



A Vision for Blind Swimmers

# Designing and Building Prototypes for Assisting Blind and Visually Impaired Swimmers

## Communication

### STATISTICS

- 1.8 million people with blind condition in the US (US Census)
- 7.8 million people with blind and visually impaired (BVI) condition in the US (US Census)
- Up to 80% abandonment rate of assistive technology (Michigan Dept of Education)

### OBJECTIVES

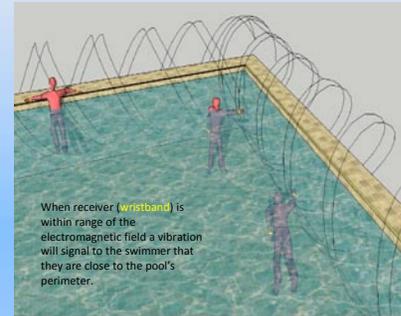
- Since lack of assistance leads to a sedentary lifestyle, create an assistive technology that allows BVI individuals to, along with the rest of the nation, seek a more active lifestyle safely
- Develop a method of communicating available information between the device and the swimmer
- Include the BVI community in the design process using surveys, interviews, and BVI facility visits
- Incorporate surveys in to the website to increase feedback from the BVI community

### MISSION STATEMENT

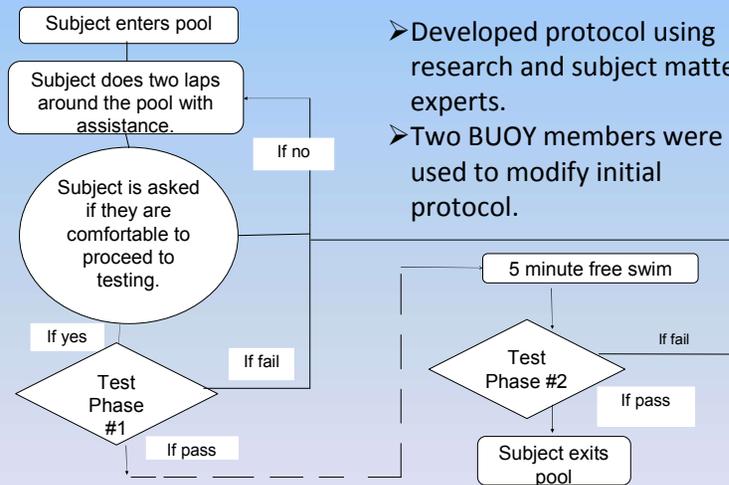
“To develop, test, and implement assistive technology with the community that promotes safety and improves independence of blind and visually impaired (BVI) swimmers.”

### RESEARCH

- Mobility training (current methods for cane training, dog training, etc.)
- Spatial Mapping (creating a cognitive map of the pool)
- Communication Methods (tactile, verbal, and auditory feedback)



### METHODOLOGY



- Developed protocol using research and subject matter experts.
- Two BUOY members were used to modify initial protocol.

### Data

- Subjects: 6
- Gender: 4 male, 2 female
- Age Range: 18-24
- Dry and Pool testing



### RESULTS

- After completion of the pool testing, despite being comfortable within the pool environment, participants were only able to form a weak cognitive map – these results lead us to continue testing to determine time it takes a single person to create a strong cognitive map.
- Determined that using a vibrating device leads to improved cognitive spatial mapping abilities.
- Results vary on an individual basis.



### NEXT STEPS

- Conduct significant amounts of testing in order to determine the range of laps required to form a strong cognitive map
- Incorporate BVI community in pool testing
- Continue contact with the BVI community
- Integrate updated survey onto the website

### ACKNOWLEDGEMENTS





IPRO 310

A vision for Blind Swimmers

The Next Generation

# TECHNOLOGY

## Objectives

- Evaluate approaches by past IPROs
- Research previously unconsidered technologies
- Design and develop a prototype for preliminary testing
- Evaluate performance of prototype and document findings

## Device

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## Research

Radio research

Generating signals

-Simple single frequency oscillator requires less processing

Amplification

-Integrated operational amplifiers are reliable and affordable

Transmission

-Loop antenna can create a barrier of any shape and size

Receiving

-Ferrite core antenna small and compact



Medium Frequency Considerations

-Higher frequencies require shorter antennas but attenuate faster

-Transmission through water causes greater attenuation

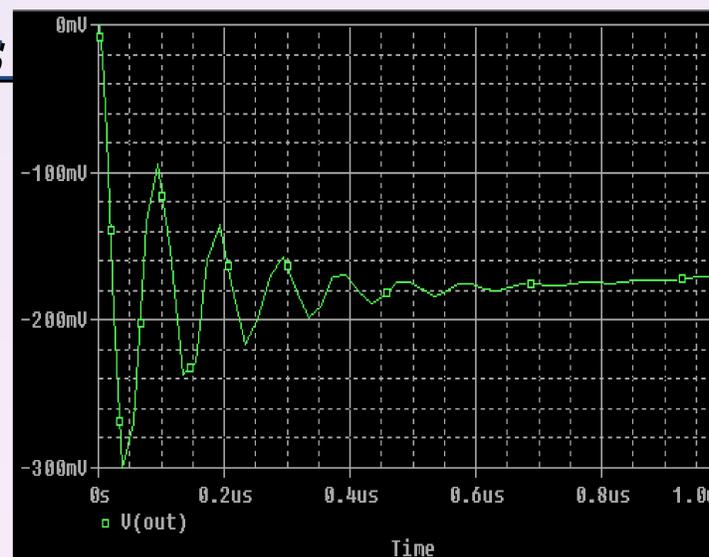
-There are limited frequency options due to FCC regulations

## Conclusion

The technology team met all our objectives. We successfully managed to assess relevant technologies and decided on Radio. We then researched the technology and incorporated the knowledge into our design. We designed and built a prototype device that communicates tactile information to the swimmer. The tactile feedback design was based on the survey collected from the previous three semesters. Theoretically there is a wide range of applications for the technology.

## Testing/ Results

- Tests predicted a potential issue with our standard operation amplifiers
- The slew rate on a typical op amp is not high enough to function properly with our chosen frequency



## Next Steps

- Test cue conflict theory and its effects on disorientation by means of the communication team protocol
- Waterproof the receiver and the transmitter
- Incorporate the receiver into a wristband to maintain low profile

## ACKNOWLEDGMENTS



Professor Glodowski  
Professor Segre

