IPRO 310 Project Plan

Spring 2010

Devices that Assist Blind & Visually-Impaired Individuals in Swimming and Other Exercise Activities

I. Team Charter

1. Team Information

A. Team member roster

Name	Email	Phone #
Amine, Mukarram	mamine@iit.edu	708-539-6364
Antony, Claude	cantony@iit.edu	708-289-7009
Chipman, Aubrey	achipman@iit.edu	214-546-5911
Choi, Lien	lchoi@iit.edu	312-725-3610
Dykeman, Kimberly	kdykeman@iit.edu	410-322-5160
Healton, Michaela	mhealton@iit.edu	763-913-0524
Jayanthy, Ashika	ajayanth@iit.edu	312-533-9822
McKinley, Matthew	mmckinle@iit.edu	408-375-6925
Noorts, George	gnoorts@iit.edu	847-321-5860
Reilly, Jeffrey	jreilly2@iit.edu	440-371-5019
Schafer, Michael	mschafe1@iit.edu	815-341-9489
Taylor, Joseph	jtaylo8@iit.edu	319-558-8442

B. Team member strengths, needs and expectations

Team Member	Email	Major, Year	Skills/Strengths	Skills to Learn/Gain	Hopes/ Expectations
Amine, Mukarram	Mukarram1@gmail.com	BME, 2nd Year	Basic knowledge of circuits and digital systems, Ability to swim decently, Experience in a machine shop (specifically with metalwork), Ability to weld	Soldering, Experience working with people in need of assistance, Working with and contributing to a team effort	To successfully develop the technology, and learn from all aspects of the project
Antony, Claude	cantony@iit.edu	Psyc, 4th Year	Strong ability to communicate	Leadership	To provide positive results to the IPRO and the BVI community
Chipman, Aubrey	Aubrey.Chipman@gmail.com	BME, 3rd Year	Creativity, Experience in biomedical engineering labs, Some experience with circuitry, Ability to swim	Teambuilding and Leadership experience, Greater ease in communication, More circuits knowledge	To create a working prototype that through testing and refinement will produce a product that assists the BVI community
Choi, Lien	lchoi@iit.edu	MBB, 4th Year	Knowledge of Biology and Physics, Circuitry soldering	Technical expertise in construction of a device of	To help people, Build a working device, and see said device

			experience, Experience building machines, History in teaching swimming, Trained as an ER Technician	this type, Experience working with people with disabilities	being put to use
Dykeman, Kimberly	kdykeman@iit.edu	Psyc, 2nd Year	Proficient at Microsoft Office (Word, PowerPoint, Publisher, Excel) Basic experience with C++ and Visual Basic programming languages. Psychology experience	Gain skills in circuitry	To increase interaction with the BVI community
Healton, Michaela	mhealton@iit.edu	Chem, 3rd Year	Skilled in communication, Proficient with Microsoft Office Suite, Basic experience with C++	Leadership, Business communication, Increased knowledge of circuitry	To gain leadership skills while assisting in the manufacture of a working prototype
Jayanthy, Ashika	ashika.me@gmail.com	MBB, 4th Year	Knowledge about the biology underlying the needs of blind swimmers, basic knowledge of circuitry	Teambuilding, Leadership, Greater understanding of the underlying technology, Communication skills	To learn more about project development while improving people and communication skills and generally increasing my knowledge base.
McKinley, Matthew	mmckinle@iit.edu	Mech. E, 4th Year	Effective communication and problem solving skills, Some starting knowledge of circuitry, Enjoyment of working with others	Increase understanding of underlying technology, Learn to multitask in balancing major and minor team responsibilities	To see a working prototype, work well with teammates, and have an effective role in the process of manufacturing the prototype
Noorts, George	gnoorts@iit.edu	CS, 3rd Year	Experience swimming competitively (7 years), Some previous experience with this IPRO	Experience working with other students on an interesting project	To help this IPRO finally finish its project

