A Methodology to Transform Speech into Symbolic Gestures

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ABSTRACT
Communication plays an important role in making a society perfect. Generally, people use voice for expressing their views while a deaf person uses symbolic languages for communication as an effective tool communication. Communication between normal and deaf person requires a common language or a system that performs the conversion for both. This paper proposes a system which will useful for communion between normal and deaf person. This system takes audio as an input, by extracting the text from audio input it generates corresponding symbolic language.

***Keywords:-**Indian Sign Language, American Sign Language, Alphabets, deaf and Extraction.*

INTRODUCTION

People who are deaf, blind or have a hearing aid need a way to express their feelings and emotions with other people. Sign language is this way which helps them convey their thoughts to others. This language was taken into consideration when the number of people facing these problems remain increasing day by day. [1].

The All India Federation of deaf estimates around 4 million of deaf people and 10 millions of hard hearing people in India. Studies shows that 1 out of every 5 deaf people in the world is from India. Communication is defined as exchange of thoughts and messages either by speech or visuals, signals or behavior.

Deaf and dumb people use their hands to express their ideas. The gestures include the formation of English alphabets. This is called sign language. When this language is used through a computer, it might be inconvenient for the other person to understand what is shown. Therefore for a person to understand easily, these gestures through parts of body can be converted to messages. The sign language is different for each place. It can be considered to be regional.

We can see that the sign language used in America is totally different from that used in India. Americans use single hand to express the gestures whereas Indians use both hands to showcase the letters of the alphabet. While there are lot of efforts going into American Sign Language detection the same cannot be said about Indian Sign Language. The systems are usually updated with the existing sign language which creates a problems for understanding the new version of sign language being introduced.

Indian Sign Language (ISL) is a mode of communication that is used by deaf people as well as by hearing parents of deaf children too. Indian Sign Language uses manual communication and body language to convey thoughts, ideas and feelings.
Due to the inability of the deaf people in accessing the information like television, radio etc. and in the common places like

railways, banks, hospitals etc. are difficult.

A large section of hearing impaired in India uses ISL as a mode of communication for the deaf community ty. We use ICT to improve their quality of life by developing system that can help them communicate better with the rest of the world and among themselves.

There are different sign languages all over the world such as American Sign. Language (ASL), British Sign Language (BSL), Japanese Sign Language family (Japanese, Taiwanese and Korean Sign Languages), French Sign Language family (French, Italian, Irish, Russian and Dutch Sign Languages), Australian Sign Language, etc.

Similarly Indian Sign Language was also developed for Indian deaf community. It is different in the phonetics, grammar, hand gestures and syntax from other country's sign languages. Designing a hand gesture recognition system for ISL is more challenging than other sign languages due to the following reasons:

- ISL uses both hands to picturize most of the alphabets.
- ISL uses static and dynamic hand gestures.
- Facial expressions are also included.
- The speeds of both the hands differ. One hand moves faster than the other at times in dynamic hand gestures.
- Many of the gestures result in obstruction.
- Complicated hand shapes.
- Locations of the hand with respect to body contribute to the Sign.
- Head/Body postures.
- ISL Involves both global and local hand motion.

Despite the common assumption that Indian Sign Language is the manual representation of spoken English or Hindi, it is in fact unrelated to either language and has its own grammar. Zeshan discusses three aspects of ISL: its lexicon, syntax and spatial grammar. Some distinct features of ISL that differ from other sign languages include:

1) Number Signs: The numbers from zero to nine are formed in ISL by holding up a hand with the appropriate handshape for each number. From one to five the corresponding number of extended fingers forms the numeral sign, whereas for zero and the numbers from six to nine special handshapes are used that derive from written numbers. Ten may either be expressed by two 5-hands or by '1+0'.

2) Family Relationship: The signs for family relationship are preceded by the sign for 'male/man' and 'female/woman'.

e.g.: i) BROTHER: MAN + SIBLING
ii) SISTER: WOMAN + SIBLING

3) Sign families: Several signs belong to same family if they share one or more parameters including handshapes, place of articulation and movement.

