A Vision for Blind Swimmers
Outline

• Significance
• Mission Statement
• Ethics
• History
• Problem and Goals
• Team Organization
• Preparatory and Supplemental Activities
• Progress
• Suggested Next Steps
Significance

• 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)
Buoy Mission Statement

“Our mission is to develop, test, and implement an assistive technology in collaboration with the blind and visually impaired (BVI) community that promotes safety and improves independence of BVI individuals while swimming.”
Ethics

- Beneficence
- Non-malfeasance
- Autonomy
- Justice
- Fidelity
## History

<table>
<thead>
<tr>
<th>Then</th>
<th>Now</th>
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<tbody>
<tr>
<td>Exploring possible technology to use</td>
<td>Using radio technology</td>
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<tr>
<td>Prior prototypes did not meet consumer needs</td>
<td>System prototype designed and constructed</td>
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<tr>
<td>Did not know how to introduce the device to the BVI community</td>
<td>Communication team formed Testing protocol developed</td>
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Problems

• Past system prototype built at the end of Fall 2009 semester did not work
• Pool training protocol needed to be updated based on previous semester results
Goals

• Redesign and build a radio frequency transmitter and vibrating receiver system prototype

• Revise and improve the method of communicating available information between device and swimmer
Team Organization

Technology Team
Aubrey Chipman (BME): LEAD
Mukarram Amine (BME)
Lien Choi (MBB)
Ashika Jayanthy (MBB)
Matthew McKinley (MechE)
George Noorts (CS)
Jeffrey Reilly (Physics)

Communication Team
Michaela Healton (Chem): LEAD
Claude Antony (Psyc)
Kimberly Dykeman (Psyc)
Michael Schafer (Arch)
Joseph Taylor (Tech Comm)

Status Documents
Lien Choi (T): LEAD
Claude Antony (C)
Aubrey Chipman (T)
Michaela Healton (C)
Joseph Taylor (C)
Jeffrey Reilly (T)

Presentation
Michael Schafer (C): LEAD
Mukarram Amine (T)
Kimberly Dykeman (C)
Ashika Jayanthy (T)
Matthew McKinley (T)
George Noorts (T)

Faculty and Advisors
Frank Lane (Rehab Psyc), Phil Troyk (BME)
Preparatory and Supplemental Activities

- Team building
- In-pool blindfold activity
- Strategic division of labor
  - Communication
  - Technology
- Extensive ethics training and code of ethics
- Completed IRB certification
Technology Team Diagrams

[Diagram of RF Transmitter and RF Receiver]
Radio Technology

- Transmitters produce an invisible wall by broadcasting a unique signal
- Receiver detects signal at or above threshold intensity and produces tactile feedback indicating relative position to obstacles
Technology Team Progress

- Concluded device in theory should work but did not due to poor workmanship
- Met with subject matter expert
- Determined desired system specifications
- Tested economy of power specifications
Technology Team Progress

• Constructed and tested receiver and transmitter prototype
Technology Team Progress

- Verified correct operation of transmitter
- Troubleshooting receiver

Transmitter Oscilloscope Readout
Communication Team History

• Mobility training of BVI individuals
• Fall 2009 testing
Subject enters pool

Subject does two laps around the pool with assistance

Subject is asked if they feel they have formed a mental map.

If yes

Test Phase #1

If no

Subject does another lap with assistance.

If fail

Test Phase #2

If fail

If fail

5 minute free walk

If pass

If fail

If pass
Communication Team Progress

- Maintenance and upkeep of devices
  - Waterproofed testing device
  - Made new blacked-out goggles
- Revision of protocol
- Recruitment of research participants
- Pool testing
- IRB revision
- Constructed scale model of pool
Suggested Next Steps

Technology
• Develop prototype onto a printed circuit board
• Incorporate the receiver into a wrist band
• Waterproof the system

Communication
• Continue testing in order to determine the range of laps required to form a strong spatial-cognitive map
• Incorporate the BVI community into pool testing