

COMPUTER GRAPHICS

(E2UC402B)

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Scan Conversion

Find the **next** PIXEL position on Screen

also called

Rasterization

Scan Conversion Types

1. Line
2. Circle
3. Curve

Scan Conversion Techniques

Line Generation Algorithms :

1. DDA Line Drawing Algorithm
2. Bresenham's Line Drawing Algorithm

Scan Conversion Techniques

Circle Generation Algorithms :

1. DDA Circle Drawing Algorithm
2. Bresenham's Circle Drawing Algorithm
3. Mid Point Circle Drawing Algorithm

Scan Conversion Techniques

Curve Generation Algorithms

1. DDA Curve Generation Algorithm
2. Bezier Curve Generation Algorithm
3. B-splin Curve Generation Algorithm

Line Drawing Algorithms

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graph TD; A[Line Drawing Algorithms] --> B[DDA]; A --> C[Bresenham]
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The diagram is a simple tree structure. At the top is a light green rounded rectangle containing the text 'Line Drawing Algorithms'. Two black arrows originate from the bottom center of this rectangle and point downwards and outwards to two separate light red rounded rectangles. The left rectangle contains the text 'DDA' and the right rectangle contains the text 'Bresenham'.

DDA

Bresenham

DDA Line Drawing Algorithm

(Digital Differential Analyzer)

Step 1: Enter the value of starting point (X_1, Y_1) and end point (X_2, Y_2)

Step 2: $X_k = X_1$ and $Y_k = Y_1$

Step 3: Calculate the slope of line i.e. m

$$m = (Y_2 - Y_1) / (X_2 - X_1)$$

Step 4: Check value of m

DDA Line Drawing Algorithm

Step 5: If $m == 1$ CASE I

Step 6: for ($x_k = x_1$; $x_k \leq x_2$; x_k++)

Plot the point x_k and y_k

$y_k = y_k + 1$

DDA Line Drawing Algorithm

Step 7: If $m < 1$ CASE II

Step 8: for ($x_k = x_1$; $x_k \leq x_2$; x_k++)

Plot the point x_k and $(abs) y_k$

$y_k = y_k + m$

DDA Line Drawing Algorithm

Step 9: If $m > 1$ CASE III

Step 10: for ($y_k = y_1$; $y_k \leq y_2$; y_k++)

Plot the point (abs) x_k and y_k

$x_k = x_k + 1/m$

Step 11: Exit

Advantage & Disadvantage

Advantage

1. Not Require advance skill
2. Fast method for line generation

Disadvantage

More computation is required in case of floating point arithmetic operation

Numerical

on

DDA

(Digital Differential Analyzer)

$(m < 1)$

(Digital Differential Analyzer)

Suppose starting coordinates (0,0) and ending coordinates are (8,4)

Step 1: Enter the value of starting point ~~(0,0)~~ and end point ~~(8,4)~~

Step 2: $X_k = 1$ and $Y_k = 1$

Step 3: Calculate the slope of line i.e. m

$$m = (4-0) / (8-0) = 0.5$$

Step 4: Check value of m

(Digital Differential Analyzer)

Step 5: Is $m == 1$ X (NO)

LEAVE STEP 6

(Digital Differential Analyzer)

Step 7: Is $m < 1$ (YES)

Step 8: for ($X_k = 0.1$; $X_k \leq 8.2$; X_k++)

Plot the point X_k and (obs) Y_k

$Y_k = X_k++0.5$

Loop until TRUE

(Digital Differential Analyzer)

Step 9: Is $m > 1$ X (NO)

