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Eye-Blink Detection System for Virtual Keyboard

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Abstract- *These days every work needs a computer and to access the computer becomes the basic need in our society. Human Computer Interaction (HCI) is necessary for everyone to become more computer literate. Human-Computer Interaction focuses on the interface and interaction between people and computers. The main goal of the Human-Computer Interaction is to design machinery that lets people interact with computers in a novel way. This is very useful for people who are physically challenged as they can interact and surf the internet. An eyeblink is used in this system to enter special characters and alphabet numbers similar to when a user enters it manually on a keyboard instead of the user entering it by blinking an eye. Also, it allows those people to explore and interact with the different websites with just an eye blink. The most extensive technique people use to engage is eye blinking and eye movement for people with bodily disabilities.*

Key Words: Eyeblink, keyboard, Virtual Keyboard, Blinking Keyboard, Open cv, Web camera

1.INTRODUCTION

Verbal exchange may be very enormous things in human lifestyles to join and make exchange of thoughts with others. However a few people could not talk thoroughly resulting from some problems. In particular humans with a few unfitness of their motoric function especially fingers and legs could not do movement and a few could not communicate the shortage of communication. There are many systems, including applications that are based on human eye movements and eye blinking. Artificial intelligence is of many different technologies to interact, comprehend and use in our life. Technologies like machine learning and natural language processing are all part of the AI landscapeThere is a tremendous need for an eye-tracking system, especially for people with severe motor disabilities resulting from injury, illness, or disease. The system works to alleviate the symptoms of their disability and create self expression tools. This technology is aimed at mitigating the isolation suffered by disabled communities in terms of social interaction by providing a system for enhanced interaction through self expression eye detection is broadly used in face detection and distinct areas like synthetic intelligence (AI), digital reality (VR), ubiquitous computing (UC), augmented reality (AR), synthetic neural network (ANN), etc. Eye gaze is another method of HCI. In such techniques, realtime data is gathered for tracking and estimation of eye gaze. We propose an eye blinking detection system that translates eye movement into a message, which will allow those severely impaired to become more independent and interact with others using an interface adapted to their needs.

Human-Computer-Interaction is widely implemented in many areas, such as medical technologies, robotics, urban design, gaming, and assistive technologies. AI plays an essential role in image processing and powers facial recognition, giving functionality to detect and recognize objects and patterns in images and videos.Images or a sequence of images comprise the input data, which are acquired first and converted to digital form. To perform the next operation, the images must be enhanced, which is achieved by applying different mathematical operations. Human-Computer-Interaction is a part of AI that is an emerging technology field focused on designing and enhancing the interaction process between humans and computers.

1.1 LITERATURE SURVEY

According to the survey conducted by Afraa Z. Attiah, Enas F. Khairullah Department of Information Technology Faculty of Computing and Information Technology King Abdulaziz University Jeddah, Saudi Arabia [1] Arabia they have researched and talked about late proposed virtual console controlled frameworks. They proposed an eye-flickering discovery framework that makes an interpretation of eye development into a message, which will permit those seriously hindered to turn out to be more free and communicate with others utilizing a connection point adjusted to their necessities. Their examinations' primary goal is to help individuals who can't compose with their own hands by utilizing the virtual console and flickering an eye. The thought behind the venture is to plan a virtual console to show characters on the screen like a standard console by constantly illuminating characters one

by one; then, at that point, the client shuts his/her eye (flickers) at whatever point the ideal person illuminates[3]. Subsequently, the person will actuate naturally and show up on the screen. To achieve this, we really want a facial identification framework to assist with recognizing the eye furthermore, track flickering.

Brijil Chambayil Dept. of Instrumentation and Control Engineering, Dr. B. R. Ambedkar National Institute of Technology, Jalandhar, India[2] He examined an improvement of a BCI framework, the Virtual Keyboard. Eye squints are utilized as control signals in this BCI and kurtosis coefficient, greatest sufficiency and least playfulness in an example window are effectively used to identify the eye flickers from non-eye squint sign[12]. The BCI created can be utilized for correspondence purposes, which use eye squints as control signals, particularly for security in patients like those experiencing Amyotrophic horizontal sclerosis (ALS). The Virtual Keyboard created got a right spelling pace of 1.00 person/min which is great. The spelling rate can be improved by lessening the time given to deliver the eye flicker.

