Communication via Eye Blinks

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***Abstract*—A real-time algorithm to detect eye blinks in a video sequence from a standard camera is proposed. The proposed algorithm therefore estimates the landmark positions, extracts a single scalar quantity eye aspect ratio (EAR) characterizing the eye opening in each frame. The system enables communication using blinks and interpreted as semiotic messages.**

***Index Terms*—Blink detection, Scanning keyboards, Eye typing, EAR, Blink rate, Blink timeseries plot.**

I. Project goal

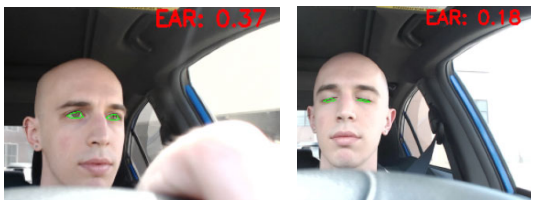
THE goal is to develop computer vision systems that make computers perceptive to a user's natural communicative cues such as gestures, facial expressions, and gaze direction. Such systems are especially relevant for people who cannot use the keyboard or mouse due to severe disabilities.

The primary motivation of our research is to provide an alternative communication tool for people who have severe disabilities such as amyotrophic lateral sclerosis (ALS), cerebral palsy (CP), or locked-in syndrome (LIS) often lead to complete loss of control over voluntary muscles, except the eye muscles, rendering the individual paralyzed and mute.The eyes, therefore, become an important input modality to connect persons with a severe motor impairment to the digital world, and through the digital world to the friends, colleagues, and loved ones with whom they wish to communicate. Therefore the main goal is to display the desired sentence on the screen through some gestures.

II. Introduction

Detecting eye blinks is important for instance in systems that monitor a human operator vigilance, e.g. driver drowsiness , in systems that warn a computer user staring at the screen without blinking for a long time to prevent the dry eye and the computer vision syndromes, in human computer interfaces that ease communication for disabled people.

we are going to develop a computer vision application that is capable of detecting and counting blinks in video streams using facial landmarks and OpenCV.we proposed a simple but efficient algorithm to detect eye blinks by using a recent facial landmark detector. A single scalar quantity that reflects a level of the eye opening is derived from the landmarks.



(a) Open eye (b) Closed eye

A user who is capable of blinking voluntarily can generate mouse clicks through his or her eye blinks in order to operate software applications requiring such input.Eye typing involves looking at the desired letter or key to highlight it, and dwelling on it for selection.Performance may also improve using a three-level selection scheme, known as block, group, or quadrant scanning.Block scanning is most effective if there are a large number of selectable items.Plots the eye aspect ratio EAR and results of the EAR thresholding.

III. Design and Implementation

In our work we use a camera to capture the images of eyes, used the Adrian Rosebocks algorithm to extract the eyes from the image.Eye movements are translated into an understandable language by the softwares present.

A. Architecture:

1.Camera input :- The camera takes in continuous video input of the face of the patient. This is done using the webcam in the first tablet. The patients eyes are continuously monitored.

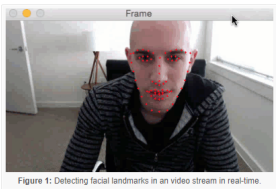
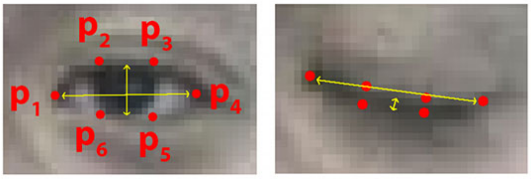


Figure 1: Detecting facial landmarks in an video stream in real-time.

2.Grab the frame from the threaded video file stream, resize it, and convert it to grayscale channels, detect faces in the grayscale frame and determine the facial landmarks for the face region, then convert the facial landmark (x, y)-coordinates to a NumPy array.

3.In the first part well discuss the eye aspect ratio and how it can be used to determine if a person is blinking or not in a given video frame.

