SCHOOL OF COMPUTER SCIENCE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
DEHRADUN, UTTARAKHAND

UPES
UNIVERSITY OF TOMORROW

COMPUTER GRAPHICS
LABORATORY FILE
(2024-2025)

For

Vth Semester

Submitted To:
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Assistant Professor
[Vth Semester]
School of Computer Science

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LAB EXPERIMENT – 2

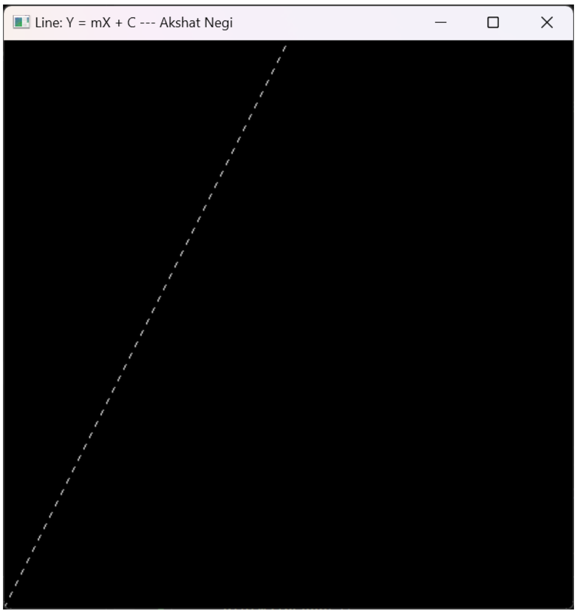
DRAWING A LINE

[Usage of Open GL]

# Take the input from user for all the three scenarios i.e. value of (x1, y1) and (x2, y2).

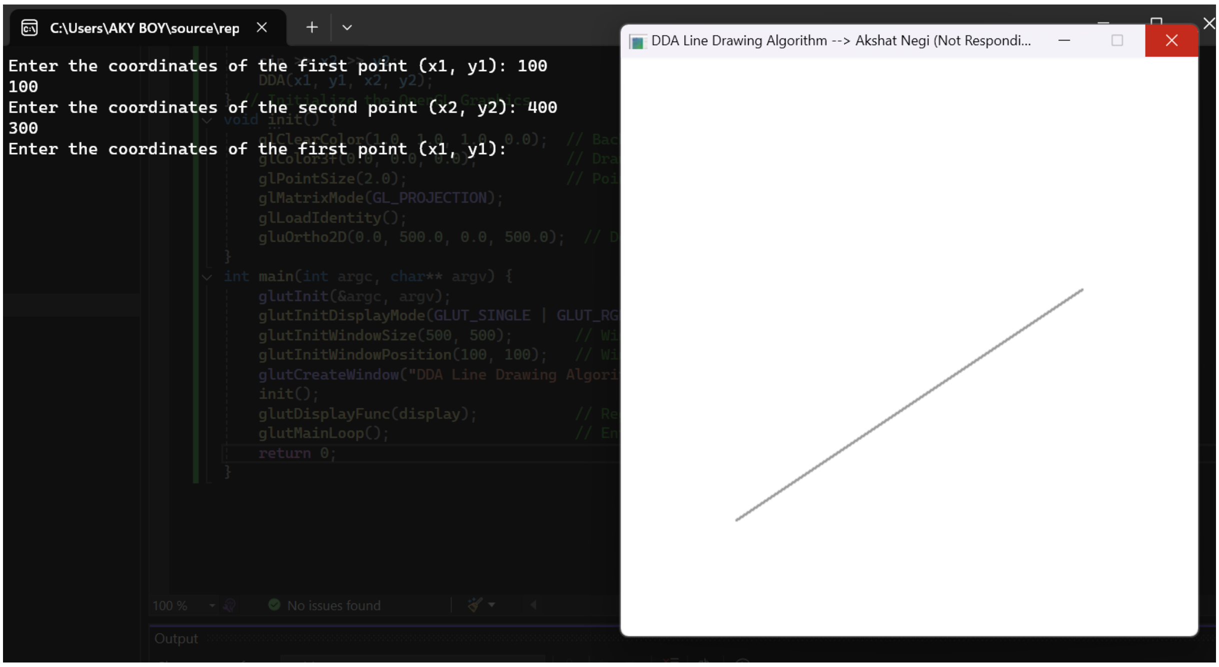
a) Draw a line using equation of line Y=m*X+C.

