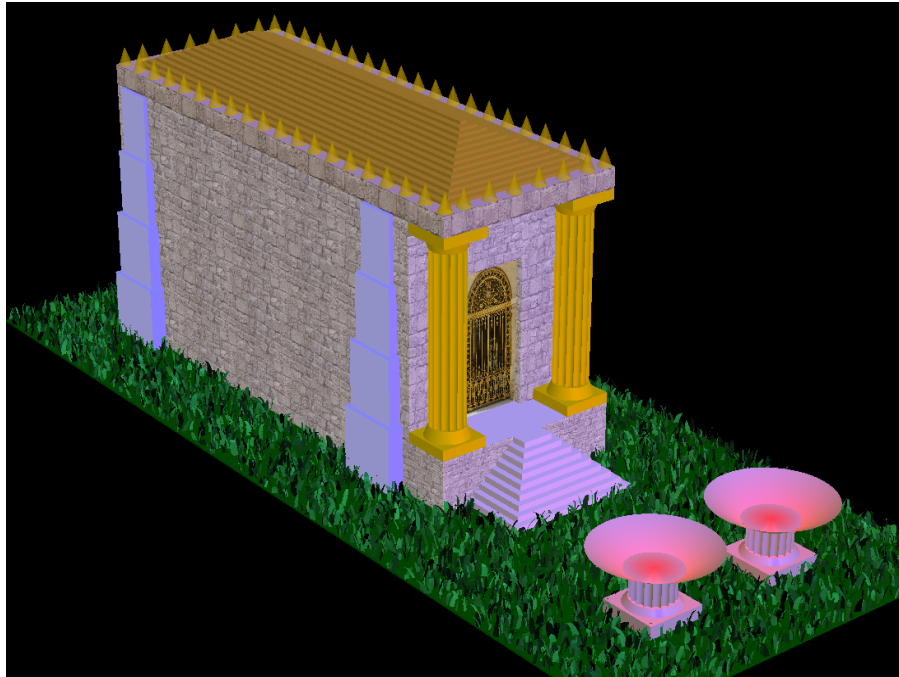# Project 4 Additions Documentation

Paul Kline

The idea behind your project and/or where you got the idea:

No change.

How you generated your model:

Fixing the memory map dump took quite a bit of time--a couple weeks here and there actually. I started by commenting out my entire main method, and adding models back in one by one to find the first perpetrator. I was able to render a block just fine, but the addition of stairs caused a memory dump and a "double free or corruption error." This was troubling since stairs is simply an array of blocks. But the problem went away when I no longer deleted the coords array in the Block class. The only conclusion I can come up with is perhaps since I used new to create it but it was of fixed size (8 vec3's -- x,y,z for each corner), there was some optimization going on behind the scenes that resulted in a memory dump when I tried to delete coords in the destructor. The weirdness may also come from the fact that coords is an array of vec3's which is a typedef of float[3].

I suppose compared with the difficulty I've had with lots of other things in previous projects, texture mapping wasn't too bad. I found a website that let me download a small number of textures for free so long as I promised not to give them out to people. I found a stone texture I liked and a door texture I liked as well. I've added parameters to the block constructors to indicate: which texture should be drawn if any, and which part of the temple each block is (if any). This allows me to draw a door or the stone texture depending on the specified texture, and with the particular temple part parameter of each block, I can scale the stone texture appropriately over the entire surface. So for the main part of the building, I tile the texture 5 times across and 3 times upwards. In order to have the doorway inset, the front of the temple is actually somewhat of a facade and is made up of 3 fairly thin blocks--one on the left and right sides, and one along the top. If examined closely, one can see the texture not quite matching up with the rest of the main building, but it is in fact reasonably scaled. To have this reasonably scaled look was the motivation behind specifying which part of the temple each block was. To handle textures in the fragment shader (aside from boiler plate stuff), I found what looks the best to me is half the color comes for the texture and the other half comes from the color from the lighting model.

To make objects translucent, I followed the fragment shader method we covered in class. To do this, I added 2 (public) uniforms to ModelViewWithLighting that indicate if the scene has translucent objects and if we we are currently drawing opaque objects or not. Then in my MyController class, handleDisplayCallback draws everything twice-- the first time through drawing opaque objects and the second time drawing the translucent ones. The Column class (the class used to create the cones along the top of the temple) now has another constructor where the opacity can be specified. The opacity of all the cones (Column class instances) on the top of the temple are halfway translucent.

