

Eye Blink to Voice for Paralyzed Patients

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ABSTRACT

Prior, the deadened patients couldn't communicate and decipher thus the connection with the outside world happens over human-PC cooperation; for example, following eye developments and checking cerebrum waves. By and by, individuals are badly arranged to utilize mind development observing gadgets on the grounds that the clients must wear it. Our venture is shrewd framework which is exceptionally intended for MND patients. The patients can't speak with the consideration suppliers on the off chance that he/she is experiencing MND sickness over the bed. In this examination investigation, a component supports to demand others since it is both basic just as laid-back method that plans to help MND victims. This examination study gives an assistive gadget to distinctively abled patients predominantly incapacitated patients. Everybody realizes that deadened patients can't speak with the outside world, so this framework gives a help to them to speak with their own eye squint and get their prerequisites satisfied via overseers. Likewise gives an effective and exact outcome when contrasted with the current ones. Both of the guardian not being available or the patient necessity isn't satisfied a message will be sent to his relatives alongside the patient's prerequisite required. The business can utilize this investigation for secret word validation utilizing virtual keypad where dependent on the flickers comparing to the specific component in the virtual keypad individually. Our investigation focuses to produce an ongoing video preparing strategy, which identifies the eye squint absolutely independent of the head directions, day or night. In light of the flicker relating to the prerequisite by the patient is identified and it is covert to voice and given as a yield. Aside from this, a message alarming framework is additionally made so the overseers and the relatives will become more acquainted with about the patient's prerequisites.

Keywords :— Motor Neuron Disease (MND), eye blinks, video processing, paralyzed, message, alerting, requirements, virtual keypad.

I. INTRODUCTION

In nowadays, electronic gadgets are improving step by step and their interest are likewise improving (Smart telephones, tablets are case of this). The framework identifies the squint of the eye and recognizes a deliberate long wink and a typical eye wink. Tetraplegia is a circumstance of individuals who can't move parts underneath the neck. The framework proposed is utilized to control and speak with these sort of individuals [1]. In the advanced years inferable from the quick improvement in the expertise, rich interest of human machine is required. Eye wink is a quick demonstration of shutting and opening of eyelids. Flicker acknowledgment is a head supporting part for deadened patients to communicate their opportunity of articulation through eye squints [2].

We use Haar Course Classifier figuring for perceiving sub-area picture. An open and close eye goes about as organization for squint model decisions reliant on relationship estimation that is used. The methodology was expressly significant for people with genuinely crippled. A profitable procedure is proposed subject to picture planning frameworks for perceiving natural eye squints and making between eye-glimmer intervals. A Sequence Haar Classifier and Camshaft estimations focused on face following are therefore valuable

for accomplishment of facial rotate information. Flexible Sequence Haar Classifier [3] starting an arrangement of upheld classifiers are subject to highpoints of like haar utilizing association among eyes notwithstanding facial center which are valuable for eye arranging. The count results and advises that procedure can work gainfully dynamic applications.

An eye phone application which was made, is a system that is utilized to fit for driving convenient applications/limits using only the customer's eyes advancement and exercises (for instance Wink). Eye phone tracks the customer's eye advancement via phone's feature using the web camera joined to exterior of phone. Results that exhibit the Eye phone [4] is empowering route toward managing rousing convenient introductions without impacting way. A capable eye following system outfits an elective technique for correspondence with the people who are encountering extraordinary physical impediment. The proposed structure uses understudy segment for following the eye advancement. Deadened individuals come up short on the capacity to control muscle work in at least one muscle gathering. The condition can be brought about by strokes, ALS, numerous sclerosis, and numerous different ailments. Secured Syndrome (LIS) is a type of loss of motion where a patient has lost in charge of almost all deliberate muscles. These individuals can't control any piece of their body, other

than eye development and squinting. Because of the conditions these individuals can't talk, message, and impart when all is said in done. Indeed, even though individuals that have LIS are intellectually mindful, their considerations and thoughts are bolted within them. These individuals rely upon eye flickers to impart. Depending on medical attendant and overseers to decipher and interpret their squinting. At whatever point patients don't have an individual to peruse their Eyeblink, there is no methods for self-articulation.