Reilly, Jeffrey	jreilly2@iit.edu	Phys, 3rd Year	Excellent leadership and communications skills, ability to identify and solve problems, computer competency with proficiency in Microsoft Office Suite and Computer Programming (Language C++).Certifications in CPR and First Aid	Increased knowledge of prototype fabrication and marketing	To create a useful and cost-effective prototype to meet the needs of the BVI community
Schafer, Michael	mschafe1@gmail.com	Arch, 5th Year	Communication skills and contact with SMEs, Skilled in recruitment, Skilled at giving presentations	Refinement of skills (listed to the left)	To succeed in getting a prototype completed and tested
Taylor, Joseph	jt319swimguy@yahoo.com	Tech. Comm., 4th Year	Experience with web design, editing, and document design	Learn to gain quantitative data through testing	To develop a working prototype and see it put to use with test subjects, and to contribute to improving quality of life in the BVI community

C. Team Identity

- Name: Buoy
- Logo: 
- Motto: “A Vision for Blind Swimmers”

2. Team Purpose and Objectives

A. 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.

B. Team Objectives

(1) Refine and develop a cost effective assistive technology prototype

(a) Meet with subject matter experts (SME)

(b) Analyze results of testing done on the prototype constructed in the fall 2009 semester

(c) Continue testing of the training protocol to establish a set capable of reliability testing pool of data

(d) Construct transmitter prototype

(e) Construct receiver prototype

(f) Incorporate receiver into a discrete device

(2) Include the BVI community in the testing process.

(3) Maintain the Buoy website for continued accessibility to the BVI community.

(a) Modify the web page to be compatible with existing screen-reader software.

(4) Create a cooperative, motivational and innovative team environment using team-building techniques

(5) Research other applications of the system

(6) Utilize past resources to enhance continuity between semesters

(7) Discuss ethical matters as they arise

3. Background

A. Collaborators

(1) The Chicago Lighthouse for the Blind & Visually-Impaired was founded in 1960, its main mission is to serve people who are blind or visually impaired with a broad array of innovative programs designed to assist them in leading richer, more independent lives.

(2) Professor Phillip Troyk, Biomedical Engineering

(3) Professor Ken Schug, Chemistry

(4) Customer: The blind and visually impaired community

According to the American Foundation™ for the Blind as of 2006 there are:

(a) 21.2 million: Blind or Visually Impaired Individuals

(b) 254,000: Individuals who are younger than 17 and blind

(c) 6.2 million: Individuals who are older than 65 and are Blind or Visually Impaired

(d) 121,000: Individuals who are completely blind

B. User Problem

(1) In the past, most of the IPRO groups focused on technology prior to incorporating feedback from the BVI community into the design. As a result, the devices that had been created did not facilitate user autonomy. The prototypes were bulky, drew attention to blind swimmers, and caused impediments in the swimmers' performance.

C. Technology

(1) The independent living philosophy must be employed in the development of the system this project focuses on. Consumers must be involved in the conception, design, and development of any assistive device.

(2) The technologies explored by previous semesters include sonar, laser sensors and electromagnetic field technology (EMF).

D. The IPRO began with an attempt to modify an existing passive device developed at Notre Dame University and later moved on to devices that would allow the swimmer to be independent. Below is a brief semester by semester history of the IPRO:

(1) In fall 2006, the IPRO was started, with research on the passive device created at Notre Dame.

(2) In spring 2007, research on the passive assistive technology, redesigned the passive device, and conducted testing on their re-designed advice was continued.

(3) In summer 2007, research began sonar technology, and continued improving and testing the modified passive device design.

(4) In fall 2007, looking into the sonar technology and modifying the passive device continued.

(5) In spring 2008, a vibrating belt concept was tried, and modifying the passive device continued.

(6) In summer 2008, modifications to the passive device continued along with the creation of a device to store the passive device. Also a snorkel based technology was explored.

(7) In fall 2008, an improved storage unit for the passive device was created. Also accomplished was selecting two active technologies to explore. Also the IPRO came under new management.

(8) In spring 2009, sonar technology was discontinued as a direction of inquiry, and instead electromagnetic field and laser technologies were explored.

(9) In fall 2009, a radio frequency design was decided upon a circuits for transmitting and receiving such a signal were designed. The team structure was also changed to include a team focused on developing a method of teaching BVI individuals to use the finished device effectively to run parallel with the team developing the technology.

