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LANGUAGE TRANSLATOR FOR SPEECH TO INDIAN SIGN

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Abstract

Communication plays a critical role for people and is regarded as a skill in life. Having this important aspect of life and surroundings in mind, we present our project article, which focuses primarily on supporting patients with pain or silent speech. Our research work leads to improved contact with the deaf and the mute. Each sign language uses sign patterns visually conveyed to express the true meaning. The combination of hand gestures and/or motions of arm and body is called Sign Language and the Dictionary. It is the combination of hands and facial expressions. Our program project is able to understand signals in sign language. These symbols may be used to interact with hearing aids. Our article suggests a program that allows common people to interact effectively with others that are hard to understand. In this case, we are implementing the Indian Sign Language (ISL) method by using a microphone and a camera. Translation of the voice into Indian sign language system by the ISL translation system is possible. The ISL translation framework uses a microphone to get pictures (from ordinary people) or continuous video clips, which the application interprets. Deaf people always miss out the fun that a normal person does, may it be communication, playing computer games, attending seminars or video conferences, etc.Communication is the most important difficulty they face with normal people and also every normal person does not know the sign language. The aim of our project is to develop a communication system for the deaf people. It converts the audio message into the sign language. This system takes audio as input, converts this audio recording message into text and displays the relevant Indian Sign Language images or GIFs which are predefined. By using this system, the communication between normal and deaf people gets easier.

Keywords: Sign Language Recognition, Communication Barrier, Indian Sign Language Translator

INTRODUCTION

Sign language serves as a natural and essential mode of communication for individuals facing challenges related to speaking and hearing disabilities. While several mediums exist for translating and recognizing sign language, systems that convert text to sign language are relatively scarce. This scarcity can be attributed to the limited availability of sign language corpora, which are essential for training and developing such systems. However,the development of text-to-sign language conversion

systems holds immense significancen providing access to information and services for deaf individuals, particularly in Indian sign language. The primary objective of this project is to facilitate communication for individuals who are deaf and mute, enabling them to interact more easily with individuals who do not know sign language. Through the conversion of text into sign language, this web application aims to break down communication barriers and promote inclusivity within society. By offering an open-source and freely available platform, this initiative seeks to benefit the deaf community by providing them with greater access to communication tools. Ultimately, the goal is to enhance opportunities for advancement and success in various aspects of life, including education, employment, personal relationships, and participation in public access venues.

LITERATURE SURVEY

The study conducted by Amit Kumar Shinde underscores the critical role of sign language recognition, particularly within languages like Marathi, where it serves as the primary mode of communication for individuals with hearing impairments. Shinde highlights the potential of hand gesture recognition systems in facilitating communication between deaf individuals and those who do not understand sign language, emphasizing its importance in bridging communication gaps.In their research, Neha Poddar, Shrushti Rao, Shruti Sawant, Vrushali Somavanshi, and Prof. Sumita Chandak shed light on the significant prevalence of deafness in India, ranking as the second most common cause of disability. To address this challenge, they propose the development of a portable interpreting device capable of converting mathematical sign language into text and voice. Such a device could greatly enhance communication accessibility for the deaf community and alleviate various communication barriers they face in daily life. Anbarasi Rajamohan, Hemavathy R., and Dhanalakshmi introduce a novel glove-based communication interpreter, which integrates flex sensors, tactile sensors, and an accelerometer. This innovative system enables deaf individuals to communicate with non-sign language users by interpreting hand gestures and matching them with pre-stored

outputs. The evaluation of this interpreter, focusing on ten letters, demonstrates its potential efficacy in facilitating communication.Purushottam Kar et al. present the development of INGIT, a system tailored for translating Hindi strings into Indian Sign Language (ISL), specifically focusing on railway inquiries.Leveraging Formal Concept Analysis (FCG) for grammar implementation, their system

achieves a notable success rate in generating semantic structures, although further refinement may be necessary for broader applicability.

In their work, Ali et al. propose a domain-specific system translating English text into ISLsymbols, featuring components such as a tokenizer and ISL symbols repository. Theiapproach aims to enhance communication accessibility for specific domains, leveraging synonyms and filtering offensive or non-translatable words to ensure accurate representation in ISL.

MS Anand et al. develop a sophisticated two-way ISL translation system, incorporating modules for noise removal, speech recognition, natural language conversion, and sign animation. Their system aims to provide seamless translation between spoken language and ISL, enhancing communication accessibility for both deaf and hearing individuals.

Finally, Dasgupta et al. propose a system for converting English text into ISL structure, leveraging modules for text analysis, f-structure representation, grammar transfer, and sentence generation. Despite its complexity, their approach offers a systematic framework for converting textual inputs into grammatically accurate ISL representations, contributing to the development of more effective sign language translation solutions.

These endeavors reflect a multifaceted approach to addressing the challenges associated

with sign language translation, including the prevalence of deafness, the need for accurate gesture recognition, and the development of efficient translation algorithms. By leveraging technologies such as flex sensors, accelerometers, and natural language processing, researchers aim to create intuitive and effective communication tools that enable seamless interaction between deaf and hearing individuals.

