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Smart Translation For Deaf People

Pavan Kumar M[1], K M Sowmyashree[2]

Research Scholar, Dept. of MCA, P.E.S College of Engineering, Mandya, India[1]

Assistant Professor, Dept. of MCA, P.E.S College of Engineering, Mandya, India[2]

Abstract: The proposed web application aims to address communication barriers faced by individuals with hearing impairments by converting spoken language into Indian Sign Language (ISL) visuals and vice versa. The system utilizes speech recognition via the Google Speech API, natural language processing (NLP) for text preprocessing, and dictionary-based machine translation to generate ISL visuals, which are displayed as images for real-time communication. Designed specifically for the Deaf community in India, this application empowers users by enabling smoother interactions and reducing social isolation. By promoting inclusivity, this project enhances access to essential services and fosters greater participation in everyday activities for those who rely on ISL

Keywords: Indian Sign Language (ISL), Speech Recognition, Natural Language Processing (NLP), Machine Translation.

I. INTRODUCTION

In a world that relies heavily on verbal communication, individuals with hearing impairments face significant challenges in expressing themselves and accessing information, often leading to social isolation and limited access to essential services. Our project aims to address these issues by developing a web application that enhances communication for the Deaf community.

The system first converts spoken audio into text using the Google Speech API and processes the text with natural language processing (NLP) techniques to ensure accurate translation. It then translates ISL images back into text using MediaPipe. This two-phase approach effectively bridges communication gaps and promotes inclusivity, making interactions between hearing and Deaf individuals more seamless and accessible.

II. RELATED WORK

1. Conversion of Voice to Indian Sign Language for Hearing Impaired People:
This paper introduces a system that converts voice input into Indian Sign Language (ISL). It addresses the lack of text-to-sign conversion systems due to limited sign language dictionaries. The process involves converting voice to English text, parsing sentences, applying ISL grammar, stemming words, and matching them to an ISL video dictionary. The system's real-time response and use of human videos are noted, with suggestions for further research to improve communication.

2. D-Talk: Sign Language Recognition System for People with Disability using Machine Learning and Image Processing:
The paper presents D-Talk, an AI-powered application designed to assist people with hearing and speech impairments. It highlights the need for inclusive technology and focuses on enabling effective communication through hand gestures. The application uses webcams to detect hand movements, recognizes gestures, and translates them into actions like browsing websites. The system employs machine learning techniques, to identify gestures and execute commands. The research details the training phase, gesture recognition process, and implementation,gesture recognition and its potential to make communication more accessible for disabled individuals. ".

3. Audio to Sign Language Translation for Deaf People:
This paper presents a system that translates voice communications into graphics or GIFs representing Indian Sign Language (ISL). The system processes audio input, recognizes speech, preprocesses text, and translates it into ISL representations, enhancing communication and accessibility for the deaf community. The paper discusses potential applications in education and healthcare and suggests future improvements, such as integrating facial expressions and expanding use in news broadcasts.

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4. **Sign Language Converter for Deaf and Dumb People:**
This article explores methods for translating sign language motions into text and speech. It examines various approaches, including glove-based recognition, vision-based methods using CMOS cameras, and hybrid approaches combining both techniques. The paper emphasizes the use of embedded systems like Arduino and Raspberry Pi for real-time sign language translation, envisioning improved communication accessibility for the broader public.

5. Implementation of Gesture-Based Voice and Language Translator for Dumb People:
The research on the implementation of a gesture-based voice and language translator describes a system that uses the Trajectory Recognition algorithm to convert gestures into English alphabets. It employs Voice RSS and Microsoft Translate to generate voice output in supported languages, with three modes: Training, Testing, and Translation (for generating voice output). In the second phase, MediaPipe is used to convert images into text or speech. The framework processes and analyzes images, which are then used to train a Multilayer Perceptron (MLP) model.

III. EXISTING SYSTEM

Many projects have focused on converting sign language into text or audio, helping deaf individuals communicate with hearing people by translating gestures. However, systems that convert sound into sign language are less common. Such technology would significantly benefit both hearing and deaf individuals by translating spoken words into sign language gestures in real time. This would enhance accessibility in classrooms, workplaces, and public events, allowing deaf people to receive information concurrently with hearing people and facilitating more inclusive communication.

DRAWBACKS

· **Accuracy and Context Understanding**:

- Audio-to-sign language systems may struggle with correctly interpreting spoken language, potentially leading to errors in translation.
- These systems might have difficulty understanding idiomatic expressions, accents, and other contextual nuances, which can result in miscommunication.

· **Complexity of Sign Language::**

- Sign language involves more than just hand gestures; it includes facial expressions and body language.
- Systems may find it challenging to fully capture and represent these elements accurately.

· **Real-Time Processing::**

- Converting spoken language to sign language in real-time requires fast and accurate processing.
- Delays or inaccuracies can hinder effective communication and reduce the system's usability.

