FP-International Journal of Computer Science Research (IJCSR)
Volume 2, Issue 1, Pages 1-5, March 2015

Hamburg Notation System

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ABSTRACT
HamNoSys plays an important role in sign language animation. In 19th century it was challenge for all the sign language researchers that how to write sign language. They did not have any notations. This was the main problem to generate sign animation. This problem gets solved when HamNoSys was generated in 1980 at the University of Hamburg. This paper describes all notation used to write Sign language. This paper gives overview of HamNoSys and describes its application area.

Index Terms
Stokoe Notation System, Sutton Sign Writing, HamNoSys, ISL.

1. INTRODUCTION

Sign language is a non-verbal form of communication specially found in deaf communities [9]. Sign language is a communication mode for those people who are hard of hearing and hearing impaired. It is commonly used in deaf communities like their friends and families. Sign language helps them to interact with each other. Sign language is not a universal language. Like spoken language it varies from country to country and region to region. In sign language deaf and dumb people use their hand and arms to convey their thoughts, feelings and messages. Sign language comes into existence in 1620. People usually used their hands and arms to convey their messages to others. In 1620 Juan Pablo de bonet published first book that helps the deaf and dumb people to learn sign language. In 1750 first school for Deaf and dumb people was opened by Abe de I Epee in France [4]. During 16th to 20th century there was no such system to writ
e sign language and the researchers of sign language face difficulties to write it.

This paper has been divided into 5 sections. Section 1 gives introduction to Sign language and HamNoSys. Section 2 includes Evolution of various Notation systems. Related work on HamNoSys describes in section 3. Application of HamNoSys Generation system is described in section 4. Section 5 describes the Conclusion.

2. EVOLUTION OF VARIOUS NOTATION SYSTEMS

There are various notation systems for writing sign language. These notation systems are explained below:

2.1 Stokoe Notation system
The first notation system that was developed for writing sign language was Stokoe Notation System. It was developed in 1960 by William Stokoe. William Stokoe developed a linguistic, self-named notation system. After developing this notation system he proved that American Sign Language is a Real Language [15]. He also showed that hand shapes, hand location and hand movements are basic parameters of sign language. Roman alphabet has phonemic level script unlike it; Stokoe notation has feature level script. Stokoe Notation System is explained with the help of example shown below:

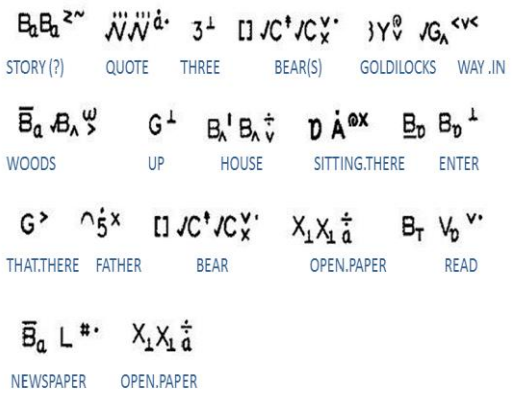

Fig.1. Stokoe Notation System [15]

Main drawback of this notation system was that it does not include symbols for non-manual functions like eye, eyebrow and body postures. It is not so easy to read unlike sign writing. Stokoe notation was not so much popular script. Most of the people who want to learn sign language they usually preferred to learn sign writing rather than Stokoe notations. Sign language researchers used stokoe notations; it was not used by deaf peoples in everyday life.

2.2 Sutton Sign Writing

Sutton Sign writing was not developed by any linguist, it was developed by a Dancer. Valerie Sutton introduced a self named, another way to write sign language in 1974. He developed this notation system for Danish Sign Language. This notation system recovers the limitations of stokoe notation system. Sutton sign writing also contains symbols for non-manual functions. The main purpose of this sign writing was not to capture any linguistic data but to capture movements of DTS. This writing system was developed in such a way that it can also be used to transcribe movements for craftsmen and animations. Sutton had published his book in 2002 and he states that 27 different countries had been adopted his Sutton Sign Writing. Sutton Sign Writing records the movements of signs but it also record the linguistic details, as it was not considered by Sutton [15]. Example 2 shows words along with their perspective notations.

