COSC 4370 HomeWork 1

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1. **Problem**

The assignment requires the rasterization of the ellipse. The function is defined as $(x/6)^2 + (y/12)^2 = 64^2$ and R = 100 where y >=0 with the center point (0,0), major-axis radius is 386, and minor-axis radius is 768. The output should be BMP image.

2. **Method**

The solution is sold by using "Midpoint Ellipse Algorithm". This is a method for scan converting an ellipse that is center at the origin in standard position. Midpoint Ellipse Algorithm plots point of an ellipse on the first quadrant by dividing the quadrant into two regions. Each point(x, y) is then projected into other three quadrants (-x, y), (x, -y), (-x, -y) i.e. it uses 4-way symmetry. Take input radius along x axis and y axis obtain center of ellipse. Obtain the initial decision parameter for region 1 P1. If P1 < 0, find the next point. We do the same for region 2 but start at the last point of region 1. Now obtain the symmetric points in the three quadrants left and plot the coordinate.

3. **Implementation**

The size of the image is decided by radius so that the placement of each pixel should be fit into the boundaries. The reason for this is the origin of the coordinate system for pixel placement is at the bottom-left while the origin of the coordinate system for determining location on an arc is at the center. In this problem, we have center point at (0,0)and when we rasterize it, some pixels are outside the boundaries so we need to move the center point as long as all the pixels are inside the boundaries.

4. **Rasterize Ellipse**

Take input radius along x axis and y axis obtain center of ellipse. Obtain the initial decision parameter for region 1 P1. If P1 < 0, find the next point. We do the same for region 2 but start at the last point of region 1. Now obtain the symmetric points in the three quadrants left and plot the coordinate by using the function sex_pixel() in the file "BMP.h" to plot all

the pixels. Setting up the size image to be at least bigger than the diameter x/y of ellipse.

5. **Result**
   The output of the program is a HW1 folder, which consists of a comment on the file, the dimensions of the image, the maximum color value of any pixel and the values for each pixel.