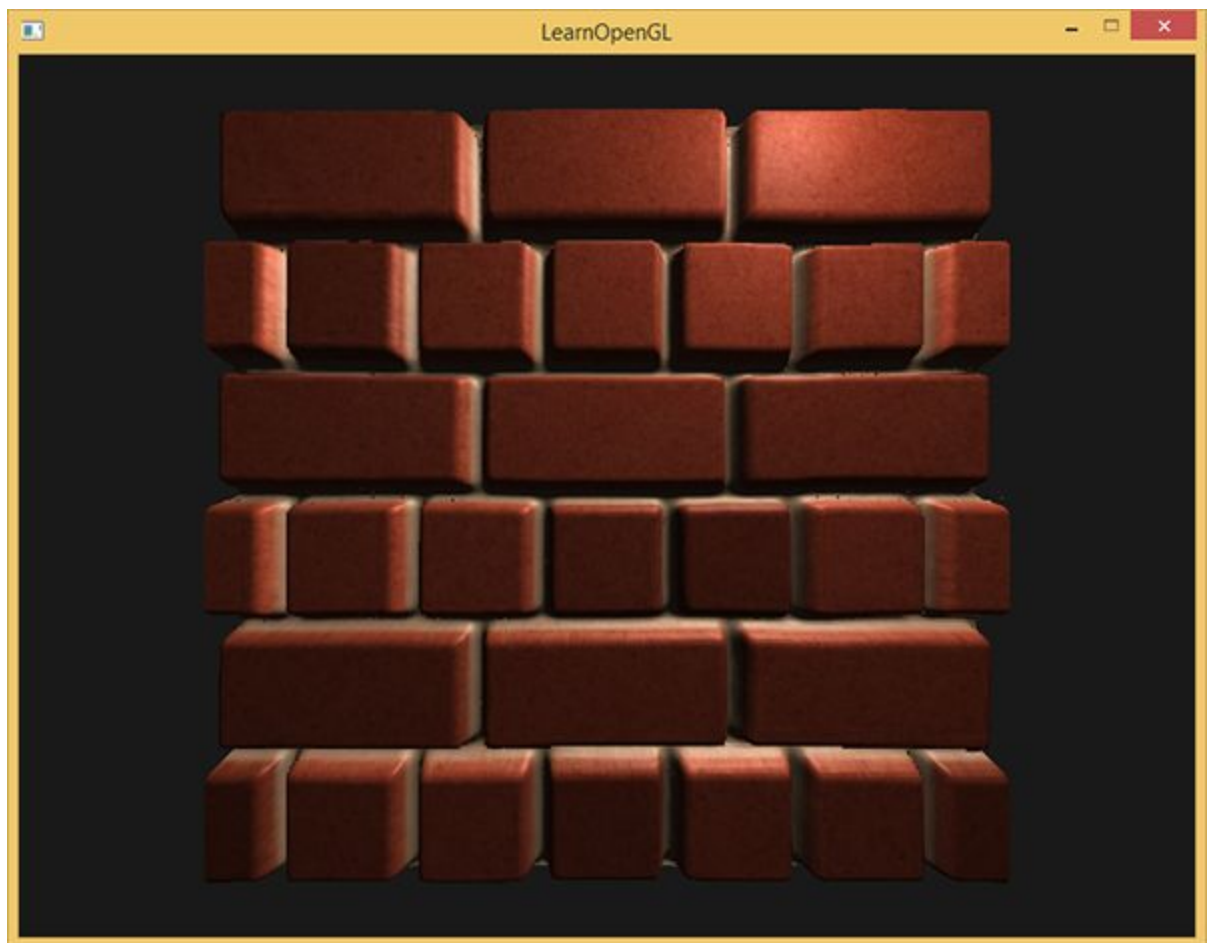
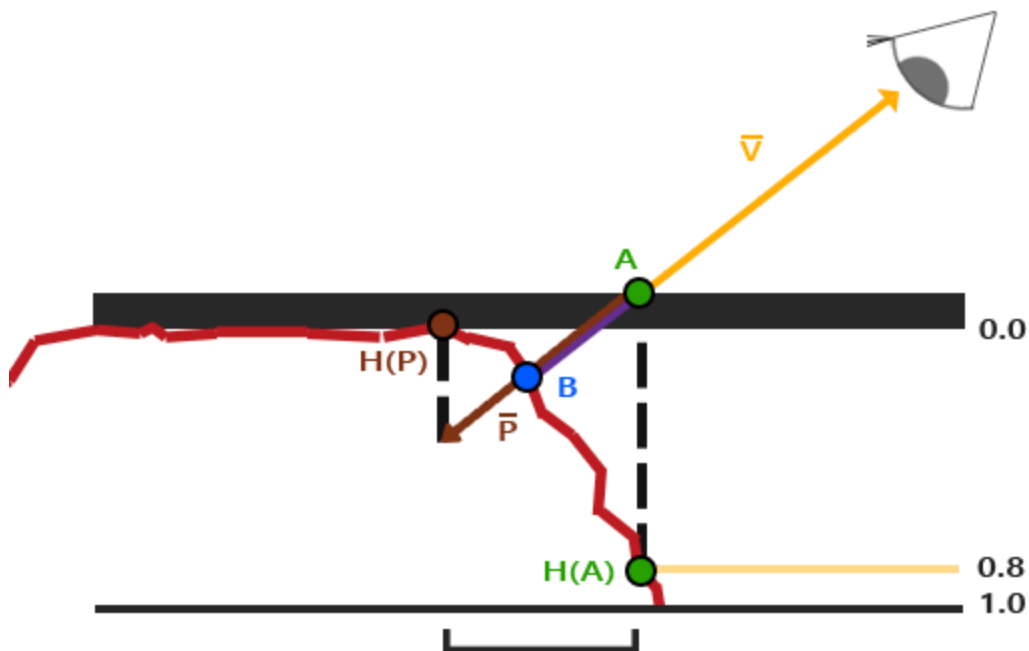


