Midpoint Ellipse Algorithm

Step 1: Start

Step 2: Declare variables x_c, y_c, r_x, r_y, x, y, P

Step 3: Read values of x_c, y_c, r_x, and r_y

Step4: Initialize the first point ($x=0$, $y= r_y$)

Step 5: Initial decision parameter for region 1

$$P_{o(01)} = r_y^2 – r_x^2r_y^2 + (r_x^2/4)$$

Step 6: For region 1, Iterate until $2r_y^2x \leq 2r_x^2y$

If $P_{k(01)} < 0$

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

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

$$P_{k+1(01)} = P_{k(01)} + 2r_y^2x_{k+1} + r_y^2$$

Else if $P_{k(01)} > 0$

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

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

$$P_{k+1(01)} = P_{k(01)} + 2r_y^2x_{k+1} + r_y^2 - 2r_x^2y_{k+1}$$

Step 7: We evaluate initial decision parameter for region 2 at last point of region 1 (x_o, y_o)

$$P_{o(02)} = r_y^2 (x_o + 0.5)^2 +r_x^2(y_o – 1) – r_x^2r_y^2$$

Step 8: For region 2:

If $P_{k(02)} < 0$

$x_{k+1} = x_k$

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

$P_{k+1(02)} = P_{k(02)} + 2r_x^2 y_{k+1} + r_x^2$

Else if $P_{k(02)} > 0$

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

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

$P_{k+1(02)} = P_{k(02)} + 2r_y^2 x_{k+1} + r_x^2 - 2r_x^2 y_{k+1}$

Step 9: Use symmetry for other 3 quadrants and plot.

$x = x + x_c$

$y = y + y_c$

Step 10: Stop