Moreover, the emphasis on domain-specific translation systems tailored for specific contexts, such as railway inquiries, demonstrates a nuanced understanding of the diverse communication needs within the deaf community. Through the integration of linguistic analysis, grammar implementation, and semantic structure generation, these systems strive to achieve accurate and contextually relevant sign language translations.

EXISTING SYSTEM

Although sign language serves as a crucial medium of communication worldwide, particularly for individuals with hearing or speech impairments, there exists a notable deficiency in efficient models capable of converting text into Indian Sign Language (ISL).

This gap is further exacerbated by the lack of comprehensive audiovisual support for oral

Communication. While considerable advancements have been achieved in the realm of computerized recognition of sign languages in various countries, the focus has predominantly been on languages such as American Sign

Language (ASL) and British Sign Language (BSL). In contrast, the development of systems specifically tailored for Indian Sign Language (ISL) remains significantly limited. The existing efforts in this field have primarily concentrated on ASL or BSL, leaving ISL underrepresented in terms of computerization The inefficiency in text-to-ISL conversion systems can be attributed to several challenges and limitations inherent in the existing approaches. One major challenge lies in the complexity of accurately representing the nuanced grammar and syntax of ISL through computational models. Additionally, the lack of comprehensive datasets and corpora specific to ISL poses a significant obstacle to the development of robust recognition

systems. Moreover, the variations and regional dialects within ISL further complicate the task of standardizing computational models for accurate interpretation. Several methodologies and techniques are employed to address the challenges associated with ISL computerization. These include the utilization of natural language processing (NLP) algorithms to parse and analyze textual inputs, as well as the integration of machine learning and pattern recognition algorithms for gesture and sign recognition. Furthermore, linguistic rules and grammatical structures specific to ISL are incorporated into the system to ensure accurate translation from text to sign language

Problems in Existing System:

Limited focus on Indian Sign Language (ISL), with most efforts concentrated onAmerican Sign Language (ASL) or British Sign Language (BSL).

• Insufficient availability of comprehensive datasets and corpora specific to ISL,hindering the development of robust recognition systems.

• Complexity in accurately representing the nuanced grammar and syntax of ISLthrough computational models.

• Challenges associated with standardizing computational models for accurate interpretation due to variations and regional dialects within ISL.

PROPOSED SYSTEM

The proposed system aims to fill a crucial gap in sign language translation technology by focusing on Indian Sign Language (ISL) and implementing a transfer-based translation approach. Unlike existing projects primarily focused on converting sign language input into text or audio output, this system targets the conversion of audio input into ISL, catering to the needs of both hearing-impaired individuals and the general population. By leveraging Python programming language, the system introduces an innovative audio-to-sign language translation technology, offering a comprehensive solution for facilitating communication accessibility The primary objective of the system is to assist individuals with hearing

impairments by providing them with an effective means of communication. While numerous projects have addressed sign language translation, the development of audio-to-sign language conversion systems remains relatively rare. By introducing this technology, the system not only serves the deaf community but also enhances communication capabilities for both deaf and hearing individuals, promoting inclusivity and accessibility. the system operates through a series of four main steps: input acquisition, tokenization, word search in the dataset, and video/clip display. Initially, the system accepts audio input, which is then processed to extract textual content for further analysis. Subsequently, the text undergoes tokenization to break it down into individual words or letters. These words are then compared against a dataset containing videos and GIFs Representing ISL gestures. If a match is found, the corresponding video or clip is displayed, providing users with a visual representation of the input. If no match is found, the system further breaks down the input into individual letters and displays corresponding videos/clips for each letter. Through this iterative process, the system effectively translates audio input into ISL, facilitating seamless communication for individuals with hearing impairments

Advantages of Proposed System

Accessibility: The system enhances accessibility by providing a means for individuals with hearing impairments to communicate effectively using Indian Sign Language (ISL).

• ***Inclusivity***: It promotes inclusivity by catering to the communication needs of both hearing-impaired individuals and the general population, fostering better interaction and understanding.

• ***Real-time Translation***: With its ability to translate audio input into ISL in real-time, the system facilitates instantaneous communication, reducing communication barriers.

• ***Ease of Use***: The system's user-friendly interface and straightforward operation make it accessible to a wide range of users, including those with limited technical expertise.

• ***Adaptability***: The system's modular design allows for future enhancements and updates, enabling it to evolve and adapt to changing needs and technological advancements

ALGORITHMS USED

Porter Stemming Algorithm

Porter Stemming algorithm provides a basic approach to conflation that may work well in practice. Natural Language Processing (NLP) helps the computer to understand the human natural language. Porter Stemming is one of the Natural Language Processing techniques.It is the famous stemming algorithm proposed in 1980. Porter Stemmer algorithm is known for its speed and ease. It is mainly used for data mining and to retrieve information. It produces better results

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than any other stemming algorithms. It has less error rate. The system removes the morphological and inflexional endings of the English words. The system uses Porter stemming Algorithm to remove the commonly used suffixes and prefixes of the words and find the root word or original word. For example, the Porter stemming algorithm reduces the words “agrees”, “agreeable”, “agreement” to the root word “agree”. Because of this stemming, we can reduce the time taken for searching the sign language for the given word.