E. Ethical Issues

(1) Beneficence: the action that is done for the benefit of others. Beneficent actions can be taken to help prevent or remove harms or to simply improve the situation of others.

(a) Developing assistive technology to aide BVI swimmers

(b) Training the BVI community with the device

(2) Non-malfeasance: to “do no harm.” Refrain from providing ineffective treatments or acting with malice toward subjects. The pertinent ethical issue is whether the benefits outweigh the burdens.

(a) Quality and safety of the prototypes

(b) Include precautionary information for when using the device

(3) Autonomy: the “personal rule of the self that is free from both controlling interferences by others and from personal limitations that prevent meaningful choice.” Autonomy is used to help individuals act intentionally, with understanding, and without controlling influences.

(a) Informed consent of participants

(b) Discrete appearance of device in order to raise positive self-image

(4) Justice: the quality of being fair and reasonable

(a) Price that fits the intended market

(b) Patent and copyright

(c) Overall availability and serviceability of the device to the BVI community

(5) Fidelity: faithfulness to a person, cause, or belief, demonstrated by continuing loyalty and faith.

(a) Maintaining past contacts, as well as developing rapport with new contacts and facilities

(b) Receiving input from the BVI community

(c) Providing demonstrations of the technology to the BVI community

(d) Continued involvement with the BVI community

(e) Providing training in proper use of the device

F. Business and societal costs

(1) A significantly smaller portion of BVI individuals exercise compared to the general population due to safety issues. This leads to an increase in health problems.

(2) Public swimming pools by and large do not to meet the requirements put in place by the Americans with Disabilities Act (ADA), so BVI individuals rely on specific facilities to meet their needs. The availability of such facilities however, is very limited.

G. Practical Solutions

(1) Our team will arrange to visit the Chicago Light House and keep the BVI community up to date on our progress

(2) Two major teams were continued from the precious semester: Technology and Communication.

(3) A radio frequency technology prototype will be created.

H. Similar Solutions

(1) Some underwater swimming devices that are used by BVI individuals currently include: Life Buoyancy Device, Swimming Aid, Sonar Lifeguard and Easy Float.

(2) Devices that can be used underwater but not for swimming purposes that may be adapted for our design may include: Underwater phone, underwater iPod and underwater headphone.

(3) Devices using either sonar or ultrasound to guide the blind but they cannot be used underwater: Tongue Sensor and Electrode.

(4) Several of the devices stated above are already being sold while the few others are only in the patent phase.

4. Team Values Statement

Behavior	How to address?
Punctuality and absences	Publish attendance chart for peer reviews; any member who plans to miss a class session will provide the team leader with 48 hours notice; in the case of a last minute emergency, the member will contact the team leader and professor

Conflict resolution	Team leader encourages antagonists to discuss the problem face to face.
	If the problem is related to the direction of the IPRO and the face to face method fails, the issue will be brought up during a class session and open for discussion. A vote (simple majority rule) is then taken for a final decision. The vote ensures that the issue is closed and the teams can move forward with their work. We want to ensure that conflict/issues will not impede the progress of the IPRO.
	If the problem is of a personal nature and the face to face method fails, the class advisors will be consulted.
Communication	Break the ice by conducting team building activities and encourage team members to express ideas and suggestions.
	Major teams and minor teams will each decide among themselves the best method and times to meet and announce meeting times to the class.
	Host regular meetings that promote an open dialogue and allow team members to share their findings or problems directly.
	All communication between Bouy and the community will be done by the survey sub-team in coordination with the team leader.
	Team members can share documents and obtain contact information on iGroups.
Motivation	Team building to improve team interaction
Fair Distribution of work	Two major teams and two minor teams
	Leaders of each major and minor team ensure members have fair workload.
	Volunteers for non-categorized work
Documentation	One member of status documents team in charge of recording meeting minutes during each class and uploading to iGroups.
	Agendas are decided on by the team leader and discussed with professor before class to ensure our work is on track.
	Status documents team ensures group is on-track with each deliverable.
	Time sheets record each member's time contribution in this project.
	iGroups houses all documentation ensuring organization and visibility to entire team.

