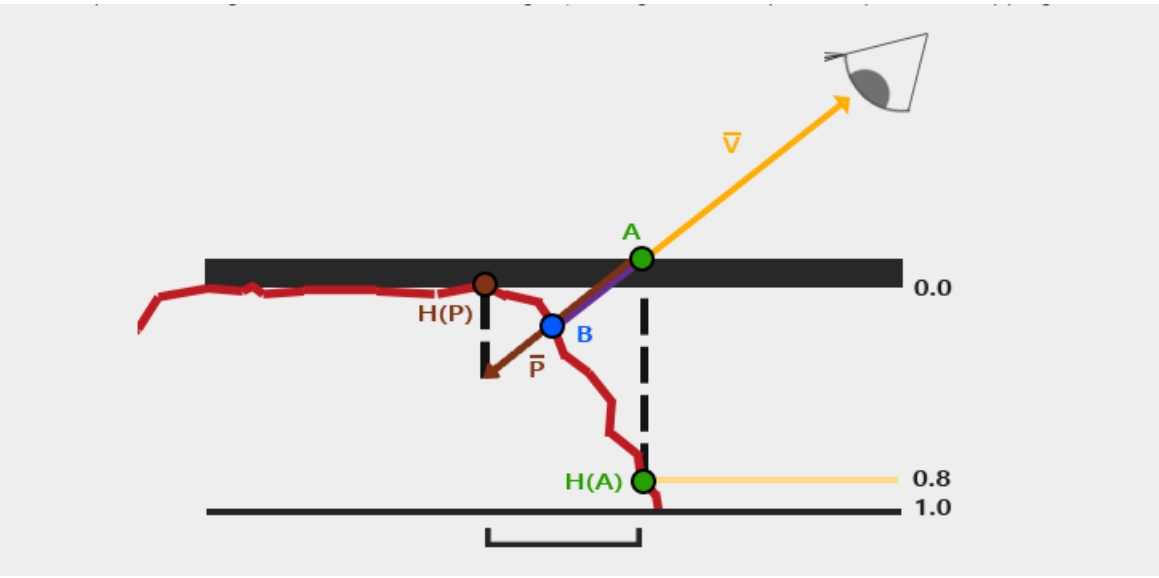
CS562: FINAL PROJECT
PYRAMIDAL DISPLACEMENT MAPPING

SYNOPSIS

Parallax mapping is a technique similar to Normal Mapping but completely different principles. In Normal mapping texture values are used to give a sense of depth by changing the normal of fragments. Light calculation is done base on the position and the normal to every pixel. Normal can be found out by supplying a different normal texture. Normal Texture can be created using image editing softwares.

Another technique to give a sense of depth is by displacement. We displace the vertex with respect to the eye vector to get the desired depth. Displacement can be by increasing the height or by pushing it down thus increasing the depth.

IMPLEMENTATION



Here the red outline indicates the height map. Vector V represents the surface to view direction. If the surface had actual displacement, then the viewer would see the point A on point B. We can obtain vector P by subtracting V from the texture coordinate at point

A. We can achieve the depth value by subtracting the sampled height map values from 1.0.

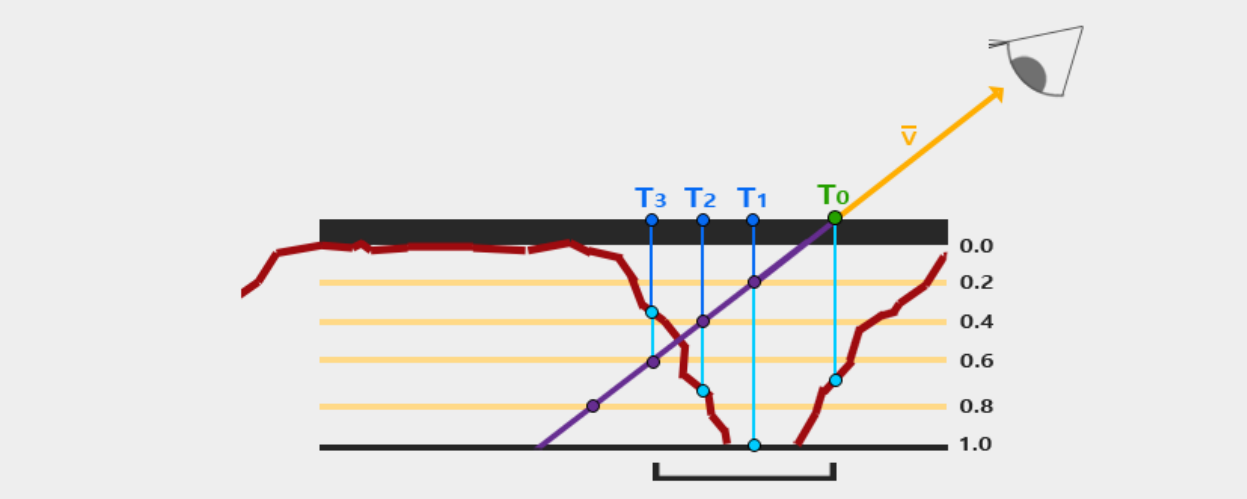
I sent the following data to the Fragment Shader:

- Position
- Viewer Position

I implemented the parallax mapping login in the fragment shader. Displaced texture coordinate is calculated using fragment's texture coordinate and fragment to view direction.

