

HAND GESTURES AND SPEECH RECOGNITION SYSTEM FOR DEAF-DUMB

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ABSTRACT

In the present world it is very complicated for the deaf & dumb people to talk with the ordinary people. So here we build the system which would make able the deaf and dumb to communicate with the ordinary world. This system bridges the gap between the impaired and normal people. Gesture recognition uses computing devices to the mathematical interpretation of human hand. Speech Recognition is nothing but the automatically recognizing particular words spoken by a particular speaker based on whatever the information involved in the speech waves. The whole system is based on the MATLAB and image processing. The major application of this system is for the hand gesture and speech recognition and to make easier the life of deaf-dumb people.

Keywords – Webcam, deaf-dumb, Gestures Recognition, Image Processing, Speech Recognition, MATLAB.

1. INTRODUCTION

Here is a system introduces for making the easier communication of impaired people. Computer recognition of hand gesture is very essential research problem for enabling communication with deaf and dumb people. The idea consists of designing and building up an intelligent system using image processing, machine learning and artificial intelligence concepts to take visual inputs of sign language's hand gestures and generate easily recognizable form of outputs.

It is an intelligent system which can act as a translator between the sign language and the spoken language dynamically both effective and efficient. Since people with hearing impairment or deaf people cannot talk like normal people so they have to depend on some methods of visual communication in most of the time. Similarly for the deaf people speech recognition system is also included in this system. The speech recognition aims to the conversion of whatever spoken by someone can be captured, recognized and converted to the comfortable text. Coding of these processes into machine language needs a complex programming algorithm. The whole system should be design by using the basic concepts of the digital image processing.

2. NEED OF TECHNOLOGY

Human beings have been gifted by nature, with voice that allows them to interact and communicate with each other. Unfortunately, everybody does not possess such capability because of hearing and speaking impaired. It is hard for most people who are not familiar with a sign language to communicate with the person without any type of interpreter. Thus, there is a need for developing a technic that transcribes symbols in hand gesture and voice of speaker into plain text or audio which can help with real-time communication. Thus we find that a new approach using these new depth sensing devices, applied to machine learning, stochastic processes and vision.

3. LITERATURE REVIEW

Various approaches were used by researchers for the same system included in this paper which can be used in different applications. Some of them are vision based [5], glove based approaches, Artificial Neural Network [7], Canonical Analysis, etc. This all approaches are classified into the three huge categories like - Hand segmentation approaches, Feature extraction approaches and Gesture recognition approaches. This

researcher's work is very helpful to us to design the system we included. So we add the working of few of them in this paper.

[2] This paper introduces a converter which recognizes the signed images made by the impaired person and converts them into text as well as speech without using other approaches like data gloves or other equipment. For this system implementation, videos of hand gesture are captured and recognized by the implementation of the same algorithm.

[4] This paper developed a system for reliable recognition of voice and this has been designed and developed. This system use the voice of speaker who speaks to verify his/her identity and provide the controlled access to various services like voice based biometrics, database access services, voice based dialing, voice mail and remote access to computers.

[5] In this paper researcher pay attention to the Indian Sign Language (ISL) as compared to other sign languages like ASL, PSL etc. This survey tells that ISL interpretation remains unfocused by the researcher. In this paper, some historical background about ISL, need and scope of ISL are mentioned. Vision based system have various challenges over traditional hardware based approaches. Efficient use of computer vision and pattern recognition makes it possible to work on such system which will be natural and accepted.

[6] This project aims to make communication simpler between deaf and dumb people. For that purpose author introduces computer in path of their communication in such a way that sign language can be automatically get captured, recognized, translated to text and displayed on LCD. There are some drawbacks highlighted here like electronic gloves available until are costly. Another drawback of the glove based system is that one person cannot use the glove of other one. Conversion of RGB image to binary and matching it with database using a comparing algorithm is done by simple, efficient and robust techniques.

[7] This thesis implemented an isolated word recognition system with an artificial neural network. Speech recognition in computers is similar to the speech recognition capabilities of the human brain. In this paper author gives the detail study about the Artificial Neural Network. With this network implementation of the recognition system could be design.

