International Journal of Innovative Research in Computerand Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | Impact Factor: 7.194 |

||Volume 8, Issue 4, April 2020||

An Android App: Ears for the Deaf and Voice of the Dumb

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ABSTRACT: Sign language is the language used by the deaf and dumb people as an intermediate with other people to communicate, but for normal people, it's not possible to understand sign language easily as it is a non-verbal language. Keeping these aspects in mind we present our paper to mainly focus on aiding the speech impaired and paralysed patients. Our work helps in improving the communication with the deaf and dumb using an android application, by making the mobile phone as an aid for their communication troubles, by making the mobile phones the voice of the dumb and the ears of the deaf. An application is developed that can translate text or voice input to different signs of sign language(ASL) by representing each letter by its respective sign used in sign language, as well as it will translate different signs of sign language(ASL) to text and voice format. We are using a sign keyboard in QWERTY format to take sign input that is converted to its respective text as output.

KEYWORDS: Sign language, Android, ASL(American Sign Language), Signboard(QWERTY format)

I. INTRODUCTION

Communication plays an important role for human beings. Communication is treated as a life skill. But people having hearing and speaking disabilities faces a lot of trouble while communicating. The understanding between deaf and dumb with the normal people is to be a serious problem. All India Federation of the Deaf estimates around 4 million deaf people and more than 10 million people have hearing problem in India.

Loss of hearing and speech also causes people to become isolated and lonely, having worse effect on both their social and working life. There comes the sign language as an intermediate for them to communicate. But they faces a lot of problems while communicating with normal people who doesn't know sign language aslooking up the meaning of a sign is not a straightforward task. Also there is a variety of sign languages used in different regions, countries like ISL(Indian Sign Language), ASL(American sign Language), JSL(Japanese Sign Language), Arabic Sign Language, International Sign Language, and many more. In India, ISL and ASL are commonly used. The main difference between these two is double-handed and single-handed gestures for representing symbols, alphabets.

The deaf and dumb persons are not mentally retarded people, they are persons which are having hearing and speaking disabilities.The deaf are unable to listen to others and to understand their words; while the dumb people are unable to put their words in front of others due to speaking disability. But as the technology is improved, demand for mobile phones is also increased that also helped deaf and dumb people to communicate with other people by using mobile phone speaker as their mouth to put their words in front of others and using mobile phone microphone as their ears to listen to people's words. Now the problem persists with the people who doesn't understand normal language, so they can't use mobile phone as their ears to listen or mouth to speak. These people will need a sign language converter also in their mobile phones to understand and communicate with others. This can be done easily as the technology is increasing day by day

and providing various techniques through which the sign language can be converted to normal language and vice-versa. With advancement of science and technology many techniques have been developed not only to minimize the problem of deaf and dumb people but also to implement it in different fields. Android application have shown a dramatic improvement in their functionality to a point where it is now possible to have cellular phone execute Java programs. As a result, cellular users throughout the world are now able to read and write email, browse web pages and play java games using their cellular phones. This trend has promoted as to propose the use of android application for better communication. Before SMS/MMS, deaf people rarely used mobile phones. Now texting allows deaf people remotely to communicate with both deaf and hearing parties. But there are such peoples also which faces troubles in dealing with text also, they only understand and deal with sign language.So we are introducing a simple and user-friendly application in which the disabled people will deal with the sign language that is converted to text for communication with normal people. This application will translate text or voice input(acting as the ears for the deaf people) to different signs of sign language(ASL) by representing each letter(alphabet or number) by its respective sign used in sign

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | Impact Factor: 7.194 |

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language, as well as it will translate different signs of sign language(ASL) to text and voice(acting as voice of the dumb people)that is processed using a sign keyboard (in QWERTY format) to take sign input from the challenged people that is converted to its respective text as output to let the other people understand their words in speech form with the help of speaker in mobile phones.

II. LITERATURE SURVEY

Deaf and dumb people use sign language that is a big issue for them to share their thoughts to normal people who doesn't understand sign language. Solving these problems of communication, many techniques have been developed not only to minimize the problem of deaf and dumb people but also to implement it in different fields. The whole approaches could be divided into three broad categories:

- **Hand segmentation approaches**
- **Feature extraction approaches**
- **Gesture recognition approaches**

