Scan conversion ... محاضرة ١

Scan Convert A line (Two end Point) بسيطة

Line equation — Bersenham's algorithm

$y = mx + b$ معادلة الخط المستقيم

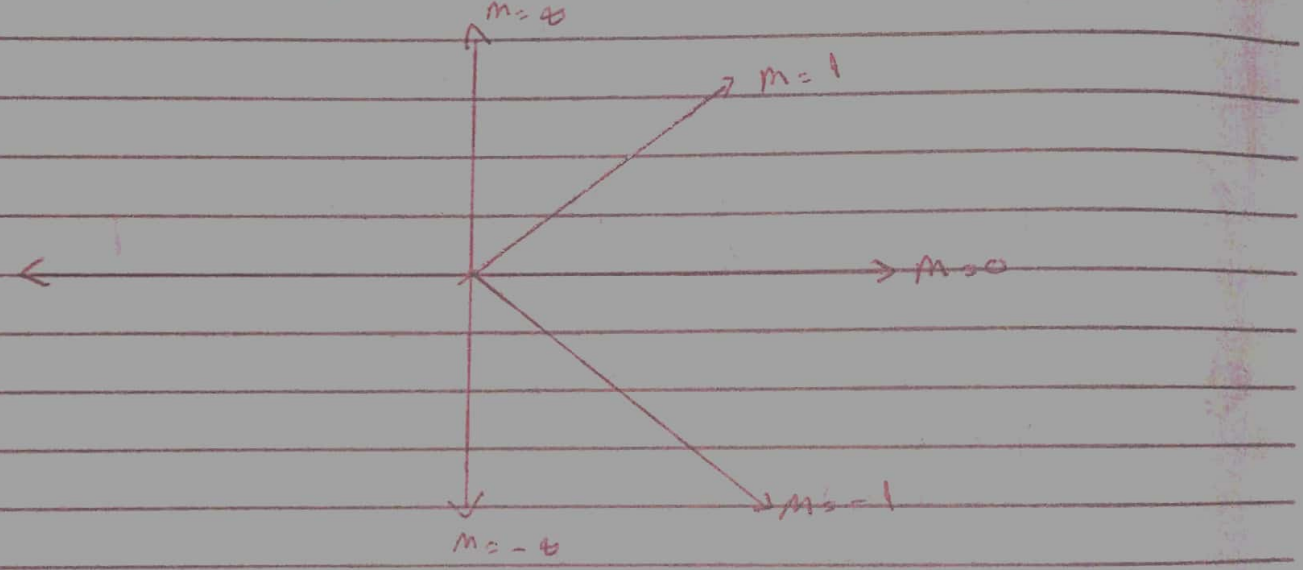
$m = \frac{y_2 - y_1}{x_2 - x_1}$ الميل

* لو line بيعمل زاوية 45 يبقى الميل بتاعي = 1

$m = 1$

$\rightarrow |m| > 1$ increment y

$\rightarrow |m| \leq 1$ increment x



ex $(x_1, y_1) = (1, 5)$, $(x_2, y_2) = (3, 4)$

$m = \frac{4-5}{3-1} = \frac{-1}{2}$

(1, 5) lies on The line

$y = mx + b$

$5 = -\frac{1}{2} * 1 + b \Longrightarrow b = 5.5$

$y = -\frac{1}{2}x + 5.5$

$|m| = \frac{1}{2} < 1$ increment x

x	1	2	3
y	5	5	4

Beresenham's algorithm

```
X1 < X2 , 0 < m < 1
X = X1 , y = y1
dT = 2(dy - dx)
dS = 2dy
d = 2dy - dx
stepixel (x,y)
while (x < x2)
{
x++
if d < 0
d = d + dS
else
{
y++
d = d + dT
}
setpixel (x,y);
}
```

ex (1,5) , (3,6)

