Machine Learning Based On Multilingual Translation

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ABSTRACT- The need for any multilingual communication has never been advanced in the connected world nowadays. Speech-to-speech translation systems that are multilingual are essential for promoting efficient communication between speakers of various languages. With the use of machine learning and natural language processing advances, this paper aims to create a solid Python framework for multilingual speech translation. Real-time spoken language translation is through possible by the suggested method by utilizing the capabilities of the well-known cloud-based translation service, Google Translate API. The method achieves end-to-end voice translation capabilities through the integration of Google Cloud Platform services, including the Cloud voice-to-Text and Text-to-Speech APIs. With the system's intuitive interface, users can record speech in their original tongue and have it translated into the language of their choice. The method is also easily expandable to include more languages and dialects, which increases its adaptability and usefulness in a variety of linguistic contexts.

KeyWords:SpeechRecognition,Google TranslateAPI,.

1. INTRODUCTION

Effective language barrier communication is essential in the globalized world of today in order to foster inclusivity, understanding, and collaboration. Language diversity, however, represents a big obstacle, especially in situations when real-time communication is crucial. A possible solution to this problem is provided by speech-to-speech translation, a subset of machine translation that facilitates seamless interaction between speakers of various languages. Speech-to-speech translation is the process of digitizing spoken language between languages while maintaining the tenor and style of the original speaker. With the use of this technology, language barriers could be eliminated in a variety of contexts, such as corporate negotiations, foreign diplomacy, healthcare consultations, educational settings, and casual interactions.Artificial intelligence's machine learning field is essential to the advancement of speech-to-speech translation technology. Machine learning models are able to precisely map input voice in one language to output speech in another language by means of training algorithms on massive datasets of speech samples and their related translations.

2. LITERATURE SURVEY

The author of the article [1] mainly discusses the thesaurus maintenance, engine allocation, development benefits, and service realization of a multi-engine Web machine translation system. It specifically outlines the unique verb-driven algorithm as well as methods and strategies to increase the productivity of grammatical analysis. Because the sci-tech journal translation fusion system was tested using automatic evaluation indicators, its findings are better than those of a statistical system and a single rule system. The results show the feasibility and effectiveness of the fusion approach, which can improve the quality and performance of the system when translating scientific publications.

The author created an English machine translation system and suggested a human-computer interaction algorithm in the paper [2]. The article demonstrates how the translation system created for this research increases translation efficiency, decreases the cognitive load and thinking time of the translator, and does not require an excessive quantity of time or effort for proper translation recognition. The author of the paper [3] suggested using machine translation to process language from English to Bangla and vice versa. This intelligent language processing system uses a few machine translation methodologies, including word-to-word, direct, transfer, interlingual, corpus-based, and statistical translation, to translate text from the source language to the target language. Additionally, it emphasizes output acquisition by analyzing various models' performances.

The author of the paper [5] explains a model that was developed for Text-to-Text Translation, which translates text from Marathi, the source language, to Gujarati, the target language. The adaptability of LSTMs, which provide a large variety of parameters including learning rates and input/output biases, is utilised by this model.

Based on deep learning principles, the model integrates multilingual features into the LSTM Model. This proposal's main goal is to create a deep learning-based translation system. The proposed system uses many models for text-to-text translation, i.e., translating the input text to the destination language that is desired.

3. PROBLEM STATEMENT

Speech-to-speech translation application that allows users to translate spoken language from one language to another in real-time. The application should provide a seamless and intuitive interface for users to input speech through voice commands, translate the input speech into the desired target language, and output the translated speech as synthesized audio.The following language translation options must be offered: Hindi, Marathi, Bengali, Gujarati, Tamil.Users can select the desired input and output languages from these options using the GUI provided in the application. The selected languages determine the source language for speech input and the target language for speech translation.

