Midpoint Ellipse

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1 Objective

To draw an ellipse using midpoint ellipse drawing algorithm.

2 Theory

2.1 Midpoint Ellipse Drawing Algorithm

The midpoint ellipse algorithm is an algorithm used to determine the points needed for drawing an ellipse. It is a variant of Bresenham's circle algorithm where the calculation of d is altered to accommodate for the ellipses' eccentricity.

3 Algorithm

1. Input the center of the ellipse, radius in x and y direction.
2. Calculate the initial value of the decision parameter in region 1 as $p_1 = b^2 - a^2b + \frac{1}{4}a^2$.
3. At each xk position starting at k = 0, perform the following test:
   (a) If $p_k < 0$, the next point along the ellipse at x_{k+1} is chosen to be $(x_k + 1, y_k)$ and $p_{k+1} = p_k + 2b^2x_{k+1} + b^2$.
   (b) If $p_k \geq 0$, the next point along the ellipse at x_{k+1} is chosen to be $(x_k + 1, y_k - 1)$ and $p_{k+1} = p_k + 2b^2x_{k+1} - 2a^2y_{k+1} + b^2$.
4. Repeat step 3 until $2b^2x \geq 2a^2y$.
5. At each yk position starting at k = 0, perform the following test:
   (a) If $p_k > 0$, the next point along the ellipse at y_{k+1} is chosen to be $(x_k, y_k - 1)$ and $p_{k+1} = p_k - 2a^2y_{k+1} + a^2$.
   (b) If $p_k \leq 0$, the next point along the ellipse at y_{k+1} is chosen to be $(x_k + 1, y_k - 1)$ and $p_{k+1} = p_k + 2b^2x_{k+1} - 2a^2y_{k+1} + a^2$.
6. Repeat step 5 until $y_{k+1} = 0$.

4 Source Code

5 Output

Figure 1:

6 Conclusion

We have successfully drawn an ellipse using midpoint ellipse drawing algorithm.