

BSc Computer Science

CS1541 Computer Graphics

MODULE I

BRESENHAM'S LINE DRAWING

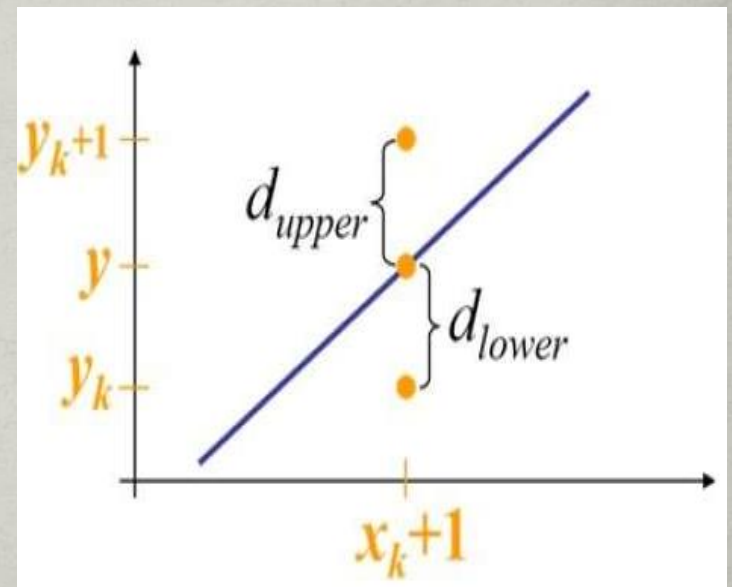
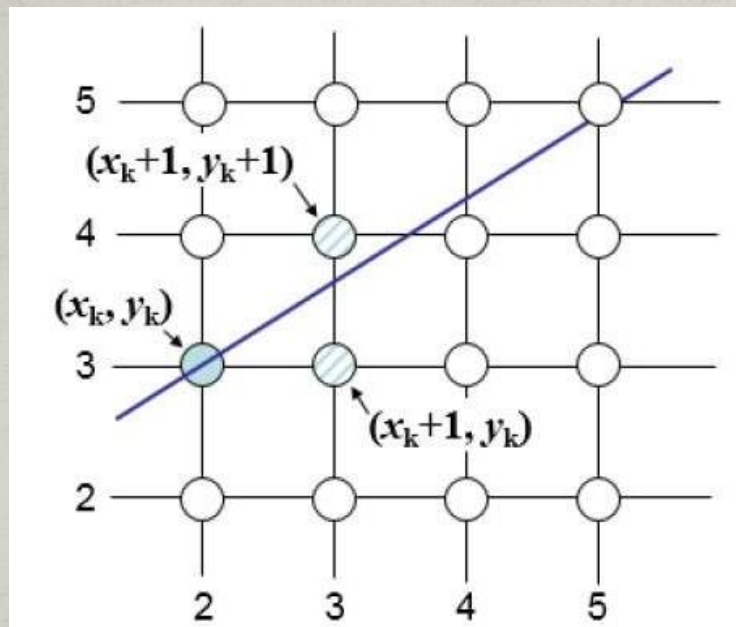
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Introduction

- ❑ Another incremental scan conversion algorithm.
- ❑ Uses only integer calculations.
- ❑ Moving across the x axis in unit intervals and at each step choose between two different y coordinates.(or vise versa)
- ❑ Close approximation to a straight line between two end points



Algorithm

Algorithm Bresenham'sLine(X_1, Y_1, X_2, Y_2)

[This algorithm draws a line from (X_1, Y_1) to (X_2, Y_2)]

Step 1: [Initialize and plot the first point]

$X \leftarrow X_1$

$Y \leftarrow Y_1$

PLOT(X, Y)

Step 2: [Compute the displacement in X axis and Y axis]

$DX \leftarrow \text{ABS}(X_2 - X_1)$

$DY \leftarrow \text{ABS}(Y_2 - Y_1)$

Step 3: [Compute the axis of greatest displacement]

If($DX \geq DY$)

 goto Step 4

 else goto Step 5

End if

Algorithm

Step 4: [Draw the line]

$P \leftarrow 2 * DY - DX$

Repeat while ($X \leq X_2$)

$X \leftarrow X + 1$

If($P \geq 0$)

$Y \leftarrow Y + 1$

$P \leftarrow P + 2 * DY - 2 * DX$

else

$P \leftarrow P + 2 * DY$

End if

PLOT(X, Y)

Return

Step 5: [Draw the line]

$P \leftarrow 2 * DX - DY$

Repeat while ($Y \leq Y_2$)

$Y \leftarrow Y + 1$

If($P \geq 0$)

$X \leftarrow X + 1$

$P \leftarrow P + 2 * DX - 2 * DY$

else

$P \leftarrow P + 2 * DX$

End if

PLOT(X, Y)

Return

Example

(10,10) to (20,17) $DX=20-10=10$ $DY=17-10=7$ $P=4$

Step	X	Y	P
1	10	10	4
2	11	11	-2
3	12	11	12
4	13	12	6
5	14	13	0
6	15	14	-6
7	16	14	8
8	17	15	2
9	18	16	-4
10	19	16	10
11	20	17	4

Plot(10,10)

Plot(11,11)

Plot(12,11)

Plot(13,12)

Plot(14,13)

Plot(15,14)

Plot(16,14)

Plot(17,15)

Plot(18,16)

Plot(19,16)

Plot(20,17)

Example

(10,10) to (15,20) $DX=15-10=5$ $DY=20-10=10$ $P=15$

Step	X	Y	P
1	10	10	0
2	11	11	-10
3	11	12	0
4	12	13	-10
5	12	14	0
6	13	15	-10
7	13	16	0
8	14	17	-10
9	14	18	0
10	15	19	-10
11	15	20	0

Plot(10,10)

Plot(11,11)

Plot(11,12)

Plot(12,13)

Plot(12,14)

Plot(13,15)

Plot(13,16)

Plot(14,17)

Plot(14,18)

Plot(15,19)

Plot(15,20)

Advantages and Disadvantages

Advantage:

1. **It involves** only integer arithmetic, so it is simple.
2. It avoids the generation of duplicate points.
3. Operations are done rapidly and lines can be generated quickly
4. It is faster as compared to DDA (Digital Differential Analyzer) because it does not involve floating point calculations like DDA Algorithm.

Disadvantage:

1. This algorithm is meant for basic line drawing only. Initializing is not a part of Bresenham's line algorithm. So to draw smooth lines, you should want to look into a different algorithm.

Thank You