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Need for Standardisation of Sign Language and the use of E-learning tools for Deaf Education

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Abstract— ***Abstract*- In this paper, we have tried to highlight the importance of sign languages with the need for a global sign language and the use of e-learning tools for deaf education. While spoken languages are accorded respect and recognized all over the world, there is a lot of stigma associated with sign languages. This stigma towards sign language in our country has become an impediment for the education of the deaf children as parents and schools tend to avoid teaching sign language to them and focus more on other methods such as oralism or lip reading. Even the schools which offer courses in Indian Sign Language face challenges such as regional variations of Indian Sign Language. This paper reckons that the non-standardization of one particular Sign Language in our country has exacerbated the state of education of the deaf. Another major problem associated with the hearing impaired community of our country which has been acknowledged in this paper is their isolation from the deaf community of the rest of the world. A possible solution for these problems can be the standardization of one particular sign language for the entire country. Adaptation of International Sign Language can be a great step towards narrowing the communication gap between the deaf communities across the world. We further focus on the use of new evolving e-learning technology for the deaf education using a standard sign language.**

Keywords— ***International Sign Language(ISL), Augmented Reality(AR),NPTEL(National programme on Technology Enhanced Learning)***

I. Introduction

Today's Over 5% of the world's population (i.e 360 million people) has disabling hearing loss (328 million adults and 32 million children).India is a very populous country (estimated 1 billion plus population) so the number of deaf people cannot be definitely estimated. It is roughly estimated to be between 5 and 15 million.

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Four out of 1,000 children in India are born deaf, making it the country with the largest number of Deaf, and perhaps also the largest number of sign language users. Although India is rapidly developing, there is still plenty of poverty, and thus a high rate of deafness.

The population of individuals who are deaf or hard of hearing i s very diverse. Hearing losses range from mild through profou nd. Many individuals are born with a hearing loss, yet large percentages acquire their hearing loss between the ages of 0 to 3. Approximately 45 percent use speech and residual hearing a s their primary mode of communication, 49 percent use speech and sign, and about 6 percent use sign only .The majority of st udents attend regular schools, while about 20 percent attend sp ecial schools. The racial/ethnic backgrounds of individuals wh o are deaf or hard of hearing also vary in a manner similar to t he racial/ethnic backgrounds of individuals who are hearing.T here have been a variety of points of view about how individua ls who are deaf should learn to communicate. Debate about wh ether to use natural sign language, speech, signs in English wo rd order, created sign systems, or how to integrate speech, spee ch reading and auditory training with sign has been consistent and ongoing. Professionals in the field of deafness, family me mbers and individuals with a hearing loss consistently have be en reconciling the differences in each of these perspectives and determining how to proceed.

II. Related Work

The Indian Sign Language has about 1,500,000 users collectively in India, Bangladesh and Pakistan aiding it to make it to the top three if not the top-most used sign language in the world. Comparing by the number of users, the top-most used sign language of the world is ASL followed by the Chinese Sign Language [1]. Currently, Indian Sign Language is not considered a language in most government circles in India; however, it would rank eighteenth among the 114 languages assessed (Mallikarjun 2001) according to the 1991 census [1].

No language exists without variations, and researchers over the years, have found fair amount of variations in various sign languages of the world at different levels of phonology, lexicon, and grammar. Regional varieties of Australian Sign Language (Auslan) vary in their use of signs for colors, such as BLUE, GREEN, and WHITE [2]. Conversations in British Sign Language (BSL) appear to differ in structure from narratives. Woodward and DeSantis in [3], found that white signers use comparatively newer one-handed variations of the signs as compared to black signers in

America. India is a huge country and has many variations, or dialects, of sign language. According to International Encyclopedia of Linguistics [4], the different dialects of ISL are Delhi Sign Language, Kolkata Sign Language, Bangalore-Madras Sign Language, Bombay Sign Language. 70% of signs from all regions are related. Among all the existing dialects, Delhi dialect is the most influential. Indian sign language is developed indigenously in India. Some part of it is influenced from British Sign Language mostly in the finger-spelling system and a few other signs, but most are unrelated to European Sign System or American Sign System. But, Vasishta et al.[7], concluded in a more recent survey(1977),that the language varieties in ISL have systematic variations in and between regions and would not create problems for language standardization or planning.