Part 1:

For the final project I plan on implementing is Parallax mapping. Parallax mapping is an enhancement of normal mapping or bump mapping techniques typically used on textures for 3D games as it gives a flat polygon an illusion of depth without many vertices. This technique gives surfaces with cavities and rough surfaces a even more appearance of depth than can be achieved in normal mapping and most other bump mapping techniques. Parallax mapping works by displacing the texture coordinates at a point on the rendered polygon by a function of the view angle in the angle relative to its surface normal (tangent space) and the value of the heightmap at that point. The texture coordinates are displaced even more when the surface is viewed at steeper angles, giving the illusion of depth.

The surface below is actually a flat surface with only 6 vertices. The illusion of depth here is possible because of Parallax mapping. This is great for real time graphics particularly in video games where 3d meshes cannot have very high polycounts.





Above is a visual sketch of how Parallax mapping works. Vector V represents the surface to view direction. The illusion of depth is achieved when the viewer sees B. This is achieved by offsetting the texture coordinates at fragment position A so that we get texture coordinates at point B's texture coordinates. B's texture coordinates are then used for all other texture samples making it appear as if the viewer is looking at point B.

So we need to know how to get B's texture coordinates from point A. This is achieved by scaling the fragment to view direction vector V by the height at fragment A. We are effectively scaling V 's length to be equal to a sampled value from the heightmap $H(A)$ at fragment position A. P denotes the scaled vector. P 's vector coordinates that align with the flat plane as the texture coordinate offset.

A displacement map is used to denote which areas appear to bulge out of the surface and which parts appear concave. Parallax mapping is implemented entirely in the fragment shader.

Part 2:

I have already formed a group. For reference their names are: Shuo-En Li, Joseph Sandmeyer, and the other Kevin Wu.