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# Efficient Hand Gesture Recognition for Physically Challenged People

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**ABSTRACT:** One of the important problems that our society facing is people with disabilities which are finding hard to cope up with the fast growing technology. About nine billion people in the world are deaf and dumb. Communications between deaf-dumb and a normal person have always been a challenging task. Generally deaf and dumb people use sign language for communication, Sign language is an expressive and natural way for communication between normal and dumb people. Some peoples are easily able to get the information from their motions. The remaining is not able to understand their way of conveying the message. In order to overcome the complexity, the artificial mouth is introduced for the dumb people. So, we need a translator to understand what they speak and communicate with us. Hence makes the communication between normal person and disabled people easier. This work aims to lower the barrier of disabled persons in communication. The main aim of this proposed work is to develop a cost effective system which can give voice to voiceless people with the help of Sign language. In the proposed work, the captured images are processed through MATLAB in PC and converted into speech through speaker and text in LCD by interfacing with Arduino.

**KEYWORD:** - Disabled people, Sign language, Image Processing, Arduino, LCD display, Speaker.

## I. INTRODUCTION

One of the most precious gifts to a human being is an ability to see, listen, speak and respond according to the situations. But there are some unfortunate ones who are deprived of this. Humans know each other by conveying their ideas, thoughts, and experiences to the people around them. There are numerous ways to achieve this and the best one among the rest is the gift of "Speech". Through speech everyone can very convincingly transfer their thoughts and understand each other. It will be injustice if we ignore those who are deprived of this invaluable gift, the deaf and dumb people. Communication is the best media used by the people to communicate with each other. The problem arises when normal people and deaf-dumb people want to communicate with each other [15]. It actually becomes the same problem of two persons which knows two different language, no one of them knows any common language, so it becomes a problem to talk with each other and so they requires a translator physically which may not be always convenient to arrange and this same kind of problem occurs in between the Normal Person and the Deaf person or the Normal Person and the Dumb person.

To overcome this problem, we introduce a unique application. Our application model is a desirable Interpreter which translates. Natural English Sentences as, an text input by Normal Person for Deaf Person and Sign Language, in form of Gesture by a Dumb Person to Synthesize English Words which have a corresponding meaning in Sign Language which interprets a particular thing, as an Audio Output for Normal Person. This will help Normal and Deaf and dumb communities by removing the communication gap between them [4].

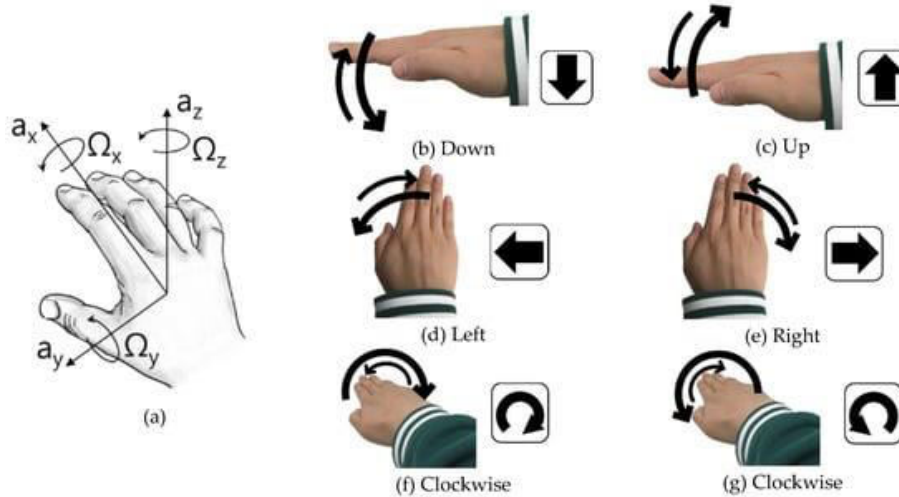


Fig 1: Gyroscope-Based Continuous Human Hand Gesture Recognition

The big reason behind this is lack of communication, as deaf people are unable to listen and dumb people are unable to speak. The communication between a dumb and hearing person poses to be an important disadvantage compared to communication between blind and ancient visual people. The blind people can speak freely by implies that of ancient language whereas the dumb have their own manual visual language is referred as sign language. The only means of communication available to the deaf and dumb people is the use of Sign Language [5]. Limitation prevents them from interacting with the outer world to share their feelings, creative ideas and Potentials.

