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Automatic Translation of Real-Time Voice to Indian Sign Language for Deaf and Dumb People

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ABSTRACT: Sign language is a universal way of communication for challenged people with speaking and hearing limitations. Multiple mediums are accessible to translate or to acknowledge sign language and convert them to text. However, the text to signing conversion systems has been rarely developed; this is often thanks to the scarcity of any sign language dictionary. Our project aims at creating a system that consists of a module that initially transforms voice input to English text and which parses the sentence, then to which Indian sign language grammar rules are applied. This is done by eliminating stop words from the reordered sentence. Indian Sign Language (ISL) does not sustain the inflections of the word. Hence, stemming is applied to vary over the words to their root/ stem class. All words of the sentence are then checked against the labels in the dictionary containing videos representing each of the words. The present systems are limited to only straight conversion of words into ISL, whereas the proposed system is innovative, as our system aims to rework these sentences into ISL as per grammar in the real domain.

KEYWORDS: Sign language, ISL

I. INTRODUCTION

Sign language is a universal way of communication for challenged people with speaking and hearing limitations. There have been various mediums accessible to translate or to recognize sign language and change them to text, but the text to sign language conversion systems have been seldom developed, this is due to the lack of any sign language corpus. According to the 2011 census of India, there are approximately 63 million people, which sums up to 6.3% of the total population, who are suffering from hearing problems. Out of these people, 76–89% of the Indian hearing challenged people do not understand language, either signed, spoken, or written. The reason behind this low literacy rate is either the shortage of sign language interpreters, unavailability of the ISL tool, or then necessity of researches on ISL. ISL is the predominant sign language in South Asia, used by a minimum of several hundred thousand deaf signers.

II. RELATED WORK

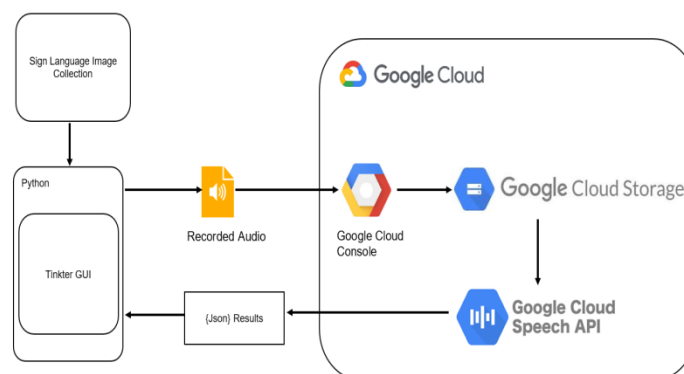
In the system generated by Dasgupta et al. [1]. English text was taken as input and it was then converted into the corresponding ISL structure that adhered to the rules of the grammar. Their system comprised of the following key modules: a) Analysing text coupled with parsing Syntax b) Representation using LFG f-structure c) Transferring grammar rules and finally d) Generating proper ISL TESSA [2] is a Speech-to-British Sign Language translation technology that attempts to let a deaf person communicate with a post office clerk. A formulaic grammar approach is used by the system. The translation is done using a phrase lookup database and a collection of predetermined phrases. However, because there are just a few sentences to use as templates, the conversation between the participants is limited. This makes TESSA a highly domain specific system. The SignSynth project [3], developed by Grieve Smith in 1998 and 1999, uses ASCII-Stoke model to represent signs. It displays an animated output that is generated through conversion of ASCII-Stoke to VRML (Virtual Reality Modelling Language). Any source language or communication should be translated to syntactically and semantically valid target language in the architecture by using appropriate transfer grammar rules satisfying both source and target. The ViSiCAST translator proposed by Bangham et al. [4] is an example of a transfer architecture system. It translates

English to BSL by using HPSG (Head-driven Phrase Structure Grammar) and a Prolog based freeware system ALE (Attribute Logic Engine). The phonology of the system is represented in HamNoSys.

The ASL (American Sign Language) Workbench, developed in 2001, is a text-to-ASL system [5] and [19] that uses LFG (Lexical Functional Grammar) to represent English f-structure in ASL. It is one of the most sophisticated machine translation systems and uses a phonological model based on Movement-Hold principle of ASL phonology.

