

4Sight: Guidance for the Visually Impaired

MAKERLAB

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Problem Definition

The visually impaired use either blind canes or guidance dogs for guidance while completing daily tasks, but encounter difficulties while facing obstacles that are above the waist.

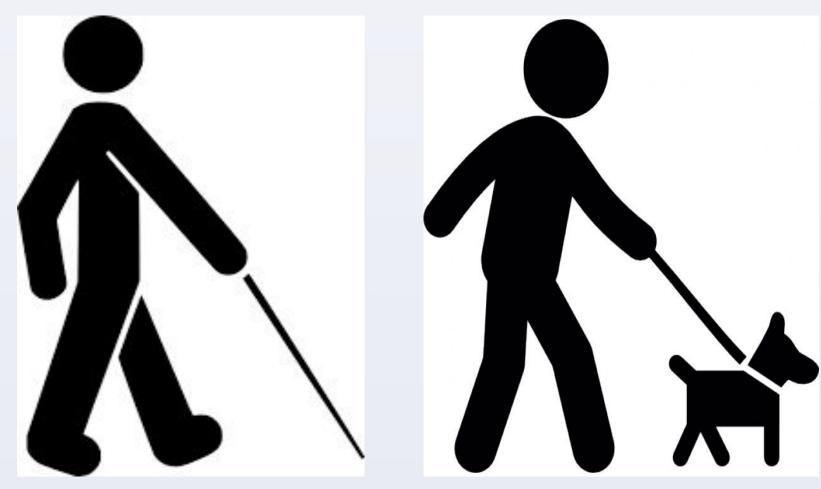


Figure 1. Current types of guidance methods

The occurrence of accidents due to obstruction by objects above the waist can result in serious injury, as well as financial consequences with the required treatment for injuries.

4 in 10 legally blind/blind users experience head-level accidents at least once a month.

Need Statement: To aid the visually impaired in identifying obstacles not detectable by current treatments.

Design Inputs



Figure 2. Value Proposition venn diagram.

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Functional Requirements	The device must detect and notify the visually impaired of above-the-waist impediments.						
Constraints	Portable	Range	Easy-to- use	Non- invasive	Battery Life		
Desired Specification	<1 sq ft & <5 lbs	> 1m	No Special Training	No surgery	>24hrs		
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Figure 3. Constraints and desired specifications.

Engineering Design Solution The ultrasonic sensor emits ltrasound waves as the use walks toward an obstacle Waves reflect off the obstact to the ultrasonic sensor. The Arduino interprets the distance of the obstacle from Figure 4. Image of prototype. the user. When the user is 5 feet from the obstacle, the user begins to hear beeping. Arduino Sensors board As the user gets closer to the obstacle, the frequency of the beeping increases. Buzzers The user moves to the left or right until the beeping stops, avoiding the obstacle.

Prototyping & Testing Outcomes

Contingency Table	Is Block Detected?		
		Yes	No
Is the path blocked?	Yes	45	5
	No	4	46

Figure 7. The contingency table shows the sensitivity and specificity of the device.

Sensitivity: 90% Specificity: 92%

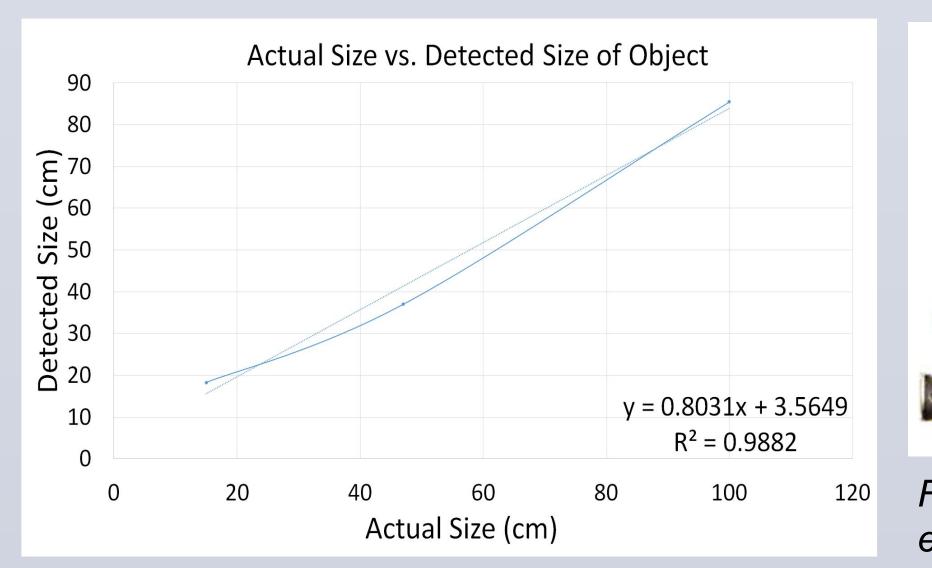


Figure 5. Block diagram of our device and its

components.

Figure 8. The graph demonstrates the correlation between the actual length and the detected length of an object.

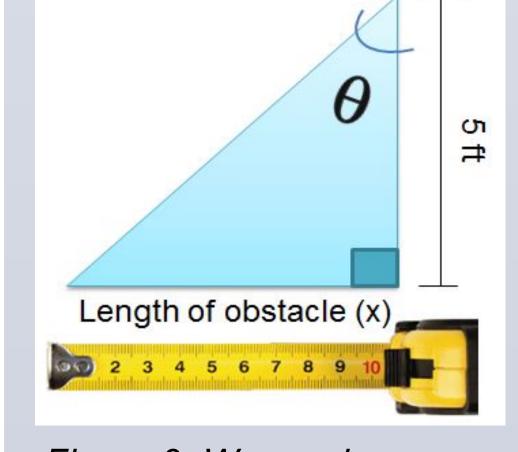


Figure 6. Flow chart describing

how our device is used.

Figure 9. We used an electronic protractor to find angle θ and used trigonometry to find the length(x).

Business Model & Future Work Insurance Visually Product Doctors Figure 10. Channels of distribution. 6 months: Complete Testing Evaluate Prototype **Product** Development / File Patent Year 1: Finalize Prototype **Product** Clinical Trials Finalize Device Testing Projected FDA Year 2: Approval **Product** Manufactured Device Sales Sell Product Figure 11. Future plans.

Conclusion

- ✓ Portable (0.4 lb)
- Wearable as glasses
- Detects above waist obstacles
- **Easy to use**
- Notifies user with piezo buzzer that beeps
- Changing frequency of the beeping informs user of changing distance to obstacle

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