IPRO It takes a team INTERPROFESSIONAL PROJECTS PROGRAM

IPRO 310: Swimming Aid for Visually Impaired Swimmers

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Accredit: Cypress Semiconductor Corporation

Passive Device Team
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2.1 Objectives

IPRO 310's objectives are to continue the designing and building process of devices that help visually impaired swimmers. The IPRO 310 team intends to design, create and test a sonar device that actively aids a visually impaired swimmer. The team also plans on redesigning, building and testing a swimming lane tapper that passively aids visually impaired swimmers. In addition, the 310 IPRO team has a business and marketing team that will be surveying members of the visually impaired community to assess their need and acceptance of the proposed devices.

In order to accomplish these objectives the IPRO 310 team is determined to achieve several goals by the end of the summer 2007 semester by dividing up tasks among three sub-teams.

A. Current Objectives

Specifically, the **Business and Marketing sub-team's** objectives are to:

- Produce a thoughtful and thorough report that captures the essence of issues blind swimmers face as well as the design criteria for the future prototype. The information will be gathered by conducting interviews and surveys with blind or visually impaired athletes or coaches. Information gathered from these interviews and surveys will then be used to design and create a prototype that will address some of the issues faced by the visually impaired or blind while they swim.
- Literature search lead to a post left by an engineer in Ohio who had developed and patented a unique swimming pool lane marker. The design was created to produce a track of air bubbles the length of a swimming pool and was designed to be installed into existing pools with no pool modifications. We contacted Notre Dame about the idea of a bubbler and they mentioned that they had considered a similar technique of using bubbles to guide the swimmer but they had dismissed the idea early in their research.

The **Active Sonar Device sub-team's** objectives are to:

- Design and build prototypes that will assist visually impaired people to swim. There are three million blind or visually impaired people in the US and another half million in Mexico and Canada. Many of these individuals do not participate or find it too expensive to participate in athletic endeavors because of the physical constraints imposed by their disability. It is this IPRO's goal to make it easier and efficient for the visually impaired to partake in activities like swimming, both competitively and recreationally. The Sonar Subgroup, we are in charge of designing and building a device that uses sonar technology to fulfill this IPRO's goal.

Lastly, the **Passive Device sub-team's** objectives are to:

- Redesign and build a device that has been previously conceived by a Notre Dame project team call the 'Lane Tapper'. With the Notre Dame team's permission, our team hopes to create a version of this device that can be permanently mounted to standard pool lane dividers. Another goal for the passive sub-team is to test the ease of use and effectiveness of the prototype in the water. In conjunction with testing we plan on recording both the test plan and results in an Engineer's Notebook for future reference of the following semester's teams.

B. New or Revised Objectives

Business and Marketing sub-team

- No changes have been made to our objectives since the project report.

Active Sonar Device sub-team

- No changes in the objectives on the active sonar sub-team.

Passive Device sub-team

- There have been no changes in the objectives of the passive device sub-team.

Overall, the IPRO 310 team hopes to provide an extensive record of information regarding visually impaired people, specifically swimmers, so as to better understand their needs.

2.2 Results to Date

Business and Marketing sub-team

The business and market research team's goal is to gather as much primary research as possible. This will be accomplished by conducting interviews and surveys with blind and visually impaired swimmers or people who work with them so that we can better understand their needs and create a prototype that will best fit their needs. So far we have conducted 3 interviews, visited with the Lighthouse for the blind and made several connections via email. Two of the interviews have been with visually impaired and blind individuals who currently swim or used to swim in the past, respectively. The third interview was with Dr. Kara Hagerman, an ophthalmologist who specializes in low vision rehabilitation and ocular disease.

Some important information gathered from the primary research is:

- Challenges related to swimming for the blind or visually impaired:
    - Access to swimming facilities

    - Orientation in the water
    - Location of the wall
- Preference of a prototype that vibrates over one that gives an audio signal
- Need for a prototype that does not affect the range of motion used in swimming
- Need for a prototype that is weightless

Some ideas for location of the vibrating device were:

- Around the wrist
- Belt like device around the waist or lower back

Three more interviews have been scheduled for the week of July 9th as well as some possible survey participants. Our subteam goal of conducting 3-5 interviews, as stated in the project plan, will be achieved if everything goes as planned. The data collected from these interviews and surveys will be used to create a prototype that best fits the needs of visually impaired and blind individuals who currently swim or would like to swim.

Active Sonar Device sub-team

A. Current data results from research or testing involved in the project

- Our first experiment to find a vibration unit failed. We've learned that: (i) the vibration should be spread in a much larger surface area for someone to be able to sense it in a swimming pool; (ii) we need better housing for the motor that produces the vibration. Poor housing of the motor will cause the vibration to be absorbed, and therefore, the swimmer wouldn't be able to feel the vibration.
- We've successfully tested that the transducer works in terms of sending signals. When we applied 1 kHz sine wave to the transducer, an audible noise was produced.

B. Current or potential products or outputs resulting from research and testing

- The output resulting from the first testing of the vibration unit helped us to understand how to design a better and more efficient vibration unit.
- From the transducer test, we now know that it is capable of sending a signal, which is essential to our project device.

C. Current results in terms of deliverables that will be produced by the project team

- Unfortunately, there are no working prototypes yet. All we have are written data results in the engineering notebook that will help the project team to understand better the design obstacles in producing a working product.

D. Current results and the problem of the customer

- Yes, the current results of the experiments address the problem of the customer. Without understanding and producing a working vibration unit, there will be no way to alarm the blind swimmer when he is approaching the wall.

