

# Review paper on Implementation of Communication Model for Paralyzed patient using Non-invasive technique

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**Abstract**— Speech disorders is the most critical condition for human being which causes from brain damage, stroke to paralysis and several other diseases. It can also causes from motor damage during accidents and leave a person completely unable to communicate. The only ability to remain intact in patients suffering from speech disorder and paralysis is control over eyelid movements. The patient having only way to interact with others by eyes movement only. By using this terminology making a model where input will be eyes blinking of paralyzed patient. This paper is related to overcome the problem of communication (speaking or interaction) of paralyzed patient and going to implement such a communication model so that patient will able to communicate with the help of eyes blinking by using camera which is a non-invasive technique. The main objective of this study is bio medical sensors are not required for eyes blinking detection, using wireless device to send the message towards patient's caretaker side system to avoid complexity of the system.

**INDEX TERMS**—EYES BLINKING, MATLAB , NON-INVASIVE, PARALYZED PATIENT.

## I. INTRODUCTION

Any patient who suffers from speech disorder is the most serious problem in which he has to face lot of things which causes lack of communication with others. If paralyzed patient with speech disorder can not interact with other and can not express his feelings by any other part of the body. Paralysis is the complete loss of muscles function in any part of a body ,causes due to when there is a problem of passing a body reaction message from muscles to brain. In other words ,It also related with loss of feeling and other bodily function.

It is caused by problem with nerves or spinal cords ,a person with paralysis will usually have some form of nerve damage. There is an important to research on this topic, because there are many people which are suffering from this condition ,but there is a need to think about their families, care- taker or health care provider, because they want to communicate with each other. Number of people living with paralysis for their treatment required more cost. Each

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paralysis cost the health care system a lot of money. For this things the research is important.

Paralysis is classified in different types. paralysis can be localized - where specific part of the body is paralyzed such as the face or hand and other can be generalized - where a larger part of the body is affected. There are also some medical terms in which paralysis is classified, for example-a)monoplegia- where one limb is paralyzed, b)hemiplegia - where arm or leg of one side of body are paralyzed,c)paraplegia - where both legs and some time the pelvis and some of the lower part of body are paralyzed,d)tetraplegia - where both the arms and legs are paralyzed. There are three most common causes of paralysis that stroke, head injury, multiple sclerosis. currently there is no cure for paralysis. Some paralyzed patient can not move any other part of the body other than their eyes. There are many techniques use for the appropriate treatment for paralyzed person. But in the present research is focusing for such a model which is separate from the body or such a system which does not harm the body.

The input will be eyes blinking of the patient. Previously there were used the medical sensors for detection of eyes blinking such as EOG or EEG sensors. Now in this system ,the detection of eyes is through camera. The work on the detection of eyes blinking through camera is already done. But the new concept is that, if the patient want any help or he has any emergency or if he want to give any type of message to his caretaker then such messages will detect or select by eyes blinking of patient by selecting the images which will create on the screen and patient will be select that pictures through camera by eyes blinking and that message will display on the notification system or on the alert side system. In this system, image processing techniques are using and realtime face and eyes detection with the help of camera. The person living with speech disorder having lack of communication. He has only way to communicate is eyes movement only. The work on eyes blinking detection is already done with lot of techniques. The communication with the help of eyes blinking is possible. The present work is only for this motivation that patient can easily interact. If this system is apply for the handicapped person will definitely helpful for him and the quality of life of the paralyzed patient will be improve. The complexity of the system will be reduce.

In the biomedical field ,the diagnosing of the paralysis is done with the many modern methods. Some paralyzed patient can not move a single part of the body other than their eyes. Therefore some researchers have worked on the eyes

blinking detection and face detection ,but they have done with various methods.The work on the detection of eyes blinking and the detection of the face is done with the help of many modern methods.some have used bio medical sensors for detection and diagnosed the disorder through the huge hardware which are very bulky.The system are not cost effective as it comprises a lot of circulatory.So it is necessary to reduce the hardware complexity.

