

# Wireless TV Control Using EOG Based Eye Movement Detection

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**Abstract-** Various human machine interfaces have been built to help disabled. Based on Electro- oculography (EOG) technology, the signals with different directions in eye-movements are detected and analyzed. This technology is intended to give functionality to peoples with severe motor disabilities to control television by moving the eyes. The project describes a method of controlling television using the electrical potentials developed by eye movements known as EOG. The EOG signals are recorded from electrodes placed at appropriate positions around the eyes. The captured EOG signal is detected analyzed and classify eye-movement based on features of interests. The project proposes to design EOG signal based eye movement detection and its application for controlling television, this includes analog system design and signal processing in embedded system followed by wireless interface to device control system.

**Keywords-** electro-oculography ; movements;

## I. INTRODUCTION

Communication is one amongst the requirements for an individual's being to move with the society. an oversized section of society suffers from one or the opposite reasonably motor disabilities as a result of accidents, medicine disorders, brain damages etc. wherever they can- not move their hand and leg however have capability of moving eyes. These disabilities force the patients to swear fully on their members of the family, relations or care-takers for everyday activities along with quality, for communication and dominant the house hold instrumentation etc. therefore an eye fixed primarily based human machine interface has been planned to commune while not verbal communication and body movements to reinforce the eminence of life for the disabled while not the care takers. an eye fixed controlled communication interfaces victimization voluntary movement are urbanized for immobilized people UN agency have severely paralytic and vegetative cell diseases. They increase the quality of life light-emitting diode by the differentially in a position people and increase their vanity. Eyes are the most effective choice to convey a message for paralytic patients. Eye movements may well be wont to perform straightforward tasks. The relative motion of the eyes is half-track and message is sent through

interfaces like electro-oculography (EOG). EOG is that the fashionable technique since its effectiveness is established and it's simply used. EOG is AN electrical potential obtained from eye movements that may be detected within the membrane of the attention. EOG recordings ar straightforward, cheaper and may be measured even once eye is closed for example throughout sleep than totally different ways and may be recorded with smallest discomfort. In general, part or absolutely disabled persons have a dominant vision which can be used as a residual necessary tool in developing their rudimentary works through human-machine interface. EOG may be a new technology of inserting electrodes on user's forehead round the eyes to record eye movements. EOG may be a terribly tiny electrical potential that may be detected victimization electrodes. The necessary issue builds that creates that produces} EOG much better than the opposite modalities may be a linear relationship of EOG signal over the attention movements that make it appropriate for the applying. the opposite reason includes higher face access, smart accuracy and backbone, smart vary of eye displacements and additional significantly economical.

## II. OBJECTIVE

The main intention of this project is to make physically paralyzed people independent.

To design and develop EOG acquisition and data processing system to help physically disabled persons to control television.

To generate the commands through eye movements without using hand gesture or voice control.

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## III. PROBLEM STATEMENT

In the previous research there are few methods proposed to control television like EEG system, IR LED based and camera based eye movement detection.

In EEG system, there is a possibility of incorrect and unintentional input because input is automatically selected even if the requirements are accidentally met.

Camera based eye movement detection uses MATLAB, to produce good eye movement detection, but it is of high cost and requires good lightening condition.

IR Led based eye movement detection is fatal for eyes for long time use as these systems are to be used 24X7 365 days, which not only block the eyes but damages eye completely.

**IV. LITERATURESURVEY**

The analysis on Human pc Interaction is nusus to assist disabled peoples to convert human intentions into management signals to control devices. Eye movements area unit behaviors which will be measured and their measurements offer the sensitive suggests that of learning concerning psychological feature and visual stimuli. By following the position of the attention movement helpful interfaces are often developed that let the user to commune and management in an exceedingly a lot of general manner. The brain-computer interface technology permits users UN agency area unit impaired or unfit to speak with the external surroundings. the fundamental plan of BCI is to translate user created patterns in encephalogram. during this system, there's a prospect of incorrect and unintentional input as a result of input is mechanically chosen albeit the wants area unit accidentally met.

A tv management mistreatment hand gesture recognition during this paper the hand gestures are often recognized simply and action performed area unit the first focus. Recognition system methodology includes the pre-processing segmentation and recognition. This methodology uses coloured glove, information glove vision primarily based and depth camera for recognizing the hand gesture and posture. to acknowledge the hand gesture, it needed an honest resolution camera and each time user should wear the gloves therefore it's inconvenient.

