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# HUMAN COMPUTER INTERACTION (HCI) THROUGH EYE-GAZE TECHNOLOGIES BASED ON IMAGE PROCESSING

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**Abstract:** Eye movement can be regarded as a pivotal real-time input medium for human-computer communication, which is especially important for people with physical disability. In order to improve the reliability, mobility, and usability of eyetracking technique in user-computer dialogue, a novel eye control system with integrating both mouse and keyboard functions is proposed in this paper. The proposed system focuses on providing a simple and convenient interactive modeby only using user's eye. The usage flow of the proposed system is designed to perfectly follow human natural habits. Additionally, a magnifier module is proposed to allow the accurate operation. In the experiment, two interactive tasks with different difficulty (searching article and browsing multimedia web) were done to compare the proposed eye control tool with an existing system. The Technology Acceptance Model (TAM) measures are used to evaluate the perceived effectiveness of our system. It is demonstrated that the proposed system is very effective with regard to usability and interface design.

Objective

The main objective of the project is to develop a software that useful to all peoples including physical disabilities to accesssystem through eye commands and files (multimedia).and some peoples affected by diseases like Cerebral palsy or Amyotrophic lateral sclerosis(losing control of hands ) also can access system through eye gaze actions and pointes access.

**Keywords:** Eye Gaze ,TAM(Technology Acceptance Model),Mouse Functions, Eye Tracking.

## I. INTRODUCTION

Eye trackers have existed for a number of years but, early in the development of the field decade ago, it was too expensive to consider use in real user computer interfaces. In recent years, with the development of better and cheaper components for gaze interaction, low-cost eye trackers have been produced by several high-profile companies, such as Tobil's eyex tracker gaze point's GP3 tracker , and the eye tracker . As eye tracking gear gets cheaper, new applications with the concept of using eye tracking in HCI are clearly beginning to blossom Various methods have been developed based on tracking Contact lenses. 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. The remainder of this paper is structured as follows

1. The proposed system realizes all of the functions of regular input sources, including mouse and keyboard. User can efficiently interact with computer by only using their eyes.
2. The proposed system provides more natural and more convenient communication mechanism for user computer dialogue and could also avoid annoying user with unwanted responses to their actions..

## II. HCI TRACKING

- Accessing system through nose track moments and eye gaze is our primary work.
- The applications, outcomes, and possibilities of facial landmarks are immense and intriguing. Dlib's prebuilt model, which is essentially an implementation and not only does a fast face-detection but also allows us to accurately predict 68 2D facial landmarks
- It sends the view point of user to the mouse function module; it receives information from modules and executes the corresponding mouse events for users

  

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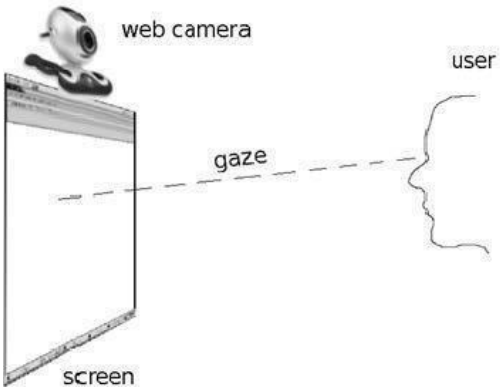
## III. RELATED WORK

There exists a lot of HCI systems that can automate the simple tasks such as speech recognition, touch sensitiveon different devices, computers and launching various applications by using HCI enabled computer .
The research issue in designing improved eye gaze based human computer interaction (HCI) for argumentative and alternative communication (AAC). Argumentative and alternative communication is the domain of communicating methods or techniques that provide improved human-human or human-system interaction. AAC technique help user with certain communication disability to perform everyday conversation without helper. The paper of this author gives main idea of Augmentative and alternative communication (AAC) for developing main AAC.

## PROPOSED METHOD

The proposed system is based on existing system. The most important part in our system is that the system can be able to useby both the persons whether they are normal persons or handicapped. The current system is not able to do this so we are developing a new system which will help a lot to disable peoples and also illiterate peoples. Current system focuses more onnormal users but our system is friendly to all types of users whether they are normal, visually impaired or else illiterate. When using this system, the computer will guide the user for performing the operation which he/she wants to perform. The most important advantage of this system is that the user doesn't have to worry about how to use keyboard because all the operations are based on voice recognition and eye tracking in this user use their eye movement and voice command to operatecomputers and laptops.




## IMPLEMENTATION

This application includes modules

1. Eye Gaze Tracking
2. Main Interface
3. Mouse function module
4. Algorithms
5. User action detection module
6. Halt (sleep) module
7. Mouse simulation engine

**Eye Gaze Tracking:** An illustration of setup is given in fig.13 . A user is looking at computer screen and at the same time webcam is capturing live stream. The idea is to enable computer system to manipulate eye gaze by detecting important feature points and combining those features in away which can result in useful information to calculate user's point of interest.Basicconcept of eye gaze tracking and framework implemented in this project is being explained using following points:

- Determine facial features which are necessary and sufficient for eye gaze tracking.
- Detecting and tracking these features points in live feed coming web-cam.
- Using these features in a way to extract user's point of interest.
- Track user's point of interest.

