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AUDIO TO SIGN LANGUAGE TOOL

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Abstract: - By using this sign language people who are not able to listen, or speak, in other words, the peoples who are disabled make them to communicate with each other via this sign language tool. Sign language is a natural way of communication for challenged people with speaking and heaving disabilities. It will help them to know what they are saying, what they want etc. There have been various mediums available to translate or to recognize sign language and convert them to text, but text-to-sign language conversion systems have been rarely developed, this is due to the scarcity of any sign language corpus. Our project aims at creating a translation system that consists of a parsing module that parses the input English sentence-to-phrase structure grammar representation on which Indian sign language grammar rules are applied. This is done by eliminating stop words from the reordered sentence which we have given in the input. Stemming is applied to convert the words to their root form as Indian sign language does not support inflections of the word. All words of the sentence are then checked against the words in the dictionary containing videos representing each of the words. If the words are not found in the dictionary, their corresponding synonym is used to replace them. The proposed system is innovative as the existing systems are limited to the direct conversion of words into Indian sign language whereas our system aims to convert these sentences into Indian sign language grammar in the real domain and help disable's.

Key Words: —Software, Translation,Communication.

1 INTRODUCTION

Introduction

The sign language is used widely by people who are hearing impaired as a medium for communication. A sign language is nothing but composed of various gestures formed by different shapes of hand, its movements, orientations as well as the facial expressions. There are around 466 million people worldwide with hearing loss and 34 million of these are children. Deaf people have very little or no hearing ability. They use sign language for communication. People use different sign languages in different parts of the world.

Compared to spoken languages they are very less in number. India has its own sign language by the name Indian Sign Language (ISL). In developing countries there are only very few schools for deaf students. Unemployment rate among adults with hearing loss are very high in developing countries. Data from Ethnologue states that among deaf population in India, which is about 1% of total population, literacy rate and number of children attending school is very less. It goes on to state that official recognition of sign languages, increasing the availability of interpreters and providing transcription in sign languages greatly improve accessibility. Signs in sign languages are the equivalent of words in spoken languages Signed languages appear to favor.
There are approximately 7105 known living languages in the world divided in 136 different language families. Among these 136 language families, Sign language is one and this family contains 136 sign languages all over the world depending upon the region of the world. Sign language is used by hearing impaired people to convey their message. Sign language is the non-spoken language which is used by deaf and hard of hearing people using hand shapes, face expressions, gestures and other parts of the body. Sign languages do not have well defined structure or grammar therefore there is no or very less acceptability of these signs outside their small world. Out of nearly 7 billion people on earth, nearly 72 million are deaf and hard of hearing.

Out of such a big number approximately 4.3 million such people use Sign language. Rest of nearly 67 million deaf and hard of hearing people do not use any proper sign language to communicate. Thus nearly 90% deaf have a very limited or no access to education and other information. Sign Language (SL) is a visual-spatial language which is used to communicate using hands, arms, face, head, and body postures. The signer uses the three-dimensional space around his body to describe an event (Zeshan,2003).

Signs are categorized as manual signs (single handed or double handed) and non-manual signs. Manual signs are those signs which uses the hand shapes, hand location, and hand movement where as non-manual component is the face expressions, head and body postures. A sign may have only manual part or only non- manual part or combination of both. For example, the sign “Yes” is signed by vertical head nod and it is pure non-manual component. One Handed Signs are represented 62 by a single dominating hand where as two- handed signs are represented by using both the hands. These signs can be either static or dynamic (having movements).

Problem Definition

Sign language is a language that uses manual communication methods such as facial expressions, hand gestures and bodily movements to convey information. This project makes use of videos for specific words combined to translate the text language into sign language. To create a system where communication between every human, be it hearing impaired, vision impaired, or people with no physical disability, is possible. To create a system where sign language is converted into text and speech and vice versa.

Objective & Motivation

The objective of the project is to convert English text language to Indian Sign Language using Natural Language Processing to enhance the communication capabilities of people with hearing disabilities. Translation of one spoken language to another spoken language is complex task if both the languages have different grammar rules. Our project aims to encompass the domain of Indian Sign Language which roughly consists of 1500 words in its dictionary. For each of these words its corresponding video will be gathered. For words which do not fall in this dictionary, they would be replaced by their synonyms considering duplicacy of words as well as their parts of speech. Translation of one spoken language to another spoken language is complex task if both the languages have different grammar rules.

Scope

Scope of the project
Sign Language Recognition System could be used at reception desks or during video conferences to allow signing people to speak with people who don't know Indian Sign Language.

