ISSN: 2278 – 1323
International Journal of Advanced Research in Computer Engineering & Technology (IJARCET)
Volume 5, Issue 4, April 2016

Design and Implementation of Electrooculogram Based Alarm System for Disabled

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***Abstract*—The study on Human computer interaction (HCI) is increased in these days. There are lots of techniques proposed on this subject. So many techniques were creatively proposed goods for medical which can help in diagnosis. There are some products which can help disabled person to live life easily. Electrooculography (EOG) is a technique which can help some people to do their regular work which they are unable to make due to their disability. This technique has wide scope in day to day life. EOG does not provide any physical body parameter or part for operating application or disease diagnosis. It is a technique from which disabled can operate application with the help of their eye. The person who is suffering from quadriplegia kind of disease for these people eye is only medium of communication. EOG provide voluntary movement to control application. Normal person can convey their needs with the help of mouth or gesture but patient with quadriplegia or paralyzed person cannot easily communicate. The only thing they can control is their eye. This system will help these kind of people to operate application easily only through eye.**

***Index Terms*—Human Computer Interaction (HCI), Electrooculogram (EOG), Electromyogram (EMG), Electroencephalography (EEG).**

I. INTRODUCTION

Human computer interaction is communication term between computer system and human. As we know normal person can easily communicate with other, they can easily operate any kind of application and can do their regular work by themselves without asking for help. On the other hand paralyzed person is unable to do simple task by their own because they have no control over their body, only they have control over their eyes. Spinal cord injury, cerebral palsy and neurological diseases lead to paralysis. EOG signals can be generated by the movement of eye balls. There is potential and voltage existing between cornea and retina, this potential generate EOG signal. The cornea is positively charged, while the retina is negatively charged for these people eye movement remains lasting and common area of movement for communication. Armless person can also perform simple task through eye. Proposed system provides human computer interaction. This system provides easy access to control the application for disabled patient. For EOG measurement there are various instruments available in the market but these instruments are very expensive and occupy large space. Proposed system can reduce the cost as well as size of instrument.

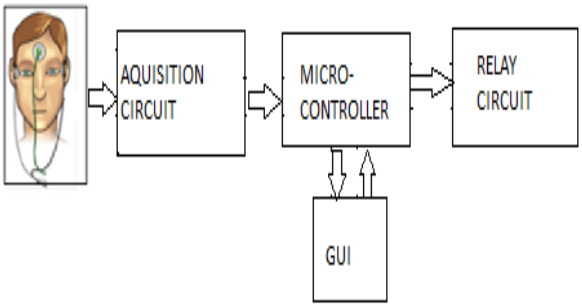

Fig1: System Architecture.

When the eye is looking straight, electrodes are equally spaced from the eye and will be at right angles to the eye's electric field, which results in an output of zero. However, when the eye moves, there is a direct current voltage shift which is positive and negative values for right and left movement respectively. This voltage shift due to eye movement is known as an Electrooculogram (EOG) signal. This system can operate in two steps first is detection of eye movement through electrode. And second one is to move the computer cursor to control the application.

II. METHODOLOGY

2.1 SIGNAL AQUISITION

Signal can be captured from disposable electrode which is attached near eye area. Eye is the only organ we have which has electric duel pole, positive at cornea side and negative charge at retina side. Electrodes are attached near left and right side of eye in which positive electrode near right eye and negative electrode near left eye. One extra electrode is attached on forehead which is considered as ground.

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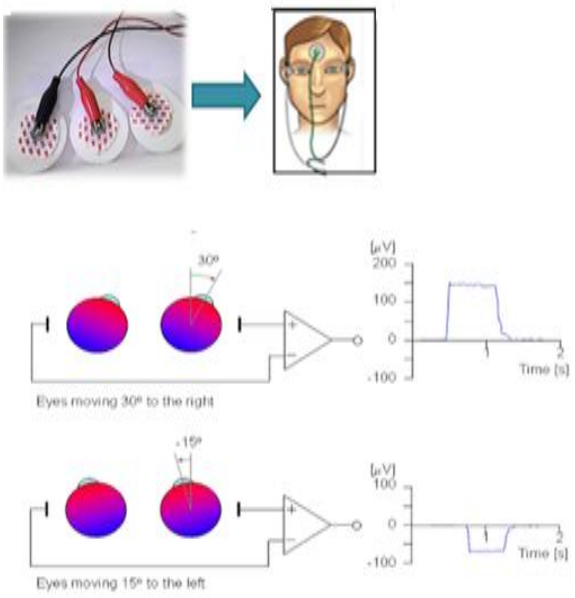


Fig2.1:- Signal Acquisition.

When person look in right direction positive waveform is generated and when he look in left direction negative waveform is captured.

