

Indian Sign Language as a Mode of Communication

Sandeep Kaur, Maninder Singh

Department of Computer Science and Engineering, Chandigarh University, Gharuan, Mohali, Punjab (India)

Abstract - One of the most precious gift of God given to the human is their ability to express themselves by communicating with each other. Normal human beings can see, listen and react to the situation by speaking out, but the Disable person who cannot speak out and listen, face many problems when communicate with normal people, even with disable persons. To help them Sign language comes into existence. Sign language is also known as a deaf and dumb language. It is used by deaf and dumb people to communicate with each other. Sign language does not have any written form, so to give written form to sign language HamNoSys (Hamburg Notation System) comes into existence. HamNoSys are basically symbols used to write signs in particular form.

Keywords: Sign Language, HamNoSys, ISL.

I. INTRODUCTION

Indian sign language is a visual-gesture language used by deaf, dumb and hard of hearing people. They use sign language as their mode of communication. Sign Language does not have any written form. To resolve this problem HamNoSys comes into existence. HamNoSys are notation used to write signs [1]. Sign language is used by deaf and dumb people to interact with each other and to express their feelings. Sign Language comes into existence in Deaf Communities [2]. Sign language is not universal. It vary from country to country, it is a complete natural Language with its own syntax and grammar. Sign Language even varies from region to region within same country. Sign Language in India commonly referred as Indian Sign Language. The All India Federation of Deaf estimates around 4 million Deaf People and more than 10 million hard of hearing peoples are in India. Survey Revealed that India has more Deaf and Dumb People than other countries. As we know that there is huge population of Deaf People in India but there is Lack of education in Deaf Communities. One Survey Revealed that only 5% Deaf People get education in India. The Reason behind Low Literacy Rate can be following:

- 1) Lack of Sign Language Interpreters.
- 2) Till the 20th century it was considered that Deafness is punishment for Sins and signing was strictly discouraged.

- 3) Unavailability of ISL tool.
- 4) Lack of researches on ISL.[4]

Here is a Hierarchy Classification of ISL:

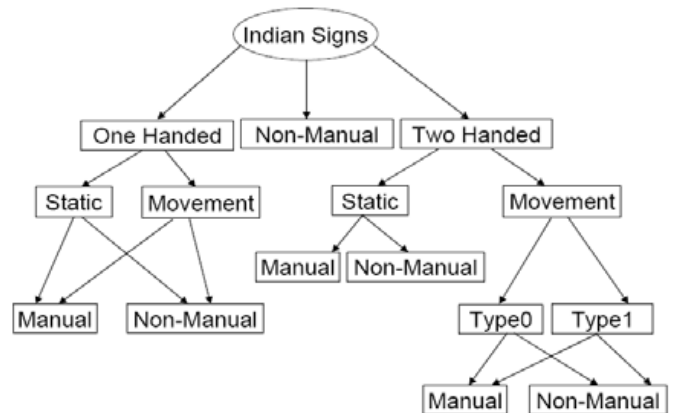


Fig.1: Hierarchy of ISL [3]

ISL signs are generally classified into three classes: One Handed, Non Manual and Two Handed.

One Handed Signs: Only a single dominating hand is used to represent one handed signs. These signs can be either static or dynamic. Each of the Static and Dynamic is further divided into manual and non-manual signs. Manual Signs are those which include hand, arms and other body parts and non-manual such as facial expressions, eyebrows. Here is an example which shows (fig.2) one handed static sign with manual and non-manual components [3].



Fig.2.Ear shows the one handed static manual sign whereas headache shows the non-manual sign [4].

Two Handed Sign: These signs are represented by both hands. These signs are also classified into two categories

Static and Dynamic. Static signs are further classified into two classes: manual and non-manual. Dynamic signs are classified into: Type 0 and Type 1.

Type0: Signs where both hands are in active position. (as shown in fig 3).

Type1: Signs where Right hand is more active than other hand. (As shown in fig.3).

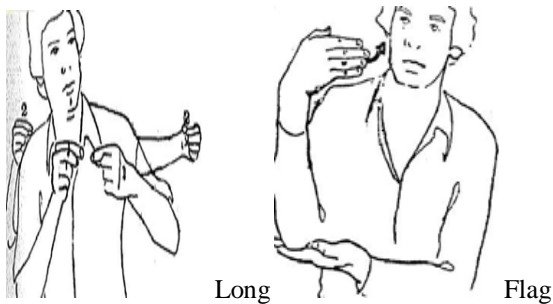


Fig 3. Shows the two handed sign Long (where both hands are moving) and Flag (where one hand is more active than other hand) [4].

