Eyeball Based Cursor Movement Using Opencv

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Abstract- *There are different reasons for which people need an artificial of locomotion such as a virtual keyboard. The number of people, who need to move around with the help of some article means, because of an illness. Moreover, implementing a controlling system in it enables them to move without the help of another person is very helpful. The idea of eye controls of great use to not only the future of natural input but more importantly the handicapped and disabled. Camera is capturing the image of eye movement. First detect pupil center position of eye. Then the different variation on pupil position get different command set for virtual keyboard. The signals pass the motor driver to interface with the virtual keyboard itself. The motor driver will control both speed and direction to enable the virtual keyboard to move forward, left, right and stop.*

Keywords— Eye Ball, Cursor Movement, Controlling System, Camera.

I.INTRODUCTION

Nowadays personal computer systems are carrying a huge part in our everyday lives as they are used in areas such as work, education and enjoyment. What all these applications have in common is that the use of personal computers is mostly based on the input method via keyboard and mouse. While this is not a problem for a healthy individual, this may be an insurmountable bound for people with limited freedom of movement of their limbs. In these cases it would be preferable to use input methods which are based on more abilities of the region such as eye movements. To enable such substitute input methods a system was made which follows a low-price approach to control a mouse cursor on a computer system. The eye tracker is based on images recorded by a mutated webcam to acquire the eye movements. These eye movements are then graphed to a computer screen to position a mouse cursor accordingly. The movement of mouse by automatically adjusting the position of eyesight. Camera is used to capture the image of eye movement. In general, any digital image processing algorithm consists of three stages: input, processor and output. In the input stage image is captured by a camera. It sent to a particular system to focus on a pixel of image that's gives, its output as a processed image.

Embedded system is combination of hardware and software.An embedded system can be an independent system or it can be a part of a large system. An embedded system is a microcontroller or microprocessor based system which is designed to perform a specific task. For example, a fire alarm is an embedded system; it will sense only smoke Python is a high-level language. This means that Python code is written in largely recognizable English, providing the Pi with commands in a manner that is quick to learn and easy to follow [1]. This is in marked contrast to low-level languages, like assembler, which are closer to how the computer ―thinks but almost impossible for a human to follow without experience. As the computer technologies are growing rapidly, the importance of human computer interaction becomes highly notable. Some persons who are disabled cannot be able to use the computers. Eye ball movement control mainly used for disabled people [2]. Incorporating this eye controlling system with the computers will make them to work without the help of other individual. Human-Computer Interface (HCI) is focused on use of computer technology to provide interface between the computer and the human. There is a need for finding the suitable technology that makes the effective communication between human and computer. Human computer interaction plays the important role [3].Thus there is a need to find a method that spreads an alternate way for making communication between the human and computer to the individuals those who have impairments and give them an equivalent space to be an element of Information Society [4]. In recent years, the human computer interfaces are attracting the attention of various researchers across the globe. Human computer interface is an implementation of the vision-based system for eye movement detection for the disabled people [5]. In the proposed system, we have included the face detection, face tracking, eye detection and interpretation of a sequence of eye blinks in real time for controlling a non-intrusive human computer interface. Conventional method of interaction with the computer with the mouse is replaced with the human eye movements. This technique will help the paralyzed person, physically challenged people especially person without hands to compute efficiently and with the ease of use. Firstly, camera captures the image and focuses on the eye in the image using OpenCV code for pupil detection. This results the center position of the human eye (pupil). Then the center position of the pupil is taken as a reference and based on that the human or the user will control the cursor by moving left and right [6-9].

II. RELATEDWORKS

There are two components to the human visual line-of-sight: pose of human head and the orientation of the eye within their sockets. Investigated these two aspects but will concentrate on the eye gaze estimation in this concept. The present of novel approach called the ―one-circle algorithm for measuring the eye gaze using a monocular image that zooms in on only one eye of a person. Observing that the iris contour is a circle, Estimate the normal direction of this iris circle, considered as the eye gaze, from its elliptical image [10]. From basic projective geometry, an ellipse can be back-projected into space onto two circles of different orientations. However, by using a geometric constraint, namely, that the distance between the eyeball's center and the two eye corners should be equal to each other, the correct solution can be disambiguated. This allows
us to obtain a higher resolution image of the iris with a zoom-in camera, thereby achieving higher accuracies in the estimation. A general approach that combines head pose determination with eye gaze estimation is also proposed. The searching of the eye gaze is guided by the head pose information. The robustness of our gaze determination approach was verified statistically by the extensive experiments on synthetic and real image data. The two key contributions in this concept are that show the possibility of finding the unique eye gaze direction from a single image of one eye and that one can obtain better accuracy as a consequence of this. The first technique is proposed to estimate the 3-D eye gaze directly [11]. In this technique, the cornea of the eyeball is

