Bresenham's Line Drawing Algorithm

The Bresenham's Line Drawing Algorithm is a technique used to draw straight lines on pixel-based displays like computer screens. It was first introduced by Jack E. Bresenham in 1962. It's widely used because it's both efficient and simple to implement.

The algorithm works by determining which pixels should be colored to create a close approximation of a straight line between two points. It uses only incremental integer calculations, making it fast and accurate

How Does the Bresenham's Algorithm Work

The algorithm works by making decisions about which pixels to plot based on the calculated error at each step.

Here's a step-by-step breakdown of how it operates

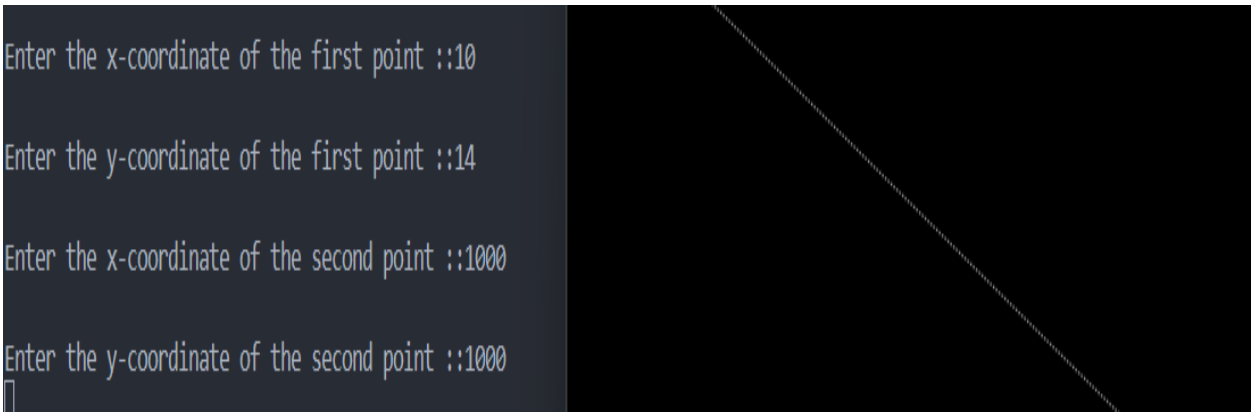
- Input – The algorithm takes the coordinates of two endpoints of the line as input
- Calculation – It calculates the differences in x and y coordinates between the endpoints.
- Decision Parameter – The algorithm uses a decision parameter to determine which pixel to plot next.
- Pixel Selection – Based on the decision parameter, it chooses whether to move horizontally or diagonally to the next pixel.
- Update – The decision parameter is updated at each step.
- Repeat, steps 4 and 5 are repeated until the end point is reached.

Deriving the Bresenham's Algorithm

Here's a more detailed look at the steps of Bresenham's line drawing algorithm:

- Input the two endpoints of the line. Save the left endpoint as (x0, y0).
- Plot the first point (x0, y0).
- Calculate the constants Δx, Δy, 2Δy, and (2Δy - 2Δx).
- Calculate the initial decision parameter: p0 = 2Δy - Δx
- For each xk along the line, starting with k = 0:
- If pk < 0, plot (xk+1, yk) and set pk + 1 = pk + 2Δy
- Otherwise, plot (xk+1, yk+1) and set pk+1 = pk + 2Δy - 2Δx
- Repeat step 5 until you reach the end point.

Output:


Enter the x-coordinate of the first point ::10
Enter the y-coordinate of the first point ::14
Enter the x-coordinate of the second point ::1000
Enter the y-coordinate of the second point ::1000