Table-1: Summary of literature review

Year	Author	Techniques
2005	Jonathan Rupe	Vision based hand shape identification for sign language recognition.
2010	Mansi Gupta, Meha Garg and Prateek Dhawan,	Sign language to speech converter using neural networks.
2011	Muhammad Inayatullah Khan.	Hand gesture detection and recognition system.
2012	Sonam Kumari, Gbtu, Kavita Arya, and Komal Saxena	Controlling of device through voice recognition using MATLAB
2014	Archana S. Ghotkar and Dr. Gajanan K. Kharate	Study of vision based hand gesture recognition using Indian sign language
2014	Nidhi Chauhan	A highly robust hand gesture recognition system
2015	Alexander Murphy	Implementing speech recognition with artificial neural networks.
2016	Mohit Koul, and Siddhesh Patil	Sign language recognition using leap motion sensor.

4. OBJECTIVES

The objectives of proposed system are as below:

1. To develop a robust and efficient algorithm for natural hand gesture recognition as well as speech recognition system in real time application.
2. System makes communication between hearing impaired and normal people both effective and efficient.
3. We mainly focuses on the problem of gesture recognition in real time that sign language used by the community of deaf people.
4. To develop the reverse process using speech processing for the deaf people.

5. SYSTEM OVERVIEW

This section included the block diagram and block diagram description of the corresponding system which includes gesture recognition and speech recognition.

5.1 Gesture Recognition

The block diagram of gesture recognition system is as below:

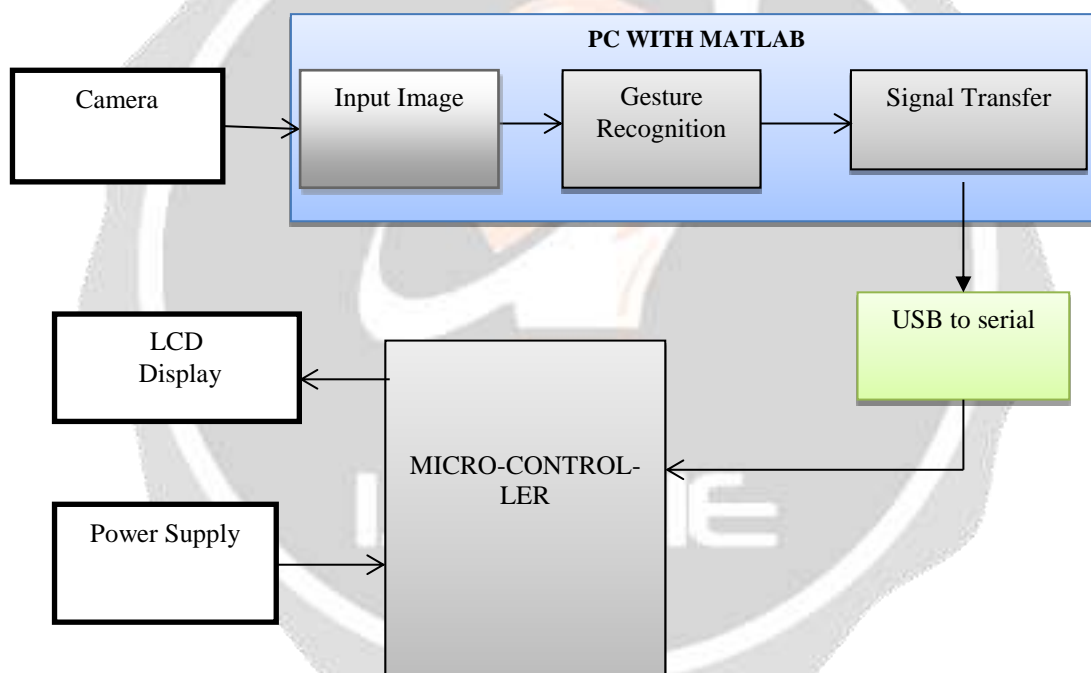


Fig-1.Block diagram of gesture recognition

This system combines two types of processes, gesture recognition and speech recognition. Fig.1 gives the block diagram of gesture recognition which contains the webcam camera which is connected to computer or laptop through the USB. The USB cable supplies power to the webcam from the computer and takes the digital information of hand gesture captured by the webcam's image sensor back to the computer. The computer should install with MATLAB software. The digital image processing on the captured image done with the MATLAB software [6]. In programming the captured image compare with previous templates and decide the output. Now the output has been displayed on the LCD, for that purpose microcontroller interface with LCD and also with the computer. In this way the hand gesture converts into the text.

