COSC 4370 – Homework 1

Name: Hugh Hoang PSID:1833106

February 12, 2022

1 Problem

This assignment requires us to implement an algorithm for rasterizing eclipse. The ellipse is given with the equation (x/12)^2+(y/6)^2=64^2 where y>=0. This means that the ellipse has a major axis of 768 and minor axis of 384.

2 Method

The method I used for rasterizing eclipse was that I would find which pixels to graph by going through the width and height of the screen to find the x and y for each pixel. I used the equation of the eclipse in the y= equation for the base and x=equation to supplement the missing pixels where the slope is too steep near the sides. I understood that for the y-equation, there was a y for every x and for the x-equation there was not an x for every y so I used both equations to figure out which pixel nearby was suitable to fill in the gaps. Using the circle algorithm on the pdf, we follow the same steps except we use an ellipse's 4-way symmetry instead of a circle's 8-way symmetry which mean we have to calculate the arc in a single quadrant and mirror it on the other axis. This is because we only graph the ellipses' top half since y>=0;

3 Implementation

Because the screen does not have negative coordinates, we cannot set the origin as our center which means that we need to first create a screen big enough to fit the ellipse in which is the width of the ellipse (2 times the major axis plus padding) for x and the height of the eclipse (2 times the minor axis plus padding) for y. We also need to treat the center of the screen which is (768+padding,384+padding) as the center which is the major and minor axis when we start graphing the pixel for drawing our arc. Since the ellipse has 4-way symmetry, we draw the starting arc by calculating the correct y pixel for each x pixel for the entire width of the ellipse by using the equation given which has been solved for y which is y=sqrt((x*(-x+2*major)))/2. We then copy each pixel drawn on the starting arc across the y-axis by setting the equation negative to draw the other quadrant to get a half ellipse. Since it still is missing a couple y pixels where the slope was greater than 1, we do the same with the y-equation. We draw the starting arc by calculating the correct x pixel for each y pixel for the entire height of the ellipse by using the equation given which has been solved for x which is x=2*sqrt(y*(-y+major));

4 Results

The output of the program was a set of pixels in the form of a bmp file which when viewed through a image viewer shows the top half of an ellipse with a major axis of 768 and minor axis of 384 centered at (1000,576) with a screen dimension of (2000,1000)