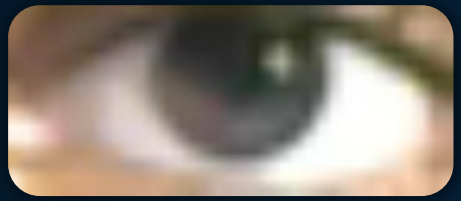
opTrak

Aryan Mahesh
Nihal Pinto

What is opTrak?

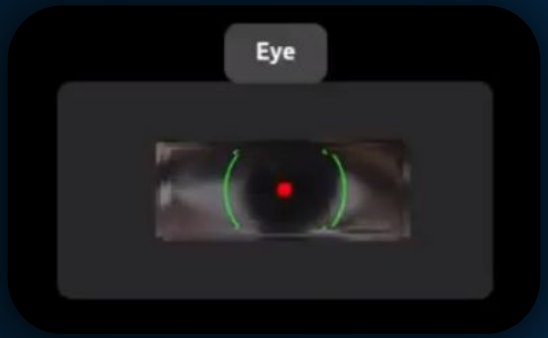
opTrak is an assistive device for physically impaired patients such as paraplegics or quadriplegics, or those who are unable to speak.

opTrak consists of a stereo camera system, a Jetson Nano development board and a display monitor. The system displays context dependant visual information on the screen, which can be selected by the eye movements of the user. EyeWriter uses OpenCV and Python to track the user's eyes and moves a cursor across the screen in order to make the selection.



How does it work?

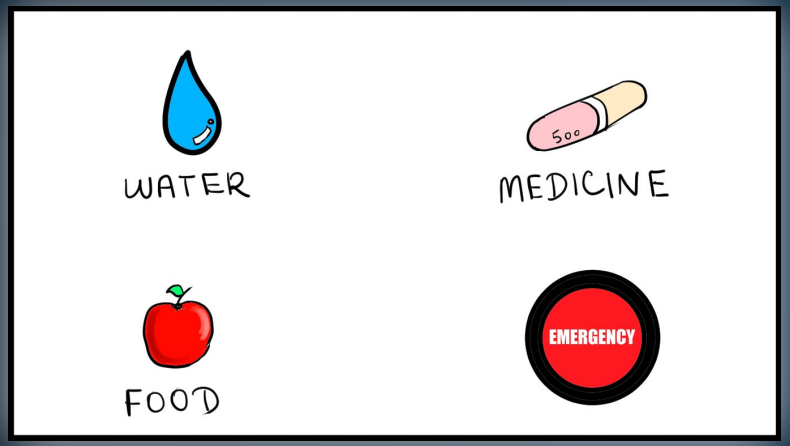
- EyeWriter uses OpenCV, a computer vision software library.
- It starts by identifying the user's face, and within the face it finds the eyes.
- The part of the frame that contains the eye is then converted from the BGR format to Binary format with a threshold can be set manually. This is done to accomodate for the changing light level in the surroundings.
- After a little bit of image processing, only the iris will remain in the image.
- Using blob detection, the center of the iris is found from the eye.



How does it work?

- It asks the user to calibrate by looking at a point in the center of the screen.
- Based on the user's eye movement, it then moves the cursor accordingly.
- On the screen a series of icons or images is displayed from which the user can select by looking at it for a certain period of time. A text to speech program then reads out what the user has selected.

How does it work?



- For the sake of the demo, the screen is divided into four regions which light up when the user looks at each one to demonstrate the program's working
- Actions can be done depending on which icon is selected. For example, an emergency sound alert.
- In addition to this, machine learning can be implemented so that the program can be customised to the user's requirements.

