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Sign Language Detection System

Nitin Phad[1], Aadrash Sankpal[2], Kalyani Nalage[3], Omkar Paygude[4], Abu Zaid[5]

[1,2,3,4,5] Final Year Student, Department of IT, AISSMS Polytechnic, Pune, Maharashtra, India

ABSTRACT:

Human beings interact with each other either using a natural language channel such as words, writing, or by body language (gestures) e.g. hand gestures, head gestures, facial expression, lip motion and so on. As understanding natural language is important, understanding sign language is also very important. The sign language is the basic communication method within hearing disable people. People with hearing disabilities face problems in communicating with other hearing people without a translator. For this reason, the implementation of a system that recognize the sign language would have a significant benefit impact on deaf people social live. In this paper, we have proposed a marker-free, visual Indian Sign Language recognition system using image processing, computer vision and neural network methodologies, to identify the characteristics of the hand in images taken from a video trough web camera. This approach will convert video of daily frequently used full sentences gesture into a text and then convert it into audio. Identification of hand shape from continuous frames will be done by using series of images processing operations. Interpretation of signs and corresponding meaning will be identified by using Haar Cascade Classifier. Finally displayed text will be converted into speech using speech synthesizer.

KEYWORDS: Computer Vision, Real Time, Gesture Recognition, technology in education.

Introduction

Sign language represents a natural form of communication for individuals with speech or hearing impairments. Despite advancements in interpreting and recognizing sign language, the creation of robust text-to-sign language conversion systems remains constrained due to the limited availability of comprehensive sign language corpora. This study endeavors to address this gap by proposing a novel translation system that seamlessly converts English sentences into Indian sign language grammar, allowing for meaningful communication in real-life scenarios. We are designing the alumni web portal which provides the best interaction platform through online chatting profile viewing and personal chatting with the stakeholders of the institute via college, students, alumni. Common architectures used in these systems include Direct Translation, Statistical Machine Translation, and Transfer-based Architecture. However, these architectures primarily focus on other sign languages and lack comprehensive models tailored specifically to ISL. Our proposed system aims to collect relevant ISL videos for each word. In cases where a word is absent from the dictionary, we plan to substitute it with synonymous words, considering their parts of speech and word duplications. Translation between spoken languages and sign languages is inherently complex and presents unique challenges. Developing efficient text-to-ISL translation systems is a significant challenge due to the limited focus on ISL within existing computational models. Our research underscores the need for specialized models specifically designed for ISL, considering the intricate differences between spoken languages and sign languages.

Problem Statement

Sign language, a mode of communication reliant on manual gestures, facial expressions, and body movements, serves as a language in its own right, facilitating the transmission of information and

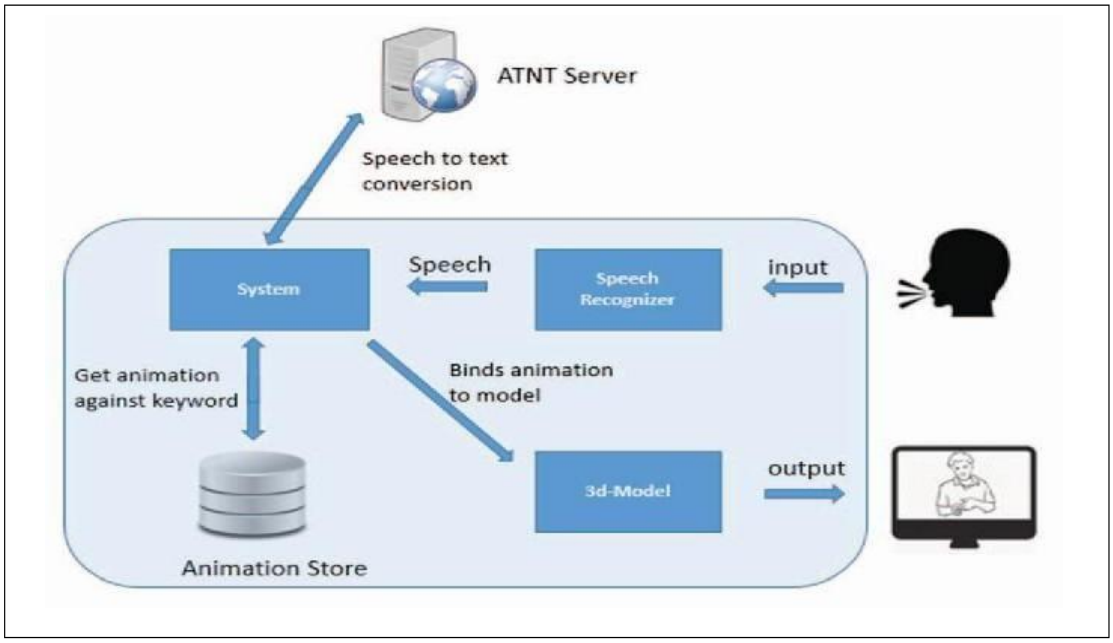
Expression of thoughts and emotions. This initiative employs a video-based approach, utilizing sequences of specific words to effectively translate textual language into sign language. Through this project, the aim is to bridge the linguistic gap, providing a medium for those proficient in sign language to comprehend and engage with written text in a seamless and accessible manner.