## II. BACKGROUND

Shraddha R. Ghorpade et.al [15], reviewed various methods and techniques which are provided by different authors for recognition of hand gestures. Hand gesture recognition provides an intelligent and natural way of human computer interaction (HCI). Human computer Interaction (HCI) is a branch of artificial intelligence, it is a scientific discipline that is concerned with the development of algorithms that take as input empirical data from sensors or databases, and yield patterns or predictions thought to be features of the underlying mechanism that generated the data. Hand gesture is one of the most expressive and most frequently used among a variety of gestures. Applications of hand gesture recognition are varied from sign language to virtual reality. Thus, we propose a new technique called artificial speaking mouth for dumb people which will be very useful to them for conveying their views to others. Mute people can use fingers to perform hand gesture and it will be converted into speech so that normal people can understand their expression.

Pallavi Verma et.al, [10] describes about a hand gesture based device for deaf and dumb person as communication for a person, who cannot hear is visual, not auditory. There is a barrier in communication between these two communities. This work aims to lower this barrier in communication. The main aim of the proposed project is to develop a cost effective system which can give voice to voiceless people with the help of Smart Gloves. With the proposed work sign language is converted into text and speech using flex sensor and microcontroller. It means that using smart gloves communication will not be a barrier between two different communities. Gowri.D and Vidhubala .D [5] have proposed a work to produce an algorithm for recognition of hand gestures with accuracy. This project has a hand gloves model for gesture recognition. MEMS sensor is used to detecting the hand motions based on the stress. This project is used for the deaf and dumb people to communicate with normal people. The hand motions are detected by the MEMS sensor and the values are stored on the microcontroller memory unit. The output voices are previously stored on the voice processor unit. Depends on the hand motions the output will be displayed on the LCD and also played through the speaker.

R.Pradipa and Ms S.Kavitha [12] proposed a discussion of various techniques, methods and algorithms related to the gesture recognition. The hand gesture is the most easy and natural way of communication. Hand gesture recognition has the various advantages of able to communicate with the Technology through basic sign language. The gesture will

able to reduce the use of most prominent hardware devices which are used to control the activities of computer. The Segmentation is the process of finding a connected region within the image with a specific property such as colour or intensity, or a relationship between pixels, that is, a pattern and the algorithms should be adaptable. There are few Segmentation algorithms such as Anticipated Static Gesture Set, Hand Segmentation Using HSV Colour Space and Sampled Storage Approach, Hand Tracking and Segmentation (HTS) Algorithm provide the segmentation of given input to be sent for recognition without any noise. The Hand gesture recognition models such as Hidden Markov model(HMM), YUV colour space model, 3D model and Appearance model will detect the input and process them for recognition.

Ms. Rashmi R Gundaet.al [14] have proposed the project about design and development of a user friendly technology to communicate between the deaf as well as dumb person and a blind person .In this project image processing is used to recognize gesture, comparing that with stored database, recognizing correct expression using MATLAB and displaying output in the form of voice through voice processor. And on other side speech of blind person is transmitted to pc through mike. Speech signal is processed through MATLAB present in the pc and displaying as text through LCD by interfacing with micro controller. Pooja Dongare et.al, [11] proposed a project that aims to lower the communication gap between the deaf or mute community and the normal world. This project was meant to be a prototype to check the feasibility of recognizing sign language using sensor gloves. With this project the deaf or mute people can use the gloves to perform sign language and it will be converted into speech so that normal people can easily understand. The main feature of this project is that the gesture recognizer is a standalone system, which is applicable in daily life.

