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Bresenham's line algorithm

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Bresenham's line algorithm

- It is a line drawing algorithm that determines the points of an n-dimensional raster that should be selected in order to form a close approximation to a straight line between two points.

Bresenham's line Algorithm

Step 1: Start.

Step 2: Now, we consider Starting point as **(x_1, y_1)** and endingpoint **(x_2, y_2).**

Step 3: Now, we have to calculate **▲x** and **▲y.**

$$\blacktriangle x = x_2 - x_1$$

$$\blacktriangle y = y_2 - y_1$$

$$m = \blacktriangle y / \blacktriangle x$$

Step 4: Now, we will calculate the decision parameter p_k with following formula.

$$p_k = 2\blacktriangle y - \blacktriangle x$$

Step 5: Theinitial coordinates of the line are **(x_k, y_k),** and the next coordinatesare **(x_{k+1}, y_{k+1}).** Now, we are going to calculate two cases for decision parameter **p_k**

Case 1: If

$$p_k < 0$$

Then

$$p_{k+1} = p_k + 2\blacktriangle y$$
$$x_{k+1} = x_k + 1$$
$$y_{k+1} = y_k$$

Case 2: If

$$p_k >= 0$$

Then

$$p_{k+1} = p_k + 2\blacktriangle y - 2\blacktriangle x$$
$$x_{k+1} = x_k + 1$$
$$y_{k+1} = y_k + 1$$

Step 6: We will repeat step 5 until we found the ending point of the line and the total number of iterations = **$\blacktriangle x - 1$.**

Step 7: Stop.

Example: A line has a starting point (9,18) and ending point (14,22). Apply the Bresenham's Line Drawing algorithm to plot a line.

Starting Point = (x_1, y_1) = **(9,18)**

Ending Point = (x_2, y_2) = **(14,22)**

Step 1: First, we calculate **▲x, ▲y.**

$$\blacktriangle x = x_2 - x_1 = 14-9 = 5$$

$$\blacktriangle y = y_2 - y_1 = 22-18 = 4$$

Step 2: Now, we are going to calculate the decision parameter (p_k)

$$p_k = 2\blacktriangle y - \blacktriangle x$$

$$= 2 \times 4 - 5 = 3$$

The value of $p_k = 3$

Step 3: Now, we will check both the cases.

If

$$p_k >= 0$$

Then

Case 2 is satisfied. Thus

$$p_{k+1} = p_k + 2\blacktriangle y - 2\blacktriangle x = 3 + (2 \times 4) - (2 \times 5) = 1$$

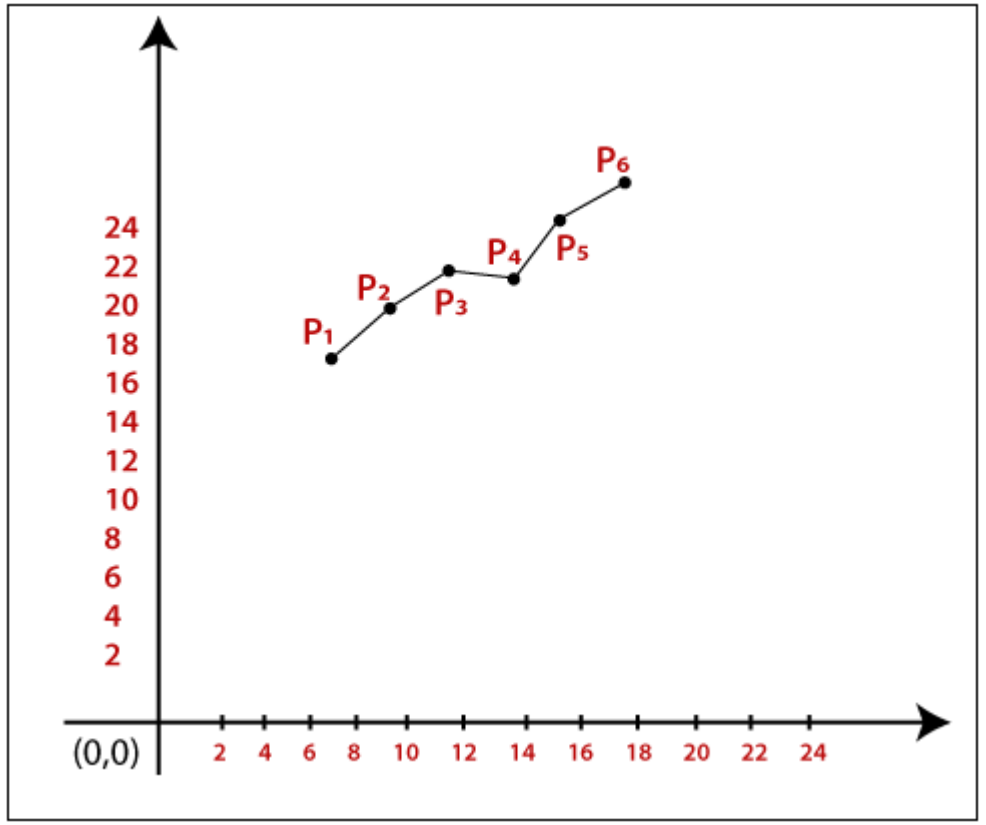
$$x_{k+1} = x_k + 1 = 9 + 1 = 10$$

$$y_{k+1} = y_k + 1 = 18 + 1 = 19$$

Step 4: Now move to next step. We will calculate the coordinates until we reach the end point of the line.

$$\blacktriangle x - 1 = 5 - 1 = 4$$

p_k	p_{k+1}	x_{k+1}	y_{k+1}
		9	18
3	1	10	19
1	-1	11	20
-1	7	12	20
7	5	13	21
5	3	14	22



Advantages of Bresenham's Line Drawing Algorithm

- It is simple to implement because it only contains integers.
- It is quick and incremental
- It is fast to apply but not faster than the Digital Differential Analyzer (DDA) algorithm.
- The pointing accuracy is higher than the DDA algorithm.

Disadvantages of Bresenham's Line Drawing Algorithm

- The Bresenham's Line drawing algorithm only helps to draw the basic line.
- The resulted draw line is not smooth.

Self Learning topic

- Mid-Point Line Drawing Algorithm in Computer Graphics

Thank you