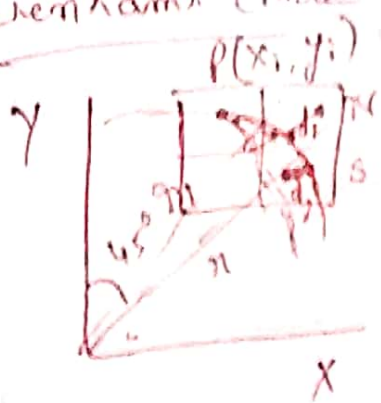


# Bresenham's Circle Drawing Algo



$$f(N) = (x_{i+1}, y_i)$$

$$f(S) = (x_{i+1}, y_{i-1})$$



How to decide the next point S or N?

$$f(C) = x^2 + y^2 - r^2 \quad \text{--- (1) (+ve) } r_1 > r$$

$$f(N) = x_{i+1}^2 + y_i^2 - r^2 \quad \text{--- (2) (-ve)}$$

$$f(S) = x_{i+1}^2 + y_{i-1}^2 - r^2$$

Decision parameter:  $d_i = f(N) + f(S)$   
 if  $d_i < 0$  then we will select point N otherwise S.

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

$$x_{i+1} = x_i + 1$$

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

$$d_i = (x_i + 1)^2 + y_i^2 - r^2 + (x_i + 1)^2 + (y_i - 1)^2 - r^2$$

$$d_i = 2(x_i + 1)^2 + y_i^2 + (y_i - 1)^2 - 2r^2 \quad \text{--- (3)}$$

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

$$= 2(x_i + 2)^2 + y_{i+1}^2 + (y_{i+1} - 1)^2 - 2r^2 \quad \text{--- (4)}$$

$$d_{i+1} - d_i = 2(x_i + 2)^2 + y_{i+1}^2 + (y_{i+1} - 1)^2 - 2r^2 - [2(x_i + 1)^2 + y_i^2 + (y_i - 1)^2 - 2r^2]$$

$$d_{i+1} = d_i + 4x_i + 6 + 2y_{i+1}^2 - 2y_{i+1} - 2y_i^2 + 2y_i \quad - (5)$$

if  $d_i < 0$  Select point  $x(x_{i+1}, y_i) \Rightarrow y_{i+1} = y_i$

$$= d_i + 4x_i + 6 + 2y_i^2 - 2y_i - 2y_i^2 + 2y_i$$

$$d_{i+1} = d_i + 4x_i + 6$$

if  $d_i > 0$   $y_{i+1} = y_{i-1}$

$$d_{i+1} = d_i + 4x_i + 6 + 2y_{i-1}^2 - 2y_{i-1} - 2y_i^2 + 2y_i$$

$$= d_i + 4x_i + 6 + 2(y_i - 1)^2 + 2(y_i - 1) - 2y_i^2 + 2y_i$$

$$= d_i + 4x_i + 10 - 4y_i$$

$$= d_i + 4(x_i - y_i) + 10$$

Initial Decision Parameter —

$$(0, n)$$

$$x=0 \quad y=n$$

$$d_i = 2(x_i + 1)^2 + y_i^2 + (y_i - 1)^2 - 2n^2$$

$$d_0 = 3 - 2n$$

$$n = 10$$

Decision Parameter

$$D_0 = -17$$

$$= -11$$

$$= -1$$

Iteration

0  
1  
2

x  
y  
0  
10  
10  
10  
10

13  
5  
17  
11  
13

$$d_k < 0$$

$$d_{k+1} = d_k + 4x_k + 6$$

$$x_{k+1} = x_k + 1$$

$$y_{k+1} = y_k$$

$$d_{k+1} = d_k + 4(x_k - y_k) + 10$$

$$x_{k+1} = x_k + 1$$

$$y_{k+1} = y_k - 1$$