**Main Interface:**

It sets and manages the startup dialogue, provides user access to user action detection module, halt (sleep)module, mouse function module, and keyboard function module. In our system we use various packages of python which are

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discussed below.

1. NumPy
2. Scipy
3. OpenCV
4. PyautoGUI

**Mouse Function Module:**

it receives the view point of user from simulation engine and transfers the coordinate to the fixation function within user action detection module, which allows the system to perform directly at the view point after the function is selected. If a second view point is required to finish the action, the view coordinate is transferred to the simulation engine to execute the event. Besides, the module provides various virtual mouse functions for users to operate computers with eye movement. There are totally six mouse functions in this module, namely, left-click (ILEFT), continuous left-click (LEFT), double left- click (DOUBLE), right-click (RIGHT), drag (IDRAG), and scroll (SCROLL).

**Algorithms:**

**1. Harr-cascade Algorithm:**

Har-cascade is a protest detection algorithm used to find faces, people on foot, items, outward appearances in a picture and primarily utilized for face detection. In Har-course, the framework is given a few quantities of constructive pictures (like appearances of changed people at various foundations) and pessimistic (pictures that do not face but rather can be whateverelse like the seat, table and divider and so forth).

**2. Hough Transform Algorithm:**

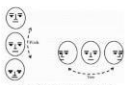
The Hough transform [28], algorithm is a worldwide strategy for discovering straight lines, picture examination, computer vision, and advanced imaging preparing. The reason for this method is to discover flawed occurrences of courses classified,a specific lesson of figures through a polling technique. The Hough transforms are connected for the inquiry of a typical focus of round or mostly roundabout segments exhibit in a picture.

**Halt (sleep) module:**

it determines whether to stop eye tracking and enter the sleep mode and determines whether to jump out of the sleep mode and restart the eye tracking.

**Mouse simulation engine:**

1) RIGHT CLICK: When Right Eye is blinked then it performs Right click operation of mouse.
2) LEFT CLICK: As same as that of the left Click, when left eye is blinked left click will be performed.
3) CURSOR MOVEMENT: Whenever the eye gaze is relocated from one point to the another, position of cursor willmove according to the gaze.
4) DOUBLE CLICK: When both eyes are blinked twice with a very short delay then double click operation can beperformed. To avoid collisions and for better performance there is no operation for simultaneous single blink of both eyes

| 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 |

5) ACTIVATE SCROLLING: When squeezing the both eyes, scrolling enable , the same way to disable scrolling cursor. 6)SCROLLING: When head look upwards screening scrolling up , when head look downwards scrolling down, right and leftside look decides landscape scrolling both right and left side.

**METHODOLOGY:**

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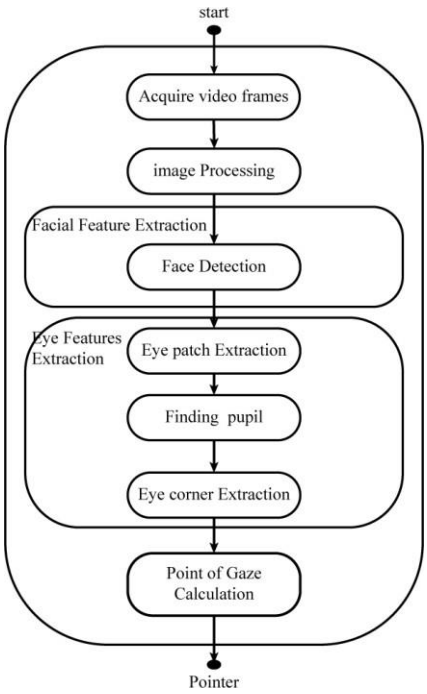


## SYSTEM REQUIREMENTS

**Software Requirements:**

- FRONT END - PYTHON 3
- IDE - PYCHARM

**Hardware Requirements**

- OPERATING SYSTEM - WINDOWS 11
- PROCESSOR - INTEL ® CORE I5
- RAM - 8 GB
- CAMERA - ASUS ® INBUILD WEBCAM

## CONCLUSION

In order to make user interact with computer naturally and conveniently by only using their eye, we provide an eye trackingbased 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 enablesthe 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. According to our TAM questionnaire analysis, the participants considered our eye movement system to be easy to learn. Meanwhile, participants show their interest in using the proposed eye control system to search and browse information. They are looking forward to see more of our research results on the use of eye tracking techniqueto interact with the computer. In future, we will try to add new operation functions for more usage situations for users to communicate with media and adjust our system on new platform, such as tablet or phone. We will also develop series operation modules in order to achieve a complete operating experience for users from turning on to turning off the computer.

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