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Human-Computer Interaction Based Head Controlled Mouse

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Abstract:

Computers have become ingrained in many people's lives due to their widespread use and ongoing technical advancements. At present situation paralyzed people need a guidance to do any work. Giving patients complete access to the digital world can increase their independence and confidence while also enhancing their quality of life by enabling them to manipulate technological devices. This system guarantees the easy usage of electronic applications for quadriplegic patients with quick response time and customized processing.

***Keywords* — Quadriplegia; Electrooculographic; Computer Vision ; Spondylosis**

I. INTRODUCTION

A interdisciplinary branch of research called human-computer interaction (HCI) is devoted to the design of computer technology and, in particular, the interaction between people (the users) and computers. HCI, which was first focused on computers, has recently broadened to include practically every aspect of information technology design.

With the proceeding of computer science and technology, the usage of computer has brought about significant facilitation in every aspect of the society. However, the common computer input devices are usually designed for normal capable users, instead of elderly and disabled ones. The use of computers requires a mouse, a touchpad, a keyboard or other external devices. Users with upper limbs disabilities are incapable of controlling the mouse or keyboard easily, which makes it extremely difficult for them to use a computer. For common computer users, the long-term usage of conventional input devices causes chronic sore in hands, shoulders or neck, and greatly increases the risk of getting cervical or vertebral spondylosis.

Numerous efforts have been made, and two different types of solutions are offered, to make it easier for people with disabilities to use computers. The first approach is to detect the user's gestures to control a computer via contact-type auxiliary equipment, such as thermal imaging cameras and infrared reflectors. A special kind of specs with three light-emitting LEDs was designed by Takami et al. By sitting in front of a computer with the eyeglasses, the user’s image will be captured by camera, and the head movements are judged, so as to operate the computer. Evans et al. used infrared light-emitting diodes and photo detectors as auxiliary equipment to determine the user's head position to operate a computer. A mouse and keyboard that can recognise infrared signals were created by Chen et al. These gadgets enable head-based mouse and keyboard operations by using infrared light to accomplish positioning and determine whether something has been clicked or not. It is also possible to use the corneal reflex to determine the direction of the eyes' gaze when using a computer. Gips et al. used EOG (electrooculographic potential) to detect eyes movements. They designed an EOG-based system that allowed people to control a mouse through moving eyes. The results of such research have been applied in the lives of children. The benefit of a contact-type solution is that movement is accurately detected. However, the solution requires the user to wear special glasses, sensors or other equipment, which brings inconvenience to the user. These auxiliary devices are quite expensive, which severely restricts how widely they may be used.

II. EXISTING SYSTEM

The previous systems used complex algorithms. They were based on the biometric identification techniques. Some needed to mount devices on the user like Lasers which was not feasible. Hence, our aim is to devise an application that will be cost effective and not be dependent on the biometrics but on the feature classifications of the user. Less hardware and easier algorithms should be used. The objective is to use such a system that will help the upper limb disabled who cannot use the traditional mouse or keyboard.

III . PROPOSED SYSTEM

Patients who have little to no hand function typically find it challenging to use traditional input methods like a mouse or a touch screen. Giving patients complete access to the digital world can increase their independence and confidence while also enhancing their quality of life by enabling them to manipulate technological devices. In this work, a facial gesture-based human-computer interface was created to enable patients to operate computers without using their hands. Five facial movement patterns were detected by web camera of the laptop, and classified using myoelectric pattern recognition algorithms. Cursor activities including clicks and various cursor movements were matched to facial movement patterns.

The study presents a human-computer interface based on vision. The interface detects voluntary head movements and interprets them as control commands. The image processing techniques used include template matching-based eye tracking and eye-blink detection, as well as Haar-like features for automatic face detection. According to test results, interfaces are useful for providing an alternative method of computer communication. The interface is based on a laptop equipped with a typical web camera and requires no extra light sources. The interface programme is open-source software that can be downloaded online.

