

ELECTRO OCULO GRAM BASED PERSONAL ASSISTIVE SYSTEM FOR AMYOTROHIC LATERAL SCLEROSIS PATIENTS

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ABSTRACT

Electrooculography (EOG) signals, which can be used to conjecture the intents of a user based on eye movements, are widely used in human-computer interface (HCI) systems. Most existing EOG-based HCI systems incorporate a restricted variety of commands as a result of they typically associate completely different commands with a couple of differing kinds of eye movements, like trying up, down, left, or right. This paper presents associate degree electrooculogram based mostly personal helpful system for amyotrophic lateral sclerosis patients that permit users to spell asynchronously by solely blinking. Twenty six buttons reminiscent of twenty six English alphabets presented the user via a visible stimulation paradigm area unit intense in a very

random order to pick out a button; the user should blink his/her eyes in synchronization because the target button is flashed. Two processing procedures, specifically support vector machine (SVM) classification and waveform detection, area unit combined to discover eye blink throughout detection, we tend to at the same time feed the feature vectors extracted from the continued EOG signal into the SVM classification and waveform detection

Modules choices area unit created supported the results of SVM classification and waveform detection. Three on-line experiments were conducted with three healthy subjects. Here, the typical accuracy choosing a personality in synchronous mode, similarly as a mean accuracy a false positive rate of within

the idle state in asynchronous mode. The experimental results thus incontestable the effectiveness of this EOG based mostly personal helpful system for amyotrophic lateral sclerosis (ALS) patients.

INTRODUCTION

Biomedical signal processing includes the investigation of these degrees to give valuable data whereupon specialists can decide. Once a biomedical signal is recorded by a sensor, it has to be preprocessed and filtered. This is essential because the measured signal frequently contains some unwanted noise that is combined with the significant biomedical signal. The usual sources of noise include the activities of other biological systems that interfere with the desirable signal and the variations due to sensor imperfections.

The following step is to process the filtered signal and extract features that characterize or describe the prominence and conditions of the biomedical system under study. Such biomedical features are expected to distinguish between healthy and deviating cases. A group of extracted features are defined based on the medical characteristics of the biomedical system.

Electrooculogram (EOG), is a signal that is measured on the skin around the eyes. The electrodes are placed on the sides of the eyes for measuring the eye

movements and eye blinking signals. In each case, differential amplifiers are used to detect any potential difference between each pair of electrodes caused by the eye movements and eye blinking. More specifically, this potential difference is the result of a dipole (i.e., eye ball) changing the potential balance between the two points where measurements are taken. This potential is primarily generated between cornea and retina (i.e., corneoretinal potential) and is often between 0.4 and 1.0 mV. The major application of EOG is helping severely paralyzed patients.

LITERATURE SURVEY

The paper states that the one target button and three pseudo buttons, which are intensified in a random order to produce P300 potential, are set in the graphical user interface. The user can issue a switch command by focusing on the target button. Two support vector machine (SVM) classifiers, namely, SVM1 and SVM2, are used in the detection algorithm. During detection, we first obtained four SVM scores, corresponding to the four flashing buttons, by applying SVM1 to the ongoing EEG[1]. The paper presents the most SSVEP based BCI devices are not portable and have high price, which are not suitable to be used for clinical and commercial purpose. Because of the minimal effort and compact Emotive EPOC, it brings BCI into day

by day life. In this paper, SSVEP based BCI through Emotive EPOC is actualized. BCI 2000 is employed to connect Emotive EPOC and Matlab to implement the online system[2]. The paper represents the information transfer is accomplished using P300 event-related potential paradigm and the control state (CS) detection is achieved using SSVEP, overlaid on the P300 base system. Offline and online experiments have been performed with ten subjects to validate the proposed system [3]. The paper presents, to evoke a SSVEP, a Repetitive Visual Stimulus (RVS) of rectangular shape has been proposed to the subjects in various ways. RVS is rendered on a computer screen by flashing graphical patterns. The properties of SSVEP depend on the rendering device and frequency, size, shape and color of the stimuli [4].

