We-Sign – A Device that Fosters Communication of the Auditorily Disabled

(WINKLE): Izzy Alfred, Liam Briggs, Natalie Connors, Keon Jin, Waleed Sawan, Edward Zurabov

PROBLEM

Individuals with auditory disabilities face a universal challenge; their lack of audial clarity imposes natural limitations on them when in pursuit of education, employment, and social interaction. Over 5% of the world's population have disabling hearing loss, which refers to hearing loss greater than 40 decibels (dB) in adults and a hearing loss greater than 30 dB in children. Hearing impairments can consist of mild hearing loss (hearing loss of 20-40 dB), moderate to severe hearing loss of (41-80 dB), or severe hearing loss of more than 81 decibels.

OUR SOLUTION

To help facilitate communication of the auditorily impaired community, We-Sign aims to create a seamless interaction between auditorily disabled individuals and individuals without those disabilities. By using machine learning and natural language processing, We-Sign can recognize letters within the ASL framework when the user interacts with the device's modular camera. The system achieves a full two-way interaction by encompassing text-to-speech and voice recognition capabilities. The integration of hand detection and mapping enables an ever-expansive feature realm.

ALTERNATIVES

Current solutions offered to the auditorily disabled vary under several methods, such as traditional, technological, and medical approaches.
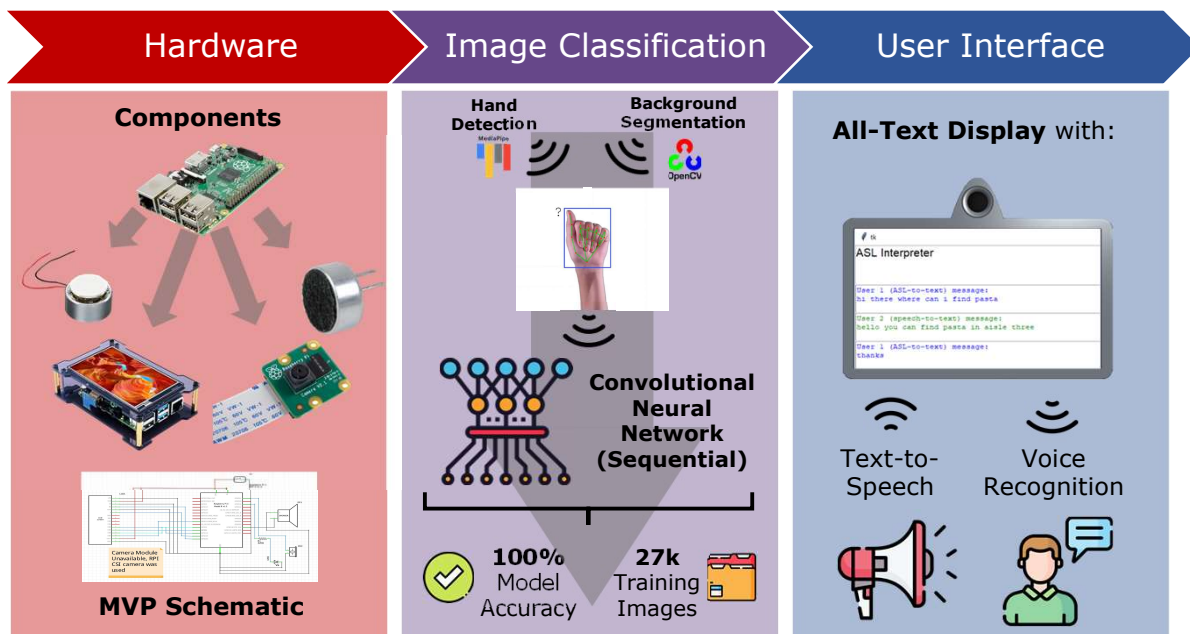
Interpreter   **Hearing Aid**   **Cochlear Implant**

Each feature their own challenges in approach and accessibility. From high cost of ownership to general lack of availability, each solution can only be treated as a tool to the user – rather than a dependence.

SYSTEMS OVERVIEW

Hardware	Image Classification	User Interface

Components

MVP Schematic

Hand Detection   **Background Segmentation**

Convolutional Neural Network (Sequential)

✓ **100%** Model Accuracy   **27k** Training Images

All-Text Display with:

ASL Interpreter

User 1 (ASL-to-text) message:
hi there where can i find pasta

User 2 (speech-to-text) message:
hello you can find pasta in aisle three

User 1 (ASL-to-text) message:
thanks

Text-to-Speech   **Voice Recognition**

APPLICATION

The flexibility in design of We-Sign allows for a breadth of opportunity in terms of applications. Notable stand outs include the ones listed below, yet the technology can additionally be branched out to other sign languages, including deaf & auxiliary sign languages.

Government   **Education**   **Retail**

FEASIBILITY

To guarantee We-Sign's success in commercializing, the initial phase of the device's public market implementation would consist of prototyping its functionality in institutions such as Service Ontario. Projecting a price per unit of $300, We-Sign is set to take on cost-cutting measures throughout the span of its venture to make it accessible to the general public including various commercial and residential environments.

OUTLOOK

To further advance We-Sign's functionality, multiple approaches are planned to take into effect. This includes the following:

Educational Capabilities
Learning program to allow educators to promote ASL learning in the classroom.

Expanded Functionality
Addition of ML hand detection allows inclusion of more complex phrases.