FARIDPUR ENGINEERING COLLEGE

Dept. of Computer Science & Engineering

Lab Report

Subject Name : Computer Graphics (Sessional)

Subject Code : CSE 802

Lab Report On : Implement a Line using DDA Line Drawing Algorithm with OpenGL and Codeblocks IDE

Submitted To:

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REMARKS

Date of submission

Experiment No: 01

Experiment Name: Implement a Line using DDA Line Drawing Algorithm with OpenGL and Codeblocks IDE.

Aim: The aim is to understand the concept of DDA line drawing algorithm, its advantages and disadvantages, and its implementation using OpenGL and Codeblocks IDE. The report should include the algorithm, code, and output screenshots, as well as a discussion on the performance of the DDA algorithm compared to other line drawing algorithms. The lab report will provide a practical understanding of line drawing algorithms and their application in computer graphics.

Description: The Digital Differential Analyzer (DDA) algorithm is a commonly used method for drawing lines in computer graphics. The algorithm is based on the idea of incrementally stepping along a line, determining the coordinates of each pixel that the line crosses, and setting the color of those pixels to the desired color. The basic idea of the algorithm is to use the slope of the line to determine the increment in x and y for each step.

Requirements:

1. Codeblocks
2. OpenGL
3. Glut

Some of the functions:

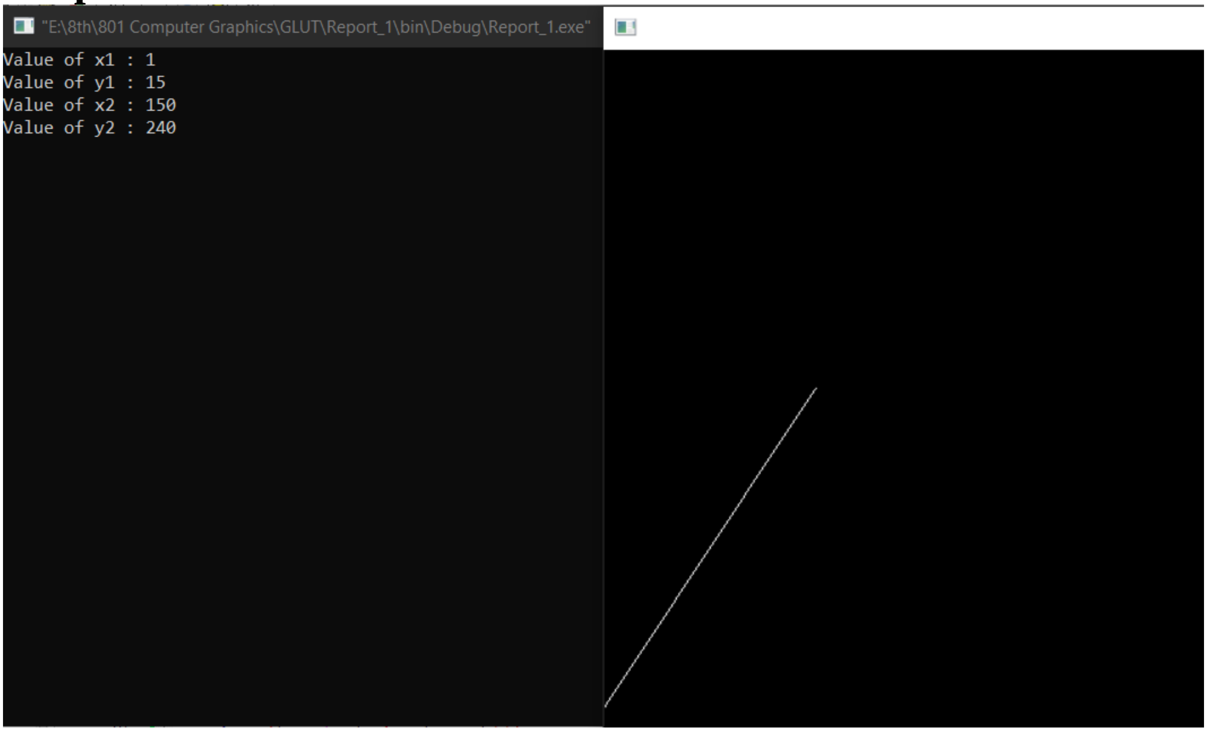
glBegin, glEnd: Delimit the vertices of a primitive or a group of like primitives.
glClear:Clears buffers to preset values.
glClearColor: Specifies clear values for the color buffers.
glFlush: Forces execution of OpenGL functions in finite time.
glMatrixMode: Specifies which matrix is the current matrix.
glutInit: Initialize GLUT
glutCreateWindow: Create window with the given title
glutInitWindowSize: Set the window's initial width & height
glutInitWindowPosition: Position the window's initial top-left corner
glutDisplayFunc(display): Register callback handler for window repaint event
initGL(): Our own OpenGL initialization
glutMainLoop(): Enter the event-processing loop

Algorithm: The DDA (Digital Differential Analyzer) line drawing algorithm is a simple and efficient method used for drawing lines in computer graphics. The algorithm works by calculating the slope of the line and then incrementing the coordinates by the slope value to generate a set of pixels that fall on the line. The following is the algorithm for implementing a line using the DDA line drawing algorithm with OpenGL and Codeblocks IDE:

1. Initialize the graphics system and set the window size and viewport.
2. Get the coordinates of the two endpoints of the line from the user.
3. Calculate the slope of the line using the formula m = (y2 - y1) / (x2 - x1).

4. Determine the direction of the line by comparing the absolute values of x2 - x1 and y2 - y1.
5. If the absolute value of x2 - x1 is greater than the absolute value of y2 - y1, set the increment value for x to 1 and calculate the increment value for y using the formula y_increment = m * x_increment.
6. If the absolute value of y2 - y1 is greater than the absolute value of x2 - x1, set the increment value for y to 1 and calculate the increment value for x using the formula x_increment = y_increment / m.
7. Set the current point to the starting point (x1, y1).
8. While the current point is not equal to the ending point (x2, y2), do the following: a. Plot the current point. b. Increment the x-coordinate or y-coordinate depending on the direction of the line. c. Calculate the new y-coordinate using the formula y = y + y_increment. d. Calculate the new x-coordinate using the formula x = x + x_increment. e. Set the current point to the new coordinates.
9. End the algorithm.

Output:


"E:\8th\801 Computer Graphics\GLUT\Report_1\bin\Debug\Report_1.exe"

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Value of x1 : 1
Value of y1 : 15
Value of x2 : 150
Value of y2 : 240
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Discussion:

1. The DDA line drawing technique is a straightforward and effective method for drawing straight lines on a computer screen. It entails calculating and rendering the coordinates of each pixel in the line using the OpenGL graphics library.
2. The algorithm's first step is to initialize the coordinates of the line's two endpoints. These coordinates reflect the line's beginning and terminating positions.
3. The slope of the line is computed by dividing the difference in y-coordinates by the difference in x-coordinates. This slope is used to determine the direction of the line as well as the rate at which the pixel coordinates are incremented.