LEAVE STEP 10

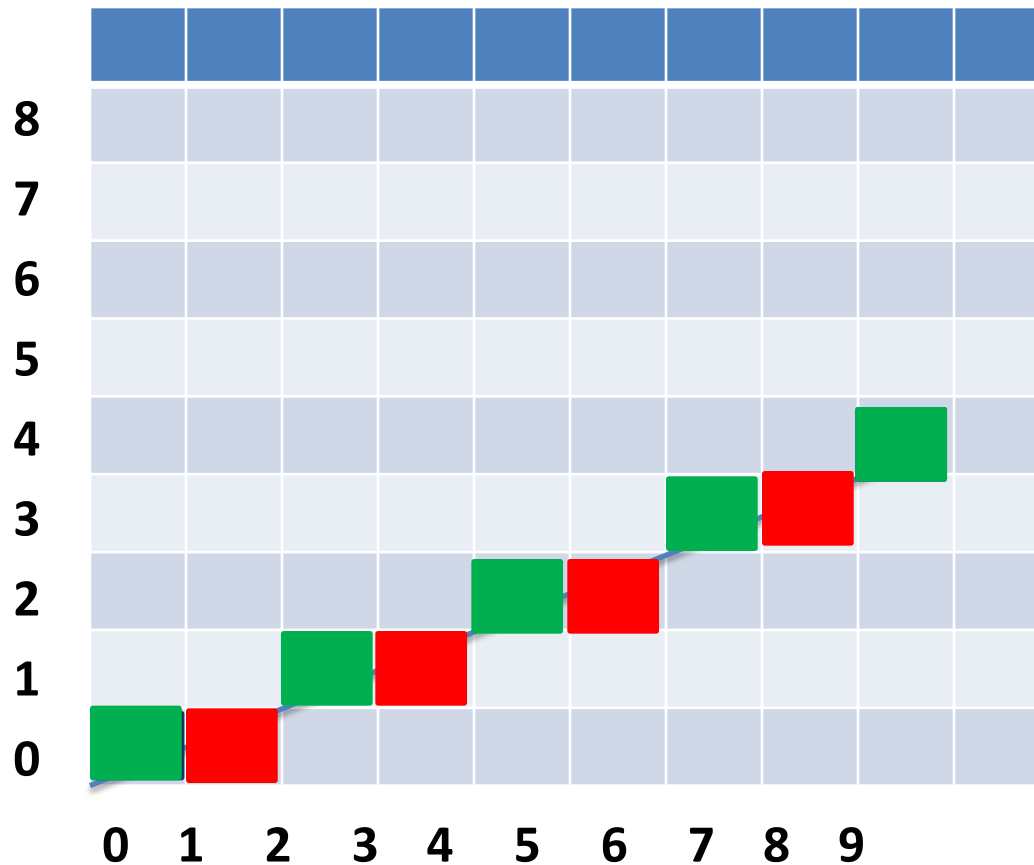
Step 11: Exit

Table for Intermediates coordinate points

X	Y	(X,Y)
0	0	(0,0)
1	$0+0.5 = 0.5$	(1,0)
2	$0.5 + 0.5 = 1.0$	(2,1)
3	$1.0 + 0.5 = 1.5$	(3,1)
4	$1.5 + 0.5 = 2.0$	(4,2)
5	$2.0 + 0.5 = 2.5$	(5,2)
6	$2.0 + 0.5 = 3.0$	(6,3)
7	$3.0 + 0.5 = 3.5$	(7,3)
8	$3.5 + 0.5 = 4.0$	(8,4)

Pixel Positions

Line: (0,0) to (8,4)



Numerical

on

DDA

(Digital Differential Analyzer)

($m > 1$)

(Digital Differential Analyzer)

Suppose starting coordinates (0,0) and ending coordinates are (4,6)

Step 1: Enter the value of starting point (X_1, Y_1) and end point (X_2, Y_2)

Step 2: $X_k = X_1$ and $Y_k = Y_1$

Step 3: Calculate the slope of line i.e. m

$$m = (Y_2 - Y_1) / (X_2 - X_1) = 1.5$$

Step 4: Check value of m

(Digital Differential Analyzer)

Step 5: Is $m == 1$ X (NO)

LEAVE STEP 6

(Digital Differential Analyzer)

Step 7: Is $m < 1$ X (NO)

LEAVE STEP 8

(Digital Differential Analyzer)

Step 9: Is $m > 1$ (YES)