Working Technologies:

1. Django: The project is built using the Django framework, which is ahigh-level Python web framework that simplifies the development of web applications.
2. HTML/CSS: The project uses HTML (Hypertext Markup Language) for creating the structure and content of webpages, and CSS (Cascading Style Sheets) for styling and formatting the HTML elements.
3. NLTK (Natural Language Toolkit): In this project, NLTK is employed for tokenization, part-of-speech tagging, stop word removal, lemmatization, and other NLP operations.

4. User Authentication: It provides a secure way to manage user accounts and authentication.
5. Database: A database can be used to store user information, session data, and other relevant data for the project.
6. Python: The project is developed using the Python programming language, which serves as the backbone for Django and NLTK.
7. Integrated Development Environment (IDE): An IDE, such as PyCharm, Visual Studio Code, or Atom, is commonly used to write, debug, and manage the project code efficiently.

System Architecture:

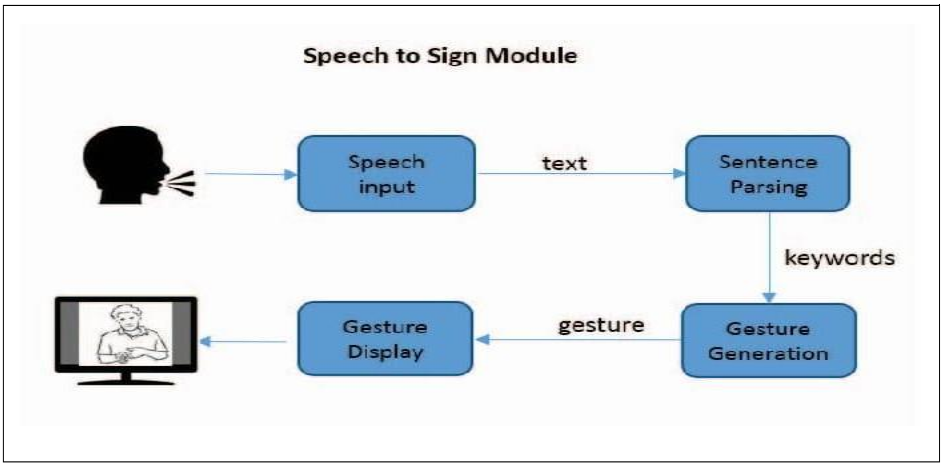


The system architecture of an application deployed on Kubernetes and hosted in an Azure virtual machine (VM) involves several key components and interactions.