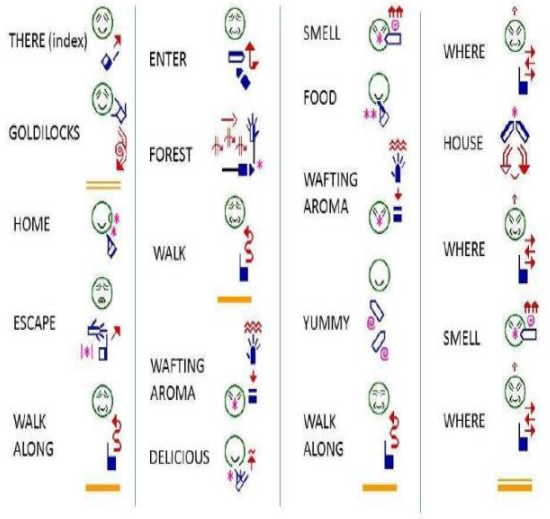

Fig.2. Sutton Sign Writing [15]

2.3 Hamburg Notation System

In 21st century there is one system developed named as HamNoSys which is used to write sign language. HamNoSys stands for Hamburg Notation System is a phonetic transcription system for sign language. It is developed in 1985 at the University of Hamburg. It helps the researcher to provide sign language a written form. First version of HamNoSys was released in 1984. First version of HamNoSys contains only manual behavior but did not contain notations for non-manual behavior. This problem recovers in its 4th version. HamNoSys notations are used universally all over the world. Sign language varies from country to country but HamNoSys Notations are same throughout the world. In HamNoSys signs are elaborated in forms of signing parameters. Signing parameters contains hand shapes, hand location, hand orientation and hand movement. Fig.3. Shows the syntax of HamNoSys notation that is Symmetry order, non-manual components, hand shapes, position, location and movements

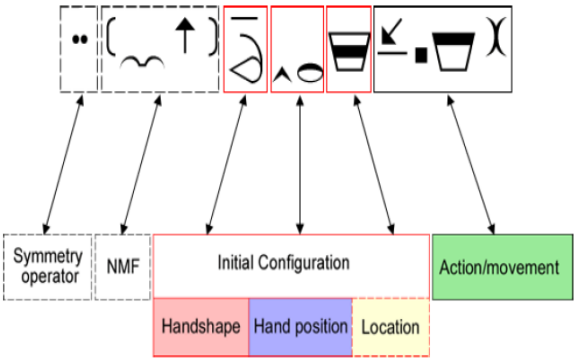

Fig.3. Parameters of sign [12]

Descriptions of these parameters are:

2.3.1 Hand shapes

Hand shape include all basic hand shape, hand bending and finger shapes. Hand shapes play an important role in sign language. Sign language basically started from hand shapes. In 16th century people started to communicate using their hands with deaf and dumb people. Sign Language started from homes because if any family had hearing-impaired people then they try to interact with them by making signs with the help of their hands. Basic hand shapes described in figure 4.

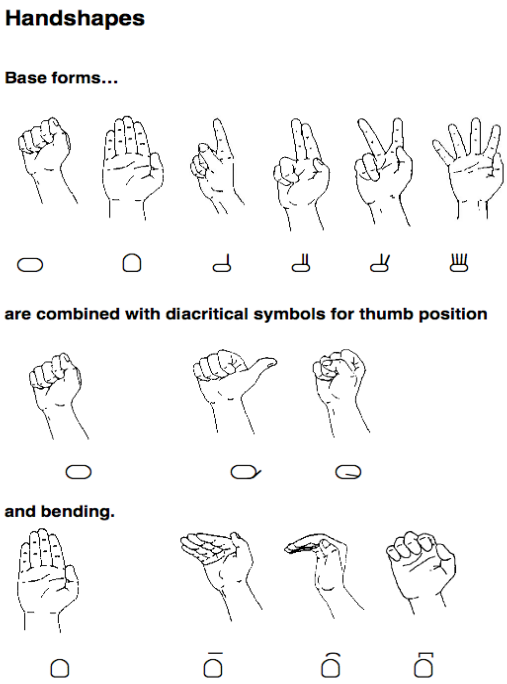

Fig.4. Basic hand shapes [15]

The first series of shapes describe the basic shapes of hands and their perspective HamNoSys, 2nd describe the HamNoSys of different thumb position and last

describe the hand bending positions with their respective HamNoSys.