II. CLASSIFICATION OF MACHINE TRANSLATION

Automatic Sign language generation systems are under research. Researchers from different countries are working on it. Those automated systems which translate a text into sign language are known as translation system. These system take text as input process it and convert it into particular sign language. Machine Translation is classified into three Categories:

- Direct translation system
- Transfer based translation
- Interlingua based translation

A. Direct Translation System

In this system there is only word to word conversion, none of the sentences are taken into consideration. Words are directly transform into target sign language without passing through an additional representation. In this translation input is taken as a text and target sign language is achieved without performing any type of syntactic analysis on the original text. Basically the word order of target sign language is same as the word order of English text. But in case of English to ISL the word order of target sign language may not be the same as input text. So to overcome this problem one system is required which have strong knowledge of both English as well as target sign language. There is one system to recover this problem named as “TESSA” has been developed based on direct translation approach. TESSA stands for Text and Sign Support Assistant[2]. Smith had proposed a system called “SignSynth project”. It is text to American Sign Language

Machine Translation. This system has been developed in weather Information Domain[1].

B. Transfer based Translation

This system takes text as input, analyze it syntactically and semantically and then transfer it into target sign language. In this system source language is transformed into abstract, some linguistic rules are applied to abstract to transfer it into target sign language. Transfer based Translation is also called as “Rule based Translation” in which special set of rules are used which read the information of the source language and produce a semantic or syntactic structure in target language. This approach is basically used in text to sign language machine translation and in text to text machine translation systems. A system names as “TEAM” is used for text to ASL (American Sign Language) translation system [5]. There is another system based on this approach named as “ASL workbench” is a text to ASL MT(Machine Translation) system which performs a deeper analysis than TEAM system. One more system based on this approach is “ViSiCAST translator”[6].

C. Interlingual Systems

In Interlingual system, the source is analyzed and processed semantically to produce an Interlingua i.e., Abstract language-independent representation. The target language is then generated from this Interlingua. This system is an alternative of both direct translation system and transfer based system. One system named “ZARDOZ” is based on this translation which is used for English to Sign Language translation [6].

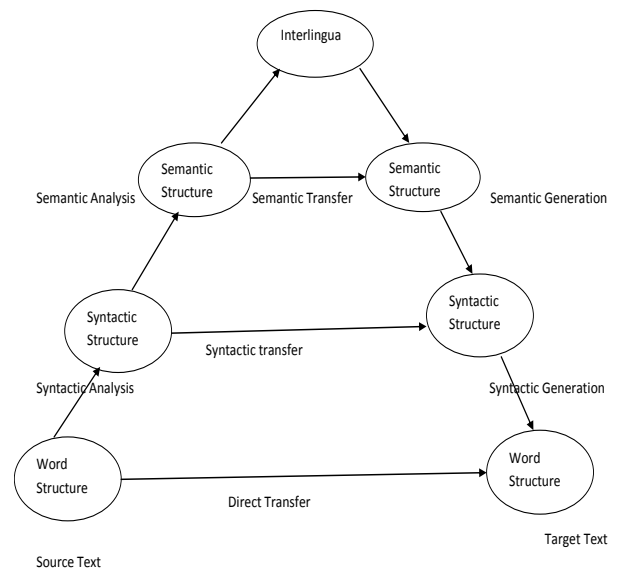


Fig. 3. Architecture of Machine Translation [6]

III. EXISTING SYSTEMS DEVELOPED IN SIGN LANGUAGE

A. TESSA Project

TESSA stands for Text and Sign Support Assistant, has been developed at UAE to help those people who are deaf and dumb and hard of hearing. It is a Speech to British sign language translation system which help the deaf person to communicate with post office clerk [2]. This system combines speech recognition technology and state of art of virtual human animation to help post office worker to communicate with deaf and dumb people. It takes speech as input convert it into text which is further converted into sign language. The post office clerk speaks into microphone which is recognized by the computer speech recognition system. The speech is then converted into British Sign Language and signed by the virtual human. This system is also useful for the normal people because this system also display the English text. Those people who don't want to use sign language they can see the English Text of the inputted speech.

B. TEAM Project

TEAM is English to ASL translation system. It is actually a syntactic transfer approach. It was developed at the University of Pennsylvania that uses synchronous tree adjoining grammar rules to generate an ASL [6]. The English input string is analyzed with the TAG Parser during the translation process. The Syntactic analysis of the English word is then converted into ASL.

C. ViSiCAST Translator

Ian Marshall and Eva Safar at the University of East Anglia developed a system for translating English text into British Sign Language. This System is called ViSiCAST Translator. The System also considered a research for translation to German or Dutch Sign Languages, but this research has not yet been implemented [6]. This System uses the CMU link parser to analyze an input text and then uses the Prolog Declarative clause Grammar rules to transfer the output of CMU link parser into a Discourse Representation Structure (DRS). During the half of the translation, Head Driven Phrase Structure rules are used to develop a symbolic SL representation script. This script is basically an XML file called Signing Gesture Markup Language (SIGML), a coding scheme for the movements required to perform a Natural Sign Language [5]

D. ASL workbench

D'Armond implemented an ASL Machine Translation system called ASL workbench which is based on the knowledge of modern ASL linguistic research. In this system, lexical-functional grammar (LFG) is used for the analysis of the English text into Functional Structure. The English

Functional Structure is then converted into ASL with the help of hand-crafted transfer rules [6].