LAYERED PARALLAX MAPPING

I subdivided the image and the height map in to 200 sub layers. For delta value I used 1/numLayers. In this case 1/200



We traverse the depth layer from top to down by comparing the depth value to the depth value stored in the height map. If the depth value is less than the height map's value then it simply means that this part of the layer is not on the surface. For example:

We can see that the Height map value at the second layer (D(2) = 0.73) is still lower than the second layer's depth value 0.4 so we continue. In the next iteration the layer's depth value 0.6 does become higher than the height map's sampled depth value (D(3) = 0.37). We can thus assume vector $\bar{P}\bar{P}$ at the third layer to be the most viable position of the displaced geometry. We can then take the texture coordinate offset T3T3 from vector

P3¯P3¯ to displace the fragment's texture coordinates. You can see how the accuracy increases with more depth layers.

RESULT

Figure 1: Final Image with Parallax Mapping

Figure 2 Result from a different angle

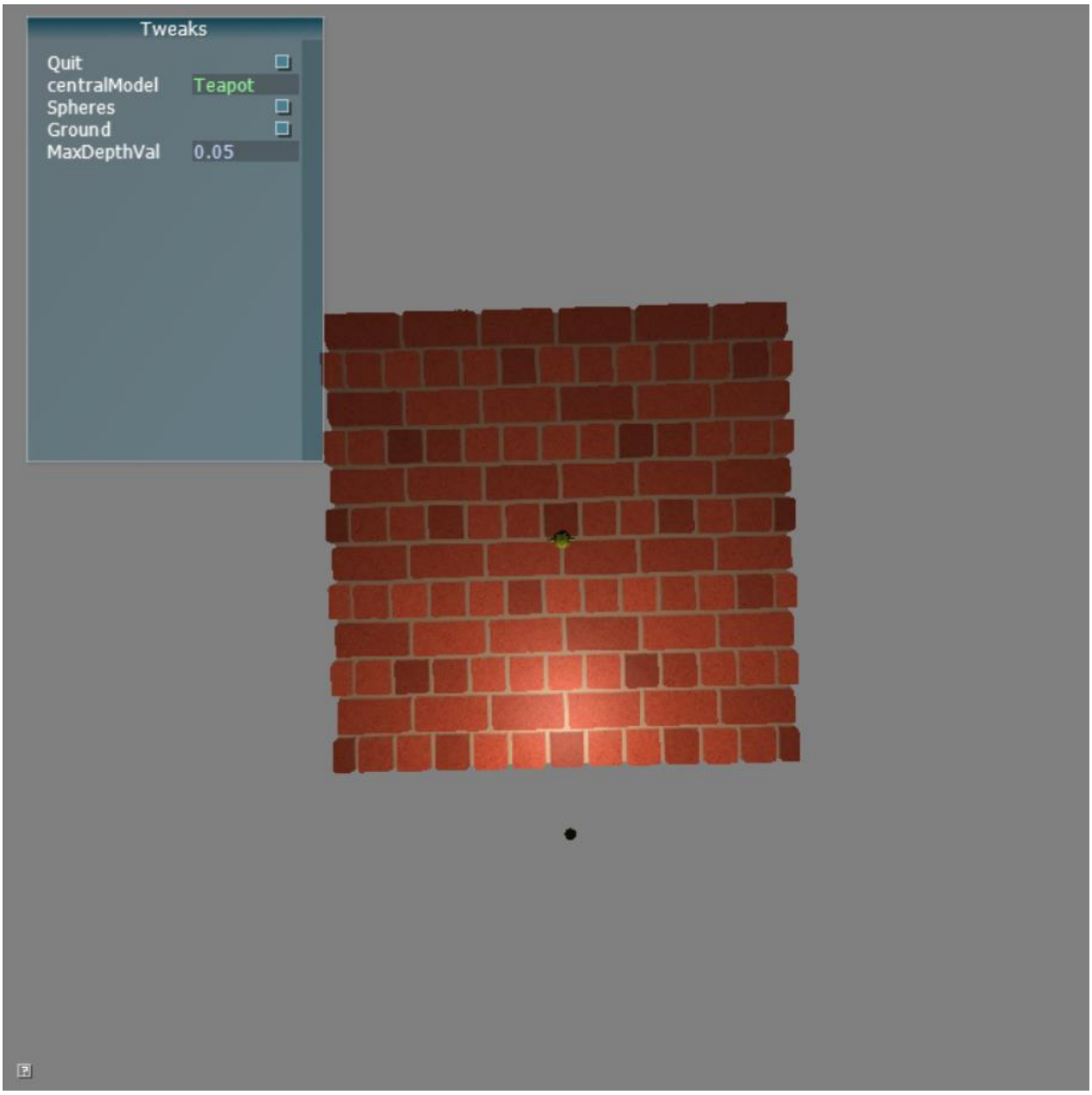


Figure 3: Ideal for walls

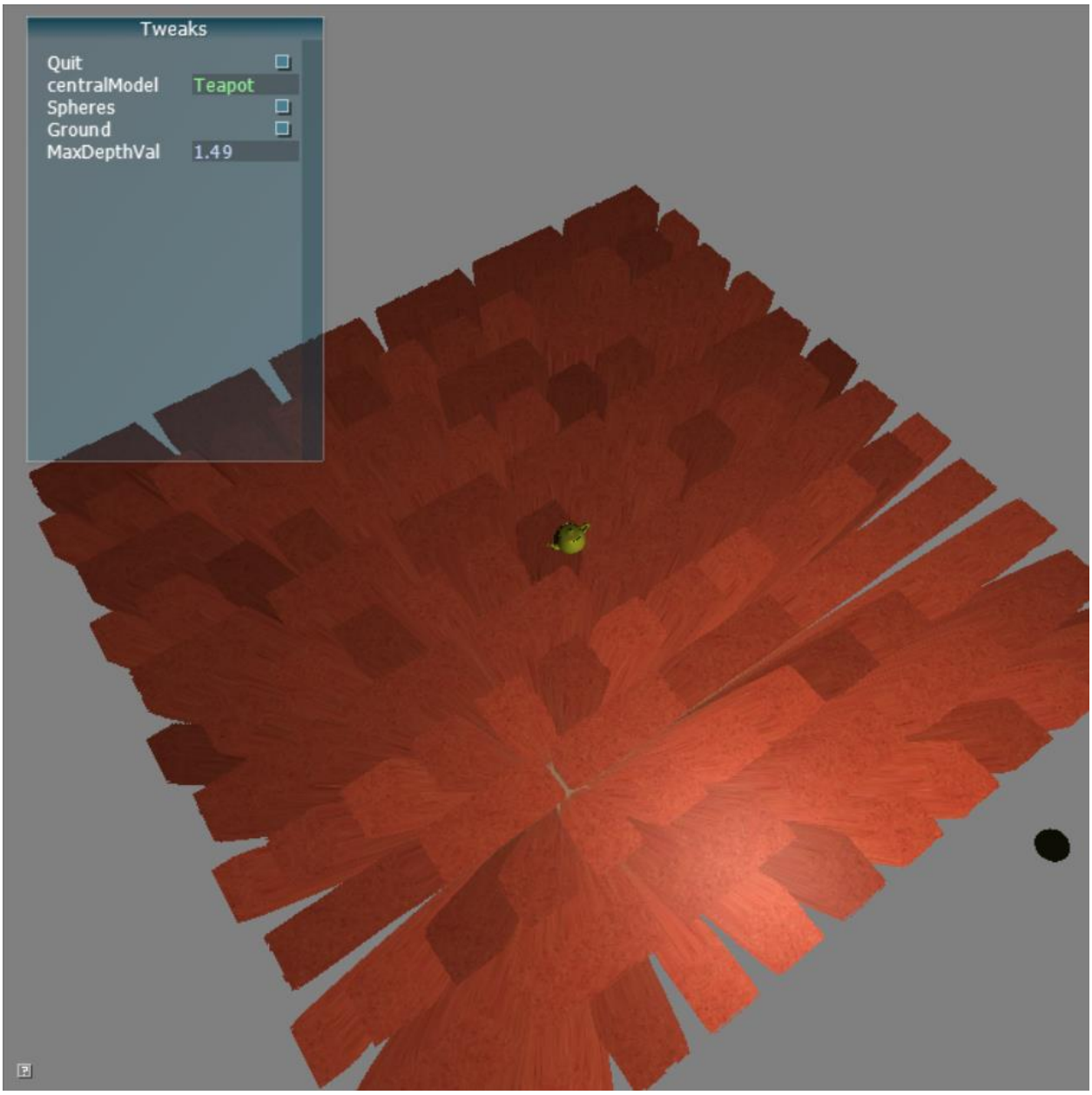


Figure 4: By increasing the constant depth value

Figure 5: Desired Output