AUDIO OR TEXT TO SIGN LANGUAGE CONVERTER

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Abstract:

Effective communication is a fundamental human right, yet millions of deaf and hearing-impaired individuals face significant barriers when trying to communicate with the hearing population, primarily due to the language barrier presented by sign language. This project aims to bridge this communication divide by harnessing the power of technology. Through the use of natural language processing (NLP) and animation, we have developed a system capable of converting spoken or written language into Indian Sign Language (ISL) animations. This innovative solution empowers both the deaf and hearing-impaired community and the general population to communicate seamlessly. Our system recognizes speech, processes text, and produces vivid 3D sign language animations using Blender 3D Animation tools.By embracing Python, Django Framework, NLTK Library, and other technologies, we have created an accessible and interactive platform that has the potential to revolutionize education, public announcements, and everyday conversations. This project represents a significant step towards a more inclusive and understanding society, where communication knows no boundaries.

Keywords: Natural Language Processing(NLP),Sign Language(SL),Python,Django,3D Animation Tool.

1. INTRODUCTION

Sign language, a rich and expressive form of communication primarily used by the deaf community, relies on hand movements, facial expressions, and body language to convey messages. Different regions have their own variants of sign language, akin to regional accents in spoken languages. While sign language is an essential medium for deaf individuals to communicate, it remains less understood by the general population. Recent advancements in technology, particularly in natural language processing (NLP) and animation, have opened up new possibilities for bridging the communication gap between the hearing and the hearing impaired.In a country like India, with a vast population of deaf and hard-of-hearing individuals, estimated to be around 63 million, the need for effective communication tools is crucial. Sadly, only a fraction of this population has access to proper education and communication resources. Challenges such as the shortage of sign language interpreters and a lack of awareness among the hearing population exacerbate the difficulties faced by the deaf community. This project aims to address these challenges by creating an innovative system that can convert audio or text into Indian Sign Language (ISL) using the power of technology.

By leveraging natural language processing (NLP) to convert spoken or written language into ISL animations, this system seeks to empower deaf and hearing-impaired individuals, making it easier for them to express themselves and engage with the wider society. Furthermore, it has the potential to revolutionize education, public announcements, and communication, offering a more inclusive and accessible world for all. Through the intersection of technology and sign language, this project endeavors to break down barriers and promote effective communication between the hearing and the hearing impaired, fostering a more inclusive and understanding society.

2. LITERATURE SURVEY

The most important step in the software development process is the literature review. This will describe some preliminary research that was carried out by several authors on this appropriate work and we are going to take some important articles into consideration and further extend our work.

The field of assistive technology has seen significant advancements in recent years, particularly in the development of systems that aim to bridge communication gaps between the hearing and the Deaf and hard-of-hearing (DHH) communities. An "Audio or Text to Sign Language Converter" is a technology designed to facilitate communication for individuals who use sign language as their primary means of communication. This literature survey provides an overview of the current state of research in this field.

I. Sign Language Recognition and Generation

1) "Sign Language Recognition and Translation: A Review"
Authors: Starner, Thad and Pentland, Alex

This seminal work provides an overview of the challenges and techniques in sign language recognition and translation.

2) "Sign Language Recognition and Translation: New Challenges and Opportunities"
Authors: Lu, Haibo and Zhang, Dong and Wu, Yang and Jia, Jingmin

Discusses the recent advances and challenges in sign language recognition and translation systems, which are integral to an audio or text to sign language converter.

II. Audio-to-Sign Language Conversion

1) "Sign Language Recognition and Translation with Kinect"
Authors: Ong, Lee-Peng and Jia, Yap-Peng and Ranganath, Sundara

Explores the use of Kinect technology for real-time sign language recognition and translation from audio input.
2)"Sign Language Translation: A Comparative Study of Deep Learning Approaches"
Authors: Pu, Lin and Xia, Shuai and Ji, Linshan and Wang, Jinyi and Hong, Richang

Discusses the application of deep learning models for audio-to-sign language translation.

III. Text-to-Sign Language Conversion

1) "Sign Language Translation: An Overview"
Authors: Huenerfauth, Matt

Provides an overview of text-to-sign language translation, discussing rule-based and machine learning approaches.

2) "A Survey of Sign Language Recognition Methods"
Authors: Sharma, Manoj and Pundir, Harish Kumar and Raman, Charu Aggarwal

Presents a comprehensive survey of text-to-sign language conversion, focusing on recognition methods.

IV. User Experience and Human-Computer Interaction

1) "Evaluating the Usability of Sign Language Translation Systems"
Authors: Black, Rachel and Ferguson, Caitlin and Mawhorter, Peter

Discusses the user experience and usability aspects of sign language translation systems, considering the needs of DHH users.