Step 10: for ($Y_k = 0; Y_k \leq 1; Y_k++$)

Plot the point (obs) and θ_k

$X_k = \theta_{k+1} / 1.5$

Loop until TRUE

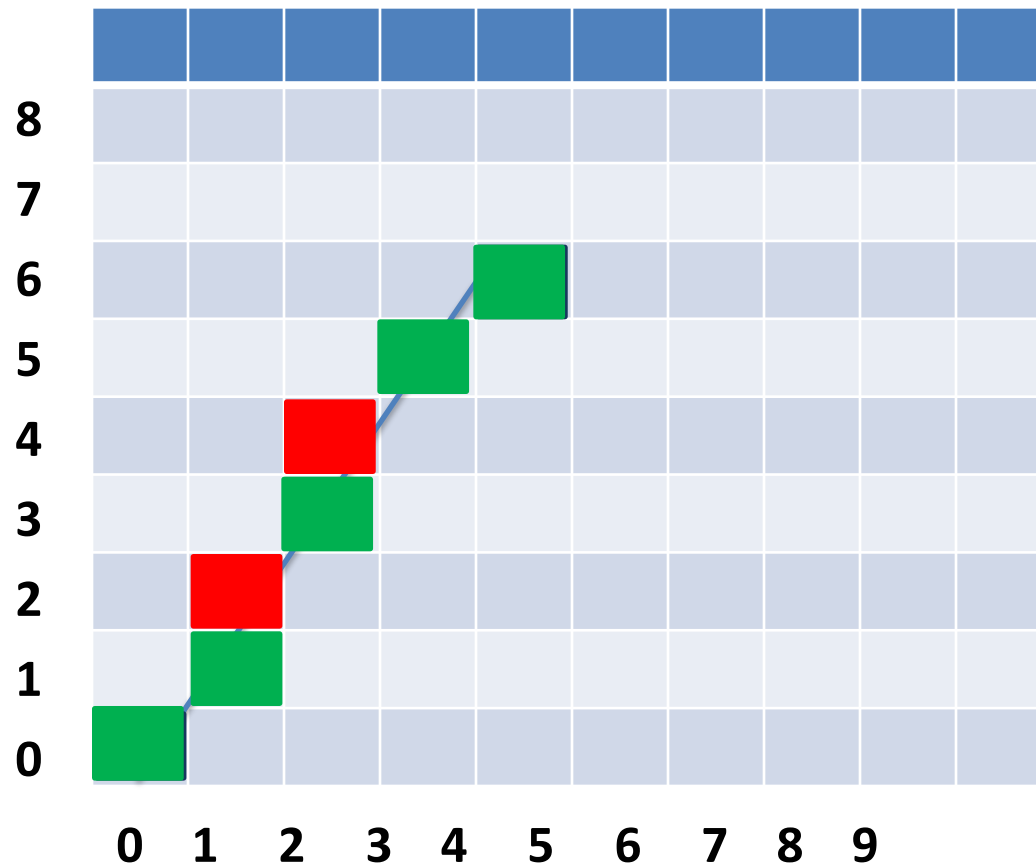
Step 11: Exit

Table for Intermediates coordinate points

X	Y	(X,Y)
0	0	(0,0)
$0+0.6 = 0.6$	1	(1,1)
$0.6 + 0.6 = 1.2$	2	(1,2)
$1.2 + 0.6 = 1.8$	3	(2,3)
$1.8 + 0.6 = 2.4$	4	(2,4)
$2.4 + 0.6 = 3.0$	5	(3,5)
$3.0 + 0.6 = 3.6$	6	(4,6)

Pixel Positions

Line: $(0,0)$ to $(4,6)$



Numerical

on

DDA

(Digital Differential Analyzer)

($m=1$)

(Digital Differential Analyzer)

Suppose starting coordinates (0,0) and ending coordinates are (4,4)

Step 1: Enter the value of starting point (X_1, Y_1) and end point (X_2, Y_2)

