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Human Facial Gesture and Voice Command Based Desktop Control

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ABSTRACT :
Human Computer Interface and automation is one of the prime demands of today's age. With this regard the processing time which includes capturing image by any media, tracking image i.e. extracting eye and nose feature, setting various reference points, calculating distance between reference points, becoming significantly very short. This technology is used for an application that it is capable of swapping mouse with human face for interaction With PC. Facial features e.g. eyes, nose tip are traced and tracked to use their movements for performing mouse events. Co-ordinates of the nose tip in the video feed are interpreted to develop co-ordinates of the mouse on screen. The left blink or right blink controls the left click or right click events of mouse. The external device will be webcam for the video stream. Our proposed system will enable the physically disabled people to control PC operations through facial expressions which will act as mouse. By using six segmented rectangular filter and face verification through Support Vector Machine, the face structure of the user can be quickly recognized. The image of user's face will be captured and tracked after every interval of time. System automatically detects the users eye blinks and accurately measures their duration. Left eye blinks triggers left mouse click event, while right blinks right mouse click event. In addition this system includes some voice command for daily utility applications.

***KEY WORDS** : Human Computer Interface, rectangular feature, six segments, Face Detection, Face Tracking*

I. INTRODUCTION

Human–Computer Interface (HCI) can be used as the communication point between the computer and human user. Commonly used input devices require manual control and cannot be used impaired in movement capacity by person. Therefore, there is a need for developing alternative methods of communication between human and computer which will be suitable for the persons with impairments of hardware and would become a part of the Information Society. In recent years, the development of alternative HCI is attracting attention of researchers all over the world. Alternative means of interacting for persons who are physically disable like person who cannot speak or cannot use their limbs are their only way of communication with the world and to obtain access to entertainment or education. A user friendly HCI should fulfill several conditions: first of all, it should be non-contact and should use as much less specialized equipment as possible, it should give real-time performance, and it should be able to run on a consumer-grade computer.

It is real time system which captures a movement of mouse cursor through face detection and facial features. It overcomes the existing system by avoiding the use of external hardware that caused serious eye damages. Also it could be used by physically challenged people. It uses a template matching method for eye extraction instead of using hardware, even as in previous system the short blinks of eyes were avoided or neglected. In this system the left or right blink is only used for selecting particular file or folder. With eye detection its first aim is to capture face for the movement of mouse cursor. Then it reacts as the mouse does.

We propose an algorithm that allows a user to interact with the computer by using their eyes to simulate clicking a traditional mouse. The algorithm is able to automatically locate the user's eyes and learn the status of both eyes like which one is open and close. Online learning provides a better level of robustness which allows the algorithm to work more efficiently and more consistently for various individuals. Also it works successfully for individuals wearing glasses. Work on camera-based blink detection has focused on specific tasks such as HCI. Blink detection modules have been part of more general systems on eye motion analysis. Some research e orts in camera-based blink detection use infrared lighting. The advantage of an infrared system is that the pupils of the user are highlighted when exposed to infrared lighting. While infrared systems make the problem of detecting the eyes easier, the typical user does not have access to infrared lighting and there are safety concerns about long-term exposure to infrared lighting. Proposed system uses standard lighting and a typical USB camera. Other systems use active appearance models and locate, track the eyes and make assumptions about the color, shape, and lighting of the user's eyes.

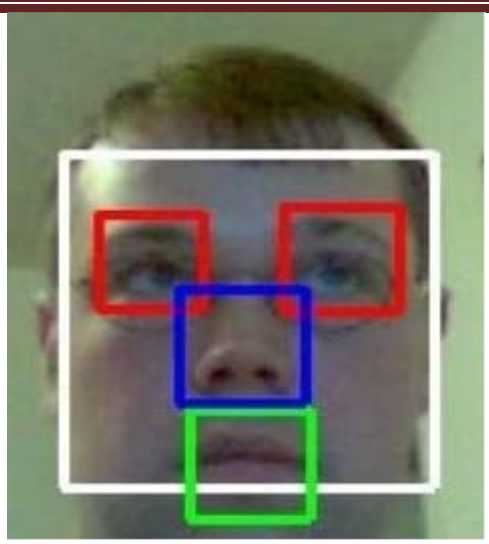

Figure 1: captures a movement of mouse cursor through face detection and facial features

The templates of the user's eyes that proposed system automatically captures eliminate the need for us to make such assumptions. Previous interaction systems for people with disabilities interpret a user blink as a trigger for binary switch among the applications. By tracking and interpreting both eyes of the user, proposed system allows interaction with a computer on a level that is closer to using a traditional mouse. Proposed system enables users to move the mouse pointer on the screen, it can issue hands-free mouse-clicking commands and voice command for daily utility applications. For individuals who are not able to control the muscles around their eyes to a degree that they can wink, the system still enables them to simulate the click commands of a traditional mouse. This is an improvement over current assistive mouse-replacement systems such as Camera Mouse, which limits the user to left-click commands by hovering over a certain location for a predefined amount of time. This is counterintuitive as the lack of action on the part of the user causes a click to occur. It can lead the system to issue a click command that was not intended by the user if the user is not moving the mouse within the threshold of hovering time. Our system provides a more intuitive method for controlling the mouse, as it requires a specific action (eye blink) by the user to simulate a mouse click.