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

float m = 2.0f;
float C = 1.0f;

void display()
{
    glClear(GL_COLOR_BUFFER_BIT);

    glBegin(GL_LINES);
    for (float x = -1.0f; x <= 1.0f; x += 0.01f)
    {
        float y = m * x + C;
        glVertex2f(x, y);
    }
    glEnd();

    glFlush();
}

void init()
{
    glClearColor(0.0, 0.0, 0.0, 0.0);
    glColor3f(1.0, 1.0, 1.0);
    gluOrtho2D(-1.0, 1.0, -1.0, 1.0);
}

int main(int argc, char** argv)
{
    glutInit(&argc, argv);
    glutInitDisplayMode(GLUT_SINGLE | GLUT_RGB);
    glutInitWindowSize(500, 500);
    glutInitWindowPosition(100, 100);
    glutCreateWindow("Line: Y = mX + C --- Akshat Negi");
    init();
    glutDisplayFunc(display);
    glutMainLoop();
    return 0;
   }
```



b) Draw a line using DDA algorithm for slope m<1 and m>1.

```
#include <GL/freeglut.h>
#include <iostream>
#include <cmath>
using namespace std; // Function to plot points
void plot(int x, int y) {
    glBegin(GL_POINTS);
    glVertex2i(x, y);
    glEnd();
    glFlush();
}  // DDA Line Drawing Algorithm
void DDA(int x1, int y1, int x2, int y2) {
    int dx = x2 - x1;
    int dy = y2 - y1;
    int steps = abs(dx) > abs(dy) ? abs(dx) : abs(dy);  // Maximum steps
    float xIncrement = dx / (float)steps;
    float yIncrement = dy / (float)steps;
    float x = x1;
    float y = y1; // Draw the line by plotting points
    for (int i = 0; i <= steps; i++) {
        plot(round(x), round(y));
        x += xIncrement;
        y += yIncrement;
    }
}// Function to get input from the user and call DDA
void display() {
    glClear(GL_COLOR_BUFFER_BIT);
    int x1, y1, x2, y2;
    cout << "Enter the coordinates of the first point (x1, y1): ";
    cin >> x1 >> y1;
    cout << "Enter the coordinates of the second point (x2, y2): ";
    cin >> x2 >> y2;
    DDA(x1, y1, x2, y2);
} // Initialize the OpenGL Graphics
void init() {
    glClearColor(1.0, 1.0, 1.0, 0.0);  // Background color
    glColor3f(0.0, 0.0, 0.0);          // Drawing color
    glPointSize(2.0);                  // Point size
    glMatrixMode(GL_PROJECTION);
    glLoadIdentity();
    gluOrtho2D(0.0, 500.0, 0.0, 500.0);  // Define the drawing area
}
int main(int argc, char** argv) {
    glutInit(&argc, argv);
    glutInitDisplayMode(GLUT_SINGLE | GLUT_RGB);
    glutInitWindowSize(500, 500);        // Window size
    glutInitWindowPosition(100, 100);    // Window position
    glutCreateWindow("DDA Line Drawing Algorithm --> Akshat Negi");
    init();
    glutDisplayFunc(display);            // Register display function
    glutMainLoop();                      // Enter the event-processing loop
    return 0;
}
```



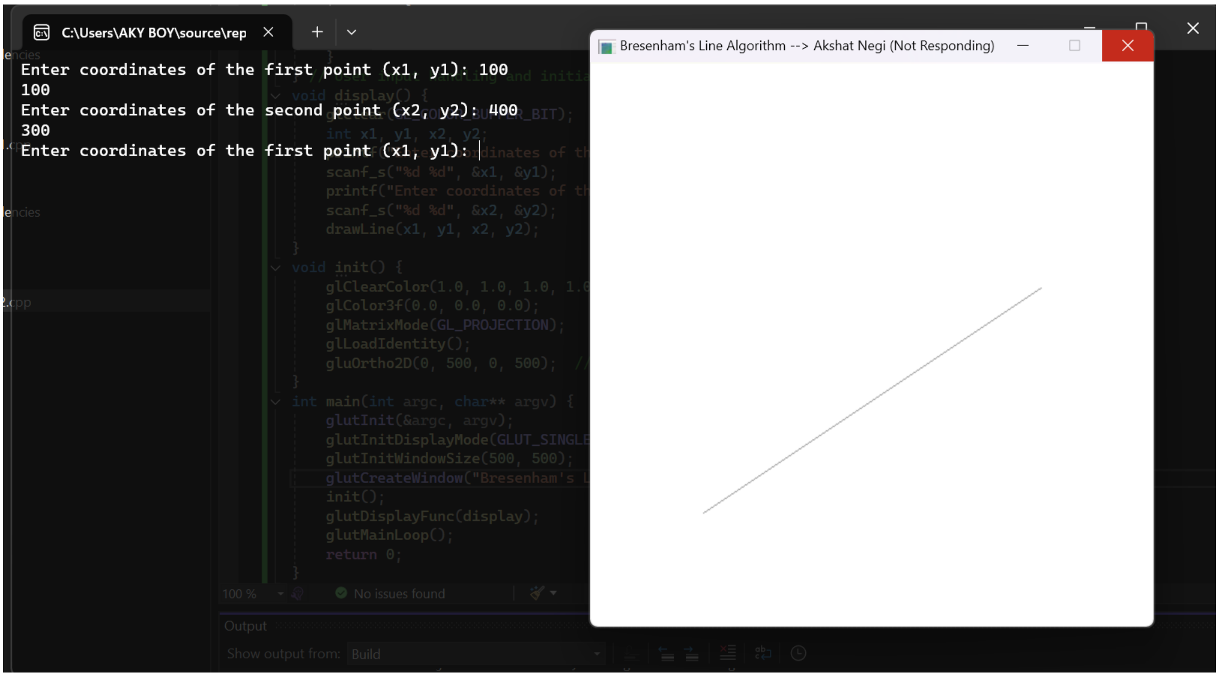
C:\Users\AKY BOY\source\rep
DDA Line Drawing Algorithm --> Akshat Negi (Not Respondi...
100 %
No issues found
Output

