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Course: Computer Graphic
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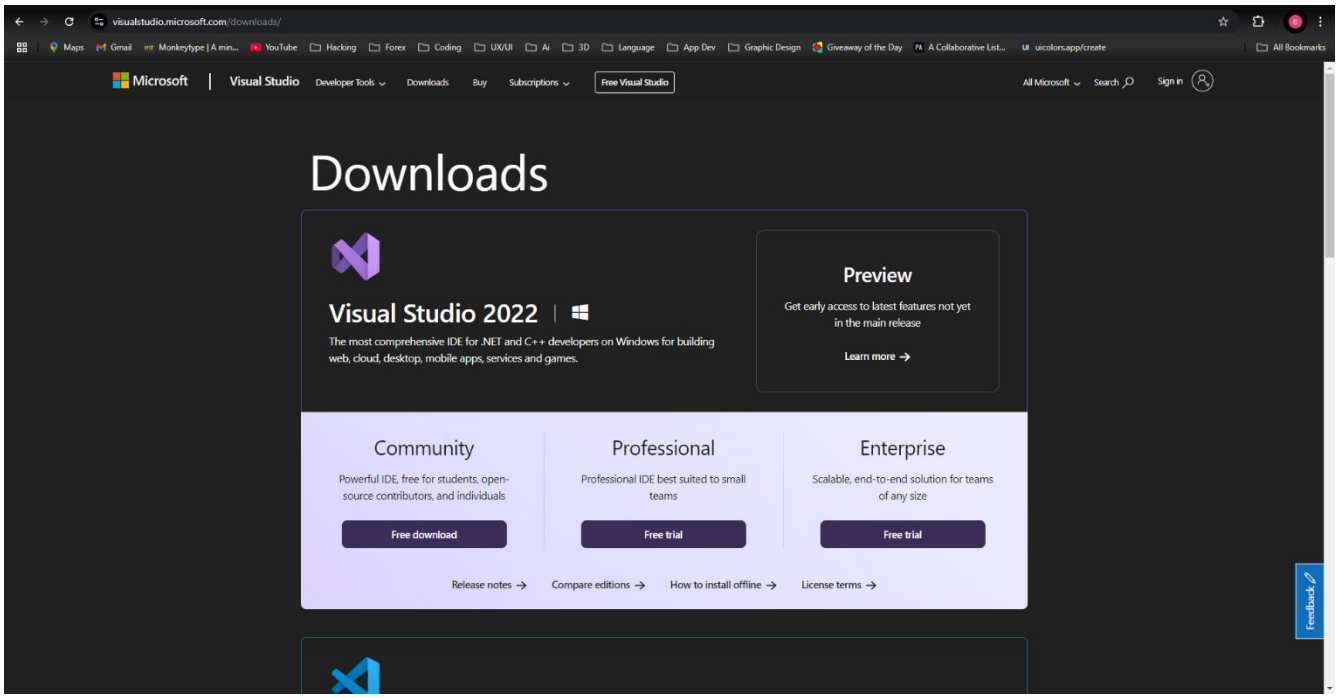
Assignment I