### III. METHODS

The user/patient will perform the certain gesture on the above of the gesture sensor and which will be transferred through the RF communication (Hc-12 wireless sensor) from Arduino 1 to Arduino 2. And the signals will further send to the L298N motor driver i.e. Arduino one will act as a transmitter and Arduino two will act as a receiver. The user will perform certain blink actions/gesture in the front of the web cam i.e. if the user blink the left eye then the wheel chair will move in the left direction likewise if the user blink right eye then it will move in right direction. For the communication will be using the Bluetooth serial communication or can be using RF module for sending signals to the motor driver.

Usage of the system as shown in Fig. 1 and Fig. 2 were tested several times to achieve the desired accuracy and the system is developed considering a major issue with the gesture recognition that it should detect only the action performed by the user or the patient. As this will is themajor drawback in every proposed system. The HC-12 Wireless Communication and the Bluetooth Module is used for the communication between the transmitter and the receiver. A Bluetooth serial communication is used for the eye tracking as the laptop frequency is not matching the HC -12 frequency. The APDS-9960 gesture sensor have 6 default gesture pattern and can be increased by combination of these default gesture pattern. For eye gesture the proposed system have 4 working gesture pattern i.e. left, right, forward and stop. For the reverse/back gesture, it is in implementation phase as the accuracy is achieved less (logic for the gesture is blink any one eye 2 times).

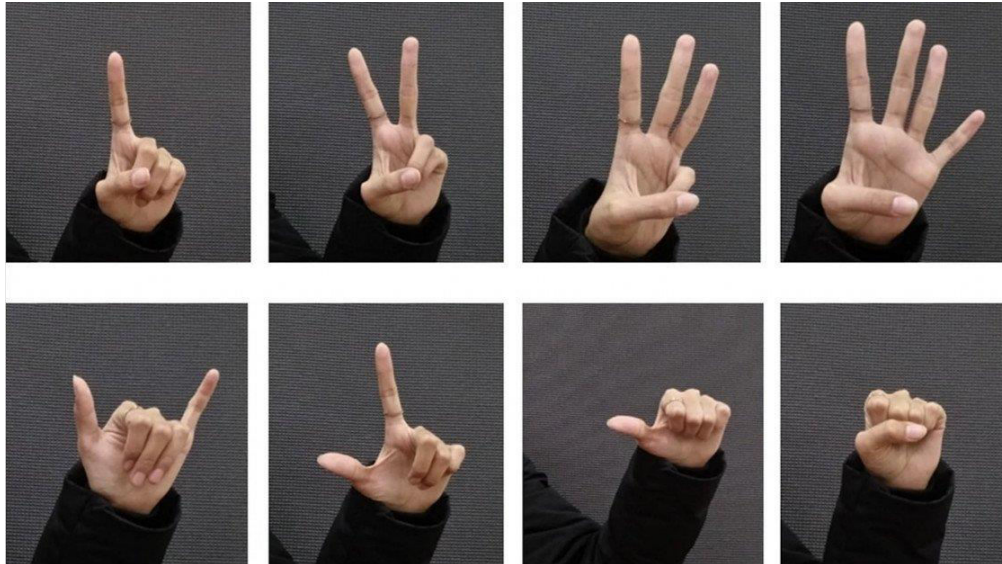


Fig 2: Researchers Develop New Hand Gesture Recognition Algorithm

Image processing is processing of images using mathematical operations by using any form of signal processing for which the input is an image, a series of images, or a video, such as a photograph or video frame, the output of image processing may be either an image or a set of characteristics. Pre-processing is a common name for operations with images at the lowest level of abstraction both input and output are intensity images. The aim of pre-processing is to improve the image quality to make it ready for further processing by removing or reducing the unrelated and surplus parts in the background of the images. It aims to correct some degradation in the image. A Pre-processing is very much required stage for reducing the computational noise using filters. The Pre-processing is applied to images before we can extract the features from images [1].

