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Talking Hands: Speech to Sign language Converter

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Abstract: Deaf people face communication challenges in many aspects of their lives. This project proposes a speech-to-sign language converter that can help to bridge the communication gap between deaf and hearing people. The converter would use speech recognition technology to transcribe spoken language into text. This text would then be translated into sign language images or GIFs. The images or GIFs would be displayed on a screen, allowing deaf people to easily understand the message. The converter would be designed to be as accurate and user-friendly as possible. It would also be customizable to support different sign languages. This project has the potential to make a significant impact on the lives of deaf people. It could help them to communicate more effectively in school, at work, and in social settings. It could also help to break down communication barriers and foster greater understanding between deaf and hearing people. The converter would be developed using a variety of technologies, including speech recognition, machine translation, and image processing. The objective of our project is to reduce the communication gap between normal people and disabled people by providing a virtual animation translator for sign language.

Keywords: Speech-recognition, speech-to-sign-language, machine learning, NLP, communication challenge

I. Introduction

Communication is a fundamental aspect of human interaction, enabling us to connect, share experiences, and express our thoughts and emotions. However, for the deaf community, this essential channel of communication can often be a challenging and elusive part of daily life. Deaf individuals frequently encounter significant barriers when trying to engage with the hearing world, and these obstacles can manifest in educational, professional, and social settings. "Talking Hands" is a visionary

project that aspires to bridge this communication gap by developing a real-time speech-to-sign language converter using the power of Natural Language Processing (NLP) and computer vision technology. This ground breaking initiative places inclusivity and accessibility at its core, seeking to empower deaf individuals with a transformative means of communication.

Deaf individuals, while possessing the same aspirations and desires as anyone else, often find themselves missing out on the full spectrum of experiences that the hearing world enjoys. Whether it's participating in classroom discussions, attending seminars, engaging in video conferences, or simply connecting with friends and colleagues, communication barriers persist. The reality is that not everyone has the knowledge of or access to sign language, further deepening the divide. "Talking Hands" recognizes the importance of equitable communication for all and, as such, aims to create a communication system designed specifically for the deaf community. By instantly converting audio messages into sign language, it endeavours to make communication seamless, intuitive, and universally accessible.

This project addresses the daily challenges faced by deaf individuals, such as limited access to sign language interpreters, difficulties in educational and professional environments, the inaccessibility of digital content, and the isolation often experienced in social interactions. Through "Talking Hands," we aim to provide a solution that empowers the deaf community to engage more effectively in school, at work, and within social settings. The development of this real-time converter is an intricate endeavour that involves various technologies, including speech recognition, sign language recognition, NLP, and computer vision. By combining these elements, the project endeavours to provide a lifeline for those who have long faced communication barriers, promising a world where "Talking Hands" can foster inclusivity, accessibility, and a deeper understanding between deaf and hearing individuals.

II. OBJECTIVES

 To develop a speech-to-sign language converter using machine learning algorithms, natural language processing, and deep learning.

 To achieve a high level of accuracy in the conversion of speech to sign language.

 To make the speech-to-sign language converter easy to use for both deaf and hearing people.

 To evaluate the effectiveness of the speech-to-sign language converter in improving communication between deaf and hearing people.

 Develop a speech-to-sign language converter that is 3 affordable and accessible to people with disabilities.

III. DELIVERABLES

• A system that allows deaf people to communicate with others.

• A system which converts sentence into set of keywords and performs actions which are understandable to deaf people

• A system generates video in which man performs all the sign which are understandable by the deaf people

• A system that allows deaf people to communicate with all the peoples who don’t know sign language

• A system which allows normal people to easily and efficiently communicate with all deaf people

IV. APPRATUS

A. The front end of this platform audio to sign language converter primarily employs HTML, CSS, and Django's Jinja syntax for template rendering. Unlike the ReactJS-based platform, it emphasizes an efficient and scalable architecture while ensuring dynamic data updates without full page reloads. It leverages NLP for audio processing, enabling the conversion of audio content into sign language. This approach is designed to create a responsive and user-friendly web application for audio to sign

language conversion, catering to a diverse user base.

B. Back end The backend of this platform is developed using the popular open-source python library Django. Django is a REST framework that provides a toolkit for backend development. Here we have used S3-backed database engine as a database. It is an open-source relational database that allows us to store a large amount of data sophistically and securely. The backend is very crucial part where the data is fetched from the templates and displayed on the web page.

V. CONCEPT

Our project, a Speech to sign language converter, aims to bridge the communication gaps in the deaf community by providing a tool for communication. It accepts input in two forms: text and speech, and uses advanced NLP techniques to feed the underlying machine learning capabilities. This research is very important to the deaf community and has a wide range of applications. Stop words are systematically removed during the initial preprocessing step to extract important terms from the content. Each important sentence is carefully linked with an associated GIF or video that allows users to properly understand the movement of sign language.

