Real time Application of Eye tracking for Physically Challenged in a Natural Desktop Environment

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Abstract — Various human activities can be indicated by eye blink patterns especially for paralyzed people where verbal communication is impossible. In this paper is described a method based on image processing techniques for detecting human eye blink. The system is mainly based on indirect MATLAB based communication for paralyzed people. Image acquisition toolbox of MATLAB 8.1 used to take the real time image of the paralyzed people in front of a system. Region of interest (ROI) is eye to check the status of eye open/close. Whenever particular eye are open or closed it give different commands to facial segmentation algorithm. The commands are then converted into audio message using SAPI (Speech Application Programming Interface) tool of windows and can be heard and viewed by the caregiver. The system is a real time implementable concept to provide the maximum accuracy for eye tracking and visual message conversion.

Keywords—Image processing, Region of Interest (ROI), Facial segmentation, SAPI (Speech Application Programming Interface) tool.

I. INTRODUCTION

This project mainly focuses on the adversity of paralyzed people. Most of the research works are done on basis of using wearable device. The region of interest (ROI) is extracted from eye additionally using sequential Monte Carlo approach [2], mapping the gaze of eye by Low pass filtering and stability of the point[7], User's body don't attach devices but wearable or head-mounted mechanism can be used [8]. Many applications support text entry through eye gaze [16, 17, 18]. Also in the mobile environment [19]. Selection task can be performed by setting up eye gaze on a key for an expanded time [20]. IT University of Copenhagen is developed Open source ITU Gaze Tracker software [21]. Eye gaze-based text work of art can be performed in three ways specifically (1) direct gaze pointing or Eye typing, (2) Eye gesturing and (3) continuous writing [22, 23]. Introduction to the modern mechanism of eye tracking equipment and gaze evaluation. Challenges involved in using a perceptual appendage, eye, as an input modality [24]. Multi-modal human-computer interface (HCI) combining an eye-tracker and a soft-switch which may be well thought-out as typically on behalf of one more modality [25]. Evaluate the manners of the user when they are using the edge of eye gaze is measured using different techniques and different models [26]. Assortment techniques of eye gaze tracking are used. In this techniques comprising the Eye-lid tracking, and Pupil [27]. Neurosky Mindwave which is a innovative product to detect Electroencephalogram sign (EEG) which also detects an eye blink [28]. The eyes are directly connected to the brain. For some people, who are suffering from a brain-stem stroke, neuro motor disability or ALS. Research is to provide a different message tool for people proper communication by eye blink detection [29]. The first eye tracking was completed in 1947 for American Air Force is also using this mechanism for find out greatest position for the greatest control in an airliner cockpit [30]. This proposal is used to detect the eye blink by using a normal webcam for capturing the streams of videos and images. A Webcam provides high resolution and sophisticated response to any light condition. It mainly detects the face and avoids the background details (wall, window). So high accuracy is obtained for detecting the eye blinks. When the paralyzed people blink their eye's the three way messages are conveyed and automatic audio message is produced by using the SAPI tool.

II. EXISTING AND PROPOSED SYSTEM

A. Existing system

In existing system the hardware based eye blink detection used infrared cameras and illuminators [11], wearable devices, glasses with a special close-up camera observing the eyes [12]. Automatically detecting the eye blink in a video sequence based on motion estimation [1]. Detection of eye blinking is significant to monitoring human operator alertness [2, 9, 10]. Is driver's eyes is closed for certain period of time and mouth is used for yawning the automated alarm is sounded [4]. The easiest way to avoid the symptoms of Dry eye is to blink regularly [14, 15]. Eye blink is measured in a proper manner for fatigue diagnostics and different tasks of human are also measured. Eye blink constraint provides reliable information for detection of liveliness of a person [6]. Eye blink detection algorithm is hope so as to serves as a visual cue that may be concurrent to the state of fatigue of the driver, real world situation is the minimized processing time essential to allow for satisfactory driver response time [3]. Eyelid movement estimated the quantity of observation of the driver [13]. Dry eye prevention systems were designed by eye blink detector [5]. There are several works has been implemented in the eye tracking to detect open/close of an eye. Eye-gaze detection techniques are used for various applications from medical to education [31]. Detection of eye blink are included in several applications like controlling wheel chairs, voice alert system and controlling home appliances. Eye tracking also assists in designing E-learning systems to get feedback from users to improve the users' learning ability[32].

