

# Eye Blink Detection – A Survey

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**Abstract:** *We live in world where nothing is impossible. The technology has come handy not only for the physically abled, but also for the disabled. Several products are being launched to help the section of the society which comprises of the physically challenged population. Blink detection based methods are being explored for the paralysed to help them. A survey in these methods is discussed in this paper.*

**Keywords:** *Blink; Paralysis; Microcontroller; Motor Neuron Disease; Embedded System*

## I. INTRODUCTION

Paralysis is the loss of muscle function in part of your body. It happens when something goes wrong with the way messages pass between your brain and muscles. The paralyzed people who are completely immobile have a condition called Motor Neuron Disease from which they face a lot of problems in gripping, walking, speaking, swallowing, breathing. As the condition progresses, people with motor neuron disease will find some or all of these activities increasingly difficult. Quadriplegia refers to a condition characterized by weakness in all four limbs which may be caused by an infection like polio or by a neuromuscular disease or due to damage to the nervous system by an injury or another medical condition. Due to these kinds of diseases they need to face difficulties in their daily life interaction with their surrounding environment. They have quite low mobility and may lose communication abilities locked in their own body which causes frustration, depression and anxiety. In today's world, the highly advanced civilization believes a person's potential and power are not confined in only physical ability and strength rather it sees a disabled person as none but a differently able person. It is also believed that no man's potential should be wasted. The rapid growth of technology and development of sensing devices have created opportunities for physically impaired people to translate their interests in various ways where they can't do many routine tasks in the conventional way.

For utilizing the intellectual potential of these people, distinctive human computer interfaces (HCI) or human mobile interfaces (HMI) are needed. In an HCI or HMI, the communication between human user and computer

depends mainly on keyboard, mouse, touchpad or touchscreen. But a person with limited or no movement capacity cannot use these means. It leads to the urge of creating an alternative method that can interpret their choices.

Detecting blink can be considered an effective way because the last voluntary action a disabled person loses control of his eye-blinking. Spontaneous eye blinks come subconsciously from psycho-physiological state while voluntary eye blinks depend on the person's decision to blink. So, through voluntary eye blinks, the disabled person can deliver information. People suffering from diseases resulting muscle control loss, e.g., ALS, Palsy, Botulism, Guillian Barré syndrome, cannot use their hands or speak to communicate. So, an eye-blink based HCI system can utilize their capacity of critical thinking to make decisions especially for industrial automation purposes.

In this paper, the designed eyeblink based wireless device is used to capture intentional eyeblink and eye movement performed by the patient. The recorded series of blinks are then processed in microprocessor platform and converted to command signals to communicate. Blinking is an activity that serves physiologic maintenance, protective, and brain restorative functions. And our eyeblink based device is user friendly and wireless. And it is audible so that communication and control can be taken from distance. A major task of designing this eyeblink based wireless device is to produce sufficient commands rapidly and accurately. The facilities provided by a typical device is for the people at least who can have the ability to blink. In this paper, communication is targeted to find reasonable solution with smart speaking wireless device through eyeblinks. So, eyes play as primary input mode for disabled persons to communicate with the outside world.

## II. LITERATURE SURVEY

In [1], the electrodes are connected around the eyes to detect EOG signal. They were connected in a way that they can detect both horizontal and vertical eye movements. AD620 instrumentation amplifier were used to amplify the signal and detect if there is any change in eye position. It's an affordable and highly accurate instrumentation amplifier. Arduino has been used to

detect the eye movement direction and to give the corresponding command to the wheelchair. The EOG signal was recorded both in oscilloscope and in pc using Arduino. The signals were quite accurate. At first using the signals we have successfully turned LED on and off. The LEDs were turned on as long the subject kept looking left and right. And the LEDs were turned off when the subject was neutral. The blinks have also been detected. The disadvantage of this project is that since they connect electrodes around the eyes, it will be very uncomfortable for the patient as they have to wear it everyday.

