was set perfectly and the initial eye was adjusted a little higher to give the best view of the scene.
- The mouse motion was handled to go the opposite way as the cursor movement.
- I implemented the basic phone shader model using the equation discussed in class.
- All views-orthogonal, perspective and oblique gave a reasonable view of the scene.

Challenges and Difficulties

- I initially had issues understanding how the cylinder was being generated with 18 points.
- Positioning things in the scene started off as an excessive amount of trial and error.
- My initial eye had to be adjusted by adding a vector to have a higher line of sight, so it looked a bit like looking down on the view.
- Randomizing my grass within the bounds of the other objects was hard because I was having trouble deciding which values to tweak to keep them contained within the patch.
- I thought it would be a lot of work created all 4 legs of the bench but using an initial coordinate and setting constant lengths and width dimensions were very helpful.

Unique Features I created a patch of soil underneath the grass to create a realistic effect using a thin cube of brown color and a -0.01 y coordinate to go underneath the patch of grass. It did not feel necessary to create a separate class for this implementation, and so I added it to my addGrass function in main. Some of my friends could not tell that the grass was just a collection of mini tetrahedrons, and instead thought it was a very basic texture that I had applied. I think with my limited skills, using tetrahedrons turned out to be a good idea.