Practical Homework Assignment 1: Development Environment Setup

Tasks and Solutions

1. Software Installation

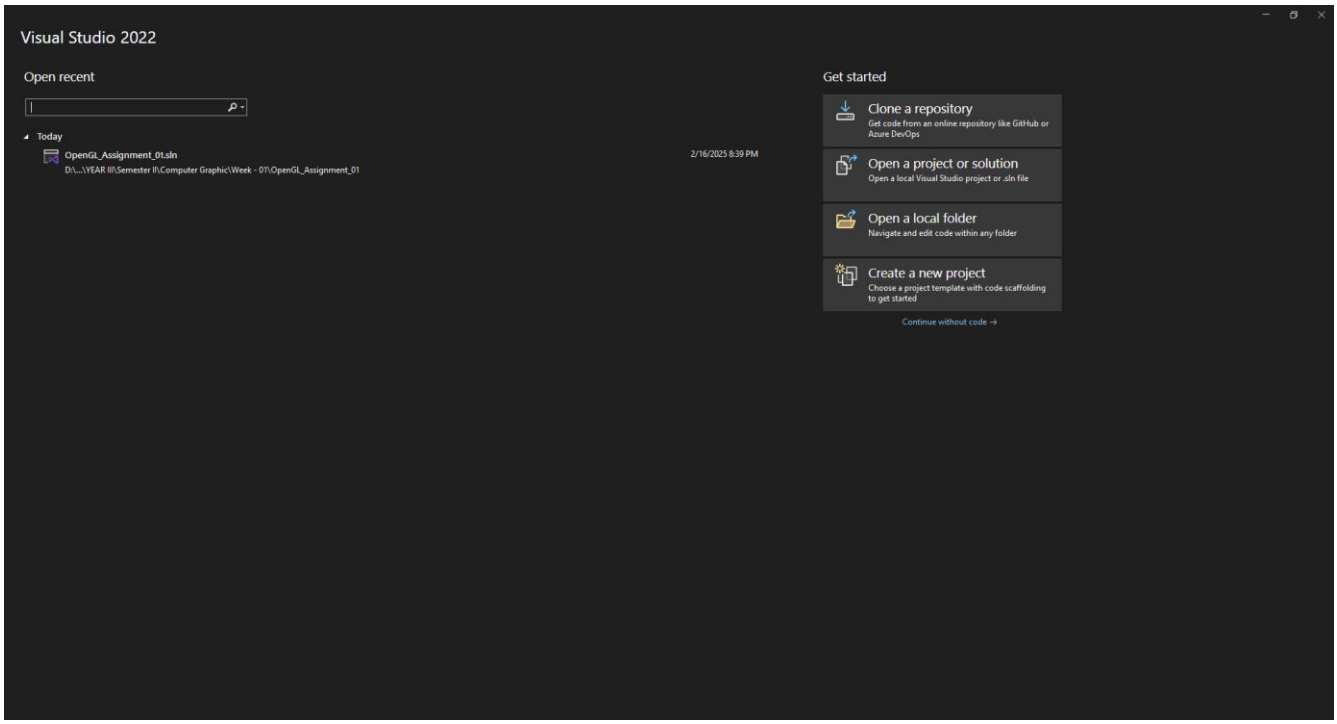
1. **Install Visual Studio Community Edition**:
    - Download and install Visual Studio Community Edition from the official website: Visual Studio.
    - During installation, select the **Desktop development with C++** workload.



2. **Set up OpenGL and GLUT libraries**:
    - Download the GLUT library files:
        - glut.h
        - glut32.lib
        - glut32.dll
    - Place glut.h in the include folder of your Visual Studio installation (e.g., C:\Program Files (x86)\Microsoft Visual Studio\2019\Community\VC\Tools\MSVC\14.XX.XXXXX\include\GL).

- Place glut32.lib in the lib folder (e.g., C:\Program Files (x86)\Microsoft Visual Studio\2019\Community\VC\Tools\MSVC\14.XX.XXXXX\lib\x86).
- Place glut32.dll in the System32 folder (e.g., C:\Windows\System32).

3. **Configure Project Settings**:
   - Open Visual Studio and create a new C++ project.
   - Go to **Project Properties** > **Linker** > **Input**.
   - Add opengl32.lib, glu32.lib, and glut32.lib to the **Additional Dependencies** field.