So far we can establish that just like spoken languages , sign languages also differ across the boundaries of countries or to be more precise across the boundaries of states .There is always some kind of variation found in the sign languages used by different kinds of people even within a small area .Sometimes people from a particular region devise signs according to their convenience and that's how their innovation leads to the variation. For decades, researchers have worked in this direction, holding the views that sign language is not universal and each country has its own sign language [5]. Until now, interpreters of various sign languages have played a central role in enabling human interactions for the hearing impaired at various international meetings and conferences. But there are limits to what can be done in this way. The prospect that a lingua franca might be needed for the whole world is something which has emerged strongly since 1950's [6]. The need for a global language is particularly appreciated by the international academic and business communities and it is here that the adoption of a single lingua franca is most evident.

Therefore, continuous efforts have been made worldwide for finding a sign language which can act as a 'lingua franca' or 'common language' globally. It was in 1973, that the World Federation of the Deaf began to create a standardized vocabulary of signs. A lexicon of 1,500 signs was developed and named "Gestuno". A book was published by the commission in the early 1970's, "Gestuno: International Sign Language of the Deaf", containing this vocabulary list of 1500 signs. Gestuno is a word of Italian origin meaning "oneness of sign languages". Gestuno was later renamed as International Sign Language. Deaf people from various countries have worked together to select "iconic" signs from various sign languages for common words that might be the easiest to understand across the globe, agreeing on a single sign to use in the International Sign Language. Most of the signs in ISL come from the sign languages of Western countries (ASL and FSL).

Michael W Morgan in [8], pointed out that there is no proper comprehensive dictionary of ISL available in India. Only glossaries of a few less than thousand local and regional signs have been produced which are also not readily available. He was right when he said that "Without dictionaries and grammars it is difficult to imagine a large corpse of trained and professional sign language interpreters or sign-proficient teachers, let alone the as-yet unimaginable: educational materials for the Deaf in their own language."

Various organizations in India have come a long way in making the unimaginable a reality since then. In Jan 1990, the Ramakrishna Mission embarked upon a very unique project in collaboration with CBM International, Germany to standardize the ISL. In India, 24 nov,2001 became an important day for people who had hearing impairment. The 1st ISL dictionary was released in august. The ISL dictionary in India was an earnest attempt in the field of research, documenting over 2500 signs from 42 cities in 12 states and this all was done to provide a standard code. Apart from sign language, a technical sign language dictionary was introduced so that impaired students can pass polytechnic education. There are also signs for physics subject taught in schools and with the help of ALL India Deaf Bank Employees Association the Mission also brought a sign language dictionary on banking terminologies.

We have further described the techniques by which signed dictionaries can prove to be a greater help to the deaf students using the augmented reality technology. We have also tried to explain the methods by which the available educational videos on the internet (for e.g. NPTEL videos) can be augmented with sign language gestures as subtitles (captions).

III. TECHNIQUES AND FUTURE WORK

In this section, we have explored two comparatively newer technologies and developed a framework for how these can be used for the benefit of the deaf.

A. AUGMENTED REALITY FOR UNIVERSAL SIGN LANGUAGE DICTIONARIES

Augmented reality is defined as a real-world environment whose elements are built upon computer-generated sensory input such as sound, video, graphics or GPS data. In the educational field, students with special needs would benefit from this technology the most. Often students with disability of some kind experience difficulties in the classroom. Augmented reality is the latest technology that could accommodate or modify their learning experience to their specific needs. Their barriers could be broken down and they could receive a functional equivalent education quality as their classmates. The AR technology is now bridging the gap that exists between the worlds of the hearing and the deaf.

For the applications and videos that are available on the internet today, to be communicable to a larger audience, the signs communicated in the videos should be known to all. This calls for a need to develop standard signs that will be

followed universally. This can be facilitated by a standard sign language dictionary that will be accepted globally. Although some such standard dictionaries exist worldwide, but they are not much known and are hence not exploited to their best.

Here we present a general description of the prototype of an augmented universal sign language dictionary. The main prerequisites for developing an augmented reality dictionary is: a) camera to capture the real world environment, b) display devices (head mounted displays or display screens), c) AR dictionary (with text/images). For an augmented dictionary, we require markerless image/text recognition. A mobile application has to be developed on any of the AR supporting platforms, which will recognize the text or images in the physical dictionary and this recognition will trigger a video of the sign in the International Sign Language with options to display the same sign in any other sign language as well. The application will use mobile's GPS and image recognition technology to look up the data (videos) from an online database. A database of video dictionaries of various sign languages such as "Signing Savvy" is required. Along with that, high speed internet connectivity such as a 3G or wi-fi is also required.

Fig.1. Using augmented reality, the signed video corresponding to the word in the dictionary is triggered on the mobile display screen[1]

B. *SIGNED VIDEOS*

There are many ways in which signed interpreters or signed animations can be added to the videos. Different equipments and softwares can be used.

