Bidirectional Sign Language (Gestures) Communication

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Abstract: *This project seeks to bridge the communication gap between the speech-impaired community and the hearing population by facilitating a real-time, bidirectional translation system for sign language alphabet, text, and speech. The system utilizes computer vision and deep learning to identify hand gestures and translate them into audible and textual output, while conversely interpreting spoken or typed words into visual sign language representations. Hand detection is effectively managed through a dedicated camera module that extracts a specific Region of Interest (ROI) for processing. Static gestures are translated using a pre- trained Convolutional Neural Network (CNN) model to ensure high-accuracy letter prediction. To complete the bidirectional communication loop, the system integrates Text-to-Speech (TTS) for vocalizing recognized signs and Speech-to-Text (STT) capabilities to convert spoken input into sign sequences. The application offers multiple operational modes, including sign-to-speech, word-to-sign sequence, and the accumulation of sign sequences into full words. This modular solution provides a high potential for facilitating inclusivity and accessible human interaction, specifically benefiting the hearing and speech-impaired community.*

Keywords: *Bidirectional Communication, Computer Vision, Deep Learning, Gesture Recognition, Sign Language Translation, Text-to-Speech*

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