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IRIS Controlled Human Computer Interface for Paralytic Person

Supriya Gaikwad[1], Zuber Shaikh[2] , Rahul Salunke[3]

[1,2]A.I.C.T.E
[1,2]Dhole Patil College Of Engineering, Pune, India

Abstract: **It is an efficient alternative channel for communication without speech and hand movements is important to increase the quality of life for patients suffering from Amyotrophic Lateral Sclerosis or other illnesses that prevent correct limb and facial muscular responses. In this respect, the area of study related to the Human Computer Interaction and Brain Computer Interface (BCI) is very important in hopes of improving the medium term quality of the life for such patients.**

Keywords: **HCV, computer, iris, H.C.I.**

1. INTRODUCTION

We have seen that eye movements in HCV (human computer vision) have been studied for many years. They continue to appear to be a promising approach, but we do not yet see widespread use of eye movement interfaces or widespread adoption of eye trackers in the marketplace. The basic hardware components of an HCV are a video camera, frame grabber, and a processor capable of analyzing the video in real time. The components are easily available in the market. The chances of error are very less. Moreover the system is much cost effective. The system developed is a boon for a physically challenged person.

2. OVERVIEW

There are different ways of determining the direction of a person's gaze. The "pupil-centre/corneal-reaction" method is probably the most effective and the most commonly used one. The method is based on the idea that the direction of a person's gaze is directly related to the relative positions of the pupil and the reaction of an object of the cornea.This remote eye-tracking method does not require physical contact with the user's eye or eye socket. It uses reactor trackers: a beam of light is projected onto the eye, after which a sophisticated camera picks up the difference between the pupil reaction and known reference points to determine what the user is looking at. So, this method involves the following procedures:

1. A calibration procedure, enabling the eye-tracking system to learn about several
2. physiological properties of the tested person's eye
3. Illuminate the eye in order to reach the bright-pupil affect (cf. red-eye effect in ash photography), an effect necessary to locate the centre of the pupil.
4. Measure the locations of the pupil centre.
5. Locate the relative position of the corneal reaction
6. Calculate the direction of gaze (through image processing algorithms)
7. The system developed is a boon for a physically challenged person.

3. BRIEF DESCRIPTION

System is based on the idea that the direction of persons gaze is directly related to the relative positions of pupil. System has been developed to provide computer access for people with severe disabilities. The system tracks the computer user's movements with a video camera and translates them into the movements of the mouse pointer on the screen. In the proposed system tracking of user gaze at particular position and thereby enable mouse clicks is introduced. The objective of the present chapter is threefold. First, we capture real time image from video camera. Second, we examine various methods for image processing by which we can convert image into grey scale and after that we detect the edges and circle. Third, movement of Mouse Pointer on the GUI for capturing persons eye movements as an input mechanism to drive system interaction. Eye tracking is a practice where an individual's movements of an eye are calculated so that the associate knows both where a person is looking at any given time and the series in which their eyes are shifting from one position to another position. Tracking movements of an eye of any person can help HCI researchers to be aware of display-based and visual or optical processing of information and also identify with the interface of the system and factors that may impact upon the usability of it. Activities of an eye can also be captured as well as used to control signals to permit individuals to interrelate with graphical user interfaces directly without the requirement for mouse otherwise keyboard input, that can be benefit for population of disabled individuals.

Eye Tracking:

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A. Electronic Method:

In the 1920's, it was discovered that by placing electrodes on the skin in the region of the eyes, one could record electrical activity which changed in synchrony with movements of the eye in the head. It was initially believed that these potentials reacted the action potentials in the muscles that are responsible for moving the eyes in the orbit. In eye movements, a potential across the cornea and retina exists, and it is source of electro oculogram (EOG). EOG can be modeled by a dipole and these systems can be used in medical systems. It is now generally agreed that these electrical potentials are generated by the permanent potential difference which exists between the cornea and the ocular funds (cornea-retinal potential, 10-30mV: the cornea being positive). This potential difference sets up an electrical field in the tissues surrounding the eye. As the eye rotates, the field vector rotates correspondingly. Therefore, eye movements can be detected by placing electrodes on the skin in the area of the head around the eyes.

