Report of CPT205 Assessment 2 – 3D Modelling Project

Module Code/Title	CPT205 Computer Graphics
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1.Read Me Instructions

This project implement a simple city model containing some essential elements like buildings, road, grass big billboard using OpenGl Freeglut library.
This section is intended to inform some basic instructions about the scene so that you can have a better view of the whole project. Following the instruction sets below, you can modify your viewing position as you want.
Key board interaction:
When pressing:
Key **W**: Rotate the main camera downwards
Key **A**: Rotate the camera clockwise around the y axis
Key **S**: Rotate the main camera upwards
Key **D**: Rotate the camera counterclockwise around the y axis
Key **Z**: zoom out
Key **X**: zoom in
Key **C**: changing the light effect

2. Specific features and design techniques

1.Lighting and Material

Two different light effects are used in this project indicating two time periods in a day. glLightfv () function is used to add the light source. The light0 used in this project is *point light source*. By adjusting the parameters(GL_DIFFUSE,GL_AMBIENT) within this function, several types of lights including ambient light and diffuse light are used in light0. Some variables indicating the RGB intensity of the light is declared in the head of the project to adjust the light. In addition, glMaterialfv() function is also used to enable the elements which reflect the light to represent a certain kind of a material texture. Here are two sample snapshots showing the light effect in the scene.

Figure 1 light effects

The zebra crossing and the sphere are ought to show a pure white color, but with the lighting

they represent yellow to some extent.

2.Texture Mapping

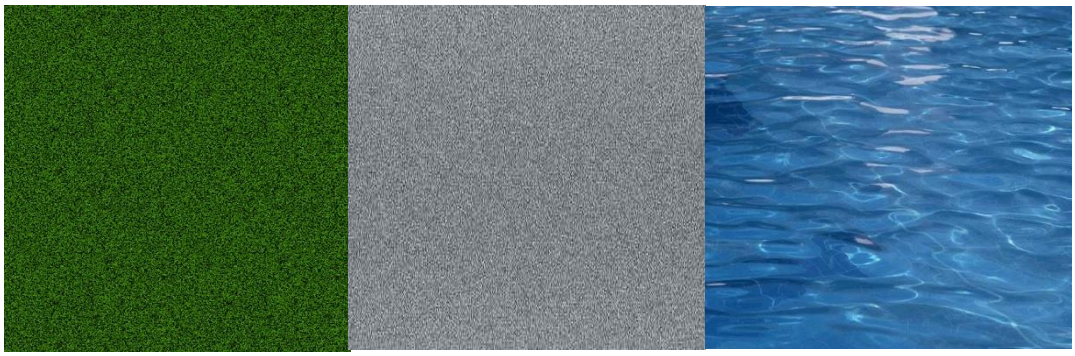

Figure 2 BMP examples

The above pictures are some texture images applied to the scene. glTexImage2D () function and glTexParameterf() function are used to apply these images onto the surface of the cube in the scene. Basically, all the plain surfaces in the scenes are all implemented by this way. Besides, to attain the visual effect that the city is wrapper by the sky (the sky box), three images are mapped into the top, left and right side of the scene.

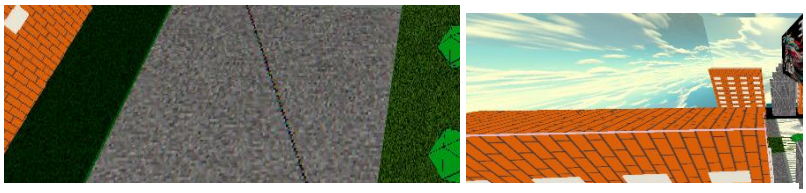

Figure 3 Surface and Skybox using Texture Mapping

3. Modelling

3.1 Linear Modeling

Most of the elements in the scene like buildings and roads are implemented by linear modelling. By calling the glutsolidcube() function, a main body of the element is obtained. And by calling pushmatrix() and glRotatef(), glTranslatef(), and glScalef() , their sizes and position can be modified in the world coordinate system.

3.2 Hierachical Modeling

The car, the twin building and the tree are detailed designed using hierarchical modeling. (especially the car) Every part of the car including the main body, the front and back glass, four wheels are modeling separately. By push the model matrix into the stack and pop one after one out. Every part has its own coordinate system (the world coordinate system and the local coordinate system).

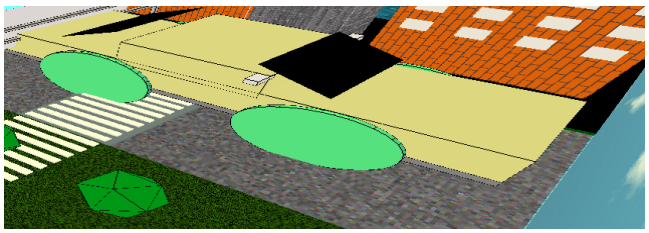

Figure 4 Car Model (Scaled)

4.Viewing

As mentioned above the view position and view angle could be changed by keyboard interactions. This is implemented by changing the parameters in glutLookAt() function. Modifying the coordinate of the main camera and its up-direction vector and its gaze position, the view could be changed accordingly.

