EYE-BALL CURSOR CONTROL

VORUGANTI NARESH KUMAR
Associate Professor
Department of CSE
CMR TECHNICAL CAMPUS, HYDERABAD

YVS Vaishnavi
B.Tech student
Department of IT
CMR TECHNICAL CAMPUS, HYDERABAD

M. Ramya
B.Tech student
Department of IT
CMR TECHNICAL CAMPUS, HYDERABAD

Y. Vaishnavi
B.Tech student
Department of IT
CMR TECHNICAL CAMPUS, HYDERABAD

ABSTRACT

The field of Human-Computer Interaction (HCI) has witnessed a tremendous growth in the past decade. The advent of tablet PCs and cell phones allowing touch-based control has been hailed warmly. 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. This paper strives to present a low cost real time system for eye gaze based human-computer interaction.

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. 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. For this purpose, we propose an imouse gesture control system which is completely operated by human eyes only. The purpose of this work is to design an open-source generic eye-gesture control system that can effectively track eye-movements and enable the user to perform actions mapped to specific eye movements/gestures by using computer webcam. It detects the pupil from the user's face and then tracks its movements. It needs to be accurate in real-time so that the user is able to use it like other every-day devices with comfort.

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[1]. "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" [2]. 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.

SYSTEM ANALYSIS AND DESIGN
INPUT DESIGN

The input design is the link between the information system and the user. It comprises the developing specification and procedures for data preparation and those steps are necessary to put transaction data in to a usable form for processing can be achieved by inspecting the computer to read data from a written or printed document or it can occur by having people keying the data directly into the system. The design of input focuses on controlling the amount of input required, controlling the errors, avoiding delay, avoiding extra steps and keeping the process simple. The input is designed in such a way so that it provides security and ease of use with retaining the privacy. Input Design considered the following things:

➢ What data should be given as input?
➢ How the data should be arranged or coded?
➢ The dialog to guide the operating personnel in providing input.
➢ Methods for preparing input validations and steps to follow when error occur.

OUTPUT DESIGN

A quality output is one, which meets the requirements of the end user and presents the information clearly. In any system results of processing are communicated to the users and to other system through outputs. In output design it is determined how the information is to be displaced for immediate need and also the hard copy output. It is the most important and direct source information to the user. Efficient and intelligent output design improves the system's relationship to help user decision-making.

1. Designing computer output should proceed in an organized, well thought out manner; the right output must be developed while ensuring that each output element is designed so that people will find the system can use easily and effectively. When analysis design computer output, they should Identify the specific output that is needed to meet the requirements.

2. Select methods for presenting information.

3. Create document, report, or other formats that contain information produced by the system.

The output form of an information system should accomplish one or more of the following objectives.

❖ Convey information about past activities, current status or projections of the
❖ Future.
❖ Signal important events, opportunities, problems, or warnings.
❖ Trigger an action.
❖ Confirm an action.

EXISTING SYSTEM:

• A number of eye-gaze tracking techniques are already available. Some researchers performed eye gaze tracking using the Electro-Oculography tracking technique[3]. 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 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 [4]. 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[5]. 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[6]. 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[7].

Disadvantages:
➢ Using Electro-oculogrphy it cause damage to the skin used for long time
➢ It is difficult to predict the centroid of eye so we go for opencv

