Audio To Sign Language Translator

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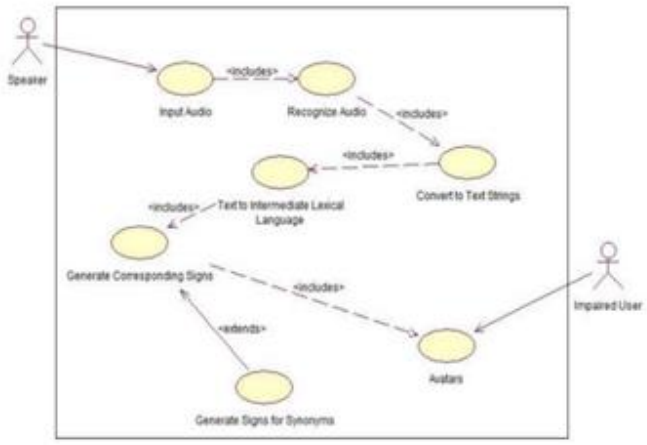
Abstract- *Sign language is a visual language used by deaf and dumb people as their mother tongue. Unlike acoustically conveyed sound patterns, sign language uses body language and manual communication to fluidly convey the thoughts of a person. It can be used by a person who has difficulties in speaking or by a person who can hear but can not speak and also, by normal people to communicate with hearing disabled people. As far as a deaf person is concerned, having access to a sign language is very important for their social, emotional and linguistic growth. Our project aims to bridge the gap between these Deaf people and normal people with the advent of new technologies of web applications, Machine Learning and Natural Language Processing. The main purpose of this project is to build an interface which accepts Audio/Voice as input and converts them to corresponding Sign Language for Deaf people. It is achieved by simultaneously combining hand shapes, orientation and movement of the hands, arms or body. The interface works in two phases, first converting Audio to Text using speech to text API (python modules or Google API) and secondly, represent the text using Parse Trees and applying the semantics of Natural Language Processing (NLTK specifically) for the lexical analysis of Sign Language Grammar. The work builds upon the rules of ISL(Indian Sign Language) and follows the ISL rules of Grammar*

Keywords- Natural language Processing , ISL

I. INTRODUCTION

A sign language (SL) is a natural visual-spatial language that uses the threedimensional space to articulate linguistic utterances instead of sound to convey meaning, simultaneously combining handshapes, orientation and movement of the hands, arms, upper body and facial expressions to express the linguistic message. The language came into existence because of the deaf, dumb and hard of hearing people in India. All around the world there are different communities of deaf and dumb people and thus the language of these communities will be different. Just like there are many spoken languages in the world like English, French, and Urdu etc. Similarly there are different sign languages and different expressions used by hearing disabled people worldwide..

Use Case Diagram:



INDUSTRIAL VERTICAL:

The healthcare sector consists of businesses that provide medical services, manufacture medical equipment or drugs, provide medical insurance, or otherwise facilitate the provision of healthcare to patients. Economically, healthcare markets are marked by a few distinct factors . Government intervention in healthcare markets and activities is pervasive, in part due to some of these economic factors. Demand for healthcare services is highly price inelastic. Consumers and producers face inherent uncertainties regarding needs, outcomes, and the costs of services.

DOMAIN TECHNOLOGY :

Communication tech refers to the tools, platforms, and systems that facilitate communication between individuals, groups, and organizations. These technologies include but are not limited to: Email: Email is a widely used communication tool that allows individuals to send and receive messages and attachments over the internet. Video Conferencing: Video conferencing allows individuals and groups to communicate via live video and audio feeds, regardless of location. Social Media: Social media platforms such as Facebook, Twitter, and LinkedIn allow individuals and businesses to share information, connect with others, and build communities online. Voice over IP (VoIP): VoIP is a technology that enables voice calls to be made over the