5.Animation

Using onTimer(),glutTimerFunc() to keep the car moving forward and when it goes out of the range, relocate it to the start the point.
Using the above two functions and glRotatef(), the solar model is always rotating.

3. Snapshots of the entire program

This is the front view of the whole project (daylight).
Element Listing:

1. The big billboard, The Mcdonald's sign, Sky Box
2. The twin tower connected by the board
3. The sun
4. Four brick buildings
5. Trees
6. Grass lands, Water lands, Traffic roads

This is the front view of the whole project (moonlight)


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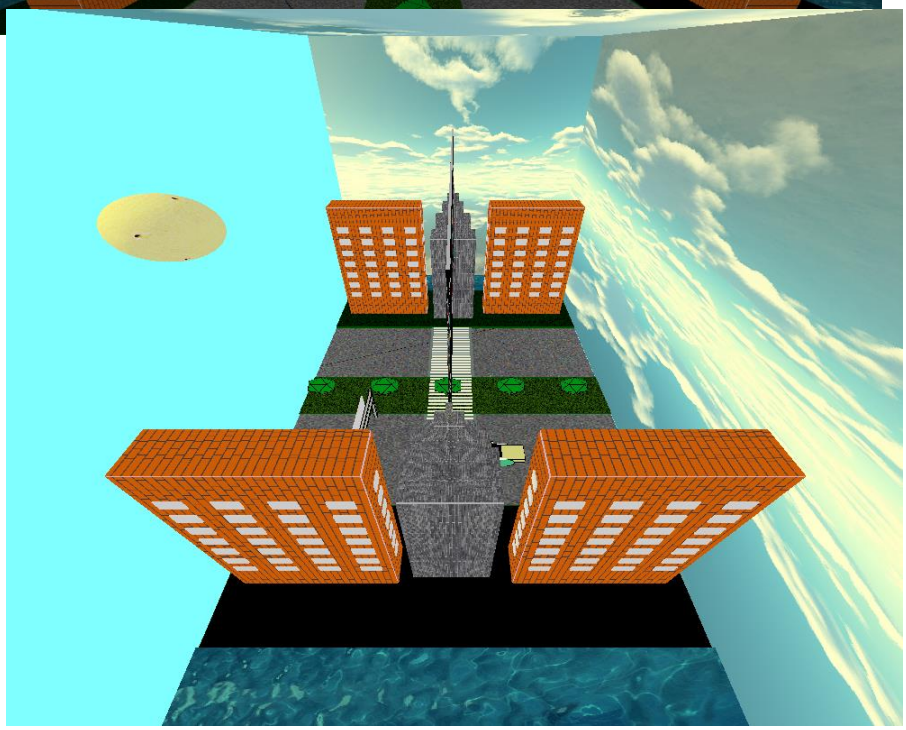

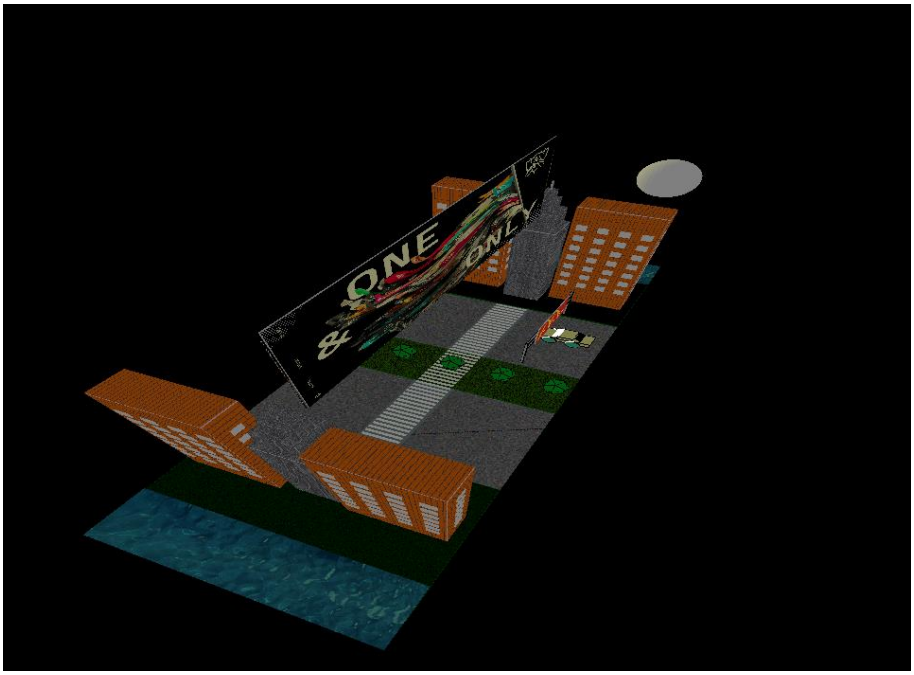
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