Sign Language Interpretation

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***Abstract*: The aim of this project is to help the communication of two people, one hearing impaired and one without any hearing disabilities by converting speech to finger spelling and finger spelling to speech. Finger spelling is a subset of Sign Language, and uses finger signs to spell words of the spoken or written language. We aim to convert finger spelled words to speech and vice versa. Different spoken languages and sign language such as English will be considered.We propose design and initial implementation of a smart system which can automatically translates voice into text and text to sign language. Sign Language Translation Systems could significantly improve deaf lives especially in communications, exchange of information and employment of machine for translation conversations from one language to another has. Therefore, considering these points, it seems necessary to study the speech recognition. Usually, the voice recognition algorithms address three major challenges. The first is extracting feature form speech and the second is when limited sound gallery are available for recognition, and the final challenge is to improve speaker dependent to speaker independent voice recognition. Extracting feature form speech is an important stage in our method. Different procedures are available for extracting feature form speech. One of the commonest of which used in speech recognition systems is Mel-Frequency Cepstral Coefficients (MFCCs). The algorithm starts with preprocessing and signal conditioning. Next extracting feature form speech using Cepstral coefficients will be done. Then the result of this process sends to segmentation part.**

Index Terms: Deaf Human, Sign Language Translation Systems, Humatronics, Automatic Speech Recognition

I. INTRODUCTION

Today's one in 1000 people become deaf before they have acquired speech and may always have a low reading age for written Persian. Sign is their natural language. Persian Sign Language has its own grammar and linguistic structure that is not based on Persian. So voice recognition systems play a very significant role in field of human electronics and its wide applications in deaf live.

This research was started with several speeches to text experiments to measure the communication skills of deaf people, and to understand their everyday problems better. The primary aim of our project was to develop a communication aid for deaf persons which can be implemented in a mobile telephone. In our system a partially animated face is displayed in interaction with deaf users. They are very useful in much application. Our system starts with preprocessing and signal conditioning. Next extracting feature form voice using Cepstral Coefficients will be done. Feature extraction is the process that extracts a small amount of data from the voice signal that can later be used to represent each word. Then the result of this process sends to Feature matching Hand gesture recognition is of great importance for human-computer interaction (HCI), because of its extensive applications in virtual reality and sign language recognition. Despite lots of previous work, traditional vision-based hand gesture recognition methods are still far from satisfactory for many real-life applications. The quality of the captured images is sensitive to lighting conditions and cluttered backgrounds, because of the limitations of the optical sensors. Thus it is generally not able to detect as well as track the hands robustly. This largely affects the performance of hand gesture recognition. An effective way to make hand gesture recognition more robust is to use different sensors to capture the hand gesture and motion, e.g. through the data glove. Unlike optical sensors, such sensors are generally more reliable and are also not affected by lighting conditions or cluttered backgrounds.

II. LITERATURE SURVEY

• **Automated Sign Language Interpreter, 2018 Eleventh International Conference on Contemporary Computing (IC3):** Taking huge leaps in technologies with each passing year, the humans are making smart inventions every year to help themselves and for the ones who are affected by any disability. We aim to make the communication for dumb people easy and hence proposing a sign interpreter, which automatically converts sign language into audio output. For the dumb people, sign language is the only way of communication. With the help of sign language, physically impaired people express their thoughts to the other people. It is difficult for common people to understand the specific sign language therefore communication becomes difficult. The sign language recognition has become an empirical task, as it consists of various movements and gesture of the hands and therefore getting the right accuracy at a low-cost is a mammoth task. Instrumented gloves with audio out are the solution to this problem. The gloves attached with various sensors are worn for sign interpretation. Hence, the proposed system solves the problem and helps the dumb people in communication with the rest of the world at low cost.

• **Vision-based sign language translation device, 2013 International Conference on Information Communication and Embedded Systems (ICICES):** This report presents a mobile VISION-BASED SIGN LANGUAGE TRANSLATION DEVICE for automatic translation of Indian sign language into speech in English to assist the hearing and/or speech impaired people to communicate with hearing people. It could be used as a translator for people that do not understand sign language, avoiding by this way the intervention of an intermediate person and allow communication using their natural way of speaking. The proposed system

is an interactive application program developed using LABVIEW software and incorporated into a mobile phone. The sign language gesture images are acquired using the inbuilt camera of the mobile phone; vision analysis functions are performed in the operating system and provide speech output through the inbuilt audio device thereby minimizing hardware requirements and expense. The experienced lag time between the sign language and the translation is little because of parallel processing. This allows for almost instantaneous recognition from finger and hand movements to translation. This is able to recognize one handed sign representations of alphabets (A-Z) and numbers (0-9).The results are found to be highly consistent, reproducible, with fairly high precision and accuracy.

- **Stringing Subtitles in Sign Language, 2016 IEEE Eighth International Conference on Technology for Education (T4E):** This research uses the extension neural network type-1 (ENN-1) method for air pollution inspected by remote sensing data of automobile's exhaust. The outdated automobiles emit exhaust as part of the moving air pollutants. To lessen the air pollution effectively and improve the efficiency of remote sensing tools, this paper develop a automatic inspected method based on the ENN-1 and using the data of automobile exhausted telemeter, the ENN-1 can embed the salient features of parallel computation and learning capability. The experimental results show that the proposed method has less learning time, high classificatory accuracy rate, and fault-tolerant than the other methods.

