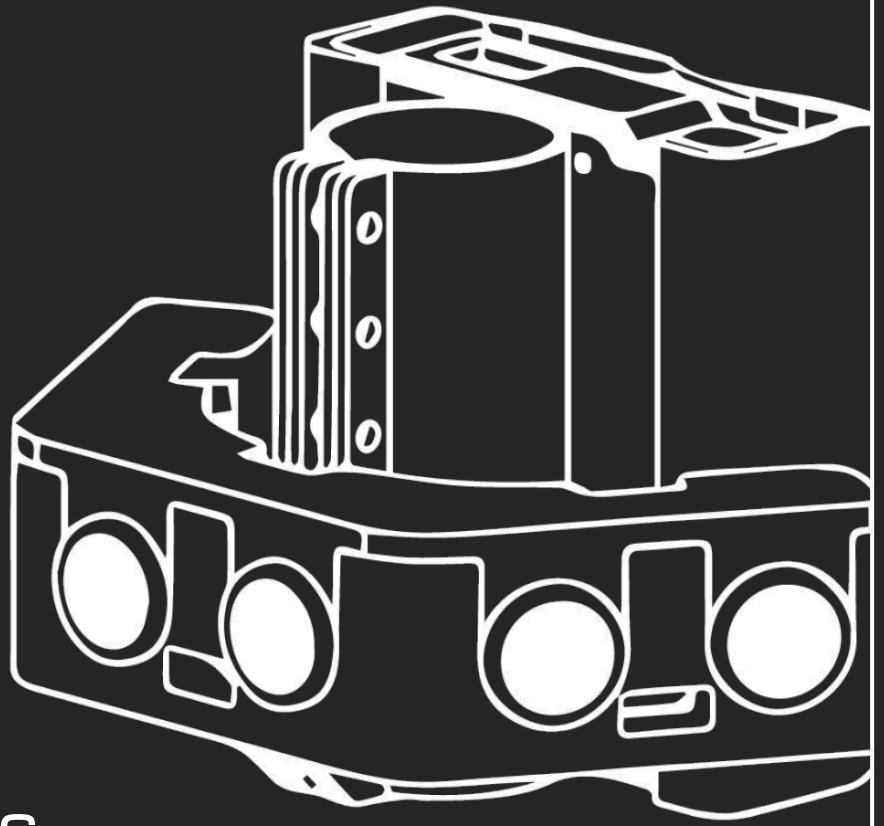
SMART STICK



DESN2008 - Design Development

By Jake, Sulayman, Amir & Zac

13 million Australians
have one or more chronic eye conditions.

More than 1 in 7 people
with a disability use mobility aids.

Australian Health & Welfare Institute (2024)

That’s millions of people facing barriers to independence **every single day.**

Accessibility-focused innovation in the technology industry is often sacrificed for profit.

Based on our research, there is a distinct lack of commercially available, technological solutions for individuals with partial visual impairments.

While there are solutions for those with severe visual disabilities, individuals with partial vision are often overlooked.

Bhowmick and Hazarika (2017)

To help address this issue, we designed a device to assist people that live with both partial vision and a mobility impairment requiring a walking aid. *(Typically Seniors)*

While there are a number of visual impairments, we are focusing specifically on partial vision.

Partial vision is *'a visual impairment in which visual acuity is 20/70 or poorer in the better-seeing eye'*

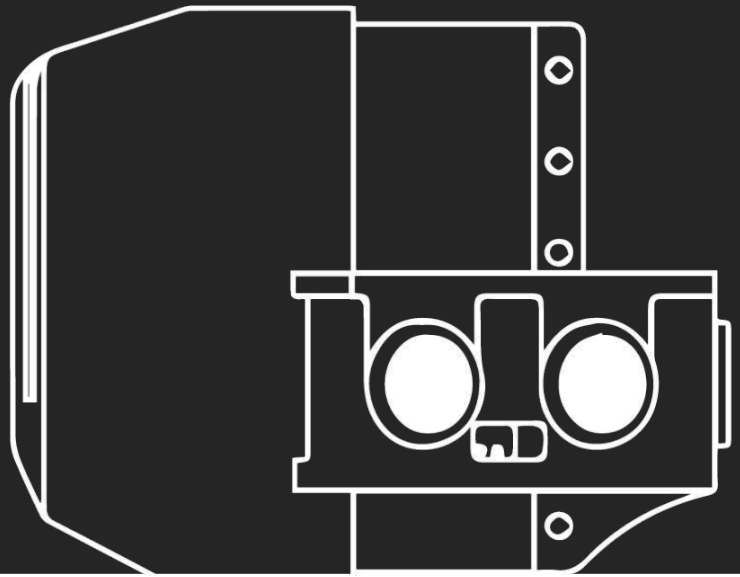
University of Pittsburgh (2024)