E. Current results and the proposed solution framework

- As explained in section A: (i) the vibration should be spread in a much larger surface area for someone to be able to sense it in a swimming pool; (ii) we need better housing for the motor that produces the vibration. Poor housing of the motor will cause the vibration to be absorbed, and therefore, the swimmer wouldn't be able to feel the vibration.

Passive Device sub-team

A. Current data results from research or testing involved in the project

- Our first experiment to consisted of a swimmer who performed four different types of strokes both sighted and again with blacked out goggles. From this we learned the width of the swimmer as he comes in contact with the tappers. We also made note of the number of strokes the swimmer made for each length of the pool, and for each of the four different strokes. From this we learned how the presence if tappers in the lane may interfere with easy swimming and the frequency these should be placed at. We've used this information to determine the length of the tappers and their spacing along the pool's length
- We've conducted a second test. This second test consisted of using the previous testing results to construct a prototype and then test this prototype in a similar manner. The second test tested the prototype by measuring the number of strokes the swimmer took for each type of stroke for each length of the pool. Also, each length for each type of stroke was timed. The swimmer's reaction to the pool tappers for each type of stoke as well as comparing the results of these same strokes in a control lane were helpful in analyzing the effectiveness of the tappers.

B. Current or potential products or outputs resulting from research and testing

- The output of the results of the preliminary testing helped us construct a prototype of the lane tappers. Two lengths of the prototype were constructed for each side of the lane so that the swimmer could potentially feel the tappers on both sides of his or her body.
- The second test, the testing of the prototype revealed to us the improvements that need to be made to the tappers and possible modifications that should be considered to accommodate each of the four typical strokes.

C. Current results in terms of deliverables that will be produced by the project team

- The passive device team hopes to deliver a prototype of the lane tappers. We hope to have this prototype modified and tested at least twice more before IPRO Day. Unfortunately, the accelerated summer semester will not allow us enough time to refine the passive device as a final product.

D. Current results and the problem of the customer

- The current results if the experiments and the prototype seem to meet the general needs of the customer, the visually impaired swimmer. There are some aspects of the passive design that will need to be addressed as we are assured of a successful prototype. Specifically, the customer would prefer the device be inconspicuous.

E. Current results and the proposed solution framework

- The current results have been incorporated in to the solution framework by modifying the design of the prototype to reflect the few negative results of the testing.

2.3 Revised Task/Event Schedule

Business and Marketing Sub-Group

- Team Members
    - Elizabeth (Lissa) Bauer (Sub-Group Leader)
    - Ivan Tovalin
    - Palika Goldstein
    - Mohammad Mahmoud (Special Advisor)

- A couple of changes have been made from the project plan originally submitted. Some of the dates originally listed were revised to match the date or timeframe that they were completed or will be completed, respectively. In addition, some new contacts were added to the task list of people that we would like to interview and the timeframe of when we would be contacting them was also added. Lastly, a new member was recently added to the subteam and assigned tasks and responsibilities.

The revised task and event schedule for the Business and Marketing sub-team is shown below and can also be seen in the attached Excel file.

TASK	START	FINISH	DURATION (days)	HOURS NEEDED (hours)	TEAM MEMBERS
Summary Task Research	6/4/2007	6/21/2007	17	23	L, I
Research data gathered from Spring IPRO	6/4/2007	6/12/2007	8	8	L
Research Institutions for the Blind/Visually Impaired	6/11/2007	6/14/2007	3	10	L, I
Lighthouse visit	6/12/2007	6/12/2007	2	3	TEAM
Blind Swimming Experiment at Keating	6/21/2007	6/21/2007	2	2	TEAM
Project Plan	6/15/2007	6/18/2007	3	10	A, L, MG
Summary Task Primary Research (conduction of interviews and survey)	6/19/2007	7/17/2007	28	57	L, M, I
Assemble a list of appropriate questions	6/19/2007	7/5/2007	3	2	L, M, I
Make contact with blind institutions	6/19/2007	6/26/2007	7	6	L, M
* Contact Wisconsin Center for the Blind and Visually Impaired	6/19/2007	6/21/2007	2	2	L
* Contact Indiana School for the Blind	6/21/2007	6/23/2007	2	2	L
* Contact Illinois School for the Visually Impaired	6/26/2007	6/28/2007	2	2	M
* Contact Coach Jennifer	6/28/2007	6/30/2007	2	2	L
* Contact Mobility Specialist	6/28/2007	6/30/2007	2	2	L
Train Interviewers on Interviewing Process	7/2/2007	7/10/2007	5	1	L, M, I
Clarify interview method	7/5/2007	7/10/2007	3	2	L, M, I
Conduct Interviews and surveys	7/2/2007	7/17/2007	15	40	L, M, I
IRB Application	6/30/2007	7/2/2007	2	6	A, AB, J, L
Code of Ethics	6/30/2007	7/2/2007	2	10	A, L, J, MG
Midterm Report	6/29/2007	7/6/2007	7	10	A, L, MG
Summary Task Follow-up (done in unison w/interview & survey conductio	6/29/2007	7/24/2007	25	22	L, M, I
Interview Transcription	6/29/2007	7/24/2007	25	15	I
Analyze data as it comes in for the design and build team	7/5/2007	7/17/2007	12	10	L, M, I
Thank you	7/12/2007	7/17/2007	5	2	I
Writing Summary	7/17/2007	7/23/2007	5	5	L, I

L	Lissa
M	Mohammad
MG	Miguel
A	Axita
AB	Abin
J	Jeffery
I	Ivan

Final Deliverables and Milestones for the Business and Marketing sub-team:

Deliverables

- 10-15 filled out surveys addressing issues faced by blind or visually impaired swimmers.
- 3-5 or more conducted interviews with blind or visually impaired athletes, preferably swimmers or swim coaches.