The main point of this project is to use camera to recognize gestures from the Indian Sign Language to offer a new means of communication. The program will be able to transcribe gestures, done by a signing person, into written words, printed on the screen of the person who doesn't know the ISL. Our project converts ISL into text for hearing impaired people.

In future work, proposed system can be developed and implemented in such way that system would be able to communicate in both directions i.e.it should be capable of converting normal language to sign language and sign language to normal language. We will try to recognize signs which include motion. More-over we will focus on converting the sequence of gestures into text i.e word and sentences and then converting it into the speech which can be heard.

Project Modules

Module Description

Our application is made of 3 major parts

1. Sign to Text or Speech application In this function, the program will try to recognize the gestures executed in front of the camera. It is linked to a dictionary that contains all the words that the program will be able to recognize. If the gesture is recognized by the program, its meaning will be printed on the screen. If not, nothing will display.

2. Text or Speech to Sign Application In this function, the program will try to convert given input (text to speech) into Sign gesture.

3. Text to speech Application In this function, the program will convert text to speech for vision impaired people and vice versa.

Mathematical Model (set theory based)-
Mathematical model of the proposed system
• Let S be the solution set for the given problem statement,
• S= {Input, Process, Output, Success, Failure}
where,
•Input- Input to the System
•Process- Process of the System
•Output-Output of the System
• Success- Success cases of the system
• Failure- Failure cases for the System

1)Input = {Users, Query, Topology type}
where,
a) User - Two users are required for this system because it takes two to communicate. The users of the system will enter the input as different mode of communication.
User = {ul, u2, ..., un}
b) Query -
Query = {q1,q2, ..., qn}
c) Topology type - The type of topology used in the system is GRID.

2) Process = {CNN}
where,
CNN= Convolutional Neural Network
CNN are deep neural networks used to process data that has a GRID like topology.

3) Output = {Prediction, Accuracy}
The predicted result will be the output of the system that depends on the input. If the input is sign language, the output will be text or speech.

a) Prediction = model. Predict (test data)
b) Accuracy = (accuracy score (Y test,Y red)*100)
4)Success
a) Text is converted into sign gestures for those who can't read.
c) Speech is converted into sign gestures for those who can't hear.
d) Text is converted into sign language for easy communication with the hearing impaired.
e) Communication is made easy among people who use different modes to converse.
5) Failure
a) Both the users should be present at the same time.
b) The system might not know all the signs and may not be able to convert it into text.
c)The system might not be able to capture the signs accurately if it is blur.

2. LITERATURE SURVEY

General Review:
As per Amit Kumar Shinde on his study of sign language to text and vice versa in Marathi Sign language recognition is one of the most important research and it is the most natural and common way of communication for the people with hearing problems.

A hand gesture recognition system can help deaf persons to communicate with normal people in the absence of an interpreter. The system works both in offline mode and through web camera. Neha Poddar, Shrushti Rao, Shruti Sawant, Vrushali Somavanshi, Prof. Sumita Chandak in their paper discussed about the prevalence of deafness in India is fairly significant as it is the second most common cause of disability.

A portable interpreting device which convert higher mathematics sign language into corresponding text and voice can be very useful for the deaf people and solve many difficulties. The glove based deaf-mute communication interpreter introduced by Anbarasi Rajamohan, Hemavathy R., Dhanalakshmi is a great research. The glove comprises of five flex sensors, tactile sensors and accelerometer. The controller matches the gesture with pre-stored outputs. The evaluationof interpreter was carried out for ten letters _A,,_B,, _C,, _D,, _F,, _I,, _L,, _O,, _M,, _N,, _T,, _S,, _W,,.

As per the Neha V. Tavari A. V. Deorankar Dr. P. N. Chatur in his report discuss that many physically impaired people rely on sign language translators to express their thoughts and to be in touch with rest of the world. The project introduces the image of the hand which is captured using a web camera. The image acquired is processed and features are extracted. Features are used as input to a classification algorithm for recognition.

The recognized gesture is used to generate speech or text. In this system, flex sensor gives unstable analog output and also it requires many circuits and is thus very expensive. Purushottam Kar et al. [20] in their 2007 paper developed INGIT, a system for translating Hindi strings to Indian Sign Language. It was developed specifically for Railway Inquiry domain. FCG was used to implement the grammar for Hindi. The developed module converts the user input into a thin semantic structure. Unnecessary words are removed by feeding this input to ellipsis resolution.

The ISL generator module then generated a suitable ISL-tag structure depending on the type of sentence. A graphical simulation was then generated by a HamNoSys converter.

