# Assignment 1
Computer Graphics, Spring'24
Dept. of CSE, IIT Kharagpur

Posted: 25th January 2024
Due: 8th February 2024, 11:55 PM

Description

In this assignment you will be dealing with basics of OpenGL library and in-built 3D shapes in OpenGL. You have to diplay different types of 3D shapes and perform some transformations on these objects using keyboard functions. First of all, create a horizontal plane (of any color) and place it at the center of the window. Next create a 3D sphere (of any color) and place above the plane. Now extend your program so that the sphere can be replaced with other following objects: cube, torus, cone, and disc, where the objects can be switched by pressing keys as follows: 'a' for sphere, 'b' for cube, 'c' for torus, 'd' for cone, and 'e' for disc. This basic structure of your code should display something similar to the left image of the following figure:
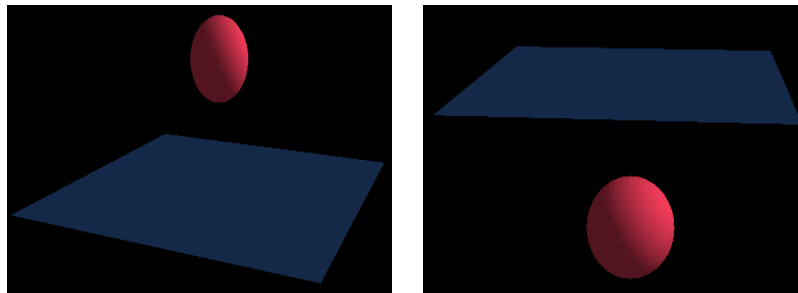
Next you will be adding more functionalities to the scene you have just created. First, implement the functionality to rotate the 3D object in the horizontal plane by the *left* and *right* arrow keys (holding one of the keys should show continuous rotation of the object). Next, implement the functionality where the *up* and *down* arrow keys will change the scale of the object to make it bigger and smaller, respectively, so that when the scale is increased, the object will move further from the plane and decrease of scale will take the object towards the plane. Further decrease of scale by the *down* arrow key will result in vanishing the object, and eventually will start appearing on the other side of the plane by the next *down* arrow key press (as shown in the demo). An example of the sphere being on the other side of the plane is shown in the right image of the above figure. The the role of *up* and *down* key will be reversed when the object is on the other side. This is the basic geometric part of the assignment.

Furthermore, set up the mouse so that the user can view the object and the plane in any direction by holding and dragging the mouse left button, as shown in the demo in the class. Add some nice lighting to the scene for better

visualization (this part is optional, you may add it to get more marks in the aesthetic part of the assignment. Being a computer graphics student, your program output should be aesthetically nice, ideally better than the demo!).

Your task is to implement this in OpenGL using C/C++. The code should run in Ubuntu system.

Weightage

This assignment carries 10% of the total mark.

What to submit?

Submit the program file(s) you have implemented. You must use OpenGL with C/C++ to implement the assignment. Put all the file(s) into a zip and submit in Moodle (no files will be accepted by email). Please do not submit any unnecessary files (such as the whole project).

Plagiarism

Copying the code is a serious academic offence, which will be treated with zero tolerance. Any detection of plagiarism will give zero marks in the assignment.

General marking scheme

The marks will be distributed as follows:

- Working program: 80%

  - Showing the plane and a 3D shape: 5%
  - Switching of 3D objects by different keys: 5%
  - Implementing the interactive rotation part: 20%
  - Implementation of interactive scaling (both sides of the plane): 20%
  - Implementing the mouse functionality: 20%
  - Aesthetic part: 10%

- Documentation: 10%

  - Main comment block identifying the student (name, roll number, email address): 4%
  - Defining input and output parameters for a function: 3%
  - Purpose of functions/blocks of code: 3%

- Program style: 5%

  - Meaningful variable names: 1%
  - Constants instead of "magic numbers": 1%
  - Readability (complete sentences, indentation, white spaces, etc): 2%
  - Code flows "nicely": 1%

- Program structure: 5%

- Modular code: 2%
- Uses appropriate data structure: 1%
- Loops when needed/no loops when not needed: 2%