EXISTING SYSTEM

Existing system approaches to usage of electroencephalography (EEG) based brain switches is to detect the control and idle states in an asynchronous manner. Most existing methods rely on a threshold. However, it is often time consuming to select a satisfactory threshold, and the chosen threshold might be inappropriate over a long period of time due to the variability of the EEG signals. The user can issue a switch command by focusing on the target button. Two support vector machine

(SVM) classifiers, namely, SVM1 and SVM2, are used in the detection algorithm. During detection, first obtained four SVM scores, corresponding to the four flashing buttons, by applying SVM1 to the ongoing EEG. If the SVM score corresponding to the target button was negative or not at the maximum, then an idle state was determined. Moreover, if the target button had a maximum and positive score, then fed the four SVM scores as features into SVM2 to further discriminate the control and idle states. As an application, this brain switch was used to produce a start/stop command for an intelligent wheelchair, of which the left, right, forward, backward functions were carried out by an autonomous navigation system. Usage of electrodes are more in EEG, one electrode failure leads to fault in working of system and gives a false output and also may leads to system damage.

PROPOSED SYSTEM

These papers propose an EOG-based personal assistive system for amyotrophic lateral sclerosis patients. Twenty six buttons corresponding to English letters were displayed via mat lab code, and the buttons are intensified in a random order. Two data processing procedure, specifically support vector machine (SVM) classification and waveform detection, are combined to detect eye blinks. During detection, simultaneously feed the feature

vectors extracted from the ongoing EOG signal into the SVM classification and waveform detection modules. Decisions are made based

on the results of SVM classification and waveform detection.

BLOCK DIAGRAM

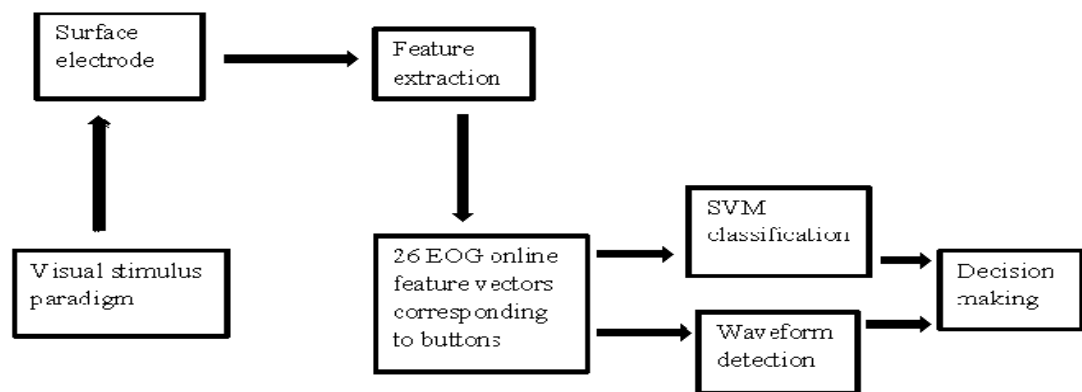


Fig 1. Block diagram

VISUAL STIMULUS PARADIGM

Eye movements are a good model to study visually guided orienting behavior to stimuli, and related perceptual and cognitive functions. Eye movements or blinking indicates the focus of visual attention in scenes, and are known to result to direct the fovea i.e., sharpness of vision, to some objects. Eye movements done by seeing a monitor or GUI those image displaying machines are known as visual stimulus paradigms. The visual content of an object of interest is processed via pathways that run from the retina via lateral geniculate nucleus to primary visual cortex, and that distribute themselves over cerebral processing areas. Letter display is used in this project.

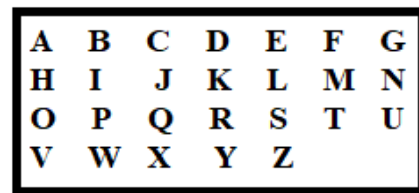


Fig 2. visual stimulus paradigm

FEATURE EXTRACTION

This system is found to acquire the EOG signal efficiently, while completely eliminating the DC drifts and interferences. The loss of the DC component of the EOG signal that occurs in the drift elimination stage has been completely avoided by adding appropriate A/D and D/A converters and latches. The reaction of the general EOG flag procurement framework is observed to be astoundingly

direct and the general framework is substantially less expensive than existing bioamplifiers for a similar reason. The EOG obtaining framework can be utilized as a part of utilizations in restorative instrumentation, for example, dependable healing facility caution frameworks. The huge feature of this framework is its flexibility, for it can used to take a shot at biomedical utilizations of EOG flag handling and additionally help in theoretical analysis tests.

