SIGN LANGUAGE COMMUNICATION WITH DUMB AND DEAF PEOPLE

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ABSTRACT — **In our day to day life we see many of the people who are facing problems like dumb and deaf. They face difficulty to communicate with each other and also with the normal people. The communication for dumb deaf people with the normal people becomes the difficult task. Sign language is the communication media or method used to bridge the gap between dumb deaf people and the normal people. But many of the normal people are not familiar with the sign language communication, so it becames difficult communication between the normal people and dumb deaf people. So real time application is required to translate sign language to text or speech so that normal people will get what the dumb deaf people is trying to say. And same application will also be applicable for the normal people to communicate with the dumb deaf people. Many communication techniques exist in market, but they did not gave the proper real time solution to convert sign language communication to voice or text. Where some of the other application are sensor based and costly at the same time with lots of complexity. Our Proposed systems is a new technique of virtual talking without any use of the sensor. In this application, Image processing technique is been used it is known as Histogram of Gradient (HOG) with Artificial Neural Network (ANN). These two technique are used to train the system or create database and that database is stored in memory. Whereas Web camera is used to capture the continuous image of different sign gestures and captured images are send to raspberry pi. Raspberry pi controller recognizes the image and compare the same image with database which is been stored in memory of raspberry pi controller. This is how the sign language from dumb deaf people is detected. By using Voice Recognition Module(VRM), voice of normal people is converted to text with the help of Artificial Neural Network(ANN) that text is converted to various sign. In this way, two way communication between dumb deaf people and normal people takes place.**

Keywords — *Sign language, Histogram of gradient, Artificial neural network, Voice recognition module, Liquid crystal Display*

I. INTRODUCTION

Sign language is widely used by the people who are unable to speak and hear. Sign language is form of various gestures and hand movement with facial expressions or body movements. These hand movements or gestures used by the dumb deaf people to express their thoughts. But to understand sign language is difficult task because common people never try to learn the sign language, that's why cause a big gap in communication between the dumb deaf people and the normal people. Usually dumb deaf community seek the help of sign language interpreters for translating their thoughts to normal people and vice versa. But that interpreters is very costly and does not have life period throughout of dumb and deaf peoples. So a system is required that automatically recognizes the sign language and convert the sign language to voice and text. Such system can minimize the gap between the dumb deaf and common people in society. There are various types of sign languages across world. In India Indian Sign Language (ISL) is used by dumb deaf community, it consist of both world level gestures and finger spelling. Finger spelling is used to form words with letter by letter coding. Letter coding is used to express words that words for which the signer does not know the gestures or to emphasis or clarify a particular word. So recognition of Finger spelling is important in sign language recognition. The finger spelling in Indian Sign Language consists of both static as well as dynamic gestures which are formed the two hands arbitrarily various complicated shapes. This paper produce a new technique of automatic recognition of gestures in Indian sign language alphabet and numerals 0-9. This paper introduced new technique which is image processing with artificial neural network based. It is real time, less time and highly efficient

technique which convert sign language of dumb people translates into voice or text and voice of dumb deaf people convert into text. In this paper we used web camera to take images of various hand shapes and send to raspberry pi for further processing, Raspberry pi 3 controller is used for interfacing purpose and image processing purpose. Raspberry pi is mini computer has own CPU and operating system. Voice recognition module is used for converting the voice of normal people to text or with the help of models of neural network convert that text into various sign gestures. In this way complete communication takes place from the both side.

1. EXISTING SYSTEM

In existing system of sign language translator are sensor based we have to wear that flex sensors on hand and flex sensors reacts on bend of each finger individually and generate different voltage range according to that voltages range different character is recognized. Only character is recognized not complete sentence or word, it is only one way communication between dumb deaf and common people having various drawback as taking to much time and high costly hardware. And do not provide proper solution.