E. ZARDOZ

This System was developed by Veale in 1998. They present a system which translates English text into target sign language. Target sign language can be ISL and JSL. In this system, they used a set of hand-coded schemata as an Interlingua for translation component. This system comes under interlingual system [6]. This system takes text in English language then translates it into either in ISL or in JSL according to the choice of the user.

IV. CHALLENGES IN SIGN LANGUAGE

Sign language does not have any written form. So it faces many problems to interpret it. One of the challenge is lack of experts (interpreters) who know complete sign language. Due to this problem only 5% deaf and dumb people get education in India. Literacy rate is very high. There is no resource by which deaf and dumb people can get knowledge about signs. They use little bit signs to communicate with each others that they know. If this problem gets resolve, they can communicate with each other in effective manner. Second challenge is that there is no written form of sign language. To overcome this HamNoSys comes into existence. HamNoSys is a stokoe based notation system. These are symbols used to represent sign language in written form. These symbols are very difficult to remember. Even no experts can remember it, so we have system which overcomes this problem named as ESigneditor. ESigneditor is basically a tool for German sign language. This tool has HamNoSys corresponding to the words. It contains symbols for around 100 words. This system has predefined notations for words but there is no choice for creating HamNoSys corresponding to new words. So this is very easy method to use HamNoSys in sign language. HamNoSys describe symbols on the basis of parameters of signs. These parameters of signs are written in order of symmetry operator, non-manual components, hand shape, hand position, location and movements as shown in fig.4

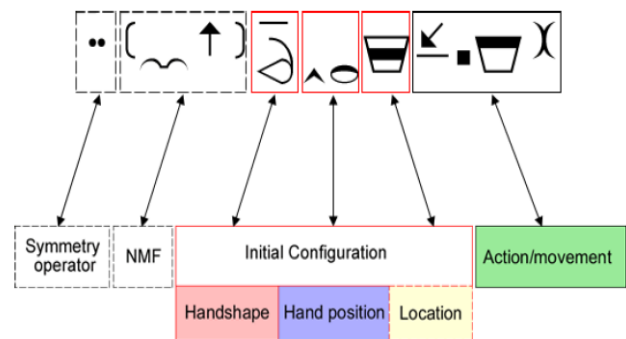


Fig.4. Parameters of sign [1]

Fig.5 and Fig.6 showing HamNoSys and sign corresponding a word "WOMAN"

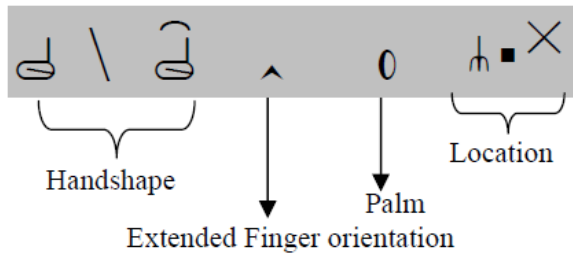


Fig.5: HamNoSys of word "WOMAN" [4]



Fig.6: Sign of word "WOMAN" [4]

V. CONCLUSION

This paper describes all system that has been developed to help deaf and dumb people. This paper covers all the hurdles that come in front of sign language. Solutions for those problems are also described in this paper. As we all know that sign language does not have any particular written form, so to write it some notations are used that are called HamNoSys. HamNoSys are also explained in this paper.

VI. REFERENCES

[1] Rupinder kaur and Parteek Kumar, "HamNoSys Generation System for Sign Language", IEEE, 2014.

[2] Syed Faraz Ali, Gouri Sankar Mishra, Ashok Kumar Sahoo, "Domain Bounded English To Indian Sign Language Translation Model", International Conference on Electrical Engineering and Computer Science, 21st April 2013, pp.179-183.

[3] Archana S.Gotkar and Dr.Ganjana K.Kharate, "Study of Vision Based Hand Gesture Recognition Using Indian Sign Language", International Journal On Smart Sensing and Intelligent Systems, March 2014, pp.96-115.

[4] Tirthankar Dasgupta, Sambit Shukla, Sandeep Kumar, Sunny Diwakar, Anupam Basu, "A Multilingual Multimedia Indian Sign Language Dictionary Tool", The 6th Workshop on Asian Language Resources, 2008, pp.57-64.

[5] Achraf Othman and Mohamed Jemni, "Statistical Sign Language Machine Translation: From English written Text to American sign Language Gloss", IJCSI, Vol.8 September 2011, pp.65-73.

[6] Matthew P.Huenerfauth, "A survey of American Sign Language Natural Language Generation and Machine Translation System".