5.2 Speech Recognition

Similarly, speech recognition can be done on the same system. For speech recognition the speaker's voice is captured by MIC and signal goes back to the computer which install with MATLAB software. In this way whatever spoken by the speaker is recognized and convert to the text as per programming in MATLAB.

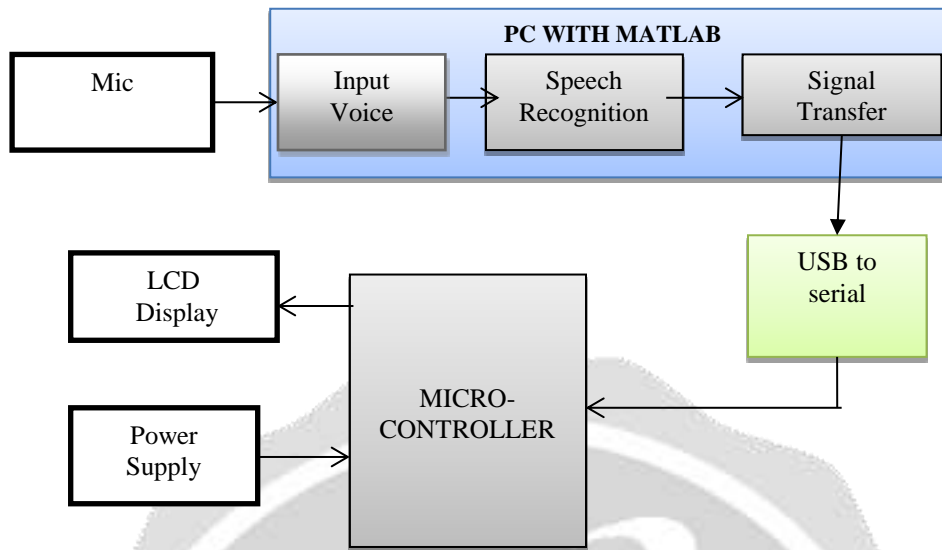


Fig- 2 : Block diagram of speech recognition

5.3 Design Flow

The important discussion of the corresponding section is to study the design flow of the system. Under this topic we studied here the actual processing and system overview. There are two processes has to be done i.e. hand gesture recognition and speech recognition. Both the processes are based on the MATLAB. This will differ in very few manners as the techniques used for both these are little bit similar. Now, let us discuss the flowchart of this system as below:

Speech and gesture easily used for daily humans interactions while human computer interactions still require understanding and analyzing signals to interpret the desired command that made the interaction sophisticated and unnatural.

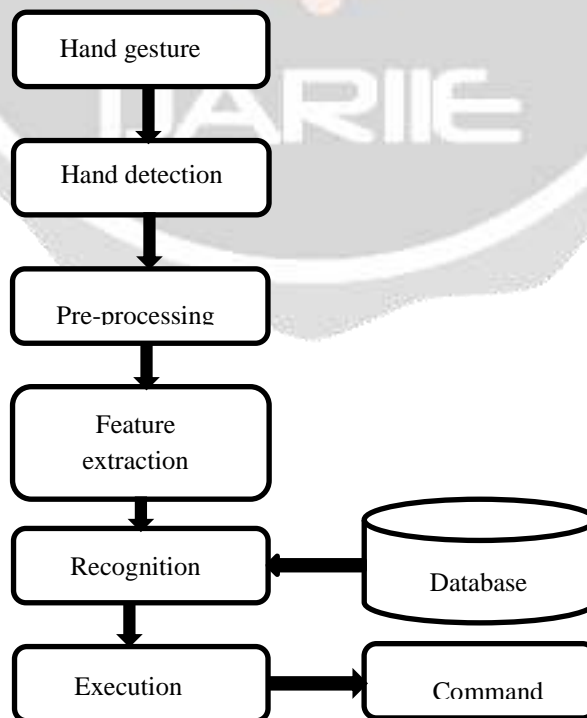


Fig-3: Design flow of gesture recognition

Fig.3 shows the design flow of gesture recognition technique. This designing includes pre-processing, feature extraction and classification. The hand gesture is captured through the camera and the signal given to computer [3]. Now the image processing starts the detection and recognition process as the design flow.