Some devices are developed like hand gloves with sensors that recognizes hand gestures and displays respective text message on LCD display connected to the system[1] [5] [9]. But the problem with this technique is that it requires the device to be installed to communicate that every disable person can't reach or afford to install. There are some applications that converts text to sign language (image form) for each respective alphabet so that the normal people can interact with deaf or dumb people, or they can get to know how to explain their words in form of signs to the disabled people using that application[4].But these types of applications are not useful for disabled people as it will be only helping normal people to let disabled people understand their thoughts. Some applications provide video interface with an avatar that shows gestures for sign language in video format and converts human gestures to voice format [7], while some techniques use JSON interpreter to do the conversion providing a keyboard in which signs are displayed to take sign input [8].Some applications are available that provide sign language learning with different languages [2] [3]. Some techniques are using sensors like "Microsoft Kinect XBOX 360TM" used for detecting movements for sign language conversion using gesture recognition [11].There are also some techniques that converts sign language to text and vice versa using image processing and gesture recognition via normal mobile phone camera [12], but some of these are having a complex interface or a cost for installation [2][10]. So our priority is to provide the installation of the application for free with a user-friendly interface which everyone should install and even children can use with ease.

III. PROPOSED METHOD

A) ARCHITECTURE

Figure 1 shows the architecture of the proposed system. It shows the two modules of our system that aid both normal and deaf/dumb people to understand languages of one another without knowing their language, as it converts their languages in understandable form of each other. It shows the conversion of text to sign language string as well as the conversion of signs to corresponding text format.

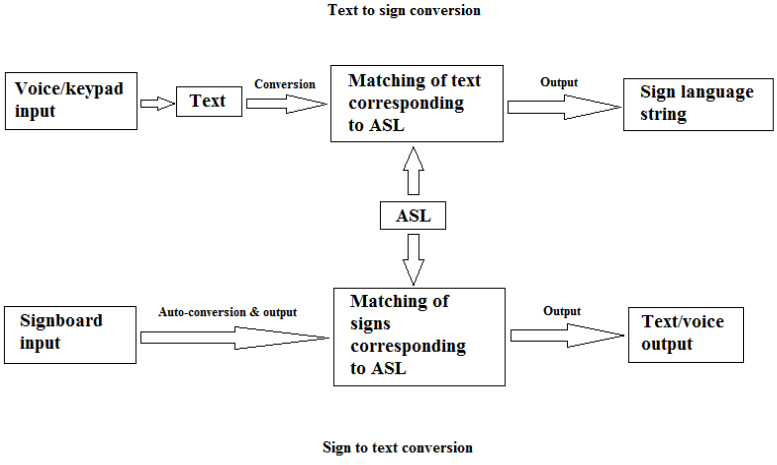

Figure 1: Proposed system architecture

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Text to Sign convertor:-
The first module of our proposed system is the Text-to-sign convertor that is used by the normal people as well as speech impaired people to communicate. This aids to normal people in such a way that they can simply input the English language known by them and this module converts their English text input into the sign output which is understood by the dumb people.Whenever a voice input(converted to text) or text input itself is processed for conversion, matching operation is performed in which matching and replacing of each letter of the string to its corresponding sign representation in sign language(ASL) is done and when all the letters get matched successfully, an output is generated and displayed in sign string form, in which each letter of text get converted into its respective sign representation. Also the deaf people can use this system as an aid of hearing, they can hear the words of normal people using microphone that gets converted into sign language so that the deaf can understand what has been said.

Voice/Keypad input: It is the input that has to be converted into sign language, from the user in either text format or in speech format.

Text: It is a string or group of strings formed of English alphabets or numerals or symbols.

Matching of text corresponding to ASL: It is the process where matching and replacing of each letter of the text to its corresponding sign representation in sign language(ASL) is performed.
Sign language string: The string we get in output after performing matching operation, where each letter of text is replaced by its corresponding sign, is sign language string.
ASL: American Sign Language (ASL) is a complete, natural language that has the same linguistic properties as spoken languages, with grammar that differs from English. ASL is expressed by movements of the hands and face. It is an easy to understand gesture language which is mostly used in different countries. This is also a one handed gesture language for fingerspelling (for alphabets and numerals). Figure 2 shows the ASL representation of different symbols.