4. SOFTWARE REQUIREMENTS

i) Datasets (opus- MT Datasets):

A set of parallel text corpora called Opus MT is used to test and train machine translation models. For developers and researchers working on machine translation, it's an invaluable resource. Text in several languages is usually included in Opus MT datasets, which are parallel corpora.Neural machine translation (NMT) models and other machine translation models are frequently trained on these datasets.
Opus MT datasets are adaptable to a variety of machine translation tasks since they can span a broad range of domains and language combinations. Models for tasks liketranslating text between languages can betrained using them.

ii) SpeechRecognition Library:

SpeechRecognition is a Python library that provides easy-to-use interfaces to several speech recognition engines and APIs, including Google Speech Recognition, CMU Sphinx, IBM Speech to Text, and Wit.ai. It allows developers to recognize speech from various sources such as microphone input, audio files, and audio streams.

iii) Machine learning Framework (Google Translate API):

Google Translate API supports a vast number of languages, allowing users to translate spoken language from one language to another. This extensive language support enables users to communicate effectively across diverse linguistic contexts.Google Translate API leverages advanced machine learning algorithms to provide accurate and contextually appropriate translations. It takes into account various linguistic factors, including syntax, semantics, and cultural nuances, to produce high- quality translations that preserve the meaning and intent of the original speech. Users can input spoken language, and the API translates it into the desired target language in near real-time, enabling seamless communication across language barriers.
Google Translate API is hosted on Google Cloud Platform, offering scalability, reliability, and availability. It can handle a large volume of translation requests concurrently, making it suitable for both small-scale applications and enterprise-level solutions.The Google Translate API provides easy-to-use APIs and client libraries for various programming languages, including Python, Java, and JavaScript. Developers can integrate translation functionality into their applications with minimal effort, enabling users to access speech-to- speech translation capabilities seamlessly.

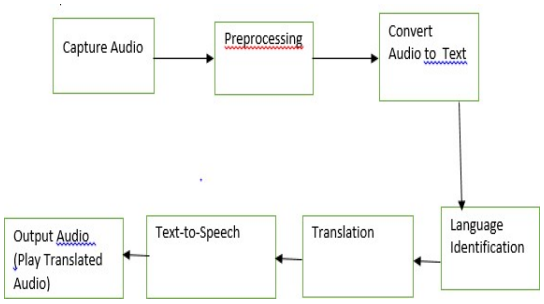
iv. GTTS libraries:

The gTTS (Google Text-to-Speech) library is a Python library that allows you to easily convert text into speech using Google Text-to-Speech API. It
provides a simple interface to generate speech from text strings in various languages.The primary functionality of the library is to convert text into speech. You can provide a text string as input, and the library will generate a speech audio file containing the spoken version of the text.gTTS supports multiple languages and accents, allowing you to generate speech in different languages and regional accents.The library provides options to customize the generated speech, such as setting the language, specifying the speaking rate, and choosing the audio output format (e.g., MP3 or WAV).gTTS offers a straightforward interface for generating speech.

v. Translation Evaluation Metrics :

A metric called Bilingual Evaluation Understudy (BLEU) is used to rate machine translation systems' quality. It measures how close a machine translation system's output is to translations created by humans as a reference. To measure how many n-grams (contiguous word sequences) in the machine translation match those in the reference translations, BLEU primarily uses n-gram precision. To account for length variations between the machine translation and references, it

5. FLOW DIAGRAM



Speech to Speech Translation

6. METHODOLOGY

Imports: The script imports necessary libraries such as Tkinter for GUI, speech_recognition for speech input, GoogleTranslator for translation, gTTS for text-to- speech conversion, and other utilities for audio manipulation.

GUI Setup: The Tkinter GUI is initialized with a window titled "Voiceprint Translator". It sets the window size, background color, and disables resizing.
lso incorporates a brevity penalty.A score of one in the BLEU system denotes an exact match between the machinetranslation and the references.

V.Jupiter Notebook(ANACONDA):

Jupyter Notebook is an open-source web application that allows you to create and share documents that contain live code, equations, visualizations, and narrative text. It is a popular tool among data scientists, researchers, and educators for interactive computing and data analysis. The name “Jupyter” is derived from the three core programming languages it originally supported: Julia, Python, and R.

VI.Web Browsers:
A web browser is a software application that enables users to explore and interact with the World Wide Web (WWW) by retrieving and displaying information from websites. It serves as a user interface forinternet access, facilitating the interaction with web content such as text, images, videos, and multimedia elements.. Notable web browsers include Google Chrome, Mozilla Firefox, Microsoft Edge, and Apple Safari.