PROPOSED SYSTEM:
• Algorithm presented in this paper performs operations on grayscale images. Camera captures BGR 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)[8]. 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.
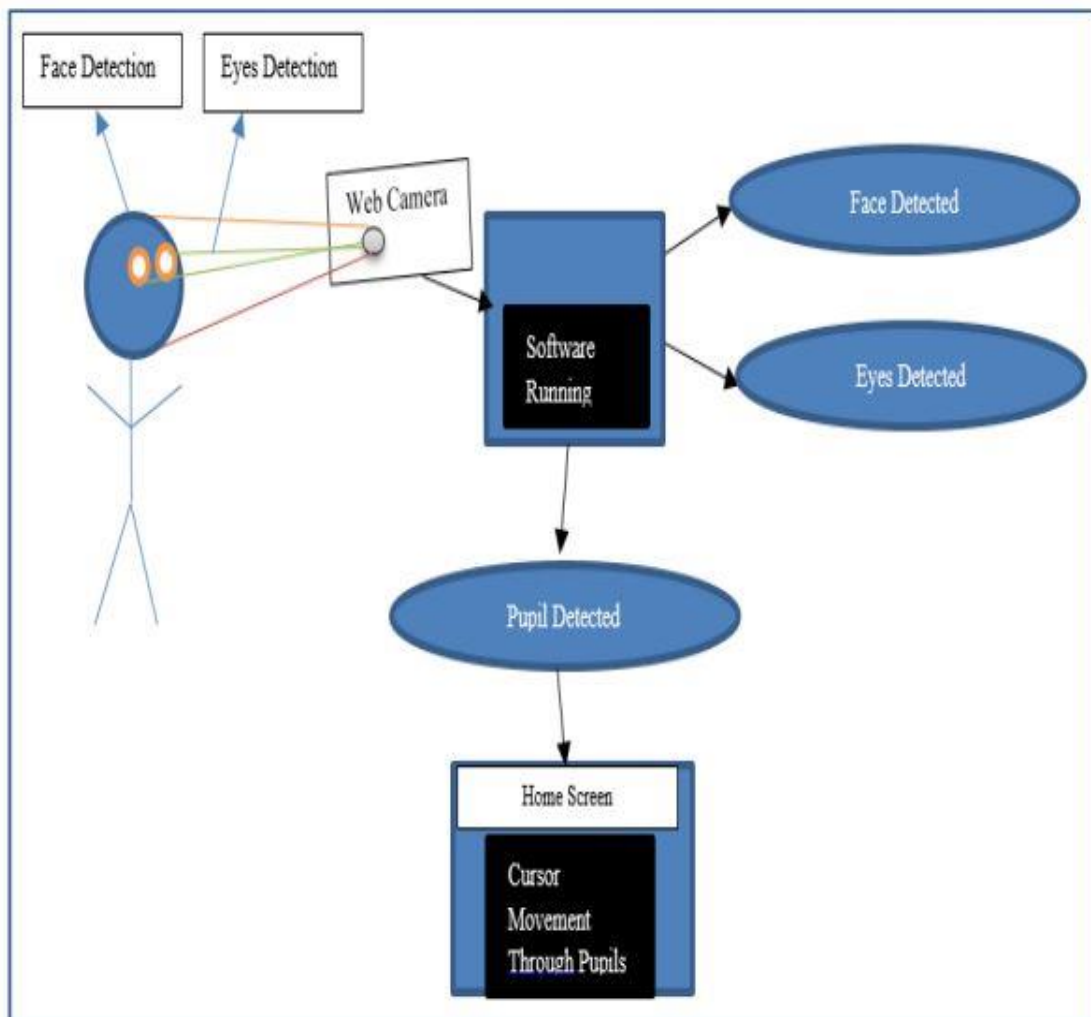
SYSTEM REQUIREMENTS

Hardware Requirements:
- Processor : Intel i3 and above
- RAM : 4GB and Higher
- Hard Disk : 500GB: Minimum

- **Software Requirements:**
  - Programming Language / Platform : Python
  - IDE : pycharm/jupyter

CONCLUSION:

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.

REFERENCES

[1] 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.

[2] Alex Poole and Linden J. Ball, "Eye Tracking in Human-Computer Interaction and Usability Research: Current Status and Future Prospects," in Encyclopedia of Human Computer Interaction (30 December 2005) Key: citeulike:3431568, 2006, pp. 211-219.

[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] 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.

[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] R. Gonzalez and R. Woods, Digital Image Processing, 3rd ed.: Pearson Education, 2009.