Squint to talk offers a type of freedom to incapacitated individuals. The product stage changes over the eye squints to talk. Each component of the product can be constrained by eye development. Subsequently, the product can be freely worked by incapacitated individuals. Utilizing the product, patients can satisfy their necessities where the requirements are converted to voice dependent on which number the incapacitated patient flickers, relating picture will be shown as the yield. Alongside this yield furthermore, a message alarming framework is additionally made with the goal that the patients' necessities are referred to by their overseers just as their relatives. The product utilizes PC vision and Haar falls to recognize eye squinting and convert the movement into content. The program utilizes language displaying to foresee the following words that the client may squint. The product can be handily redone for every patient too. Squint to content is free open source programming that is accessible.

The fundamental goal of this investigation is to build up a framework that is progressively exact when contrasted with existing ones is our accuracy objective. The exploration study is giving help to incapacitated patients through eye flickers to speak with the outside world finishes up our help objective. This undertaking intends to build up a savvy video preparing framework that can be utilized by the individuals at a moderate cost when contrasted with existing framework. It plans to build up an effective ongoing video preparing framework when contrasted with the present frameworks. All realize that terminals are punctured to human body which is agonizing for the patients and the weight is likewise more, henceforth our undertaking intends to build up a framework where the incapacitated patients can convey without the utilization of anodes. This examination expects to build up a strategy that gives the yield quicker than the current techniques. The investigation expects to build up a dependable constant video handling framework to help the deadened patients. This examination study targets giving more precision when contrasted with the current frameworks, for example, Electro-Encephalography. The investigation gives mistake rate up to one and the staying ninety-nine percent exactness is given.

II. LITERATURE REVIEW

The objective of this paper is to propose a human PC interface for a completely crippled patient using eye

development and eye squint area. The motivation of this assessment is those people who are truly crippled or who can't control the human convenient calls for relationship without using hands. Here Initial advance was face identification where the eye area is found utilizing picture handling in MATLAB and furthermore utilizes SIFT calculation. Here with the assistance of eye developments the patient can choose in light of the fact that some predefined pictures will be available on the screen(e.g., water, food, juice, music, films and so forth.). In this manner dependent on eye squints the necessary necessities will be chosen and shown before the guardian. There should be more research to get successful data and yield identified with the task [5].

In this assessment, the patient eye squint is perceived through the visual distinguishing structure which is nonstop deduction of an image with the help of CCD camera. Here eye flash ID is used to control the mobile phones. It doesn't give a trustworthy system to accomplish the endeavor. Prior data on face territory or skin concealing isn't required, nor is any excellent lighting. The estimation and programming showed in this paper include an elective specific method that is fitting for people with extraordinary impairments. Results show the Flicker Connection's ability to decisively perceive unshakable and programmed squints, a huge idea for a system obliged by facial movements or prompts [6].

In this examination the motivation is fitting just to those people who are truly incapacitate or who can't control the human versatile calls for association without using hands. For eyes and face identification they have utilized the haar course classifier calculation. The utilization of Brain PC interface strategy isn't powerful as there are numerous inconveniences in that technique. Imaging techniques, contact based strategies, breath enacted strategies are utilized. Subsequently remembering every one of these techniques for the framework made the cost high for planning the eye trackers. At any rate, more research was up 'til now required for growing the degree of negligible exertion eye trackers [7].

