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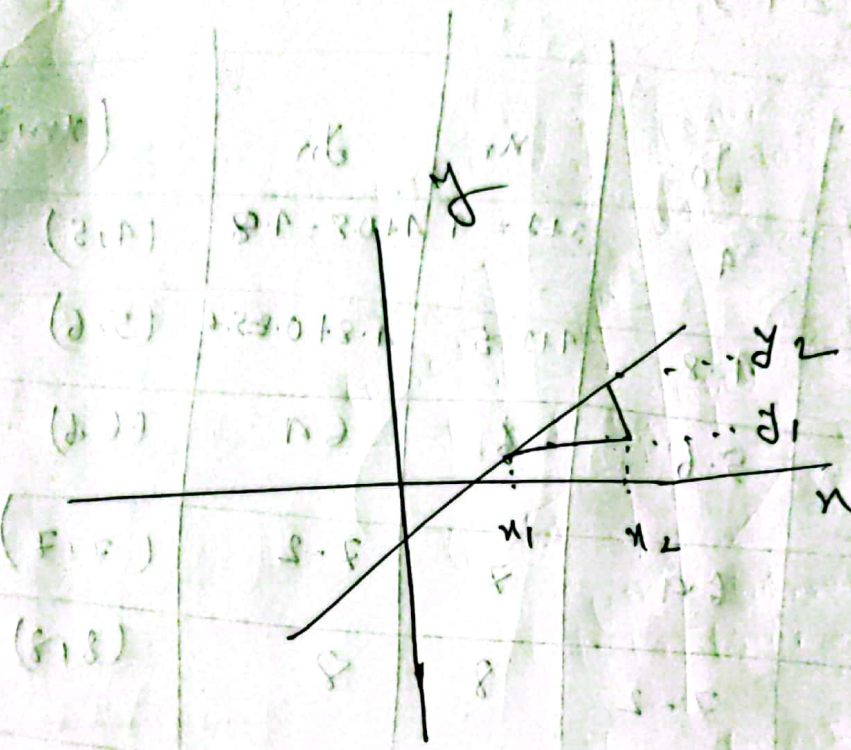
Scan Conversition



off → 0 / on → 1

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$y = mx + c$

↓

slope / gradiant

$m < 1$

$x_n = x_0 + 1$

$y_n = \text{round}\ (y_0 + m)$

where

o = old

n = new

$m > 1$

$x_n = \text{round}\left(x_0 + \frac{1}{m}\right)$

$y_n = y_0 + 1$

$m = 1$

$x_n = x_0 + 1$ | $y_n = y_0 + 1$

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Start

A (3, 1)

End

B (8, 8)

x_0	y_0	x_n	y_n	(x_n, y_n)
3	1	3+1 = 4	1+0.8 = 1.8	(4, 5)
4	1.8	4+1=5	1.8+0.8=2.6	(5, 6)
5	5.6	6	6.4	(6, 6)
6	6.4	7	7.2	(7, 7)
7	7.2	8	8	(8, 8)

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{8-1}{8-3}$$

$$= 0.8 < 1 \quad [m < 1]$$

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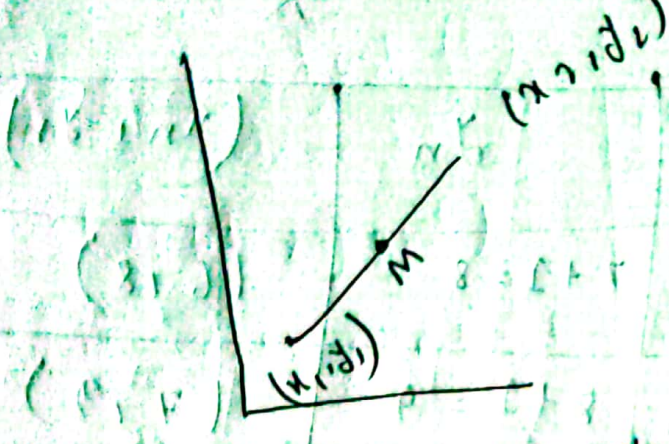
Midpoint Line Algorithm



$$M = \left(\frac{x_1 + x_2}{2} , \frac{y_1 + y_2}{2} \right)$$

*

$$y = mx + C$$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{dy}{dx}$$

$$\Rightarrow y = \left(\frac{dy}{dx}\right) x + c$$

$$\Rightarrow (dy)x - (dx)y + c\,dx = 0$$

$$\Rightarrow ax + by + D = 0$$

$$a = dy$$

$$b = -dx$$

$$D = c\,dx$$

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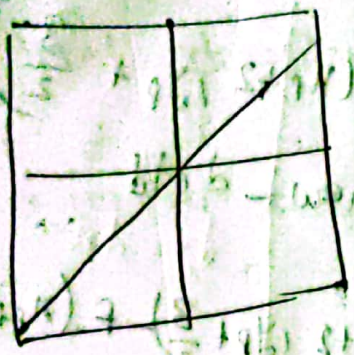

