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CS330 M7

Final Project

Justify Development choices for your 3D scene

* Meshes
  + In being limited to just a handful of basic primitives, I focused more on how to make some of the more interesting shapes in my scene without adding so many parts that it would start to be difficult to run.
  + The lamp post and ground were the first elements of my scene. Both of these were relatively easy to make with just a few parts.
  + Next up were the benches and fences. These had more details involved in their general form so in order to depict these I decided to use textures on planes. This choice let me keep the actual surfaces that these elements were drawn on down to 3 or 4 while maintaining most of the detail required in making them recognizable.
  + Last was the trees and leaves. I created a leaves texture like I did for the benches and fences and then drew them onto planes both in the sky and on the ground to simulate the leaves that are prominent in my source image. The trees were then made by procedurally drawing cylinders. I was hoping that this could be more randomized between the trees but because this function was being called inside of the rendering loop any randomness would make it regenerate every frame which looks less like a photo and more like a bug. In the future I would try to fix this with some kind of clever caching strategy where I randomly generate the data once and then cache it somewhere that can then be accessed in a more procedural way by my recursive function but that would likely be an entire project in itself on top of what I already have.
* Textures
  + For my project I got all but the tree’s wood texture by drawing the textures using a painting app. While it’s clear that the surfaces are less high fidelity this way, it did allow me to use unique techniques for rendering some elements of the benches, fenceposts, lamps and leaves.
  + We also only used the albedo textures to inform the colors of the geometry instead of having other textures like normal maps or secularity textures that would help with realistic lighting or more visceral details in the textures.
  + While I see the benefit in textures from resource packs or other online sources, I do think that developing the skill to work on my own textures gives me more flexibility in how I design a scene. I would like to be able to add more detail to my scenes but I don’t feel great about having that detail come from something I just copied from somewhere else, cause then it’s harder to really say that it’s my own.
* Lighting
  + I think that the lighting in my scene is probably the weakest point. While calling it laziness wouldn’t be the worst thing, I have weak lighting because I thought that the effort I needed to put into other places would have better returns from the time investment especially since most of the interesting lighting elements from my scene I perceive as coming from complex phenomena like subsurface scattering in the leaves, harsh shadows on some of the trees, and even somethings I might want to add artistically for a later pass like god rays near to the end of the path way or caustics coming off of the lamps.
  + Proper lighting and reflections are something that can drastically change the mood of a scene but for my scene all the lighting features I would want to implement felt out of the scope of both the course and the tools at hand. I’d like to learn more about lighting, but I’m also plenty content with letting most of the light be diffuse and focusing my attention more on the elements in the scene instead.
* Compromises
  + I admit in many ways, my source image was a bit ambitious for this kind of project. I think that if any random person saw both side by side it would be obvious that they are depicting similar things but what really makes the difference between the two is the level of detail in the photo far surpasses the amount of detail I was able to add with the time I was willing to put in. this fact was definitely exacerbated by having a great deal of time needed to be spent on much more trivial things like manipulating the 3D primitives into position or drawing and rendering the textures manually, or creating algorithms to position large quantities of my objects into the scene instead of just being able to copy paste them.
  + Another issue I haven’t mentioned elsewhere yet is the clipping issue with transparent textures occluding other elements behind what is supposed to be transparency. While rendering the elements from the back of the scene to the front has helped significantly in making this less of an issue, the problem means that the scene only really looks good from one angle.

Explain how the user can navigate your 3D scene

* The scene was designed around being viewed from the default camera so moving around will only make it look worse bit it is a good way to see how the scene was constructed.
* WASD will let you move around in the screen
* E and Q will go up and down in the scene
* Mouse movement will let you look around the scene
* Scroll wheel will speed up movement through the scene
* There is also an option to switch between orthographic and perspective projections with O and P but this isn’t that useful in my opinion and would probably be something to remove in a later version.

Explain the custom functions in your program that you are using to make your code more modular and organized.

* Most of the custom functions that I implemented were to help with rendering a lot of the same object over and over again. Since many objects in my scene were just the same element repeated many times, I was able to make a function to put one of those elements at a given position and then call it multiple times with different positions.
* I also have a couple of helper functions that do some math operations for me especially when I want a complex matrix calculation to do something that is intuitively pretty simple like rotating one of the branches of the trees, having a function instead of an equation can make the code significantly more readable.