Chang-Zheng Li, Chung-Kyue Kim, Jong-Seung Park Dept of CSE, University Of Incheon, Korea, Incheon, Korea[4] They portrays on the backhanded point of interaction framework in which general clients dole out PC guidelines through the look following, without mouse or console. To remove the face and eye areas, they utilized the Open Source Computer Vision Library (OpenCV). Besides, a round model is utilized for seeing the development of the understudy which controls cursor position on the screen. Thus, more than 95% of following exactness was accomplished when the size of a single key with proposed calculation.

Watchari Tangsuksant, Chittaphon Aekmunkhongpaisal, Patthiya Cambua, Theekapun Charoenpong, Theerasak Chanwimalueang Department of Biomedical Engineering, Faculty of Engineering Srinakharinwirot University Ongkharak, Nakhonnayok, Thailand[5], an advancement of a new electrooculography based framework for composing a word by means of virtual console by utilizing voltage limit calculation. EOG signals with various courses of eye development in flat and vertical courses are distinguished. Estimation circuit comprises three significant cycles:instrument enhancer, channel and sign molding speaker processes. The voltage limit calculation is then used to group the EOG signal. Determination order is characterized by shutting eye in a brief time of purpose to stay away from eye squint compulsory.

Kristen Grauman* Margrit Betke James Gips Gary R. Bradski [6]Results exhibit the Blink Link's capacity to precisely recognize willful and compulsory flickers, a significant thought for a framework constrained by facial signals or prompts. The framework runs reliably at an outline pace of 27 to 29 fps, which is accepted to be nearer to the continuous objective of 30 fps than other flicker recognition frameworks recently planned. Earlier information on face area or skin tone isn't needed, nor is any exceptional lighting. The utilization of squint examples as correspondence signals proposed in this work offers a book way to deal with composed word correspondence applications.

Xueshi Lu, Difeng Yu, Hai-Ning Liang, Wenge Xu, Yuzheng, Xiang Li, Khalad Hasan University of British Columbia - Okanagan [8] their investigation and assessment of without hands text section methods for computer generated reality (VR) head-mounted shows (HMD)[9]. They analyzed three without hands text section methods: BlinkType, NeckType and DwellType. Results for a client study with 36 members showed that BlinkType offered the best execution, with members having the option to arrive at a mean composing velocity of 13.47 wpm. With NeckType and DwellType, members had the option to type at the pace of 11.18 WPM and 11.65 WPM, individually. Based on their review results, we recommend the utilization of BlinkType for hands free text section in VR, on the off chance that eye following is accessible. Furthermore, they observed NeckType addresses reasonable elective ways to deal with dwell based methods that can offer clients more command over the speed of choosing the characters yet lead to somewhat quick section[7].

Bama Srinivasam, Ranjani Parthasarathi, Department of Information Science and Technology CEG Campus, Anna University, Chennai 600 025 [10] In this procedure, a programmed technique for filtering is presented through a switch. A programmed marker moves across the things in the presentation featuring and giving voice about the thing. At the point when the predetermined thing is featured, the client presses the switch. This activity of development across the things in the presentation, through the switch is known as switch access checking. The speed of this development and visual game plan of things fluctuate contingent upon the person's capacity.

Brijil Chambayil, Rajesh Singla, Rimjhim Jha Dept. of Instrumentation and Control Engineering, Dr. B. R. Ambedkar National Institute of Technology, Jalandhar, India [11] This commitment introduced an advancement of a BCI framework, the Virtual Keyboard. Eye flickers are utilized as control signals in this BCI and kurtosis coefficient, most extreme playfulness and least sufficiency in an example window are effectively utilized to distinguish the eye flickers from non-eye squint signs. The BCI created can be utilized for correspondence purposes,

which use eye flickers as control signals, particularly for security in patients like those experiencing Amyotrophic horizontal sclerosis (ALS). The Virtual Keyboard created a right spelling pace of 1.00 person/min which is incredible. The spelling rate can be improved by decreasing the time given to create the eye squint.

K. Grauman, M. Betke, J. Gips, G.R. Bradski Silesian University of Technology [13] The paper portrays the possibility of touchless virtual consoles intended for debilitated individuals with tetraparesis. Each key can be chosen by three twofold eye flickers enrolled by EMG sensor. EEG signals are utilized as a help that permits the client to change the information method of single characters to the method of anticipated word choice. The console was executed and assessed during tests.