```
Enter the coordinates of the first point (x1, y1): 100
100
Enter the coordinates of the second point (x2, y2): 400
300
Enter the coordinates of the first point (x1, y1):
```

c) Draw a line using Bresenham algorithm for slope m<1 and m>1.

```
#include <GL/freeglut.h>
#include <stdio.h> // Function to set pixel at (x, y)
void setPixel(int x, int y) {
    glBegin(GL_POINTS);
    glVertex2i(x, y);
    glEnd();
    glFlush();
} // Bresenham's algorithm for slope |m| < 1 (dy < dx)
void bresenhamLineLow(int x1, int y1, int x2, int y2) {
    int dx = x2 - x1;
    int dy = y2 - y1;
    int D = 2 * dy - dx;
    int y = y1;
    for (int x = x1; x <= x2; x++) {
        setPixel(x, y);
        if (D > 0) {
            y += (y2 > y1) ? 1 : -1;  // Increase/decrease y depending on the
slope direction
```

```
            D = D + (2 * (dy - dx));
        }
        else {
            D = D + 2 * dy;
        }
    }
}// Bresenham's algorithm for slope |m| > 1 (dy > dx)
void bresenhamLineHigh(int x1, int y1, int x2, int y2) {
    int dx = x2 - x1;
    int dy = y2 - y1;
    int D = 2 * dx - dy;
    int x = x1;
    for (int y = y1; y <= y2; y++) {
        setPixel(x, y);
        if (D > 0) {
            x += (x2 > x1) ? 1 : -1;  // Increase/decrease x depending on the 
slope direction
            D = D + (2 * (dx - dy));
        }
        else {
            D = D + 2 * dx;
        }
    }
} // Main function that checks the slope and calls the appropriate function
void drawLine(int x1, int y1, int x2, int y2) {
    if (abs(y2 - y1) < abs(x2 - x1)) {
        if (x1 > x2) {
            bresenhamLineLow(x2, y2, x1, y1);  // Line from (x2, y2) to (x1, y1)
        }
        else {
            bresenhamLineLow(x1, y1, x2, y2);  // Line from (x1, y1) to (x2, y2)
        }
    }
    else {
        if (y1 > y2) {
            bresenhamLineHigh(x2, y2, x1, y1); // Line from (x2, y2) to (x1, y1)
        }
        else {
            bresenhamLineHigh(x1, y1, x2, y2); // Line from (x1, y1) to (x2, y2)
        }
    }
} // User input handling and initialization
void display() {
    glClear(GL_COLOR_BUFFER_BIT);
    int x1, y1, x2, y2;
    printf("Enter coordinates of the first point (x1, y1): ");
    scanf_s("%d %d", &x1, &y1);
    printf("Enter coordinates of the second point (x2, y2): ");
    scanf_s("%d %d", &x2, &y2);
    drawLine(x1, y1, x2, y2);
}
void init() {
    glClearColor(1.0, 1.0, 1.0, 1.0);
    glColor3f(0.0, 0.0, 0.0);
    glMatrixMode(GL_PROJECTION);
    glLoadIdentity();
    gluOrtho2D(0, 500, 0, 500);  // Set the orthographic projection
}
int main(int argc, char** argv) {
    glutInit(&argc, argv);
    glutInitDisplayMode(GLUT_SINGLE | GLUT_RGB);
    glutInitWindowSize(500, 500);
    glutCreateWindow("Bresenham's Line Algorithm --> Akshat Negi");
    init();
    glutDisplayFunc(display);
    glutMainLoop();
    return 0;
}
```



```
Enter coordinates of the first point (x1, y1): 100
100
Enter coordinates of the second point (x2, y2): 400
300
Enter coordinates of the first point (x1, y1):
```

C:\Users\AKY BOY\source\rep
Bresenham's Line Algorithm --> Akshat Negi (Not Responding)
100 %
No issues found
Output
Show output from: Build