

EYE TRACKING CURSOR/POINTER

PROJECT PROPOSAL – COMP6982 COMPUTER VISION

Group Members

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ABSTRACT

Eye tracking is the method of tracking the movement of the eyes to know exactly where a person is looking and for how long. Eye tracking systems measure the eye position, movement, and pupil size at a specific time to detect areas in which the user has an interest. Eye trackers have been used in different research areas including visual systems. In this project we will be developing an eye tracking cursor/pointer that helps the reader to scroll down and use the basic mouse functionalities to read any document, or just surf over the internet or social media.

Problem Statement

i *The core problem that this project focuses to solve*

- The project is mainly intended for people with hands or finger disability. It will help them to control mouse cursor with eye gaze.
- We intend to provide the seamless user experience when the user reads any text such as any documentation, journal, or simply surfing through social media without any distractions.
- The dependency of the hardware device such as mouse will be reduced, and the reader does not need to always sit close to the machine or carry a mouse with them.

Methodology

The process of eye tracking involves three main steps

1. Discover the presence of eyes.
2. A precise interpretation of eye positions.
3. Frame to frame tracking of detected eyes.

The first step in eye tracking is to detect the eyes. The detection of eyes in image or video data is based on eye models. A sample eye model should be sufficiently meaningful to accommodate the variability in eyes' dynamics and appearance while adequately constrained to be computationally efficient. The eye's appearance is also influenced by light conditions, texture, iris position within eye socket, and the eye status i.e. open or closed. Eye detection methods are broadly categorized based on eyes' shape, features, and appearance.

In this project we will be using two techniques.

- **Shape-Based Techniques:** based on a geometric eye model. The main feature of these techniques is their capability of handling the changes in shape and scale.
- **Feature-Based Techniques:** based on the identification and utilization of a set of unique features of the human eyes. The commonly used features for eye localization are corneal reflections, limbus, and dark and bright pupil images.

Typically, these techniques first identify and detect the local features; then, they apply a filter to highlight desired features while suppressing the others or utilize a prior eye shape model to construct a local contour; and, finally, they apply the classification algorithms to produce the output.

Resources need to build the project

- Python 3.9+
- Python libraries
 - Opencv – Python's computer vision library used for eye detection
 - Mediapipe – Creates a mesh/grid that helps in mapping of eye patterns
 - Numpy – Serialization of data array
 - Dlib – Open-source library consisting of machine learning algorithms

References

- Bozomitu R.G., Păsărică A., Tărniceriu D., Rotariu C. Development of an Eye Tracking-Based Human-Computer Interface for Real-Time Applications. Sensors. 2019;19:3630. doi: 10.3390/s19163630. [PMC free article][Google Scholar]
- <https://github.com/google/mediapipe>
- <https://docs.opencv.org/4.7.0/>