III METHODOLOGY

User clicks the start button: When the user clicks the start button, the application starts recording audio. This can be done using an audio recording library like pyaudio in Python. User clicks the stop button: When the user is finished recording, they click the stop button to end the recording. Audio is sent to Google Cloud Storage: Once the recording is complete, the audio file is sent to Google Cloud Storage. This is a cloud-based file storage service provided by Google. Audio is processed by Google's Speech-to-Text API: The audio file is then processed by Google's Speech-to-Text API. This API uses advanced machine learning algorithms to convert speech to text. Results are sent in a JSON file: Once the audio has been processed, the results are sent back to the application in a JSON file. This file contains the text version of the recorded audio. Text is displayed in the GUI: The application then displays the text version of the recorded audio in the graphical user interface (GUI). This allows the user to see what was said during the recording. Text is matched to images: The text is then matched to images in the dataset. This can be done using natural language processing (NLP) techniques to find common keywords or phrases between the text and the images. Overall, this process allows users to quickly and easily convert audio to text and match it to relevant images. It's a powerful tool for applications that deal with audio content, such as podcasts, voice memos, and more.



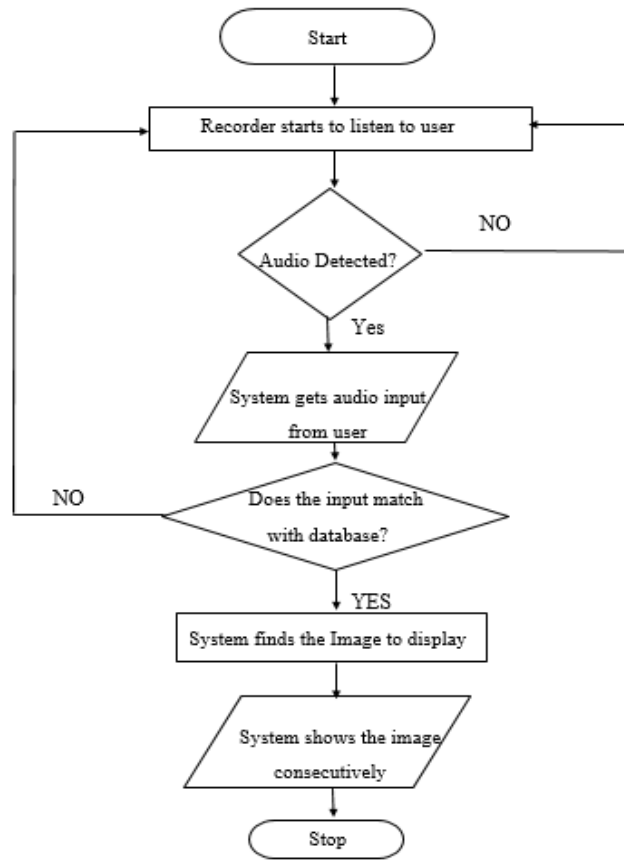
3.1 System Design

Flow chart of system design:

When the user starts application, the recorder starts recording,

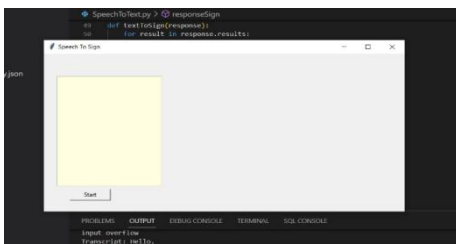
- if the audio is not detected the recorder will terminated
- if the audio is detected the application gets the input audio and converts it into text

If the text was not found in the database the application will go to start or else it will match the text in the database for the respective images of sign to display it on the screen and then terminates

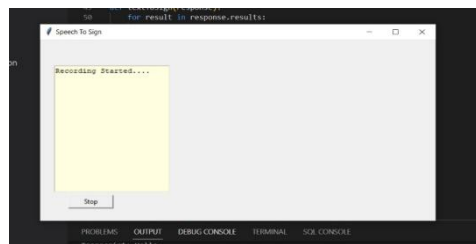


3.2Flow chart

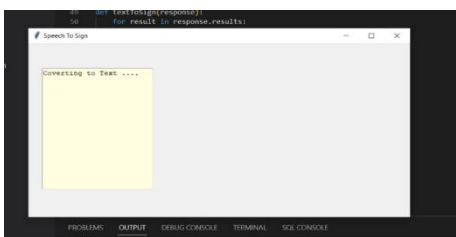
IV Experimental results



4.1 Start Recording



4.2 Recording started



4.3Converting to Text



4.4 Converting Text to Sign

V.CONCLUSION

A significant portion of the Indian society suffers from hearing and speech impairment and uses Indian Sign Language as their primary mode of communication due to difficulties in learning and understanding written text. Sign language involves the use of hands, lip movements, and expressions to communicate words, emotions, and sounds. The proposed system provides an efficient method to aid communication for individuals with hearing and speech impairment, particularly in successful implementation using the Python programming language

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