B. Video Based Method(Blink Detection):

The algorithm used by the system for detecting and analyzing blinks is initialized automatically, dependent only upon the inevitability of the involuntary blinking of the user. Motion analysis techniques are used in this stage, followed by online creation of a template of the open eye to be used for the subsequent tracking and template matching that is carried out at each frame. A own chart depicting the main state of the system is shown in Figure:

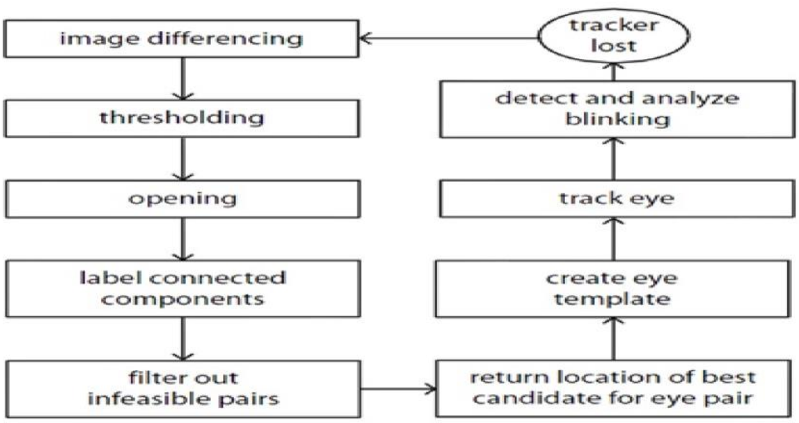

Fig. 1 Flow Chart of Video Based Method

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Fig. 2 Blink detection

4. PROPOSED SYSTEM

Video Based Eye Tracking:

- Connect the camera to the laptop's USB port.
- Calibrate the eye positions with the GUI's button positions.
- Look in the direction of a button whose function is to be performed.
- Stare for a couple of seconds to click on that button.
- After the click, the function desired is performed.

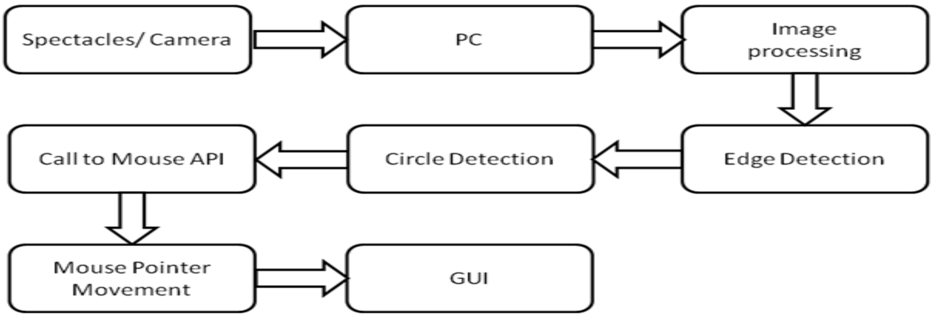

Fig. 3 proposed systems steps

Video-based eye tracking systems use a video camera to image the eye. Based on how this 'eye camera' is positioned, video-based eye tracking systems can be divided into two categories: head-mounted and remote. Head-mounted eye trackers typically include an additional camera to image the scene in which the subject is looking while remote trackers commonly operate in accordance with a computer monitor on which the subject is performing a task. Head-mounted video-based eye trackers have an optical module set on a headgear worn by the user. They are, to some extent, more intrusive than remote trackers but provide the observer with more freedom of motion. If the headgear were perfectly stable and moved exactly with the subject's head, and the eye camera and scene camera were securely mounted onto the headgear, the cameras would not move with respect to the subject's eye and any displacement of the pupil or CR within the eye images would be due solely to rotational eye movements. This idealistic scenario does not exist.

5. FUTURE SCOPE

The System provides a dependable software solution for paralytic people and people with motor disabilities, through uncomplicated eye tracker hardware, which ultimately allows the person with severe disabilities to manage functionalities of computer. The systems reliability has been exposed with the high accuracy results or accurate output reported.

1) Track user eye movement and control mouse movements.
2) Track user gaze at a particular position and thereby enable mouse clicks.
3) Use detected mouse operations to control computer functionalities.

6. CONCLUSION

The project provides a reliable software solution for paralytic people and people with motor disabilities, through simple eye tracker hardware, which eventually allows them to control computer functionalities. The reliability of the system has been shown with the high accuracy results reported in the previous section. In addition to the extensive testing that was conducted to retrieve these results, additional considerations.

However, if the camera is placed too high above the user's head, in such a way that it is aiming down at the user at a significant angle, the blink detection is no longer as accurate. This is caused by the very small amount of variation in correlation scores as the user blinks, since nearly all that is visible to the camera is the eyelid of the user. Thus, when positioning the camera, it is beneficial to the detection accuracy to maximize the degree of variation between the open and closed eye images of the user. Finally, with respect to the clinical environment, this system provides an unobtrusive alternative. It is concluded that using a web camera as a human computer interface can be viable input method for the severely disabled person

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