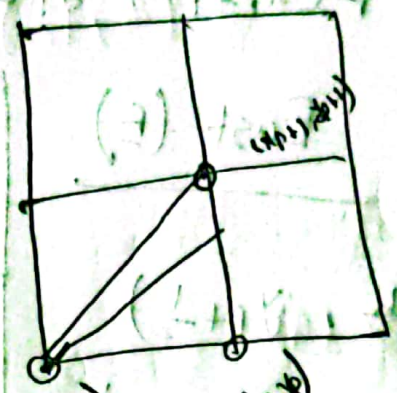

(x_p, y_p) (x_{p+1}, y_p)

decision Parameter $= d$

$d = F(M)$

$M = \left(\frac{x_{p+1} + x_{p+1}}{2}, \frac{y_p + y_{p+1}}{2}\right)$

~~$(x_{p+1}) + (x_{p+1})$~~

$= \left(x_{p+1}, y_p + \frac{1}{2}\right)$

$F(M) = F\left(x_{p+1}, y_p + \frac{1}{2}\right) = d$

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$F(M) = F(x_{p+1}, y_p + \frac{1}{2}) = d$

East (E)

$d = F(x_{p+2}, y_p + \frac{1}{2})$

$M_{new} = x_{p+2}, y_p + \frac{1}{2}$

$d_{new} = F(x_{p+2}, y_{p+1} \frac{1}{2})$

$(\Delta d) = d_{new} - d_{old}$

$= F(x_{p+2}, y_p + \frac{1}{2}) -$

$F(x_{p+1}, y_p + \frac{1}{2})$

$(\Delta d) \times 2 = a \times 2$

$(d)_E = 2a$

$= 2dy$

North East (NE)

NE

$N_{new} = x_{p+2}, y_p + \frac{3}{2}$

$d_{new} = F(x_{p+2}, y_p + \frac{3}{2})$

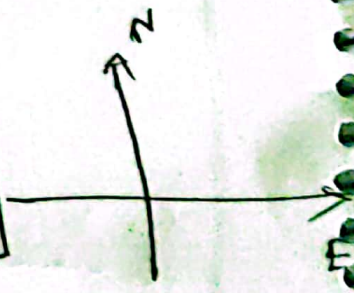
$(\Delta d) = d_{new} - d_{old}$

$= F(x_{p+2}, y_p + \frac{3}{2}) - F(x_{p+1}, y_p + \frac{1}{2})$

$\Delta d = (a+b) + 2$

$2\Delta d = 2(a+b)$

$\boxed{d_{NE} = 2(dy - dx)}$



BD SCHOOL SHOP
ONE-STOP SCHOOL SHOPPING

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Let, (x_p, y_p) be the initial point

Let's Consider,

$(x_p, y_p) = (x_0, y_0)$

initial decision Parameter, dinitial $= F(x_0+1, y_0+\frac{1}{2})$

$d_{initial} = a(x_0+1) + b(y_0+\frac{1}{2}) + 1)$

$= ax_0 + a + by_0 + \frac{b}{2} + 1)$

$= \underbrace{ax_0 + by_0 + D} + a + \frac{b}{2}$

$F(x_0, y_0) = ax_0 + by_0 + D$

$F(x_0, y_0) = 0$

$d_{initial} = 0 + a + \frac{b}{2}$

$(d_{initial}) \times 2 = (a + \frac{b}{2}) \times 2$

$d_i = 2a + b$

$= 2dy - dx$

$d_i = 2dy - dx$	$d < 0 \rightarrow E$
$d_E = 2dy$	$d > 0 \rightarrow NE$
$d_{NE} = 2(dy - dx)$	

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Example

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A (4, 8) B (9, 12)

$dy = y_2 - y_1$

$= 12 - 8$

$= 4$

$dx = x_2 - x_1$

$= 9 - 4$

$= 5$

$dy - dx = 4 - 5$

$= -1$

$d_i = 2dy - dx$

$= 2(4) - 5$

$= 3 > 0$ NE (5, 9)

$d_{new} = d_{old} + dE / dNE$

$= 3 + 2(dy - dx)$

$= 3 + 2(4 - 5)$

$= 1 > 0$ — NE — (6, 10)

$d_{new} = 1 + (-2)$

$= -1 < 0$ — E — (7, 10)