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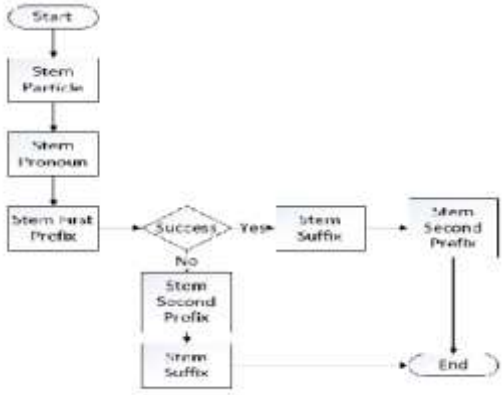
• Because of this stemming, we can reduce the time taken for searching the sign language for the given word.

• The data passes from one step to another making it a multipass algorithm. The algorithm works in five steps, and at every step, rules are applied until one among them clears the condition.



Condition><S1>→ S1 and S2 represent suffix and new suffix, respectively. For instance, a rule (m > 0) EED → EE means if the word has a minimum of one “vowel and consonant” plus EED ending, change the ending to EE. Example “disagreed” converts to “disagree,” whereas “need” remains unaffected

NLP and NLTK

• NLP is Natural Language Processing used for computers to understand text and spoken words as the same way as human beings.

• NLTK is the heart of the audio to Indian Sign Language conversion system, as it is the most powerful open-source NLP library which is used to assist with human language data. Text processing is performed using NLTK, which involves various

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steps, such as

1. Tokenization

2. The removal of stop words

3. Lemmatization

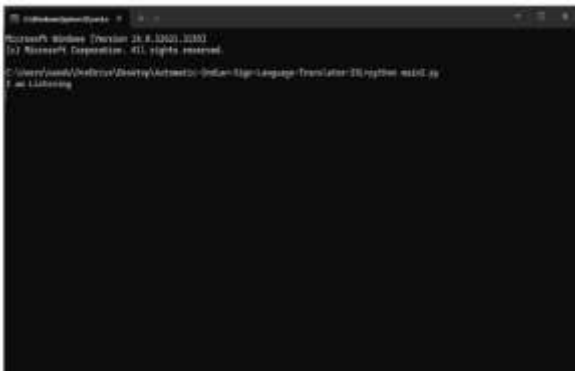
4. Parse tree generation

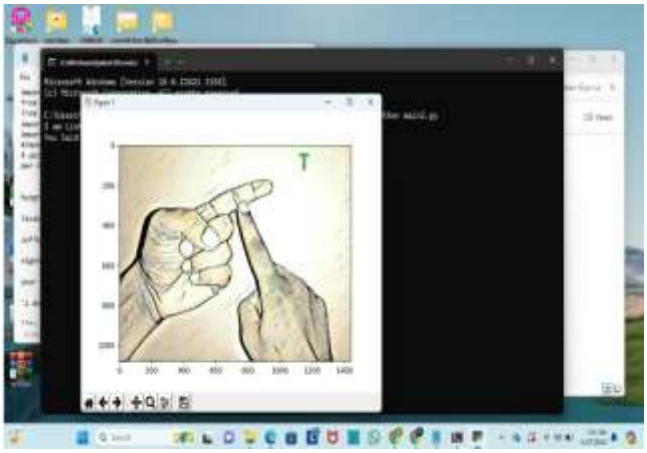
5. Part-of-speech (POS) tagging etc

Text to Sign Language

The system iterates through every word in the processed text sentence which is received from the previous step and searches the corresponding sign language video sequences in the local system. If the word is found, the system shows the output as a video sequence. If the word is not found in the local system, then it splits the word into letters, according to letter the sign video clips are play.

RESULTS





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CONCLUSION

significant portion of the Indian population grapples with hearing and speech impairments, relying heavily on Indian Sign Language (ISL) as their primary means of communication. Due to the inherent challenges in understanding written texts, sign language, with its expressive hand gestures, lip movements, and facial expressions, emerges as the preferred mode of communication for this demographic. The proposed system seeks to address this communication barrier by providing an efficient method for individuals with hearing and speech impairments to interact effectively. Despite the limited development in this field, particularly in successful Python implementation, the system holds promise in improving information accessibility for the hearing-impaired population in India. Additionally, the system can serve as an educational tool for learning ISL, further enhancing communication and integration for individuals with disabilities Our endeavor aims to create a model that empowers individuals with disabilities to express themselves distinctly, fostering their inclusion in society. By successfully converting audio inputs into animated representations, our proposed model bridges the gap between spoken language and sign language, facilitating seamless communication. As the ISL Dictionary evolves, the system can be augmented with new words to broaden its scope and effectiveness. Furthermore, integrating text-to-speech

functionalities can enhance communication techniques, enabling users to convert text inputs into ISL, thereby enriching their communication experience and promoting greater inclusivity

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