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# EYE CONTROLLED MOUSE CURSOR FOR PHYSICALLY DISABLED INDIVIDUAL

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**ABSTRACT**

The field of Human-Computer Interaction (HCI) is a interface how to interact with the computer. The people with eye neurolocomotor disabilities to operate computer system like normal people. A high number of people, affected with neurolocomotor disabilities or those paralyzed by injury cannot use computers for basic tasks such as sending or receiving messages, browsing the internet, watch their favorite TV show or movies. For these people we require separate interface with the system. To overcome this problem, we proposed system a new computer interface software . Through a previous research study, it was concluded that eyes are an excellent candidate for ubiquitous computing since they move anyway during interaction with computing machinery. Using this underlying information from eye movements could allow bringing the use of computers back to such patients. The researchers in this field have also explored the potential of 'eye-gaze' as a possible means of interaction. Some commercial solutions have already been launched, but they are as yet expensive and offer limited usability.

For this purpose, we propose a mouse gesture control system which is completely operated by human eyes only. This present work objective is to present a low cost real time system for eye gaze based human-computer interaction.

An open-source generic eye-gesture control system is developed, that can effectively track eye- movements and enable the user to perform actions mapped to specific eye movements/gestures by using computer webcam based on harr-cascade algorithm, hough transform algorithm and support vector machine algorithm. It detects the pupil from the user's face and then tracks its movements. The accuracy for this work is 92%.

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## 1.INTRODUCTION

Innovative and efficient techniques of HCI are being developed rapidly. It is an active research field of many experts. This paper concentrates on a human computer interaction application based on eye-gaze tracking. Human eyes carry much information which can be extracted and can be used in many applications i.e. Computer Interaction. Eye gaze reflects a person's point of interest. Eye gaze tracking is aimed to keep track of human eye-gaze. "Eye movements can be captured and used as control signals to enable people to interact with interfaces directly without the need for mouse or keyboard input" [1]. This can be achieved by employing computer vision and image processing algorithms. Technique explained in the paper is non-invasive and user- friendly, as it does not require a complex hardware or wires. Moreover, it does not have any physical interaction with the user. A cheap solution is provided for gaze-tracking. A built-in web-cam in laptop is used as a capturing device. A software based solution is proposed for controlling mouse pointer using 'eye gaze'. It is a natural and efficient way of interaction with the computer. Mostly the methods of interaction available are complex and cumbersome. Using this method, for controlling mouse pointer increases the interaction efficiency and reduces complexity. This technique is a special boon for disabled persons, such as spinal cord injured, or paralyzed patients. These patients are entirely dependent on assistance. Currently, disabled people usually type on the computer keyboard with long sticks that they hold in their mouth, but the technique being presented is a benefaction for handicaps to help them be independent in their lives. Giving them a chance to work, socialize, and entertain in their lives.

### 1.1 Problem Statement

Innovative and efficient techniques of HCI are being developed rapidly. It is an active research field of many experts. This paper concentrates on a human computer interaction application based on eye-gaze tracking. Human eyes carry much information which can be extracted and can be used in many applications i.e. Computer Interaction. Eye gaze reflects a person's point of interest. Eye gaze tracking is aimed to keep track of human eye-gaze. "Eye

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## 2.LITERATURE SURVEY

**REFERENCES 1**

**Title: Eye Tracking in Human-Computer Interaction and Usability Research**

**Author Name: Alex Poole and Linden J. Ball**

**Description:** This chapter discusses the application of eye movements to user interfaces, both for analyzing interfaces (measuring usability) and as an actual control medium within a human- computer dialogue. For usability analysis, the user's eye movements are recorded during system use and later analyzed retrospectively; however, the eye movements do not affect the interface in real time. As a direct control medium, the eye movements are obtained and used in real time as an input to the user-computer dialogue

**REFERENCES 2**

**Title: Non-contact Eye Gaze Tracking System by Mapping of Corneal Reflections**

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**Author Name: D. H. Yoo, J. H. Kim, B. R. Lee, and M. J. Chung**

**Description:** If the user sees the monitor, the center of a pupil is always in a polygon that is made by the glints. Consequently, the direction of the user's eye gaze can be computed ithout computing the geometrical relation between the eye, the camera and the monitor in 3D space. Our method is comparatively simple and fast. We introduce the method and show some experimental results.