This proposes a clever work targeted on planning associate intelligent living-space with automatic speech recognition system to manage all home appliances primarily electrical and electronic devices. By introducing a replacement technique within which speech recognition principles area unit wont to generate management commands at the port. The programing language here is MATLAB. two main components within the system introduced is that the voice train method and voice recognition method. In howling space

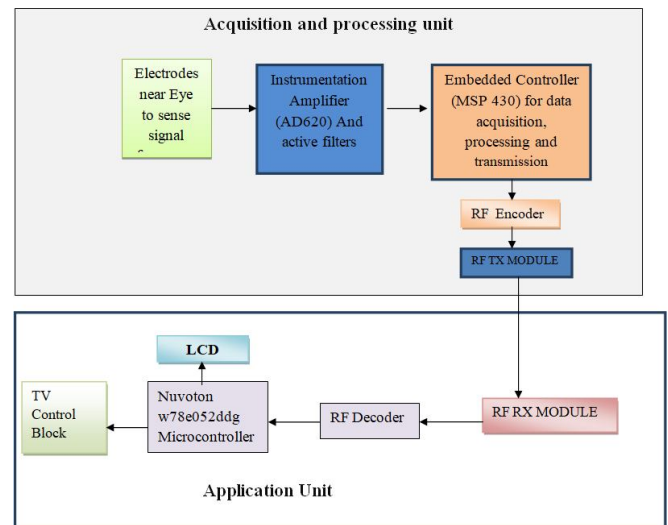
this technique cannot use as voice recognition can not be done. The people that area unit dumb cannot use this technique.

BLOCK DIAGRAM Block diagram consists of two units:

**ACQUISITION AND PROCESSING UNIT**

Electrodes capture the bio-potentials from the body but these signals are very weak and very noisy so there is invariable need of advance acquisition system which comprises of precision instrumentation amplifier, active filters, multiple gain block and for interfacing to ADC requires dc shifting(or clamping) of signal followed by clipping to avoid any residual negative voltages. To enable the signal for digital processing the analog signal is to be converted into digital counterpart the A/D convertor can be external or internal to microcontroller.

Microcontroller has to acquire signals from A/D convertor for all electrodes, process the signals and generates eye movement commands and these commands are made as data packets and transmitted it via RF interface with proper protocol and encoding.



**Figure 1: Eye movement detection and transmitter block diagram.**

**APPLICATION UNIT**

Whenever a command sequence comes from Acquisition part then that combination is compared with above combination with given time window and if both matches then respective device is operated.

Now this controller is also connected to relay board so action is converted into relays getting switch off and on. And hence functions are done.

Many other applications are also possible like Computer Mouse interface, virtual keyboard interface so disable can talk via this keyboard and send mails.

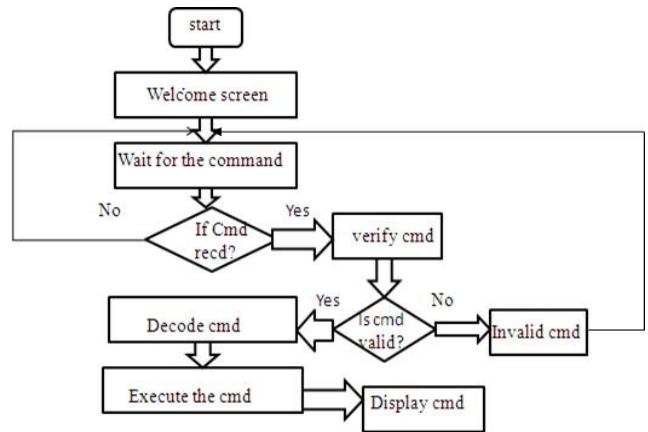
**V. METHODOLOGY**

Human-machine interface supported EOG permits interaction with a machine exploitation eye movement. EOG signal relies on the dipole at intervals the attention. it's associate electrical signal made from the voltage of the membrane (positively charged) and also the tissue layer (negatively charged). there's a gentle corneal-retinal potential from the rear of the attention to the front of the attention. This steady dipole is also accustomed live eye potential by inserting surface electrodes round the eyes. once the eyes square measure trying straight, the electrodes spaced equally from the eyes are at right angles with the eyes field which can end in the output to bezero.

The EOG stores the movement of the attention by measure activity, through electrodes. conductor used here square measure Ag/AgCl electrodes. These electrodes can choose the EOG signal. two electrodes square measure placed on the correct and left of the eyes (HR and HL) to notice horizontal eye movement. this technique is classed into 3 major parts: EOG signal assortment, transceiver, tv command generation. EOG signal square measure collected exploitation electrodes, preamplifier and A/D convertor. The signals obtained from the human subjects through electrodes square measure filtered and reborn to a digital signal by A/D convertor, this completes the acquisition half. Further, the non-inheritable signals square measure sent through the transceiver i.e., RF interface for future pre and post process of signals, this provides quality to the system.

Finally eye movements square measure extracted and sent as commands, cluster of commands combination square measure keep in micro controller incoming commands square measure matched and selected action is completed by application unit. the appliance system scans the incoming eye moments and compare with keep combination. Once the mix matches corresponding operate is activated.

The system is prepared and is expecting the attention movement commands. As shown in Figure two. the command is received, then begin collateral whether or not the received command is valid or not. If command is valid then rewrite it with the information keep and execute. If the received commands square measure invalid once more begin from thestart.