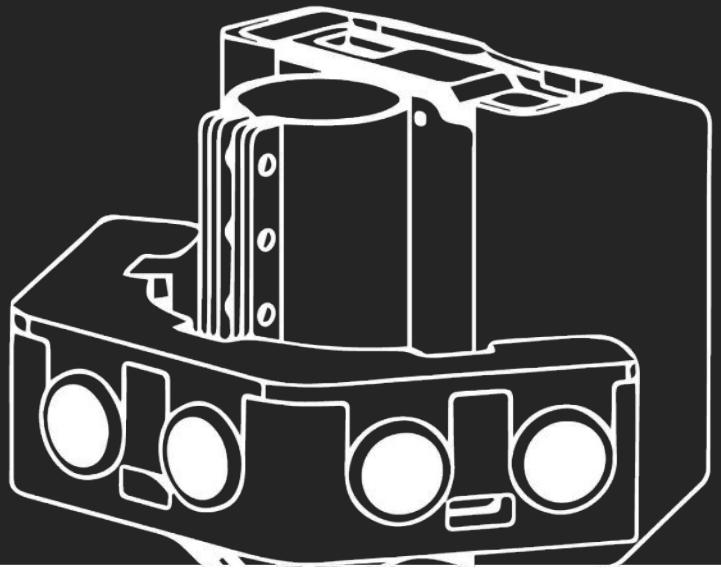
There are a number of mobility impairments that require different walking aids we are focusing specifically on impairments requiring weight-bearing devices. Typically these are conditions like arthritis or joint pain.

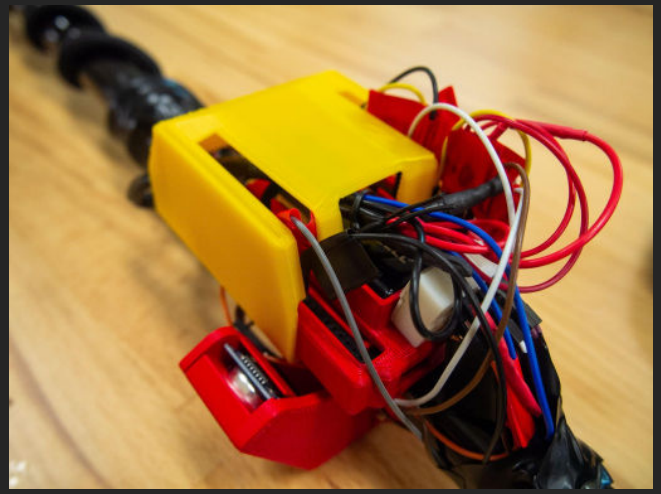
The SmartStick is not intended as a replacement for existing vision aids (glasses or white canes)

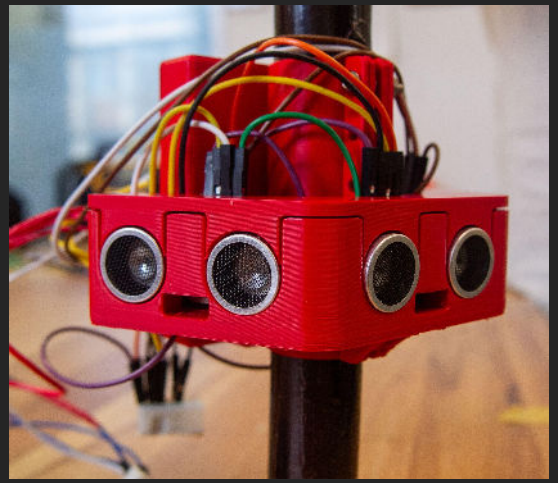
Introducing the...