Milestones

- Visiting the individual schools

- Bringing back results of the interviews and surveys

Active Sonar Device Sub-Group

- Team members
  - Miguel Dela Cruz (Sub-Group Leader)
  - Jeffrey Stanford
  - Svetlana Mokhuach
  - Palika Goldstein

The revised task and event schedule for the Active Sonar Device sub-team is shown below:

- For week 5 (July 1 –7), our goal is to complete the transducer testing and the module for it, and to finally connect it to the microcontroller.
- For week 6 (July 8 - 14), upon finishing the transducer and the microcontroller, we will then connect the vibration unit to the microcontroller. After that, testing will be done to see if the proper calculation is being made.
- For week 7 (July 15 –21), our goal is to fine tune the device, make it run better and more efficient.
- For week 8 (July 22 –27), prepare for IPRO day.
- For our device to be successful, each team member probably has to put in at least 15 hours of work each week.

Final Milestones for the Active Sonar Device sub-team:

Milestones

- Build working transmitter
- Finish Underwater Testing of Transmitter + Receiver

Passive Device Sub-Group

- Team members
  - Axita Patel (Sub-Group Leader)
  - Garrett Ezell
  - Abin Koshy
  - Mohammad Mahmoud (Special Advisor)

The revised task and event schedule for the Passive Device sub-team is shown below:

Passive Device Team

TASK		START	FINISH	DURATION (days)	HOURS NEEDED (hours)	TEAM MEMBERS
Research Visually Impaired (VI) & Needs		06/04/07	06/19/07	15	22	TEAM
	Review previous semesters research	06/04/07	06/09/07	5	5	TEAM
	Review previous semesters IPRO day	06/04/07	06/09/07	5	5	TEAM
	Visit to Lighthouse	06/12/07	06/12/07	1	3	TEAM
	Research existing patents for VI swimr	06/10/07	06/14/07	4	4	ST
	Presentation of 3 potential passive sol	06/12/07	06/14/07	2	4	ST
	Choose one passive solution to purs	06/14/07	06/14/07	1	1	ST
Research Notre Dame device		06/12/07	06/19/07	7	4	ST
Our redesign of ND device		06/14/07	06/21/07	7	7	G
Materials research		06/14/07	06/21/07	7	7	AB
Materials selection		06/17/07	06/21/07	4	2	AB
Build Prototype		06/21/07	07/01/07	10	19	A,AB,G
	Obtain Materials	06/21/07	06/25/07	4	5	AB
	Find location to build & store prototype	06/21/07	06/25/07	4	2	M
	Construct device	06/25/07	07/01/07	6	12	A,AB,G
Test Prototype		06/19/07	07/08/07	19	13	A,AB,G
	Develop testing design	06/19/07	07/01/07	12	3	AB
	Conduct testing	07/03/07	07/03/07	1	2	A,AB,G
	Record all data	07/03/07	07/03/07	1	2	AB
	Record swimmer's reactions to device	07/03/07	07/03/07	1	2	A
Analysis of Tested Prototype		07/03/07	07/03/07	1	3	A,AB,G
	Review collected data	07/03/07	07/03/07	1	1	A
	Draw comparisons to control test	07/03/07	07/03/07	1	1	AB
	Tabulate calculated data	07/03/07	07/03/07	1	1	G
	Decide if redesign is necessary (Concl	07/03/07	07/05/07	2	1	A,AB,G
Redesign Prototype		07/03/07	07/05/07	2	2	G
Modify prototype according to redesign		07/05/07	07/12/07	2	6	G,AB
	Obtain other materials if necessary	07/05/07	07/05/07	2	2	AB
	Reconstruct device	07/05/07	07/11/07	2	4	G
Testing of Modified Device		07/12/07	07/12/07	1	9	A,AB,G
	Conduct testing	07/12/07	07/12/07	1	3	G
	Record all data	07/12/07	07/12/07	1	3	AB
	Record swimmer's reactions to device	07/12/07	07/12/07	1	3	A
Analysis of Modified Device		07/13/07	07/17/07	4	6	A,AB,G
	Review collected data	07/13/07	07/17/07	4	2	A
	Draw comparisons to control test	07/13/07	07/17/07	4	2	AB
	Tabulate calculated data	07/13/07	07/17/07	4	1	G
	Conclusions	07/17/07	07/17/07	3	1	A,AB,G
Redesign Prototype		07/17/07	07/19/07	2	2	G
Modify prototype according to redesign		07/17/07	07/19/07	2	6	G,AB
	Obtain other materials if necessary	07/17/07	07/19/07	2	2	AB
	Reconstruct device	07/17/07	07/19/07	2	4	G
Testing of Modified Device		07/19/07	07/19/07	1	9	A,AB,G
	Conduct testing	07/19/07	07/19/07	1	3	G
	Record all data	07/19/07	07/19/07	1	3	AB
	Record swimmer's reactions to device	07/19/07	07/19/07	1	3	A
Analysis of Modified Device		07/19/07	07/23/07	4	6	A,AB,G
	Review collected data	07/19/07	07/23/07	4	2	A
	Draw comparisons to control test	07/19/07	07/23/07	4	2	AB
	Tabulate calculated data	07/19/07	07/23/07	4	1	G
	Conclusions	07/19/07	07/23/07	3	1	A,AB,G
Complete Engineers Notebook to be turned in		06/14/07	07/25/07	41	21	A,AB,G
Prepare for IPRO Day		07/18/07	07/26/07	8	48	TEAM

key	
	Milestone
	Revised Schedule
A	Axita
AB	Abin
G	Garrett
M	Mohammad
ST	Entire Sub-Team
TEAM	Entire IPRO team

Final Milestones for the Passive Device sub-team:

Milestones

- Pool Test of Sideline Tappers Concept
- Testing how to add sideline tappers to pre-existing pools efficiently

IPRO Deliverable Reports

The IPRO deliverables are just as important as the project deliverables because they help teams organize their time and resources. It also holds the team to a standard that is very much a part of the non-academic world preparing us for the professional environment.