B. Proposed system

The hardware sensors are costly and dangerous for our eyes as it follows laser technology. In proposed system skin segmentation and eye blinking based image processing system are done. Real time approaches is used to track the face and eye detection by using image acquisition toolbox of MATLAB 8.1. It also enables to detect the eye status whether open/close. This project proposes three ways, if we blink the left eye it intimates (I need water) in such manner the various reaction of the person is captured and by using the SAPI tool the automatic audio message is delivered to the care giver.

III.EXPERIMENTAL SETUP

Normal webcam is used for providing high resolution and for capturing the eye blinks effectively. The cost of webcam is very low compared to sensor. Since webcam contain adjustable light, angle and can be used in various light conditions.

Webcam seizures the video and display the image. The MATLAB 2013a is used for connecting to webcam; further processing is done through SAPI tool and the final output is obtained.



Fig. 1 Working of system

The acquisition thread contains two blocks Image Acquisition Engine and Memory Buffer. Images are stored in memory buffer and transferred to the workspace of the MATLAB. Camera can be controlled by using image acquisition engine.

A. Image Acquisition and Frame Processing

Image Acquisition Toolbox[™] provides functions and blocks that enable us to connect industrial and scientific cameras to MATLAB. Command: "imaqtool" Use: Starts camera for input images. Takes the frames and provides them to skin segmentation unit which is further processed to detect face. Frames per Seconds (FPS) are taken in consideration to check the ongoing changes in eye status.



Fig. 2 Image acquisition

B. Face Detection

The face frame is detected by skin segmentation mechanism by excluding the background material like wall, window. It considers only the human skin area as ROI and leaves all other parts.



Fig. 3 Face detection

C. Eye Tracking (Detection)

From the overall frames we have considered only the eye to detect the region of interest (ROI). This is based on iris and white portion of eye identification using segmentation.

D. Eye Open/Close Classification

The classification is to detect whether the eye is open or close. Our face includes dark portion that causes the change in position is detected. When the left eye blinks the first message is generated further the right eye and the both eyes blinking technique are carried out for helping the paralyzed people. The message generated is specified to care giver for procurement of more efficient output. The messages can also be easily replaced by other messages for the convenience of the people.







Fig. 5 Eye Close

E. Text to audio message

When the eyes are blinking the automatic messages will be created by using the SAPI (Speech Application Programming Interface) tool. The text messages are converted into audio messages using SAPI tool. Audio message is heard by care giver to provide more care towards the paralyzed people.

IV.ALGORITHM

The existing system uses Discrete Cosine Transform (DCT) algorithm for capturing the image without any movement of the particular person. In this paper the Skin segmentation algorithm to overcome the drawback of existing system. Skin segmentation technique captures the image even if there any movement. Limited accuracy to variance is high and specificity of human skin color is low. The new method is highly competitive, especially in color images for extracting the face regions. The algorithm is Self-adaptive for skin segmentation regions to improve the outcome.

V. WORKING PROCESS

Step 1: Image is captured using the webcam and detect the face skin.

Step 2: The detection of face skin is based on the condition.

Step 3: The condition is number of faces is greater than 0 then eye is detected. The number of face is 0 the move onto Step1.

Step 4: The number of eye (k) is greater than 0 then detect the left eye first, when the eye blinks first message is produced.

Step 5: Go to Step 1 to continue the process.



Fig. 6 Working Process

This flow diagram represent the how project work will be processed.

VI.CONCLUSION

The paralyzed people are not able to communicate their wants; hence this project provides a way to overcome the difficulty by using eye blinking technique. Detection of eye blinking is a real time application. Paralyzed people sitting in front of the webcam can blink the eye to convey their necessities and automatic messages are generated by the blinking of left, right and the both eyes. The audio messages are heard by the care taker. Normal webcam is used which is does not affect our body. The future work of this project can be enhanced by using eye blinking technique for controlling the home appliance.

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