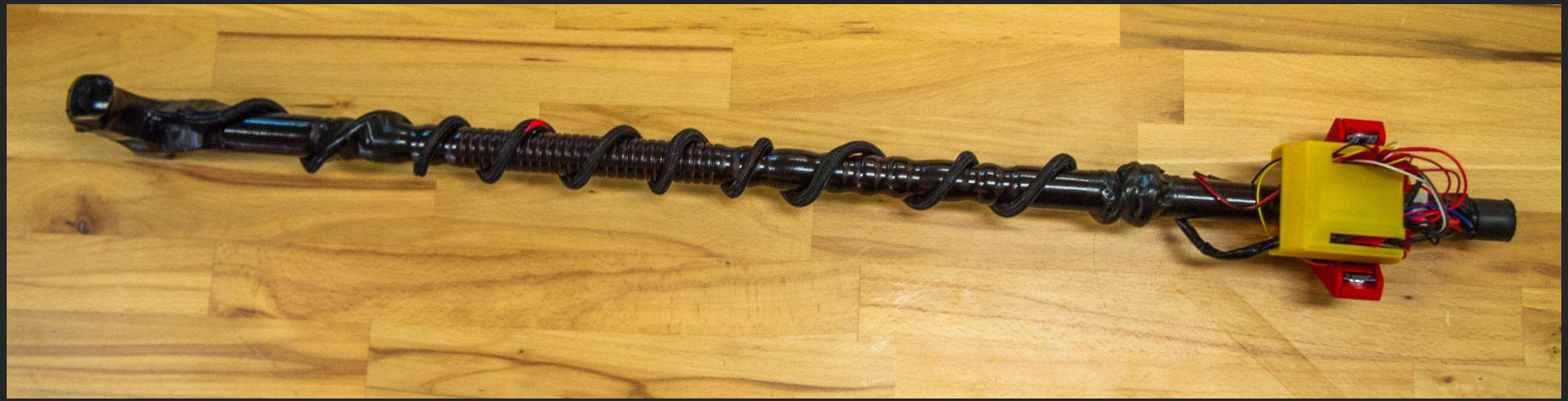
SMART STICK

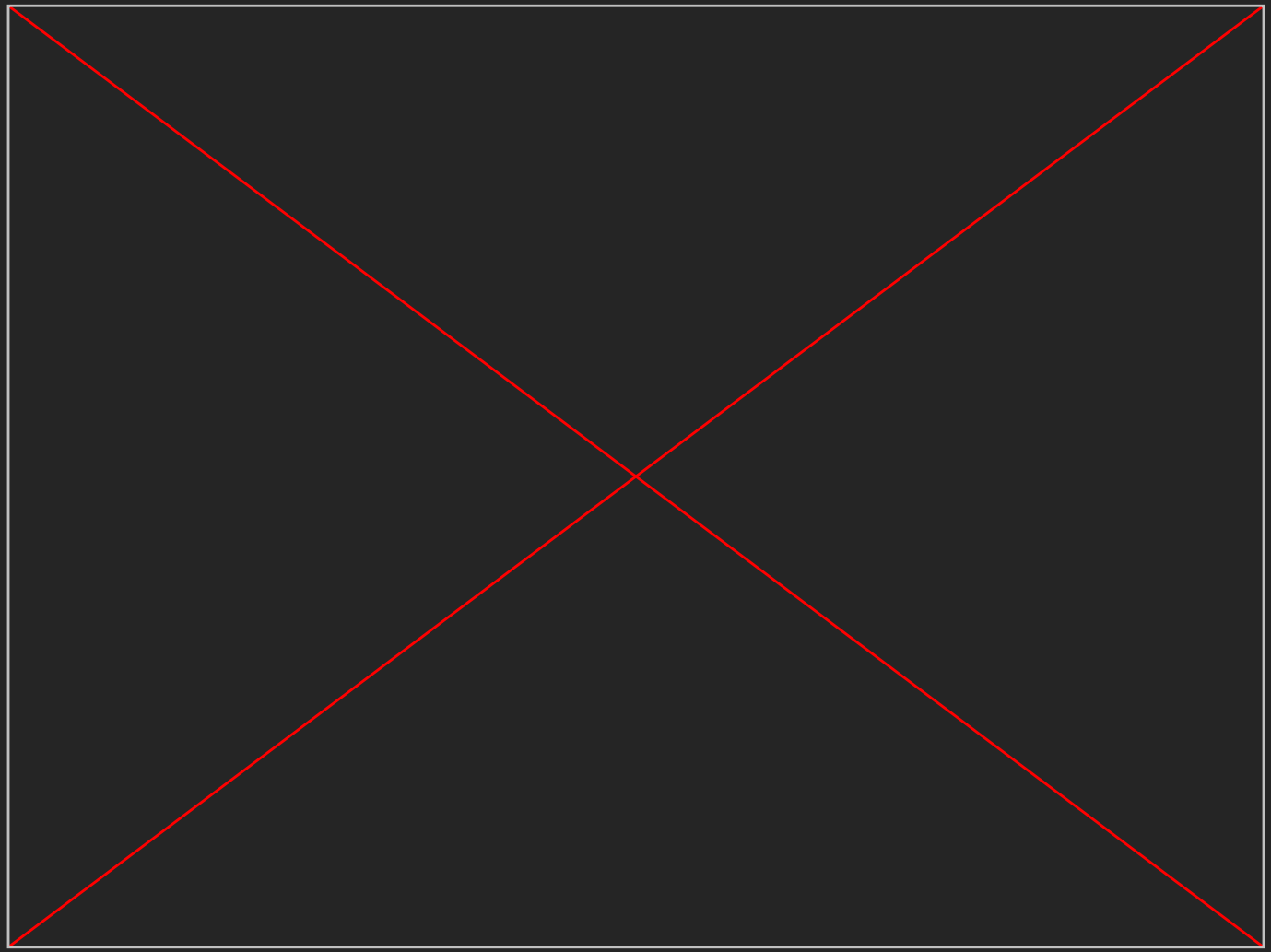








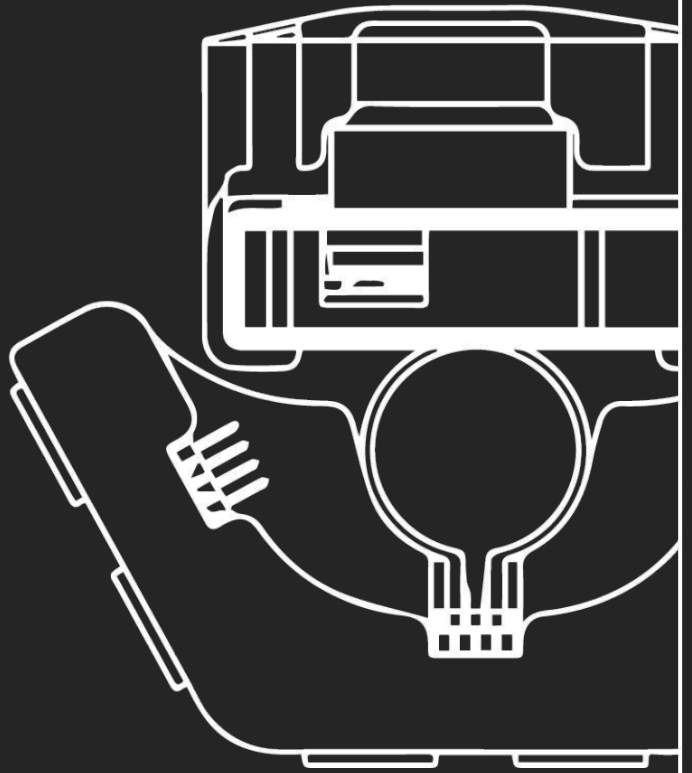


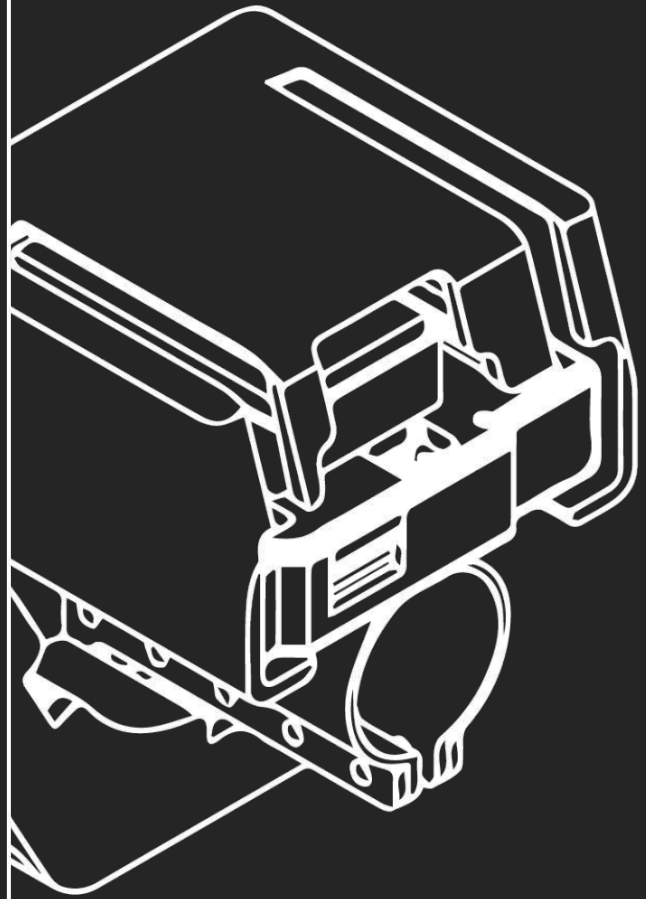


What does it do?

The Smart Stick enhances spatial awareness for individuals with partial visual impairment by providing them sensory information about objects in their environment.