Chirag Bellara, Raj Madheshia, Pranali Patil, and Mrs. Vinita Mishra, Department of Information Technology Vivekanand Education Society Institute of Technology [14]

The proposed framework utilizes the Neurosky headset to catch eye squints. The framework depicted in the paper utilizes eye flickers as a correspondence medium between the product interface and the client. The product interface comprises the virtual console. The plan of the console is finished thinking about the client and to lessen the time. The limit of 3 squints is utilized to reach to each Character. The assist with securing helps the client to raise an alert. The forecast box facilitates the word composing by anticipating the likely word by utilizing the all around printed characters. The situation of the significant capacities as the top column of the virtual console diminishes the season of the client. The essential sentences that a client will utilize every now and again can be modified in the custom buttons. This works with as the entire sentence will be spoken without the need of composing any word sentence

2.METHODOLOGY

A. Need for the system

Part of society must be integrated into the community, communicate with the other people and convey themselves but they cannot because of variable levels of incapacity. Some people are not able to move their hands, not able to speak or cannot move at all for many reasons such as chronic malady, health condition since birth, an accident within which they lost their flexibility to talk or move. Therefore they are not able to make conversation with the community. Consequently, there's a necessity for a system like Blink-Controlled-Keyboard.

B. System overview

The eye gazed controlled typing system focuses on detecting the eye and then detecting eye blinking to pick the desired key. To detect faces, the system uses a mediapipe which is widely used in the area of computer vision and image processing. It is used for the purpose of face detection. System detects the eye and face so we used a shape predictor. This system involves two components i.e. i. Image processing module and ii. Virtual keyboard on screen. So the image processing module is important and the main module which detects the face and the eye. The module initializes with the webcam, it will collect the data and detect the face and the eye. And the next part is designing a virtual keyboard using python coding language.

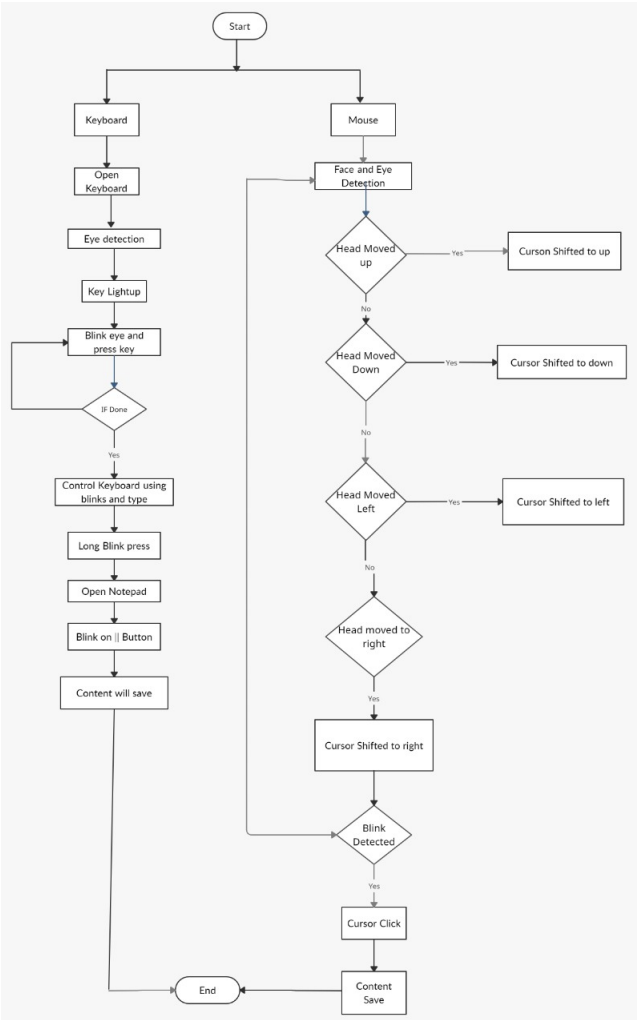

Fig. 1: Flowchart of the System

C. System functionality

After starting an application two options are visible i.e. mouse and keyboard. If we select the keyboard then the keyboard can be seen on the screen and we can start typing. To open the notepad there is a special button we have to click on and to save the document we have to do a long blink press. And if we select a mouse we can operate the laptop by using head movements we can drag the cursor. And if we want to click on any option we have to long blink, press and the web page will appear on the screen.

