Assistive Devices for Blind and Visually Impaired Swimmers

A vision for blind swimmers
Buoy 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.”
Outline

• History
• Problem Statement
• Team Organization
• Goals
• Prep. And Supp. Activities
• Progress
• Future Activities
History

Spring 2007
- Research
- Passive redesign
- Passive testing

Fall 2007
- Sonar Application
- Passive device modifications

Summer 2008
- Modified passive device
- Created storage device
- Snorkel device

Spring 2009
- Discontinued Sonar
- EMF and laser application

Summer 2007
- Sonar research
- Passive redesign
- Passive testing

Spring 2008
- Vibrator belt concept
- Modified passive device

Fall 2008
- New storage device
- Selected 2 active technologies
- New management

Summer 2009
- Continued EMF
- Continued Laser

10/13/2009 BUOY Midterm Presentation
Problem Statement

Background:

• 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)
• Lack of user input in development of technology to increase physical activity and decrease sedentary lifestyle
• Up to 80% abandonment rate of assistive technology (Michigan Dept of Education)

Fall 2009 Problems:

• Signal produced by invisible fence is encrypted thus vibrating receiver doesn't work
• Serial problem solving approach was not time efficient
Team Organization

Technology Team
Phillip Sirk (CS, CPE): LEAD
Ross Ludwig (MMAE)
Jeffrey Reilly (Phys)
Branden Toro (MMAE)

Communication Team
Jay Park (Psyc): LEAD
Kimberly Dykeman (Psyc)
Michaela Healton (Chem)
Timothy Lipman (Psyc)
Smita Sarkar (BME)

Documentation
Michaela Healton (Chem): LEAD
Jeffrey Reilly (Phys)
Branden Toro (MMAE)

Media
Smita Sarkar (BME): LEAD
Jay Park (Psyc)
Phillip Sirk (CS, CPE)

Survey
Kim Dykeman (Psyc): LEAD
Timothy Lipman (Psyc)
Ross Ludwig (MMAE)

Faculty and Advisors
Frank Lane (Rehab Psyc), Ken Schug (Chem), Ruthanna Gordon (Psyc)
Goals

• Re-design the invisible fence into a radio device and re-design the vibrating receiver to detect signal of new device
• Develop a method of communicating available information between device and swimmer
• Continue BVI community involvement, Maintain website
Prep. and Supp. Activities

- Team building
- Transition to conference room
- Blindfold experiment
- Strategic division of labor
  - Communication
  - Technology
- Completed project plan
- Posting minutes
- Completed IRB certification
- Ethics training and code of ethics
- Chicago Lighthouse tour and survey planned
- SME blind swimming instructor
Technology Team Progress

• Ruled out magnetic system
• Researched transmitters and receivers
• Designed a new transmitter device
• Circuit analysis
• Ran circuit simulations
• Simulation shows a functioning transmitter
• Working on circuit for new receiver
Radio

- Transmitters produce an invisible wall by broadcasting a unique signal
- Receiver detects signal and produces tactile feedback indicating relative position to obstacles
Communication Team Progress

• Review of literature
• Review of methodology for mobility training for BVI individuals
• Established pilot protocol for training
• Tested protocol
• Revised protocol
• Continuing testing
Subject enters pool

Subject does two laps around the pool with assistance.

Subject is asked if they are comfortable to proceed to testing.

If yes

Test Phase #1

If fail

If yes

5 minute free swim

Test Phase #2

If fail

If yes

If pass

Subject exits pool

If yes
Future Activities

- Complete design for vibrating circuit
- Build receiver
- Build transmitter
- Implement training protocol
- Visit Chicago Lighthouse for tour and survey
- Determine applicability of device for other exercising activities
Needs / Questions / Requests

• Continued communication with subject matter experts
• BVI community for testing