



UTM
UNIVERSITI TEKNOLOGI MALAYSIA

SCHOOL OF COMPUTING
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SECV2213: FUNDAMENTAL OF COMPUTER GRAPHICS

FINAL PROJECT REPORT

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Introduction

This final project is about 3D object modeling using C++, OpenGL and GLUT based on the Animal Moving Character theme. For our project we decided to do a sheep object as our model. Here, we will implement several functions in OpenGL to finish this project. For example, using a combination of 3D primitives that GLUT provides GLUT, lighting and shading and also projection and camera model. On the other hand, we will use an interactivity menu, sound effects and add some objects surrounding the sheep.

Overall concept/design

For the concept, we followed the theme which is to draw an animal and we choose to draw a sheep. Next, adding some movements on the animal. For the design, starting from the head of the sheep, we are using a sphere shape. For the sheep's neck, torso and legs, a cylinder shape was drawn to picture the figure of the sheep. Other than that, we use triangle function and quads function to draw the surrounding object around sheep.

Implementation & achievements

The functions that we implement in the project are GL_QUAD_STRIP to draw the tube and GL_POLYGON to draw the circle on top of the cylinder that will be used to draw the body part of the sheep. Then, we use GL_PROJECTION and GL_MODELVIEW for the viewing and for the lighting we use some function which are GL_DEPTH_TEST, GL_COLOR_MATERIAL, GL_LIGHTING, GL_LIGHT0, GL_LIGHT1 and GL_NORMALIZE. All this function will be used for all the objects in our output.

To draw the sun, we use glutSolidSphere formula while for the tree we use GL_TRIANGLES for the leaf part and GL_QUADS for the trunk part.

Besides, we add sounds for our sheep that only can function if we press the 'a' button and 's' button to stop it. For the 'q' and 'w' button will be used to enable lighting and disable lighting, respectively. Next, the position of the sheep can be rotated when 'f', 'l', 'b' and 't' buttons are pressed on the keyboard. Next, we can move the model in the x-axis by using the mouse function.

Last but not least, we implemented the create menu function where we can change the movement of the sheep to initial position, legs up, head down, up in two legs, walk and run.

Discussion on each topic

Firstly, to model this 3D object we start to create a draw cylinder function. This function will be used to create all parts of the model except the head. For the head we use solid sphere function. There are 11 hierarchical modeling in this 3D object which are head, neck, torso, front-left upper leg, front-right upper leg, back-left upper leg, back-right upper leg, front-left down leg, front-right down leg, back-left down leg and back-right down leg.

In our 3D object, we add ambient light, positioned light and also directed light. Besides, we are using the interactivity of the menu. By this, we can change our 3D object movement for instance in initial position, both legs up, head down and up with two legs. Other than that, our 3D objects walk and run. To make it sound realistic we use sheep sound effects by pressing a keyboard button. Last but not least, we add surrounding objects on the screen which are the sun and trees.

Conclusion

In conclusion, the functions that have been learned in previous tutorials and lab exercises are implemented in the project. There are more difficulties in some functions when they are being implemented in our coding than the previous one that is referred to. One of the crucial parts in OpenGL is probably the coordinates. The coordinates also play a role to keep each shape created in position to form the animal. Of all, projection and camera models are the hardest to be done. At last, we managed to implement the ambient light, positioned light, directed light, interactivity of menu, rotation of the shape using keyboard key and mouse movement, sounds and add surrounding objects.

Google Drive Link

<https://drive.google.com/drive/folders/1788wOBqnHnhrf9lbt3BDceGGKhOeB3cD?usp=sharing>