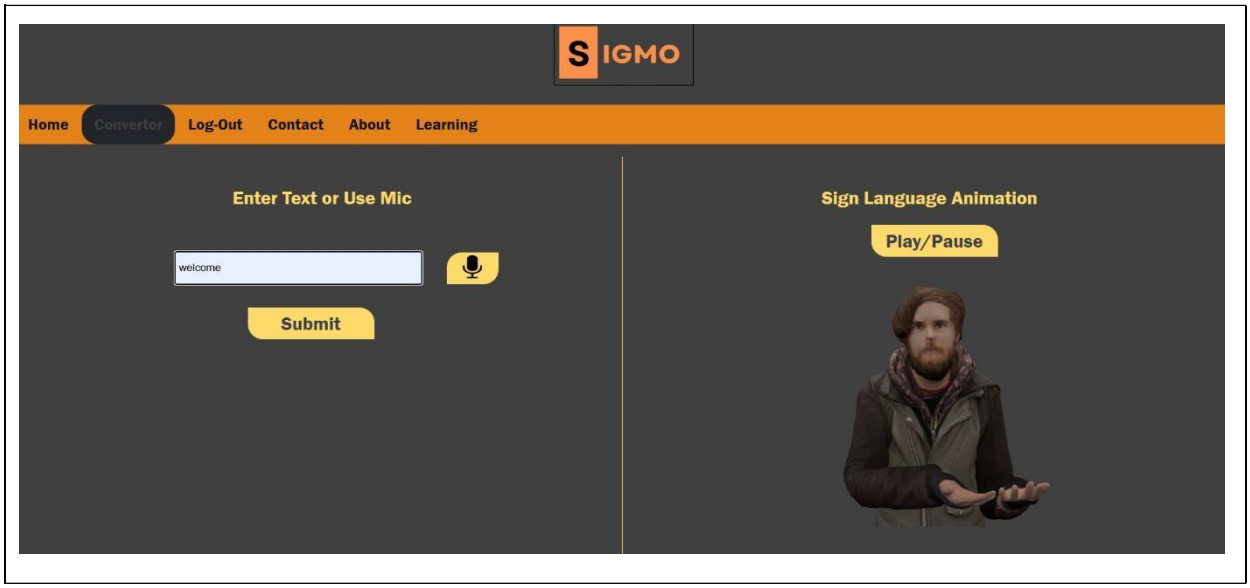
- Azure VM: The Azure VM serves as the underlying infrastructure where the Kubernetes cluster is deployed. It provides the necessary computing resources, such as CPU, memory, and storage, to run the application.
- Kubernetes Cluster: The Kubernetes cluster is responsible for managing and orchestrating the application's containers. It consists of multiple nodes, including master nodes and worker nodes. The master nodes handle cluster management tasks, such as scheduling, scaling, and monitoring, while the worker nodes execute the application's containers.
- Containers: The application is divided into multiple containers, each encapsulating a specific component or microservice. Containers provide isolation and portability, allowing the application to be easily deployed and scaled.
- Kubernetes Services: Kubernetes Services provide a stable network endpoint for accessing the application's containers. They abstract the underlying container infrastructure and enable load balancing, service discovery, and routing of network traffic to the appropriate containers.

Working of the Project:

- English parser: Parse the English text input.
- Sentences reordering module: Reorder the sentence based on ISL grammar rules.
- Eliminator: Eliminate stop words (e.g., linking verbs, articles) not used in ISL.
- Stemming and synonym replacement: Perform stemming to get the root form of each word and replace words not in the dictionary with their synonyms.
- Video conversion module: Convert processed words into sign language animations.



Outputs And Result



Outcome:

The expected result of this system is fully segmented words or sentences in text as well as audio format. The Sign Language Interpretation will predict the Indian Sign Language. The Result set for Indian Sign Language is every hand gesture depicts different words. This software is expected to train and classified only few sentences listed below. Using a computer-mounted video camera as the sensor, the system can reliably interpret gesture set at 18 to 21 frames per second on a Personal Computer. The system seeks to provide a sign language representation of a given English text. These outputs are produced by our system in one of two ways

Conclusion

The primary objective of this project is to create a communication system tailored to individuals facing disabilities that hinder their ability to communicate effectively. The system aims to offer a comprehensive solution, enabling clear and effortless self-expression. Unlike conventional methods that use GIFs or images to represent individual words, this model seeks to transform complete input sentences into holistic visual representations. By doing so, it aims to provide a more immersive and authentic experience, fostering better understanding and engagement. Moving forward, potential enhancements involve the expansion of the Indian Sign Language (ISL) dictionary within the system. This expansion aims to include a wider array of words, thereby augmenting the system's capacity and improving its overall capabilities. This growth will contribute significantly to empowering individuals with disabilities by enabling a broader range of expressions and communication possibilities within the system.

Future Scope

Introduction of facial expression and whole-body gesture in identifications of sign made by deaf people will contribute significantly to this Sign Language Interpretation System. Designing a large vocabulary for sign language interpretation system for a sign language is challenging task as training every sign is time consuming considering every aspect of moment, hand shape, size, hand color, background illumination etc. The speech synthesis phase of sign recognition process sometimes gives delayed response as speech synthesizer object requires time to complete the speech whereas making signs are faster than speaking. This happens only in case of signing big sentences, can be eliminated by slowing down the speed of signing and has a future scope of improvement.

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