COMPUTER GRAPHICS

(E2UC402B)

Prof. (Dr) Sanjeev Punia

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

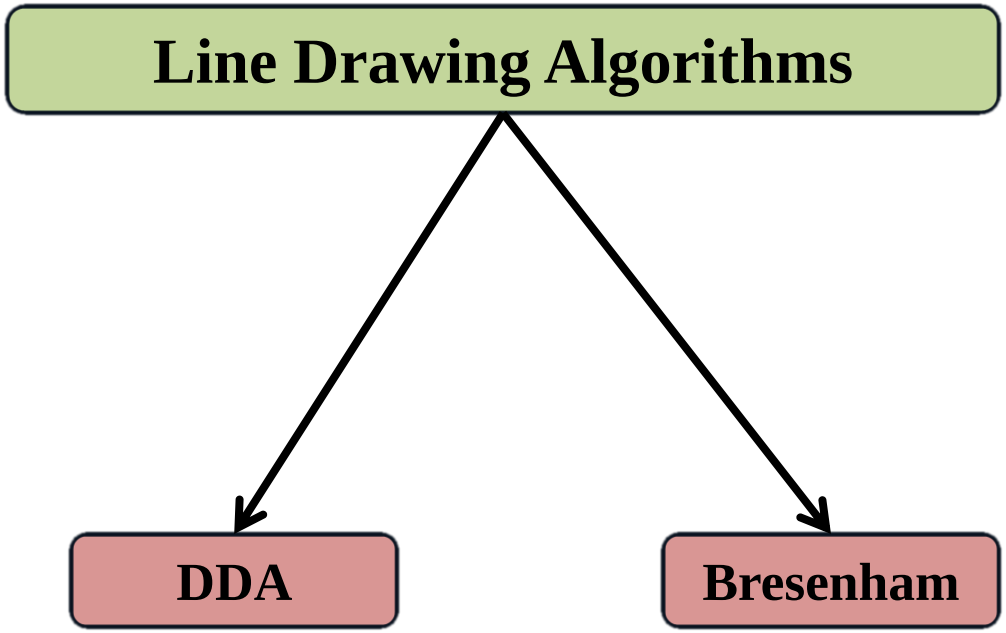
Circle Generation Algorithms :

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
DDA
Bresenham

DDA Line Drawing Algorithm

(Digital Differential Analyzer)

Step 1: Enter the value of starting point (X1,Y1) and end point (X2,Y2)

Step 2: Xk=X1 and Yk=Y1

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

$$m = (Y2-Y1) / (X2-X1)$$

Step 4: Check value of m

DDA Line Drawing Algorithm

Step 5: If m == 1 CASE I

Step 6: for (Xk=X1; Xk<=X2; Xk++)

Plot the point Xk and Yk

Yk= Yk+ 1

DDA Line Drawing Algorithm

Step 7: If m < 1 CASE II

Step 8: for (Xk=X1; Xk<=X2; Xk++)

Plot the point Xk and (abs) Yk

Yk= Yk + m

DDA Line Drawing Algorithm

Step 9: If m > 1 CASE III

Step 10:for (Yk=Y1; Yk<=Y2; Yk++)

Plot the point (abs) Xk and Yk

Xk= Xk + 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 arithmatic 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 (X1, Y1) and end point (X2, Y2)

Step 2: Xk = X1 and Yk = Y1

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

m = (Y2 – Y1) / (X2 – X1) = 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 (Xk=X1; Xk<=X2; Xk++)

Plot the point Xk and (Round)Yk

Yk= Yk+m

Loop until TRUE

(Digital Differential Analyzer)

Step 9: Is m > 1 X (NO)