- **Steps of gesture recognition**

1. Step 1: Image read module
 - Captures the image by camera.
2. Step 2: Image preprocessing
 - Removes the noise and improves image.
3. Step 3: Create database
 - Makes the list of image parameters.
4. Step 4: Image features
 - Analysis of image done.
5. Step 5: Comparison
 - Compare the input image and templates.

Similarly, Fig.4 shows the design flow of speech recognition. The general speech recognition process includes the speech analysis, robust processing and speech processing. The method used here for the speech recognition is Hidden Markov Model [4][7].

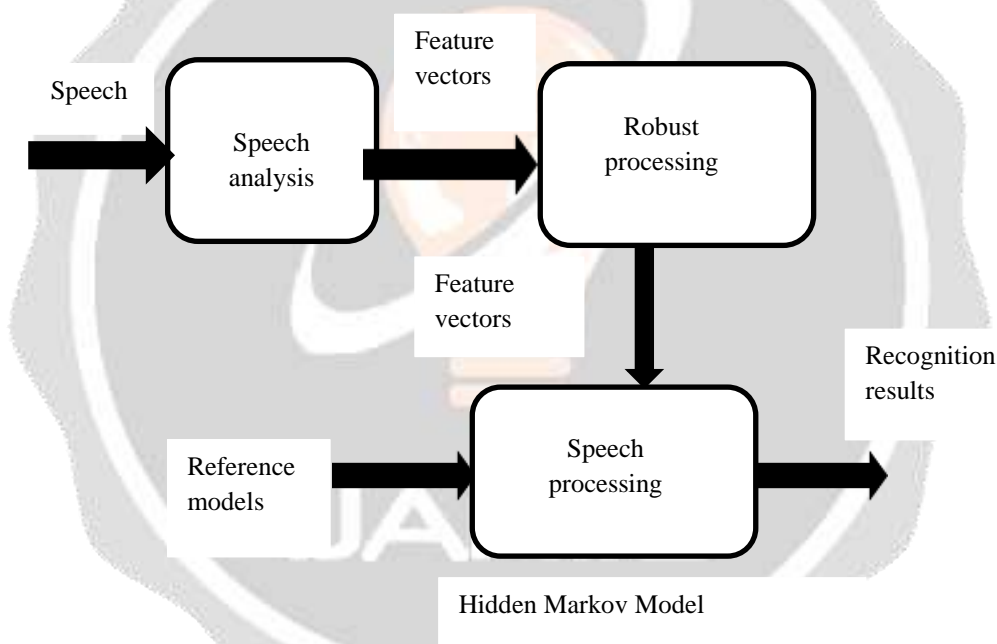


Fig-4: Design flow of speech recognition

6. ADVANTAGES

The system implemented in the corresponding paper is very much essential due to the need of real time applications. Following are the advantages of proposed system:

1. Real time functioning.
2. Portable.
3. No need of calibration.
4. Doesn't damage through use.

7. APPLICATIONS

Following are the applications of proposed system:

1. Communication of deaf and dumb

This system will be done hands free computing and aid to the speech and hearing impaired people. If the person with both the impairment the system is useful for both way communication.

2. Sign language recognition

Since the sign language is used for interpreting and explanations of a certain subject during the conversation, it has received special attention.

8. CONCLUSION

As there are number of technologies are available for hand gesture recognition and speech recognition both having different features, applications and limitations. From above analysis we conclude that we can bridge the gap between the speech and hearing impaired people and the normal people which is very essential task. The propose system develops computer based intelligent system that will be helpful to deaf-dumb people to communicate with the other world using their natural hand gestures. This system is also used to converting the normal hand gesture as well as speech whatever someone gets speak into the text.

9. REFERENCES

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