$dx = 2$ $dy = 1$

$0 < m < 1$

$m = \frac{6-5}{3-1} = \frac{1}{2}$ ✓

$dT = 2(dy - dx) = 2(1-2) = -2$

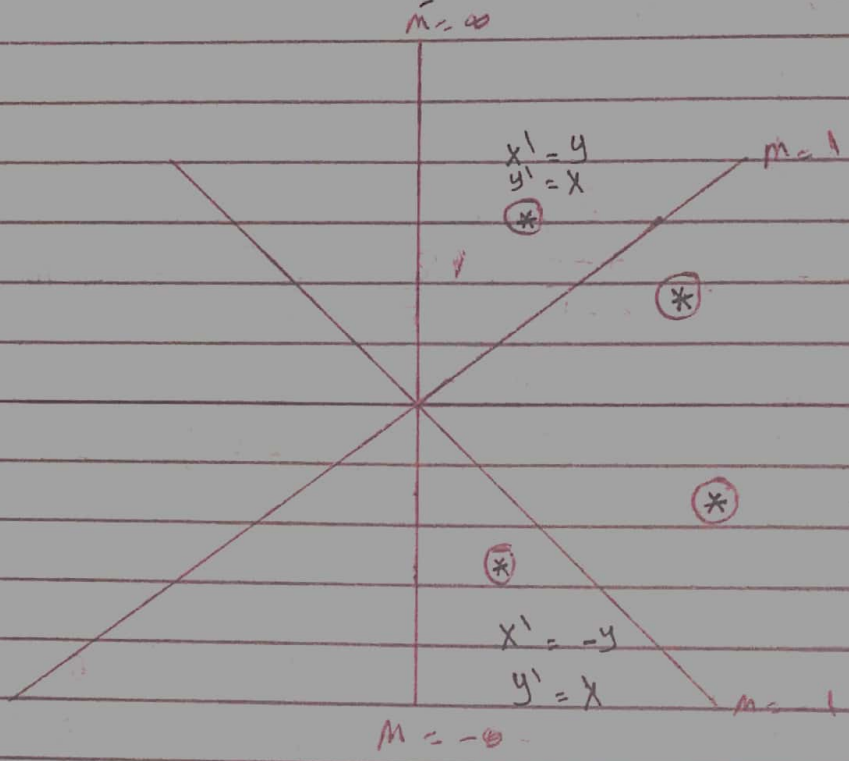
$dS = 2dy = 2 \times 1 = 2$

$d = 2dy - dx = 2 * 1 - 2 = 0$

x	1	2	3
y	5	6	6
d	$0 \geq 0$	-2	0

(1,5) , (2,6) , (3,6)

X increment فى حالة الطيل ← صغير
y increment فى حالة الطيل ← ∞ , -∞



Ex (1, -5) , (6, -3)

$m = \frac{-3+5}{6-1} = \frac{2}{5} = 0.4$ $\quad 0 < m < 1$ ✓

$\delta x = 5 \qquad \delta y = 2$

$\delta T = 2(\delta y - \delta x) = 2(2-5) = -6$

$\delta S = 2\,\delta y = 2 * 2 = 4$

$\delta = 2\,\delta y - \delta x = 4 - 5 = -1$

x	1	2	3	4	5	6
y	-5	-5	-4	-4	-3	-3
δ	-1	3	-3	1	-5	-1

(1, -5), (2, -5) , (3, -4) , (4, -4) , (5, -3) , (6, -3)

ex (1,5) , (6,3)

$\Delta x = 5$ $\Delta y = -2$

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2}{5}$ ✗ $0 < m < 1$

$x' = x$

$y' = -y$

(1, -5) , (6, -3)

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3+5}{6-1} = \frac{2}{5}$ ✓ $0 < m < 1$

$\Delta x = 5$ $\Delta y = 2$

$\Delta T = 2(\Delta y - \Delta x) = 2(2-5) = -6$

$\Delta S = 2\Delta y = 4$

$\Delta = 2\Delta y - \Delta x = -1$

x'	x	1	2	3	4	5	6
y'	$-y$	-5	-5	-4	-4	-3	-3
Δ	Δ	-1	3	-3	1	-5	-1

(1,5) , (2,5) , (3,4) , (4,4) , (5,3) , (6,3)

ex (1,5) , (3,4)

$m = \frac{4-5}{3-1} = \frac{-1}{2}$ ✗ $0 < m < 1$

$x' = x$ $y' = -y$

(1, -5) , (3, -4)

$m = \frac{-4+5}{3-1} = \frac{1}{2}$ ✓ $0 < m < 1$

$\Delta x = 2$ $\Delta y = 1$

$\Delta T = 2(\Delta y - \Delta x) = 2(1-2) = -2$

$\Delta S = 2\Delta y = 2 * 1 = 2$

$\Delta = 2\Delta y - \Delta x = 2 * 1 - 2 = 0$

x'	x	1	2	3
y'	$-y$	-5	-4	-4
Δ	Δ	0	-2	0

(1,5) , (2,4) , (3,4)