The system was successful for about 60% cases in generating the semantic structures.

Ali et al. [21] developed a domain-specific system in which the input fed had to be English text. The text was converted into ISL text which was further translated into ISL symbols.

The architecture of the system had the following components:

1) A text translation input module.

2) Tokenizer to break down the sentence into separate words.

3) A ISL symbols repository which was specific to railway inquiries. If a word had no corresponding sign assigned to it in the repository, then it's synonyms sign was used.

4) All the words were mapped with their corresponding symbols by a purposefully built translator. It also filtered the words to be translated by eliminating the words which were offensive or abusive or did not have any sign stored.

5) An accumulator which accumulated the words in the sequence entered.

Vij et al. [22] developed a 2-phase system of Sign Language Generation. The first phase dealt with preprocessing Hindi 2 Sentences and converting it into ISL grammar. The phase used a combination of Dependency Parser and WordNet for this purpose.

Dependency graphs in the Dependency Parser represented words and their relationships between head words and words which modify those heads. In the second phase, HamNoSys was used for converting this grammar into different corresponding Sign Language symbols. The generated symbols are converted into XML tags form using SIGML. The XML tags form is then readable by a 3D rendering software.

MS Anand et al. [3] developed a two-way ISL translation system. In the speech- to-sign module, the input speech was first put through the noise removal submodule. The output was then used as an input for the speech recognizer for decoding the spoken speech into a textual word sequence. A natural language converted the word sequence into a sequence of signs by a rule-based technique. Finally, a sign animation module with text annotation was used for displaying the signs.

2. BLOCK DIAGRAM OF SYSTEM

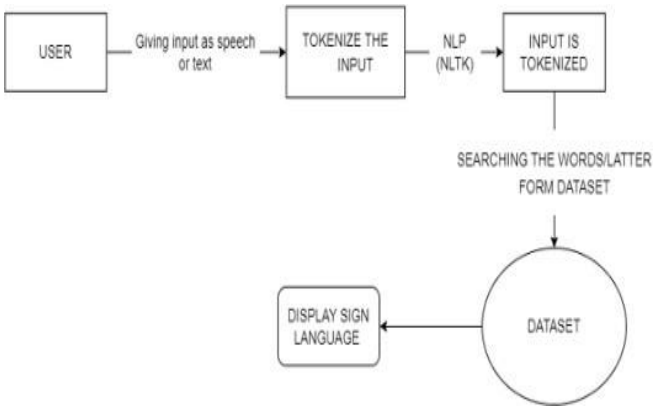
1. UML Diagram:

Following is the UML diagram first the user give the input it may give it by using the text by writing it or it may be give the input via speech by speaking into the mic. Then if it is a speech then first it is converted into the text. And then that text is divided into the small pieces.

That is the tokenization of the input text into the small tokens. Then we apply or do the natural language processing on it by using the NLTK library. Then the input is tokenized.

The separation of text is depending upon the vedio's which are stored in the database or available in the database. If for example the input text is "what is your name?" and if we not have any sign gesture vedio in our database for is then the is is separated into I and s. then based on the words. The animated character shows the sign gestures.

Then we searching the words from the input which we tokenized into the dataset and then they display the signs respective to the word.



2. System Diagram

As show in the following diagrams. ANN and decision tree is the process part of the system. In system first input signal streaming is given to the main algorithm used in the system that is ANN. The input signal may be in the form of text also or you can also give it in the form of speech i.e. voice. You can do this by using mic which is provided to you. After giving the input signal. System take that input signal and then we process that input signal such as the removal of stop words and it also removes suffix and prefixes of the words. After doing signal processing we test the input data. Once he recognized the words, he show the related animations of hand gestures as per the order ofthe words.

