Apparatus

These graphs are generated using opencv, python, numpy, scipy and matplotlib.

Extracting the ROI

The retina posterior contains two regions of interest: a black curve and a machine generated purple circle. To extract the ROI, a method was used to extract points on both curves by color. By using the function InRangeS, the coordinates of the purple can be extracted using the RGB values between (90,0,90) and (171,90,171), while the black curve existed between (0,0,0) and (3,3,3) respectively. Both coordinates are were fed through a least-squares regression algorithm in Opencv called fitEllipse2 to find the bounding ellipse.

Creating the ROIs

The ROIs were created by resizing the ellipse by percentage of the circumference, increasing the distance between the ellipses, and using the circumference to find either circle or ellipse. On the percent graph, ellipses were resized by 50% and 100% larger based on the circumference of the original ellipse by using the equation . The mic graph were increased 600 nm between each ellipse. Finally, the curve must be compensated for the scaling factor of the machine. If the machine has a scaling factor of 1.05, then the sampling ROI must be divided by 1.05 to make it smaller than the original curve.

Sampling the Heights

To accommodate the lower resolution of the 2D table, the ellipse was resized by the ratio between the image and the table. With the respect to t (position angle), (angle of rotation), and the center (h,k), the parametric equation of an ellipse is used to generated points encompassing the curve. Duplicates points are removed to generate unique pixels. These pixels sampled the heights based on location of the data. Using the center, these points was converted to polar.

Calculating AUC

Although these polar coordinates corresponded to unique pixels, they occurred at random intervals. They must be interpolated at regular intervals to estimate the AUC. Using the function interp1d in Scipy, these heights were interpolated in terms of a polar period to estimate the function based on regular interval of degrees. Using a riemann sum, the area under the curve was estimated by multiplying the circumference by the average height of the curve.

Graphing the Data.

The graphs were formatted based on left (OS) or right (OD) eye. The graph was plotted with respect to degrees. The left eye begins at 3 o'clock with its points traversing counterclockwise, while the right eye begins at 9 o'clock traversing clockwise.