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modelled as a convex mirror. Via the properties of convex mirror, a simple method is proposed to estimate the 3-D optic axis of the eye. The visual axis, which is the true 3-D gaze direction of the user, can be determined subsequently after knowing the angle deviation between the visual axis and optic axis by a simple calibration procedure. Therefore, the gaze point on an object in the scene can be obtained by simply intersecting the estimated 3-D gaze direction with the object. In addition, a dynamic computational head compensation model is developed to automatically update the gaze mapping function whenever the head moves. Hence, the eye gaze can be estimated under natural head movement. Furthermore, it minimizes the calibration procedure to only one time for a new individual [12]. The advantage of the proposed techniques over the current state of the art eye gaze trackers is that it can estimate the eye gaze of the user accurately under natural head movement, without need to perform the gaze calibration every time before using it.

Our proposed methods will improve the usability of the eye gaze tracking technology, and believe that it represents an important step for the eye tracker to be accepted as a natural computer input device. In general, the visible image-based eye-gaze tracking system is heavily dependent on the accuracy of the iris center (IC) localization. In this paper, we propose a novel IC localization method based on the fact that the elliptical shape (ES) of the iris varies according to the rotation of the eyeball. We use the spherical model of the human eyeball and estimate the radius of the iris from the frontal and uprightview image of the eye. By projecting the eyeball rotated in pitch and yaw onto the 2-D plane, a certain number of the ESs of the iris and their corresponding IC locations are generated and registered as a database (DB). Finally, the location of IC is detected by matching the ES of the iris of the input eye image with the ES candidates in the DB. Moreover, combined with facial landmark points-based image rectification, the proposed IC localization method can successfully operate under natural head movement. Experimental results in terms of the IC localization and gaze tracking show that the proposed method achieves superior performance compared with conventional ones. Students' eye movements during debugging were recorded by an eye tracker to investigate whether and how high and low performance students act differently during debugging [13]. Thirty eight computer science undergraduates were asked to debug two C programs. The path of students' gaze while following program codes was subjected to sequential analysis to reveal significant sequences of areas examined. These significant gaze path sequences were then compared to those of students with different debugging performances. The results show that, when debugging, high-performance students traced programs in a more logical manner, whereas low-performance students tended to stick to a line-by-line sequence and were unable to quickly derive the program's higher-level logic.

III. PROPOSED SYSTEM ARCHITECTURE

In our proposed system the cursor movement of computer is controlled by eye movement using Open CV. Camera detects the Eye ball movement which can be processed in OpenCV. By this the cursor can be controlled • The user has to sits in front of the display screen of private computer or pc, a specialised video camera established above the screen to study the consumer's eyes. The laptop constantly analysis the video photo of the attention and determines wherein the consumer is calling at the display screen. not anything is attached to the consumer's head or body. To "pick out" any key, the user seems at the key for a exact period of time and to "press" any key, the consumer just blink the eye. On this device, calibration procedure is not required.

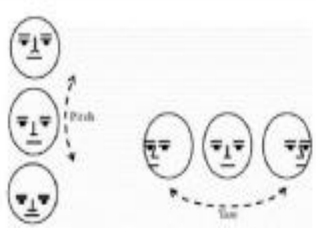
For this system enter is simplest eye. No outside hardware is connected or required. • Camera gets the input from the eye. After receiving these streaming movies from the cameras, it'll spoil into frames. After receiving frames, it will check for lights conditions because cameras require enough lighting fixtures from external sources in any other case blunders message will show at the screen. The captured frames which can be already in RGB mode are transformed into Black 'n' White. Five. Pics (frames) from the enter supply focusing the eye are analysed for Iris detection (middle of eye).

Advantages
• physically handicapped people can operate computers.
• High accuracy.

IV. RESULTS AND DISCUSSION

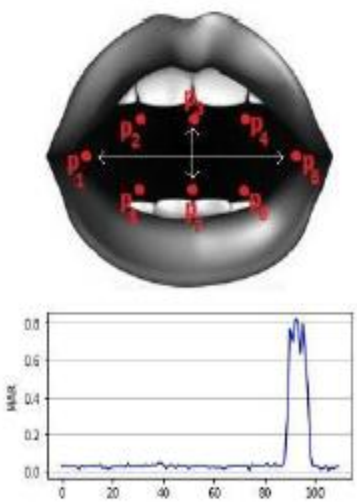
The Outputs obtained after executing the implementation code is shown from Fig.1 to Fig.5.