The revised task and event schedule for IPRO deliverable is shown below and can also be seen in the attached Excel file.

IPRO Deliverables Scheduled Tasks & Task Assignments

DATE	TASK	START	FINISH	DURATION (days)	HOURS NEEDED (hours)	TEAM MEMBERS
5-Jun	FIRST CLASS BRIEFING, LEARNING OBJECTIVES PRETEST	6/5/2007	6/5/2007	1	3	TEAM
7-Jun	REVIEW BLIND ATHLETE VIDEOS, DO INITIAL PLAN, MEET SPRING TEAM LEADER	6/7/2007	6/7/2007	1	3	TEAM
9-Jun	IPRO GAMES	6/9/2007	6/9/2007	1	5	TEAM
12-Jun	FIELD TRIP TO CHICAGO LIGHTHOUSE FOR THE BLIND	6/12/2007	6/12/2007	1	3	TEAM
14-Jun	4 1/2 HOUR ASSESSMENT BRIEFINGS, REORGANIZE AS NEEDED	6/7/2007	6/14/2007	7	3	TEAM
15-Jun	PMGT WORKSHOP	6/15/2007	6/15/2007	1	4	TEAM
19-Jun	PRESENTATION OF SUB-TEAM PROJECT PLANS	6/14/2007	6/19/2007	5	3	A, MG,L
21-Jun	PRESENTATION OF DESIGN NOTEBOOKS & POOL PARTY-BLIND SWIMMING EXP. CYPRESS SEMINAR	6/14/2007	6/21/2007	7	7	S, G, L TEAM
22-Jun	PROJECT PLAN DUE REFLECTION ONE DUE	6/14/2007	6/22/2007	8	8	A, MG,L TEAM
26-Jun	ETHICS SEMINAR DURING CLASS PERIOD	6/26/2007	6/26/2007	1	3	TEAM
27-Jun	CYPRESS SEMINAR	6/27/2007	6/27/2007	1	5	J,S,P,MG
28-Jul	PEER REVIEW ONE DUE	6/21/2007	6/28/2007	7	2	TEAM
3-Jul						
5-Jul	MIDTERM PRESENTATIONS, REFLECTION TWO DUE LO POST TEST, TEAMWORK SURVEY	6/26/2007	7/5/2007	9	9	TEAM
6-Jul	MIDTERM REPORT DUE CODE OF ETHICS DUE	6/26/2007	7/6/2007	10	10	A,MG,L
10-Jul						
12-Jul						
17-Jul	PRESENTATION SKILLS AND IPRO DAY TIPS SESSION	7/17/2007	7/17/2007	1	3	TEAM
19-Jul	MINUTES DUE	6/5/2007	7/26/2007	16	48	I
24-Jul	PEER REVIEW TWO DUE, REFLECTION THREE DUE	7/19/2007	7/24/2007	5	5	TEAM
26-Jul	DEBRIEFING SESSION IN CLASS, COURSE EVALUATION, TMWK SURVEY, SELF ASSESSMENT OF LRNG OBJS EXHIBIT POSTERS DUE, PRESENTATION DUE ABSTRACT DUE, CDROM,TOC DUE,UPLOAD TO IKNOW DUE CERTIFICATE OF COMPLETION OF IPRO OFFICE REQUIREMENTS	7/10/2007	7/26/2007	16	100	TEAM
27-Jul	IPRO DAY	7/27/2007	7/27/2007	1	5	TEAM

IPRO 310 Project Budget Revisions

Current Budget

B&M Team	
Item	**Cost**
Keating Pool Reservation	
Pool Party: (1.5hrs x $8.50)	$12.75
Prototype testing pizza party: (3 x $25.00)	$75.00
Travel Expenses (depends on what schools cooperate):	
Wisconsin Center for the Blind and Visually Impaired: (112 miles x $0.40) = ($45 x 2)	$90.00
Indiana School for the Blind: (180 miles x $0.40) = ($72 x 2)	$144.00
Illinois School for the Visually Impaired: (240 miles x $0.40) = ($96 x 2) = $192 + $130 hotel stay (2 rooms for 1 night)	$322.00
B&M Estimated Total	**$643.75**

ASD Team	
Item	**Cost**
Piezo style buzzer	$15.00
Miscellaneous components: batteries, duct tape, zip lock bag, dual timer, etc.	$20.00
Device housing (Stereo lithography)	$200.00
ASD Estimated Total	**$235.00**

PD Team	
Item	**Cost**
Foam Rods (100 x $0.98)	$98.00
Twisted Poly Rope (2 x $7.00)	$14.00
Vinyl Tube	$6.00
Adhesive	$7.00
Scissors	$5.00
Tape Measure	$10.00
Pool use for testing: 16hrs x $8.50	$136.00
Swimmer ~16hrs x $5	$80.00
PD Estimated Total	**$356.00**

Team Estimated Total	**$1,234.75**

$ Spent

B&M Team	
Item	**Cost**
Keating Pool Reservation	
Pool Party: (2hrs x $8.50)	$17.00
Prototype testing pizza party: (1 x $25.00)	$25.00
Travel Expenses (depends on what schools cooperate):	
Wisconsin Center for the Blind and Visually Impaired: (112 miles x $0.40) = ($45 x 2) (Committed)	$90.00
B&M Total to Date	**$132.00**