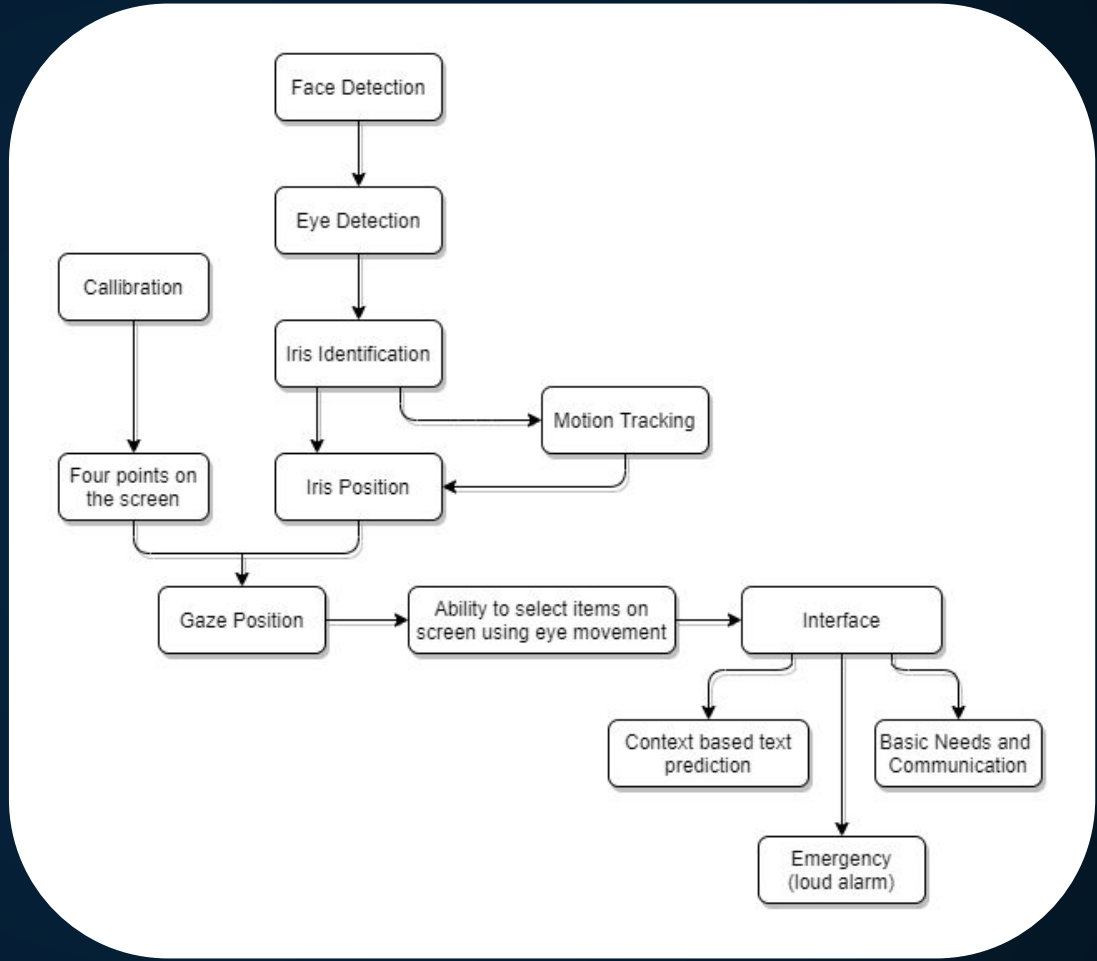
Current Status

- Ability to detect position of iris.
- Ability to compute which region of the screen the user is looking at
- A basic interface with one-click calibration.
- Four options to pick from using gaze tracking

Features To Add

- Stereo Camera for more accurate detection and tracking
- Improved calibration method
- An intuitive UI to allow easy usage
- Context based text prediction
- Different menus for communicating different needs

Block Diagram



Social Impact

- Approximately 5.4 million people are affected by paralysis. EyeWriter can help them communicate better.
- EyeWriter can also alert nearby caretakers or family members if the user is in distress. This is especially useful in nursing homes, old age homes and in households.