**REFERENCES 3**

**Title: System for assisted mobility using eye movements based on electrooculography,"**

**Author Name: Rafael Barea, Luciano Boquete, Manuel Mazo, and Elena Lpez**

**Description:** The system consists of a standard electric wheelchair with an on-board computer, sensors and a graphic user interface run by the computer. On the other hand, this eye-control method can be applied to handle graphical interfaces, where the eye is used as a mouse computer. Results obtained show that this control technique could be useful in multiple applications, such as mobility and communication aid for handicapped persons.

**REFERENCES 4**

**Title: International Journal of Advanced Engineering Technology**

**Author Name: H. Singh and J. Singh, "A Review on Electrooculography**

**Description:** The aim and scope of the journal is to emphasize research, development and application within the fields of Scientific Research Engineering &Technology that support high- level of learning, teaching, development and research. It is an international journal that aims to contribute to the constant research and training to promote research in the relevant field.

## 3. PROBLEM STATEMENT

number of eye-gaze tracking techniques are already available. Some researchers performed eye gaze tracking using the Electro-Oculography tracking technique. It takes advantage of the fact that an electrostatic field exists around the eyes which changes with eye ball movement and these small differences can be recorded with help of electrodes placed on the skin around

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eye. The use of electrodes makes this technique troublesome and not well-suited for everyday use. Existing computer input devices like a mouse, keyboard, and other type of input devices have been used for interaction with digital instruments. Individuals with disabilities cannot use these computer input devices by themselves. In this research work, a computer input device that is controlled only by human eyes is developed for individuals suffering from disabilities and also for wearable computing.Furthermore, such information could be used to produce necessary outputs for controlling a computer like moving commercially available robotic machinery such as the robotic arm or wheelchairs to enable these patients to feed themselves. This will physically enable them and make them contributing members of the society. The purpose of this research is to explore and improve upon existing avenues in the eye gesture tracking system. Particularly those areas which can help physically disable individuals, enabling them to use computers and

programmable controlled systems. Thus, such individuals could still take on their responsibilities, improve the quality of their lives and continue with their day to day tasks often without the need for a helping hand. In present times, most eye tracking systems utilizes the use of real-time video-based tracking of the pupil. We have adopted the same technique, technologies and improved upon them developing a more robust and accurate system. We used a high-definition, small, portable Microsoft LifeCam HD-6000 this is easily available at low cost. This camera can easily attach with any computer or laptop through the USB port.

**Limitations**

Troublesome. Not well-suited for everyday use. Higher cost.

## 4. PROPOSED SYSTEM

In present times, most eye tracking systems utilizes the use of real-time video-based tracking of the pupil. We have adopted the same technique, technologies and improved upon them developing a more robust and accurate system. We used a high-definition, small, portable Microsoft LifeCam HD-6000 this is easily available at low cost. This camera can easily attach with any computer or laptop through the USB port. Algorithm presented in this paper performs operations on grayscale images. Camera captures BGR