internet, bypassing traditional telephone lines. Growth Tech: Growth tech refers to the technologies and tools that businesses and individuals use to drive growth, increase revenue, and achieve their goals. These technologies include but are not limited to: Customer Relationship Management (CRM) Software: CRM software is a tool that helps businesses manage their interactions with customers, track customer data, and automate sales and marketing processes. Marketing Automation Software: Marketing automation software allows businesses to automate repetitive marketing tasks, such as email campaigns and social media posting, to save time and increase efficiency. Search Engine Optimization (SEO) Tools: SEO tools help businesses optimize their websites and content for search engines, such as Google, to improve their search engine rankings and drive more traffic to their sites. Analytics and Business Intelligence (BI) Tools: Analytics and BI tools help businesses analyze data to make better-informed decisions, track performance metrics, and identify areas for improvement. Artificial Intelligence (AI) and Machine Learning (ML) Tools: AI and ML tools are used to automate processes, improve efficiency, and identify patterns and trends that can help businesses make better decisions. Overall, communication and growth tech play a critical role in today's digital age, helping individuals and businesses communicate more effectively and efficiently, as well as driving growth, productivity, and success

EMPATHY

Empathy is the first step in design thinking because it is a skill that allows us to understand and share the same feelings that others feel. Through empathy, we are able to put ourselves in other people's shoes and connect with how they might be feeling about their problem, circumstance, or situation. Empathy Map Our project aims to bridge the gap between these Deaf people and normal people with the advent of new technologies of web applications, Machine Learning and Natural Language Processing. The main purpose of this project is to build an interface which accepts Audio/Voice as input and converts them to corresponding Sign Language for Deaf people.

DEFINE

The next step is to define the above feelings and identify the main problem. e. As far as a deaf person is concerned, having access to a sign language is very important for their social, emotional and linguistic growth. It is achieved by simultaneously combining hand shapes, orientation and movement of the hands, arms or body .Therefore , A framing should be done in order to implement this scenario.

IDEATE

Ideation is the third stage of the design thinking process where participants in a design thinking workshop come up with ideas on how to solve a specific user problem. The design thinking process is made up of three phases: empathize, ideate, and prototype. The ideation phase of design thinking is guided by the user problems that were defined during the empathize phase. Ideation is about the exploration and identification of potential solutions. Not all ideas will be viable solutions, and that's okay. The primary goal of ideation is to spark creativity and innovation.

II. PROTOTYPE PROPOSED WORK:

The proposed translation system takes the audio text as input and system converts the audio into English text, which is further translated into ISL grammar by using parse tree structure. Machine based translation has been used to translate English into ISL based grammar. Rules have been defined for translating English into semi-structured parse tree and further bi-linguistic rules have been applied to translate this parse tree according to rules of ISL grammar. This modified tree is further converted to text, which is then processed to convert it into the form of ISL language . System ArchitectureThe system consists of following modules:

1. Audio to text converter
2. Input Parser
3. ISL Generator
4. Graphics Generator

1.Audio to text :

Translator External or in-built microphone on any Personal Digital Assistant (PDA) is used to give input for the module. The module uses Google Cloud Speech for audio to text. The input can be given in any language. The output is given as English text string. The module has been developed in python script. The speech is recognized by the module and punctuation is added accordingly to the input text.

2. Input Parser :

The input paragraph is tokenized into sentences. Using machine learning and Natural Language Processing tools, each sentence is tokenized into words. The output of this module is a list of token for each line of text. Tokenization: Given a character sequence and a defined document unit, tokenization is the task of chopping it up into pieces, called tokens , perhaps at the same time throwing away certain characters, such as punctuation. Here is an example of tokenization: Input: Friends, Romans, Countrymen, lend me

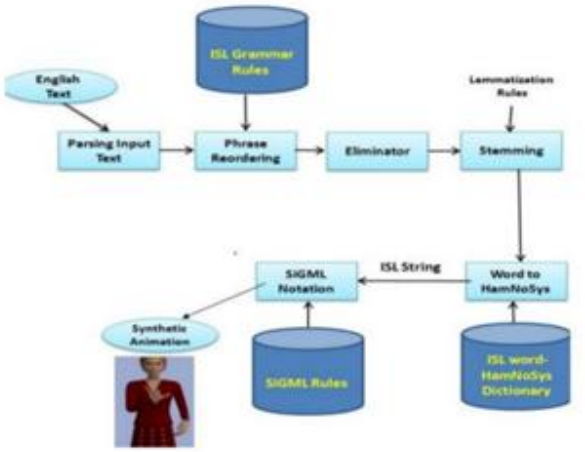
your ears; Output: Tokenizer: A tokenizer divides text into a sequence of tokens, which roughly correspond to "words".