Conditions, for instance, Secured Disorder (LIS) or motor neuron afflictions, for instance, Amyotrophic Horizontal Sclerosis (ALS) and Cerebral Paralysis are among the standard diseases that impact talk. In all or most such cases, the patient loses the ability to talk with the external world in an incredible manner in spite of the way that his knowledge is commonly unaffected. Not solely does that reason exceptional torment to that individual, yet notwithstanding his friends and family. In this report, it has organized an incredibly low assessed contraption that pursues and changes over eye-squints from the patient to an inside and out recognized correspondence code – The Morse code. This is a touch authorized system. This investigation is sensible to those people who are genuinely impaired or

who can't control the human compact calls for coordinated effort without using hands [8]

In this examination, it endeavors to develop another application for genuinely disabled children to talk with others by a squint. Taking into account compelled body improvements and mental issue, a noteworthy number of them can't talk with their families or parental figures. By then structure up the best way to deal with recognize opening and closing of eyes. We join the method using condition and using flightiness of picture to get progressively exact results to perceive a flash. The level of weakened is changed in adolescents, so one programming may not be useful to all the weakened youths. Here the arranged application was named "Eye Talk" where it would pick a letter if the customer squints when the cursor is on the letter. So the obstacle with this was the customer with insightful ineptitudes can't use this application. In this manner again another application was developed called "Eye Tell" Here subject to the situation the customer makes two pictures which are on the left and right screen and they can be turned here and there similarly. This application downside was only twenty one heaps of pictures can be taken care of and used [9].

The limit of mechanical recuperation devices to help debilitated end-customers is finally compelled by how much human-machine-association is proposed to be fruitful and capable in making an understanding of customer objective into computerized movement. Appraisal of the novel likelihood of binocular eye-following development to perceive intentional winks from programmed flash headings, to set up winks as a novel low-inertness control sign to trigger mechanical movement. Assessment of the different potential ways to deal with get the best result is found. Regardless, just differentiating the already existing examinations won't have the alternative to deal with the issue. In this paper the latest degrees of progress with fragile mechanical glove that assists with handy handle pathologies in performing activities of step by step living [10].

The paper study endeavors to develop an assistance application for genuinely obstructed children to talk with others by glints. In any case, it endeavors to recognize an eye locale by using OpenCv. Regardless, essentially taking a gander at the beforehand existing assessments won't have the choice to handle the issue. In this paper, a separated composing study is made on the progressing propels in eye gaze investigate and information in real game plan is shown to highlight the varying assortment in various points, for instance, stages, courses of action, customers, counts and execution gauges existing between different pieces of this field. Here right off the customer is arranged before camcorder, then the head stance and its edge is assessed, arrangement with eye trackers occurs and run head present depiction attempt is done by saving the eye followed data

determining the plot precision [11].

In this assessment, an endeavor is made to develop another application for truly debilitated children to talk with others by a glint. Because of compelled body improvements and mental issue, tremendous quantities of them can't talk with their families or parental figures. The patient eyes flashing is recognized through the visual identifying system. Eye glint revelation is used to control the PDAs. This doesn't give a reliable system to accomplish the endeavor close by. In this paper it proposes an adaptable look following system, Tracker, with a nearby eye seeing device. We grasped an insignificant exertion little scope point of convergence infrared camera to record a part's eye pictures consistently. Going before this paper there was no gaze following models assembled upward and no near eye show system with careful look following execution and supportive customer experience [12].

The natural eye is persuading host site for wearable social protection devices. Sharp intraocular central focuses can be used both to get external optical data and to give information to the customer, close by watching ones prosperity markers and transmitting the results to a central unit. This is called as the Eye-Fi advancement and can be sent to a point of convergence where headings to an introduced microelectronics chip are balanced either in a clear case of eye glimmers or in the light itself. This paper, demonstrates an organized circuit proposed to be inserted in an IOL, as a first stage to engage the point of convergence to later perform intraocular prosperity checking of the customer. The two central focuses are of acceptable quality. The patient's visual quality was near with the two central focuses, and optical quality was moreover similar. The shade of the point of convergence doesn't impact the visual idea of the patient [13].

