Experiment No.2
Aim: To implement Bresenham's algorithms for drawing a line segment between two given end points.
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Experiment No. 2

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

Objective:
Draw a line using Bresenham's line algorithm that determines the points of an n-dimensional raster that should be selected to form a close approximation to a straight line between two points

Theory:
In Bresenham’s line algorithm pixel positions along the line path are obtained by determining the pixels i.e. nearer the line path at each step.

Algorithm –

```
Step1: Start Algorithm

Step2: Declare variable x1,x2,y1,y2,d,i1,i2,dx,dy

Step3: Enter value of x1,y1,x2,y2
            Where x1,y1are coordinates of starting point
            And x2,y2 are coordinates of Ending point

Step4: Calculate dx = x2-x1
            Calculate dy = y2-y1
            Calculate i1=2*dy
            Calculate i2=2*(dy-dx)
            Calculate d=i1-dx

Step5: Consider (x, y) as starting point and xendas maximum possible value of x.
            If dx < 0
                  Then x =
x2                    y = y2
xend=x1                 If dx >
0                 Then x = x1
y = y1
xend=x2

Step6: Generate point at (x,y)coordinates.

Step7: Check if whole line is generated.
```

```
        If x > = xend
Stop.

Step8: Calculate co-ordinates of the next pixel
        If d < 0
          Then d = d + i1
        If d ≥ 0
     Then d = d + i2
        Increment y = y + 1

Step9: Increment x = x + 1

Step10: Draw a point of latest (x, y) coordinates

Step11: Go to step 7

Step12: End of Algorithm
```

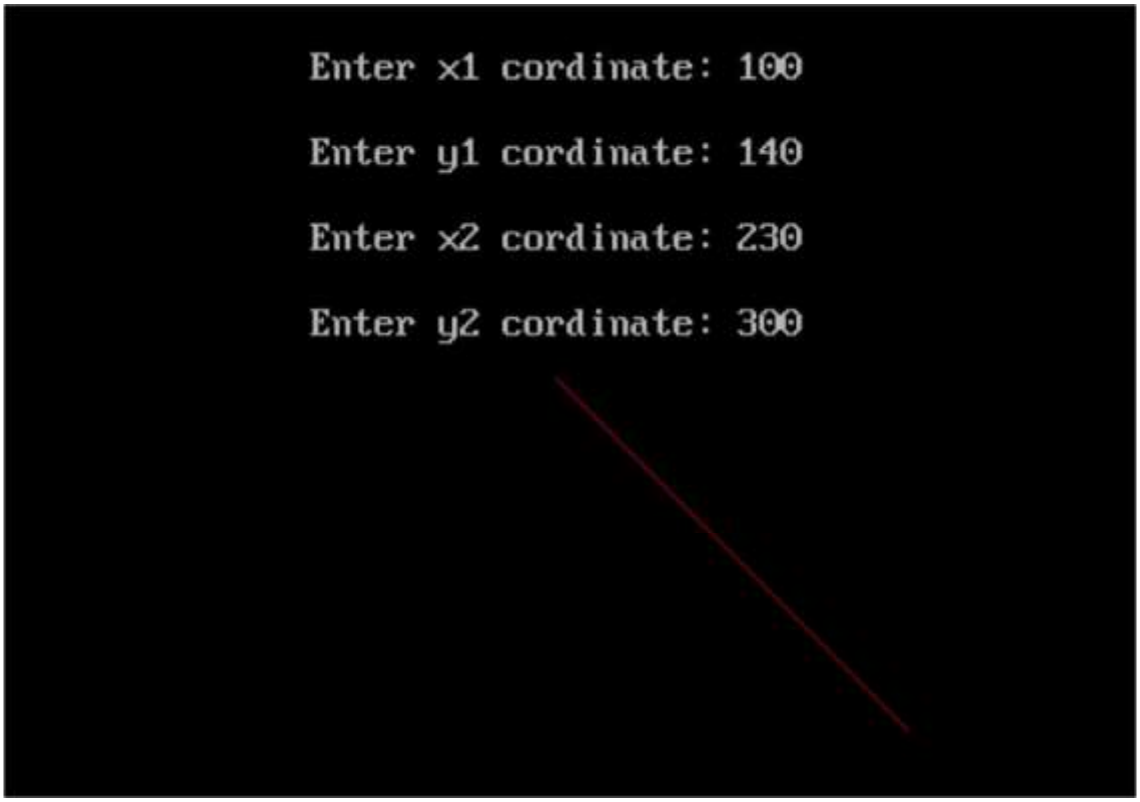
Program –

```
#include<graphics.h>

#include<stdio.h>

#include<conio.h>

int main()

{

      int x,y,x1,y1,x2,y2,p,dx,dy;

       int gd=DETECT,gm=0;

initgraph(&gd,&gm, "");          printf("\n

Enter x1 cordinate: ");

      scanf("%d",&x1);

      printf("\n Enter y1 cordinate: ");

      scanf("%d",&y1);

      printf("\n Enter x2 cordinate: ");
```

```
        scanf("%d",&x2);
        printf("\n Enter y2 cordinate: ");

        scanf("%d",&y2);


         x=x1;

y=y1;   dx=x2-x1;

dy=y2-y1;


         putpixel (x,y, RED);

p = (2 * dy-dx);


        while(x <= x2)

        {

                if(p<0)

                {

                        x = x+1;

                        p = p + 2*dy;

                }

                else

                {

                           x = x +

 1;                        y = y +

                 1;

                        p = p + (2 * dy) - (2 * dx);


                }
```

```
                    putpixel (x,y, RED);


          }


          getch();

closegraph();

}
```

Output –



```
Enter x1 cordinate: 100

Enter y1 cordinate: 140

Enter x2 cordinate: 230

Enter y2 cordinate: 300
```

Conclusion: Comment on –

1. Pixel

A pixel (short for "picture element") is the smallest unit of a digital image or display. It represents a single point in a graphic image. Pixels are the building blocks of any visual display; each one contributes to the overall image resolution and color depth. When combined, thousands or millions of pixels can form complex images, with each pixel holding specific color information

2.Equation for line

The standard equation for a line in a two-dimensional plane is: [y = mx + b] Where:

- y is the y-coordinate,
- m is the slope of the line,
- x is the x-coordinate,
- b is the y-intercept.

This equation can be used to determine the position of any point along the line given its x or y coordinate. It's a fundamental concept in algebra and graphics.

3.Need of line drawing algorithm

Line drawing algorithms are essential in computer graphics for several reasons:

- Accuracy: Ensure that lines are drawn accurately and uniformly.
- Efficiency: Optimize the process of rendering lines, especially on pixel-based displays.
- Hardware Constraints: Address limitations of raster devices, ensuring lines are smooth and visually appealing.
- Foundational: Serve as a basis for more complex rendering algorithms, such as polygon filling and text rendering.

4.Slow or fast

The speed of line drawing algorithms can vary:

- DDA Algorithm: Uses floating-point arithmetic, making it slower but more accurate.
- Bresenham's Algorithm: Utilizes integer arithmetic, making it faster and suitable for real-time applications. It's generally preferred for its efficiency and simplicity.