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A REVIEW ON HUMAN COMPUTER INTERFACE USING EOG

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ABSTRACT:

Electrooculography Signals are used to control human computer interface, if properly classified .The ability to process and measure the signals will help HCI users to overwhelm many of the physical limitations and incommode in day to day life. However, there are currently no advanced effective multidirectional methods of classification for monitoring eye movements .In this paper, we describe a classification method used in a wireless EOG-based HCI device for detecting eye movements in different directions. The EOG signals are very small in amplitude, which is measure in milivolts. Hence, it helps to capture human signals which controls the computer or other instruments.

Keywords: Electrooculography (EOG), Human Computer Interface (HCI),Eye movements.

1.INTRODUCTION

Recently, bio based human computer interface has the potential to enable severely disabled people to communicate with a machine or computer. Because communication to the outside world is important for disabled person too, with the help of bioelectricity rather than physical means. People suffering from such miserable condition and living cursed life in this advanced technological century. So in the science technology, study of the symptoms causes on the group of persons with severe disabilities shows that many of them have ability to control eye movements, which helps to develop human computer interface that improve their communication with other or control some instruments. However, their eye movement is the only resource of communication. Eye movements can be used as signals to transfer information from users to HCI systems. Nowadays, some methods which attain user's eye movements are developed.

Electrooculography is a new technology in which electrodes are placed on user's forehead around eyes to record eye movements. Compared with the EEG, EOG signals have the characteristics as follows : the amplitude is relatively high (15-200uV),the relationship between EOG and eye movements is regular and the waveform is easily detected. The voltage difference is measured between the cornea and the retina. The remaining potential ranges from 0.4mV to 1mV and a pair of electrodes are commonly used to detect signal, but the voltage difference if there's a movements of eye can be as small as just some microvolts. Depending on the position of eye, an electrode is either positive or negative with respect to the ground electrode. Hence, recorded signals are positive or negative.

2.RELATED WORK

Dong Ming et.al,[1] proposed to design brain–computer interface (BCI) using an EEG-based mouse system to move a cursor on a computer screen.This system provides a different ways for communication or control channel for patients with severe major disabilities. Such patients able to select target on a computer screen by moving a cursor through mental activity .The cursor moves by imaging his/her hand operation on mouse without any actual action while the movement direction that he/she wanted to choose was lighted in the line of four-direction.In the EEG frequency spectrum,in this system, adaptive algorithm helps to recognize cursor control patterns.The algorithm included classification preprocessing and feature extraction. A Fisher ratio was defined to determine the characteristic frequency band. Mahalanobis distance classifier was employed to recognize the effective pattern of task and the trigger signal is produced as cursor controller. Relevant experiment results shows that this system achieved 80% accuracy for IHM task pattern classification. This EEG-based mouse system is workable to drive the cursor's movements in four direction and provides a new communication and control option for patients with severe major disabilities.

Chung-HsienKuo et.al,[2] proposed an eye-movement tracking system,which Based on Electro-Oculography (E.O.G) technology that detected the signal with different directions in eye-movements and then analyzed to understand what they represented about(e.g. horizontal direction or vertical direction). It converted the analog to digital signal and then used as control signals for Human Computer Interface (HCI). In order to make the system "robust", Many applications with EOG-based HCI had been designed. Our pre - result revealed more than 90% accuracy rate for observing the eye-movement that would be a new useful human-machine user interface in the near future.

Min Lin et.al,[3] Human Computer Interface (HCI) is becoming a very intresting area of research. It could be developed for the disabled and many other application fields. Biopentials existed in human body, Electroencephalogram (EEG), Electromyogram (EMG), Electrooculogram (EOG) are used as inputs of the HCI system . In this paper, the design scheme of a wireless EOG-based Human Computer Interfaces is presented. Also, the methods of eye gestures recognition are discussed.

Divya Swami Nathan et.al,[4] Human-Computer Interface (HCI) helps people to control computer applications using bio-electric signals raised from the body.In an Electrooculogram (EOG) based HCI, signals during various eye (cornea) movements are recorded to generate control signals. This article presents the design of an EOG-based typing system which uses a virtual keyboard for typing on the monitor using 8 types of distinct EOG patterns. Identification of EOG pattern is based on the amplitude and timing of positive and negative components within the signal. Experimental results show that proposed EOG-based typing system achieves a higher typing speed of 15letters/min and an improved accuracy of 95.2% compared to the state-of art method that has a typing speed of 12.1 letters/min and accuracy of 90.4%.

Shang-Lin Wu et.al,[5] Electrooculography (EOG) signals acts like a control human–computer interface (HCI) systems, if correctly recognized .The ability to detect and proceed these signals may help HCI users to overcome many physical limitations and inconveniences in daily life. However, there are

presently no effective multidirectional classification methods for observing eye movements .Here, they describe a classification method used in a wireless EOG-based HCI device for sleuthing movements of eye in different direction. This device includes wireless EOG signal acquisition components, wet electrodes and an EOG signal classification algorithm. The EOG classification algorithm is based on the electrical signals for extracting features corresponding to eight directions of eye movement (up, down, left, right, up-left, down-left ,up-right, and down-right) and blinking. The recognition and processing of these eight different features were achieved in real-life conditions, demonstrating that the feature of EOG signals are measure by using this device. This system and the procedure of classification provide an effective method for identifying eye movement. Additionally, it may be applied to study the different eye functions in real-life conditions in the near future.

S.R.Abina Ramya Supraja et. Al,[6] Electrooculography (EOG) signals are used to control human-computer interface system. It has the ability to extract the signals so that the physical limitations would be overcome. It provides information about the human eye activity by detecting the changes in eye position. At present there is no effective multi-directional classification method to monitor eye movements. A wireless EOG-based HCI device to detect eye movements in four directions. This includes wet electrodes, an EOG signal classification algorithm which extracts the electrical signals which corresponds to four directions of eye movement (up,down, left and right) and blinking. It is also used to study eye-function in real-life conditions later. Eye movements can be used as signals to transfer information from users to HCI systems. A user can select a response by starting on it for certain amount of time the need of keyboard entry is not mandatory. This reduces the time to generate a command.

3. EVALUATION

Comparative study of different Human computer interface approaches in a table given below.

Sr. no.	Human Computer Interface	Advantages	Disadvantages
1.	Speech recognition	Speech is a very natural way tp interact,and it is not necessary to sit at a keyboard or work with a remote control.	Even the best speech recognition systems sometimes make noise or other sound in the room.
2.	EEG (Electroencephalogram)	EEG have the ability to see brain activity as it unfolds in real time, at the level of milliseconds.	EEG is that it's hard to figure out where in the brain the electrical activity is coming from.
3.	EMG (Electromyogram)	EMG is a precise and sensitive method to measure emotional expression.	Like other physiological measures, EMG is only useful when movement is not visible.

5. CONCLUSION :

In order to build a detecting system for eye movements which will use electronic signals which are gettting from the eyes it's crucial to understand the eye structure and the source of the signals which are measured by the system that includes different direction of eye movements. Understanding these signals and their nature will help to design a suitable system that will function properly and will simplify its use.

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