2.3.2 Hand Orientation

Hand orientation includes all the possible views with respect to body i.e. top view, right side, left side view. Fig.5 shows three possible views for extended finger direction. First view shows the signer view, 2nd shows the bird's view and 3rd is the view from right side.

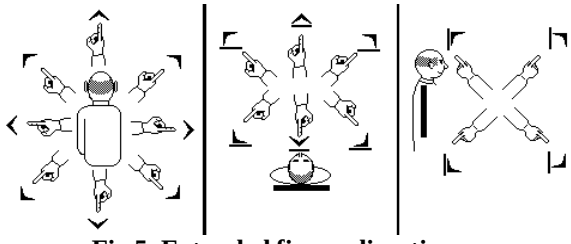

Fig.5. Extended finger directions

2.3.3 Location

Hand Location contains information about head, pair location, trunk, upper arm and lower arm. Location split up into two components [2]: First determine x and y co-ordinate and 2nd determine z co-ordinate [15]. Figure 6 shows different hand location.

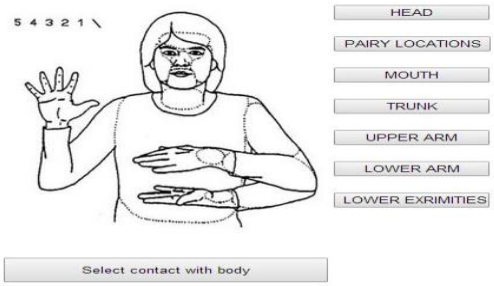

Fig.6. Location of hand with respect to body [12]

Example 7 and 8 shows HamNoSys and sign for word "woman".

Fig.7. Sign for word "woman" [14]

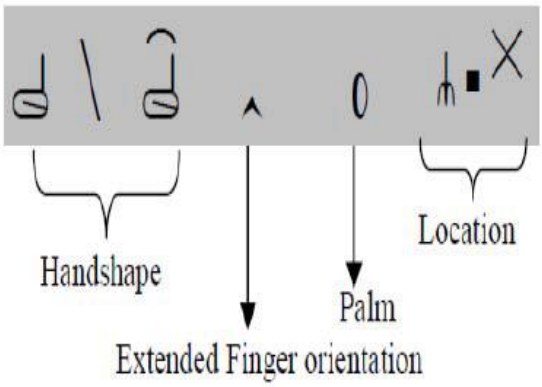

Fig.8. HamNo Sys for word "woman" [14]

3. RELATED WORK ON HAMNO SYS

Research work done on HamNoSys is not very large because there are only two system developed for Hamburg notation system. HamNoSys notations are based on stokoe based notation system. These notations represent signs in form of symbols. There are around 200 different symbols and it is very difficult to remember all these notations and their symbols [13]. Sign language experts are needed having complete knowledge of HamNoSys but in India such expert is very difficult to find. So there is need to develop a system that help to generate HamNoSys for different words. One tool that was developed for this usage is ESigneditor which is explained below:

3.1 ESigneditor

It is a tool that was basically developed for German sign language. This tool is used at everywhere around the world because HamNoSys are same for every sign language. It does not change according to the sign language as we know that sign language varies from country to country.

ESigneditor contain HamNoSys of around 200 words. ESigneditor is an editor that represents signs in the form of HamNoSys. It stores generated notations into its database. It provides search criteria for the words that are stored into its database. It also provides another facility to create HamNoSys for new words that are not in database. This tool is easily available on http://vh.cmp.uea.ac.uk/index.php/SiGML_Tools.

Example 9 shows the interface of ESigneditor where the + button is used to add new document and – button is used to delete any document. Search criteria of ESigneditor starts with letter "A".

