**Towards a system to aid communication with Deaf**



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**Abstract**

Towards a system to aid communication with Deaf is an experimental system that aims to aid communication between a deaf person and an ordinary person by translating the ordinary person’s speech to sign language. A speech recognizer recognizes speech from the ordinary person and the system then synthesizes the appropriate sequence of signs in American Sign language (ASL) using a specially developed avatar. By using a phrase lookup approach to language translation, which is appropriate for the highly constrained discourse in society, we were able to build a working system that we could evaluate. We summarize the results of this evaluation (undertaken by deaf users and Ordinary people), and discuss how the findings from the evaluation are being used in the development of an improved system.

*Keywords: Machine Learning, Speech Recognition, Machine Translation, Sign Language, Avatar*

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**Problem Definition**

**Problem Statement:**

In our modern information and communication society, daily life would be unimaginable without technology. Information and Communications Technology (ICT) is also very useful for people with special needs.

Deaf are people who can’t talk and hear, hearing people are unfamiliar with Deaf because they don’t know their language. They think that if you cannot hear, you can easily access any necessary information by simply reading it in written form, and if you really need to communicate, you can always write your message down. [6]

But this system is not an efficient way to communicate, Deaf have their own language of communication (sign language), they can only understand this language and also they write and read Faster on sign writing.

According to survey in 2015, there are 121 “Deaf sign languages” in the world, but there is not such an efficient mechanism where Deaf can easily understand people thoughts. [7]

**Introduction**

**Background**

People who are Deaf have little or no hearing ability. The word “Deaf”, (often written with a capital “D”) typically refers to people who use Sign Language as a primary language – either directly with others who sign or indirectly through an interpreter with people who do not sign.

Sign language for deaf people has special features that are quite different from those of spoken language. Sign language is an iconic language compared to spoken language, which is more of an arbitrary one. Another crucial difference between the two languages is that sign language does not have its own writing system. Therefore, in order to write descriptions of signs, line drawings, photographs and illustrations have commonly been used, but these represent only a very small moment in the process of actual signing. [1]

They may hear environmental sounds, and may even understand some speech, but they identify with what is known as the “Deaf Culture” [2]. There has recently been considerable research activity in developing automatic systems which can understand and output speech to provide information services or to perform transactions with customers [3]. We have been developing a system which enable people to communicate with Deaf. It is an interactive translation system to assist in the completion of a conversation between an ordinary person and a deaf. The system translates the ordinary person speech into American Sign Language (ASL) and displays the signs using a specially-developed avatar. A comprehensive approach to the task of enabling humans who cannot sign to communicate using sign-language would clearly require the development of a general purpose speech to sign language converter. This in turn requires the solution of the following problems:

1. Automatic speech to text conversion (speech Recognition).
2. Automatic translation of English text into a suitable representation of sign language using Machine Translation.
3. Display of this representation as a sequence of Signs using computer graphics techniques.

For many people who have been profoundly deaf from a young age, signing is their first language so they learn to read and write English as a second language [4]. As a result, many deaf people have below-average reading abilities for English text and prefer to communicate using sign language [5].

We will specify how our system will reduce the gap between Deaf and people, which models can we used to automate this system for communication between them and we will describe how technology can facilitate this mechanism.

**Literature Review:**

This chapter is based on research that we have done to solve the problems such as differences between this system and other similar systems already been built. In this system, we tried our best to overcome challenges we observed in current systems. So according to our researches and findings, there were not any system to convert text/speech or ordinary people into sign language and represent it using an avatar. Briefly, there are systems for Deaf like Tessa but they are limited to a Post Office and they used British Sign language (BSL) instead of American Sign Language (ASL).

**Area 1: TESSA**

TESSA is an experimental system that aims to aid transactions between a deaf person and a clerk in a Post Office. These systems are designed to provide translation of conversational speech between languages with a potentially very large vocabulary. It is an interactive translation system but it operates in a very restricted domain and is designed to assist in the completion of a transaction between a Post Office (PO) clerk and a deaf customer. The system translates the clerk's speech into British Sign Language (BSL) and displays the signs using a specially-developed avatar. [8]

**Area 2: HandTalk**

Founded in 2012, Hand Talk performs digital and automatic translation into the Brazilian Sign Language. HandTalk, which is internationally awarded and a reference in the segment, is run by a friendly virtual interpreter, Hugo, a 3D character that makes communication interactive and easy to understand. <https://www.handtalk.me/sobre>

**Objectives:**

We will suggest an efficient mechanism/system that Deaf can easily communicate with ordinary people to understand their thoughts. As Deaf is a part of society and they need to make a connection with people around them. Our system get the text/speech from smart phone, convert it to sign language using machine translation and represent the speech using 3D character. We will use International sign language.