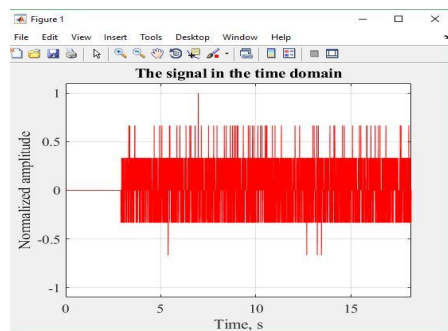


Fig 3.feature extraction

SUPPORT VECTOR MACHINE

Support vector machine classification measure a current, voltage, temperature, pressure etc. It convert the physiological process into measurable electrical signals. It consist of sensors, hardware and programmable soft wares. It has high accuracy.

SVM CLASSIFICATION

The 26 online feature vectors ($X_1, X_2, \dots, X_{26}$) that are obtained in the round are fed into an SVM classifier, and 26 SVM scores corresponding to the 26 buttons are obtained. Among the 26 SVM scores, the five maximum scores corresponding to five pre-candidate target buttons are retained, and the other scores are set to zero. Therefore, 26 SVM scores ($s_1; s_2; s_{26}$), of which only three scores are nonzero, are obtained for each round of button flashes.

WAVEFORM DETECTION

A detection step is performed for each round of button flashes in light of the aftereffects of the SVM grouping and Waveform location modules. Fourier transform based extraordinary analysis is the prevalent expository tool for frequency domain analysis. In any case, Fouriertransform can't give any information of the spectrum changes with respect to time.

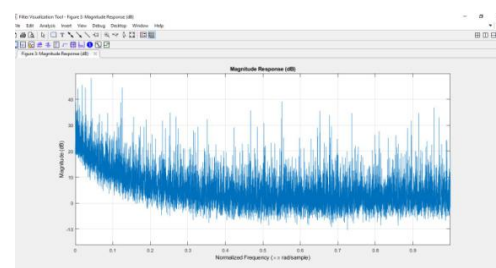


Fig 4.waveform detection

DENOISING WAVEFORM

The general denoising waveform system is as per the following: Apply wavelet transform to the uproarious flag to deliver the loud wavelet coefficients to the level which can legitimately recognize the PD event. Select suitable edge constrain at each level and limit technique (hard or delicate thresholding) to best evacuate the commotions. Backwards wavelet transform of the limit wavelet coefficients to get a denoised flag.

DECISION MAKING

A decision is made based on the results of the current detection and the previous one or two detections. Specifically, if there exists at least one button identified as the candidate target two times in the three consecutive detections (including two consecutive times), then the corresponding cumulative score (under the circumstance of two consecutive times).

RESULT

The frequency of the letters (alphabets) are detected from EOG signal by using SVM classification and waveform detection in matlab 2015. So, the complexity of frequency detection in EEG signal is reduced by using EOG signal and accurate frequency can be detected.

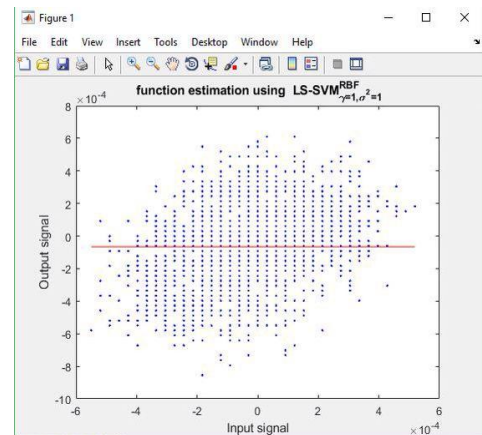


Fig 5. output of SVM classification

CONCLUSION

In summary, this report describes a Electro oculo gram based personal assistive system for amyotrophic lateral sclerosis patients. Unlike other existing EEG or EOG-based HCIs, which produce different commands depending on the types of eye blinking, the proposed approach produces commands depending on the user's eye blinks that are performed in synchrony with button. Using this approach, the number of possible commands is markedly increased. Because only one channel is used, the system has a high degree of usability and is more user friendly than most existing EEG/EOG-based HCI systems. In addition, eye blinking is an intentional and natural movement that does not cause discomfort to users, as confirmed by the workload evaluation results in this study. In the future, expanding the applications of the proposed EOG-based HCI to end-users, such as

severely paralyzed patients to spell about their personal needs.

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