Assignment 1: Lights, camera, and lots of action

Gregor Mitchell – 170010314

## Description of Design

For this assignment I chose to use OpenGL to create a 3D model of a train. The model features a locomotive created out of various 3D objects, with a moving coupling rod between the back 2 wheels. All wheels are also rotating at the correct rate on the train. The application also features realistic lighting from a positional light source. The user can interact with the application by stopping and starting the animation, by moving the light position around the model, by rotating the model, and by moving the camera around the model.

## User Controls

The following is a list of ways that the user can interact with the application:

* Q/W – Rotate model left/right around the y-axis
* E – stop/start animation
* A/S – alter the light position’s x coordinates
* D/F - alter the light position’s y coordinates
* G/H - alter the light position’s z coordinates
* I/K - alter the camera position’s y coordinates
* J/L - alter the camera position’s x coordinates
* U/O - alter the camera position’s z coordinates (zoom in/out)
* R – cycle through displaying the full model, only the vertices and only the points

## Reflections

My project runs with no major errors and is animated in a way that is realistic. However, during the implementation of the project there were some problems that I ran into. During the implementation of the coupling rod animation, I had originally planned to translate the rod in a circular motion. However, this did not go to plan and I instead had to move the coupling rod linearly, causing the diamond path shown in the model. I also had planned on adding textures to the wheels so that the user could see that they were rotating during the animation. Unfortunately, due to time constraints, I was unable to apply the textures to the cylinder objects. The only way the user can observe the spinning wheels is by pressing ‘R’ to view the vertices/points rotating around the center of the cylinder.

I was able to create my own object, the ‘pyramid’. This took inspiration from the ‘tetrahedron’ shape we had been shown earlier but adapted to instead be a square based pyramid. I adjusted the normals accordingly to ensure that lighting was applied correctly.