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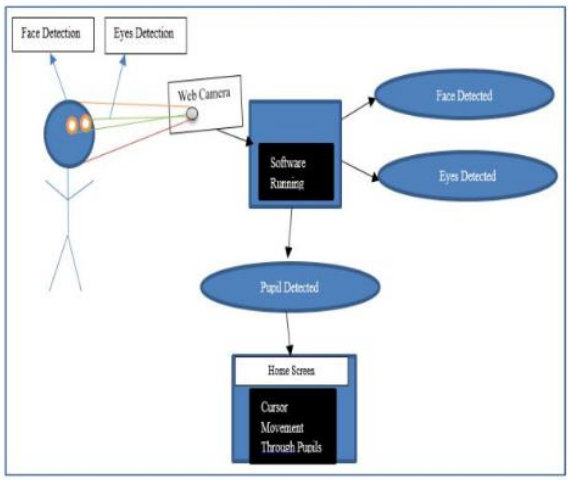
color space images, depending upon default settings. As a first step BGR → grayscale color space conversion is performed. Basic image pre-processing procedures are performed at each stage of algorithm. Histogram equalization is applied on grayscale images to normalize contrast in acquired image. It attempts to equalize the image histogram by adjusting pixel intensities in accordance with histogram. For face detection, a machine learning based approach is used, Object detection algorithm proposed in. This technique employs a Haar-features based approach for object detection, which makes the rapid and accurate object detection possible. Eye patch extraction can also be performed using same object detection algorithm. For pupil detection, extracted eye patch must be smoothed to avoid false detections. Pupil detection technique being used is Hough Circle Transform (HCT). For image binarization, edge detection approach is used. Eye region being used to trace the Test Area is to be detected, for this purpose a simple calibration technique is designed, which is explained later in this section. After features detection, a simple Point of Gaze calculation algorithm is designed which systematically interrelates the detected feature points to result in a precise POG calculation.

**Advantages**

Hands-free mouse cursor control system. Facilitating the incapacitated to use computers. Mouse pointer control through eye movements. Real time eye tracking and eye gaze estimation is achieved through eye based human computer interaction provide. Simulating mouse functions, performing different mouse functions such as left click, right click, double click and so on using their eyes.

## 5. System architecture




## 6. SYSTEM BLOCK DIAGRAM

A number of eye-gaze tracking techniques are already available. Some researchers performed eye gaze tracking using the

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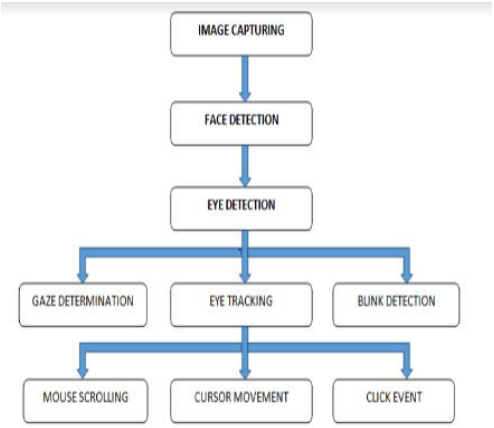


eye capturing

## 7. IMPLEMENTATION

### 7.1 IMAGE CAPTURING

The processing unit is configured to receive the first image and process the first image to generate a data signal, and transmit a command signal to a second image capturing unit of the capturing units according to the data signal.

### 7.2 FACE DETECTION

Face detection is a computer technology being used in a variety of applications that identifies human faces in digital images. Face detection also refers to the psychological process by which humans locate and attend to faces in a visual scene.

### 7.3 EYE DETECTION

Eye detection refers to the process of measuring where we look, also known as our point of gaze.

These measurements are carried out by an eye tracker, that records the position of the eyes and

the movements they make.

### 7.4 EYE TRACKING

Eye tracking is the process of measuring either the point of gaze (where one is looking) or the motion of an eye relative to the head. An eye tracker is a device for measuring eye positions and eye movement

### 7.5 BLINK DETECTION

Is a natural protection system which defends the eye from environmental exposure. The spontaneous eye blink is considered to be a suitable indicator for fatigue diagnostics

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duringmany, different tasks of human being activity. ... This function is used to detect the spontaneous eye blink action.