II. RELATED WORK

Todkar Mrunal S, Shah Sarang A., Kore Kaustubh R, Babar Divyata D, Shevade Snehal B,Prof. Gurunath G. Machhale "Gesture based desktop control ",IJIRCCE 2017 proposed system which can useful for physically disabled people it works on facial gesture nose tip and eyes. This system enables the physically disabled people to control PC operations through facial expressions which will act as mouse. By using six segmented rectangular filter and face verification through Support Vector Machine, the face structure of the user can be quickly recognized. The image of user's face will be captured and tracked after every interval of 30 sec. System automatically detects the users eye blinks and accurately measures their durations. Long blinks triggers mouse click, while short blinks are ignored [1]. This model would have to be additional voice command support for daily utility applications.

Arantxa Villanueva, Rafael Cabeza, Sonia Port a "Eye Tracking System Model with Easy Calibration", IEEE 2011 The aim of this work is to build up a mathematical model totally based in realistic variables describing elements taking part in an eye tracking system employing the well-known bright pupil technique i.e. user, camera, illumination and screen[9]. The desired model would have to be simple, realistic, accurate and easy to calibrate.

Shrunkhala Satish Wankhede, Ms. S. A. Chhabria, "Controlling mouse motions using eye movements", (IJAIEM), 2013. Introduced system for an individual human computer interface using eye motion is. Traditionally, human computer interface uses mouse, keyboard as an input device. This paper presents hands free interface between computer and human. This technology is intended to replace the conventional computer screen pointing devices for the use of disabled. The paper presents a novel idea to control computer mouse cursor movement with human eyes it controls mouse-moving by automatically affecting the position where eyesight focuses on, and simulates mouse-click by affecting blinking action [6]. However, the proposed vision-based virtual interface controls system work on various eye movements such as eye blinking.

M.mangaiyarkarasi and a. Geetha, "Cursor control system using facial expressions for human-computer interaction",(IJETCSE), April 2014. A vision based human–computer interface is presented in this paper. The interface detects eye movements and interprets them as cursor control commands [7]. The employed image processing methods include webcam for detecting the face, and template matching method based eye region detection. The Haar feature technique is used for eye feature extraction. SVM classification method is used for classifying the eye movements. The classification of eye movements such as eye open, eye close, eyeball left, and eyeball right movements are used for cursor top, bottom, left and right movement respectively.

Craig Hennessey, Jacob Fiset, "Long Range Eye Tracking: Bringing Eye Tracking into the Living Room", IEEE, 2012In this paper author present a non-contact eye tracking system that allows for freedom of viewer motion in a living room environment [2]. A pan and tilt mechanism is used to orient the eye tracker, guided by face tracking information from a wide-angle camera. The estimated

point of gaze is corrected for viewer movement in real time, avoiding the need for recalibration. The proposed technique achieves comparable accuracy to desktop systems near the calibration position of less than 1° of visual angle and accuracy of less than 2° of visual angle when the viewer moved a large distance, such as standing or sitting on the other side of the couch. The system performance achieved was more than sufficient to operate a novel, hands-free Smart TV interface.

Bacivarov, Ionita M., Corcoran .P, "Statistical models of appearance for eye tracking and eye-blink detection and measurement", IEEE, 2010. In this article, author investigates the subtleties of the spatial and temporal aspects of eye blinks [3]. Conventional methods for eye blink animation generally employ temporally and spatially symmetric sequences; however, naturally occurring blinks in humans show a pronounced asymmetry on both dimensions. We present an analysis of naturally occurring blinks that was performed by tracking data from high-speed video using active appearance models. Based on this analysis, we generate a set of key-frame parameters that closely match naturally occurring blinks. Author compare the perceived naturalness of blinks that are animated based on real data to those created using textbook animation curves. The eye blinks are animated on two characters, a photorealistic model and a cartoon model, to determine the influence of character style. We find that the animated blinks generated from the human data model with fully closing eyelids are consistently perceived as more natural than those created using the various types of blink dynamics proposed in animation textbooks.

