

Eye Motion Tracking

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Abstract: *Developing an Eye Motion Tracking system which uses various digital elements to help paralysed patients communicate. The main concept of this project to build a software, which should allow paralysed patients to communicate with others just by using their eyes. This is simple, safe and secure method that take minimum efforts and also is economical. It makes use of digital elements hence it is cheaper and also helps aiding our society.*

Keywords: Patient, Digital Keyboard, Camera, Eyes, Digital Screen

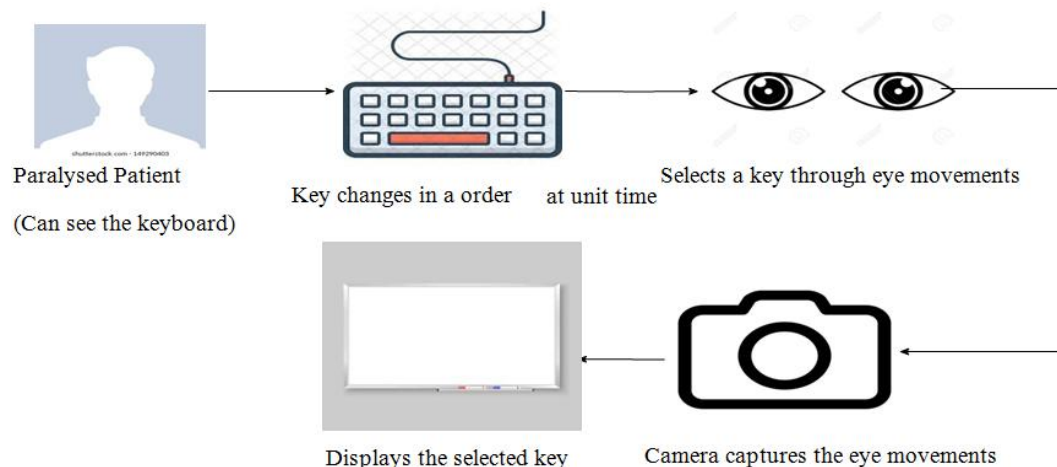
I. INTRODUCTION

“Eye Motion Tracker” is an offline application. this application improves the quality of life of people with complex physical disabilities. this project is to use eye gaze of humans as a mean of interaction between people. it was first introduced by Yarbus in 1990 and is also called as Yarbus eye tracker. The primary occupation of eyes is to observe and not for control. eye tracking is a process of measuring the point of gaze. there are various methods for tracking the motion of eye. the eye motion tracker direct-select vision, controlled communication. it is also called as hand free communication. to operate eye motion tracker application system, user should have one eye with good vision and ability to keep head fairly stable for a period of time. “Eye Motion Tracking” is a digital software whose main objective is to help paralysed patients to convey their thoughts.

This system makes use of a mobile device. This system works like as follows:

1. User should start the software.
 2. On the screen user can see a digital keyboard and a digital board.
 3. On the keyboard the key will light in order at unit time.
 4. The camera will track users eye movements like looking left/right, blink.
 5. When the required key lights up the user just have to blink, it will automatically display the key on the board.
- In this way, the user can express his/her thoughts.

II. SYSTEM ARCHITECTURE



The Eye Motion Tracking system is a software which avoids expensive machines and makes it easy to understand. Through this user can easily perform the task just with a mobile device. The user should make sure that the camera can capture their eyes. User can only select keys, and cannot delete it as it is the limitation of our project. This system don't store the data hence it is storage friendly, and has high portability and can be supported on majority devices.

III. LITERATURE REVIEW

To make use of various complex functionalities we have used python because of its easy to code feature and large inbuilt libraries, etc. The users work is minimal. It could take time to convey the message but can avoid mistakes and reduce the pressure of being quick. There are many such systems and devices worldwide but their high cost is a disadvantage which makes it unaffordable for many people. Some of the system currently are being used:

- Tobii Eye Tracker 5
- EyeTech VT3 XL Eye Tracker
- Smart Eye Aurora Eye Tracker



Fig. Eye Trackers currently being used

The architecture of the app

The app will be built in 2 main parts.

Eye detection: detection of the eyes, their movement and most important their blinking.

