

AI Based DIY Hand Gesture Speaking System for Impaired People

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Abstract: Communication is a fundamental human need, yet individuals with speech and hearing impairments often face significant challenges in expressing themselves effectively. To address this issue, we propose an AI-based Do-It-Yourself (DIY) hand gesture speaking system that bridges the communication gap by converting hand gestures into audible speech. This low-cost assistive technology leverages computer vision, deep learning, and speech synthesis to enable real-time, gesture-to-speech translation. At the heart of the system lies a camera module that continuously captures hand movements, which are then processed using image preprocessing techniques such as grayscale conversion, background subtraction, and edge detection. The refined images are fed into a convolutional neural network (CNN) trained to recognize specific gestures based on their features—such as hand shape, orientation, and finger position.

Each recognized gesture corresponds to a specific word or phrase, which is then converted to speech using a text-to-speech (TTS) engine. The DIY nature of the system ensures it remains affordable and customizable. Components such as Raspberry Pi, Arduino boards, and standard USB cameras are used to keep the cost low and allow for user modification. The system also includes a graphical interface that displays both the detected gesture and its corresponding speech output, offering a user-friendly experience.

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