Line Drawing Algorithm

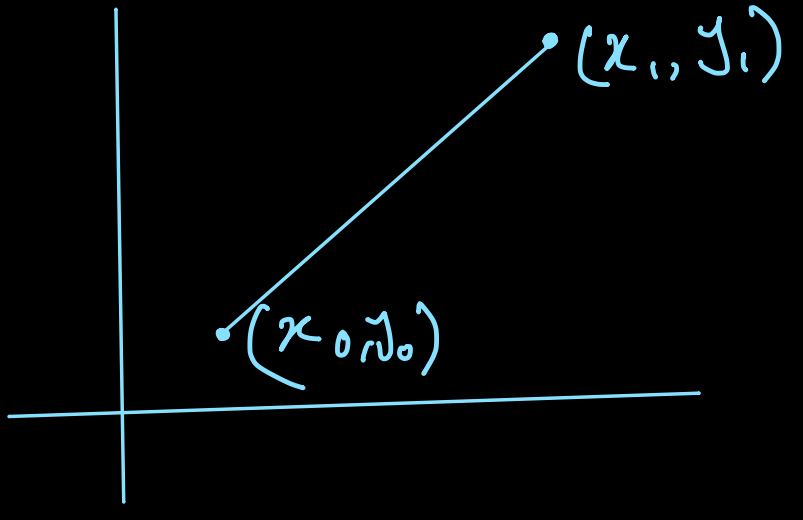
There are three ways to solve this

i) Simple Solution

ii) DDA

iii) Middle point Line Algorithm

Simple Solution



$$m = \frac{y_1 - y_0}{x_1 - x_0}$$

$$y = mx + c$$

$$\Rightarrow c = y - mx$$

$$(c = y_0 - mx \,/\, c = y_1 - mx_1)$$

Using SS find out the intermediate pixel from (2,2) to (7,5)

$$m = \frac{5-2}{7-2} = \frac{3}{5} = 0.6$$

$$C = y_0 - m x_0$$

$$= 2 - (0.6 \times 2)$$

$$= 0.8$$

now, $y = 0.6x + 0.8$

	Pixel
$y(3) = 0.6 \times 3 + 0.8 = 2.6 \approx 3$	(3,3)
$y(4) = 0.6 \times 4 + 0.8 = 3.2 \approx 3$	(4,3)
$y(5) = 0.6 \times 5 + 0.8 = 3.8 \approx 4$	(5,4)
$y(6) = 0.6 \times 6 + 0.8 = 4.4 \approx 4$	(6,4)

Drawbacks

1) Multiplication is costly operation
2 Round off

DDA:

Digital Differential Analyzer

(2,2), (3, .6), (4, .2), (5, 3.8), (6, 4.4)

$x \longrightarrow 1 \quad Y \longrightarrow 0.6$

$x_{new} = x_{prev} + 1$
$Y_{new} = Y_{prev} + m$

} when the slope, m is small value $m < 1$

$x_{new} = x_{prev} +$
$Y_{new} = Y_{prev} + 1$

when the slope, m is big value $m > 1$

Using DDA, find out the intermediate pixels from (2,2) to (5,7)

$$m = \frac{7-2}{5-2} = \frac{5}{3} = 1.61\ldots$$

$x\ (+\frac{1}{m})$	$Y\ (+1)$	Pixo
2	2	(2,2)
2.6	3	(3,3)
3.2	4	(3,4)
3.8	5	(4,5)
4.4	6	(4,6)

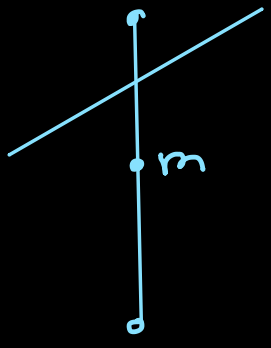
Midpoint Line Algorithm

$f(x,y) = ax + by + c$

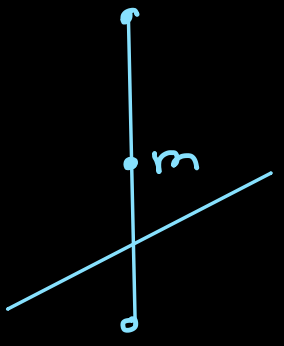
$M(x_p, y_p)$

$\Rightarrow f(x_p, y_p) = ax_p + by_p + c = d$

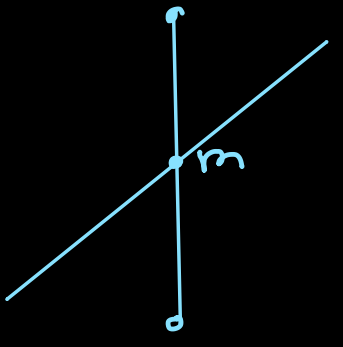
there can be three types of scenario here



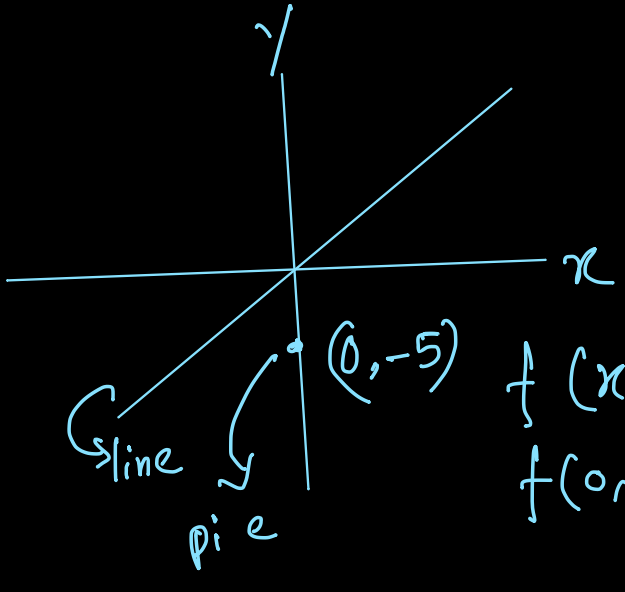
$d > 0$
(NE)



$d < 0$
(E)



$d = 0$
(E)



$f(x,y) = x - y$

$f(0,-5) = 0 - (-5)$

$= 5$