We aim to -

Partially overlay the interpreter onto one side of the video. The adding sings to the videos would be an added option on the youtube and if not selected. A non signed version of the same video material could also be provided for the audience .

A general prototype of achieving our aim is as below :

We have used the NPTEL educational videos to explain the concept. The Flash Video format can be used as it is widely used and supported. This prototype has the interpreter video partially overlaid on the original NPTEL video for the convenience of viewers. The following phases give a step by step description of how an interpreter video will be overlaid on the videos available on the internet:

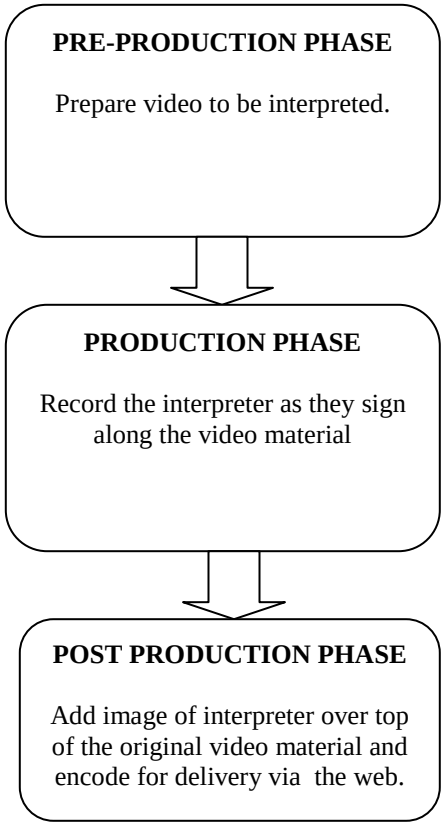

Fig 2: A flowchart representing the phases involved in overlaying an interpreter on the video.

Pre-production phase

The workflow should be carefully planned to save time and effort. The signer must view all video footage to be interpreted before production begins. A monitor and speakers are required for the signer's use: the program to be interpreted can be played on it when the signer is ready to begin. Placing the monitor close to the camera ensures that the signer is as much as possible facing the audience.

Production phase

This phase involves recording the video of the interpreter which is to be overlaid on the source video. Microphones can be used to record the audio of the playback video. The advantage is that it will act as a guide track later on to synch

up the audio. This will help discard the non-synchronization between audio and signed video.

Post-production phase

This phase involves arranging and manipulating text, images, videos and audio and output as a new video file.

Make the new signed video version as required.

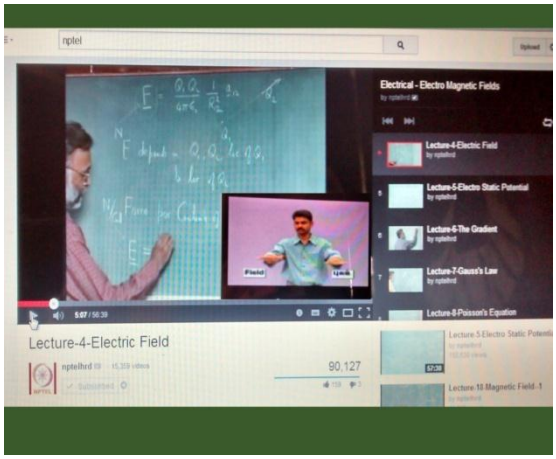

Fig 3: An example of a signed NPTEL video lecture by overlaying an interpreter at one side of the frame.

This is just a technical overview of adding signs to a video lecture, there can be many other techniques. Such techniques make the videos more comprehendible to the deaf. Such operations should be guided by institutional policy.

IV. Conclusion

Education of individuals who are deaf or hard of hearing has existed for centuries in the world. Unfortunately, the ongoing debate about how as well as where to educate students with a hearing loss often has overshadowed the great work that has been accomplished by professionals, families, and individuals who are deaf or hard of hearing themselves. The purpose of this paper has been to highlight issues that are specific to the field of education of individuals who are deaf or hard of hearing. The goal is to help parents, professionals and individuals who are deaf or hard of hearing make choices that lead to fulfilling lives. While there have been a large number of successful individuals who are deaf or hard of hearing, there also have been far too many persons with a hearing loss who have not received a quality education, shared positive relationships, or had satisfying careers. Hopefully, the future will be filled with less controversy and increased successes. Hopefully, there will be a heightened understanding that all human beings, whether they have a hearing loss or not, are diverse, complex and have specific needs that must be meet for optimum development to occur. Hopefully, each of us will work in partnership to make this a better world for people who are deaf, hard of hearing, or hearing to live and succeed.

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