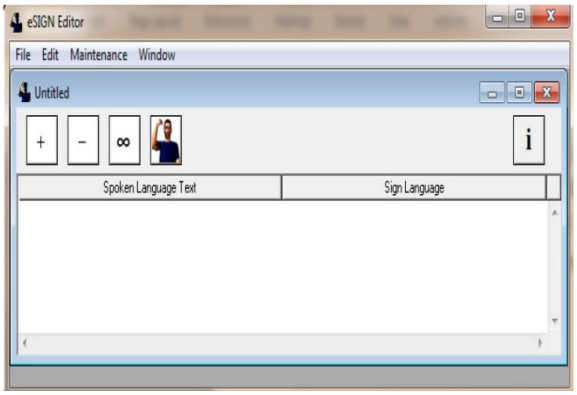

Fig.9. ESigneditor interface [13]

Figure 10 represents the interface of searching word.

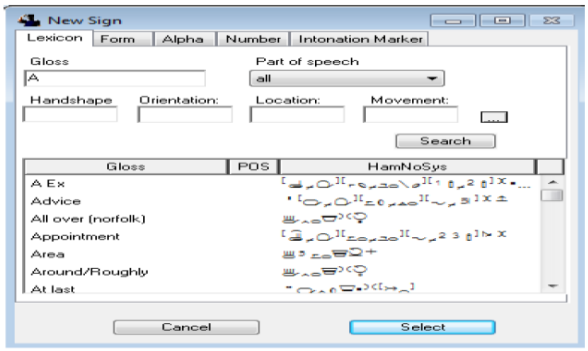

Fig.10. searching word "A" [13]

3.2 HamNoSys Generation System

In 2014 there was one system developed for HamNoSys was HamNoSys generation system. It was basically developed for Indian sign language. Working criteria is same as per ESigneditor. In this system when User enters word either in Punjabi or in English for generating HamNoSys then the signing photograph corresponding to that word displays. User can easily guess which body parts are used by the signer with the help of this photograph. There are four categories in front of user to choose: Hand Shapes, Hand Orientation, Hand Location, and Hand Movement. According to the image user can select these parameters one by one. At the end user will get HamNoSys for the entered word.

This paper discusses all the notation system from 1960 used to generate sign animation. Various difficulties faced by the sign language interpreters in 19th century when there was no such system to write the signs. First version of HamNoSys contains Notations only for manual functions. Latest version of HamNoSys contains notations also for non-manual functions like remembering them.

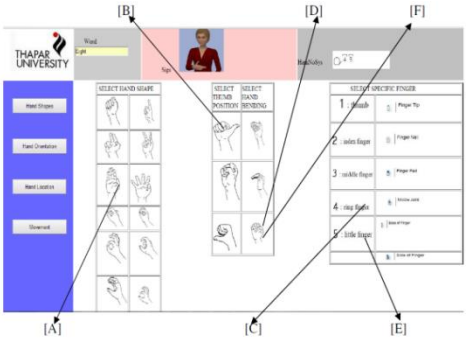

Fig.11.Interface of HamNoSys Generation System [13]

4. Application of HamNoSys Generation System

HamNoSys generation system generates HamNoSys corresponding to word. HamNoSys plays an important role in generating sign animation. Sign animation is not possible until we don't know that how to write the specific signs. Example 13 shows the need of HamNoSys to play sign animation. HamNoSys Generation system generates HamNoSys and stores them into Database [13]. It is useful in generating sign animation. HamNoSys generated by this system given as an input to the avatar module. After it SIGML URL APP plays sign animation according to the HamNoSys.

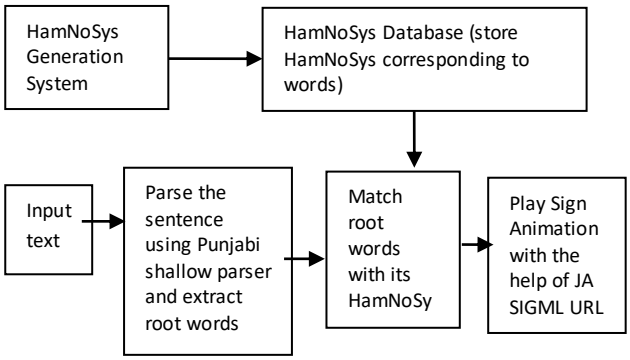

Fig.13 Use of HamNoSys in sign language generation system [13]

5. CONCLUSION

eyebrow, Eye gaze etc. It is very difficult to remember all these notations because these are very different notations. So many systems are build that stores HamNoSys corresponding to the words. With the help of these systems it is very easy to use these notations without

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