In this work, the squint distinguishing proof computation for an introduced shut hover system for a reconstructing of facial muscle chips away at record of uneven facial nerve loss of movement is proposed. The tests were acted in an electromagnetic darkroom. Three rabbits and three chips were used in the test. This test isn't unequivocal as the pigs were not individuals. Here the structure functioned admirably while implanted in the body of the rabbits. From study it was suggested that the remote correspondence between the planning chip and the control program is strong which indicated the contralateral electromyography development and the working state of the inserted chip, change the fitting parameters to replicate the crippled muscle. It will in general be also improved by covering the processor chip with securing material, the chip was in a revealed metal state in this investigation which provoked the high radiation field power [14].

III. PROPOSED METHODOLOGIES

The implemented system consists of two main modules they are face detection and eye detection, the coded algorithm first detects the face using facial landmark detector that is implemented inside dlib library and then detects the eye region and draws a square box around the detected eye co-ordinates. Then the detected eye region will be converted into grayscale image the computer monitors the movement of eye brows and detects the eye blinks. The output obtained from this algorithm can be used as input parameters for implementing an interface to assist differently abled persons to communicate with the care takers and family, the system also displays the image on the screen and assist with the voice.

The image processing module consists of web cam, eye movement image (frame) which is captured from live video and processed with OpenCV where blink patterns sequences of long and short blinks are interpreted as semiotic voice messages the image processing module consists of web cam, eye movement image (frame) which is captured from live video and processed with opencv where blink patterns sequences of long and short blinks are interpreted as semiotic voice messages. it is further improvised with one more feature i.e., the image with respect to the eye blink is displayed on the monitor along with the message sent to the family members and care taker

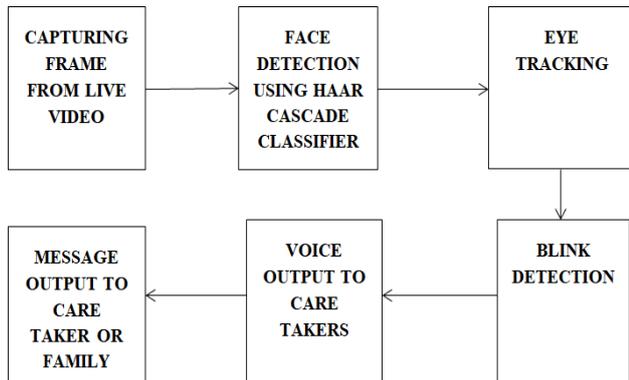


Fig. 1 System Architecture of efficient eye blinking

A. Eye Blink Algorithm.

The system consists of three major steps: Face Detection, Eye Region Location, and winking Detection. First the algorithm detects the face using OpenCV and dlib library, extract the attention region within the face. Using this bounding region, it detects the amount of blinks. The detection of the attention region is done using facial landmark detector implemented inside dlib. the attention blink is detected using eye localization,

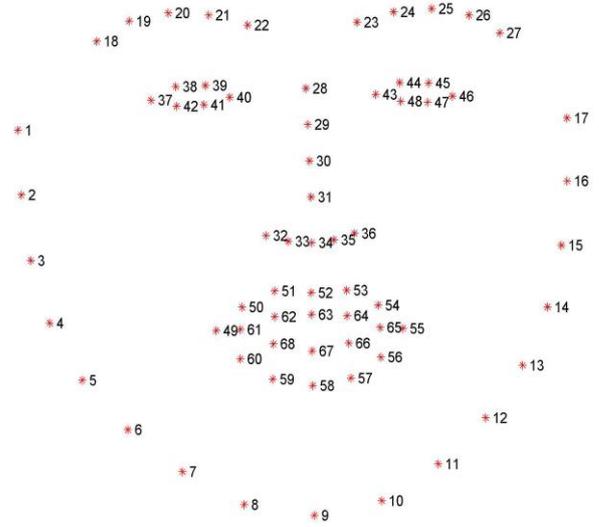


Fig. 2. The full set of facial landmarks that can be detected via dlib

Various algorithms are used to implement the eye blink detection algorithms. These algorithms are explained in further sections