Importantly, it does this all while still allowing them to support their weight.





How does it work?

Ultrasonic sensors detect objects in three directions.

This information is sent to a battery powered Arduino, which triangulates the location of the object in proximity to the cane.

The Arduino then vibrates three haptic motors based on these calculations. As the object gets closer to the cane, vibration intensity increases.

This is all contained within custom, 3D printed housing intended to be rigid, modular and adaptable to different mobility aids.

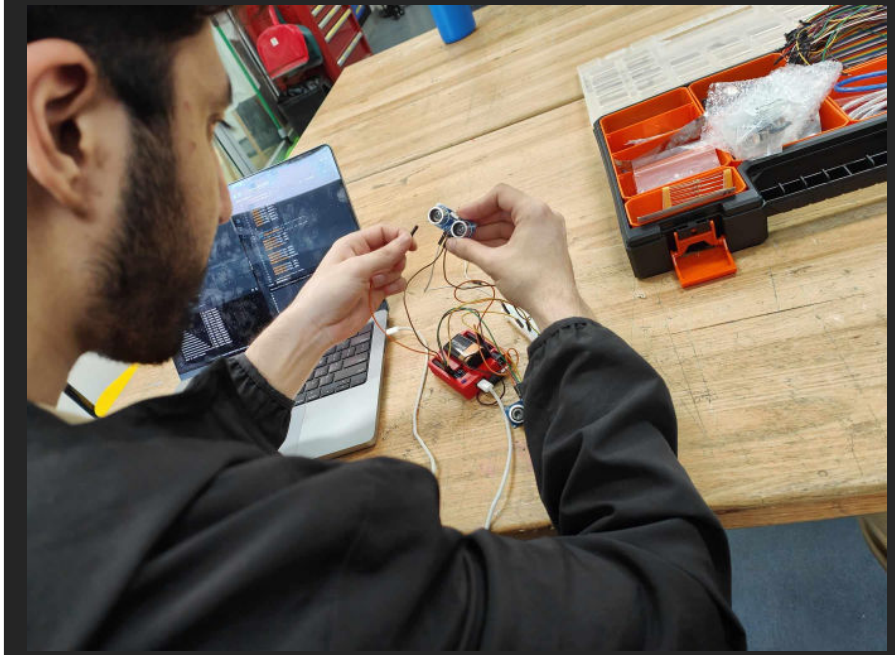
Early Iterations & Prototyping

Many solutions were investigated prototyped, including :

