REVIEW ON SMART EYE BLINK SOLUTION FOR MND PATIENT USING PYTHON

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***Abstract*: The growth of technology in medicine field diminish the difficulties of patients to a immense extent. The disease name Motor Neuron Disease (MND) .One of the major categories of physical disability leading to paralysis. MND patient unable to do work like talk, walk, express feelings and communicate due to the weakening of muscles. The patient has control only upon his eye blinks, the problems faced by MND patient is obtaining a solution day by day. The broad review on literature of different solution or MND patients is described in this paper. First it contain overview of project and the techniques used to solve the patients problem. Limitation and description of algorithm is compare our researched technique. The smart solution is obtained using python programming with open CV.**

***Keywords*: electrodes, Electro Oculography (EOG) and Video Oculography (VOG),Open cv, Electro Encephalo Gram (EEG), Raspberry Pi, HDMI, Open CV.**

I. INTRODUCTION

The progression of the human race has heralded along with it an introduction of novel methodologies to ease communication amongst the human species. Early inventions such as the telephone by Alexander Graham Bell, or more recent discoveries such as holographic communication systems which use augmented reality [5], have paved a path to make the world we live in, a far smaller place. However, it must be noted that, though such inventions are a boon to the common man, they prove to be a failure in assisting the differently-abled to communicate. Hence, it can be seen that over the past few years there has been a paradigm shift to assist this segment of the society as well. Various innovations such as Braille to speech convertors for the blind [6] or sign language to speech synthesizers for the hearing impaired [7], are gaining momentum. Similarly, there has been a spurt in the discovery of assistive devices for the speech impaired to communicate as well [8].

Speech impairment can be caused due to a wide variety of reasons – the most common of them being birth defects and deafness [9]. As mentioned above, such individuals can communicate through sign language by displaying various gestures for commonly used words. Unfortunately, this scenario changes when speech impairment is coupled with other medical conditions, which prevent the individual to locomote. Diseases such as Cerebral palsy, Motor neuron disease or Amyotrophic lateral sclerosis (Lou Gehrig's disease) not only restrains the individual to speak but also inhibits the mobility of limbs and other parts of his body [10]; rendering these traditional methods of communication to be futile. Hence, the other alternative for these types of patients would be to utilize devices, which would help them to communicate based on input stimuli provided by parts of their body not likely to be affected by the disease. According to recent literature and research conducted, these stimuli could be provided through ocular movements [11], brain stimulus signals[8] and also sphincter muscle contractions [12], which are generally spared by the disease.

In the case of utilizing brain stimulus signals, electrodes are placed at various positions on the head of the patient and these in turn measure the electronic activity of the brain. These electronic impulses are recorded in the form of an Electro Encephalo Gram (EEG) [13] and the same can be utilized to identify any input stimulus provided by the user, at any instance of time. For example, [14] utilized these signals, to identify winks and blinks of a user and used the same to operate a software system. Similarly [15] utilized the same technology to control home appliances such as televisions and mobile phones.

Another methodology to assist the paralysed to communicate is by tracking eye activity. This process is collectively known as oculography [16]. There are two ways in which oculography can be performed – Electro Oculography (EOG) and Video Oculography (VOG). In the case of EOG, electrodes are placed all around the eyes of the user and they measure any movement or blinks of the eyes based on electrical impulses generated while performing the same [17]. The authors in [18], [19] and [20] have used this approach in a multitude of applications such as drowsiness detection, human-computer interaction and blink recognition based machine control, respectively.

An alternative to this would be to utilize a camera to record eye activity and this approach is known as Video Oculography (VOG). By doing so, no direct contact with the patient is required and a live video feed or images of the face could be captured by using a camera placed at a distance from the individual. Once the facial images are obtained, suitable algorithms could be applied to detect the position of the eyes and their status [19]. In [20], eye detection has been performed using ellipse fitting. Similarly, [21] utilizes a circle matching algorithm to detect the pupil. In [22] the authors utilize a modification of the radial symmetry transform and Daugman's integro-differential operator to obtain the position of the iris. Though these methods offer a great deal of accuracy, they involve highly complex algorithms which slow down the process of eye detection. Also, many of these algorithms involve face and eye tracking as well, which remains redundant in our scope of work, since we majorly deal with users who are immobile.

In this paper, we describe a novel yet simple methodology to perform video oculography and convert a sequence of blinks identified through this process, into meaningful sentences, in the shortest time possible. Apart from this, the algorithm developed is assured of working in various lighting conditions as opposed to previous methodologies explained in [4] and [23]. Care has also been taken to ensure minimal intervention from caretakers or nurses assisting the patient. The next section describes the setup utilized for our experiments. Section 3 introduces the proposed methodology and the results for the same can be seen in Section 4. Section 4 also compares the time taken by the proposed methodology with respect to the existing approach described in [23]. The future scope of the work encompassed in this paper has been elaborated in Section 5.

III. RELATED WORK

Various system and methods are involved while doing the work on communication model that is for paralyzed patient.2.1 Augmentative and Alternative communication device by using morse code for paralyzed patient.[1] In this system , the device that uses the signals from patient and convert it into some form of data that is for communication but this system is very expensive, so that they have developed extremely low priced device that read and convert eyes blinking of patient to universally accepted code that is morse code. 2.2 Using eyes blink detection assistance for the paralyzed person.[2] In this method ,they have designed a real-time interactive system that can help the paralyzed to control the appliances such as fan,lights etc.through the prerecorded sample of eyes blinking. 2.3 Detection of eyes blinking by using video camera with region of interest[3] In this study,the patient eyes blinking are detected through the visual sensing system which is real-time subtraction of an image with the help of CCD camera. 2.4 Eye blink detection method to control mobile phone.[4] In this study the motivation of this research is those people are physically disable or who can not control the human mobile calls for interaction without using hands.For eyes and face detection they have used the haar cascade classifier.

IV PROPOSED SYATEM

HARDWARE USED

This section is also divided into 3 parts. The first part is the OS. The operating system on which the processor The Raspberry Pi processor is nothing but a series of small single-board computers developed in UK. The processor has a speed ranging from 700MHz to 1.2GHz with an on-board memory range from 256MB to 1GB. Secure SD slot is given and comes with built-in WiFi.

The speaker for the Raspberry Pi gives a voice and sound. The speaker is connected to a aux jack on the Raspberry Pi. It has its own power supply that can be charged with the USB port. The volume can be controlled with a button on the speaker or from Raspberry Pi.

The display screen is used in order to display the eye blinking and tracking motion. The screen is mostly important for the caretaker. It can guide him along the proper setup of the product. For the proper display, we have chosen to use 7'inch HDMI LCD display screen.

The iBall Face2Face HD night vision camera is used for video and picture capturing. This camera comes with the 5G wide angle lens which helps in providing the smooth video and lets to make the quality of video capturing high.[24]

SOFTWARE USED

This section is also divided into 3 parts. The first part is the OS. The operating system on which the processor works is the Raspbian OS. The second part explains the python coding environments and the third parts tells about the Open CV library which is an open source library.

Open CV is a library of programming functions mainly aimed at the real time vision. It was originally developed by intel and it was later supported by WILLOW GARAGE and is now maintained by IITSSEZ.

V Conclusion

This paper gives a literature review about smart eye blink solution for MND patient, which by researched will be overcome with proposed method with greater accuracy and quick response compare to older techniques.

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