



Comets for
Augmented
Navigation

Audio - based Navigation Glasses



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Motivation

Close your eyes - what would you miss out on?

Many day-to-day situations rely on sightedness, including the road signs for guiding pedestrians alongside traffic. Existing technology cannot fully empower the blind and vision-impaired within these situations, relying on outdated centralized mapping information or physical contact to inform one of their surroundings. To address these issues, our solution will utilize recent advancements in computer vision to recognize objects in the wearer's vicinity, reacting in real time to the changing world to increase one's awareness of their surroundings.

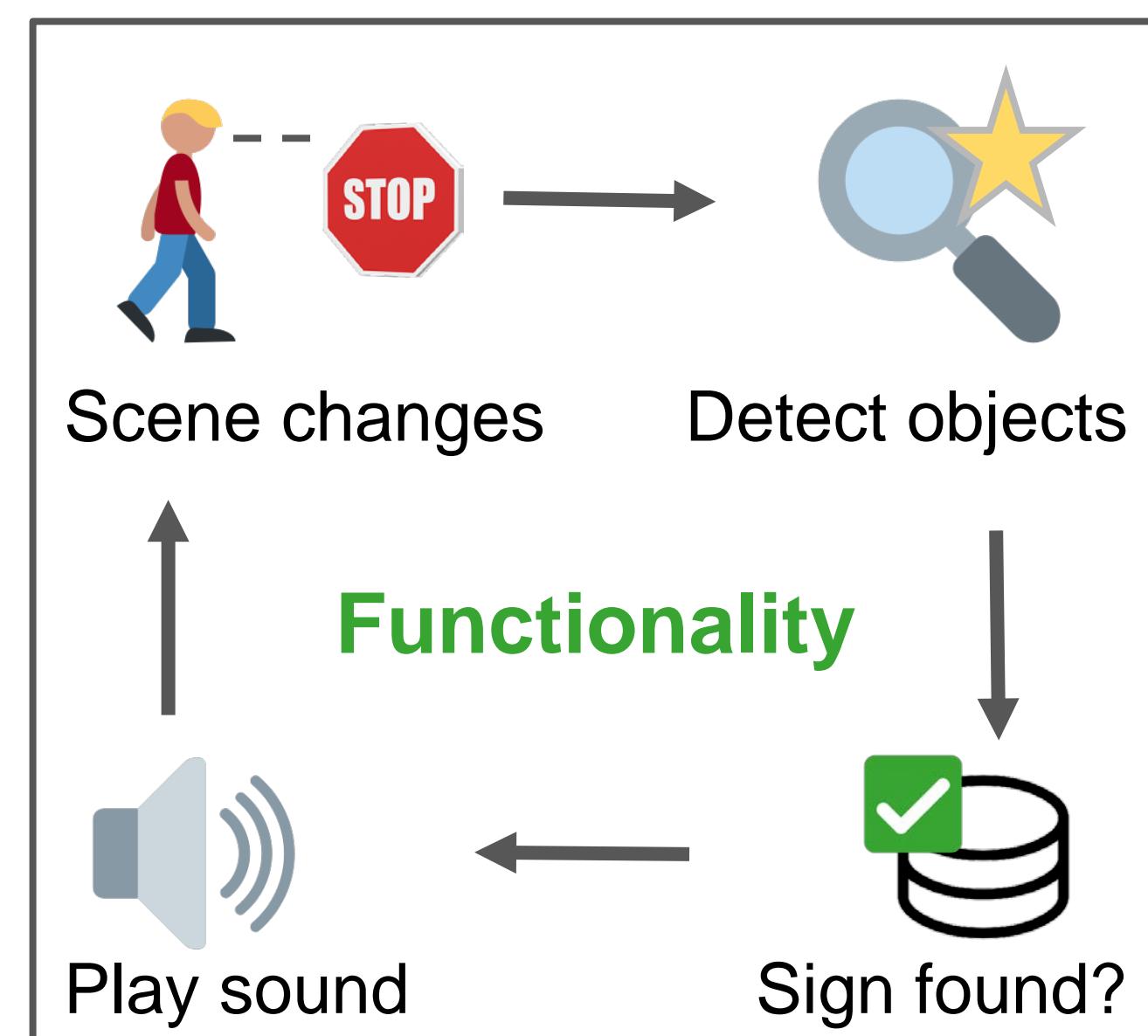
Objectives

Spatially-aware captioning of pedestrian traffic signs

- ❖ **Flexible:** in a variety of situations, recognize common symbols and signs: stop, pedestrian crossing, no entry, railroad crossing, falling back to color/shape
- ❖ **Practical:** accurately detect objects and obstacles within one second without requiring network connectivity
- ❖ **Portable:** lightweight, comfortable to wear for long walks, and battery-operated with automatic low-power mode
- ❖ **Unobtrusive:** enable user to hear environment while audio cues are played via bone conduction, compact and adaptable to any social environment, configurable importance threshold to limit interruptions