In [2], Arduino and an eye blink sensor are used to detect the patient's eye blink. This project will identify the letters in the sentences using attimo keyboard, that the person wants to convey to us. The eye blink sensor is connected to Arduino along with a power supply and a switch is attached to ON/OFF the system. The eye blink sensor illuminates the eye and eyelid area with IR light, then monitors the difference in the light reflected using a differentiator circuit and photo transmitter. The eye blink sensor will be attached to Arduino nano. The Arduino board takes the input from the sensor, when user blink, this eye blink activates the present highlighted key and the letters gets eye images are captured and will be processed printed on the text area. This is how the project will identify the letters in the sentences using attimo keyboard, that the person wants to convey to us. Based on the blink the letters will get displayed. So some care taker should be there near the patient to read the sentences to help them.

In [3], a microcontroller with embedded software and hardware for IOT is used. This system to control a wheelchair is a prototype considering slow voluntary blinking detection in order to take decision about displacement of a wheelchair. The raspberry Pi 3 was selected. All commands are processed by a raspberry computational platform, saved locally and also stored in a IOT platform. The developed system discriminates an involuntary blinking from a low motion voluntary blinking and take a decision to move forward a model wheelchair. Here the developed system will going to discriminate an involuntary blink and low motion voluntary blink which means the patient should blink his eyes within time limit otherwise he will run out of the time. So those errors will occur.

In [4], EEG Capturing will be done to capture the brain signals. After the Blink Detection, Human implementation with GUI has been done here. At first the brainwaves need to be captured through electrodes. For this reason, three disposable foam pad electrodes are placed in three different positions. Next, we can capture EEG signal. Then signal will get filtered and filtered signal is fed into the Arduino. Arduino is used to sample and quantize that particular signal. There will be GUI (Graphical User Interface) is displayed on a screen where options of several tasks are available. Different tasks can be performed and controlled through eye blinks using the GUI. The user needs to blink once to select one of the

tasks. In order to perform that selected task, the user needs to blink once more within a certain time limit. So, this how human implementation with GUI has been done here. Here based on the blinks of predefined sentences, the wheelchair will move. The problem is if there any errors occurs in eye blinks by mistake user need to face massive difficulty.

In [5], in this project, a smart wheelchair is proposed to help out physically disabled people by using their eye blink activities. Eye ball images are captured using webcam. The images are given as input to the proposed system. Input images is processed using open-cv library of python. Here Eye pupil is the subject of interest for the system. Eye blink has been used for decision making purpose. Eye blink is defined as consecutive eye opening followed by closure of eye pupil. The duration of each blink is 20ms. Here raspberry pi built in Bluetooth module works as command data transmitter and HC-05 Bluetooth module works as command data receiver. Movement command is generated from raspberry pi and is transmitted via Bluetooth to Arduino. Arduino is the motor driver controller of the proposed system. HC-05 Bluetooth module receives command from the microprocessor and feeds to Arduino. Arduino sends command to motor driver. Then, the motor driver drives the motor according to given command. Here based on the blinks of predefined sentences, the wheelchair will move. The problem is if there any errors occurs in eye blinks by mistake user need to face massive difficulty.

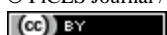
In [6], blink detection via correlation for immobile people is presented in here. The image of the actual eye is compared against an open eye image. As someone closes eyes during the blink, similarity between the images decreases, so does the correlation coefficient. The main challenge that the above-mentioned methods have is massive GPU requirement by the continuous image processing tool. Also, false positive detections occur due to gaze lowering, vertical head movements and failure to track the eye position.

### III. CONCLUSION

The patients who have communication problem in expressing what they want to express but cannot talk or move body are like people having a fully working brain confined within a nonfunctioning body. The brain of the victim would be awake and aware of the things around, he could evaluate stimuli, but impotent to express his thoughts to words. Eye blink based wireless device can be a solution which helps in communication and interaction for people who have Motor Neuron Disease etc. This project will convert the blinks into sentences. Hence if there is any important conversation that the person wants to have, he can convey through his blinks. Therefore, using the proposed block diagram, we will be overcoming the issues explained in literature survey.

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