3. ISL Generator :

The purpose of this module is to convert the input text with grammar of English into text with grammar of ISL. This has been achieved by using Transfer-based translation. Transfer-based Translation: In Transfer Based Translation systems, plain text is given as an input to the system. The system then analyses it syntactically and also semantically. It is then transferred into a sign language. In this system, source language is transformed into some intermediate abstract text, some linguistic rules are then applied to that text to transfer it into target language.

4. Graphics Generator :

Input to this module is the ISL text string. In this module, Graphics generator map each token of text to a database. For every word present in database there is a corresponding file present. e.g. for word bird , SIGML file is bird.sigml So, every word is mapped to corresponding SIGML file. For the words which cannot be mapped we present them as concatenation of SIGML files of all alphabets.



III. IMPLEMENTATION MAIN FEATURES:

Main Features

- Converts Speech to Sign Language.
- Uses Text as an intermediate
- Tokenizes text using ISL rules
- Web based interface (no installs necessary)
- Client/Server Architecture

• Machine Learning:

Uses NLP tools.

- Fully responsive: Everything is responsive ready so need to worry about how this site will look on mobile, tablet, and desktop.
- Easy to use
- User-friendly

Tools

• Front-end
(I)SigML URL App

• Back-end
(I) OpenCV
(II) phpMyAdmin

Languages

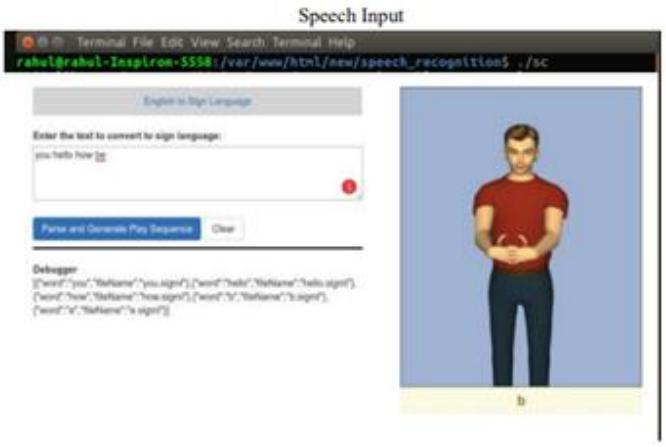
• Front-end

(I) HTML 5
(II)CSS
(lll)SiGML

• Back-end

(I) JavaScript
(II) PHP
(lll) Python3

IV. RESULT/Screen Shot Module:



TESTING

SAMPLETESTCASES:

V. CONCLUSION

In this article, an efficient English audio to ISL sign language has been proposed. The sign languages like BSL, ASL have got the particular grammar which makes it feasible for the rule based systems and the syntax and semantic analysis can be performed to get the appropriate translation. In contrast for Indian Sign Language there is no particular grammatical rule which makes it difficult for the syntax and semantic analysis as there are no rules to compare the English text with. Thus appropriate translation of the English text is not feasible. In ISL, facial expressions denote negative and interrogative sentences. While ISL animation for the verb clause is played, the expressions change to denote the negation and interrogation in the sentence. This feature has not been yet accomplished by the system. The directionality and discourse are handled minimally. Further, ISL for phrases has not been included. In the next stage of our work, we would like to handle non-manual components for the sentence as a whole, ISL for phrases will be included in dictionary. Also, directionality and discourse will be implemented. Since, a mobile based version of the application will increase the reach to more people so in next phase we shall be introducing an android based application for the same. Further, the system can be integrated with hand gesture recognition system using computer vision for establishing 2-way communication system.

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