Sign Language For Hearing Impaired People

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Abstract- *The main objective of this project is to design a robust system that could automatically convert speech into text and text into sign language animations. This system is mainly focused on helping hearing-impaired people to understand what others speak through the conversion of speech to sign language which is understandable by the hearing-impaired people. This system has two phases. Conversion of speech to text and then conversion of text into sign language animation. The first phase involves speech recognition and conversion to text. Speech recognition is accomplished with the help of microphones and conversion to text is achieved through the implementation of NLP (Natural Language Processing) in python. The second phase involves the animated video of a 3D-human avatar and mapping the sign language data to appropriate actions which can be projected by this avatar.*

Keywords*- Sign Language; INGLT; HTK; Super Vector Machine ; SSILS*

I. INTRODUCTION

In India, 63 million people (6.3%) suffer from the significant auditory loss. Four in every 1000 children suffer from severe to profound hearing loss, with over 100,000 babies that are born with hearing deficiency every year. The estimated prevalence of adult-onset deafness in India was found to be 7.6% and childhood-onset deafness to be 2%.

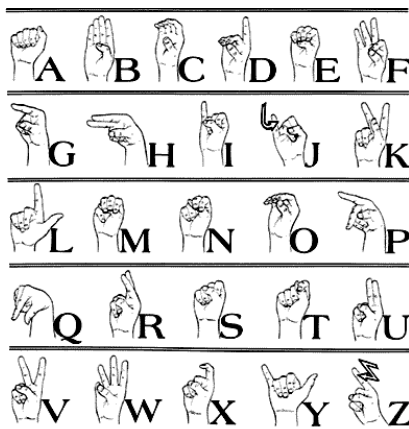It is also the first language and mother tongue to (tactile sign languages).

Fig. 1 Example of Sign Language Symbols

Each country has one or sometimes two or more sign languages, although different sign languages can share the same linguistic roots in the same way as spoken languages do. Wherever communities of deaf people exist, sign languages develop. Signing is not only used by the deaf, it is also used by people who can hear, but cannot physically speak. While they use space for grammar in a way that spoken languages do not, sign languages show the same linguistic properties and use the same language faculty as do spoken languages. Hundreds of sign languages are in use around the world and are at the cores of local deaf cultures. Some sign languages have obtained some form of legal recognition, while others have no status at all.India, with its one billion people, is the second most populated country in the world. It is estimated that there are over a million people who are profoundly deaf and approximately10 million hard of hearing people, in India. No formal census data are available. These figures are extrapolated from the number of people who are deaf and hard of hearing, in Western nations (1‰ for individuals who are deaf and 10‰ for the hard of hearing). It would be realistic to believe that the actual number of people who are deaf and hard of hearing is much higher, because of poor hygienic conditions and lack of adequate medical services in India. Based on these numbers, one of every five people who are deaf in the world, lives in India. According to an UNESCO report in the 1980's, only 5% of children who were deaf attended any special educational programme (1). Applied to the present situation, this would mean that only 50,000 children, who are deaf, receive any education while the other 950,000 are left to their own devices.

II. MYTHS AND FACTS ABOUT SIGN LANGUAGE

A. Myths About Sign Language

- Sign language is the pictorial representation of spoken language.
- Sign language is an integral part and an identifying feature of membership in the deaf culture.
- Expressing hidden meaning is not possible in sign language.
- Learning sign language is very easy.

B. Facts About Sign Language

- Sign language has its own grammatical structure
- The majority of deaf children are born to hearing parents and therefore do not acquire sign language as a mother tongue. They need to learn it at school.
- Minority of deaf children are born to deaf parents. They acquire sign language as a mother tongue.
- Some studies reveal that children can learn sign language earlier than they can learn to speak.

III. EXISTINGPROBLEM

There are about 70 million deaf people who use sign language as their first language or mother tongue. It is also the first language and mother tongue to many hearing people and some deaf blind people (tactile sign languages). Each country has one or sometimes two or more sign languages, although different sign languages can share the same linguistic roots in the same way as spoken languages do. 2008 is also the year when the United Nations' Convention on the Rights of Persons with Disabilities adopted by the U.N. General Assembly in 2006, came into force, having been ratified by the 20th country (India ratified on October 1,2007). This document, which has also been ratified by India,should, in theory, advance the status of India's deaf, and also their language ISL: Article 9, Section 2(e): Provision of professional sign language interpreters; Article 21, Section3(b): Acceptance and facilitation of the use of sign language in official interactions; Article 24, Section 3(b): Facilitation of the learning of sign language and the promotion of the linguistic identity of the deaf community; and Article 30,Section 4: "Recognition and support of their specific cultural and linguistic identity, including sign languages and deaf culture". Considering the current state of affairs in India, this is a tall order. A sign language (also signed language or simply signing) is a language which uses manual communication and body language to convey meaning, as opposed to acoustically conveyed sound patterns. This can involve simultaneously combining hand shapes, orientation and movement of the hands, arms or body, and facial expressions to fluidly express aspeaker's thoughts. They share many similarities with spoken languages (sometimes called "oral languages", which depend primarily on sound), which is why linguists consider both to be natural languages, but there are also some significant differences between signed and spoken languages. Linguistic work on Indian Sign Language (ISL) began in the 1970's. In 1977, Vasishta, Woodward, and Wilson visited India with partial support from the National Science Foundation (USA) and collected signs from four major urban centres (Delhi, Calcutta, Bombay, and Bangalore) for linguistic analyses. Vasishta et al. (7), found that ISL is a language in its own right and is indigenous to the Indian subcontinent. Subsequent efforts by Vasishta et al between 1977 and 1982, resulted in four dictionaries of ISL regional varieties and some articles (8, 5, 9). The All India Federation of the Deaf, supposedly distributed these dictionaries to selected programmes serving the Deaf in India. In 2001, another dictionary was published by the Ramakrishna Mission Vidyalaya in Coimbatore (10).Some articles on the existence of a rural sign language in India, were also published (11, 12). It is claimed that a rural Indian Sign Language (RISL) also exists and it is very different from the ISL included in Vasishta et al's dictionaries. The examples given by the author, however, do not support this contention. Development of any language, including sign languages, requires ongoing interaction between the speakers of that language. Deaf people in rural areas have little, or no opportunity, to meet other deaf people. What the author had observed, appears to be literally the gestures used by hearing people to communicate with the deaf. Such systems of manual communication used by isolated deaf people and their immediate environment are known as "home signing". Home sign systems lack the linguistic complexity of sign languages that are used in deaf communities(13).

