Mid point circle algorithm

x2 + y2 = r2

r is radius, (x,y)

If the circle is centered at point (xc, yc), it should be translated to the origin to plot the circle.

The equation of the circle in this case would be

(x - xc)2 + (y - yc)2 = r2

Steps

x = 0

y = r

d = 1 - r

EightWaySymmetry (x, y)

while x < y do

if d < 0 then

d = d + 2x + 3

No change in y value

else

d = d + 2 (x-y) + 5

y = y - 1

end

x = x + 1

EightWaySymmetry (x, y)

putPixel (x, y)

putPixel (x, -y)

putPixel (-x, y)

putPixel (-x, -y)

putPixel (y, x)

putPixel (y, -x)

putPixel (-y, x)

putPixel (-y, -x)

Ex. Find the coordinates of points that lie on the circle with radius 10 and center as (15, 5)

=>

x2 + y2 - r2 = 0

x2 + y2 - 100 = 0

x = 0, y = r = 10, and

d = 1 - r = 1 - 10 = -9

Plot (0, 10)

Iteration 1:

As d<0, update d as

d = d + 2x + 3

d = -9 + 2(0) + 3 = -6

Increment x, x=x+1=0+1=1

No change in y, y=10

Plot (1, 10)

Iteration 2:

As d<0, update d as

d = d + 2x + 3

d = -6 + 2(1) + 3 = -1

Increment x, x=x+1=1+1=2

No change in y, y=10

Plot (2, 10)

Iteration 3:

As d<0, update d as

d = d + 2x + 3

d = -1 + 2(2) + 3 = 6

Increment x, x=x+1=2+1=3

No change in y, y=10

Plot (3, 10)

Iteration 4:

As d>0, update d as

d = d + 2(x-y) + 5

d = 6 + 2(3-10) + 5 = 11 + (-14) = -3

Increment x, x=x+1=3+1=4

Decrement y, y=10-1=9

Plot (4, 9)

Iteration 5:

As d<0, update d as

d = d + 2x + 3

d = -3 + 2(4) + 3 = -3 + 11 = 8

Increment x, x=x+1=4+1=5

No change in y, y=9

Plot (5, 9)

Iteration 6:

As d>0, update d as

d = d + 2(x-y) + 5

d = 8 + 2(5-9) + 5 = 13 + (-8) = 5

Increment x, x=x+1=5+1=6

Decrement y, y=9-1=8

Plot (6, 8)

Iteration 7:

As d>0, update d as

d = d + 2(x-y) + 5

d = 5 + 2(6-8) + 5 = 10 + (-4) = 6

Increment x, x=x+1=6+1=7

Decrement y, y=8-1=7

Plot (7, 7)

Check whether x < y, that is 7 < 7, which is false hence algorithm stops here

(0,10)

|  |  |  |
| --- | --- | --- |
|  | At origin | At (15,5) |
| (x,y) | (0,10) | (15,15) |
| (x,-y) | (0,-10) | (15,-5) |
| (-x,y) | (0,10) | (15,15) |
| (-x,-y) | (0,-10) | (15,-5) |
| (y,x) | (10,0) | (25,5) |
| (y,-x) | (10,0) | (25,5) |
| (-y,x) | (-10,0) | (5,5) |
| (-y,-x) | (-10,0) | (5,5) |

(1,10)

|  |  |  |
| --- | --- | --- |
|  | At origin | At (15,5) |
| (x,y) | (1,10) | (16,15) |
| (x,-y) | (1,-10) | (16,-5) |
| (-x,y) | (1,10) | (16,15) |
| (-x,-y) | (1,-10) | (16,-5) |
| (y,x) | (10,1) | (25,6) |
| (y,-x) | (10,1) | (25,6) |
| (-y,x) | (-10,1) | (5,6) |
| (-y,-x) | (-10,1) | (5,6) |