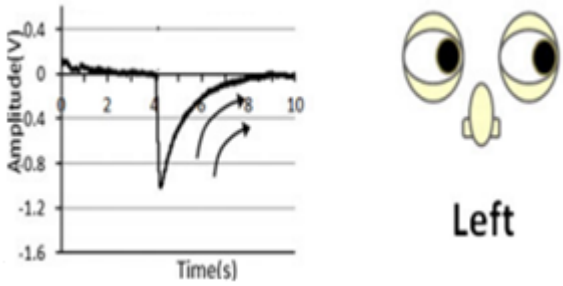


Fig2.1(a):-Signal capturing when person looking in left side.

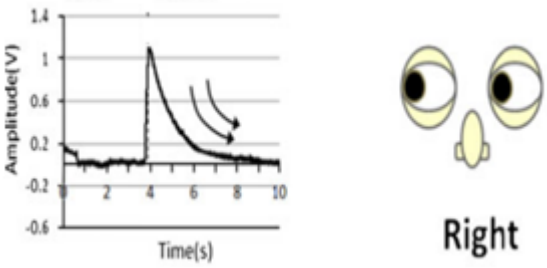


Fig2.1(b):-Signal capturing when person looking in right side.

2.2 SIGNAL AMPLIFICATION

This captured signal is given to amplifier circuit for further processing. Amplifier circuit has instrumentation amplifier and operational amplifier so that we get accurate and noise free waveform. High pass and low pass filter is also there which will limit the range of EOG signal within 0.01 to 10 Hz. This amplified signal is given to ADC because microcontroller only understands the language of digital signal. This signal is worked as input to operate the computer cursor so that to operate application.

This amplified as well as digital signal is then transferred into the computer system. This data is transferred through HyperTerminal device driver through USB port. This data transferring is vice-versa. Button clicked command is generated in computer and information is back transferred through USB port to microcontroller.

This microcontroller is then transfer received information to relay circuit so that LED can be operated that is it can be on and off.

III. RESULT

Whenever person look in right direction positive waveform is generated so that positive values are captured. This positive value can makes computer cursor to work as tab button and we are able to select the button.

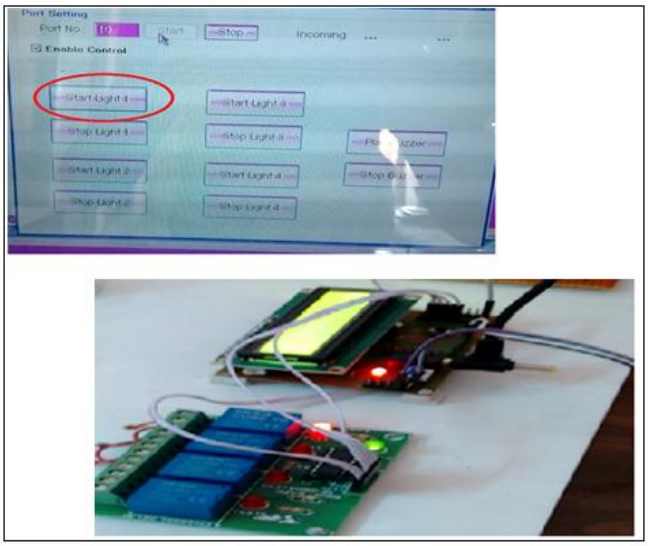
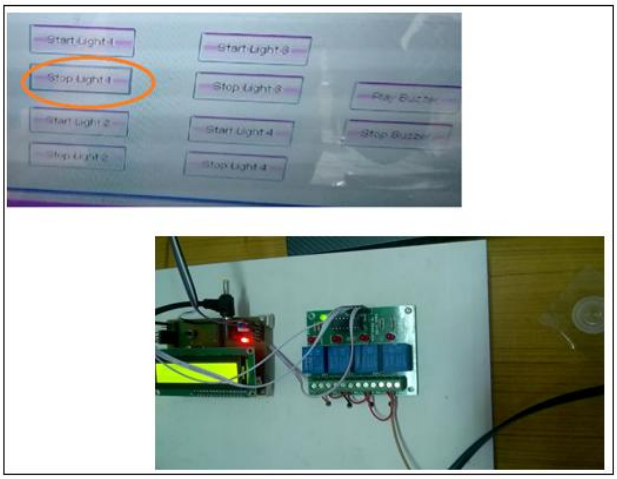


Fig3(a):-LED glows.

When person look in left direction negative waveform is generated so that negative values are captured. This negative



value can make click the button. That means selected button is clicked.

Fig3(b):-LED stop glowing.

IV. CONCLUSION

This paper proposes a real-time application which utilized electrooculography technology. With the help of this system a patient or disabled person is able to use electrooculogram to control the appliances. The proposed system can be further extended to various application control system for disabled person.

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