**Graphics – Assignment 1 (Moving Parts) Report - Kari McMahon**

**Motivation**

For the assignment I choose to create a robot, the motivation for the choice of a robot is because I found it easy to visualise in my mind in terms of shapes and it also has a range of interconnected parts which move together and independently of each other which I thought would be perfect for the assignment to demonstrate various moving parts.

**Design**

The design of the application is based on Iain Martin’s lab 2 example which I have then split up into various classes to make it easy to read and understand as the application was originally in the one cpp file which grew too large and became hard to read, understand and maintain. The main challenge with making the code more object oriented is that it’s been a while since I have used C++ and I was not sure if approached the design in the best possible way.

The classes for my application:

* Shape.cpp – Handles the creating and drawing of all the shapes in the application.
* Robot.cpp – Creates the robot and robot’s parts based on calls to the shape class and various transformations, rotations and scales.
* robotScene.cpp – Handles the scene view and the opengl calls such as initialisation, display and key callbacks.
* Wrapper\_glfw.cpp – Wraps glfw functions

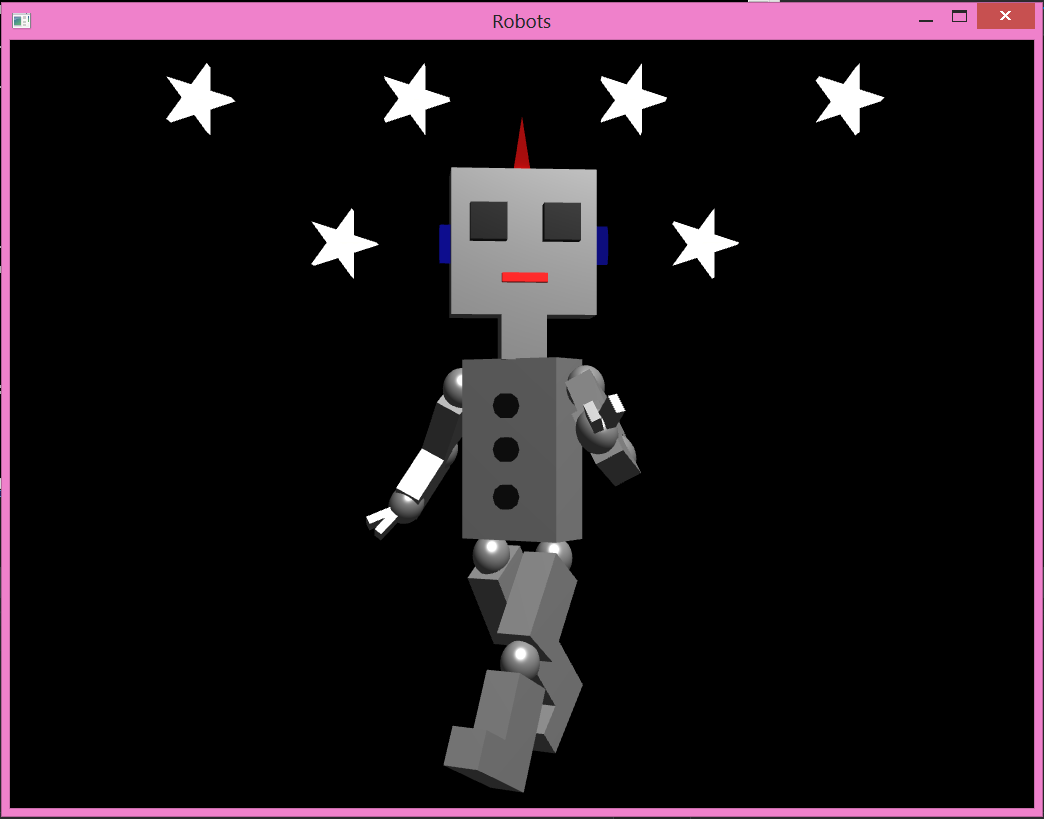
The headers for my application:

* robotScene.h – Contains global variables for the application
* wrapper\_glfw.h – Sets glfw functions

The shader’s for my application:

* robotScene.vert – Handles the position and colour selection
* robotScene.frag - Handles the lighting

**Application**



When you open the application you will be looking at the front of the robot. You can rotate the robot using Q and W keys as well as being able to rotate the whole scene in various using the arrow keys (controls are all on the console output). The robot’s movements are all based on key inputs as I felt it was the best way to represent the robots movement’s. You can move the robot in several ways such as moving the arms and legs as if the robot was walking, moving the arms up and down, moving only the forearms or only moving the robot’s fingers as well as moving the robot’s neck. I felt showing the robot’s movements by key presses represented the robot the best and was a better way to play around with the variation of movements. The robot is built using a stack making it possible to have several different interconnected parts. I placed movement constraints on the robot to try and make the movements of the robot more realistic when the user is making the robot move.

The shapes that make up the scene are cubes and spheres which were developed from Iain Martin’s examples as well as cone, bolt and star shapes. The lighting in the application sits in the one direction instead of moving with the view as I felt it gave a more realistic look to the robot and it also uses phong lighting again because I felt it made the robot appear more realistic. The view has a perspective projection.

**Project’s Achievements And Challenges**

I feel the achievements in the project was understanding and being able to use the stack helped me to create a realistic object with a variation of different movement possibilities. I managed to create various different shapes for the application which helped bring my robot to life and now have a much better understanding of OpenGL. Separating the code into an object oriented format made it easier to reuse code already there.

The challenges within in the project was getting to grips with the new version of OpenGL, it was hard to find examples in particular the best ways to approach the stack. Having very little examples available made it a lot harder to understand openGL meaning it was quite time consuming just to get minor things done. The biggest difficulty I had was with getting the lighting to look right in my project and setting the normal for shapes. I also had difficulty with the movement constraints which make the object seem more realistic but jitters when it reaches the constraint point. I also feel I did not create the objects in the best possible way and hope to gain feedback on this and improve on the next project.

**Conclusion**

Overall I am happy with the application as I feel it represents a realistic interconnected moving object. I have learnt a lot from the project about OpenGL and it has really increased my understanding about. I had hoped to also add a cylinder based pet for the robot in the code but due to time constraints I did not have time for that.

Any example code that is used are referenced within the code, the majority of example code are used are based on Iain Martin’s lab examples e.g. the code layout, cube and sphere creation and phong lighting.

If you have an issues setting up or understanding the project please contact me.