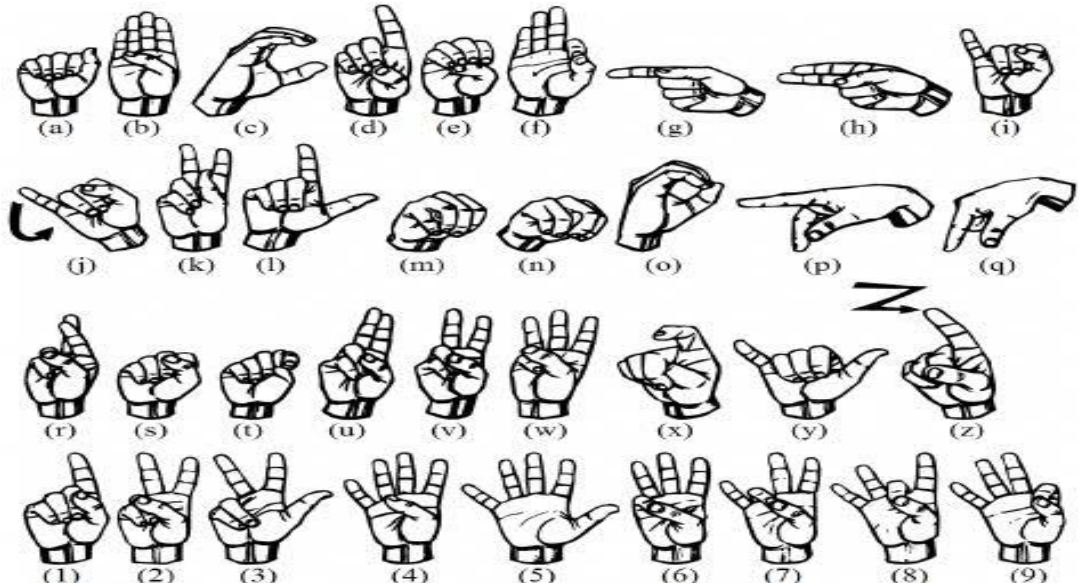

Figure 2: ASL representation

Sign to Text convertor:-
The second module of our proposed system is the Sign-to-text convertor that is used by speech impaired people to communicate. This aids to the deaf people by providing them asign keyboard from which they give input in form of signs of ASL, and when any sign is given in input, an automatic matching is done and the text letter for the respective sign is printed in the output string box as output. When theyfinish inputting, they have the final converted message in text form in the output string box, which is also audible. Thus, this audio can be considered as the voice of the dumb person to put their words in front of normal people.

Signboard input: It is the input provided by the user in form of signs of sign language (ASL) using signboard that is presented in figure 2.

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Matching of sign corresponding to ASL: It is the process where matching and replacing of each sign to its corresponding text representation in sign language(ASL) is performed.
Text/Voice Output: The output of the proposed sign to text method is either the text or the audio that is converted for text in audio form. The text message or the audio is what we get in the output after performing matching operation in which each sign is converted to its corresponding English text letter.Thus, the English string output is called the text output and the audible message is called voice output.

B) PROPOSED WORK
Our application framework provides user friendly interface that can be easily used by normal people, disabled people as well as uneducated people to communicate with each other. Our application work is going to let the mobile phones listen for the deaf and speak for the dumb thus helping the speech impaired persons to feel confident while interacting with society.

Text to Sign Conversion
Figure 3 shows the interface for text input from the user that has to be converted into sign language string. Here, the user has two options to provide input, the keypad input (text) and the microphone input (voice that is recognised and converted to text). When the user press the convert button after providing the input string, the matching operation starts and all letters of the text string are replaced with their corresponding sign representation in ASL, and the whole converted string is displayed as a sign language string as output as shown in figure 4.