ASD Team	
Item	**Cost**
Piezo style buzzer	$15.00
Miscellaneous components: batteries, duct tape, zip lock bag, dual timer, etc.	$20.00
Device housing (Stereo lithography)	$200.00
ASD Total to Date ?	**$235.00**

PD Team	
Item	**Cost**
Foam Rods (100 x $0.98)	$98.00
Twisted Poly Rope (2 x $7.00)	$14.00
Vinyl Tube	$6.00
Adhesive	$7.00
Scissors	$5.00
Tape Measure	$10.00
Pool use for testing: 2hrs x $8.50 (Spent)	$17.00
Swimmer ~ 4hrs x $40 (Spent)	$157.00
Swimmer ~ 2hrs x $40 (Committed)	$80.00
Pool use for testing: 2hrs x $8.50 (Committed)	$17.00
PD Total to Date	**$411.00**

Team Total to Date	**$778.00**

2.4 Changes in Task Assignments & Designation of Roles & Team Organization

A. Team Organization

- The IPRO 310 team's organization has not changed since the project plan was originally submitted.
- The team is still composed of three sub-teams: the Business and Marketing Sub-group, the Active Sonar Device Sub-group, and the Passive Device Sub-group.
- The business and market research team's goal is to gather as much primary research as possible. This will be accomplished by conducting interviews and surveys with blind and visually impaired swimmers or people who work with them so that we can better understand their needs and create a prototype that will best fit their needs.
- The active sonar team is in charge of designing and building a device that uses sonar technology to assist visually impaired swimmers.

- The passive design team is responsible for the redesign and building of a device that has been previously conceived by a Notre Dame project team call the 'Lane Tapper'. Also, the passive sub-team is to testing the ease of use and effectiveness of the prototype in the water.

B. Sub-Team & Individual Task Assignment & Responsibilities

The revised sub-team & individual task & responsibilities schedule for the **Business and Marketing sub-team** is shown below and can also be seen in the attached Excel file.

TASK	START	FINISH	DURATION (days)	HOURS NEEDED (hours)	TEAM MEMBERS
Summary Task Research	6/4/2007	6/21/2007	17	23	L, I
Research data gathered from Spring IPRO	6/4/2007	6/12/2007	8	8	L
Research Institutions for the Blind/Visually Impaired	6/11/2007	6/14/2007	3	10	L, I
Lighthouse visit	6/12/2007	6/12/2007	2	3	TEAM
Blind Swimming Experiment at Keating	6/21/2007	6/21/2007	2	2	TEAM
Project Plan	6/15/2007	6/18/2007	3	10	A, L, MG
Summary Task Primary Research (conduction of interviews and survey)	6/19/2007	7/17/2007	28	57	L, M, I
Assemble a list of appropriate questions	6/19/2007	7/5/2007	3	2	L, M, I
Make contact with blind institutions	6/19/2007	6/26/2007	7	6	L, M
* Contact Wisconsin Center for the Blind and Visually Impaired	6/19/2007	6/21/2007	2	2	L
* Contact Indiana School for the Blind	6/21/2007	6/23/2007	2	2	L
* Contact Illinois School for the Visually Impaired	6/26/2007	6/28/2007	2	2	M
* Contact Coach Jennifer	6/28/2007	6/30/2007	2	2	L
* Contact Mobility Specialist	6/28/2007	6/30/2007	2	2	L
Train Interviewers on Interviewing Process	7/2/2007	7/10/2007	5	1	L, M, I
Clarify interview method	7/5/2007	7/10/2007	3	2	L, M, I
Conduct Interviews and surveys	7/2/2007	7/17/2007	15	40	L, M, I
IRB Application	6/30/2007	7/2/2007	2	6	A, AB, J, L
Code of Ethics	6/30/2007	7/2/2007	2	10	A, L, J, MG
Midterm Report	6/29/2007	7/6/2007	7	10	A, L, MG
Summary Task Follow-up (done in unison w/interview & survey conductio	6/29/2007	7/24/2007	25	22	L, M, I
Interview Transcription	6/29/2007	7/24/2007	25	15	I
Analyze data as it comes in for the design and build team	7/5/2007	7/17/2007	12	10	L, M, I
Thank you	7/12/2007	7/17/2007	5	2	I
Writing Summary	7/17/2007	7/23/2007	5	5	L, I

L	Lissa
M	Mohammad
MG	Miguel
A	Axita
AB	Abin
J	Jeffery
I	Ivan

The revised sub-team & individual task & responsibilities schedule for the **Active Sonar Device sub-team** is shown below and can also be seen in the attached Excel file.

	Week Number	TO DO		SPECIFICS
June	Week 3 *Prepare components* *Project plan and budgeting*	Find lab and equipment/tool access, know our components (specs, limitations, etc), vibration unit, design prototype 1, algorithm for microcontroller.	M: S: J: P:	design prototype 1 lab and equipment access algorithm for microcontroller vibration unit
	Week 4 *Design*	vibration unit (vb), program microcontroller (mc), connect vb to mc, research on any potential health issue involving with sonar technology	M: S: J: P:	schematics of the design peripherals of mc, research on potential health issues program mc work with Ivan on unit housing
July	Week 5 *Analyze and design*	Test transducer, build module for the transducer, and program PSoC, Test 2 for the vibration unit. Health issues	M: S: J: P:	Test transducer, build module Program PSoC, test transducer Health issues, code of ethics Vibration unit.
	Week 6 *Build*	Build device, put together all the components. Test if working.	M: S: J: P:	Oversee all experiments, and testing Produce formal write up for the testing. Document experiments Make needed adjustments.
	Week 7 *Make adjustments/ fine tuning*	make final adjustments, think of alternative ways for the device to run better		everyone performs task under to-do
	Week 8 *Prepare for IPRO*	prepare for IPRO day presentation		

The revised sub-team & individual task & responsibilities schedule for the **Passive Device sub-team** is shown below and can also be seen in the attached Excel file.

