Experiment No. 1
Implement DDA Line Drawing algorithm.
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Experiment No 1.

Aim: To implement DDA algorithms for drawing a line segment between two given end points.

Objective: Draw the line using (vector) generation algorithms which determine the pixels that should be turned ON are called as digital differential analyzer (DDA).It is one of the techniques for obtaining a rasterized straight line. This algorithm can be used to draw the line in all the quadrants.

Theory:
DDA algorithm is an incremental scan conversion method. Here we perform calculations at each step using the results from the preceding step. The characteristic of the DDA algorithm is to take unit steps along one coordinate and compute the corresponding values along the other coordinate. Digital Differential Analyzer (DDA) algorithm is the simple line generation algorithm which is explained step by step here.

Algorithm:

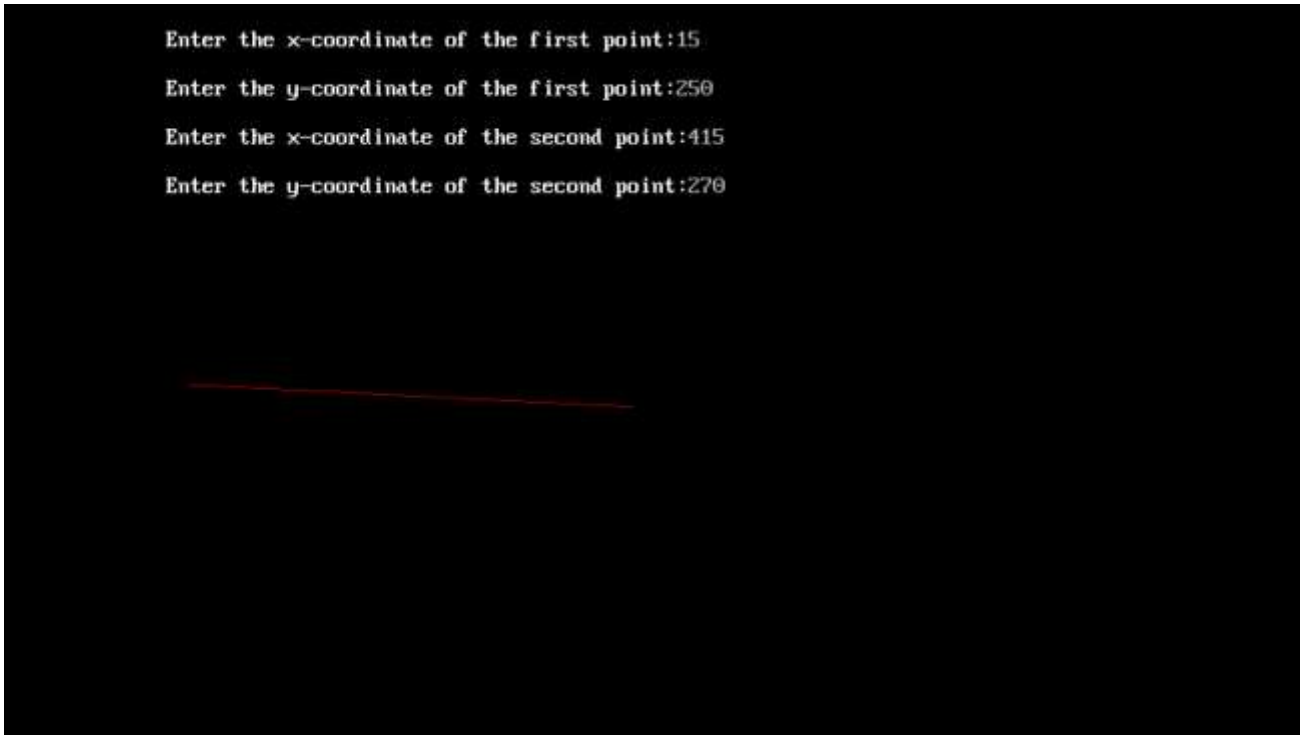
1. Input two endpoints: (x1, y1) and (x2, y2).
2. Calculate the differences in the x and y coordinates:
3. dx = x2 - x1 dy = y2 - y1
4. Determine the number of steps required to draw the line. You can use the maximum difference between dx and dy:
5. steps = max(abs(dx), abs(dy))
6. Calculate the increments for x and y:
7. x_increment = dx / steps y_increment = dy / steps
8. Initialize the current position (x, y) as the starting point (x1, y1):
9. x = x1 y = y1
10. For each step from 1 to steps:
11. a. Round the current coordinates to the nearest integer since pixel positions are discrete. b. Plot the pixel at the current position (x, y). c. Update the current position:
12. x = x + x_increment y = y + y_increment
13. Continue the loop until you have plotted all the necessary pixels to draw the line segment.

Program:

```
#include<graphics.h>
#include<stdio.h>
#include<math.h>
#include<dos.h>
int main()
{
   float x,y,x1,y1,x2,y2,dx,dy,step;
   int i,gd=DETECT,gm;
   //detectgraph(&gd,&gm);
   initgraph(&gd,&gm,"");
   printf("\nEnter the x-coordinate of the first point:");
   scanf("%f",&x1);
   printf("\nEnter the y-coordinate of the first point:");
   scanf("%f",&y1);
   printf("\nEnter the x-coordinate of the second point:");
   scanf("%f",&x2);
   printf("\nEnter the y-coordinate of the second point:");
   scanf("%f",&y2);
   dx=abs(x2-x1);
   dy=abs(y2-y1);
   if(dx>dy)
   {
      step=dx;
   }
   else
   {
      step=dy;
   }
```

```
    dx=dx/step;
    dy=dy/step;
    x=x1;
    y=y1;
    i=1;
    while(i<=step)
    {
        putpixel(x,y,14);
        x=x+dx;
        y=y+dy;
        i=i+1;
        delay(100);
    }
    getch();
    closegraph();
}
```

Output:



Conclusion:

1. A pixel stands as the tiniest building block of an image, and 'putpixel' serves as a method to individually colorize these minute units displayed on the screen.
2. The Digital Differential Analyzer (DDA) method is an approximation technique for drawing a line between two specified points, (x1, y1) and (x2, y2), by utilizing the equation y = mx + b. It evaluates the slope and makes successive updates to the coordinates.
3. The necessity for a line drawing algorithm arises from the fact that computers represent images using discrete pixels on a grid. To create smooth and continuous lines, an algorithm is required to determine which pixels should be filled with color.
4. While DDA is straightforward, it may not be the most rapid method available for line drawing.