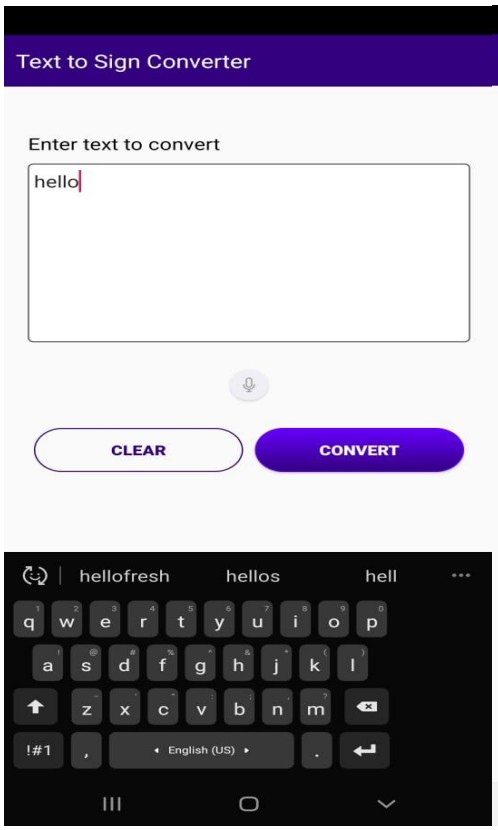

Figure 3: Text input

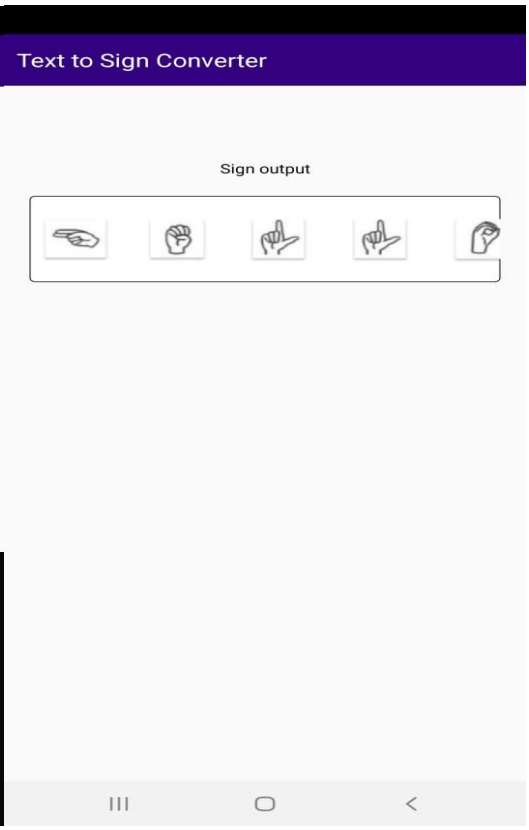

Figure4: Sign output

Sign to Text Conversion
We have provided a signboard (QWERTY format) for the disabled people to provide sign input by clicking the signs on the signboard. Whenever each sign is pressed, matching operation processes and its corresponding text letter got printed in the output message box. So, when the user finishes giving input, we have the text string in the output box, for whatever the user typed in sign form. This converted text message we got in output is also audible (voice speech form) as we also implemented text to speech conversion. An example of sign to text conversion with signboard is shown in figure 5.

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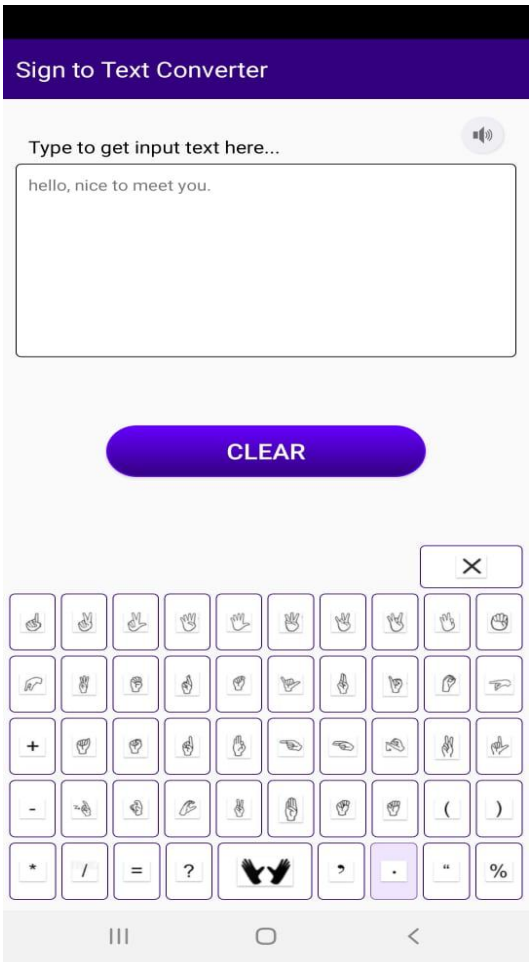

Figure 5: Sign input to text output

IV. IMPLEMENTATION RESULTS

The text or voice input message given by user will be converted into respective signs used in sign language(ASL) and the whole message is displayed on the mobile screen. If the sign message is long then it willauto-slide from start of the message to the end. The user can also slide the message back and forth according to them manually by simply sliding the message. Figure 4 shows the converted sign message on the screen. Also the sign message that is typed using the signboard is converted to text message(both visual and audible) with each sign press of the signboard as shown in figure 5.

V. CONCLUSION

The more reliable, user-friendly, portable, free and independent application to convert text message to sign language(sign message) and sign language to text messages easily with the help of signboard used in the application. It will help to overcome the communication troubles occur between both disabled and normal people by making the mobile phone act like the voice and ears of the deaf and dumb people just by installing a simple free of cost application on their android mobile phone.

VI. FUTURE WORK

We can add more languages and also implement signboards for many other sign languages like ISL(Indian Sign Language), BSL(British Sign Language), Arabic Sign Language, etc. for different users so that they can choose their own preference language. Using this concept, we can also create a social messaging application, focusing on the deaf and dumb people that have difficulties in dealing with normal text keyboard. So, with an inbuilt sign converter, the application will convert the normal text message from normal people to sign language when delivered to deaf or dumb

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user in their chosen language. Also the deaf and dumb can use sign keyboard instead of normal keyboard to type a message easily.

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