Passive Device Team

TASK		START	FINISH	DURATION (days)	HOURS NEEDED (hours)	TEAM MEMBERS
Research Visually Impaired (VI) & Needs		06/04/07	06/19/07	15	22	TEAM
	Review previous semesters research	06/04/07	06/09/07	5	5	TEAM
	Review previous semesters IPRO day	06/04/07	06/09/07	5	5	TEAM
	Visit to Lighthouse	06/12/07	06/12/07	1	3	TEAM
	Research existing patents for VI swimr	06/10/07	06/14/07	4	4	ST
	Presentation of 3 potential passive sol	06/12/07	06/14/07	2	4	ST
	Choose one passive solution to purs	06/14/07	06/14/07	1	1	ST
Research Notre Dame device		06/12/07	06/19/07	7	4	ST
Our redesign of ND device		06/14/07	06/21/07	7	7	G
Materials research		06/14/07	06/21/07	7	7	AB
Materials selection		06/17/07	06/21/07	4	2	AB
Build Prototype		06/21/07	07/01/07	10	19	A,AB,G
	Obtain Materials	06/21/07	06/25/07	4	5	AB
	Find location to build & store prototype	06/21/07	06/25/07	4	2	M
	Construct device	06/25/07	07/01/07	6	12	A,AB,G
Test Prototype		06/19/07	07/08/07	19	13	A,AB,G
	Develop testing design	06/19/07	07/01/07	12	3	AB
	Conduct testing	07/03/07	07/03/07	1	2	A,AB,G
	Record all data	07/03/07	07/03/07	1	2	AB
	Record swimmer's reactions to device	07/03/07	07/03/07	1	2	A
Analysis of Tested Prototype		07/03/07	07/03/07	1	3	A,AB,G
	Review collected data	07/03/07	07/03/07	1	1	A
	Draw comparisons to control test	07/03/07	07/03/07	1	1	AB
	Tabulate calculated data	07/03/07	07/03/07	1	1	G
	Decide if redesign is necessary (Concl	07/03/07	07/05/07	2	1	A,AB,G
Redesign Prototype		07/03/07	07/05/07	2	2	G
Modify prototype according to redesign		07/05/07	07/12/07	2	6	G,AB
	Obtain other materials if necessary	07/05/07	07/05/07	2	2	AB
	Reconstruct device	07/05/07	07/11/07	2	4	G
Testing of Modified Device		07/12/07	07/12/07	1	9	A,AB,G
	Conduct testing	07/12/07	07/12/07	1	3	G
	Record all data	07/12/07	07/12/07	1	3	AB
	Record swimmer's reactions to device	07/12/07	07/12/07	1	3	A
Analysis of Modified Device		07/13/07	07/17/07	4	6	A,AB,G
	Review collected data	07/13/07	07/17/07	4	2	A
	Draw comparisons to control test	07/13/07	07/17/07	4	2	AB
	Tabulate calculated data	07/13/07	07/17/07	4	1	G
	Conclusions	07/17/07	07/17/07	3	1	A,AB,G
Redesign Prototype		07/17/07	07/19/07	2	2	G
Modify prototype according to redesign		07/17/07	07/19/07	2	6	G,AB
	Obtain other materials if necessary	07/17/07	07/19/07	2	2	AB
	Reconstruct device	07/17/07	07/19/07	2	4	G
Testing of Modified Device		07/19/07	07/19/07	1	9	A,AB,G
	Conduct testing	07/19/07	07/19/07	1	3	G
	Record all data	07/19/07	07/19/07	1	3	AB
	Record swimmer's reactions to device	07/19/07	07/19/07	1	3	A
Analysis of Modified Device		07/19/07	07/23/07	4	6	A,AB,G
	Review collected data	07/19/07	07/23/07	4	2	A
	Draw comparisons to control test	07/19/07	07/23/07	4	2	AB
	Tabulate calculated data	07/19/07	07/23/07	4	1	G
	Conclusions	07/19/07	07/23/07	3	1	A,AB,G
Complete Engineers Notebook to be turned in		06/14/07	07/25/07	41	21	A,AB,G
Prepare for IPRO Day		07/18/07	07/26/07	8	48	TEAM

key	
	Milestone
	Revised Schedule
A	Anita
AB	Abin
G	Garrett
M	Mohammad
ST	Entire Sub-Team
TEAM	Entire IPRO team

C. Changes in Team member roles within the team & sub-teams

- Team member's roles within the team and sub-teams have not really changed with the exception of the reassignment of one of the team members from two sub-teams to one sub-team. Specifically, one of the team members who was a part of two different sub-teams was reassigned to be a part of one of the two sub-teams so that he could concentrate on one set of tasks.
- Some role assignments made with new developments in the project are:
    - Micro-controller Programmer: Jeffrey Stanford is responsible for coding the microcontroller so that it correctly operates the transducer to emit a signal.
    - Circuit Designer: Miguel Dela Cruz is responsible for creating a circuit that will allow the microcontroller to operate the transducer.
    - IPRO Deliverable Reports Manager: Axita Patel is in charge of delegating portions of all IPRO Deliverable Reports to fellow team members and compiling rough and final drafts for review.
    - Active Sonar Engineering Notebook Manager: Svetlana Mokhuach is responsible for making sure all design specifications, test plans, data/results, analysis of results, parts listing/pricing and all relevant diagrams are included and organized within the notebook for the active team.
    - Passive Engineering Notebook Manager: Abin Koshy is responsible for making sure all design specifications, test plans, data/results, analysis of results, parts listing/pricing and all relevant diagrams are included and organized within the notebook for the passive team.
    - Business & Marketing Notebook Manager: Elizabeth Bauer is responsible for making sure all interview questions, handwritten & transcripted notes, interviewee contact information, facility visitation information and contacts, directions to facilities, and IRB release forms are included and organized within the notebook for the business team.