2. PROPOSED SYSTEM

Proposed system provide both way communication with dumb deaf and normal people, proposed system has used raspberry pi for processing of hand gestures images and it generate text word and speech as well. Images are taken by web camera here image processing techniques and algorithms are used for hand movement recognition (HOG). Voice recognition module is used to translate normal people voice in text and that text is converted into various text gestures by using artificial neural network concept. The aim of this paper this paper is to provide an application to the society to establish the easy communication method between dumb deaf people by making use of image processing algorithm. And provide employability chances to dumb deaf people. In figure 1 shows the block diagram of proposed system and required hardware.
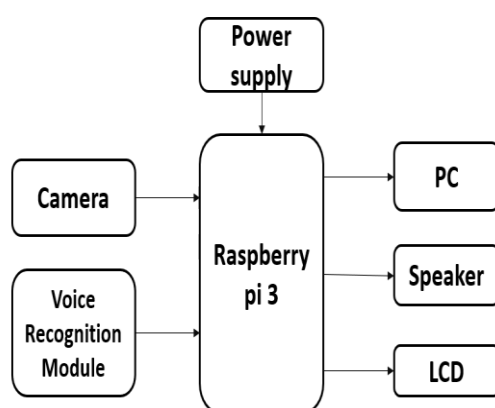

Fig. 1. Block Diagram

II. METHODOLOGY

1. Hardware description:

- Raspberry pi 3B+ - Raspberry 3 B+ is a low cost high memory credit card sized computer that connects into a computer monitor or laptop and it uses standard keyboard and mouse to operate input output device. And it is easy to operate and programming there is no end of deep knowledge to use it. Raspberry pi act as a controller to control and monitor various operations like processing of images and generating appropriate word. Raspberry pi is used to take input images of hand gestures or various signs from camera and compared to stored database and generate appropriate text.

- Camera- A camera is an optical device to take images or video recording, moving images that are stored in physical medium such as in a digital system or photographic film. Camera consists of lens that focuses light from the scene or object and camera body holds the image capture mechanism. Images are stored in the form of pixels and frames. Camera is used to capture the images of hand movement of dumb deaf people and that images send to raspberry pi module for further processing. Image processing and extraction of word is done by open CV library that is available in raspberry pi programming.

- Voice Recognition Module(VRM) – Voice Recognition Module is a compact and easy control voice recognition board which consist of mic and HM20007L 52 IC. Voice recognition is a technique that provide a natural, convenient human- machine interface by using voice recognition module. And it take out and analyses voice features of human delivered to a machine or computer through the mic. VRM is input device that recognize voice and gives the output as word.

- Liquid Crystal Display – LCD is a flat panel display that electronically modulated optical device. And this devices used to display text messages. 24X4 character LCD display is used to show the converted text of sign language gesture images.

- Speaker – Speaker is a output device that is used to speak out or produce audio output from text that is recognized by controller. Speaker is one type of converter that convert electromagnetic waves into sound waves.

2. Software description:

In our system raspberry pi is connected with computer monitor or laptop by using the 5v power wire with this line, we operate project kit with the following software. That are divided into various categories according to applications as listed below

- Python
- Putty
- WinSCP
- Tesseract OCR
- Open CV

- Python – Python is a high level programming language and python language is used for developing desktop GUI applications, web applications also it is used in internet of thing (IOT) applications. Python language focus on core functionality of the application of common programming. Raspberry pi it uses python language to develop system or modules. In python various built in library available as putty, panda, open cv, winscp etc.

- Open Cv – Open cv (open source computer vision) this library used for detection of object and processing of images, this library is free for use and easily installed in any operating system. This library mainly used for Facial recognition system, Gesture recognition, Motion understood.

III. FLOWCHART

1. Sign gestures to text or voice:

1. First step is that we have to interface web camera to take images of hand gestures of dumb people when they are forming sign language. That images of various signs are send to the raspberry pi for further processing.

2. We created database that is stored in memory card that card is inserted in raspberry pi. Database consist of predefined images of A-Z alphabets and 0-9 numbers as shown in fig.2, 3. We have to train the system.

3. In a open cv captured images of camera is converted to gray scale image for better classification. In Captured images present noise and unwanted background we have to remove it, for this purpose we use median filter and segmentation.

4. Then features of this image extracted by using OTSU algorithm in feature extraction process. After feature extraction process resulted image is compared with feature extracted image from stored database.

5. When it is matches, the corresponding letter is obtained and these group of letter forms words then sentences vice versa.