III. PROPOSED ALGORITHM

A. EYE-BLINK DETECTION ALGORITHM:

The algorithm used to detect blinks has a three-stage initialization phase. Stage one involves detecting the eyes bylooking for the involuntary or voluntary blinks of the user. Instage two, appropriate tracking points are obtained. Stagethree involves obtaining online template images of the eyes.The online templates are then used to detect closed and openeyes and two finite state machines are used to control clicking.The algorithm then finds the largest connected component of the motion image and the second largest connected component that is a minimum distance away from the first. The minimum distance requirement is necessary because sometimes the motion of a single eye blinking can create two separate connected components and, by requiring that the two connected components are located sufficiently apart, the algorithm can avoid misinterpreting these two components as two blinking eyes. For detection of face and eye recognition Haar Cascade algorithm and Haar like features can be used.

- **Training Haar-cascade**

It is mainly used for face detection. Haar-cascade is an object detection algorithm it locate faces, any objects and facial expressions in an image. In this system is provided with numbers of positive images like different faces with different different backgrounds and negative images like images that are not faces but can be anything else like chair, table, wall, etc., and the feature selection is done along with the classifier training using Adaboost and Integral images.

- **Features used by Haar-cascade**

Three kinds of features can be used in which the value of a two rectangular features is the difference sum of the pixels within two rectangular regions. These regions have same shape and size and are horizontally or vertically adjacent. Where as in the three rectangular features are computed by taking the sum of two outside rectangles and then subtracted with the sum in a center rectangle. Moreover, in the four rectangles feature computes the difference between diagonal pairs of rectangles.

Feature = w1 x RecSum(r1) + w2 x RecSum(r2)

Weights can be positive or negative, Weights are directly proportional to the area of rectangle and it is calculated at every point and scale.

IV. SYSTEM ARCHITECTURE

In proposed system, a vision-based system for detection of voluntary eye-blinks can be used, together as a Human–Computer Interface for people with physical disabilities. The proposed algorithm allows face detection and eye-blink detection, estimation of the eye-blink duration and interpretation of a sequence of blinks in real time to control a non-intrusive human–computer interface. The detected eye-blinks are classified as left eye blink or right eye blink. Separate both eye-blinks are assumed to be spontaneous and are not included in the designed eye-blink code.

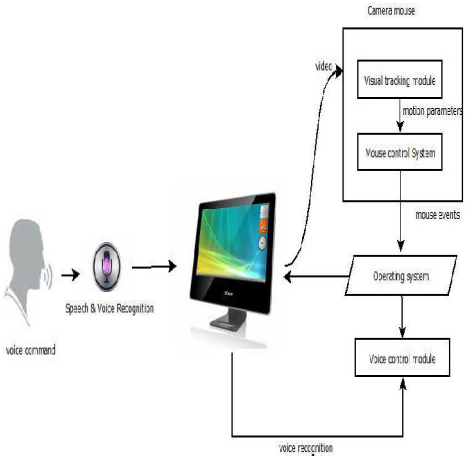

Figure 2: System architecture

- Proposed system detects the face first and tracks the nose tip to control the location of the mouse. Movement of nose tip in the image is mapped to movement of the mouse on screen. The distance the pointer moves on the screen that one-pixel movement of the tracking point maps to can be adjusted to the user's preference.
- To determines mouse commands blinking of eyes used. This is accomplished byperforming a normalized correlation search with both templates. The temples of left eye or right eye blink are alreadystored in the database as shows in figure 2. System detects user eyes and compare with stored temples and performedmouse operation.
- With a headset and microphone, you can now let your computer hear you, respondto your daily utility some commands which will reduce again human efforts of disabled person.

Basic Commands:

To give you a better idea of how windows speech reorganization (WSR Macros) works,check out some of the mostbasic and useful commands below.

- Start listening or Stop listening: If you want to computer should start listen voice command then just say "Startlistening"and say "Stop listening" when you're finished.
- Open X or Close X: After entering in voice command mode if you want to open any application then we can use WSR macros. WSR Macros indexes all of the programs of start menu, so whenever you want to openFirefox, you can say just that: "Open Firefox." Or "Close Firefox" same way you can open any application or close application.

V. CONCLUSION AND FUTURE WORK

Proposed system is built for the physically disable people or lazy people who are notable to use physical mouse properly. It will give them a newway to interact with computer world. It is efficient in real time applicationswhich give speed and accuracy of the system. Systems have presented a method of detecting andtracking faces in video sequences in real time which is basedon skin color detection. This method first compensates thelight in image then selects the skin tone for getting the facecandidates. Systems basic strategy for detection is fast trainingwith a Six- Segmented Rectangular filters. System haveevaluated algorithm on various images and face databases. The images have been taken in different positions and lightingconditions.System is aimed to implement real timefacedetection using SSR filter and tracking system using for facecandidate detection, a six-segmented rectangle filter isscanned over the entire input image. However, once the bright - dark relationsbetween the six segments indicate a face candidate, eyecandidate and nose tip regions are searched in the manner ofthe feature - based approach. Then, based on the locations of apair of eye candidates and nose tip, the scale, orientation andgray levels are normalized.

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