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EYE MOVEMENT TRACKING

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ABSTRACT

Eye tracking is a sensor technology that can detect a person's presence and follow what they are looking at and blinks in real-time . The technology converts eye movements into a data stream that contains information such as pupil position, the number of blinks, and gaze point. Essentially, the technology decodes eye movements and translates them into insights that can be used in a wide range of applications or as an additional input modalityalso focus upon the effect of panel shade on the ecosystem. Eye tracking also would be a great biometric tool for analysis in various applications. In this paper we discuss eye tracking technology and its various applications. Now days, ET is being employed in almost all field including psychology, human computer interaction, marketers, designers, academics, medical, research and many more.

Keywords— Eye tracking, Eye movement, Eye blinks , Gaze & Eye tracking, Eye detection, OpenCV, Blink Detection, Eye centre localization

I. INTRODUCTION

Eye tracking allows us to study the movements of a participant's eyes during a range of activities. This gives insight into the cognitive processes underlying a wide variety of human behaviour and can reveal things such as proper functioning of eye and social interaction methods. Eye movement tracker measures eye movements to determine where a person is looking, what they are looking at, and for how long their gaze is in a particular spot. This eye movement tracker uses webcam or IR sensor and detect the movement of eye in the real time We are using eye tracking for detection of disease called Blepharospasm.

II. METHODOLOGY

Major Methods:

1. PCCR-Pupil Center Corneal Reflection
2. Record eye moments with fixations
3. Record eye moments with saccades
4. Fixation metrics and heating
5. Fixation count
6. Fixation duration
7. Percent fixated

III. MODELING AND ANALYSIS

This eye movement tracker uses webcam and detect the movement of eye in the real time and face in the frame We are using eye tracking for detection of disease called Blepharospasm by that we can save the time and detects whether the person has blepharospasm symptoms or not.

In terms of blink detection, we are only interested in two sets of facial structures — *the eyes.* Each eye is represented by 6 *(x, y)*-coordinates, starting at the left-corner of the eye (as if you were looking at the person), and then working clockwise around the remainder of the region:

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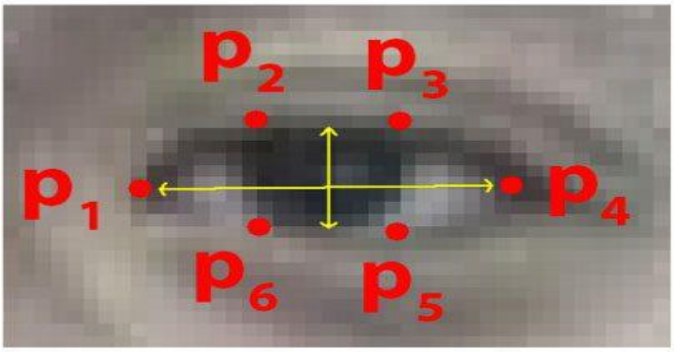


The 6 facial landmarks associated with the eye.

Based on this image, we should take away on key point:

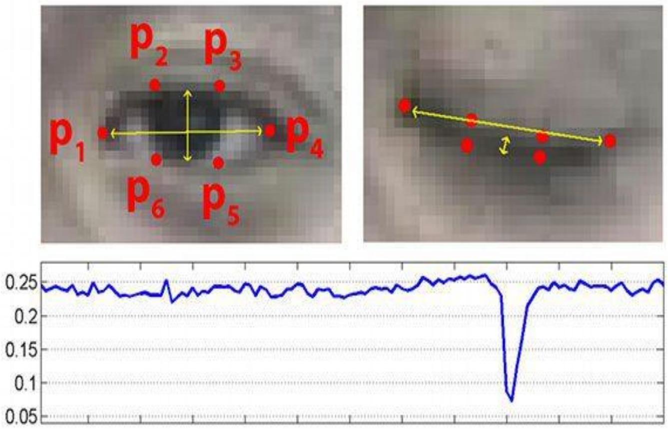
There is a relation between the width and the height of these coordinates. Based on the work by Soukupová and Čech in their 2016 paper, ***Real-Time Eye Blink Detection using Facial Landmarks***, we can then derive an equation that reflects this relation called the *eye aspect ratio* (EAR):

$$\text{EAR} = \frac{\|p_2 - p_6\| + \|p_3 - p_5\|}{2\|p_1 - p_4\|}$$

The eye aspect ratio equation

Where *p1, ..., p6* are 2D facial landmark locations.