E.g.: i)PASS and FAIL – The handshape for the sign is same but they move in opposite direction.

ii)MONEY, PAY and RICH – They have same handshape but different place of articulation and movement pattern.

iii)THINK, KNOW and UNDERSTAND – The place of articulation is head which is same for all signs.

4) The ISL consists of various non-manual gestures including mouth pattern, mouth gesture, facial expression, body posture, head position and eye gaze (Zeshan, 2001)

5) There is no temporal inflection in ISL. The past, present and future is depicted by using signs for before, then, and after.

6) The question words like WHAT, WHERE, WHICH, HOW etc. are placed at the end of interrogative sentences.

i) English: Where is the bank?

ISL : BANK WHERE

ii) English: Who is sick?

ISL : SICK WHO

7) The use of space is a crucial feature of ISL.

LITERATURE REVIEW

There are many types of sign language for each region including many pockets of home sign and local sign languages, such as Ghandruk Sign Language, Jhankot Sign Language, and Jumla Sign Language in Nepal, and Alipur Sign Language in India, which appear to be language isolates.

There are also many Sri Lankan sign languages which may not even be related to each other. However, the urban varieties of India, Pakistan, Nepal (Nepalese Sign Language), and Bangladesh are clearly related (although, for Nepalese Sign Language at least, it is not clear whether the relation is genetic, or perhaps rather one of borrowing compounded by extensive incorporation of a shared South Asian gestural base). There exists a contradiction whether these different sign languages should be considered separately or not.

- Woodward (1993) found cognacy rates of 62–71%; he concluded that the various varieties are separate languages belonging to the same language family.[8]
- Zeshan (2000)[7] proposes that Indian and Pakistani SL are varieties of a single language.
- The ISO 639-3 standard categorises these varieties as three separate sign languages in India and Bangladesh, Pakistan, and Nepal. Ethnologue (2016), which follows the ISO standard, acknowledges the relatedness of these varieties as well as the controversy over whether they are one language or many.[10] They identify the following dialects within India: Bangalore-Chennai-Hyderabad Sign Language, Mumbai-Delhi Sign Language and Kolkata Sign Language.
- Johnson and Johnson (2016)[9] argue that the varieties used in Kolkata and Bangladesh are distinct from that used in Delhi, and probably also from each other.

While the sign system in ISL appears to be largely indigenous, elements in ISL are derived from British Sign Language. For example, most ISL signers nowadays use finger spelling based on British Sign Language finger spelling, with only isolated groups using an indigenous devanagari-based finger spelling system (for example, Deaf students and graduates of the school for the deaf in Vadodara/Baroda, Gujarat).

In addition, more recently contact with foreign Deaf has resulted in rather extensive borrowing from International Signs and (either directly or via International Signs) from American Sign Language.

A small number of the Deaf in and around Bengaluru are often said to use American Sign Language (owing to a longstanding ASL deaf school there); however it is probably more correct to say that they use a lexicon based largely on ASL (or Signed English), while incorporating also a not inconsequential ISL element. Furthermore, regardless of the individual signs used, the grammar used is clearly ISL and not ASL.

The Delhi Association for the Deaf is reportedly working with Jawaharlal Nehru University to identify a standard sign language for India [11].

Extraction of hand region plays a major role in hand gesture recognition. Skin color-based segmentation technique is popularly used for segmenting hands,

faces etc. These techniques depend upon the color model used for segmentation [6].

Various extraction procedures such as using threshold values, combining collection of low-level information to high level feature information, projecting the object using Eigen vectors, detecting finger tips by segmentation, using the concept of kinematics and dynamics of the body are discussed in [2].

Some feature extraction techniques like fingertip detection, finger length detection are discussed in [6]. Many learning algorithms can be used for recognition of gestures. SVM based method is discussed in [5]. A Hidden Markov model based recognition is discussed in [3]. A neural network based approach is discussed in [4].