Fig.1 Actions a

Action	Function
 Opening Mouth	Activate / Deactivate Mouse Control
 Right Eye Wink	Right Click
 Left Eye Wink	Left Click
 Squinting Eyes	Activate / Deactivate Scrolling
 Head Movements (Pitch and Yaw)	Scrolling / Cursor Movement

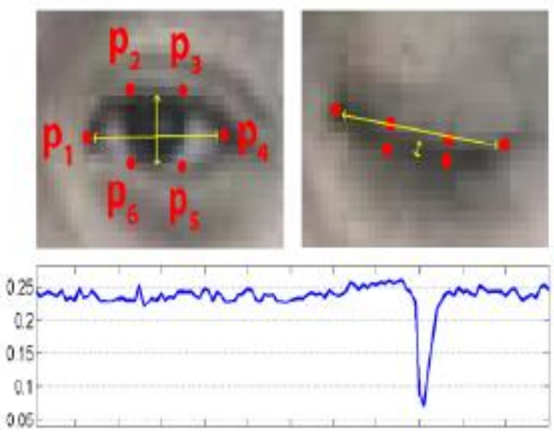
nd Functions

Fig.2 Identifying facial Landmarks



$$\mathbf{MAR} = \frac{\|p_2 - p_8\| + \|p_3 - p_7\| + \|p_4 - p_6\|}{2\,\|p_1 - p_5\|}$$

Fig.3 Mouth Aspect ratio



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

Fig.4 Eye Aspect ratio

Fig.5 reading Input

V. FUTURE SCOPE AND CONCLUSION

First detect pupil center position of eye. Then the different variation on pupil position get different command set for virtual keyboard. The signals pass the motor driver to interface with the virtual keyboard itself. The motor driver will control both speed and direction to enable the virtual keyboard to move forward, left, right and stop. • In order to make user interact with computer naturally and conveniently by only using their eye, we provide an eye tracking based control system. The system combines both the mouse functions and keyboard functions, so that users can use our system to achieve almost all of the inputs to the computer without traditional input equipment. The system not only enables the disabled users to operate the computer the same as the normal users do but also provides normal users with a novel choice to operate computer. • In browsing experiment, the proposed system improves the browsing efficiency and experience, and with the system user can interact with multimedia with little effort.

REFERENCES

[1] Brooks,R.E.(1997) ―Towards a theory of the cognitive processes in computer programming,‖ Int. J. Man-Mach. Studies, vol. 9, pp. 737–751.

[2] Cheng- Chih Wu, Ting-Yun Hou(2015)‖Tracking Students' Cognitive Processes During Program Debugging‖—An Eye-Movement Approach, IEEE.
[3] Ehrlich,K. and Soloway,E.(1983) ―Cognitive strategies and looping constructs: An empirical study,‖ Commun. ACM, vol. 26, no. 11, pp. 853–860.
[4] Eric Sung and Jian-Gang Wang (2002)―Study on Eye Gaze Estimation‖, IEEE, VOL. 32, NO. 3, JUNE .
[5] Murphy,L. (2008)―Debugging: The good, the bad, and the quirky—A qualitative analysis of novices' strategies,‖ SIGCSE Bull., vol. 40, no. 1, pp. 163–167.
[6].QiangJi and Zhiwei Zhu (2007)‖Novel Eye Gaze Tracking Techniques Under Natural Head Movement, Senior Member, IEEE, VOL. 54, NO. 12, DECEMBER .
[7].Rajlich,V. and Xu,S.(2004) ―Cognitive process during program debugging,‖ in Proc. 3rd IEEE ICCI, pp. 176– 182.
[8].Renumol,V.(2009) ―Classification of cognitive difficulties of students to learn computer programming,‖ Indian Inst. Technol. India.
[9].Seung-Jin Baek and Young-Hyun Kim(2013)‖Eyeball Model-based Iris Center Localization for Visible Imagebased Eye-Gaze Tracking Systems‖,IEEE.
[10].Tianchi Liu, Yan Yang.Driver (2015)‖Distraction Detection Using Semi-Supervised Machine Learning, IEEE.
[11] A. Sivasangari., D. Deepa., T. Anandhi., A. Ponraj and M. S. Roobini., "Eyeball based Cursor Movement Control," 2020 International Conference on Communication and Signal Processing (ICCSP), 2020, pp. 1116-1119, doi: 10.1109/ICCSP48568.2020.9182296.
[12] N. Wanluk, S. Visitsattapongse, A. Juhong and C. Pintavirooj, "Smart wheelchair based on eye tracking," 2016 9th Biomedical Engineering International Conference (BMEiCON), 2016, pp. 1-4, doi: 10.1109/BMEiCON.2016.7859594.
[13] Z. Hossain, M. M. H. Shuvo and P. Sarker, "Hardware and software implementation of real time electrooculogram (EOG) acquisition system to control computer cursor with eyeball movement," 2017 4th International Conference on Advances in Electrical Engineering (ICAEE), 2017, pp. 132-137, doi: 10.1109/ICAEE.2017.8255341.