COSC 4370 Homework 1

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Objective

This assignment requires the rasterization of an ellipse, defined with the equation $\left(\frac{x}{6}\right)^2 + \left(\frac{y}{12}\right)^2 = 64^2$ where y >= 0. The x-radius of the ellipse was 384 pixels while the y-radius was 768.

Method

One function was required to rasterize the ellipse, MidpointEllipse. The purpose of the function is to take a bmp file, the intended x-radius, and the intended y-radius of the ellipse, and draw its shape to the corresponding bmp file.

The function works by taking the starting x and y values and checking if they are within the region. If so, it will render a pixel at that location and move on to the next pixel in the while loop.

Implementation

The coordinates begin at x = 500 and y = 1. Since the total size of the bmp file was 1000 x 1000, x = 500 was selected as the midpoint, and y = 1 was selected so the ellipse would begin graphing at the bottom of the image and draw upwards.

In the MidpointEllipse function, the bmp file name, desired x radius, and desired y radius are called. Within the function, all the necessary variables are defined. x is set to 0, y to y radius, d1 as a limit for quadrant 2 on the graph, d2 as a limit for the q1 quadrant, xregion1 and yregion1 both as increments of increase if they pass the checks.

Two while loops are required to create the ellipse. Both functions check if the d1 or d2 value is less than or greater than zero, respectively. If so, the respective d value is increased by either xregion1 or yregion1, respectively. If not, the loop moves on, increasing their d value by xregion1 – yregion1 + yradius or xradius squared, respectively. At the beginning of each loop, a pixel is rendered at the x and y positions on both quadrants, the x value set to negative for quadrant 2.

Results

The resulting file is a bmp image file displaying half of an ellipse. The change in color is because the loops used different pixel colors to differentiate between what part of the graph they rendered.