1) *Face Detection*: Before detecting eye blinks, the important step is to detect the face of the patient. Face localization is initiated at initial phase to detect the face expression of the patient. This method should function smoothly in varying light conditions, head positions, face expression, hairstyle or glasses etc. The face will be detected with the assistance of facial landmark detector implemented inside dlib in real time. There are various solutions proposes for the face detection which include feature-based methods using eyes, mouth, and nose-based detection. The second method is that the template matching method supported pre-recorded template of the face. Third method detects the face using neural networks, that trains the system using haar-cascades and facial landmark detector implemented inside dlib to detect face expression like eye, nose, ear, etc. The dlib library is employed plot 68 points on the face to detect particular facial feature. Using these indexes, the specified region of face will be extracted and a bounding box will be computed round the eyes.

2) *Eye Region Localization*: In this algorithm, eye region is found from live video frames. From the detected face, the portion of eye is found with the assistance of facial landmark features. From the extracted eye region, it's further processed for winking detection. eye region localization is

completed at the initialization of the system. The located eye region from the detected face is further used for eye tracking and blink detection. The localized region is found as shown in fig. 3.

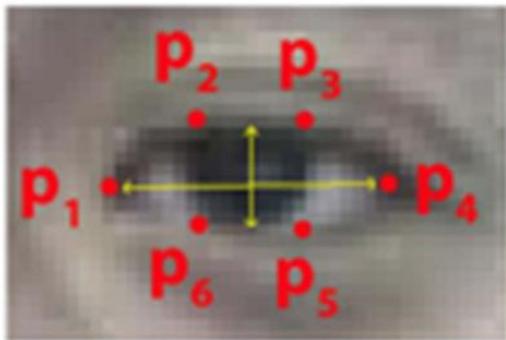


Fig. 3. The 6 facial landmarks associated with eye.

3) *Thresholding*: In thresholding, we discover whites of the eyes within the extracted eye region. With the assistance of time library, it is often determined if the white region of eye disappears for a period of time which is indicated as a blink. A blink detection is often calculated with the assistance of the EAR (Eye Aspect Ratio) which is obtained using following formula as given below.

$$EAR = \frac{\|p_2 - p_6\| + \|p_3 - p_5\|}{2\|p_1 - p_4\|}$$

Points on the eye are represented as p1, p2, p3, p4, p5, p6. After the successful detection of eye blinks the parallel assigned image and the voice will be alerted to the caretaker to assist the patient.

IV. RESULTS AND DISCUSSIONS

Our venture intends to offer a type of freedom to deadened individuals to speak with outside world. Building up a video handling framework progressively that identifies the eye flickers and changes over to voice. In light of the quantity of flickers independent of the developments of the head either day or night, the MND patients will be helped via overseers. It is an unassuming and peaceful methodology with high accuracy and hurried response contrasted with past frameworks.

A Performance Parameters.

The key parameters influencing the examination discusses light and separation factors. In the event that the eyes of the client and the webcam separation is long, at that point the discovery procedure is troublesome. The lighting is another key parameter influencing dependent on

utilizing the typical light or a fake light.

Formula to find accuracy:

$$\text{Overall accuracy} = \frac{(TP + TN)}{(TP + FP + FN + TN)} * 100\% \quad (2)$$

$$\text{Detection Accuracy} = \frac{TP}{(TP + FN)} * 100\% \quad (3)$$

The various screenshots related to the research paper are as follows:

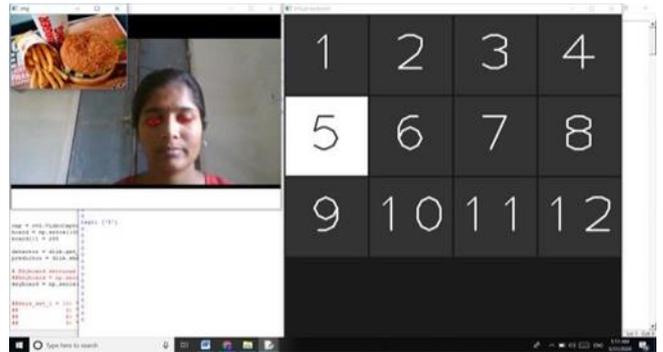


Figure 4

The above screenshot describes that when the number 5 appears and there is a blink it gives a voice message food as well as displays the image of food as shown in the figure 4.