### 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 WORK

In this present research of communication model, the overall procedure will be following-There are two systems,one is patient side system and another is notification or alert system.Initially the paralyzed patient will be there either in sleeping or in sitting position,according to that the camera will be set near or in front of the patient's face.Camera will connect to the system.The camera is IR camera because if there is darkness in the room camera should be capture the real-time video in darkness also and IR camera having this capability.So initially the camera will capture the face or detect the face with the help of Viola-Jones algorithm for face detection,next will detect the eyes portion and from eyes portion will detect the eyes blinking.These are the basic requirements or processes for the eyes blinking detection in the image processing.

If patient have a wish for any kind of requirement for example : water ,food ,music,help or entertainment then he will select the images which are shown in Fig.3 with the help of eyes blinking.After selecting messages by the patient ,the message will be send wirelessly towards alert side system and display the message towards alert side system with help of microcontroller display and connecting a buzzer to alert the caretaker of the patient.

The block diagram of the system is as shown below:

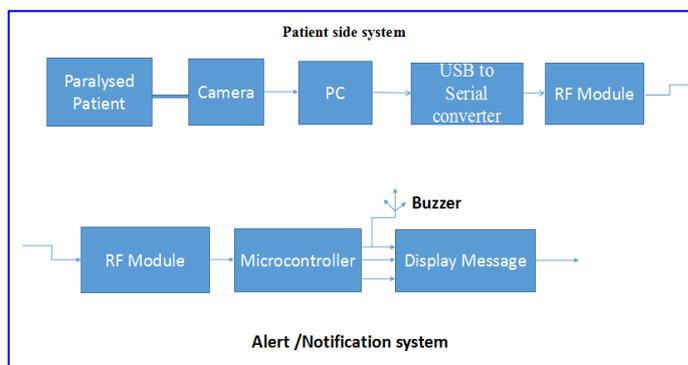


Fig.1-Block diagram

The data from system cannot directly pass on wireless module,there is a necessary USB to serial converter between system and RF module.This system can be use in hospitals or at home or wherever the paralyzed person is available.This system will very useful for the caretaker or health care provider or for family members of the paralyzed patient to interact with that person.Because every time person can not stay near the patient to identify his requirements,it is impossible to any person to take care of the patient.For this purpose communication model is very require for the patient.If the care taker is at different place in home or in a hospital then the message will be send wirelessly toward caretaker side and display the message whatever the patient have to wish on micro controller display and to alert the buzzer will play.

### V. SOFTWARE VALIDATION

In this present research there are two basics methods that are using face localization and eyes portion detection.The technique is using non-invasive technique means the system which is separate from the body and for this purpose the camera is using so that it can capture the real-time video of eye movement and detect the eyes blinking easily.Face localization is important in this research because to avoid false person in front of camera in MATLAB or to recognized the proper extracted eye portion. The overall system will be in front of patient , because paralyzed patient not able to move anywhere.For this methods the algorithm are used which are described as follows and the flow diagram for this algorithm is shown below.