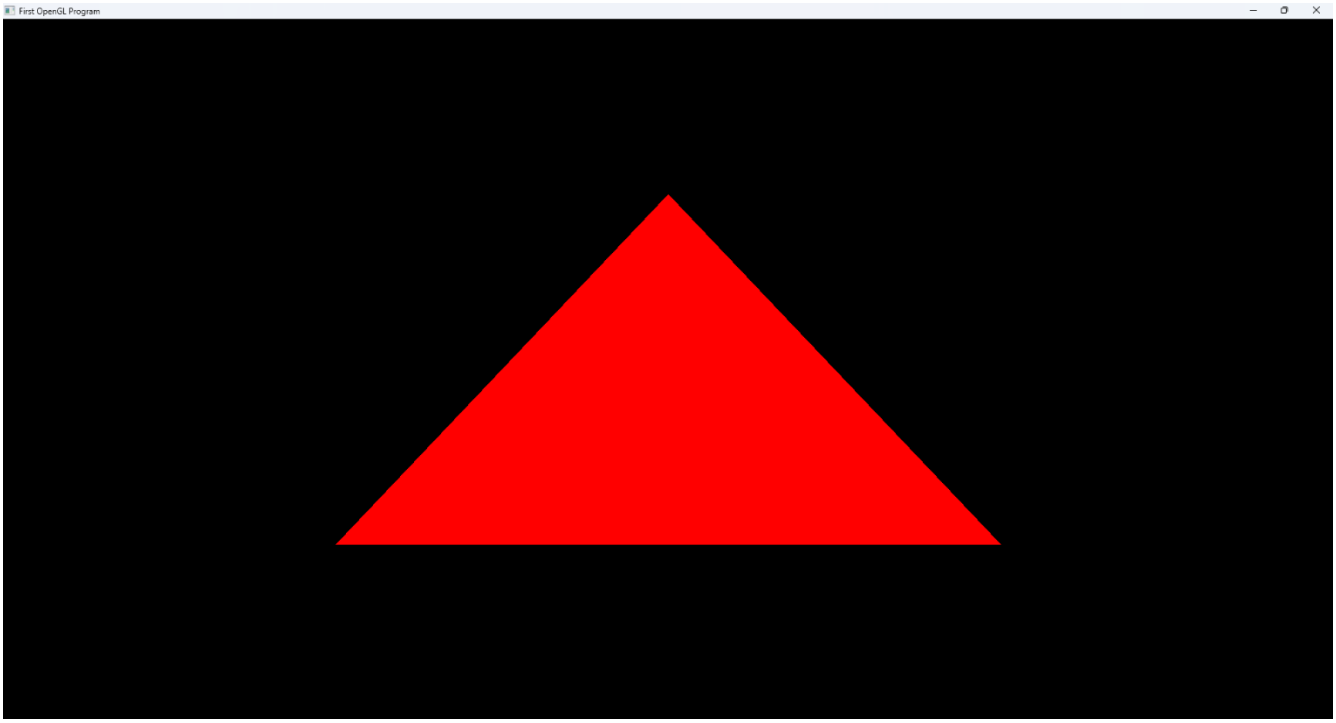
2. Test Program Creation

Create a test program to verify the setup:

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

void display() {
    glClear(GL_COLOR_BUFFER_BIT);
    glColor3f(1.0, 0.0, 0.0); // Red color
    // Draw a simple triangle
    glBegin(GL_TRIANGLES);
    glVertex2f(-0.5, -0.5);
    glVertex2f(0.5, -0.5);
    glVertex2f(0.0, 0.5);
    glEnd();
    glFlush();
}

int main(int argc, char** argv) {
    glutInit(&argc, argv);
    glutCreateWindow("First OpenGL Program");
```