#### IV. RESULT ANALYSIS

Image acquisition is the process to capture the hand gesture images which represents different signs. The resolution of various images captured by the camera may not be the same and it results in different resolution. For accurate comparison of the features and to reduce the errors present in the images, all the images should be scaled to a uniform size. Here 36 hand gesture images were considered with numeric (0-9) and alphabets (A-Z) as shown in Fig-3. Thus the images for training and testing are captured in a white background with camera and database is created [6]. The system works offline recognition i.e. gives a test image as input to the system and system tells which sign is recognized

The system reflect as the cost effective system as a survey and analysis done a minimum cost for the actual wheel chair will be Starting from 15000 Rupees (Indian) and can goes up to an higher amount depending on the component used such as there are many RF modules which can be used further in the proposed system. Also the camera and others sensor too then developing of an emergency system. A gray scale or greyscale image is one in which the value of each pixel is a single sample representing only an amount of light, that is, it carries only intensity information. The luminance of a pixel value of a gray scale image ranges from 0 to 255.

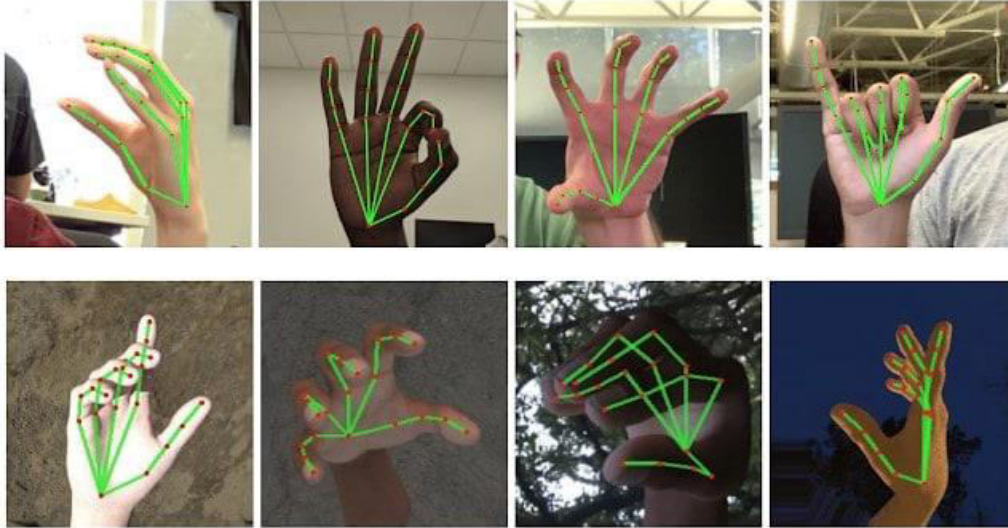


Fig 3: Result analysis

The conversion of a colour image into a gray scale image is converting the RGB values (24 bit) into gray scale values (8 bit). Various image processing techniques and software applications convert colour image to gray scale image. Conversion of colour image to gray scale image is one of the image processing applications used in different fields effectively.

## V. CONCLUSION

By using this system physically handicapped people find an easy way to navigate within the house using wheelchair without the external help. This provides ease of operation to a disabled person. The IR sensor is used for obstacle avoidance. Thus, an effective smart hand gesture controlled wheelchair is developed for the differently abled which does not take much effort to operate. In the repetitive two models there can be much more upgrade i.e. the gesture sensor can add up to more numbers of different-different gesture patterns using combinations and eye linking can update to the eye gazing i.e. which can track the pupil direction and the wheelchair move in that particular direction and we can use machine learning or the artificial intelligence so that it will detect and analyze the voice command of only the wheelchair user. Also movement of eye brow can be used for the movement of wheelchair.

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