II. Project Methodology

1. Work Breakdown Structure

A. Existing assistive technology does not allow BVI swimmers to swim as independently as they would like according to survey data from previous semesters.

B. Steps our team will take:

(1) Team members will be divided into two development teams geared towards utilizing specific technology and communicating information efficiently in the development of a prototype system in two parts: a device and a protocol for teaching someone to use the device.

(2) Team members will be further broken down into sub teams that will focus on such tasks as: presentations and status documents.

(3) It is reasonable to expect that by the end of the semester we will have developed, built, and tested a prototype based on radio frequency technology, and the circuits designed last semester. We will have made contact with the BVI community and communicated with them about our progress. We will have a completed testing method with secondary and tertiary testing, explained below. We will also have detailed documentation that allows for continuity between semesters.

C. Potential solutions will be tested by the major teams and the volunteering participants

(1) There will be three phases of testing:

(a) Initial testing will consist of only Buoy members

(b) Secondary testing will consist of Buoy members and volunteers from the IIT community

(c) Tertiary testing will consist primarily of BVI swimmers and a few control tests with sighted swimmers

(2) Tasks include: acquisition of facilities and participants, user-feedback and maximizing safety of everyone involved. Sub-tasks will include acquiring external testing locations and identifying all legal and financial issues with testing locations and participants.

D. The status documents team will be responsible for the written deliverables due during the semester. Their rough drafts of the deliverables will be presented to the entire group and a final draft will be developed through class feedback.

E. The presentation team will be responsible for the presentation deliverables due during the semester. Specifically, they will be responsible for giving the Midterm and Final presentations and preparing the PowerPoint presentation for each of these.

F. Contact List

(1) The Chicago Lighthouse

1850 West Roosevelt Road

Chicago, Il 60608-1298

Tel: (312) 666-1331

Fax: (312) 243-8539

www.thechicagolighthouse.org

(2) Wisconsin Center For Blind and Visually Impaired

Dan Wenzel, Center director

1700 W. State St. JanesVille, WI 53546

Tel: 608-758-6100

www.wcbvi.k12.us

(3) Illinois School for the Visually Impaired

658 East State St.

Jacksonville IL 62650

Tel: 1-800-919-5617

Fax: 217-479-4479

www.isvi.net

(4) Indiana School for the Blind and Visually Impaired

7725 North College Ave.

Indianapolis Indiana 46240

Tel: 317-253-1481

Fax: 317-251-6511

http://intra.isbrockets.org/public/

(5) Rose-Hulman Institute of Technology ECE department

Tel: 812-877-8228

http://ece-1.rose-hulman.edu/ece/

(6) Associate Professor of Biomedical Engineering Philip Troyk

3255 S. Dearborn #314

Chicago, IL 60616

Tel: 312-567-6902

troyk@iit.edu

(7) Assistant Professor of Psychology Ruthanna Gordon

3105 S. Dearborn #256A

Chicago, IL 60616

Tel: 312-567-3514

gordonr@iit.edu

G. Schedule of Tasks and Milestone Events

January 11-15

- IPRO Overview
- Defining the Problem
- Teambuilding Session
- IPRO Team Meeting Minutes
- Time Sheets

January 18-22

- Defining the Problem
- Research/Surveys
- Troubleshooting Devices
- Teambuilding Session
- IPRO Team Meeting Minutes
- Project Plan (2/5)
- Ethics Framework Module
- Time Sheets

January 25-29

- Research/ Surveys
- Troubleshooting Devices
- Teambuilding Session
- IPRO Team Meeting Minutes
- Project Plan (2/5)
- Design/Build Prototype
- Testing
- Website Development
- Time Sheets

February 1-5

- Research/Surveys
- Troubleshooting Devices
- IPRO Team Meeting Minutes
- Project Plan (2/5)
- Design/Build Prototype
- Testing
- Website Development
- Time Sheets

February 8-12

- Research/Surveys
- Troubleshooting Devices
- IPRO Team Meeting Minutes
- Design/Build Prototype
- Testing
- Website Development
- Time Sheets

February 15-19

- Research/Surveys
- Troubleshooting Devices
- IPRO Team Meeting Minutes
- Design/Build Prototype
- Mid-term Prep
- Testing
- Website Development
- Time Sheets