To enhance geometry, I added a set of stairs to the roof to give it a more steepled look. I also like that this addition makes the SuperFancyColumns holding up the roof seem more necessary. The difficulty here involved placing this decorative roof in the center of the roof, and tweaking parameters (stair height, width, number, etc) to what I liked best.

The way you met project specifications:

1. I have elaborated the geometry of my scene by improving the roof and also fixing the memory problems caused by the geometry.
2. Many more than 2 surfaces have textures, (all sides of the Temple) and 2 different texture maps were used--the stone texture for the walls and the door texture for the Temple door.
3. The decorative cones around the top of the Temple roof are now transparent, but nothing else is.
4. This project report.

All the interactive controls your program supports so that I know how to use them:

No additional controls.

The thing (or things) that caused you the most difficulty while developing the project:

Texture mapping was somewhat labor intensive, but didn't actually cause me too many problems. I had a little more difficulty with getting the translucency working, but the online materials helped me along enough to help me see what I was doing wrong. Finding and fixing the memory seg fault brought out the private investigator in me. All in all there weren't huge roadblocks in the project at least in comparison to previously encountered roadblocks in previous projects.

Any unique things you did in the project that you especially   want me to notice while grading:

I'd like to point out the texture map 'lines up' around corners. i.e. it really looks like stones! Also the roof is tuned to appear to be one row of larger stones all the way around. This is actually accomplished by tuning the texture map on the roof to be just the first row of stones of the texture   map.
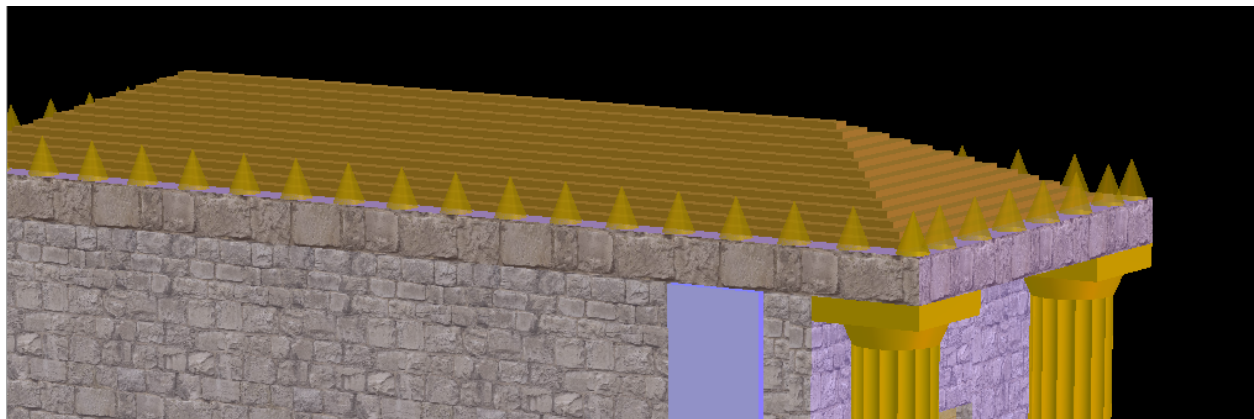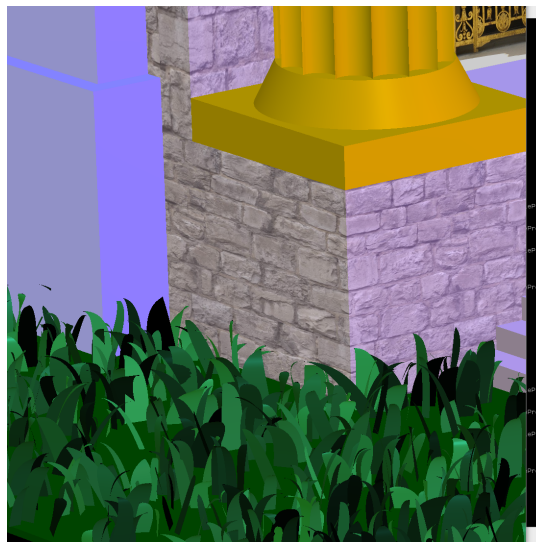
Any extra credit functionality you added.

None as of yet.