D. Why or How team reorganization has occurred

- The reorganization occurred due to one sub-team not having enough tasks to delegate between four sub-team members and another subteam having a significantly large amount of tasks to delegate between three sub-team members.

1.5 Barriers and Obstacles

Business and Marketing Sub-Group

The market research team has had problems finding potential interviewees. Our target is blind or visually impaired individuals who currently swim or have swam in the past. We are also looking for individuals who work with the swimmers, such as coaches or physical education teachers.

A. Obstacles encountered while completing the planned tasks for the project.

- The biggest problem that we are facing is trying to get a hold of such individuals. After doing a lot of research we found that there are schools for the blind and visually impaired and many of these schools have swim teams that compete within the United States. The problem is that because it is currently the summer semester the majority of the staff and students are on vacation until September.

B. How the team or Sub-team resolved these obstacles.

- The people that we have encountered have been extremely helpful and willing to cooperate but many other individuals are on vacation and have yet to return our phone calls and emails.

C. Remaining barriers or obstacles that need to be addressed before the team can successfully complete the planned work.

- One problem is the location of potential contacts from the surrounding blind or visually impaired schools. The closest school is in Wisconsin and is 112 miles away. The second closest school is in Indiana and is 176 miles away and our third choice, located in southern Illinois, 235 miles away. Each person on the marketing subteam works full time and finding time to travel to the school and conduct the surveys and interviews do pose as a problem. A potential problem we are facing is the issue of how to conduct the surveys. The surveys were made to be filled out by close members of the blind or visually impaired, such as family, friends or coaches. The main problem is trying to find these individuals who would be willing to fill out the survey. The IPRO last semester found that family members of the blind or visually impaired are very wary of exploitation and can be very uncooperative with people. A few emails have already been sent out with no reply.

D. How the team or Sub-team resolved these obstacles.

- These problems are going to be resolved by hard work and perseverance. If one door closes we are hoping that another one will open. We are also asking our interviewees if they know of other people who would be willing to work with us and are hoping to find new contacts this way.

Active Sonar Device Sub-Group

A. Obstacles encountered while completing the planned tasks for the project.

- We've encountered many obstacles while completing the planned tasks for the project. First is time management. Managing our time with all the IPRO requirements and the task lined up for the project. Second, unseen technical

difficulties. As we were working on the components of our device we've encountered problem that we didn't expect we have.

B. How the team or Sub-team resolved these obstacles.

- We had to delegate the task evenly to the other team members. Regarding technical difficulties, Ray DeBoth is a huge help if we have any problems or when we don't know what to do.

C. Remaining barriers or obstacles that need to be addressed before the team can successfully complete the planned work.

- There seems to be no remaining barriers that need to be addressed.

Passive Device Sub-Group

A. Obstacles encountered while completing the planned tasks for the project.

- There seems to be one major obstacle that both the team and sub-team encountered and that is in regards to the Institutional Review Board. The IRB for short is an organization that is concerned with the ethical and issues involved in the use of human test subjects. In the case of the passive sub-team, we will be using sighted swimmers and possible visually swimmers to test the effectiveness of our lane tappers.

B. How the team or Sub-team resolved these obstacles.

- The team has collectively addressed the issue of the IRB by filing for IRB to review our investigation and testing procedures.

C. Remaining barriers or obstacles that need to be addressed before the team can successfully complete the planned work.

- Pending the approval of the IRB we hope to conduct further testing of the lane tappers using both sighted and visually impaired swimmers.

D. How the team intends to deal with the identified barriers and obstacles.

- We intend to ensure approval of the IRB by providing them with as much information as possible without violating any confidentiality issues.

2.6 Code of Ethics

Code of Ethics

A. Overarching Principle

- Our team will develop and build a safe, reliable, and cost effective swimming aid to allow blind and visually impaired people to autonomously recreate and exercise through swimming." We are dedicated to improving the quality of life of blind and visually impaired people through the physical activity of swimming".

B. Risks & Integrity Levels

	Pressures	Ethical Risks	Layer
1	IRB compliance	If we don not meet compliance standards we do not have the right to continue working on our project	Law
2	Completing all IPRO deliverables	Not completing all IPRO deliverables may result in overall poor performance evaluation of the entire team. This in turn may affect individual grades.	Professional Codes/ Industry standards
3	Meeting all deadlines	Not meeting all IPRO deadlines may result in overall poor performance evaluation of the entire team. This in turn may affect individual grades.	Professional Codes/ Industry standards
4	Developing a solution	Not developing a feasible and safe prototype could possibly cause harm or be unreliable when used.	Professional Codes/ Industry standards
5	Keeping materials cost to a minimum	Using materials that are not cost effective when alternate materials are available that would accomplish the same goals eats up the budget and reduces the amount of funds available for the entire team.	Professional Codes/ Industry standards
6	Putting together a prototype with enough time to test it	Not being able to finish building a prototype with enough time to test it means that the prototype can not be evaluated as successful or needing modifications.	Professional Codes/ Industry standards
7	Developing a test plan that encompasses all the variables that need to be tested	Not developing a test plan that encompasses all the variables involved in the use of the prototype means that the prototype can not be objectively evaluated to be safe and successful.	Professional Codes/ Industry standards
8	Meeting the needs of the customer	Not meeting the needs of the customer means the design, the prototype and the testing failed to fulfill all of the criteria required for the prototype to be considered successful.	Contract/Professional Codes/Industry Standards

