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:

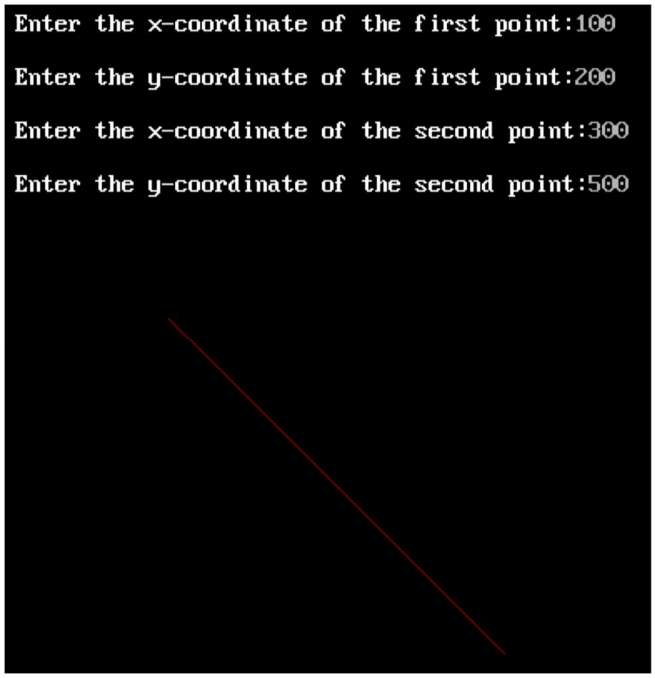
1. Input two endpoints: (x1, y1) and (x2, y2).
2. Calculate the differences in the x and y coordinates:
3. dx = x2 - x1 dy = y2 - y1
4. Initialize variables for tracking the current position, decision parameter, and steps:
5. x = x1 y = y1 d = 2 * dy - dx x_increment = 1 y_increment = 1
6. If dx < 0, set x_increment to -1.
7. If dy < 0, set y_increment to -1.
8. Start a loop that runs from 1 to dx (or -dx if dx is negative):
9. a. Plot the pixel at the current position (x, y).
10. b. If the decision parameter is greater than or equal to 0, increment y by y_increment and update the decision parameter:
11. if d >= 0: y = y + y_increment d = d - 2 * dx
12. c. Increment x by x_increment.
13. d. Update the decision parameter:
14. d = d + 2 * dy
15. Repeat the loop until you have plotted all the necessary pixels to draw the line segment.

Program:

```
#include<graphics.h>
#include<stdio.h>
#include<conio.h>
#include<math.h>
#include<dos.h>
int main()
{
   float x,y,x1,y1,x2,y2,dx,dy,p;
   int gd=DETECT, gm=0;
   initgraph(&gd,&gm,"C:\\TurboC3\\BGI");
   printf("\n Enter the x-coordinate of the first point:");
   scanf("%f",&x1);
   printf("\n Enter the y-coordinate of the first point:");
   scanf("%f",&y1);
   printf("\n Enter the x-coordinate of the second point:");
   scanf("%f",&x2);
   printf("\n Enter the y-coordinate of the second point:");
   scanf("%f",&y2);
   x=x1;
   y=y1;
   dx=x2-x1;
   dy=y2-y1;

   putpixel (x,y, RED);
   p = (2 * dy-dx);
   //to avoid floating point

   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();
return 0;
}
```

Output :



Conclusion:

Comment on –

1. Pixel - The ***"pixel"*** is represented by the ***"putpixel"*** function. It sets the color of individual pixels on the screen.
2. Equation for line - The algorithm calculates and uses the difference in the x and y coordinates (dx and dy) to determine which pixels to color to approximate the line.
3. Need of line drawing algorithm - The need for a line drawing algorithm arises from the discrete nature of digital screens, which represent images using pixels on a grid. To draw a continuous line on such a grid, an algorithm like Bresenham's is necessary to determine which pixels to color to create the appearance of a smooth line.
4. Slow or fast- Bresenham's algorithm is relatively fast and efficient, especially for drawing lines with integer coordinates. It uses integer arithmetic and avoids floating-point calculations