Graphics Assignment No: 1

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1 Assignment Description

Install OpenGL and its components in Ubuntu and compile programs for simple primitives (line, square, polygon and circle).

2 Procedure

Installation

Install the following packages from the Ubuntu repository:
• freeglut3-dev
• mesa-common-dev

```
sudo apt-get install freeglut3 freeglut3-dev mesa-common-dev
```

Check your */usr/include/GL* folder to verify the installation of the OpenGL headers that you intend to use.

Compiling and Linking

We will have to use the $-lglut$ linker option with $gcc/g++$ to compile a program with *glut* library.

For example, to compile the program, use the following to get the binary executable code:

```
g++ primitive.cpp -lGL -lGLU -lglut -o primitive
```

OpenGL Code

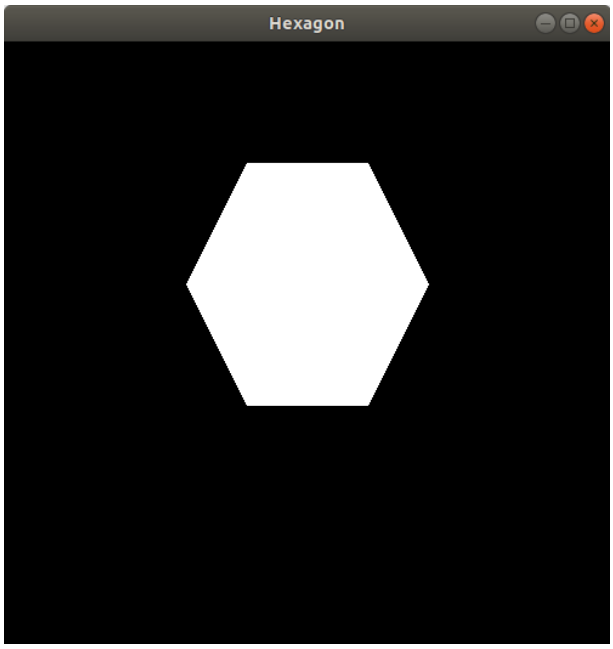
```c
#include <stdio.h>
#include <GL/glut.h>

void display() {
    // Set the display area colour.
    glClear(GL_COLOR_BUFFER_BIT);
    glColor3f(1.0, 1.0, 1.0);
    // Draw the polygon counter-clockwise.
    glBegin(GL_POLYGON);
        glVertex3f(4.0, 4.0, 0.0);
        glVertex3f(6.0, 4.0, 0.0);
        glVertex3f(7.0, 6.0, 0.0);
        glVertex3f(6.0, 8.0, 0.0);
        glVertex3f(4.0, 8.0, 0.0);
        glVertex3f(3.0, 6.0, 0.0);
    glEnd();
    glFlush();
}

int main(int argc, char **argv) {
    // Initialize to the command-line arguments.
    glutInit(&argc, argv);
    // Setup the colour depth of the window buffers.
    glutInitDisplayMode(GLUT_SINGLE | GLUT_RGB | GLUT_DEPTH);

    // Assign the position, size and name to the window.
    glutInitWindowPosition(100, 100);
    glutInitWindowSize(500, 500);
    glutCreateWindow("Hexagon");

    // Setup a black background and viewing projection.
    glClearColor(0.0, 0.0, 0.0, 0.0);
    glMatrixMode(GL_PROJECTION);
    // Initialize identity matrix and setup a 10X10X2 view.
    glLoadIdentity();
    glOrtho(0.0, 10.0, 0.0, 10.0, -1.0, 1.0);

    // Pass the display function to generate the display.
    glutDisplayFunc(display);
    // Hand over the execution to the glut library.
    glutMainLoop();
    return 0;
}
```

Python Code

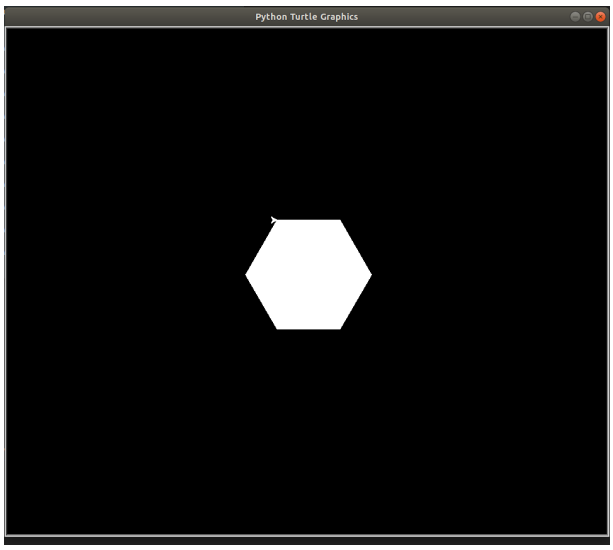
```
# Using turtle graphics library.
from turtle import *

# Function to draw a single hexagonal side.
def draw_hexagon(side_length):
    # Begin drawing with white colour.
    pendown()
    pencolor("white")
    # Draw a line of provided length.
    forward(side_length)
    # Orient the cursor by 60 degrees.
    right(60)

# Initialization and background colour.
setup()
bgcolor("black")

# Move cursor to initial drawing position.
goto(-50, 100)

# Set the colour to fill the hexagon.
# Then draw all the sides.
fillcolor("white")
begin_fill()
for i in range(6):
    draw_hexagon(100)
end_fill()

# Exit on click.
exitonclick()
```

3 Result

OpenGL



Python



4 References

[1] How to install OpenGL/GLUT libraries

[2] An Introduction to OpenGL Programming

[3] Turtle Graphics - The Python Standard Library