6. Then that text is converted into speech by using speaker. In this way text and speech of corresponding sign gestures obtained with high accuracy rate. Fig. 4. It shows the flow of sign language to text or speech conversion.
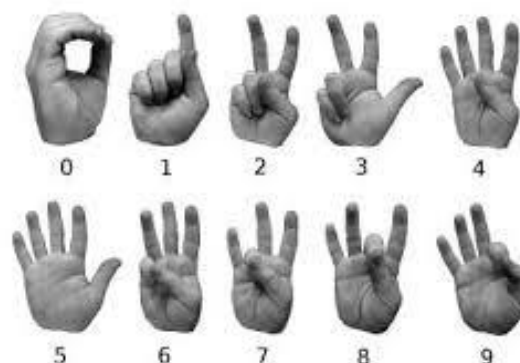

Fig. 2. Indian Sign language symbols

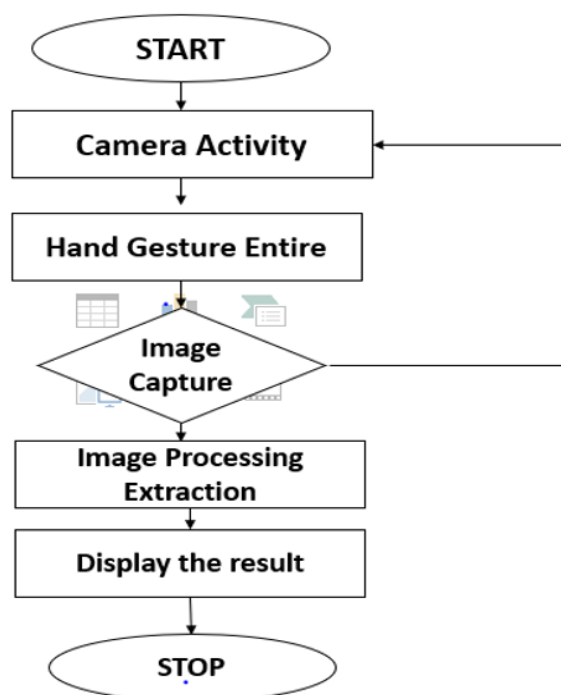Fig 3. Indian Sign language numbers

Fig 4. Sign to text or voice conversion

2. VOICE TO TEXT CONVERSION :

1. In first process voice recognition module is interfaced with raspberry pi module and power up with 5v cable.VRM operate ito two mode as manual mode and cpu mode. For speech recognition it put on cpu mode.

2. In cpu mode VRM is on it automativally translates specch into a text when the normal people speak some word that word will be recorded through mike which is connected by voice recognition module.

3. VRM will recognize the voice and convert it into the text. That is input to the raspberry pi then it produce text as output and that text will be displayed on the LCD display.

4. Also in the memory database has stored, in databases there is various signs or gestures images of letters stored when text is recognized by VRM and that text is compared with stored images and matching signs produced at the output. This is how, two way communication will take place between dumb deaf people and normal people. In fig. 5 shows flows of voice to text or sign conversion.
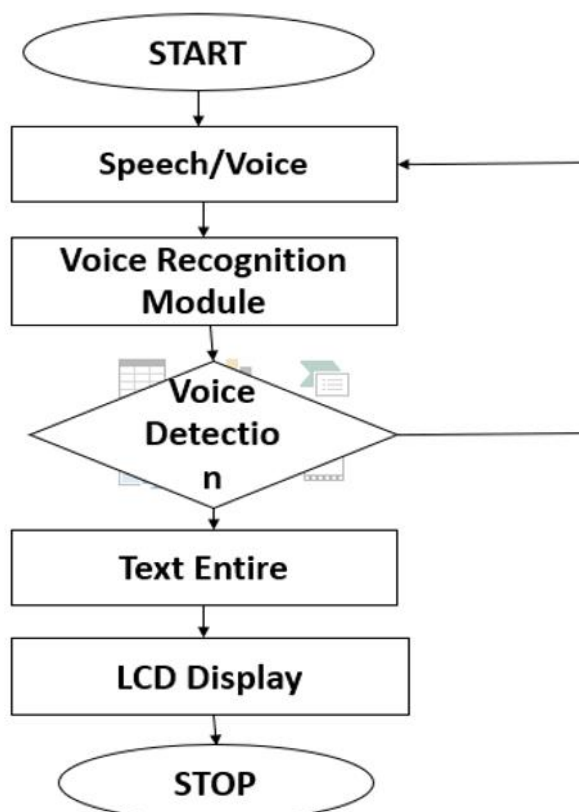

