

Caleb Smiley, DeAnna Kidd, Benjamin Jones, Hannah Clark
CEAS, University of Cincinnati, Cincinnati, Ohio, 45220

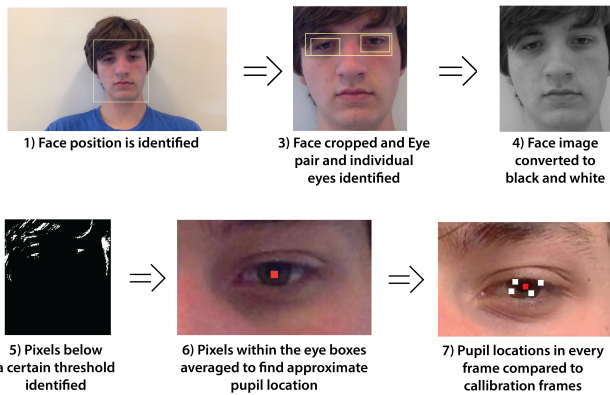
Introduction

Eye tracking is a growing technology with many applications. It allows patients with limited motor skills to use their eyes to communicate and control interfaces. It also allows researchers to track people's gaze when presented with various stimuli, and is therefore very beneficial in marketing.

This project aimed at effectively implementing eye tracking MATLAB. The team created an eye tracking program that uses a webcam to locate where a person is looking on a computer screen. The program was tested with a simple experiment that presented the user with a set of colors and found which colors the user looked at most.

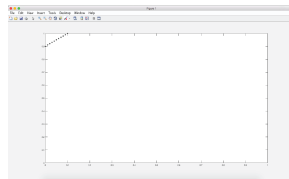
How the Eye Tracking Works

The program uses two Matlab plugins: *USB Webcam Support with MATLAB* to access the webcam, and *Computer Vision System Toolbox* to perform simple object recognition. It works by presenting the subject with visuals and recording the face. After this is finished it analyzes every frame to find the pupil position and calculates where on the screen the subject was looking. This is the procedure the program uses to find the pupil position:



The Experiment

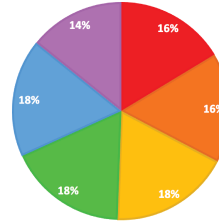
The experiment starts by calibrating for the eyes using dots on a Matlab plot. Afterwards a set of six colors appear on the screen in random arrangement ten times. During this, the program records video to analyze.



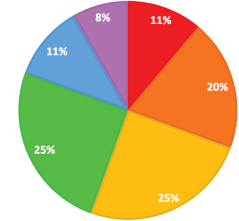
The team's intention with this experiment was to test the software for a real-world application. Color analysis is used in marketing to assist with logo development and company branding. The team hypothesized that red would be the most eye catching of all the colors.

Color Data

Viewed On Average



Most Popular To Individuals



The team found that overall there was approximately no difference in the colors viewed. But when looking at which colors were most popular to certain people, yellow and green came up the most. This means that when an audience is presented with a wide range of colors, yellow and green will likely stand out the most to the majority of people.

Sector

Viewed On Average

15.60%	12.38%	9.02%
21.00%	18.92%	23.08%

Most Popular To Individuals

18.75%	9.38%	9.38%
18.75%	21.88%	21.88%

The team also wanted to see which parts of the screen were viewed the most. Most of the attention was focused in the bottom half of the screen. Looking at both the top and bottom separately, the eye focused most on the top left and bottom right. This data should be factored in to decisions about content placement in graphic and document design.

Conclusions

The team successfully created a fully functional eye tracker within Matlab with a few minor limitations:

- The head must be still.
- Eye tracking cannot occur real time due to limited processing power.
- The program functions best with no glasses or other objects which obscure the eyes.

As for experimental results, the team found some statistically significant trends, while there was not enough data to analyze demographic preferences, the general population had a preference towards green and yellow. The same was true for sectors for the bottom right sector, though this may have been influenced by the display system in Matlab. Further research with a broader sample size would be necessary to solidify the teams findings.

Acknowledgements

Thanks to the College of Engineering and Applied Science for supporting the Models II Honors experience and Dr. Gaskins for advising the research team.