PROPOSED METHODOLOGY

Followings are the alphabets in the Indian Sign Language. They uses both the hands which differentiate it from American Sign Language (ASL).

The alphabets can be classified by the angle between the fingers, how much the specific finger is open ,how many fingers are open and which finger is open.

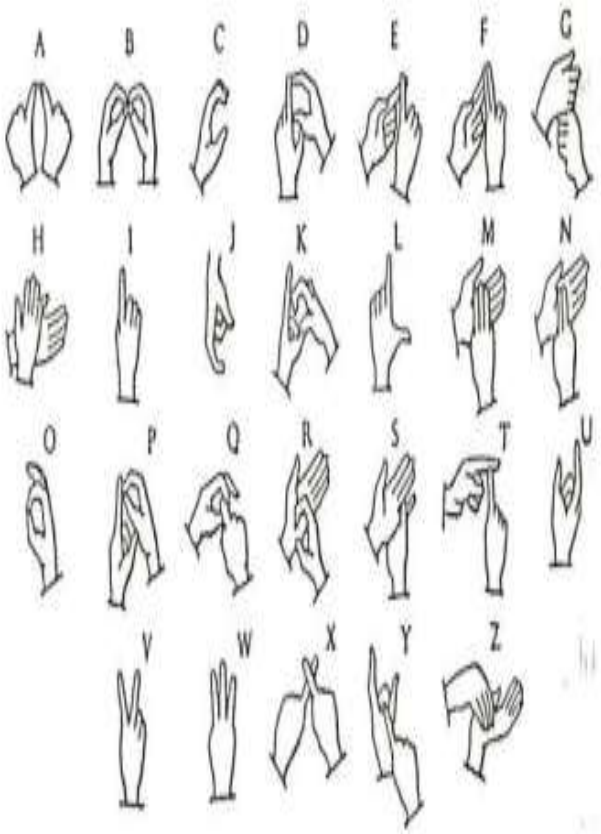

Fig 1:-*Indian Sign Language*

The block diagram shown in Figure 2 explains the various phases involved in the process. The working of block diagram is as follows.

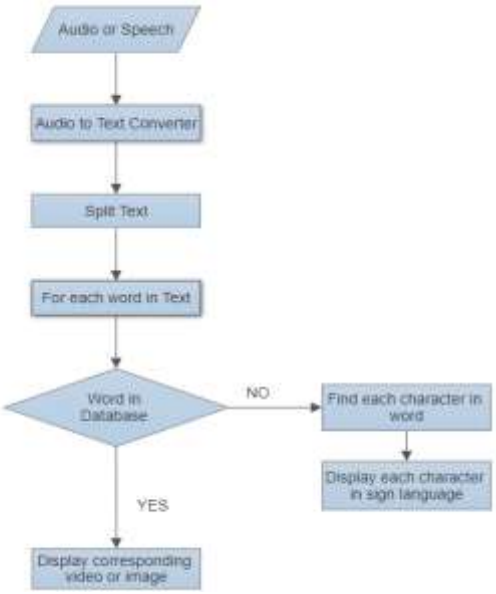

Fig 2:*-Flow chart*

1. Take the audio data as a input
2. Audio input is applied to speech to test converter
3. Here we get the corresponding text
4. If text is found in database then then corresponding image or video is displayed to the user.
5. If text is not found in the database then splits the text into alphabets and displays each alphabet in corresponding sign language.

APPLICATIONS AND CONCLUSION

By adopting this model differently abled person can communicate with other persons. This system can be applied in various places like Railway stations, airport, libraries, shopping malls, hospital etc.

In this paper we have convert the speech into text then displays their sign in Indian Sign Language respectively. This paradigm can work as a bridge between hearings impaired community and normal persons.

FUTURE WORK

In future we will focus to the capturing a gesture through web cam as well as we will also work on video data. For improving the accuracy, neural network can be used in future.

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