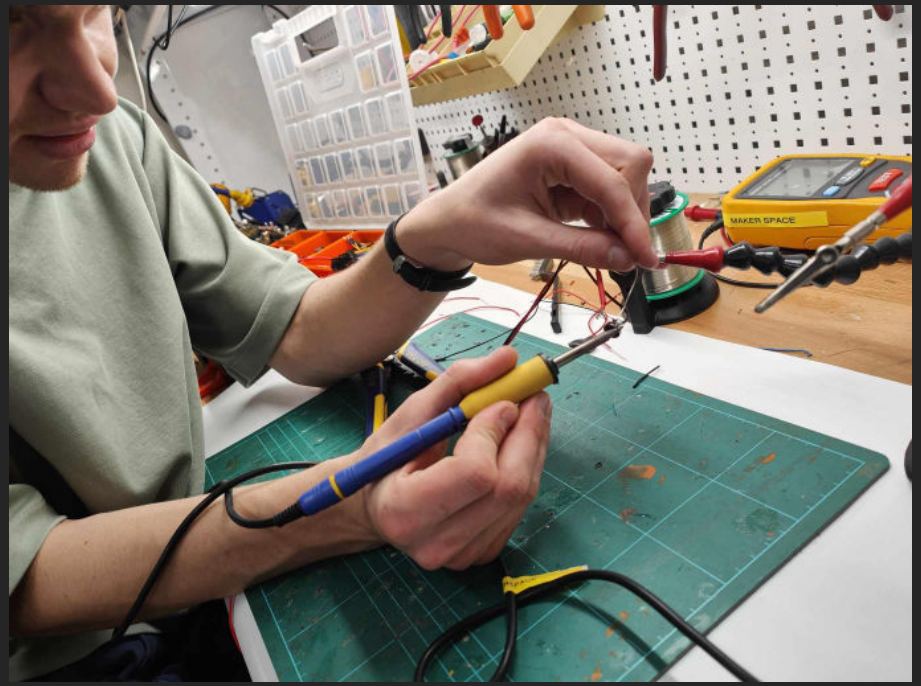
AI-based object detection: Our initial design relied on AI but had required high processing power and constant internet access.

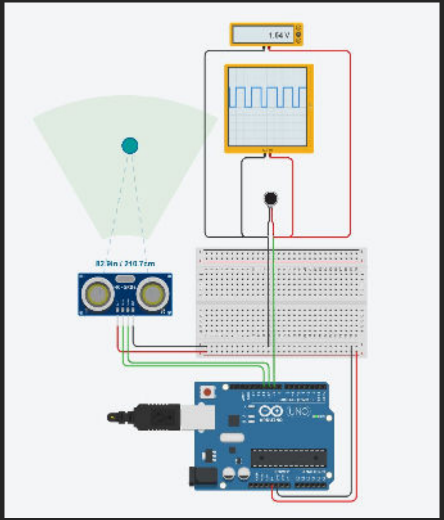
Verbal / Aural Feedback: Originally considered but deemed too impractical for senior users after our journey mapping.

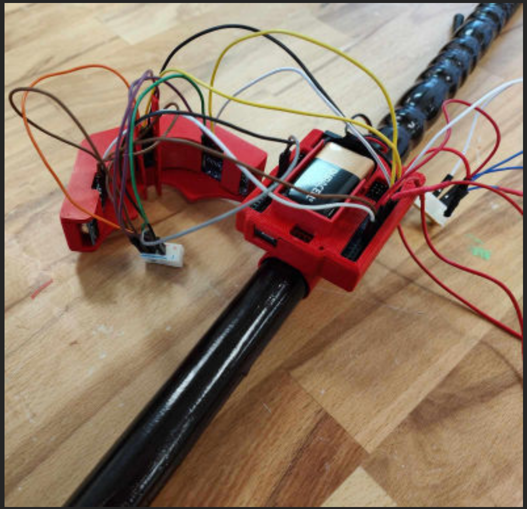
Single-sensor prototype: Initial low-fidelity prototype used a single ultrasonic sensor, giving only forward-facing feedback. This was upgraded based on our user feedback.