LEAVE STEP 10

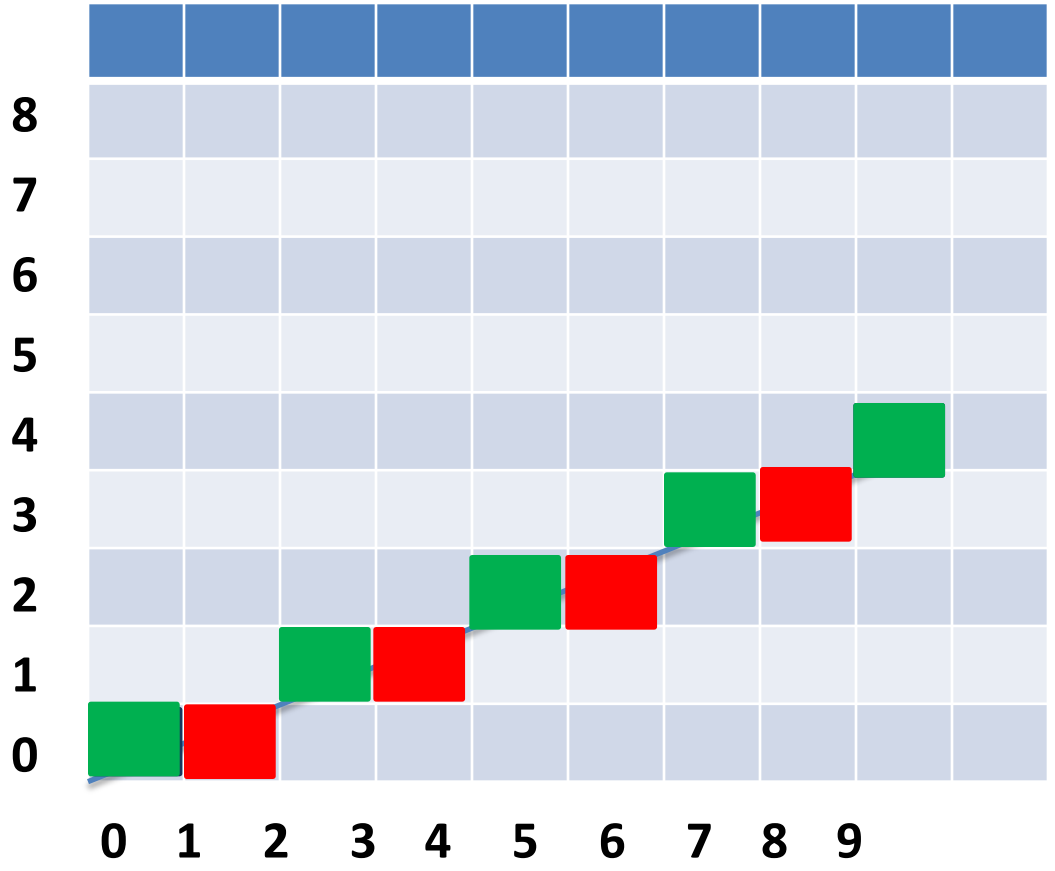
Step 11: Exit

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 (X1,Y1) and end point (X2,Y2)

Step 2: Xk=X1 and Yk=Y1

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

m = (Y2-Y1) / (X2-X1)=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 (Yk=Y1; Yk<=Y2; Yk++)

Plot the point (Xobs, Yk)

