Echo-Glove: Assistive Communication Device

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Communication barriers significantly affect those who are deaf, hard of hearing, speech impaired and/or mute. Limiting access to education, healthcare, employment, and everyday social interaction. Although sign language is a rich and expressive form of communication, most hearing individuals do not understand it, creating a persistent disconnect between signing and non-signing communities. Existing assistive communication technologies often rely on text-based input or interpreters, which can reduce communication speed, independence, and emotional expression. To address this limitation, I have developed the Echo-Glove which is a wearable assistive communication device designed to enable real-time, bidirectional communication. The system employs inertial measurement units to capture three-dimensional hand motion, a microcontroller for real-time signal filtering and preprocessing, and a central processing unit executing machine learning-based gesture recognition algorithms. Recognised gestures are converted into spoken output using text-to-speech synthesis, while incoming speech is processed through automatic speech recognition and displayed as text on an integrated display. Facial expression analysis is used to modulate speech prosody, preserving emotional context. A companion application enables gesture customisation and system configuration. Preliminary testing focuses on gesture recognition accuracy, system responsiveness, and overall usability. The Echo-Glove demonstrates the potential to reduce reliance on interpreters while supporting independent, expressive communication. This project explores how wearable assistive technology can bridge long-standing communication gaps and promote accessibility, inclusion, and empathetic human interaction.

Awards Won:
Fourth Award of $600