IV. TOOLS FOR REMOVAL OF EXISTINGPROBLEMS

a) **Speech to Sign Language Interpreter System (SSLIS):** A classifier is needed in sign language recognition to classify the input signs into different classes. The feature vector obtained from the training database is used to train the classifier during the training phase. When a test input is given, the trained classifier identifies the class corresponding to the sign and displays the text or plays the sound. The test inputs can be images or videos. Most commonly used classifiers are Hidden Markov Models (HMM), Artificial Neural Networks (ANN), Multiclass Support Vector Machines (SVM), Fuzzy systems, K Nearest Neighbor (KNN) etc. The performance of the classifier is measured in terms of recognition rate.
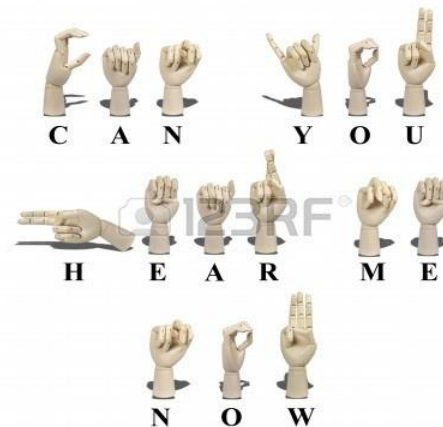
Fig. 1 Example of Speech to Sign Language Converter

b) **HTK:** HTK (Hidden Markov Model Toolkit) is software toolkit for handling HMMs. It is mainly intended for speech recognition, but has been used in many other pattern recognition applications that employ HMMs, including speech synthesis, character recognition and DNA sequencing. Originally developed at the Machine Intelligence Laboratory (formerly known as the Speech Vision and Robotics Group) of the Cambridge University Engineering Department (CUED), HTK is now being widely used among researchers who are working on HMMs.

c) **INGLT:-**INdian Gestural Interaction Translator Based on the above analysis, Ingit adopts a formulaic approach that directly generates the semantic structure where possible (about 60% cases), and defaults to a compositional mode for the others. The main modules in the system are:

- Input Parser
- Ellipsis Resolution Module
- Is 1 Generator (Including Isl Lexicon with Hamnosys Phonetic Descriptions)

d) **Artificial Neural Networks**:

An artificial neural network involves a network of simple processing elements (artificial neurons) which can exhibit complex global behavior, determined by the connections between the processing elements and element parameters. It consists of an interconnected group of artificial neurons and processes information using a connectionist approach to computation. In most cases an ANN is an adaptive system that changes its structure based on external or internal information that flows through the network during the learning phase. The utility of artificial neural network models lies in the fact that they can be used to infer a function from observations. There are several neural networking algorithms which can be used for gesture recognition. The different networks are feed forward networks, Elman neural networks, Self- organizing networks etc. There are several back propagation algorithms available for training the neural networks.

e) **HIDDEN MARKOV MODELS**:-

A Hidden Markov model is a collection of finite states connected by transitions. Each state is characterized by two sets of probabilities: a transition probability and either a discrete output probability distribution or continuous output probability density function which, given the state, defines the condition probability of emitting each output symbol from a finite alphabet or a continuous random vector. The HMM approach to gesture recognition is motivated by the successful application of Hidden Markov modeling techniques to speech recognition problems. HMM is a doubly stochastic model and is appropriate for coping with the stochastic properties in gesture recognition. Instead of using geometric features, gestures are converted into sequential symbols. HMMs are employed to represent the gestures, and their parameters are learned from the training data. Based on the most likely performance criterion, the gestures can be recognized by evaluating the trained HMMs.

f) **Support Vector Machine**:-

The SVM is a popular pattern recognition technique with supervised learning. Since it divides the feature space for each class, the SVM can handle unknown data well, although it is not suited to grouping sample data. It is originally developed by Vapnik and colleagues at bell laboratories. It was actually developed for solving binary decision problems. The basic SVM takes a set of input data and predicts, for each given input, which of two possible classes forms the output. Thus, it can be called as a non- probabilistic binary linear classifier. For multi-class problems, such problems are decomposed into several two-class problems that can be addressed directly using several SVMs.

V. CONCLUSION

Sign language is one of the useful tools to ease the communication between the deaf and mute communities and normal society. Though sign language can be implemented to communicate, the target person must have an idea of the sign language which is not possible always. Hence our project lowers such barriers This project was meant to be a prototype to check the feasibility of recognizing sign language communicate with deaf people by Sign Language Recognition. The system is not only can apply in family environment, but also can apply in public. For the Social use these system is very helpful for deaf people.

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