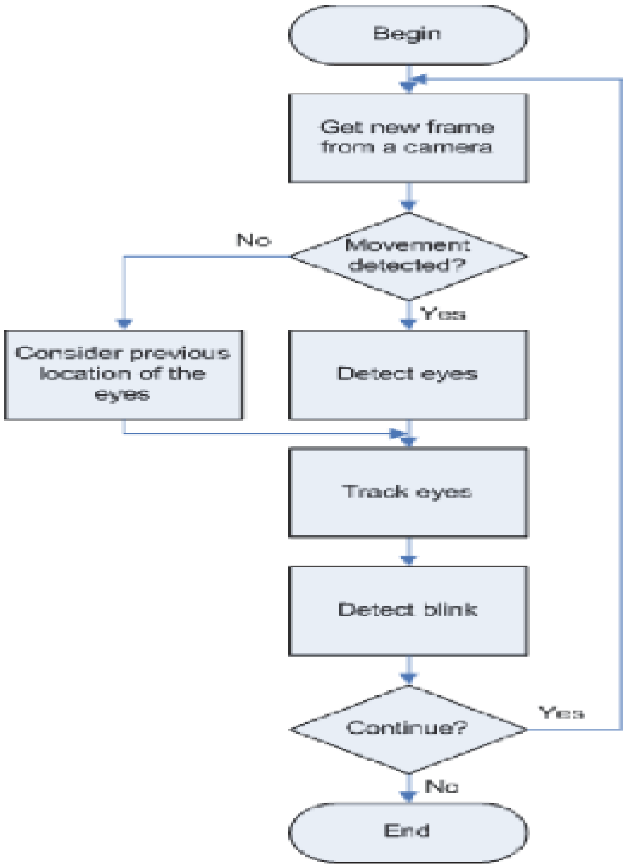
The numerator of this equation computes the distance between the vertical eye landmarks while the denominator computes the distance between horizontal eye landmarks, weighting the denominator appropriately since there is only one set of horizontal points but *two* sets of vertical points. We'll find out, the eye aspect ratio is approximately constant while the eye is open, but will rapidly fall to zero when a blink is taking place. Using this simple equation, we can avoid image processing techniques and simply rely on the ratio of eye *landmark distances* to determine if a person is blinking



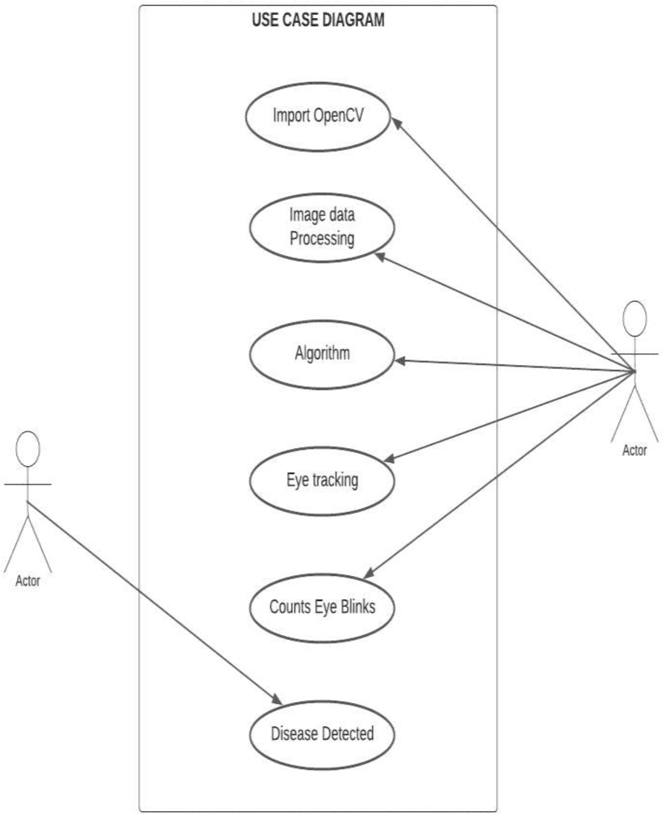
Top-left*:* A visualization of eye landmarks when then the eye is open. *Top-right:* Eye landmarks when the eye is closed. *Bottom:* Plotting the eye aspect ratio over time. The dip in the eye aspect ratio indicates a blink

On the *top-left* we have an eye that is fully open — the eye aspect ratio here would be large(r) and relatively constant over time.However, once the person blinks (*top-right*) the eye aspect ratio decreases dramatically, approaching zero.The *bottom* figure plots a graph of the eye aspect ratio over time for a video clip. As we can see, the eye aspect ratio is constant, then rapidly drops close to zero, then increases again, indicating a single blink has taken place.In our next section, we'll learn how to implement the eye aspect ratio for blink detection using facial landmarks, OpenCV, Python, and dlib.

Design:



Block diagram og blink detection



Use case Diagram

IV. CONCLUSION

The most widely used current designs are video-based eye-trackers. A camera focuses on one or both eyes and records eye Healthcare providers diagnose blepharospasm after asking about your medical history and performing a physical exam .Previously the disease is detected manually but now with the help of eye tracking we can achieve the detection of the disease at home and also at hospitals which is so time saving This eye movement tracker uses webcam and detect the movement of eye in the real time and face in the frame. We are using eye tracking for detection of disease called Blepharospasm by that we can save the time and detects whether the person has blepharospasm symptoms or not. Blepharospasm is a neurologic disorder affecting the muscles controlling your eyelids. Which includes continuous blinking and too often blinking this disease symptom can be detected by eye tracking system which includes the blink detection.

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