C. Canons & Codes

	Pressures	Principle
1	IRB compliance	We will meet IRB compliance issues to the best of our ability.
2	Completing all IPRO deliverables	We will complete all IPRO deliverables in a timely manner to the best of our ability.
3	Meeting all deadlines	We will meet all deadlines pertaining to IPRO and the project with quality work or well thought out recommendations.
4	Developing a solution	We will develop a solution that is both safe and reliable.
5	Keeping materials cost to a minimum	We will use materials that meet the requirements of our design and that are cost effective.
6	Putting together a prototype with enough time to test it	We will create a simple prototype that can be tested to the best of our ability.
7	Developing a test plan that encompasses all the variables that need to be tested	We will develop a test plan that encompasses as many variables as possible to the best of our ability with the room to modify and retest our prototype.
8	Meeting the needs of the customer	Will meet the need of the customer to the best of our ability.

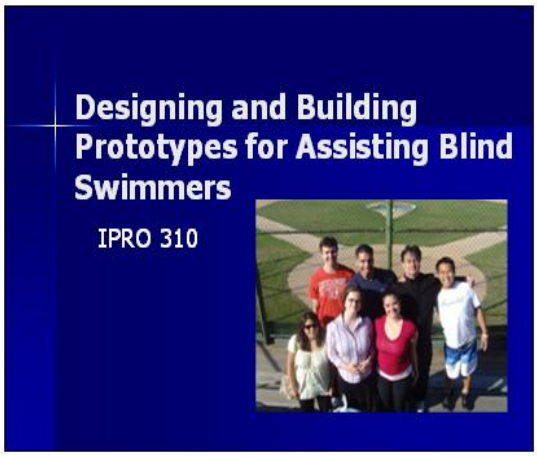
Principles

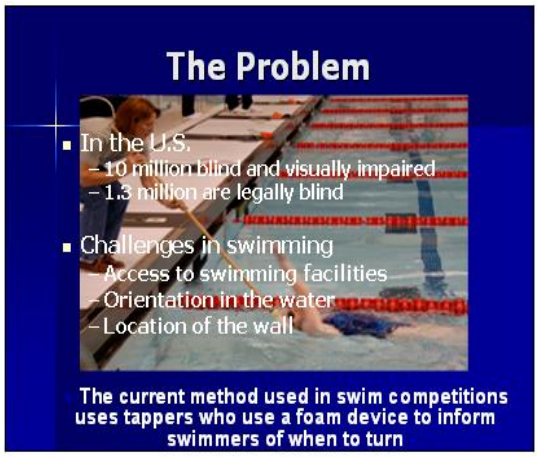
1. We will comply with all IRB regulations to the best of our ability.
2. We will complete all IPRO deliverables in a timely manner to the best of our ability.
3. We will meet all deadlines pertaining to IPRO and the project with quality work or well thought out recommendations.
4. We will develop a solution that is both safe and reliable.
5. We will develop a prototype that can be tested in the time available to the best of our ability.
6. We will develop a test plan that encompasses as many variables as possible to the best of our ability with the room to modify and retest our prototype.
7. We will meet the needs of our customer to the best of our ability.
8. We will maintain the confidentiality of all our interview and test subjects.
9. We will obey all laws pertaining to the interviewing and testing with minors.
10. We will honestly represent our accomplishments or lack thereof.
11. We will treat our customers and test subjects with respect.

D. Ethics Issues & the Team

There have not been any significant ethical issues that the team has faced. However, some smaller ethical issues the team has faced include an unfair distribution of tasks. Some team members experienced role overload in the face of so many IPRO deliverable deadlines as well as project deadlines that included the deadline for the submission of the IRB form. A select few team members experienced task under-load but failed to volunteer for additional tasks because of a lack of knowledge and experience that these tasks involved. Another issue concerned the use of project designated funds. The team discussed the potential involved in spending a portion of the project budget for further testing of the passive prototype in lieu of spending these funds on a business and marketing related interview.

2.7 Midterm Presentation



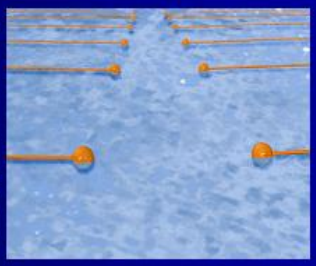


Next Steps

- Scheduled interviews with:
  - 2 Swimming Coaches from Wisconsin School for the Blind and Visually Impaired (WCBVI)
  - 1 visually impaired swimmer on WCBVI swim team
- Tentative Interviews
  - Chicago Swimming Coach for the visually impaired
  - Mobility Specialist
- Survey Conduction

Passive Device Team

The Tapper Solution



First Test

First Prototype

Active Sonar Device Team

- Design and build a prototype that will help visually impaired people swim
- Prototype
  - Continuing last semester's design
  - Sonar
  - Strapped to the body
  - Vibrates to let swimmer know where the end of the lane is

Sonar Underwater Personal Anti-collision Device (SUPAD)

- Transducer
- Microcontroller
- Vibration Unit

Accomplishments

- Attended the Cypress PSoC seminar
  - Learned how to use and program the microcontroller
- First experiment in the pool
- Preliminary testing of transducer
- Developed basic algorithm for the microcontroller
- Researched possible health risks

Next Steps

- Build circuit for transducer
- Program microcontroller
- Find suitable vibration unit
- Combine individual parts