Zach Schneider

CS 450 Final Project Report

Proposal Text:

For my final graphics project, I'd like to replicate a miniature version of The Battle of Wolf 359 from Star Trek: TNG. My scene will involve 3 starships: One Borg cube and 2 Starfleet ships. The ships will be flying around each other (likely the 2 ships flying in a circle around the cube) firing phasors and torpedoes at each other.

The cube will be a simple cube model, with a ship texture placed on all sides of it. The starships will either be created as .obj files in Blender or imported from free 3D modeling sites. I will attempt to apply appropriate textures to the starships as well. The phasors and torpedoes will be animated, flying towards to opposing ships. These weapons will be light sources, and I will apply shader lighting if possible, but will revert to the previous method of OpenGL lighting if that proves too difficult. These lighting effects will illuminate the various ships, in addition to an ambient light source (perhaps a nearby star).

If time allows, I'll add extraneous features such as a starry background, explosions on weapon impact, more elaborate ship movement animations, etc.

What I Did and Differences from Proposal:

I largely accomplished what I set out to do in my initial proposal. I have the 3 ships: one stationary Borg Cube that is textured, and 2 starships from an obj file flying around it. I was not able to texture these obj files as the images that accompanied the files were broken into dozens of pieces. After a good deal of time spent trying to texture the starships, I abandoned that course as it never looked good during my attempts.

I also implemented torpedoes being fired from one ship to another. The torpedoes are light sources, and they use fixed-function OpenGL lighting. I only used torpedoes instead of also using phasors, as I felt the tools within OpenGL to animate beams of light were a bit beyond my comprehension at this time. To add additional light sources to the scene, I added two textured

spheres as stars on either side of the battle. Lastly, I created a huge cube, textured on all sides with a star pattern to create a starfield background for my battle.

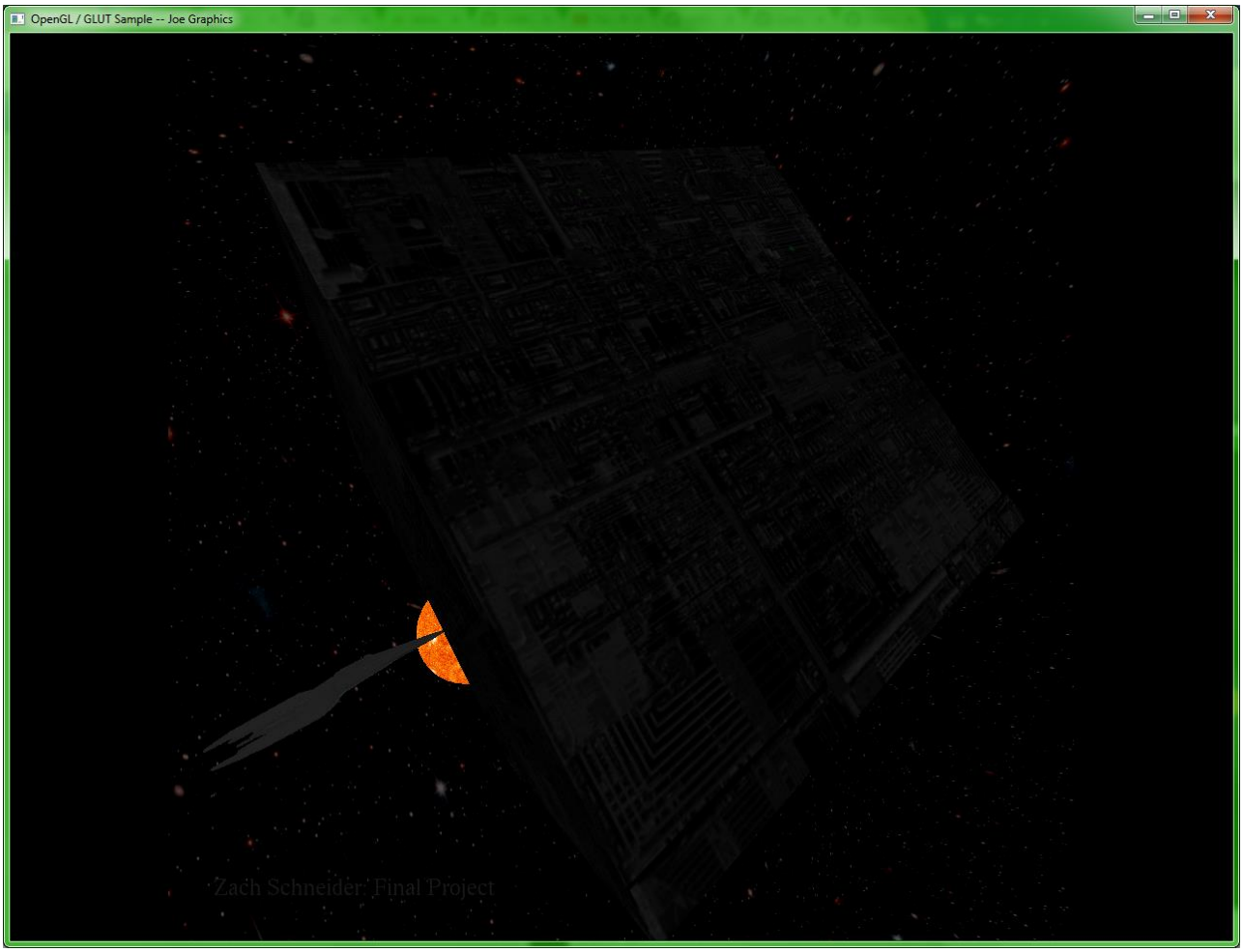
Cleverness:

Many of the tricks I implemented to create this scene were related to the motion of the ships and the torpedoes. In order to get the ships to always face their direction of instantaneous velocity as they translated around the cube, I had to rotate the ships in relation to the animation run time as well as a specific angle. I attempted to find this angle mathematically at first, but opted to eyeball it in the long run. Additionally, in order to have the torpedoes disappear upon impact on their respective enemy ships, I only rendered the sphere and enabled that light when the torpedo was traveling over certain portions of a Sin function. This worked well when I made my total animation time divisible by 4, as it made calculating the Sin values more intuitive.

What I learned:

I probably learned more about graphics and animation from things I *didn't* implement in this project than things I did. The first example of this was when I attempted to import my obj files for starships. I learned more about the relationships between vertices, edges, faces and normal within objs, as well as their accompanying mtl files that often detail color and texture information. I also learned about cube maps and sky boxes (what they are and what they can be used for) when I was thinking of ways to create my starry background. Though I just implemented a single texture solution, I'm aware of those concepts now. Lastly, I had a bunch of trouble with getting textures to apply to my obj models early on, and learned a lot about different ways multiple textures can be applied to a model.

Images:


OpenGL / GLUT Sample -- Joe Graphics
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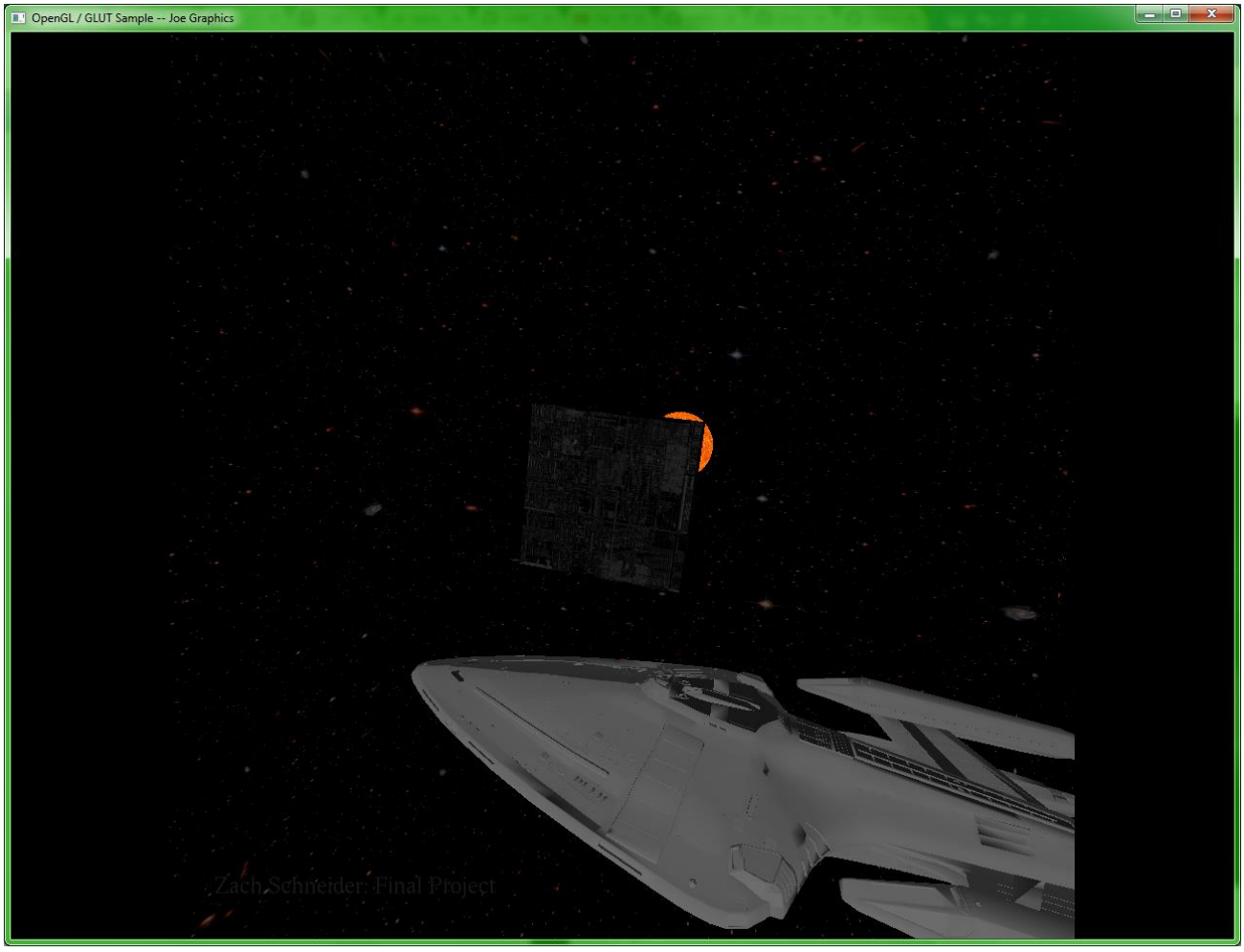
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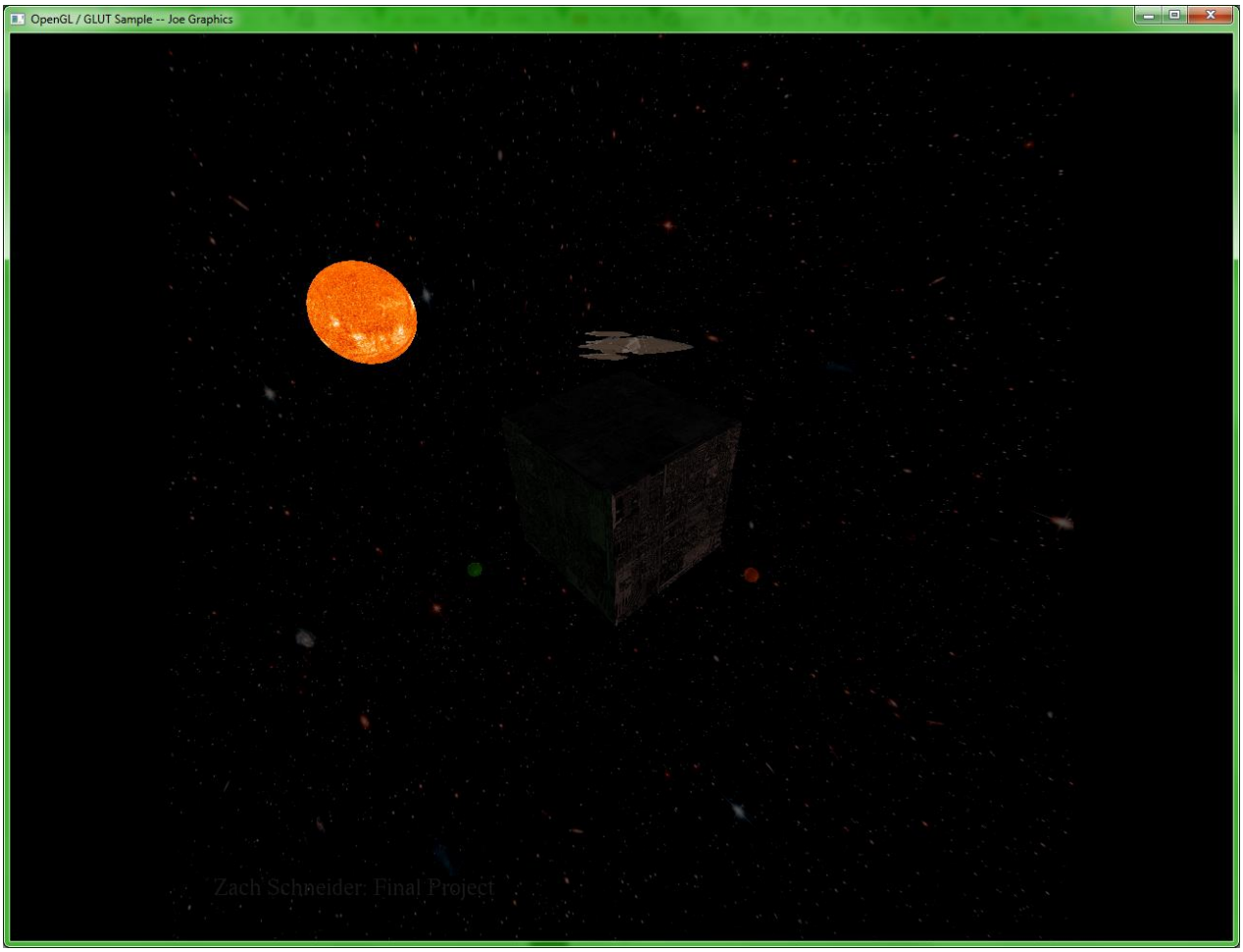
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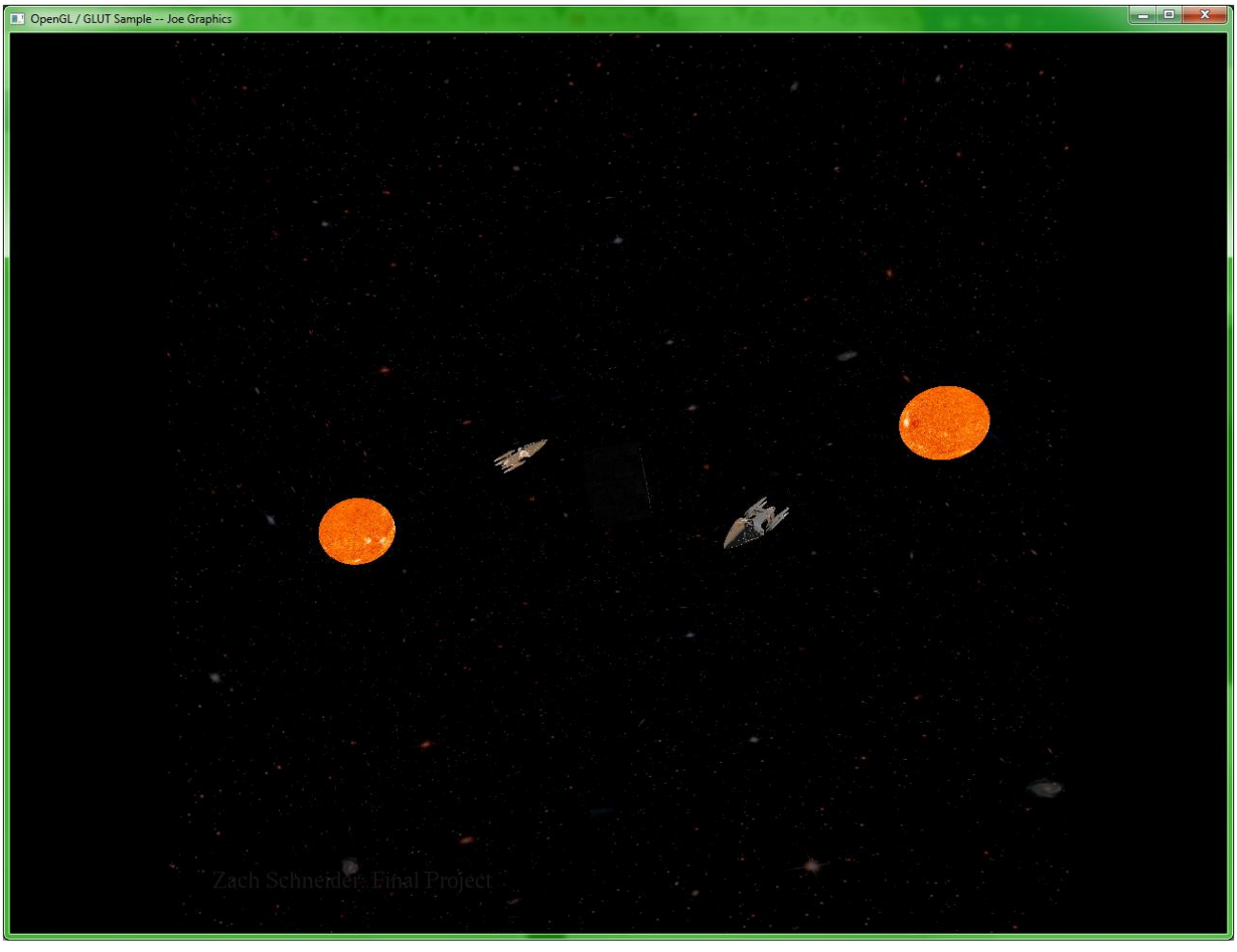
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