$d_{new} = -1 + 2dy$

$= -1 + 2(4)$

$= 7 > 0$ — NE — (8, 11)

BD SCHOOL SHOP

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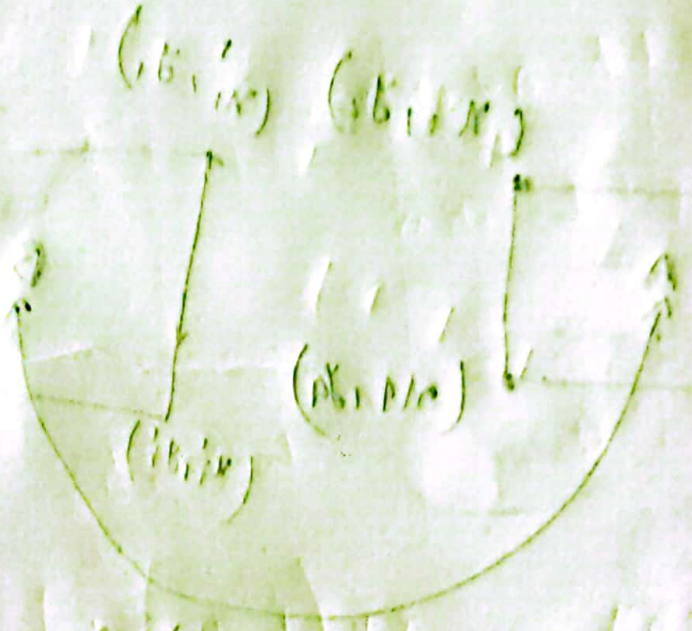
$$d_{new} = 7 + (-2)$$

$$= 5 \text{ NE} - (9, 12)$$



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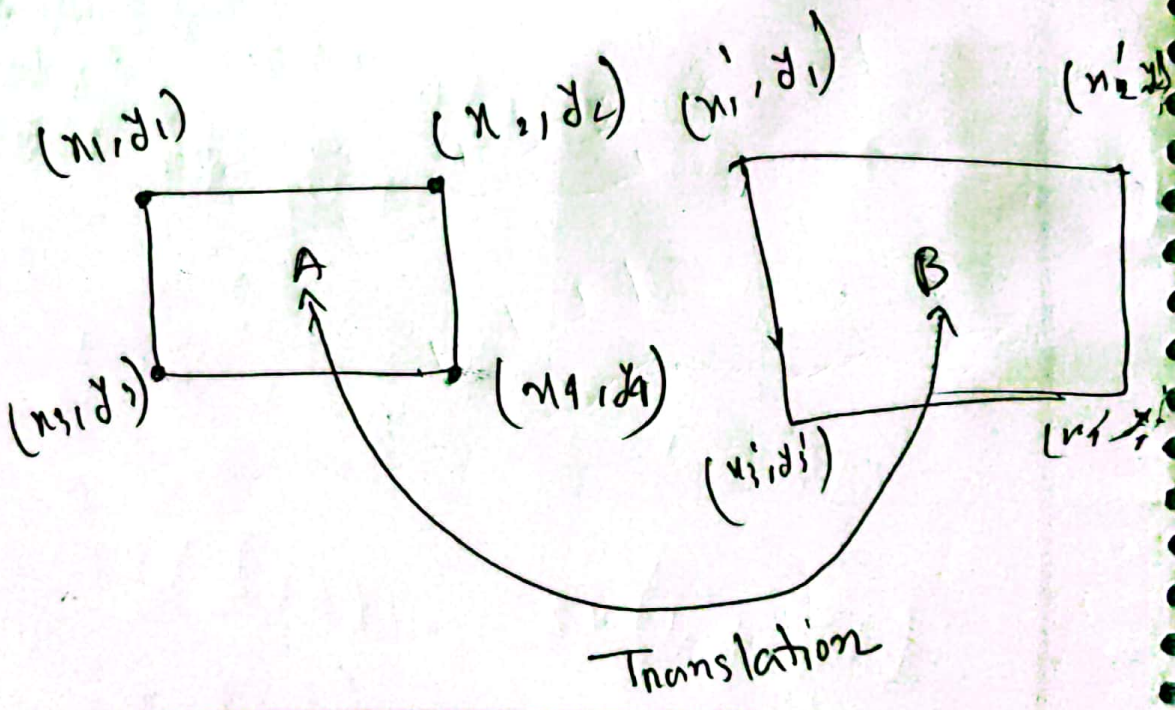
Transform

1. Translation
2. Rotation
3. Scaling



gl Translatef (x, y, z)

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