Xk= Xk+1/m

Loop until TRUE

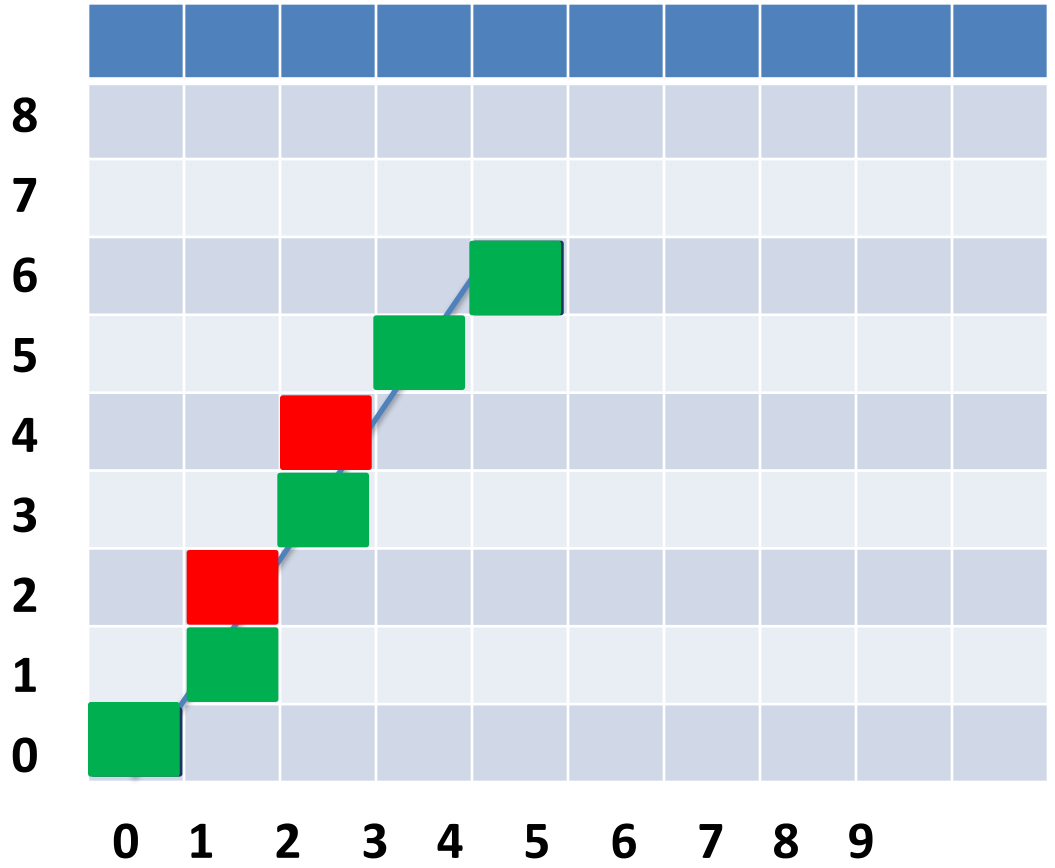
Step 11: Exit

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 (X1,Y1) and end point (X2,Y2)

Step 2: Xk=X1 and Yk=Y1

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

m = (Y2-Y1) / (X2-X1) = 1

Step 4: Check value of m

(Digital Differential Analyzer)

Step 5: Is m = 1 (YES)

Step 6: for (Xk=X1; Xk<=X2; Xk++)

Plot the point Xk and Yk

Yk= Yk++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

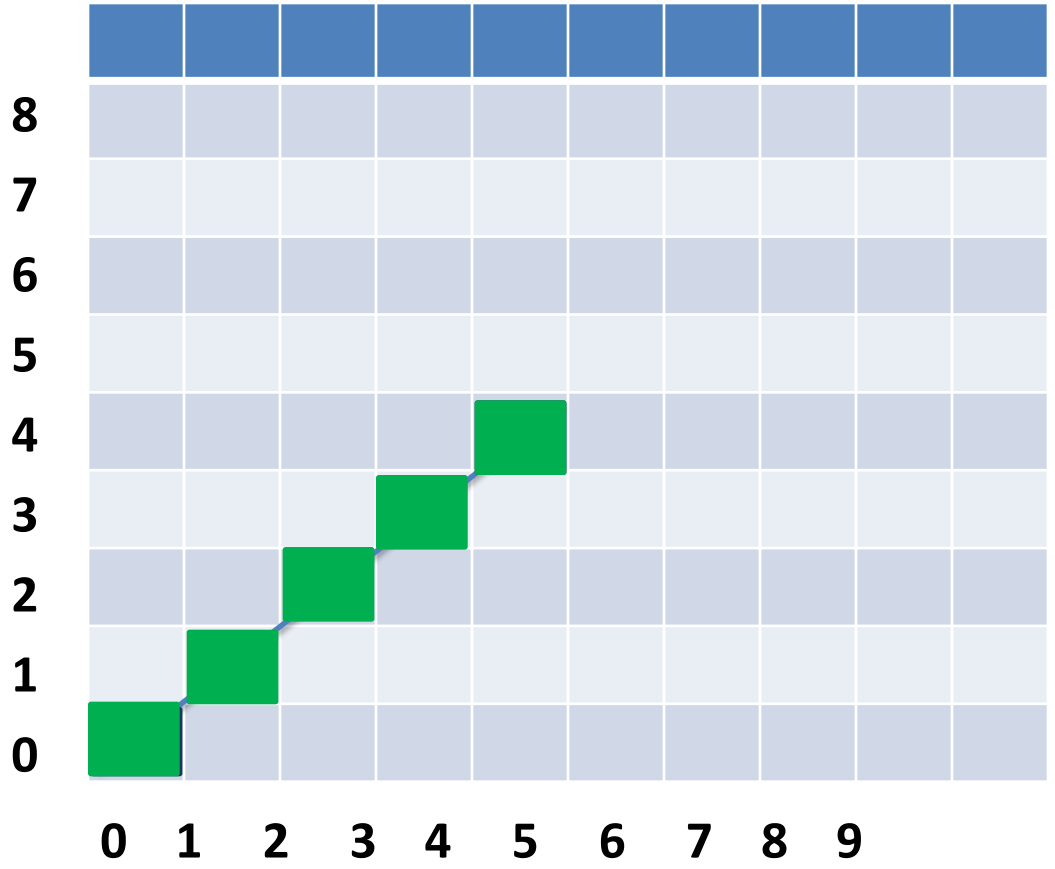
Step 11: Exit

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)

Pixel Positions

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



Any

QUESTION

OR

DOUBT