- **A machine learning based approach for the detection and recognition of Bangla sign language, 2016 International Conference on Medical Engineering, Health Informatics and Technology (MediTec):** Speech impaired people are detached from the mainstream society due to the lacking of proper communication aid. Sign language is the primary means of communication for them which normal people do not understand. In order to facilitate the conversation conversion of sign language to audio is very necessary. This paper aims at conversion of sign language to speech so that disabled people have their own voice to communicate with the general people. In this paper, Hand Gesture recognition is performed using HOG (Histogram of Oriented Gradients) for extraction of features from the gesture image and SVM (Support Vector Machine) as classifier. Finally, predict the gesture image with output text. This output text is converted into audible sound using TTS (Text to Speech) converter.

- **Sign language interpreter using a smart glove, 2014 International Conference on Advances in Electronics Computers and Communications:** Sign language is the communication medium for the deaf and the mute people. It uses hand gestures along with the facial expressions and the body language to convey the intended message. This paper proposes a novel approach of interpreting the sign language using the portable smart glove. LED-LDR pair on each finger senses the signing gesture and couples the analog voltage to the microcontroller.

III. METHODOLOGY

1. Audio input on a Personal Digital Assistant (PDA) using python PyAudio module.
2. Conversion of audio to text using Google Speech API.
3. Dependency parser for analysing grammatical structure of the sentence and establishing relationship between words.
4. ISL Generator: ISL of input sentence using ISL grammar rules.
5. Generation of Sign language with signing Avatar.

IV. MATHEMATICAL MODEL

System Description:

S = (I,O,F)
Where,

- **S: System.**

- **I = { S,A, T }** are set of Inputs

Where,

S: Sign
A: Audio
T: Text

- **F = {C}**are set of Function

Where,

C: Conversion

- **O = { O1,O2,O3}** are set of Output

Where,
O1: Sign
O2: Audio
O3: Text

- **Success Conditions :**

Images, Accuracy, proper database.

- **Failure Conditions :**

No database, internet connection

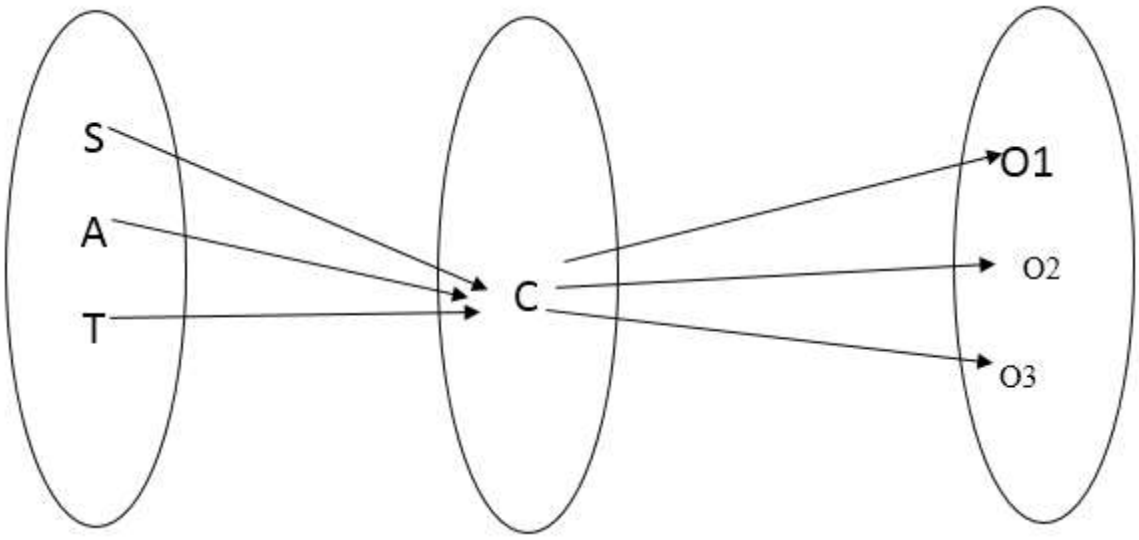

Figure 1: Venn diagram

V. SYSTEM ARCHITECTURE

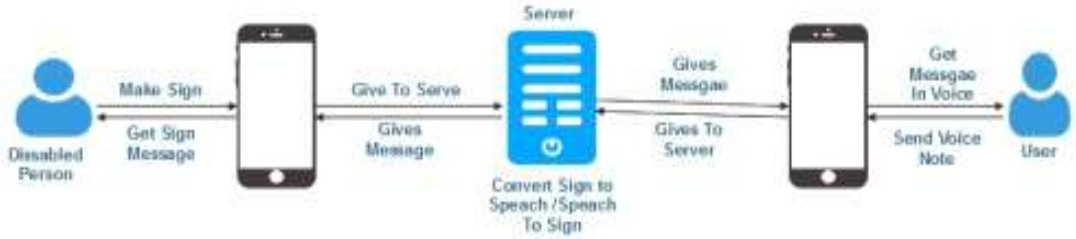

Figure 2: System architecture of sign language intepretation

Indian Sign Language is used by deaf and hard of hearing people for communication by showing signs using different parts of body. All around the world there are different communities of deaf people and thus the language of these communities will be different. The Sign Language used in USA is American Sign Language (ASL); British Sign Language (BSL) is used in Britain; and Indian Sign Language (ISL) is used in India for expressing thoughts and communicating with each other. The \Indian Sign Language (ISL)" uses manual communication and body language (non-manual communication) to convey thoughts, ideas or feelings. ISL signs can be generally classified into three classes: One handed, two handed, and non-manual signs. One handed
signs and two handed signs are also called manual signs where the signer uses his/her hands to make the signs for conveying the information. Non Manual signs are generated by changing the body posture and facial expressions. This system is to help hearing impaired people in India interact with others as it translates English text to Sign language.

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