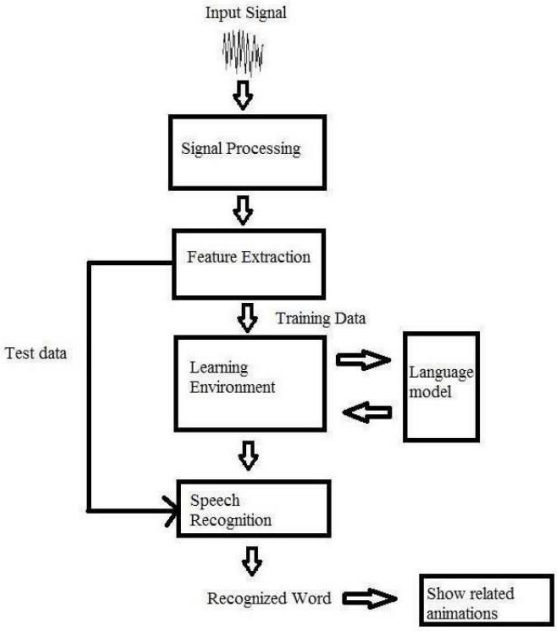


Figure 3.1: System Block Diagram

PROPOSED SYSTEM

Few works have been done to generate a system that is based on the above concepts listed in the existing approaches section and cater to Indian sign language. Thus we propose to develop one for Indian sign language based on transfer based translation. The success of this translation system will depend on the conversion of English text to Indian sign language bearing its lexical and syntactic knowledge. Our objective is to help people suffering from the problem of hearing. There have been many projects done on the sign languages that convert sign language as input to text or audio as output. But audio to sign language conversion systems have been rarely developed. It is useful to both normal and deaf people. In this project we introduce new technology that is audio to sign language translator using python. In this it takes audio as input, display the text on screen and finally it gives sign code/language of given input. All the words in the sentence are then checked against the words in the dataset containing videos and GIFs representing the words. If the words are not found, it splits the words into an individual latter and show the corresponding videos/clips which are predefined in the system. In this section we will discuss about our project. Our system consists of four main steps: input audio or text, tokenizing the input, searching the words/latter form dataset and display videos/clips.

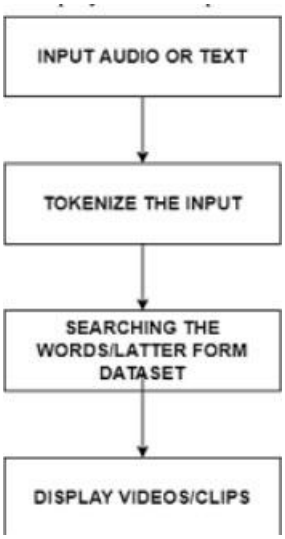


Fig: Purposed System.

3. ALGORITHM

Algorithm
1. Open Web Application.
2. Signup or login.
3. Input the text or click on microphone to speak.
4. Click on submit.
5. Input is process by system.
6. Start button for display of animation.
7. Shows the Required result.
8. Close.

Overview

World's normal people has been in a difficult situation in the society because of their inability to communicate vocally with hard hearing people in connection with that the indifference of others to learn their language, the sign language.

With the arrival of multimedia, animation and other computer technologies, it is now becoming possible to bridge the communication gap between the normal and hearing- impaired person. Sign language is a visual/gestural language that serves as the primary means of communication for hard hearing individuals, just as spoken languages are used among the hearing. Hard hearing individuals encounter the difficulty that most hearing individuals communicate with spoken language.

1. First, we use the web-kit Speech Recognition to capture audio as input.
2. We then use the Chrome/Google Speech API to transform the audio to text.
3. Currently, we use NLP (natural language processing) to break down the material into smaller, more easily comprehensible chunks.
4. We have a reliance parser that analyses the sentence's grammatical structure and builds up the word connections
5. Finally, we converted audio into Sign language and user will get videos/clips as sign language for given input.

CONCLUSIONS

In this project, we have tried to develop a system that would be helpful for the disabled people having communication difficulties by developing a system that would help them in expressing themselves clearly and easily. Our model successfully converts the entire input sentence into a single visual rather than depicting different words through a GIF/ picture giving the model a much realistic and lively appeal. Much more development on this track can be done as the ISL dictionary is still small and needs to grow eventually. As the ISL is new and not much development has been done on this topic, many new videos for different words can be added to the dictionary to widen its scope and help people communicate better using this language. Moreover, text to speech integration can be performed in the project to enable better communication strategies which will allow users to convert text to Indian Sign Language with manually entering the input sentence. This project is mainly about solving two-way communication problem for Deaf people. This problem is also the root of many Deaf people's social problems. When I conducted my literature research, I found out that only few types of technology solutions are design for this problem. I think our society should give more attention to the Deaf community. Also, during the research, I started noticing the value and power of communication. Talking with others is an every-day routine for most hearing people. However, we should not ignore its significance because of it appears to be ordinary. At the beginning of the project, I found it hard to design interactions for Deaf people. Not just because of their limitation of expressing, but also because of my lack of understanding of Deaf community. I knew very few about how ASL works, and how Deaf people communicate with others. After the interviews, my problems were successfully solved. Therefore, it has deepened my understanding of the importance of design research. In the future, science and technology will continue giving the world more possibilities. I hope the problem which this thesis project is focused on can be solved permanently.

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