CSE 333/533 - Monsoon 2024
Assignment 2: Transformations, Viewing and Projection
Due date: 23:59, 20th Sept. 2024

The given program renders a cube in perspective projection. Study the program and understand how viewing and projection matrices are applied in the OpenGL programmable pipeline.

Transformation

1. Construct a 4x4 matrix for rotating 30 degrees anti-clockwise about axis v (1, 2 , 2). Your are required to derive this using change of basis. Show all of your working. [10 marks]
2. Generate screenshot after applying above transformation to the cube. [5 marks]

Viewing

3. GLM provides a lookAt function to construct the viewing matrix.
   (a) Write code for your own version of the same. [10 marks]
   (b) Use this to render the rotated cube (from previous question) with following camera parameters: [10 marks]
   - Position: (50, 100, 20)
   - Gaze: centre of rotated cube
   - Up: (0, 0, 1)
   (c) Verify correctness of your routine by comparing it with the GLM lookAt() function. In case of any differences, explain. [5 marks]

Generate screenshots for parts (b) and (c) above.

Projection

4. Perform appropriate viewing transformations and generate screenshots for the following projected views of the cube (original, unrotated):
   (a) Perspective: one-point, two-point, three-point (bird's eye view), three-point (rat's eye view). [10 marks]

Deliverables (as a single zipped file **Assignment02_<studentID>.zip**) containing:

- C/C++ code (make sure to upload full code and do not include any intermediate object files, delete any other temporary files).
- 2~3 page PDF Report written with with **Latex/MS Word**. Use the acmlarge option (single column) (see sample-acmlarge.tex if writing with Latex). Include screenshots within the report itself (and DO NOT attach separately).

Total marks for this assignment: 50 marks

Note: Your code should be written by you and be easy to read. You are NOT permitted to use any code that is not written by you. (Any code provided by the TA can be used with proper credits within your program)