**Dataset:**

The dataset used is a sample of common words and sentences that deaf are using daily.

The font that we used is American Sign Language which is published on 2014.

We have searched many sources for gathering dataset such as Wikipedia pages, some books like (Goldilocks & the Three Bears in American Sign Language, The Book of Jonah) , Signbank and other sources, but the dataset that was used for this project is a subset of a much larger dataset, as described in <http://www.signbank.org/signbank.html> . As dataset in this website was so diffused so we gathered and sorted dataset first. In this website there are more than 10000 words in ASL and has the following feature vectors:

𝠀񀀁񀀉񈗥񈗵񋸦𝠃𝤝𝤨񀀁𝤎𝣤񀀉𝣰𝣮񈗥𝤏𝤇񈗵𝣱𝤑񋸦𝤆𝤜 Come

𝠀񀀁񆇡񈗥񋾡𝠃𝤘𝤰񋾡𝣴𝣵񀀁𝣹𝤒񈗥𝣣𝤇񆇡𝤋𝤘 Disappointed

𝠀񀀁񆕁񇆥񆡁񆡁񍘡𝠃𝤧𝤺񆡁𝤜𝤲񍘡𝣴𝣵񆡁𝤐𝤲񆕁𝤔𝤔񇆥𝤎𝤢񀀁𝣹𝤑 Red

𝠀񀀁񆨡񋲡񍦁𝠃𝤟𝤬񍦁𝣴𝣵񀀁𝣾𝤎񆨡𝤓𝤚񋲡𝤓𝤤 Throw in mouth

𝠀񀀙񈁑񋾡𝠃𝤘𝤵񀀙𝣝𝣲񋾡𝣴𝣵񈁑𝣟𝤗 He

𝠀񀀙񈁑񋾡𝠃𝤘𝤵񀀙𝣝𝣲񋾡𝣴𝣵񈁑𝣟𝤗 She

𝠀񀀡񀀁񆫡𝠃𝤛𝤚񀀁𝤄𝣼񆫡𝤉𝣲񀀡𝣱𝣼 111

𝠀񀀡񂤁񁳑񈙇񇆥𝠃𝤯𝤡񀀡𝣝𝣬񂤁𝣱𝣶񁳑𝤆𝣫񈙇𝤑𝤇񇆥𝤈𝤓 155

𝠀񀀡񂤁񁳑񈙇񇆥𝠃𝤯𝤡񀀡𝣝𝣬񂤁𝣱𝣶񁳑𝤆𝣫񈙇𝤑𝤇񇆥𝤈𝤓 One hundred fifty five

𝠀񀀡񂤁񁳑񈙇񇆥𝠃𝤯𝤡񀀡𝣝𝣬񂤁𝣱𝣶񁳑𝤆𝣫񈙇𝤑𝤇񇆥𝤈𝤓 One-hundred-fifty-five

𝠀񀀡񂤁񃋁񀭡𝠃𝤰𝤖񀀡𝣜𝣷񂤁𝣰𝤁񃋁𝤅𝣹񀭡𝤙𝣷 163

In the dataset, there are 3362 example vectors.

**Conclusion**

**Summary**

We conclude that the dataset is not a complete space, and there are still other feature vectors missing from it.Our goal in developing this trial system was to establish whether the introduction of a limited speech-to-sign translation system for ordinary people would be beneficial to deaf whose primary means of communication was sign language. Moreover, we are using International sign writing mechanism but for testing our first version of our system we are using American Sign Language, in future it is possible to fit any sign wiring language with our system. In addition, concatenation of signing is more fluent and controlled for avatar than for video signing, as the exact positioning of the avatar can be manipulated. For these reasons, we decided to display the signs using an avatar (3D character).

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