AUSIGN - An AUSLAN Interpreter

Needs Assessment

Who are you designing the product for? What is your target audience?

People who have hearing and/or speech impairment, and use sign language to communicate. Targeting the Australian community specifically.

Why do they need it?

From our market research, we can see that a good percentage of Australians with hearing and/or speech impairment feel ostracized from society due to not being able to properly communicate with the wider public. There is a lot more research/projects targeting ASL (American Sign Language) but very little for AUSIGN, leaving them in the dust.

What do they need?

Again looking at our primary and secondary market research, there is a lack of a sure front and easy way for our target audience to communicate with the larger public. A lot of them use smartphone apps/ text-to-speech devices but are not satisfied with the current scope of technology available to them. They are skeptical of previous products as they do not take into account the context issues associated with it. E.g. The word for "chair" could mean "sit" depending on context. They also prioritize portability and ease of use.

Where and how will it used?

Ideally, we would like to incorporate a device with extended battery life, allowing our target audience to use the device throughout the day, as this product would be of the utmost importance during emergencies, which we cannot predict. It will

be available as easy to wear gloves and will convert their hand movements into audio through a speaker attached on the glove.

What features do they need in it?

- Long battery life

- Portable and lightweight

- Ease of use with a easy to access button to turn on/off the gloves

- Strong and solid UI to adjust the gloves based on personal preferences (e.g. volume, special signals etc)

- Large database of signs with context awareness

What are the issues/limitations of existing products/solutions?

As mentioned before, most devices are based on ASL with little to no support for AUSLAN. They also lack context awareness which severely limit the usage of these devices as it could be very different to traditional sign language. Also fail to recognize facial expressions as they affect what the sign could mean (e.g. signs with a tensed look on face could be associated with more strong meanings which the products in the market fail to identify)

Requirements Analysis

- Lightweight - This is a strong requirement among most of our respondents. Light cotton gloves weigh around 15-30 grams per glove; winter-fleeced gloves weigh around 40-60 grams per glove and mechanics/work gloves can weigh up to 100 grams per glove. We want our users to be comfortable so would want to keep our gloves weight to around 50 grams per glove.

- Long battery life - Another strong requirement. Should last at least a full day of charge.

- Durable - Would not want to keep replacing gloves

- High accuracy - Would want it to be highly accurate with a large database of signs with context awareness

Problem Statement

Deaf and non-verbal individuals in Australia need an effective, real-time communication tool because current solutions—such as text-to-speech apps and sign language gloves—fail to interpret the full complexity of Auslan, often lacking contextual awareness, facial expression recognition, and support for regional variation. This communication barrier limits independence and inclusivity in everyday social, professional, and emergency situations.

Product Concept

AUSIGN is a wearable communication aid designed to empower deaf and non-verbal individuals by translating Auslan (Australian Sign Language) gestures into spoken language. It aims to reduce communication barriers in everyday settings such as public transport, workplaces, retail, and healthcare. By doing so, it helps users engage more independently with the broader community without needing an interpreter present.

The product is intended to be lightweight, comfortable, and easy to use throughout the day. It will support user-specific preferences and context-aware communication to make interactions feel more natural and intuitive. AUSIGN directly addresses the unmet needs identified through our user research, especially around portability, reliability, and the lack of Auslan-specific solutions in existing products.

Design Concept

AUSIGN will consist of pair of light gloves with flex sensors along the fingers to detect stretching/folding of fingers. An Inertial Measurement Unit will be placed along the wrist. This combines an accelerometer (to measure linear motion), gyroscope (to measure rotational motion) and potentially a magnetometer (to measure orientation). These two can be combined to help us understand the hand movements made by the user in sufficient detail. The values from this sensor will

be fed into an ESP32, which will process these signals and drive the audio output on the speaker attached to the glove.

To enhance context-awareness, a heartbeat sensor will be incorporated into the glove system. By monitoring the user's physiological state (e.g. elevated heart rate during stress), the device can infer emotional tone or urgency behind signs. This serves as a partial substitute for facial expressions and body language, which are key components of Auslan communication but difficult to capture with sensors alone.

An ESP32 is chosen as it has Bluetooth capabilities which would allow us to make a frontend app to enhance user experience and modify certain settings such as voice output volume, gesture sensitivity, preferred Auslan dialect, and custom sign mappings to their particular needs.

We will use a 3.7V 800mAh Li-Po battery as this is lightweight, rechargeable with a good energy density allowing for a long battery life. An easy to use button should also be included to turn on/off the gloves and also for emergency situations(e.g. to shout 'help' in case of emergency - this would be user customizable).

Unique Selling Points

1. **First Auslan-Focused Wearable Translator**

   Unlike most sign-to-speech devices built for American Sign Language (ASL), AUSIGN is designed specifically for Auslan, addressing regional sign variations and grammar unique to the Australian Deaf community.

2. **Context-Aware Translation Using Biometrics**

   AUSIGN uses a heartbeat sensor to infer emotional tone (e.g. urgency or stress), adding contextual awareness that conventional gloves lack.

3. **Gesture + Motion Fusion for High Accuracy**

   Combines flex sensors on fingers with a wrist-mounted IMU (inertial measurement unit) to recognize both static hand shapes and dynamic gestures, improving recognition accuracy for complex Auslan signs.

4. **Lightweight and Comfortable Design**

Designed to weigh under 50g per glove, AUSIGN prioritizes long-term comfort for daily use, exceeding the wearability of most commercial smart gloves.

5. **Bluetooth-Enabled Personalization App**

   Built on the ESP32, AUSIGN supports wireless communication with a companion mobile app, allowing users to adjust settings like voice output, gesture sensitivity, and dialect preference.

6. **Custom Sign Mapping and User Training**

   Allows users to add personal or region-specific signs and train the system to recognize them, increasing inclusivity for diverse signers.

7. **All-Day Battery Life with USB Charging**

   Powered by a 3.7V Li-Po battery optimized for energy-efficient use, the gloves can run for a full day and recharge via standard USB.

8. **Voice Output Through Onboard or Phone Speaker**

   Offers both onboard audio output and phone-based speech relay, giving users flexibility based on environment and preference.