SMART ASSISTIVE FRAMEWORK FOR BLIND, DEAF AND DUMB PEOPLE

Project Reference No.: *47S_BE_1278*

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Keywords:

Gesture recognition, Communication system, Speech and hearing impairments, Computer vision, Machine learning, Human-computer interaction.

Introduction:

The Smart Assistive Framework is a groundbreaking project aimed at revolutionizing communication for individuals with disabilities, particularly those who are blind, deaf, or mute. Through a fusion of advanced technologies like computer vision, machine learning, and human-computer interaction, it offers a transformative solution to bridge communication gaps. By deciphering hand gestures into meaningful messages or actions, the framework empowers users to interact effectively with their environment. Leveraging previous research in the field, it enhances accuracy and accessibility, setting new standards for assistive technology. Beyond communication, the framework introduces novel interaction patterns, paving the way for future digital environments. Integration with virtual reality systems further enriches user experiences, fostering inclusivity and immersion. More than a technological advancement, this project signifies a commitment to social progress, empowering individuals with disabilities and promoting a more inclusive society. As a beacon of innovation, the Smart Assistive Framework holds promise for improving countless lives and advancing accessibility on a global scale.

Objectives:

The project aims to empower individuals with speech, vision, and hearing impairments by creating a unified communication device. Using OpenCV and Python, it develops a compact system for sign language recognition, enhancing human-computer interaction. Additionally, the project implements text-to-voice and speech-to-text conversion using speech synthesis and optical character recognition (OCR) via Tesseract. Furthermore, it focuses on creating a user-friendly real-time hand gesture recognition and voice conversion system, enabling interpretation of messages through sign language or lip synchronization, fostering independence and confidence in the disabled community.

Methodology:

The proposed system comprises four modules catering to different communication needs: Text to Speech (TTS), Image to Speech or Text (ITS), Gesture to Speech (GTS), and Speech to Text (STT).

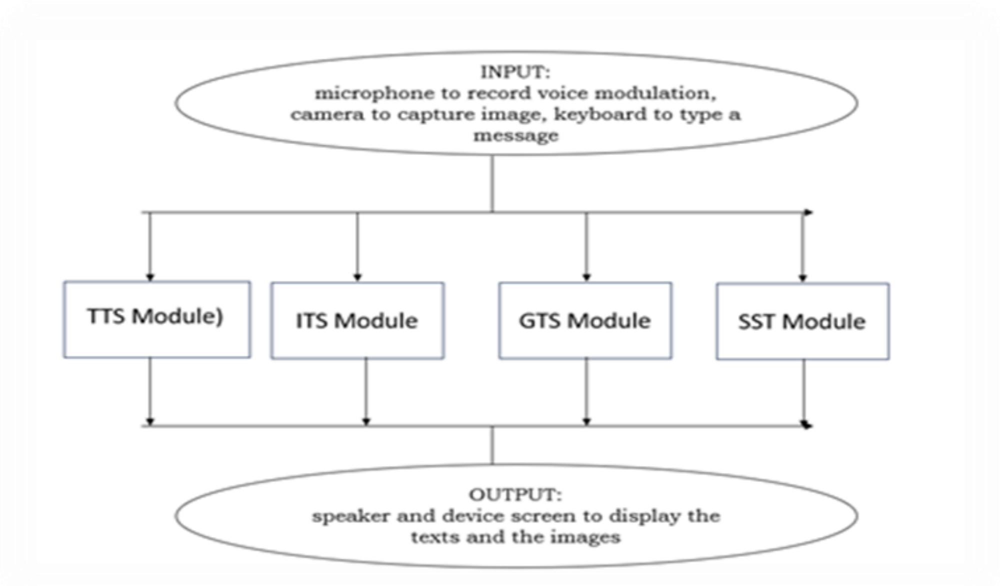
The TTS module facilitates the conversion of text input into audible speech, enabling non-verbal individuals to express themselves via a synthesized voice.

The ITS module utilizes a Logitech camera and Tesseract OCR for image-to-text conversion. Adaptive thresholding techniques enhance image quality, and text segmentation facilitates speech synthesis.

In the GTS module, hand gestures are captured, cropped, and processed to recognize specific gestures using convex hull functions. The count of defects aids in gesture interpretation.

The SST module converts spoken words into text, accommodating various languages and providing error signals for unidentified voice signals.

Architecture if the project diagram illustrates the workflow and components of each module, aiding in understanding and implementation. Together, these modules offer a comprehensive communication solution, empowering individuals with disabilities to communicate effectively and independently.



Architecture of the project

Conclusion:

This project is dedicated to bridging the communication gap between the deaf, dumb, and blind communities and the broader society, aiming to enhance inclusivity and foster a standard lifestyle for individuals with disabilities. The user interface, enriched with features tailored to the needs of the visually impaired, vocally impaired, and deaf communities, stands as a pivotal achievement in bridging communication barriers. Through six distinct features including text-to-speech, gesture-to-voice, voice-to-text, image-to-voice, and object detection, this interface serves as a versatile communication tool. Its role as a language-independent system, functioning akin to an artificial ear, tongue, and eyes, empowers individuals with disabilities to participate more actively in daily life activities. By providing a seamless grid layout, users can effortlessly navigate and select their desired feature with simplicity and intuitiveness. Upon selection, the system delivers feedback through the chosen output modality, whether it be speech, text, or gestures, ensuring effective communication for users with diverse impairments.

This interface not only enhances accessibility but also promotes independence and confidence among its users. As we continue to refine and improve upon this interface, we aim to elevate the quality of life and societal engagement of differently abled individuals, fostering a more inclusive and equitable society.

Scope for future work:

In addition to consolidating features into a compact device, future advancements could focus on expanding language support and incorporating advanced image recognition and object detection techniques. By catering to diverse linguistic backgrounds and providing comprehensive assistance in identifying objects, the system would become even more accessible and useful to users. Integration with wearable devices or augmented reality glasses could further enhance mobility and independence, enabling hands-free interaction and real-time feedback. Ongoing research efforts could also refine accessibility features such as optimizing color contrast and text-to-speech synthesis for users with visual impairments. Together, these advancements promise to continuously enhance functionality, accessibility, and user experience, fostering a more inclusive and equitable society through assistive communication systems.