Step 2: $X_k = X_1$ and $Y_k = Y_1$

Step 3: Calculate the slope of line i.e. m

$$m = (Y_2 - Y_1) / (X_2 - X_1) = 1$$

Step 4: Check value of m

(Digital Differential Analyzer)

Step 5: Is $m = 1$ (YES)

Step 6: for ($X_k = X_1$; $X_k \leq X_2$; X_k++)

Plot the point X_k and Y_k

$Y_k = Y_{k++m}$

Loop until TRUE

(Digital Differential Analyzer)

Step 7: Is $m < 1$ X (NO)

LEAVE STEP 8

Step 9: Is $m > 1$ X (NO)

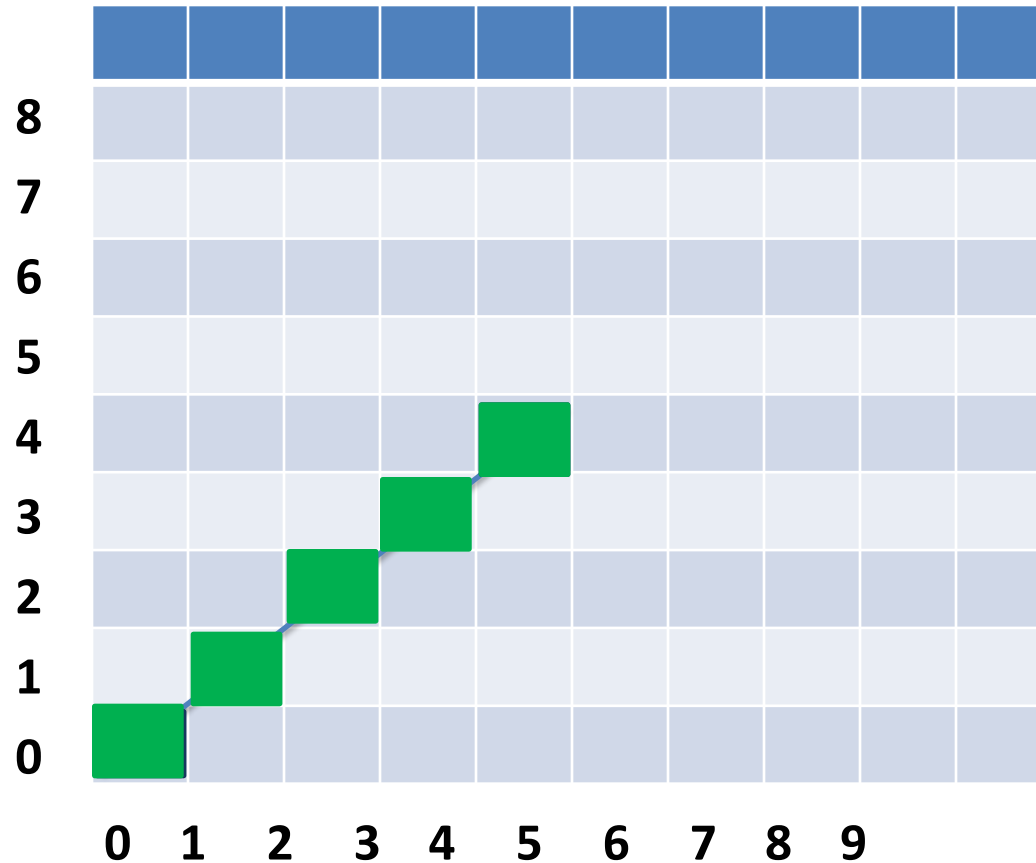
LEAVE STEP 10

Step 11: Exit

Table for Intermediates coordinate points

X	Y	(X,Y)
0	0	(0,0)
1	$0 + 1 = 1$	(1,1)
2	$1 + 1 = 2$	(2,2)
3	$2 + 1 = 3$	(3,3)
4	$3 + 1 = 4$	(4,4)

Line: $(0,0)$ to $(4,4)$



Any
QUESTION
OR
DOUBT