February 22-26

- Research/Surveys
- Troubleshooting Devices
- Team Building Session
- IPRO Team Meeting Minutes
- Design/Build Prototype
- Mid-term Prep
- Mid-term Peer Evaluations
- Testing
- Website Development
- Time Sheets

March 1-5

- Research/Surveys
- Troubleshooting Devices
- IPRO Team Meeting Minutes
- Design/Build Prototype
- Mid-term Prep
- Mid-term Reviews (3/1)
- Testing
- Website Development
- Time Sheets

March 8-12

- Research/Surveys
- Troubleshooting Devices
- IPRO Team Meeting Minutes
- Design/Build Prototype
- Testing
- Website Development
- Time Sheets

March 15-19

- Research/Surveys
- Troubleshooting Devices
- IPRO Team Meeting Minutes
- Design/Build Prototype
- Testing
- Website Development
- Time Sheets

March 22-26

- Research/Surveys
- Troubleshooting Devices
- IPRO Team Meeting Minutes
- Design/Build Prototype
- Testing
- Website Development
- Time Sheets

March 29-April 2

- Research/Surveys
- Troubleshooting Devices
- IPRO Team Meeting Minutes
- Design/Build Prototype
- Testing
- Website Development
- Time Sheets
- Final Project Draft (4/9)

April 5-9

- Research/Surveys
- Troubleshooting Devices
- Teambuilding Session
- IPRO Team Meeting Minutes
- Communication Experience & IPRO Day Prep
- Abstract/Brochure
- Website Development
- Time Sheets
- Final Project Draft (4/9)

April 12-16

- Teambuilding Session
- IPRO Team Meeting Minutes

- Communications Experience & IPRO Day Prep
- Exhibit/Poster
- Abstract/Brochure
- IPRO Materials Hand-Off
- IPRO Project Closure
- Website Development
- Time Sheets
- Final Project Report (4/30)

April 19-23

- Teambuilding Session
- IPRO Team Meeting Minutes
- Communications Experience & IPRO Day Prep
- IIT Course Evaluation
- Exhibit/Poster
- Abstract/Brochure
- Final Report
- Team Work Product
- IPRO Materials Hand-Off
- Final Peer Evaluation
- Individual Team Member Project Analysis Report
- IPRO Project Closure
- Website Development
- Time Sheets
- Final Project Report (4/30)

April 26-30

- Final Project Report (4/30)

H. Master Team Schedule

(1) As availability of members of this IPRO is incredibly variable from month to month, it was determined that a master team schedule would not be able to accurately reflect the availability of each team member. In place of this schedule at the beginning of each month, all major and minor teams will hold a meeting to schedule all foreseeable out of class meetings for the month and express the general availability of the team members.

I. Task Breakdown

(1) Identifying the Problem/ Solutions: The entire class will participate in brainstorming sessions to identify potential problems and solutions for prototype design and communications methodology. No special skills or education is needed.

(2) Project Plan: Interested members worked to create the project plan. Preferred skills include previous experience with IPRO, organizational skills, and proficiency with Microsoft Office.

(3) Midterm Review: Selected members from the presentation minor team and volunteers will participate in the midterm review. Skills for this task include presentation skills, general knowledge of all technologies, comprehension of ethical issues related to this project, and proficiency in power point.

(4) IPRO Day/ Deliverables: Selected Members from the presentation minor team will present the IPRO day presentation and run the booth at IPRO day. Skills for this task include management

experience, presentation skills, a general understanding of technology and ethical issues. Members of the status documents team will design Deliverables. Skills include general understanding of the technology and ethical issues related to this project, computer skills in Microsoft Office, and basic web design.