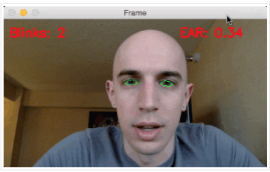


Where p1, , p6 are 2D facial landmark locations.

The ratio of eye landmark distances to determine if a person is blinking or not.

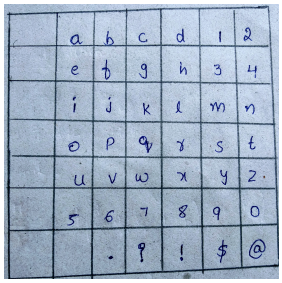
4.Ability of two state-of-the-art landmark detectors to reliably distinguish between the open and closed eye states.

5.Initially eye blink count is intialized to zero as the EAR decreases and reaches some threshold value it is considered as a blink and count is incremented and displayed on the frame.



6.The idea is to scan through a block of items (perhaps a group of rows). The list is displayed in a dedicated region with a mechanism for the user to select the word early. The first selection enters a block. Scanning then proceeds among items within the selected block. The second selection chooses an item within that block.

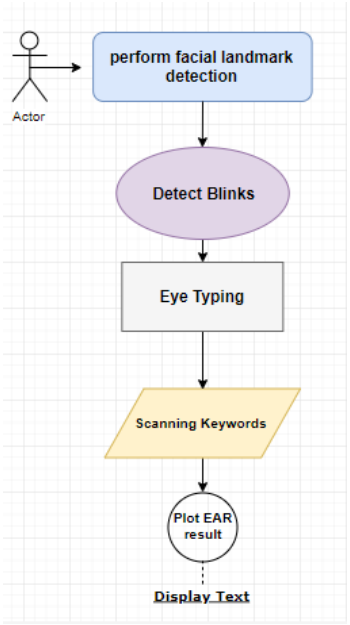
7.Overall, all scanning keyboards in use are variations on divide and conquer. For any given entry, the first selection chooses a group of items and the next selection chooses within the group.



8.Desired text is displayed on the screen after the completion of eye typing and keyboard scanning.

9.At last we display blink timeseries as step plot using eye aspect ratio. Plots a graph of the eye aspect ratio over time for a video clip.

10.BLOCK DIAGRAM :



B. Algorithms used:

Adrian Rosebocks algorithm :-

This algorithm is used to detect the eyes of the patient from the real time video.we can apply facial landmark detection to localize important regions of the face,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.To build our blink detector, well be computing a metric called the eye aspect ratio (EAR).The eye aspect ratio is instead a much more elegant solution that involves a very simple calculation based on the ratio of distances between facial landmarks of the eyes. The eye aspect ratio is constant, then rapidly drops close to zero, then increases again, indicating a single blink has taken place.

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

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

Once the person blinks (top-right) the eye aspect ratio decreases dramatically, approaching zero. 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. This method for eye blink detection is fast, efficient, and easy to implement.

BlinkWrite is designed to assist the severely motor impaired individuals who are unable to create motion input, but are able to voluntarily blink their eyes.For the BlinkWrite implementation, work is planned to improve the method of selecting candidates, to substitute a web cam for the eye tracker, and to implement new input methods using, for example, longer blinks or a re-organized word list.

IV. ADD-ONS

We can make computer speak with Python. Given a text string, it will speak the written words in the English language. This process is called Text To Speech (TTS).

Add some more keywords to the scanning keyboard.

V. CONCLUSIONS

This work will provide patients with complete paralysis the benefit of communicating with the outside world. It will not just help him/her meet his personal needs but also give them the chance to interact with other people. This can make them much more self-reliant and will also not let them feel isolated in todays fast-paced and developing world.

This paper has presented a new hands-free text entry system using blinks as the only source of input. BlinkWrite was implemented using the core concepts of a scanning ambiguous keyboard. A user study was conducted to assess the text entry speed of the system based on the scanning interval.

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