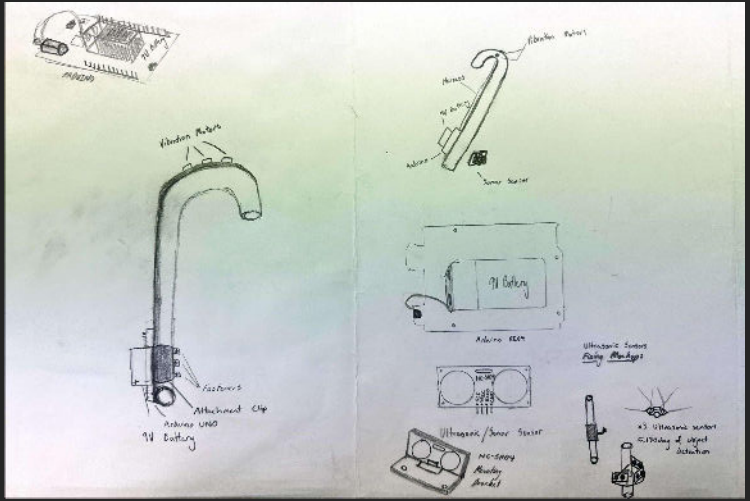


Rapid, Iterative Prototyping & User Testing

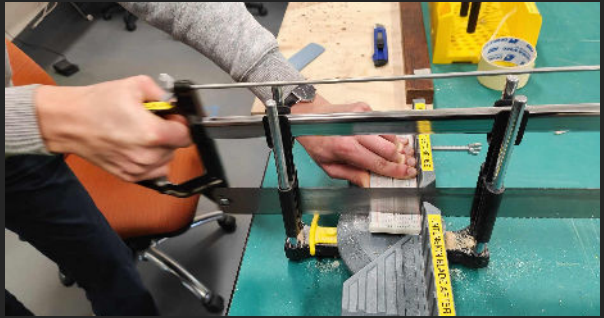


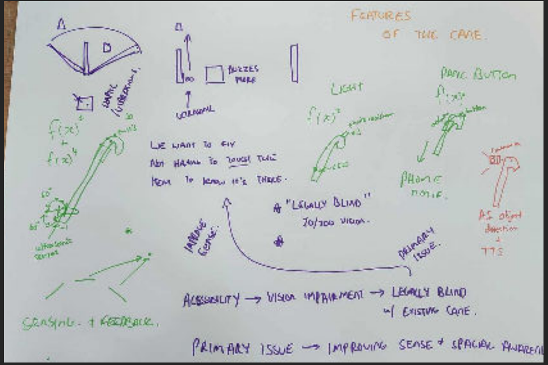




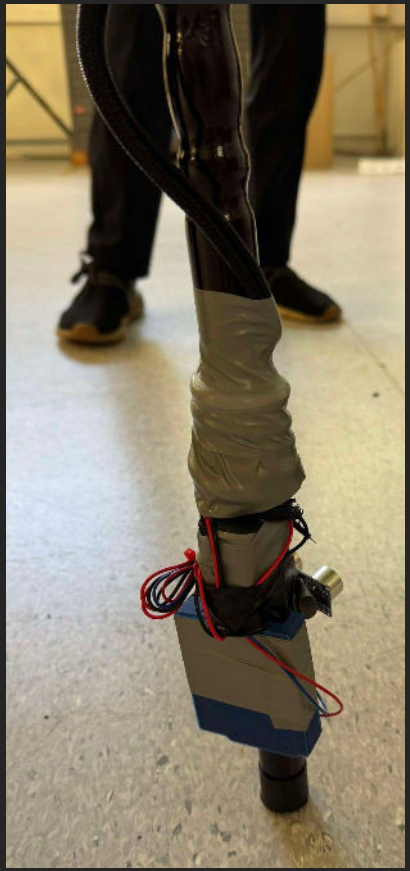


ARDUINO
Vibration Motors
Fasteners
Attachment Clip
Arduino UNO
9V Battery
Sonar Sensor
9V Battery
Ultrasonic/Sonar Sensor





FEATURES
OF THE CANE.
BUZZES
HERE
LIGHT
PANIC BUTTON
PHONE
NOTIF.
"LEGALLY BLIND"
PRIMARY
ISSUE.
AI object
detection
+
TTS
SENSING + FEEDBACK.
ACCESSIBILITY → VISION IMPAIRMENT → LEGALLY BLIND
w/ EXISTING CANE.
PRIMARY ISSUE → IMPROVING SENSE + SPACIAL AWARENE



Future development opportunities :

- Refining the devices' housing to be fully universal.
- Refining ultrasonic sensing to work in three dimensions (height)
- Development of the housing with Carbon Fiber-reinforced Nylon.
- Implementation of retractable haptic sensors (or wireless sensing)
- Adding higher quality haptic motors to improve difference in vibration.
- Implementation of Lithium-ion battery for recharging.
- User testing of high-fidelity prototype with target demographic

SMART STICK

Product Demonstration