Course Project

CS4182 Computer Graphics
Semester B 2019/20

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Declaration

This is a solo project. I did it my own and thus, reference learnings from "Introduction." *LearnOpenGL*, learnopengl.com/Introduction. https://learnopengl.com/Introduction and Jeremiah. "OpenGL Archives." *3D Game Engine Programming*, 24 Feb. 2014, https://www.3dgep.com/category/graphics-programming/opengl/

Brief Description of the 2 Projects

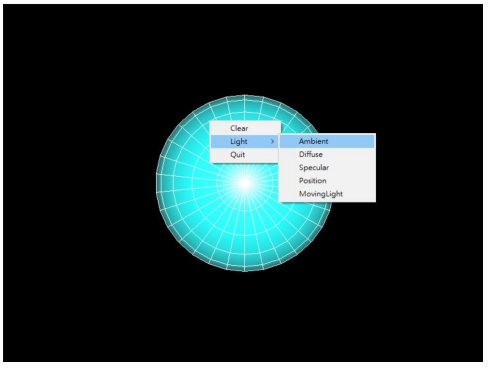
Basic - Objective

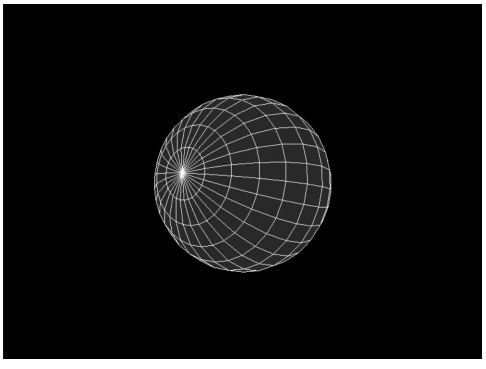
The objective of this project is to implement the knowledge of OpenGL/C++ to the real application. I aim to practice some basic graphic programming skills here.

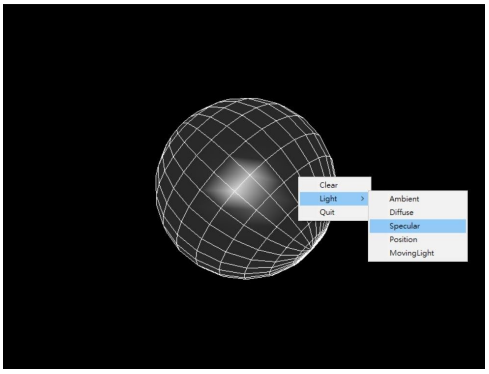
Basic Requirements

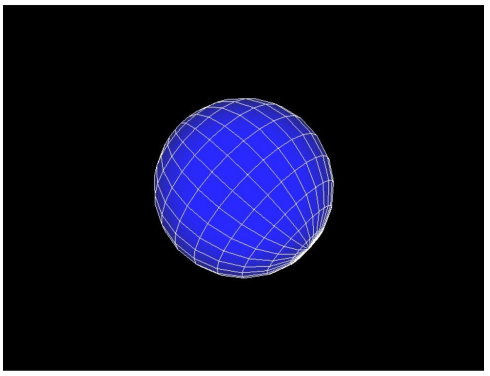
As asked our course leader, Dr.Hou suggested that it is fine that *not* to use the 3D room. Therefore, in the project, I implemented a simple sphere and tried to catch-up with 4 of the requirements as I want to make something more and make sure the tasks are completed entirely. To put it simpler, the requirements implemented in my project include:

1. ***Create New Object***
   There are two objects in my project, the sphere and the light source respectively. Whereas the sphere is preset as wireframe, it is coloured with light materials; the light source is colour as white and can implement 2 specific functions: automatically move and controlled move by keyboard (a,d).
2. ***Menu and Lighting***
   As required, the pop-up menu in my project is initialised. There are 3 main choices:
   - Clear: to clear the sphere into the preset state (wireframe);
   - Light: there are 6 submenu choices, including ambient, diffuse, specular and position; noted there are also MovingLight and KeyboardMovingLight, which is not required in this requirements but it's required in other sections.



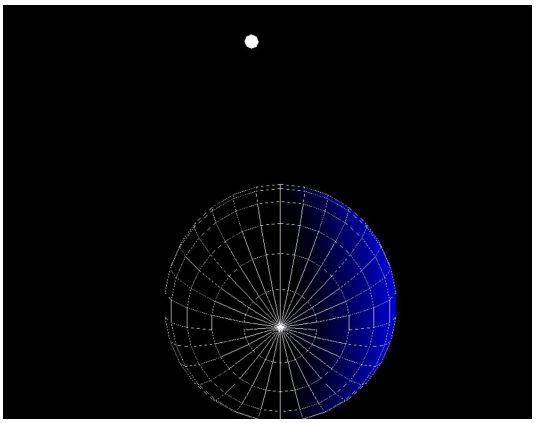






- Quit: to quit the window and end the scheme.

3. ***Manipulation***



It is requested to use the keyboard and mouse to manipulate the object(s). In my project, the object can be manipulated (angle) using the keyboard. This is also the reason why I used wireframe, which can facilitate the reading of rotating the sphere. Hence, when the user clicks the KeyboardMovingLight in the menu, he/she can use 'a' and' to control and translate the z (position) of the light source object.

4. ***Adding Autonomous Objects***

Refer to the requirement, set an object to move around automatically and react to the environment (e.g. light). Therefore, when the user clicks to the MovingLight option, he/she can see the light source (white object) move around the sphere and it reacts to the environment (global ambient, specular and spot exponent)

Advanced- Objective

The objective of this project is to implement the knowledge of OpenGL/C++ to the real application. I aim to practice some basic graphic programming skills here.

Advanced Requirements

The objective of the advanced project is to make an educational application for new learners/kids to feel interested and gain some basic knowledge of the transformation between 2D and 3D.

How to Run...

1. CTRL+F5, to start running the program
2. Follow the instructions in the program executed, including:
    a. Choose to click from 1-4 first, to get familiar with the changes of 2D and the 3D world with animated transformation;
    b. Explore Key s/S, f/F, l/L, d/D and r/R ;
    c. Click 5 for the question section. Answer the questions and explore more;
    d. Click 6 for the five scenes. Move the camera using arrow keys and learn about the camera motion in the 3D world;
    e. Quit by q/Q, ESC, Enter
3. Noted that the words and instructions are posted on the command window. It can guide you to explore the application.

Keys and Functions

L/l- Lights on
D/d- Light Off
S/s- Smooth Shading
F/f- Flat shading
R/r- reset parameter
1 - simple scene with 2D primitives
2 - slight complex scene with colours
3 - animated transformation
4 - rotations on all 3 axis 3D
5 - questions / little quiz
6 - keyboard animation on the snowman (use the arrow to move the camera, zoom in/ out)