521140S Computer Graphics Programming Assignment III

General information

In this assignment, you will explore the OpenGL implementation of shading with the Phong illumination model and hierarchical modeling.

The assignment should be finished alone. Feel free to discuss about the assignment with other students but sharing code is not allowed.

What to return

Return the finished codes (including CG_assignment3.py, the utils folder, the shader folder, the data folder and your other codes and resource) and a PDF report with the requested screenshots before the deadline.

Tasks

In this assignment, you are expected to implement a simplified version of the solar system, which just includes the sun, earth and moon. You need to draw the sun, earth and moon, shade them based on the Phong illumination model and implement their revolution and rotation.

1. Get the scene to work.

    a. Download example code package from Moodle.

    b. Find the *CG_assignment3.py* file. Run the code and you can see the sun and earth. If there is any problem, please refer to Tutorial 0. (0 p)

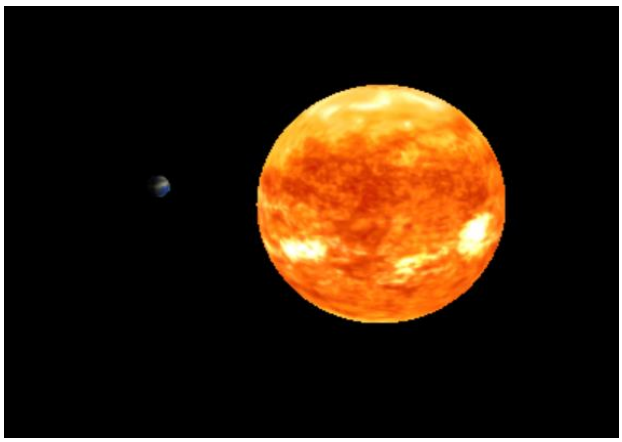

Figure 1

2. Draw the moon.

    In the def `draw` function (*CG_assignment3.py*), we have finished the codes to show the sun and earth. In a similar way, please implement the codes to show the moon. Note that the size and

position of the moon model depends on the sizes and the positions of the sun model and earth model. Run the code and take a screenshot of this. (1 p)

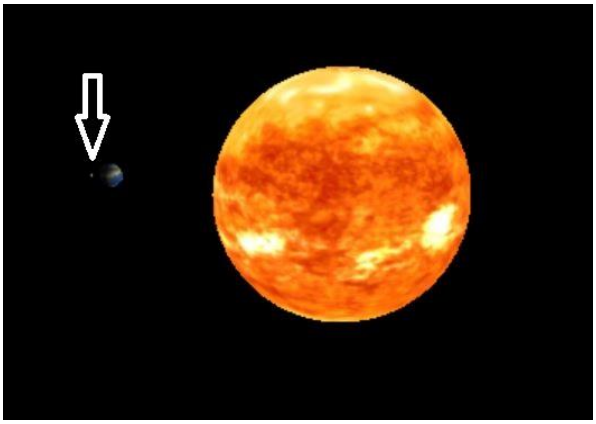

Figure 2

3. The rotation of the sun, earth and moon.

   In the def `draw` function, you need to implement the codes to rotate the sun, earth and moon over their respective y-axis continuously. Similar to our programming assignment 1, for rotation, please use the glm library. To make the rotation continuous use the time library. Run the code to get the result below (see the gif from assignment3 slides). Take a screenshot in the report. (2 p)

Figure 4

4. The revolution of the earth and moon.

   In this solar systerm, the earth should rotate around the sun and the moon should rotate around the earth. When setting the positions and the sizes of the earth and moon, we have considered the relationships between them and the sun, and their relationship with each other. You need to finish

this task using a very similar way. Run the code to get the result below (see the gif from assignment3 slides). Take a screenshot in the report. (2 p)

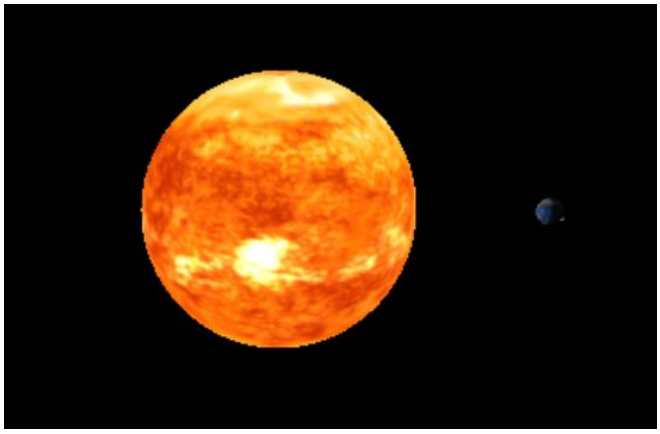

Figure 5

5. Implement a new hierarchical model

Try to understand the mechanism of hierarchical modeling, and then implement a new hierarchical model which should contain at least 3 objects. The illumination should also be implemented to the objects. You can freely choose your own hierarchical model as long as it has at least 3 objects and shows the hierarchy through certain transformations, such as rotations, translations and scaling. Note that you can use simplified objects such as cubes with a uniform color or more complex objects like spheres or cylinders with texture maps. Besides the solar system, the commonly used examples of hierarchical scenes include robot, robot arm and so on. Submit the codes and the relevant resource, take a screenshot of your model and explain the hierarchy between the different objects in the scene. (3 p)

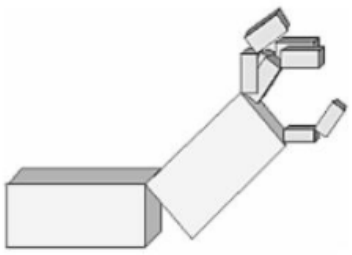

Figure 5