```
18      glutDisplayFunc(display);
19      glutMainLoop();
20      return 0;
21  }
```

2. **Screenshot of Test Program Running**:



3. **List of Errors and Solutions**:

- **Error**: glut.h not found.
  - **Solution**: Ensure glut.h is placed in the correct include folder.
- **Error**: glut32.lib not found.
  - **Solution**: Ensure glut32.lib is placed in the correct lib folder.

Practical Homework Assignment 2: Basic Graphics Programming

Tasks and Solutions

1. Program Implementation

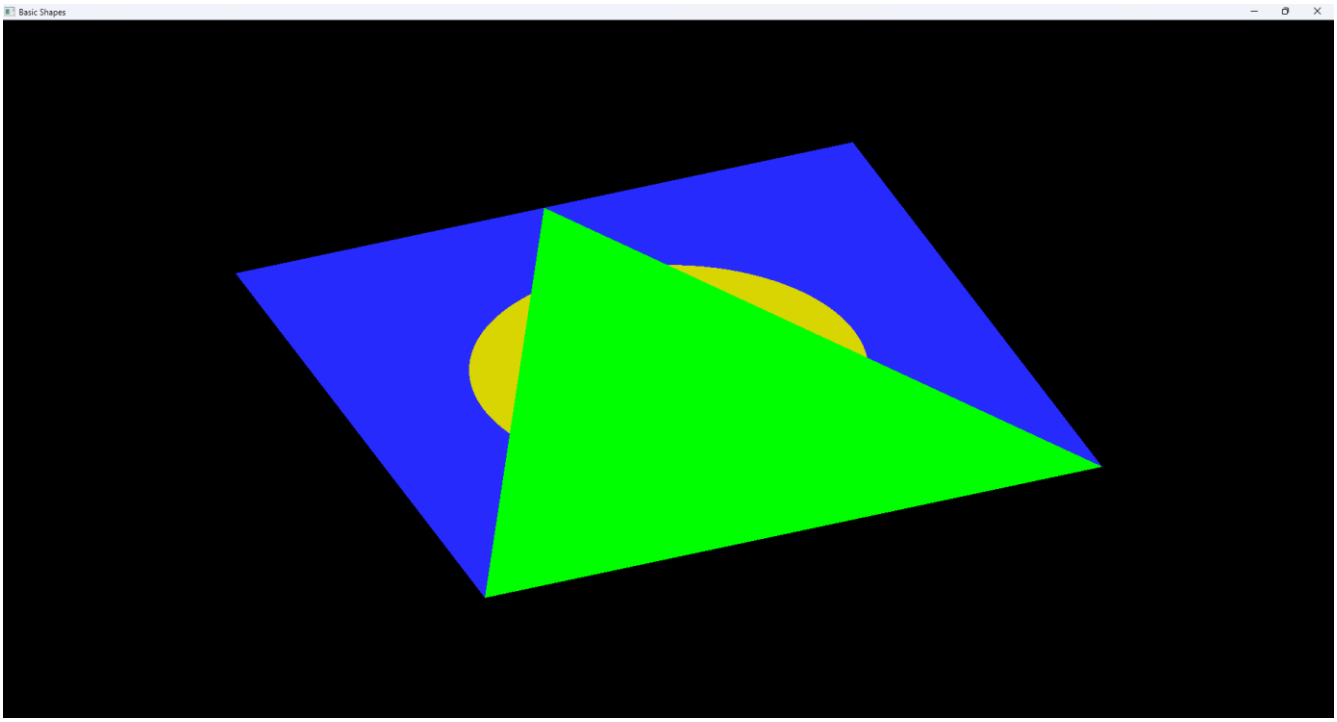
The program draws basic shapes, implements mouse interaction, and changes colors.

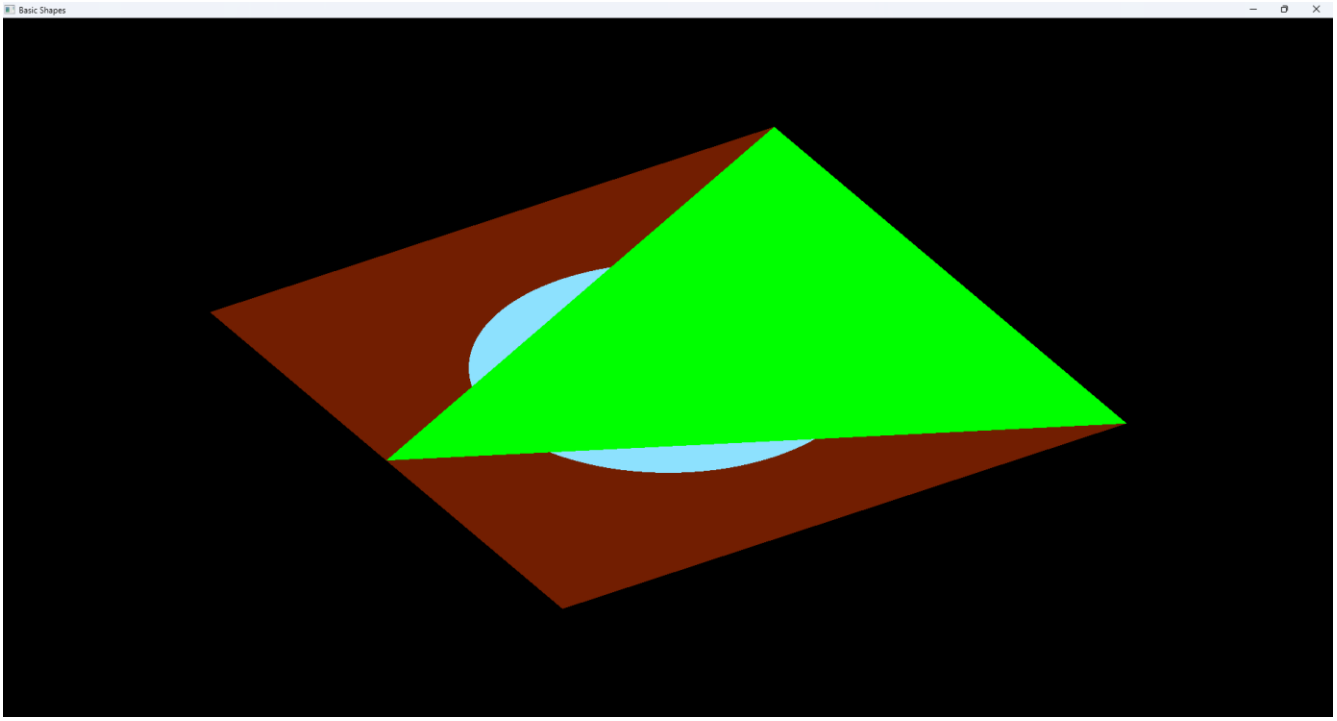
```
1  #include <GL/glut.h>
2  #include <cstdlib> // For rand()
3
4  // Window dimensions
5  const int WINDOW_WIDTH = 800;
6  const int WINDOW_HEIGHT = 600;
7
```

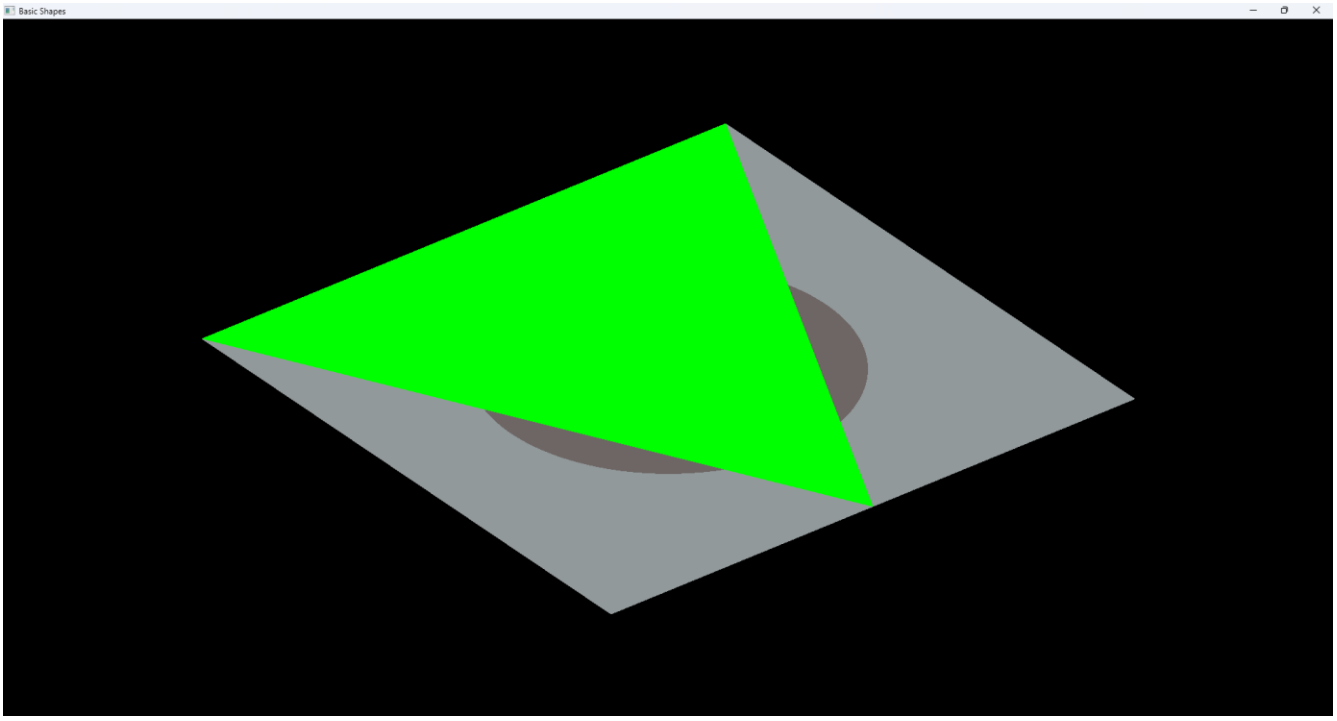
```
// Global variables for color and animation
float red = 1.0, green = 0.0, blue = 0.0;
float angle = 0.0;