Virtual keyboard: keyboard on the screen where we're going to select the letters by using our eyes

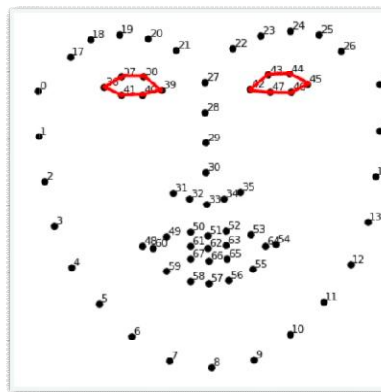
Eye detection

We need two detect separately the two eyes:

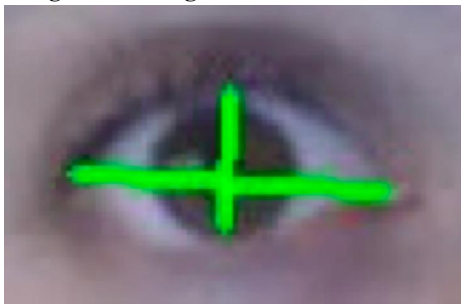
Left eye points: (36, 37, 38, 39, 40, 41)

Right eye points: (42, 43, 44, 45, 46, 47)

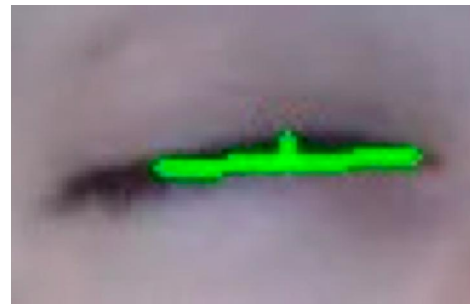
Once we know the exact position of the eyes we can start working with them.



Detecting the blinking



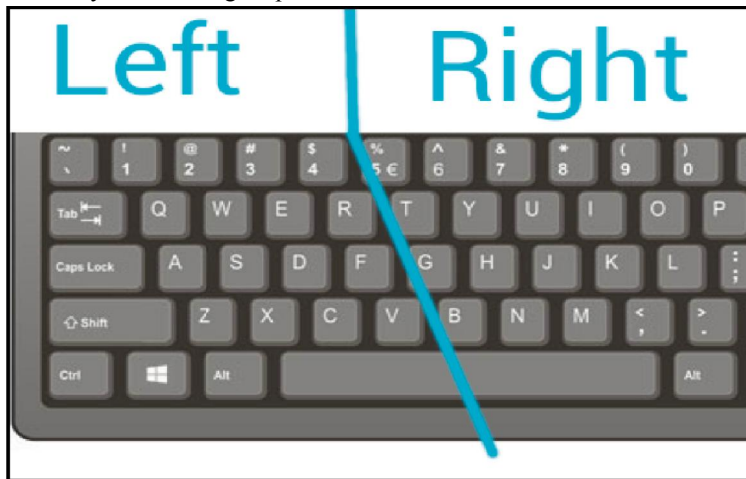
eye open



eye closed

Divide the keyboard in two parts

If we look on the left side only the left part of the keyboard will be activated, while if we look on the right side only the letter on the right part of the keyboard will light up.



Detect gaze of left eye

We know that the left eye region corresponds to the landmarks with indexes: 36, 37, 38, 39, 40 and 41, so we take them.

we can create the mask to extract exactly the inside of the left eye

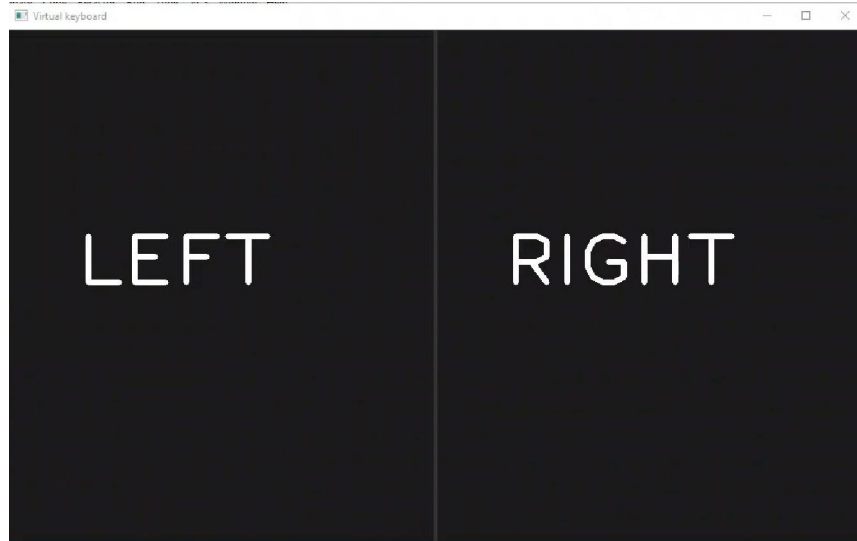
we can only cut out rectangular shapes from the image, so we take all the extremes points of the eye

And finally we display it on the screen.



Choose keyboard's side:

The webcam is controlling the position of your eyes, so if you want to select the left side you need to look on the left for around a second, for the opposite side you need to look on the right.