Fig. 5. Voice to text or sign
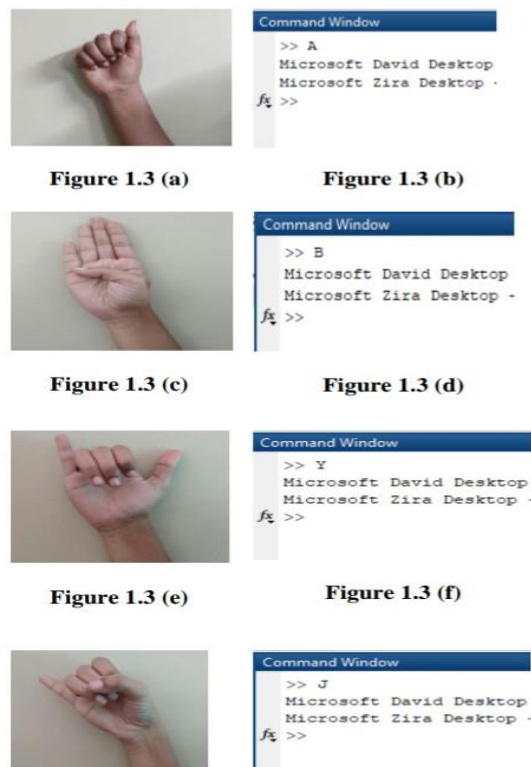
IV. MODELLING AND ANALYSIS

Figure 1.3 (a)   Figure 1.3 (b)

Figure 1.3 (c)   Figure 1.3 (d)

Figure 1.3 (e)   Figure 1.3 (f)

Fig.6. Matlab sign detection and recognitation
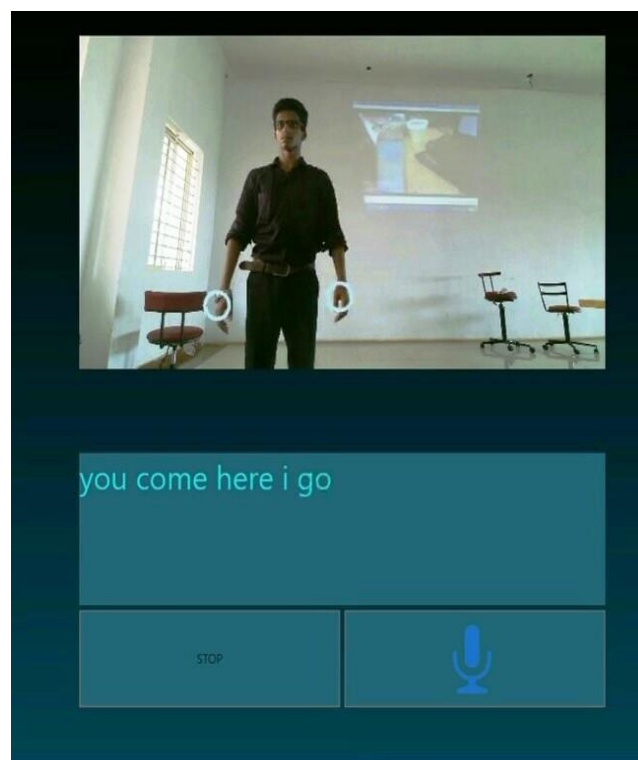

you come here i go

Fig 7. Sign to text conversion

V.   FUTURE WORK

In a future work this project can be done by using only coding language and deep learning models by developing android app. There is no need of any costly hardware device to build system but android phone is required. That will be less complicated. In a future, everyone will use android phone. It will be so beneficial for dumb deaf community that will create more opportunities for dumb deaf people to work in a professional work.

VI.   CONCLUSION

Our project aims to develop and provide a useful tool that uses gesture recognition for reducing the communication gap between the deaf and dumb community and the normal people. This project is a prototype for checking the feasibility of recognizing sign language using image processing and neural network. This system is image processing and artificial neural network based method for automatically recognizing the finger spelling in Indian sign language is presented in this paper. The signs gestures are identified by the features extracted from the hand shapes. In our system we used skin color based segmentation for obtaining the hand region from the image. A new shape feature based on the distance transform of the image is proposed in this work. The features extracted from the sign image are used to train a model and artificial neural network that recognizes the sign. This method completely uses digital image processing techniques so the user does not have to wear any costly hardware device to translate sign language to text and speech. Our proposed system has low computational complexity and very high accuracy with compared to the other system. And it provide both way of communication as dumb deaf people can easily communicate with normal people because sign language is converted to text and speech, on other side normal people can also easily communicate with dumb deaf people because voice of normal people get converted to text. This system provide full communication between dumb-deaf and normal people.

VII.   ACKNOWLEDGEMENTS

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