### 7.6 MOUSE SCROLLING

The scroll wheel at the front of the mouse is mounted on a switch mechanism that detects both how much it's rotated and whether you've pressed it (it functions like the central button of a conventional mouse). Rotations of the scroll wheel can be detected in a variety of different ways.

### 7.7 CURSOR MOVEMENT

Arrow keys or cursor movement keys are buttons on a computer keyboard that are either programmed or designated to move the cursor in a specified direction.

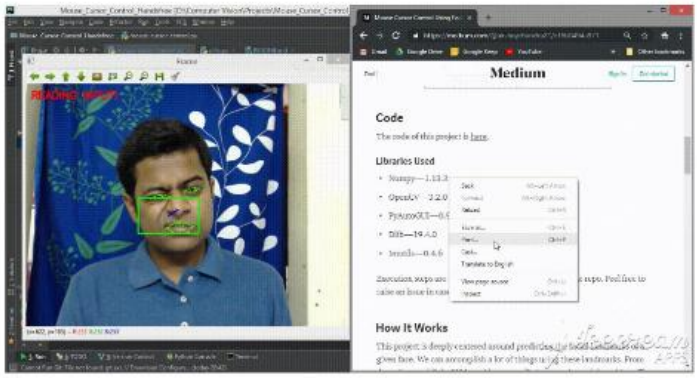
### 7.8 CLICK EVENT

The click event occurs when an element is clicked. The click() method triggers the click event, or attaches a function to run when a click event occurs. It gives an outline of different stages involved between frame capturing by we_cam and movement of pointer in accordance with users eye gaze.

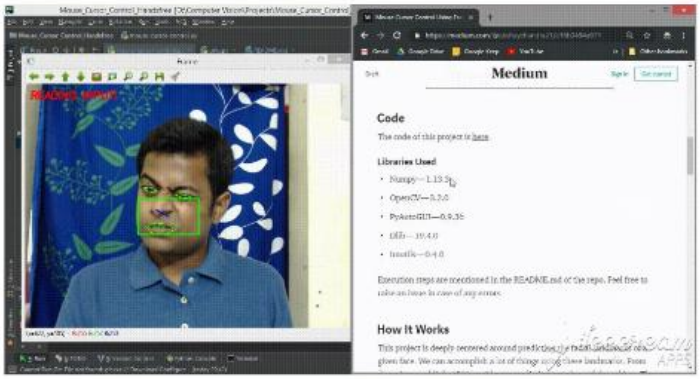
### 7.9 IMAGE ACQUISITION:

A web_cam is required to acquire images. System will start with Image Acquisition using an integrated web_cam or USB web_cam.

## 8. OUTPUT RESULTS




Screenshot of right eye cursor placing on the screen to select the data




Screenshot of left eye cursor placing on the screen to select the data

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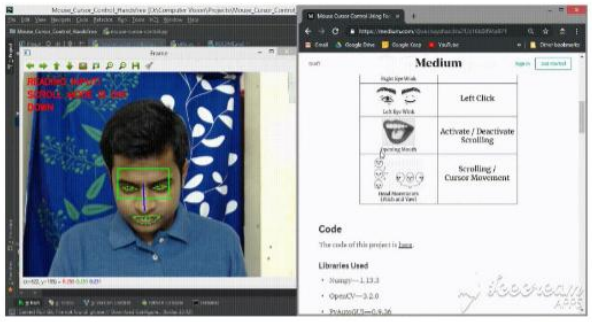
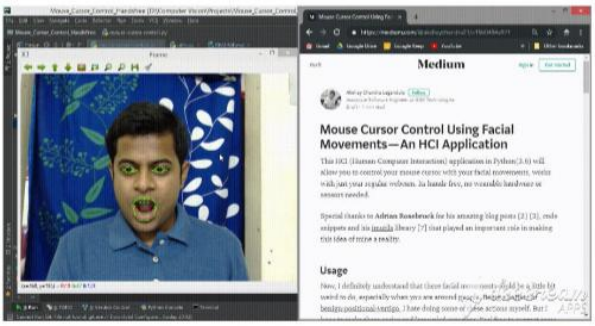