The Speech to Sign Language Project is an essential resource for the deaf to improve communication and understanding. Its ability to accept both text and voice input makes it a useful tool for users. Using natural language processing (NLP) to process content improves the accuracy and efficiency of this ML-enabled system. This project significantly promotes inclusion and accessibility by addressing the language and communication needs of deaf people. In addition, automatic content segmentation ensures that only relevant words remain, speeding up the sign language conversion process. The use of GIFs and movies in each sentence improves the user experience, making it more intuitive and informative. This unique method empowers deaf people and promotes a more inclusive and supportive world with a wider social impact.

Overall, the Speech to sign language converter project highlights the transformative potential of technology to improve the lives of the hearing impaired. The Speech to sign language converter project is an important step forward in assistive technology that aims to benefit not only the deaf, but society as a whole. This project promotes enhanced communication and a greater sense of inclusion by

allowing everyone to express themselves through sign language. Using natural language processing (NLP) to process text and speech allows users to transform spoken or written content into a visual language that transcends auditory limitations. This transformative power is especially powerful in educational institutions, business relationships and everyday social encounters, making it a versatile tool that can transform lives.

In addition, the project's user-centered approach is demonstrated by segmenting its input content to find meaningful words and associate them with sign language representations. This ensures that the main medium of communication is preserved and removes unnecessary language barriers. Visual aids such as GIFs and movies act as an effective bridge between spoken and sign language, making learning easier and more fun. Furthermore, there is huge potential to extend this concept to areas of education and professional life where sign language is crucial. This can lead to greater job opportunities and a more inclusive educational environment.

In short, the Speech to sign language project is more than just a technical innovation; it is a catalyst for positive change. By fostering a deeper understanding and connection between the deaf and the deaf, it promotes a world where communication has no boundaries. Its educational, social and professional implications underscore its importance as a transformative tool that empowers deaf people and promotes a society that values diversity and inclusion.

VI. MODULES

Speech Recognition Module:

Error Handling: Implement robust error handling to deal with cases of mispronunciations, background noise, and accents to improve accuracy and provide meaningful feedback to the user.

Multimodal Input: Extend the module to accept not just speech but also input from other modalities such as text or gestures to enhance accessibility.

Language Processing Module:

Context Analysis: Enhance the understanding of context within a conversation to improve the system's ability to interpret the meaning of spoken sentences and generate contextually relevant sign

language.

Speech Emotion Recognition: Integrate emotion recognition to convey the emotional nuances of spoken language through sign language gestures.

Text-to-Sign Language Translation Module:

Natural Gestures: Incorporate natural signing movements and facial expressions to convey the meaning and emotions more accurately, making the signing more expressive.

Real-time Updates: Enable the module to adapt to the evolution of sign language over time and incorporate new signs or variations.

Sign Language Animation Module:

Realistic Avatars: Utilize advanced technologies like motion capture to create more realistic and expressive sign language avatars.

Personalization: Allow users to customize the appearance and style of the sign language avatar to make the communication experience more relatable and engaging.

User Interface (UI) Module:

Accessibility Features: Implement features such as high-contrast modes, voice commands, and keyboard shortcuts to accommodate users with diverse accessibility needs.

Learning Resources: Provide links to sign language learning resources within the UI to support users in learning sign language alongside their interactions with the system.

VII. FEATURES

1. Accurate Speech Recognition:

- High-quality Automatic Speech Recognition (ASR) to transcribe spoken language into text accurately.
- Support for multiple languages and dialects to cater to diverse users.

2. Contextual Understanding:

- Understanding of conversational context to ensure that sign language translations are contextually

relevant.

 Ability to track ongoing dialogues to provide accurate sign language interpretations.

3. Realistic Sign Language Gestures:

 High-quality animations or avatars that accurately depict natural sign language movements and expressions.

VIII. FUTURE SCOPE

 Develop a speech-to-sign language converter that can be used in real time. This would allow deaf and hearing people to communicate with each other directly, without the need for an interpreter.

 Develop a speech-to-sign language converter that can be used for a variety of languages, including both spoken and signed languages. This would make the converter more accessible to people from different parts of the world.

 Develop a speech-to-sign language converter that can be used in a variety of settings, such as educational institutions, workplaces, and public places. This would make it easier for deaf people to participate in all aspects of society.

 Develop a speech-to-sign language converter that is affordable and accessible to people with disabilities. This would ensure that everyone has the opportunity to benefit from this technology.

 Improve the accuracy of speech recognition. This is essential for developing a speech-to-sign language converter that is reliable and accurate.

 Improve the fluency and naturalness of sign language generation. This would make the speech-to-sign language converter more engaging and pleasant to use.

IX. RESULT

The "Talking Hands" speech to sign language converter achieved promising results during the evaluation phase. The model demonstrated accuracy in converting spoken language into corresponding sign language gestures. Tokenization and lemmatization of words is done efficiently for converting a sentence into resultant words.

CONCLUSION

The "Talking Hands" project successfully developed a speech to sign language converter, providing a valuable tool for facilitating communication between the hearing-impaired and the hearing community. Future enhancements could involve expanding the dataset to improve model accuracy, incorporating real-time capabilities, and exploring potential applications for mobile devices to make this technology more accessible and widely applicable.

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