

# Mid Point Circle Drawing Algorithm

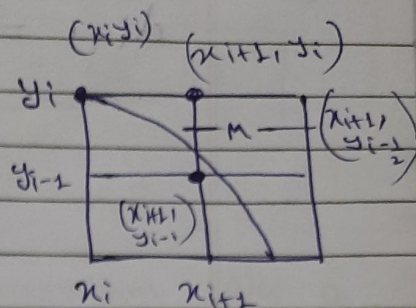
Circle eqn  $x^2 + y^2 = r^2$

$$f(x, y) \Rightarrow x^2 + y^2 - r^2$$

$f(x, y) < 0$ ,  $(x, y)$  is inside the circle

$f(x, y) = 0$  on circle

$f(x, y) > 0$   $(x, y)$  is outside the circle



$$d_i = f_{\text{circle}}\left(x_{i+1}, y_{i-\frac{1}{2}}\right) = (x_{i+1})^2 + \left(y_{i-\frac{1}{2}}\right)^2 - r^2$$

Initial value  $x_i = 0$   
 $y_i = r$

put the value

$$= (0+1)^2 + \left(r - \frac{1}{2}\right)^2 - r^2$$

$$= 1 + r^2 - 2 \cdot r \cdot \frac{1}{2} + \frac{1}{4} - r^2$$

$$= 1 - r + \frac{1}{4}$$

$$d_i = 1.25 - r$$

$$d_i = (x_{i+1})^2 + \left(y_i - \frac{1}{2}\right)^2 - r^2$$

$$= (x_{i+1})^2 + y_i^2 - y_i + \frac{1}{4} - r^2$$

①

$$d_{i+1} = (x_{i+1} + 1)^2 + \left(y_{i+1} - \frac{1}{2}\right)^2 - r^2$$

$$= x_{i+1}^2 + 2x_{i+1} + 1 + y_{i+1}^2 - y_{i+1} + \frac{1}{4} - r^2$$



$$d_{i+1} = \left[ (x_{i+1})^2 + 2(x_{i+1}) + 1 + (y_{i+1})^2 \right] - y_{i+1} + \left[ \frac{1}{4} - y^2 \right]$$

from eq (1)

$$= d_i - y_i^2 + y_i + 2(x_{i+1}) + 1 + (y_{i+1})^2$$

$$- y_{i+1}$$

$$= d_i + 2(x_{i+1}) + (y_{i+1})^2 - y_i^2$$

$$- y_{i+1} + y_i + 1$$

(11)

Case 1  $d_i < 0$  then  $y_{i+1} = y_i$

$$d_{i+1} = d_i + 2(x_{i+1}) + \cancel{y_i^2 - y_i^2} - \cancel{y_i} + \cancel{y_{i+1}}$$

$$= d_i + 2(x_{i+1}) + 1$$

Case 2  $d_i > 0$  then  $y_{i+1} = y_i - 1$

$$d_{i+1} = d_i + 2(x_{i+1}) + (y_i - 1)^2 - y_i^2$$

$$- \cancel{y_i - 1} + \cancel{y_i} + 1$$



$$d_{i+1} = d_i + 2(x_{i+1}) + y_i^2 - 2y_i + 1 - y_i^2$$

$$d_{i+1} = d_i + 2(x_{i+1}) - 2y_i + 1$$

Ques: Using Midpoint circle algorithm plot a circle whose radius = 10 units

$$P_i = 1 - r$$

$$P_i < 0$$

$$P_i = P + 2x + 1$$

$$P_i \geq 0$$

$$P_i = P + 2x - 2y + 1$$

S. No.	x	y	P	Plot (x, y)
1.	0	10	-9	Plot (0, 10)
2.	1	10	-6	Plot (1, 10)
3.	2	10	-1	Plot (2, 10)
4.	3	10	6	Plot (3, 10)
5.	4	9	-3	Plot (4, 9)
6.	5	9	8	Plot (5, 9)
7.	6	8	5	Plot (6, 8)
8.	7	7	6	

Step 1 :-  $1 - 10 \Rightarrow -9$

Step 3 :-  $-6 + 2 \times 2 + 1 \Rightarrow -1$

Step 2 :-  $-9 + 2 \times 1 + 1 \Rightarrow -6$

Step 4 :-  $-1 + 2 \times 3 + 1 \Rightarrow 6$



Step 5 :-  $6 + 2 \times 4 - 2 \times 9 + 1$   
 $6 + 8 - 18 + 1 \Rightarrow -3$

Step 6 :-  $8 - 3 + 2 \times 5 + 1 \Rightarrow 8$

Step 7 :-  $8 + 2 \times 6 - 2 \times 8 + 1$   
 $8 + 12 - 16 + 1 \Rightarrow 5$

$$x - 1 = 9$$

$$1 + x \leq 9$$

$$x + 1 \leq 9$$

(C, 1) to 9	9	6	5	0.1
(C, 2) to 9	8	5	4	0.1
(C, 3) to 9	7	4	3	0.1
(C, 4) to 9	6	3	2	0.1
(C, 5) to 9	5	2	1	0.1
(C, 6) to 9	4	1	0	0.1
(C, 7) to 9	3	0	-1	0.1
(C, 8) to 9	2	-1	-2	0.1
(C, 9) to 9	1	-2	-3	0.1
(C, 10) to 9	0	-3	-4	0.1
(C, 11) to 9	-1	-4	-5	0.1
(C, 12) to 9	-2	-5	-6	0.1
(C, 13) to 9	-3	-6	-7	0.1
(C, 14) to 9	-4	-7	-8	0.1
(C, 15) to 9	-5	-8	-9	0.1
(C, 16) to 9	-6	-9	-10	0.1
(C, 17) to 9	-7	-10	-11	0.1
(C, 18) to 9	-8	-11	-12	0.1
(C, 19) to 9	-9	-12	-13	0.1
(C, 20) to 9	-10	-13	-14	0.1