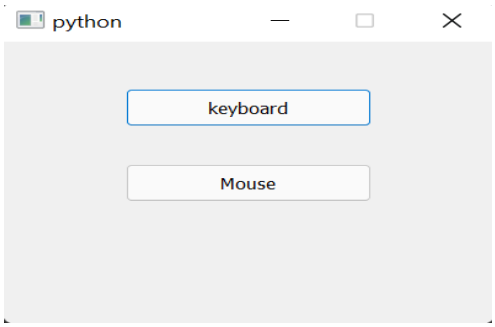

Fig.2 : Initial page of an application

D. Face and Eye blinking Detection

Face and Eye detection is the process of detecting human faces from digital video or images. OpenCV and dlib are being widely used to detect the face by using numerous strategies. In this system we are using a mediapipe for face detectors in dlib. Eye detection is implemented by training a model using dlib. Using facial landmark detection process there is a specific index assigned and according to this approach, we need to detect only eyes i.e. Left eye point and right eye point. Here the next step is detecting eye blinking to achieve the main task of the system. System identifies eye blinking by calculating the ratio which is between normal eye blinking and targeted blinking behavior by setting the threshold value.

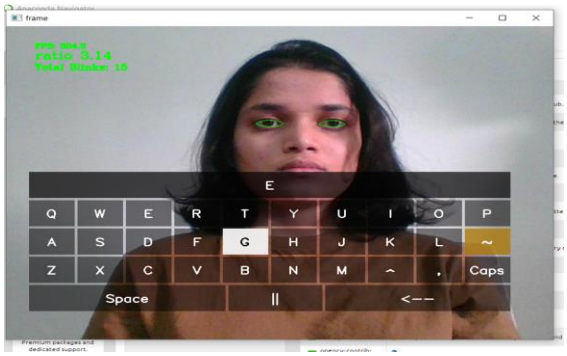

Fig.3: Detection of Eyes

E. Key Selection and typing on Screen

Keyboard involves all the alphabets, numbers, special characters, cpas, space button. It will also show the blink ratio and total number of blinks. The keyboard is designed to light up each character row wise and column wise and we have to blink for a second when the letter is highlighted and then the chosen character will appear on the screen. Fig.4 illustrates typing a "HEL" successfully by proposed system.

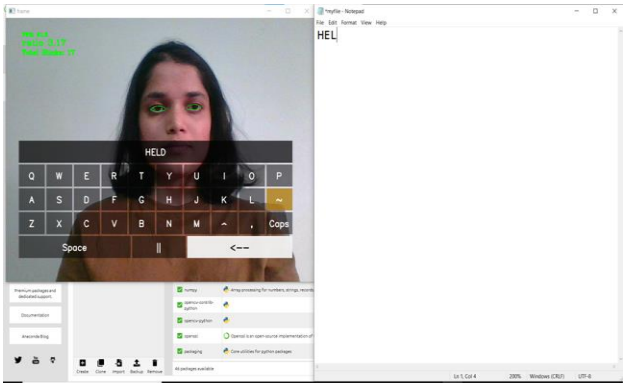

Fig.4 : Typing by virtual keyboard

We have also added shortcuts of some apps like facebook and flipkart you can change it according to your convenience. Blinking on that particular shortcut you will be directed to that page and have added sign in with google option.

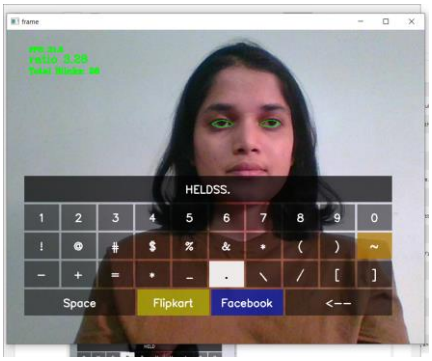

Fig.4: Keyboard with special characters

3. CONCLUSION

An eye blink recognition framework for a virtual console is introduced in this paper. The PC's camera is utilized to catch a facial picture, then the eye recognition module recognizes the eye area. Eye blink is utilized to choose the ideal person as the featured one on the virtual console like selecting letter sets "a-z", numbers and special character

button. The framework is intended for individuals with an incapacity. The outcomes show that it is attainable for any user. One extra component is, one can parchment and utilize the mouse just by head for individuals who can basically utilize the head. It's optional for the individual who can't even move the head. In future work, we might want to incorporate the regional language, extend it to a portable application, and add voice help, a night mode, and alternate way and pictures to the virtual console.

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