Design Overview

Software



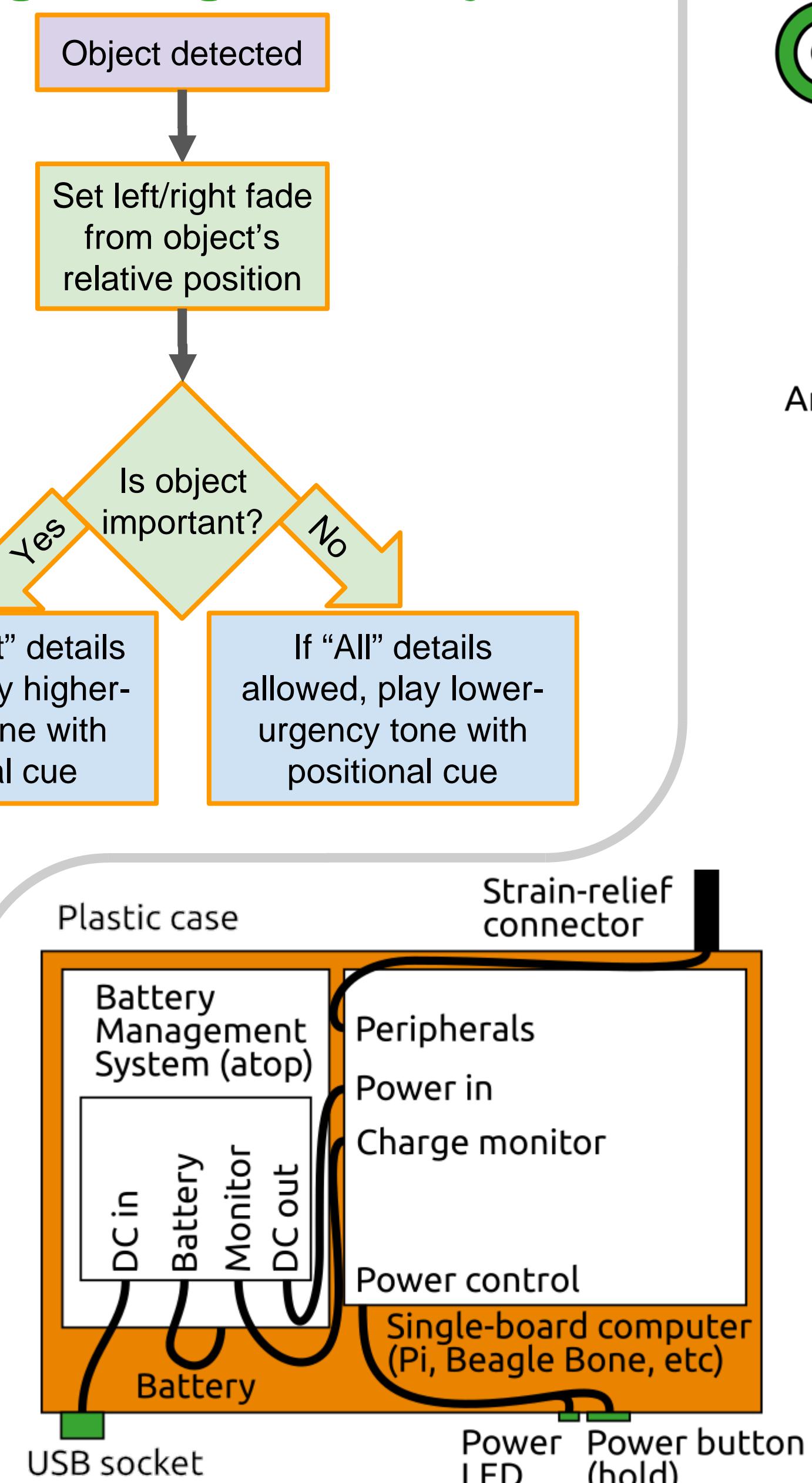
Object detection:

For each still image from the camera sensor, regions of interest are selected by computing saliency. Within these regions, SURF feature detection finds and describes keypoints (e.g. edges, corners), comparing to stored keypoint descriptors derived from an image collection of pedestrian signs.

