CS7.302: Computer Graphics Assignment #2

Weightage: 20%

Due: April 11th, 2025

Learning objectives

- Learn OpenGL pipeline.
- Learn 3D transformations.
- Learn Lighting and Shading.

Tasks

The broad aim of this assignment is to develop components of a 3D mesh viewer. The geometry of an object/shape is stored as a mesh in formats such as OFF/obj. **[N]** denotes the weight for each task out of **20**.

1. **[3] Loading the mesh**
    - **[1]** Add OffReader.h to your project and use it to load the mesh.
    - **[2]** Calculate the face and vertex normals.
2. **[3] Displaying the mesh**
    - **[2]** Determine and apply appropriate model transformations and orthographic projection to the mesh such that it appears in the middle of the screen.
    - **[1]** Allow rotation of the mesh about a fixed but arbitrary axis. Rotate the mesh continuously at an appropriate rate.
3. **[3] Drone view**
    - **[3]** Apply appropriate view transformations to implement a fly-through mode to display the model from different view points. The fly-through should be user- controlled.
4. **[8] Lighting and shading**
    - **[4]** Implement the Phong shading with the Blinn-Phong illumination model using shaders.
    - **[2]** Add at least 3 lights and show their effect individually and together. The light positions and switches should be user controlled.
    - **[2]** Color vertices of the mesh based on their current depth (distance from the camera) using CPU and shaders
5. **[3] Blow up view**
    - **[3]** Blow up the mesh into its constituent primitives, and bring it back to its original configuration. See Figure 1

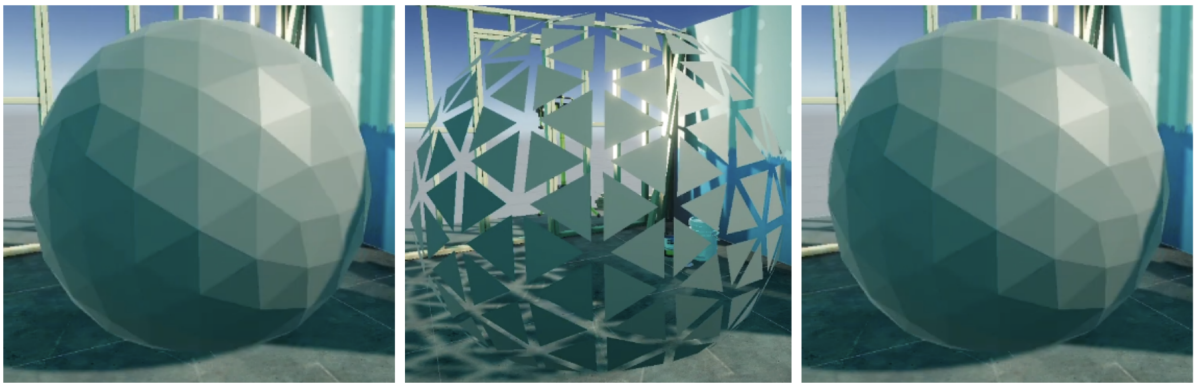

Figure 1: Blow-up view

Submission

1. Submissions should be made through github.
2. A valid submission would comprise of all the code (with makefile, readme, etc..) with adequate instructions to compile and run the code, the code **should** compile without errors.
3. Please do not upload executables.
4. Deadline: **23:59 hrs, April 11th**.
5. Any submission beyond the deadline will be considered as **late submission**. Late submissions will be evaluated out of **13** instead of **20** if submitted by **23:59 hrs, April 14th**.
6. Submissions past April 14th will not be evaluated.

Notes

1. The files are provided in off format. The details of the format will be explained during the tutorial.
2. Avoid hard-coding values in intermediate instructions of code. Define constants/values in the global section so that changing and testing the code is easier. You may be asked to do so during the interactive demo.
3. For task 3, fly through can be done using keys, for task 4, the light selection, positions, and switches can be controlled by appropriate controls in *imgui*.