

Computer Graphics Project 1: Basic OpenGL viewer

Handed out: April 3, 2023

Due: 23:59, April 16, 2022 (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**

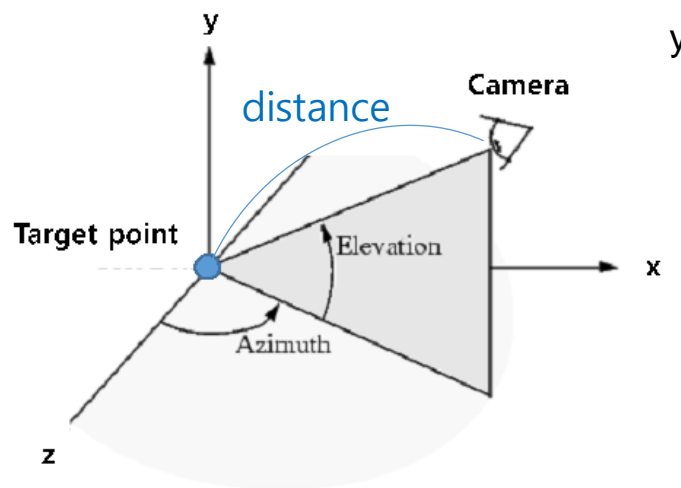
3.3 Core Profile.

D. Total points: 80 pts

2. Requirements

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

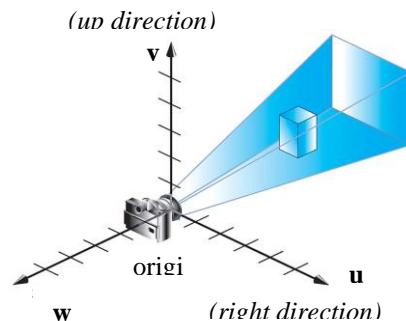
- i. Refer the camera manipulation of Blender software.
 1. <https://www.blender.org/download/>
- ii. The camera of your program should initially look at a target point, similar to that of Blender.
 1. Initialize the target point to the origin (0, 0, 0)



- 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 perspective 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)**
grid line .

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)

- € 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**