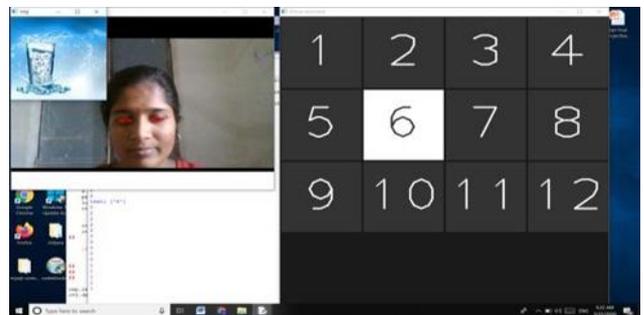


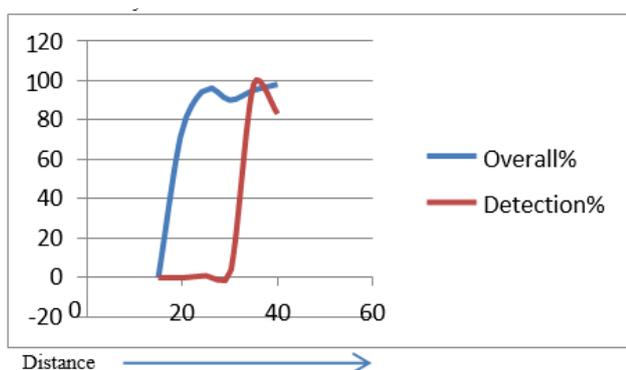
Figure 2:

The above picture represents that when the number 6 appears and a blink happens it gives a voice message water as well as displays the image of the water as shown in the figure. Similarly, every number has a corresponding requirement assigned so that the paralyzed patients can fulfil their needs respectively. A message is also pinged to the person whenever there is a blink occurring corresponding to the need required.

I. TABLE
ACCURACY MEASURES

Distace (cm)	TP	FP	FN	TN	Overall %	Detection %
15	0	0	0	0	0	0
20	0	0	18	53	75	0
25	1	0	99	2489	96	1
30	3	0	265	2300	90	1
35	221	77	4	1355	95	98
40	142	16	30	2671	98	83

Graph representing accuracy:



The underneath chart speaks to the exactness of the exploration study where the sources of info are taken from the precision estimating table 1 where the general rate at separation 40 cm gives precision of 98 percent and level of identification is 83 percent. One can see that as the separation expands the general precision rate increments upto separation of 40 cm.

This examination gives an assistive gadget to distinctively abled patients fundamentally deadened patients. Everybody realize that incapacitated patients can't impart so this framework gives a help to them to speak with their own eye squints and get their necessities satisfied via overseers. It gives a productive and precise outcome when contrasted with the current ones. Either if the guardian is absent or his necessity isn't satisfied a message will be sent to his relatives alongside the patients prerequisite required. The business can utilize our venture for secret word verification utilizing virtual keypad where dependent on the flickers comparing to the specific component in the virtual keypad individually.

V. CONCLUSION

This exploration study plans to draw out an answer for the deadened individuals with no mischief to their body remotely or inside. It overweighs the recently evolved models

in this field since none of the segments are in direct contact with the patient's body subsequently it unquestionably will end up being more secure. Acquired outcomes show that the proposed calculation takes into consideration precise discovery of intentional eye-flickers with the pace of 98% exactness. Performed tests exhibit that the planned eye-flicker controlled UI is a valuable apparatus for the correspondence with the machine. The assessments of the clients with diminished working were energetic. This exploration study might be additionally improved and created for the secret word confirmation and in IOT applications, for example, room computerization utilizing equipment types of gear and methods.

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