Algorithm presented in this project performs operations deeply centered on predicting the EYE landmarks of a given face. Using these landmrks we can draw lot of outcomes. The applications, outcomes and possibilities of EYE landmarks are immense and intriguing. Dlib's prebuilt model, which is essentially an implementation of not only does a fast face detection but also allows us to accurately predict 68 2D EYE landmarks. Very handy using these predicted landmarks of the face, we can build appropriate features that will further allow us to detect certain actions, like employing the mouth aspect ratio to identify a yawn, etc., or perhaps even a pout, or using the eye-aspect ratio to detect a blink or a wink. These actions serve as triggers in this project to manage the mouse pointer.

A Python module for cross-platform GUI automation for people is called PyAutoGUI. used to automate the control of the keyboard and mouse. An algorithm introduced in that is based on machine learning is utilised for face detection. This method uses a Haar-features based methodology for object detection, making it feasible to recognise objects quickly and accurately. We defined five motions as the basis of head movements, namely, standard head, head left, head right, head up, and head down, the face which represents the detected

head (the head in this project refers to front area of the face) and scrolling
up and down.

IV. RESULTS

	RIGHT	LEFT	TOP	DOWN
User 1	YES	YES	YES	YES
User 2	YES	YES	YES	YES
User 3	YES	YES	YES	YES

V. CONCLUSION

This paper introduced the principles of a computer-human interaction system based on real-time state-detection of head and mouth. Additionally, the head-trace mouse system was created and put into use. It was proved that this system was capable of performing the majority of an ordinary mouse's operations. With this system, users can operate computers by their head and mouth movements in front of web cameras. This system has been tested by an extensive number of persons and has been widely recognized. This system has already created its commercial items.

We have implemented a system to access the mouse pointer on the computer screen using only EYE features. With the use of a camera and python technology, the system architecture is prepared. User is able to view head and eye movements captured through the camera which is displayed on the screen, accordingly the user can move the mouse pointer as needed and also perform various mouse actions. The proposed system is feature based thus allowing any user to use the system without prior registration. This system is especially useful for the upper limb disabled. Currently, we are extending our implementation to support keyboard press technology for the ease of the User to use the Keyboard hands free along with the already existing mouse movements provided by the system. This would then enable the User to access the computer owing to only EYE features and movements without the use of traditional mouse and keyboard i.e Hands free system.

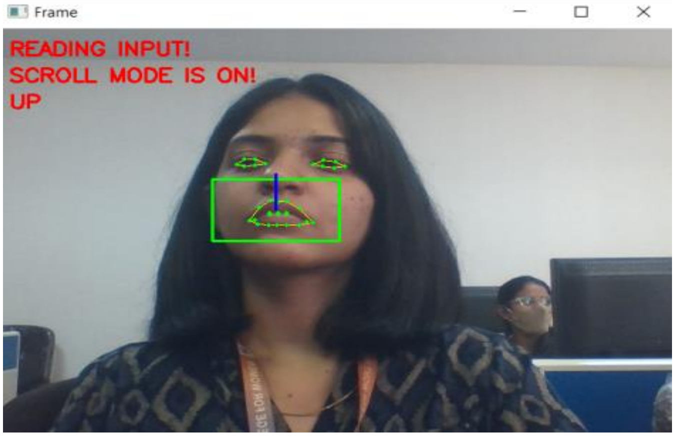

Fig. 1 A picture that shows scroll mode is activated i.e moving up.

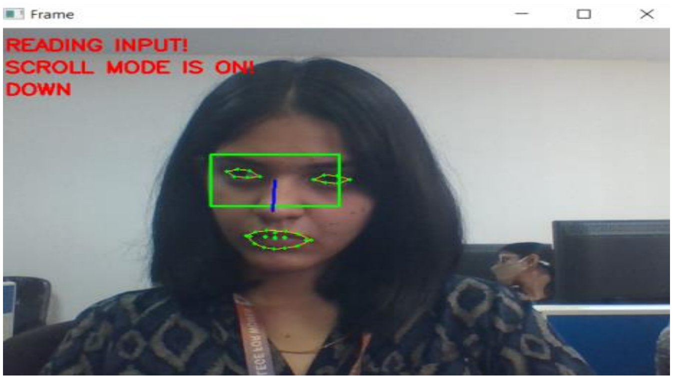

Fig. 2 A picture that shows scroll mode is activated i.e moving down.

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