IV. PROPOSED SYSTEM

IThis project introduces a novel technology for translating audio into Indian Sign Language (ISL) using Python. It processes audio input through several steps: first, it converts the audio to text using the Google API, then displays the text on-screen. Next, the system uses an ISL generator to provide corresponding sign language gestures. Words from the text are compared to a dictionary of ISL images and GIFs; if a word isn't found, a synonym is used instead. The project also includes converting ISL images into text or speech, involving data collection, pre-processing (resizing, denoising, grayscale conversion), and training with CNN algorithms. This comprehensive approach bridges communication gaps and enhances interaction for both hearing and deaf individuals. The system first converts spoken audio into text using the Google Speech API and processes the text with natural language processing (NLP) techniques to ensure accurate translation. It then translates ISL images back into text using MediaPipe. This two-phase approach effectively bridges communication gaps and promotes inclusivity, making interactions between hearing and Deaf individuals more seamless and accessible.

V. ALGORITHM

The development of our communication system for the deaf involves the implementation of several advanced algorithms in both phases: Audio to Sign Language Conversion and Image to Text/Speech Conversion. This section details the algorithms used, their mathematical foundations, and the step-by-step processes involved.

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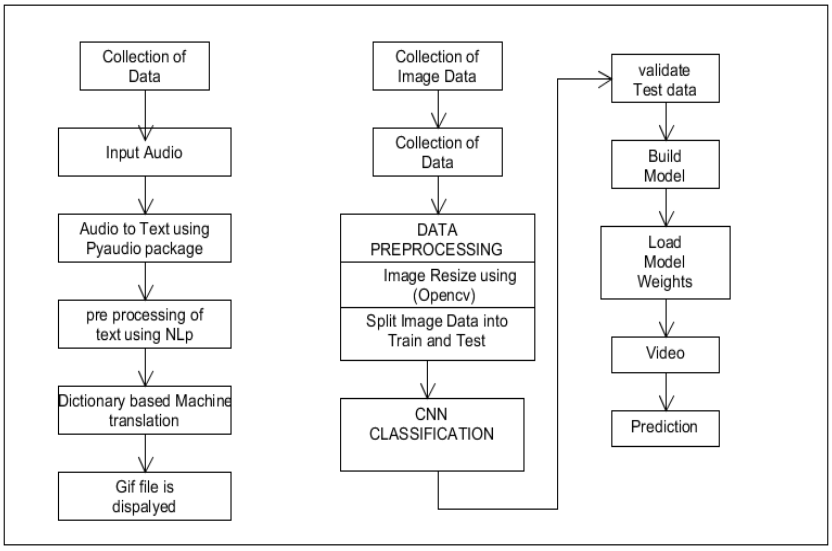

In the first phase, the system focuses on converting audio messages into Indian Sign Language (ISL). It starts by capturing audio through a microphone for live conversations or processing recorded files. Speech recognition technology is used to convert this audio into text. This text is then matched to a curated set of ISL images or GIFs that accurately represent the language's vocabulary and grammar. The corresponding ISL visuals are displayed, allowing deaf individuals to understand spoken messages through sign language representations. This phase ensures effective translation of auditory information into a visual format that the deaf community can comprehend.

Audio Input Acquisition:
This module is designed to convert spoken language into sign language. It begins by capturing spoken input via a microphone or audio file. Advanced speech recognition technologies then transcribe this audio into text. The text is processed using natural language processing (NLP) techniques to ensure accurate interpretation and translation. This processed text is then mapped to sign language gestures using machine translation methods. The final output is presented as animated GIFs representing the corresponding sign language gestures, allowing effective communication for users who rely on sign language.

Image to Text/Speech:
This module focuses on interpreting images of sign language gestures. It first captures images that represent various sign language gestures. These images are then analyzed using a convolutional neural network (CNN), which classifies and recognizes the gestures based on the training data. The recognized gestures are translated into text or spoken language. This functionality enables users to convert sign language gestures into readable text or audible speech, enhancing interaction with individuals who do not use sign language and facilitating smoother communication across different modalities.

VI. CONCLUSION

The frame is designed to capture hand movements without requiring gloves or any electromechanical devices. It converts spoken language into a visual format for deaf individuals. The web application includes a parser that translates spoken or written English into a structured sign language format, using Indian Sign Language (ISL) grammar. It processes the input by removing stop words, applying stemming and lemmatization to reduce words to their root forms. Words are then matched against a database of sign language video representations. The system's innovative approach improves upon existing methods by not only translating words into ISL but also arranging them according to ISL grammatical rules. This platform-independent technology offers real-time translation, making it both accessible and versatile.

VII. FUTURE ENHANCEMENT

1. Contextual Understanding:
Implement advanced natural language processing techniques to better understand and translate idiomatic expressions, emotions, and context, improving accuracy and meaning.

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2. Facial Expression Integration:
Incorporate technology to capture and interpret facial expressions and body language, enhancing the expressiveness and completeness of the sign language translations..

3. Real-Time Translation:
Improve real-time processing capabilities to reduce latency in translating spoken language into sign language, ensuring smoother and more natural communication..

4. Enhanced Learning Features:
Integrate educational tools and resources to help users learn and practice sign language, promoting greater proficiency and usage.

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