J. Individual Team Member Assignments
  (1) BUOY Overall Team Leader: Jeffrey Reilly
  (2) Major teams
    (a) Active Team 1: Technology
      (i) Aubrey Chipman (BME) TEAM LEAD
      (ii) Mukarram Amine (BME)
      (iii) Lien Choi (MBB)
      (iv) Ashika Jayanthy (MBB)
      (v) Matthew McKinley (Mech E)
      (vi) George Noorts (CS)
      (viii) Jeffrey Reilly (Phys)
    (b) Active Team 2: Communication
      (i) Michaela Healton (Chem) TEAM LEAD
      (ii) Claude Antony (Psyc)
      (iii) Kimberly Dykeman (Psyc)
      (iv) Michael Schafer (Arch)
      (v) Joseph Taylor (Tech. Com.)
  (3) Minor Teams
    (a) Presentation Team
      (i) Michael Schafer (Team 2) TEAM LEAD
      (ii) Mukarram Amine (Team 1)
      (iii) Kimberly Dykeman (Team 2)
      (iv) Ashika Jayanthy (Team 1)
      (v) Matthew McKinley (Team 1)
      (vi) George Noorts (Team 1)
      (vii) Jeffrey Reilly (Team 1)
    (b) Presentation Team Responsibilities
      (i) PowerPoint Presentations
      (ii) Delivering mid-term and final presentations
    (c) Status Documents Team
      (i) Lien Choi (Team 1) TEAM LEAD
      (ii) Claude Antony (Team 2)
      (iii) Aubrey Chipman (Team 1)
      (iv) Michaela Healton (Team 2)
      (v) Joseph Taylor (Team 2)
    (d) Status Documents Team Responsibilities

(i) Midterm/Final report
(ii) Meeting minutes
(iii) Budget Management
(iv) Timesheets
(v) Compiling engineering designs
(vi) Weekly status reports

(4) The major teams are organized based on member skills and field of expertise to ensure equal distribution of talent. The minor teams are organized to include at least one member from each major team to ensure that both major teams have equal influence over the minor team's respective responsibilities and deliverables.

(5) Every sub-team member is responsible for the tasks indicated in section 9.C as delegated by the respective team leader.

2. Expected Results

A. Expected activities during the project:

(1) The technology team will be involved in researching, designing, building, and testing a prototype device using information obtained from the survey and interview data.

(2) The communication team will be involved in researching and developing a method of communicating available information between the device and the swimmer, and testing that method thoroughly.

(3) The presentation team will prepare and deliver both the mid-term and final presentations.

(4) The status documents team will create and deliver all required deliverables for the project, take minutes during all group meetings, and document all the progress made on the project so that the next semester will be able to continue the project without backtracking.

B. The expected data will be obtained research and testing done by the group. The data we hope to obtain will tell us the current problems with our device and where it needs improvement.

C. We expect to have developed a device prototype that will most suit the community. We will also provide information about testing and research to future semesters so that they can improve the device to even better suit the community.

D. We expect to utilize the research done last semester to design and develop a device prototype.

E. The objective of this semester is to develop a working prototype device using radio frequency technology. We will also have documented all our research, as well as the designs to recreate the prototype.

F. A major challenge we may face will be in utilizing the technology we have into a usable device, and to be able to communicate the necessary information to the user of the device. There are challenges and risks associated with testing, such as IRB approval and creating a safe and secure testing environment

G. Buoy will document and incorporate all results into a final proposal, with all results being based on extensive research and testing in coalition with the BVI community.

3. Project Budget

Category	Requested	Approved	Explanation	Status
Supplies	$175 2/1/10	Awaiting	General circuit building materials, and general pool test supplies	Pending
Equipment	$200 2/1/10	Awaiting	-Vibration Motors -Water resistant wristbands -Batteries (for motors)	Pending
Services	$25 2/1/10	Awaiting	Printing etc.	Pending
Participant Support	$50 2/1/10	Awaiting	Paying a Lifeguard (As needed)	Pending
Misc.	$100 2/1/10	Awaiting	Used for team building exercises to be determined	Pending
TOTAL	**$550.00**	**$0**		

4. Designation of Roles

- Master Schedule Maker: Jeffrey Reilly
- Weekly Timesheet Collector/Summarizer: Status Documents Team
- Minute Taker: Aubrey Chipman and Michaela Healton
- iGroups Facilitator: Status Documents Team
- Website Creator and Facilitator: Aubrey Chipman and Joseph Taylor
- Agenda Maker: Jeffrey Reilly
- Pool Liaison: Joseph Taylor