Screenshot of face placing on the screen to scroll down the data




Screenshot of face for screen activation

## 9.CONCLUSION AND FUTURE SCOPE

In this paper a computer vision algorithms based solution is implemented. An attempt has been made towards development of low cost, real-time solution for eye gaze tracking. There are many applications of eye gaze tracking, for instance in HCI, appliances control, usability studies and in advertising effectiveness. Accuracy for features extraction algorithms depends upon image quality and lighting conditions. Algorithm performance drops down in poor lighting environment. Computer Vision algorithms are employed for features detection and they don't perform well in bad lighting. PoG is accurately calculated provided detections are correct. Pointer size is large due to low web-cam resolution and small 'Test Area' size. To improve the projection results, image quality must be enhanced. Better image quality would improve accuracy of computer vision algorithms. Sophisticated Pre-Processing algorithms should be introduced to compensate lighting variations and web-cam resolution should also be increased to decrease the pointer size. A feature describing head-posture must also be introduced, it will allow the user to move freely while interacting with system. Introducing the concept of gaze estimation along with gaze projection will be beneficial because it will improve gaze projections drastically. The idea of gaze estimation promises to learn from usage statistics and infer gaze projections. Particle Filters can be used to implement gaze estimation because they are quite simple and has resemblance with problem of gaze estimation.

## 10. BIBLIOGRAPHY

[1] Alex Poole and Linden J. Ball, "Eye Tracking in Human-Computer Interaction

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and Usability Research: Current Status and Future Prospects," in Encyclopedia of Human Computer Interaction (30 December 2005) Key: citeulike:3431568, 2006, pp. 211-219.

[2] D. H. Yoo, J. H. Kim, B. R. Lee, and M. J. Chung, "Non-contact Eye Gaze Tracking System by Mapping of Corneal Reflections," in Fifth IEEE International Conference on Automatic Face and Gesture Recognition (FGR02), 2002, pp. 94-99.

[3] Rafael Barea, Luciano Boquete, Manuel Mazo, and Elena Lpez, "System for assisted mobility using eye movements based on electrooculography," IEEE TRANSACTIONS ON NEURAL SYSTEMS AND REHABILITATION ENGINEERING, vol. 10, no. 4, pp. 209-217, DECEMBER 2002.

[4] H. Singh and J. Singh, "A Review on Electrooculography," International Journal of Advanced Engineering Technology, vol. III, no. IV, 2012.

[5] K. Irie, B. A. Wilson, and R. D. Jones, "A laser-based eye-tracking system," Behavior Research Methods, Instruments, & Computers, vol. 34, no. 4, pp. 561-572, 2002.

[6] P Ballard and George C. Stockman, "Computer operation via face orientation," in Pattern Recognition, 1992. Vol.I. Conference A: Computer Vision and Applications, Proceedings., 11th IAPR International Conference on, 1992, pp. 407-410.

[7] T. Horprasert, Y. Yacoob, and L.S. Davis, "Computing 3-D head orientation from a monocular image sequence," in Second International Conference on Automatic Face and Gesture Recognition, 1996, pp. 242- 247.

[8] K. Arai and M. Yamaura, "Computer Input with Human Eyes-Only Using Two Purkinje Images Which Works in a Real-Time Basis without Calibration," CSC Journals, vol. 1, no. 3, pp. 71-82, 2010.

[9] D. Back, "Neural Network Gaze Tracking using Web Camera.," Linkping University, MS Thesis 2005. [10] R. Gonzalez and R. Woods, Digital Image Processing, 3rd ed.: Pearson Education, 2009.

[11] P. Viola and M. Jones, "Rapid Object Detection using a Boosted Cascade of Simple Features," in COMPUTER VISION AND PATTERN RECOGNITION, 2001.