// Draw a rectangle
void drawRectangle() {
    glBegin(GL_POLYGON);
    glVertex2f(-0.5, -0.5);
    glVertex2f(0.5, -0.5);
    glVertex2f(0.5, 0.5);
    glVertex2f(-0.5, 0.5);
    glEnd();
}

// Draw a circle
void drawCircle(float radius) {
    glBegin(GL_POLYGON);
    for (int i = 0; i < 360; i++) {
        float angle = i * 3.14159 / 180;
        glVertex2f(cos(angle) * radius, sin(angle) * radius);
    }
    glEnd();
}

// Draw a triangle
void drawTriangle() {
    glBegin(GL_TRIANGLES);
    glVertex2f(-0.5, -0.5);
    glVertex2f(0.5, -0.5);
    glVertex2f(0.0, 0.5);
    glEnd();
}

// Display function
void display() {
    glClear(GL_COLOR_BUFFER_BIT);
    glLoadIdentity();

    // Rotate shapes
    glRotatef(angle, 0.0, 0.0, 1.0);

    // Draw shapes with different colors
    glColor3f(red, green, blue); // Set color
    drawRectangle();

    glColor3f(1.0 - red, 1.0 - green, 1.0 - blue); // Complementary color
    drawCircle(0.3);

    glColor3f(0.0, 1.0, 0.0); // Green
    drawTriangle();

    glFlush();
    glutSwapBuffers();
}

```

```
// Mouse interaction
void mouse(int button, int state, int x, int y) {
    if (button == GLUT_LEFT_BUTTON && state == GLUT_DOWN) {
        // Change color on left click
        red = (float)rand() / RAND_MAX;
        green = (float)rand() / RAND_MAX;
        blue = (float)rand() / RAND_MAX;
    }
    glutPostRedisplay();
}

// Timer function for animation
void update(int value) {
    angle += 2.0; // Rotate shapes
    if (angle > 360) angle -= 360;
    glutPostRedisplay();
    glutTimerFunc(16, update, 0); // ~60 FPS
}

int main(int argc, char** argv) {
    glutInit(&argc, argv);
    glutInitDisplayMode(GLUT_DOUBLE | GLUT_RGB);
    glutInitWindowSize(WINDOW_WIDTH, WINDOW_HEIGHT);
    glutCreateWindow("Basic Shapes");
    glutDisplayFunc(display);
    glutMouseFunc(mouse);
    glutTimerFunc(0, update, 0);
    glutMainLoop();
    return 0;
}
```

- When click on it, it will change color







Troubleshooting Notes

- **Error**: glut.h not found.
  - **Solution**: Ensure glut.h is placed in the correct include folder.
- **Error**: glut32.lib not found.
  - **Solution**: Ensure glut32.lib is placed in the correct lib folder.
- **Error**: Program crashes on mouse click.
  - **Solution**: Ensure the mouse() function is correctly implemented and linked.