Language Selection: Two Option Menus are provided for selecting the input and output languages. The available languages are "English", "Hindi", "Tamil", "Gujarati", and "Marathi".

Text Input and Output Boxes: Two Text widgets are used for displaying input speech and translated text. Users can input speech through voice commands, which are then transcribed into text and displayed in the input box. The translated text is displayed in the output box.

Speech Input: The detect() function continuously listens for voice input using the device's microphone. The speech_recognition library is used to capture audio and transcribe it into text. This text is then displayed in the input box.

Translation: The translate() function translates the text from the input box into the selected output language

using the Google Translator API. The translated text is then displayed in the output box.

Speech Output: The speak() function converts the translated text into speech using the gTTS library. The generated audio file is played back to the user.

Start and Stop Buttons: The "Give Voice Input" button starts the speech input process, while the "StopSpeaking" button stops it. These buttons control the start() and stop() functions respectively.
Main Loop: Finally, the Tkinter main loop is started to run the GUI application.

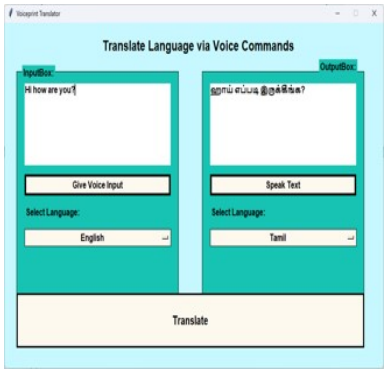


Fig 1:Translator output screen

7. RESULT AND DISCUSSION

The technology employed, the caliber of the voice recognition and synthesis engines, and the difficulty of the languages involved can all affect the outcome of speech-to-speech translation. The goal is usually to accurately translate the spoken input's meaning into the target language.Speech-to-speech technology aims to remove language barriers and promote meaningful relationships by enabling smooth communication between speakers of various languages. Even while translation technology has advanced significantly, it is still difficult to achieve perfect translation, especially for languages with large linguistic variances.

OUTCOME

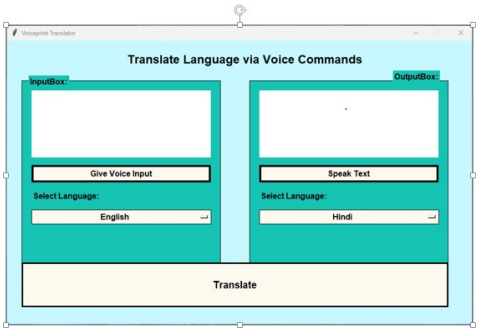


Fig 2:Translated from English to Gujarati

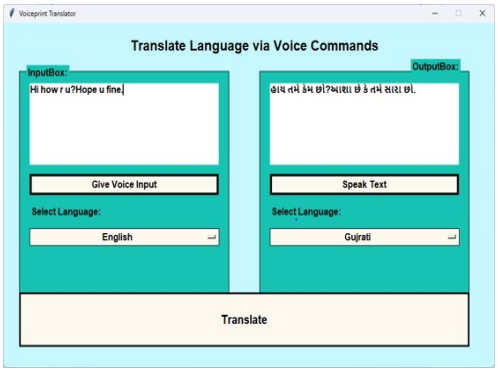


Fig 3:Translated from English to Tamil

8. CONCLUSION

Speech-to-speech technology has a significant impact on society since it seems to promote communication in areas like international trade, healthcare, and education. Nevertheless, it's important to remember that speech-to-speech interpretation shouldn't take the place of the need to learn about and comprehend various dialects and communities because machine translation isn't capable of capturing some nuances.In conclusion, this article has provided an overview of the state of the art in speech-to-speech translation innovation today, including the key innovations as well as the many methods applied to discourse recognition, interpretation, and fusion. Through an examination of the advantages and limitations of this technology, this project has brought to light the potential for speech-to-speech interpretation to transform global communication and enable people from different backgrounds to connect and work together.

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