



Experiment No. 2
Implement Bresenham's Line Drawing algorithm.
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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 -

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 $d \geq 0$: $y = y + y_increment$ $d = d - 2 * dx$
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>
```

```
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 coordinate:123
Enter y1 coordinate:324
Enter x2 coordinate:234
Enter y2 coordinate:234
```

Conclusion: Comment on -

1. Pixel: A "pixel" is a single point or unit on a digital screen. The ``putpixel`` function is used to set the color of individual pixels, allowing you to create images or graphics by specifying the color of each pixel.
2. Equation for Line: In the code, the algorithm uses the differences between x and y coordinates (dx and dy) to determine which pixels should be colored to approximate a line. It calculates the progression of pixel positions to form the line.
3. Need for Line Drawing Algorithm: Digital screens are discrete, composed of a grid of pixels. To create the illusion of continuous lines, an algorithm like Bresenham's is essential. It helps decide which pixels to color in order to represent a smooth line on this grid.
4. Slow or Fast: Bresenham's algorithm is relatively fast and efficient, particularly when drawing lines with integer coordinates. It's efficient because it employs integer arithmetic and avoids floating-point calculations, making it well-suited for drawing lines quickly and accurately.