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:

Input the two endpoints of the line segment, (x1,y1) and (x2,y2).
Calculate the difference between the x-coordinates and y-coordinates of the endpoints as dx and dy respectively.
Calculate the slope of the line as m = dy/dx.
Set the initial point of the line as (x1,y1).
Loop through the x-coordinates of the line, incrementing by one each time, and calculate the corresponding y-coordinate using the equation y = y1 + m(x – x1).
Plot the pixel at the calculated (x,y) coordinate.
Repeat steps 5 and 6 until the endpoint (x2,y2) is reached.

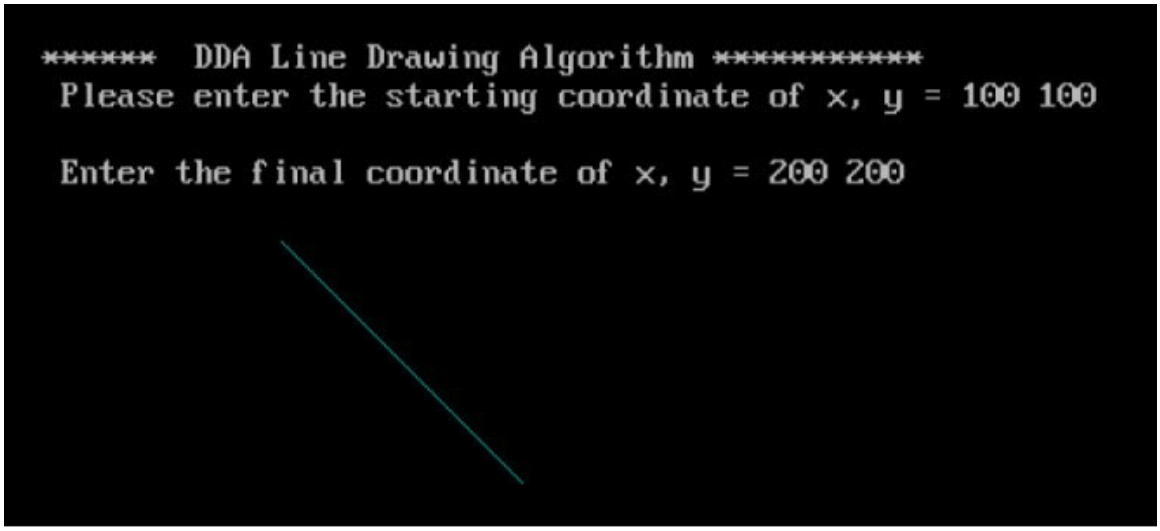
Program:

```
#include<graphics.h>
#include<math.h>
#include<conio.h>
void main()
{
int x0,y0,x1,y1,i=0;
float delx,dely,len,x,y;
int gr=DETECT,gm;
initgraph(&gr,&gm,"C:\\TURBOC3\\BGI");
printf("\n****** DDA Line Drawing Algorithm ***********");
printf("\n Please enter the starting coordinate of x, y = ");
scanf("%d %d",&x0,&y0);
printf("\n Enter the final coordinate of x, y = ");
scanf("%d %d",&x1,&y1);
dely=abs(y1-y0);
```

```
delx=abs(x1-x0);

if(delx<dely)
{
len = dely;
}
else
{
len=delx;
}
delx=(x1-x0)/len;
dely=(y1-y0)/len;
x=x0+0.5;
y=y0+0.5;
do{
putpixel(x,y,3);
x=x+delx;
y=y+dely;
i++;
delay(30);
}while(i<=len);
getch();
closegraph();
}
```

Output:



Conclusion: Comment on -

1. Pixel

2. Equation for line
3. Need of line drawing algorithm
4. Slow or fast

Pixel: In Digital Differential Analyzer (DDA) algorithm, a "pixel" refers to the smallest controllable element on a digital display or raster image. The DDA algorithm is used for generating points on a line between two given points by calculating the intermediate pixel positions.

Equation for line: The DDA algorithm essentially utilizes this line equation and incremental calculations to determine the pixel positions along the line and generates the points to draw the line on a digital display. The equation used is typically the slope-intercept form of a line, which is y = mx + c, where 'm' is the slope of the line and 'c' is the y-intercept.

Need for line drawing algorithm: Line drawing algorithms are fundamental in a wide array of applications, serving as the building blocks for visual representation, aiding in geometric modeling, supporting image processing, and playing a crucial role in both creative and technical domains. Without such algorithms, it would be challenging to accurately represent lines and shapes in computer graphics and various applications that involve graphical representations.

Slow or fast: The DDA algorithm operates by calculating and rounding off incremental values to determine the next pixel's position, which is why it is a little bit slow. Additionally, the DDA algorithm might suffer from precision issues, especially when dealing with lines of high slope or lines that are close to vertical, leading to discrepancies in pixel placement and potentially requiring more iterations to plot the line accurately.