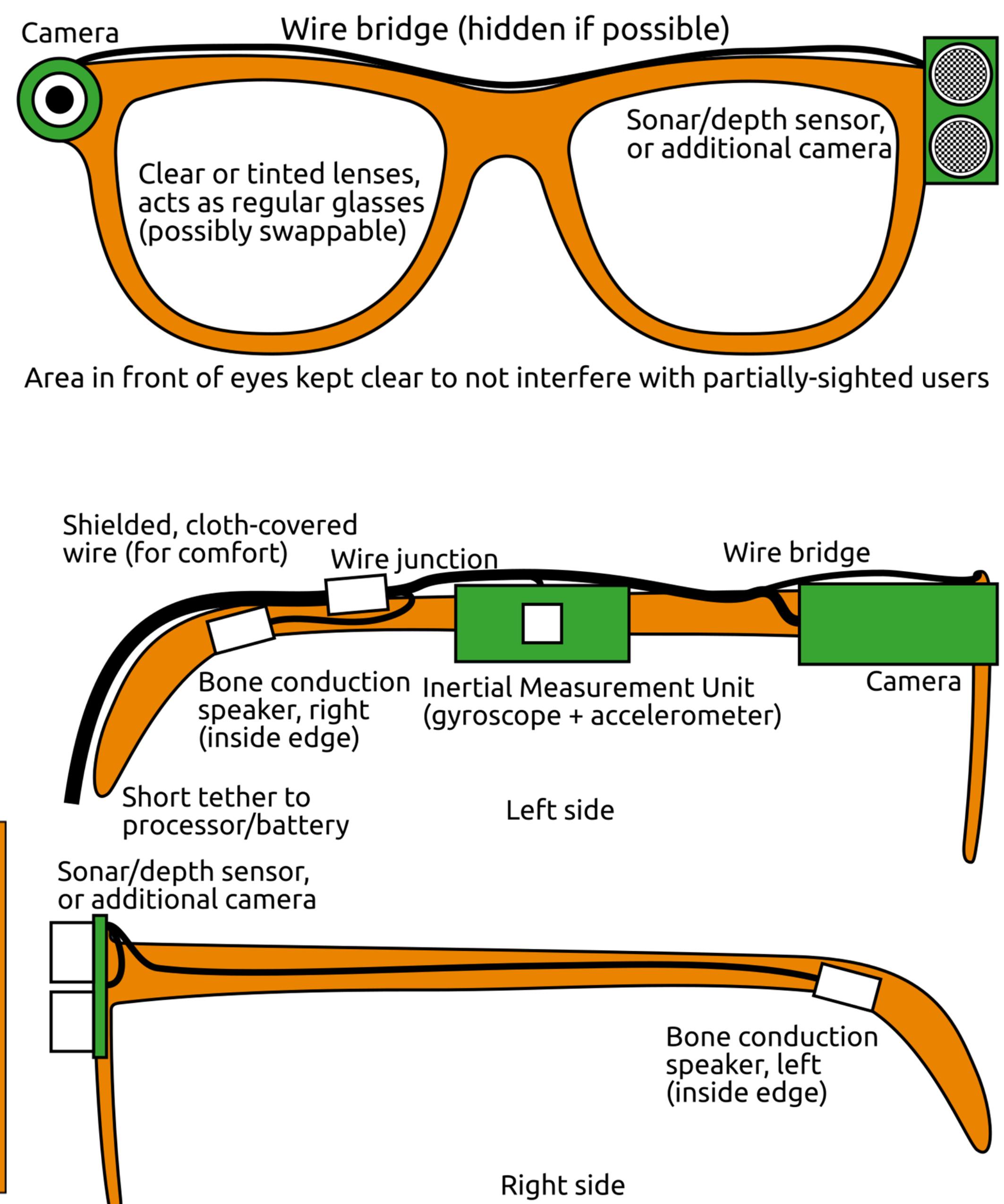
Gesture control:

- ❖ Look up: Describe details of nearest object
- ❖ Tilt head: Toggle verbosity of audio output:
"All information", "Important only", "Silence"

Handling Recognized Objects



Hardware



Conclusion

Our Audio-based Navigation Glasses will provide the visually-impaired and blind with an inconspicuous way to stay informed of their surroundings, harnessing a camera and sensors to reliably detect nearby objects, relaying the most relevant information about signs and oncoming obstacles via positional audio cues.

Ethics statement: Our team respected all known copyright and licensing requirements in the design of our device.

(Some symbols in this poster © Twemoji project, used under license CC-BY 4.0)

Current Status

Completed

- ✓ Developed and finalized software and hardware designs
- ✓ Researched object detection, statistical feature recognition
- ✓ Decided on user interaction and initial database of signs

Next semester

- Assemble hardware components with custom enclosure
- Implement and train machine vision algorithm with camera
- Program system and peripherals to accomplish functionality