**Figure 2: Flowchart**

**VI. RESULTS**



a) TV Off



b) TV On



c) Volume Up



d) Volume Down

**Figure 3: Output display on LCD.**

Output of the system is eye movement commands L-eye left movement, R-eye right movement.

Initially TV will be in off state so LRL command is given to turn on TV. The same command given again turn off the TV. Volume up and volume down are controlled by LLL and LLR commands respectively.

## VII. CONCLUSION FUTUREENHANCEMENT

From this project it helps paralyzed person to be independent in their daily needs and can overcome the disadvantage of using IR Sensor and MATLAB by using EOG system which is most efficient and low cost which consume less power. The list of commands is given through eye movements as input and the command is verified, the output is seen in the LCD Display.

## VIII. FUTURE ENHANCEMENT

In this project dominant TV victimization eye movements through EOG signals square measure allotted effectively. In future adding favorite channels for the previous choice of user for TV. It may be programmed so to recharge the TV which may conjointly function a base for dominant wireless wheelchair that would end up to be a decent helpful technique for folks laid low with extraordinarily restricted peripheral quality.

## REFERENCES

- [1] S.Ramkumar, K. Sathesh Kumar, M. Ilayaraja and K. Shankar, A review-classification of electrooculogram based human computer interfaces, ISSN 0970-938, Biomedical Research Vol 04, 2018, pp1078-1084.
- [2] Kanwade, Snehal J. Ahire and Ashay R. Borkar, Study of EOG signal generation, Analyses, and acquisition system, International Research Journal of Engineering and Technology, Vol. 4, 2017, pp2092-2096.
- [3] Shenghong He and Yuanqing Li, A Single-Channel EOG Based Speller, IEEE transactions on Neural Systems and Rehabilitation Engineering, Vol 25, 2017, pp1011-1018.
- [4] Eunha Moon, Hyeonjun Park, Jargalbaatar Yura and Donghan Kim, Novel Design Of Artificial Eye Using EOG, IEEE International Conference on Robotic Computing, 2017.
- [5] M. Ranjith Kumar, M. Pravitha and P. Babu, Paralyzed Patient Eye Monitoring Using MSP430, International journal For Trends In Engineering and Technology, Vol 23, 2017 pp2041-2048.
- [6] Jyoti Jadhav and Prashant Avhad, Hand Gesture Based Home Appliances Control System, International Research Journal of Engineering and Technology, Vol 04, May 2017.
- [7] Alberto Abaroa Villanueva, A. Barak Guerrero Ortega, Fernanda Tapia Ruiz and Omar Morales Rodríguez, Electrooculografo (EOG), Researchgate, Nov2016.
- [8] Prashant Salunkhe, Ashwini R. Patil, A Device Controlled Using Eye Movement, International Conference on Electrical, Electronics and Optimization Techniques, 2016.
- [9] C.Kavitha and G. Nagappan, Sensing and Processing of EOG Signals to Control Human Machine Interface System, International Journal of Science, Engineering and Technology Research, Vol 4, May2015.
- [10] Samata Mutha, Dr. K. S. Kinage, Television control using hand gesture recognition, International Gesture on Computer Science and Mobile Computing, 2015.
- [11] Aswin Raj V and Karthik Raj V, EOG Based Low Cost Device for Controlling Home Appliances, International Journal of Innovative Research in Science, Engineering and Technology, Vol3, March2014.
- [12] Andre U, Eduardo and Jose M. Azor, Wireless and Portable EOG-Based Interface for Assisting Disabled People, IEEE Transactions on Mechatronics, Vol 16, 2011, pp 2005-2010.
- [13] T. Yagi, Y. Kuno, K. Koga, and T. Mukai, Controlling a Wheelchair by Use of EOG Signal, IEEE Intl. Conf. on Systems, Man, and Cybernetics, Taipei, Taiwan, vol. 4, Oct, 2006, pp. 3222-3226.
- [14] Kohei Arai and Ronny Mardiyanto, A Prototype of Electric Wheelchair Controlled by Eye Only for Paralyzed User, Journal of Robotics and Mechatronics, Vol 23, No.1, 2011.
- [15] <https://electronicexperimentsindia.wordpress.com/2014/10/rf-transmitter-and-receiver-sect>, accessed on October 24<sup>th</sup>, 2018.
- [16] <http://www.datasheet-pdf.com/mobile/791047/RCT-433-AS.html>, accessed on October 24<sup>th</sup>, 2018.
- [17] <https://electroicsforu.com/learn-electronics/16x2-lcd-pinout>, accessed on October 9, 2018.
- [18] [www.nuvoton.com](http://www.nuvoton.com), accessed on October 9, 2018.
- [19] Hercules Setup utility, online available on <https://www.hw-group.com/software/hercules-setup-utility>, accessed on October 9, 2018.
- [20] Energia online available on
- [21] <https://www.ti.com/tool/ENERGIA>, accessed on October 1, 2018.
- [22] The Eye Tracking System, <https://people.ece.cornell.edu/land/courses/ece4760/FinalProjects>, accessed on September 15, 2018.