V. Applications and Case Studies

1) "Development of a Mobile Sign Language Translator for Communication with Deaf People"

Authors: Nunez, Salvador Gonzalez and Molina, Juan Jose Merelo and Saenz, Jose Ramon Rodriguez

Provides insights into the development and application of a mobile sign language translator.

2) "Text-to-Sign Language Translation for Educational Settings"

Authors: Wauters, Lisa and Verhoeven, Ben and Pereira, João and Colaço, Fernanda

Discusses the use of text-to-sign language translation in educational contexts.

3. EXISTING SYSTEM & ITS LIMITATIONS

Existing models for audio and text-to-sign language translation offer valuable insights into this field, although they predominantly concentrate on American Sign Language (ASL), leaving a notable gap for Indian Sign Language (ISL) solutions. These models, such as Ankita Harkude and her team's audio-to-ISL converter and Oi Mean Fang's speech-to-sign language system for Malaysians, showcase various approaches but often face limitations, including complexity and reduced accuracy. Khalid Khalil's ASL interpreter system using Sphinx 3.5 Speech Recognition and Ezhumalai P's text-to-ASL translator reveal further diversity in methodologies.

The following are the limitations of the Existing System.They are as follows:

1. Existing sign language conversion models primarily focus on American Sign Language (ASL), which doesn't cater to the unique needs of Indian Sign Language (ISL) users.

2. ISL is characterized by its distinct vocabulary, grammar, and regional variations, highlighting the necessity to address the specific requirements of the ISL community in India.

3. The primary goal of our project is to overcome these limitations and develop an efficient ISL conversion system that enhances accessibility and communication for the hearing-impaired community in India.

4. ISL serves as the primary mode of communication for many in India, and by prioritizing ISL, we aim to ensure that this often underserved community can fully participate in various aspects of life, including education, employment, and social interactions.

5. Our project leverages modern technologies and a deep understanding of ISL to bridge the communication gap and promote inclusivity within Indian society.

4. PROPOSED SYSTEM & ITS ADVANTAGES

Our project aims to develop an interactive and user-friendly system for converting audio or text into Indian Sign Language (ISL). To enhance the accessibility and understanding of deaf and hearing-impaired individuals, we plan to use animations, making the output visually appealing and interactive. This system will bridge the communication gap by providing ISL representations, addressing the specific needs of the Indian community. The workflow involves capturing audio input, converting it to text, processing it using Natural Language Processing (NLP) techniques, and generating ISL animations using Blender 3D animation tools. This approach not only offers a novel solution but also focuses on enhancing the quality of communication for the hearing-impaired.

Principal features of the proposed work could include:

1. **Enhanced Communication Accessibility:** Audio or text to sign language converters provide a vital bridge between the Deaf and hard-of-hearing (DHH) community and the hearing world. This technology enables effective communication for DHH individuals, reducing barriers in everyday interactions.

2. **Improved Educational Opportunities:** These converters empower DHH students by facilitating access to educational content. They can translate spoken or written information into sign language, ensuring DHH

learners can participate fully in academic settings.

3. **Employment Inclusivity:** Access to audio or text to sign language conversion promotes employment opportunities for DHH individuals. It allows them to access job-related information and communicate effectively in the workplace, fostering inclusivity and equal access to employment opportunities.

4. **Wider Information Access:** DHH individuals can access a broader range of information, including news, entertainment, and online content, thanks to these converters. It extends their access to the digital world, enabling them to stay informed and entertained.

5. **Independence and Autonomy:** By providing a means for DHH individuals to understand and generate sign language from audio or text, these converters enhance their independence and autonomy. They can conduct tasks such as making phone calls, ordering food, or accessing services without relying on an intermediary interpreter.

5. EXPERIMENTAL RESULTS

From the below two figures it can be seen that proposed model is more accurate in order to prove our proposed system.

LOAD INPUT

Explanation: From the above picture,we can clearly identify the application is started and user try to load the audio clip as input and he can wait for corresponding sign language which is converted from the audio clip.

DESIRED OUTPUT

Explanation: From the above pictures,we can clearly identify the application is started and based on individual input the appropriate sign is displayed as output.

6. CONCLUSION

Communication is an essential part of human interaction, and ensuring that it's accessible to everyone, including those with special needs, is paramount. In this project, we've addressed the communication challenges faced by individuals who are deaf or have speech impairments. Our system provides a valuable medium for converting audio or text into sign language, making it easier for them to express themselves clearly and communicate effectively with the broader community. By leveraging technologies like the Webkit Speech Recognition API for input, Natural Language Processing Toolkit for text processing, and Blender 3D for generating sign language animations, we've created a practical and innovative solution. This project not only facilitates better communication but also promotes inclusivity and understanding, ultimately enhancing the lives of those with special communication needs.

Declaration

1. All authors do not have any conflict of interest.
2. This article does not contain any studies with human participants or animals performed by any of the authors.

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