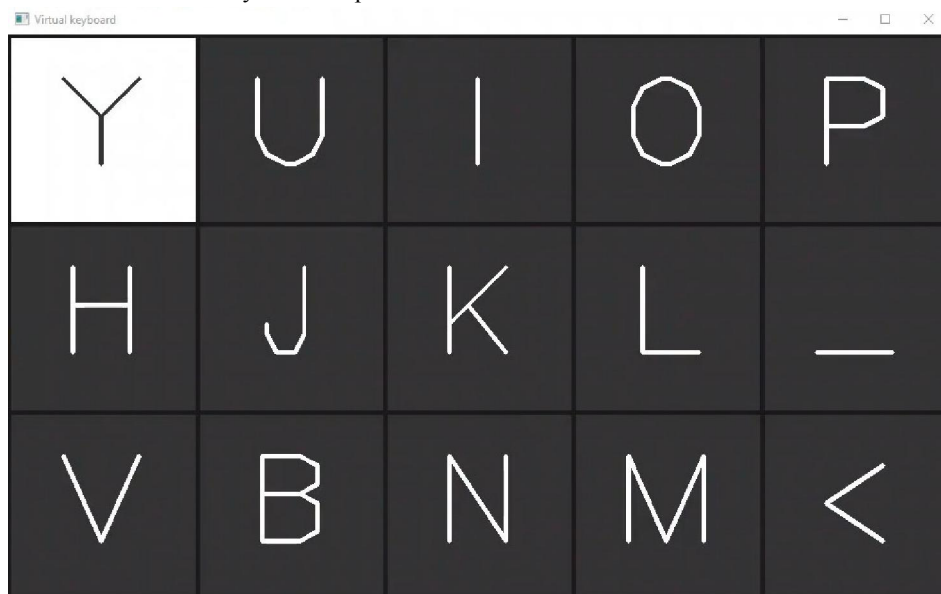


Press a key

Let's suppose that we chose the Right side.

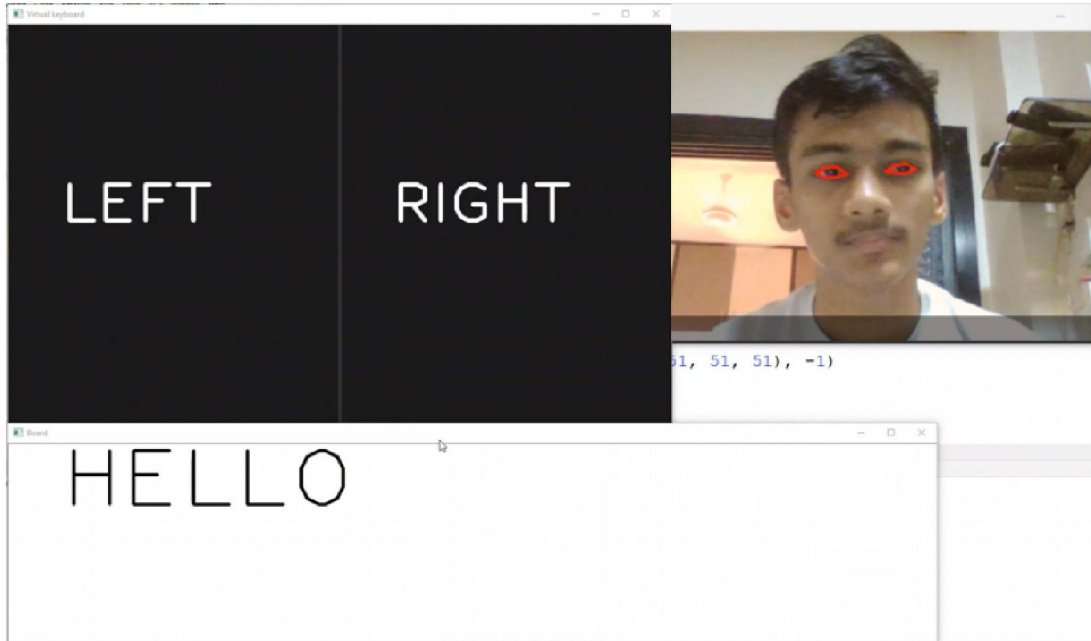
Now we will see the keys contained on the right side.

To press a key we need to wait that the key lights up, and then we blink our eyes. We keep them closed until we hear a sound. That sound means that the key has been pressed.



Repeat step 1 and 2 to press a new key.

Each time we press a key, we need to repeat the step 1 and 2. Each time the key is pressed, it is added to the white board. For example we typed the word "Hello" and below you see the result.



IV. CONCLUSION

Eye Motion Tracker is a cheap and easy to use software. It helps to aid our society and help patients to lead a happy life. It can't compete with currently available eye trackers over technology as it doesn't provide those complex features but is a good choice for its price. In coming future, we will update it to provide those heavy functionalities so that it can compete with current trackers while being cheaper than them.

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