Computer Graphics Project 1: Basic OpenGL viewer

Handed out: April 3, 2023

Due: 23:59, April 16, 2023 (NO SCORE for late submissions!)

- *LMS course home > Lecture Contents (강의콘텐츠) > Week 5> Project 1 > "Submit Assignment" Button> Upload your zip file*
- *Compress your files into a zip file as in the following example. The zip file can be named whatever you want.*

```
+ submission.zip
  - main.py
  - ...
  - report.pdf
```

- *Your program may consist of several python source files. But the main module should be in **main.py**. That is, your program should be executed with the following command:*

```
python main.py
```

1. Implement a basic OpenGL viewer. This viewer will also be used in your future projects.
   A. You must implement all requirements in a single program. This project DOES NOT require each requirement to be a separate program.
   B. The window size doesn't need to be (800, 800). Use the larger window that is enough to see the details of the viewer.
   C. **Your program must use OpenGL 3.3 Core Profile**, meaning that …
      i. Your python code must include:

```
glfwWindowHint(GLFW_CONTEXT_VERSION_MAJOR, 3)
glfwWindowHint(GLFW_CONTEXT_VERSION_MINOR, 3)
glfwWindowHint(GLFW_OPENGL_PROFILE, GLFW_OPENGL_CORE_PROFILE)
```

      ii. Your shader code must start with:

```
#version 330 core
```

      iii. **You will not get any score for this project (except report) if you do not use OpenGL**

3.3 Core Profile.

D. Total points: 80 pts

2. Requirements

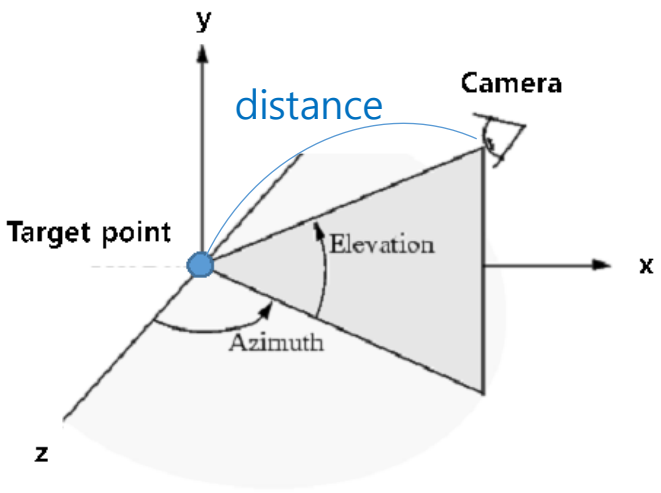
A. **Manipulate the camera with mouse movement (70 pts)**

i. Refer the camera manipulation of Blender software.

1. https://www.blender.org/download/

ii. The camera of your program should initially look at a target point, similar to that of Blender.

1. Initialize the target point to the origin (0, 0, 0)



2.

iii. Provide the following three camera control operations.

1. **Orbit**: Rotate the camera around the target point by changing azimuth / elevation angles. (MMB (mouse middle button) in Blender) **(20 pts)**

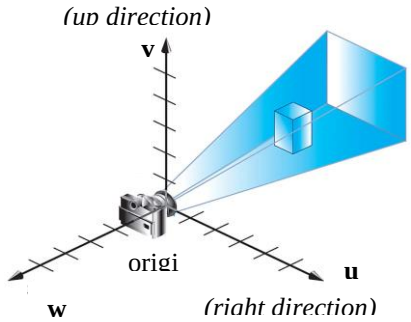
A. Do not rotate the camera about a vector from the camera to the target point.

2. **Pan**: Move both the target point and camera in left, right, up and down direction of the camera (Shift-MMB in Blender) **(20 pts)**

A. More specifically, translate both the target point and camera along u axis (left & right) and v axis (up & down) of the camera frame.

3. **Zoom**: Move the camera forward toward the target point (zoom in) and backward away from the target point (zoom out) (Ctrl-MMB in Blender) **(15 pts)**

   A. A. More specifically, translate the camera along w axis of the camera frame.



   B. (backward direction)

4. You MUST use the following mouse movement:

   A. Orbit: Click mouse left button & drag

   B. Pan: Click mouse right button & drag

   C. Zoom: Rotate mouse wheel

   D. Using above mouse movements is essential for scoring your assignment, so if you use any other set of mouse movement or keyboard shortcuts for Orbit / Pan / Zoom, you won't get any score for them.

iv. Toggle perspective projection / orthogonal projection by pressing **'v' key (10 pts).**

   1. When the program is executed, it starts in perspective projection mode.

v. Draw **a rectangular grid with lines (not polygons) on xz plane** as a reference ground plane (like Blender). Choose number of rows and columns, size as you want. **(5 pts)**

3. Report (10 pts)

A. Submit a report of **at most 2 pages** in a **pdf** file. Using MS Word is recommended. Do not exceed the limit.

B. The report should include:

   i. Which requirements you implemented (5 pts)

   ii. A few screenshot images of your program (5 pts)

~~C.~~ You do not need to try to write a long report. Just only write down the required information.

Use either English or Korean.

4. Runtime Environment

A. Your program should be able to run on Python 3.8 with only NumPy, PyOpenGL, glfw, PyGLM installed. Do not use any other additional python modules.

B. Only **glfw** is allowed for event processing and window & OpenGL context management. **Do not use glut functions for this purpose.**

C. If your program does not meet this requirement, it will not run on TA's computer so you will not get any score for this project (except report).

5. What you have to submit: A zip file including

A. **.py files -** *Your program may consist of several python source files. But the main module should be in* ***main.py****.*

B. **.pdf report file**