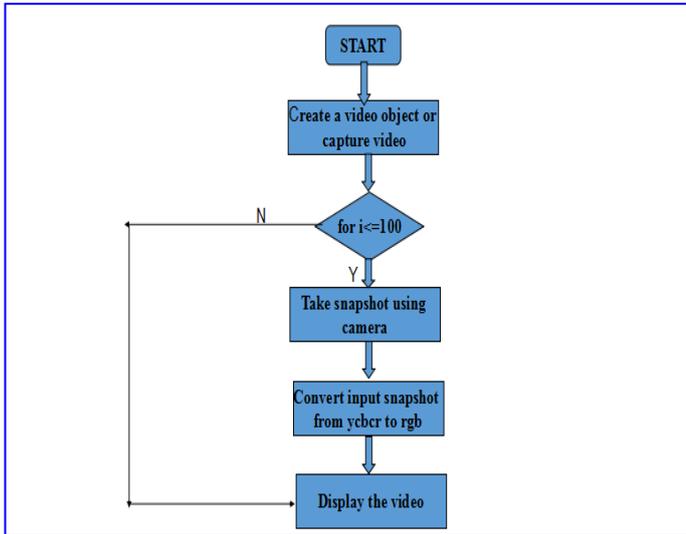


Fig.2- Flow chart

The above algorithm is the Viola-Jones algorithm for face and eyes portion localization. This are the initial stages in an image processing for face and eyes localization. For the detection of eyes the very basic eyes and face localization. The technique is using in the present research is image processing. In this process first face detection is executed then eye region will locate in the image processing in MATLAB. In this research, there are using SIFT concept for key point detection. SIFT stands for scale invariant feature transform is a precise rule in a computer vision to detect the local feature in images. In this application SIFT plays important role to find the matching points or key points and the concept of face and eye recognition in image processing SIFT is the best solution. According to the SIFT the unvarying characteristics of the images are extracted and to perform true matching points from different images of the different views. The characteristic have shown to be constant during scale and rotation of image, noise and illumination change as well as robustness. The SIFT algorithm capture an images and convert it into cluster of general lineament vectors. There are many application of SIFT such as object recognition, tracking of video, recognition of gesture etc. In this concept we can extracted the interesting region in the image. This technique plays very important role in this research. Because we need only eye portion to detect the blinkings and all this model is depends on the eye blinking detection of the patient. The steps of scale invariant feature transform is shown below:

Steps for SIFT algorithm for key point detection:

1. Constructing the scale space
2. Extrema detection
3. Key point Elimination
4. Orientation assignment
5. Computation of descriptor

The very first step of SIFT algorithm is construct the scale space. In this step the scale space is used to recognized images at different distances. Scale space is important when accomplished to recognized the features in an image. In this algorithm generate the scale space of the image to blur the image and then shrink it and use that blur images to generate another set of images that is called difference of gaussian. Another step is taking difference of gaussian that takes the blurred image and apply second order derivative on it and it

is better to find the key points (Interest points), second order derivative is very responsive to noise. Next step is detection of extrema which is used to find the scale at which characteristics has the highest points, the next stage is key points orientation and further is descriptor which gives the exact interest points. Descriptor includes  $k \times 128$  matrix. There are some images which are shown below in Fig.3 which are using for patient so that he can select the image what he have to wish in the screen which will be in front of the patient and the data will be send towards another system wirelessly and will display the result. The advantages of this images are if patient is illiterate if he can not read the word which mentioned in English at least he can be recognize the things with the help pictures such as bottle of water, food, etc.



Fig.3-The patient can be select the above images with the help of eye blinking and display the result on patient's caretaker side or at alert system

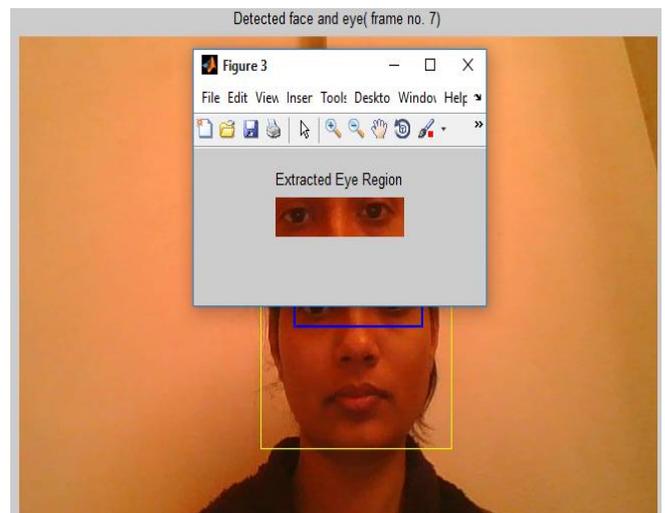


Fig.4-Extracted eye region in MATLAB for blink detection and to select the above messages in the for of pictures which are shown in Fig.3 with the help of eye movement.

The system which is arranged in front of the patient is capable because the patient will be in stable condition and he will not be able to move anywhere. So the whole system will be separate from the body which is non-invasive.

## VI. HARDWARE VALIDATION

In this research the hardware to be used towards an alert system is a microcontroller display which will display the result. The microcontroller is AVR ATMEGA16 and a 16x2 LCD display and the camera is ROBO K20. The hardware is shown as below.



Fig.5-Alert side system or Notification system/hardware

## VII. Conclusion

The system modeled can give and deal with the real-time communication for the paralyzed patient in terms of eye blinking and by selecting the images and send the result towards another system which is an alert system. The system is non-invasive and which does not harm the body, it provides a major role while treating the paralyzed patient and will be helpful to overcome the emotions to interact with others with this communication model.

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