

IPRO 310: Swimming Aid for Visually Impaired Swimmers

Advisors

David Gatchell
Ken Schug
Frank Lane
Shital C Patel
Fiona Daay

Active Device Team

Daniel Chiu
Vaibhav Gupta
Jan Teves
Lorne Turrentine
Hsuen Yew
Sikander Soleja

Passive Device Team

Arun Sood
Jodi Warns
Neha Padwal
Lisa Reed
Sunny Sajjad

Abstract

The primary focus of this project is to help blind and visually impaired individuals to swim independently. The team will be divided into two sub-teams. One sub-team will create a passive device, which uses a mechanical device to provide tactile feedback to the swimmer. The other sub-team will create an active device which uses special electronic devices such as a sonar based device to help guide the swimmer. These devices will be repeatedly tested and updated to help increase the independence of blind and visually impaired individuals exercise and further improve their quality of life.

Background:

I PRO 310 is a project aimed at enabling the blind and visually impaired individuals to swim at ease without any of their physical disability hampering their activity. There are a total of 40 million people who are blind and around 120 million people having visual disability. This type of serious visual impairment has left merely 25% of the population to participate in various activities. Though there are instructors for the blind and visually impaired to aid them in their endeavors, there is a dearth of non-invasive technology that can be provided to them for additional support and assistance. I PRO 310 aims at filling the void in assistive technologies present for blind and visually impaired swimmers by designing, documenting, testing and marketing the prototype. The team is comprised of students from different fields of engineering and science to make the goal achievable. This I PRO also has collaborated with the Chicago Lighthouse, enabling us to have a deeper understanding of the common and basic problems faced by the visually impaired individuals and what they expect from our outcome in order to feel independent in water. The Chicago lighthouse supports us in our mission by encouraging interaction among the unfortunate individuals.

Passive Team

This issue is being resolved in two ways. One way is by using a passive device and the other way is by using an active device. The passive device comprises of side tappers and icicles that signal the swimmers of their diversion from their central track and movement in a zig-zag pattern. Tappers also had been hired for visually impaired individuals to warn them of the end of the lane. This was done by tapping them at a proper location on their back. However, there had been loopholes in these methods, the presence of side-tappers left the swimmers bruised or scraped by the end of their swimming and for the tappers to do a good job, the swimmers had to be trained efficiently. To overcome these problems, the passive team has decided to modify the previous versions and design new assistive devices that could eliminate the problems faced by the blind and visually impaired people.

Active Team

Active devices deal with the electronic devices and wireless communication through RF signals. Visually impaired people while swimming put on these devices. These are smaller, more versatile and do not deprive the swimmers from their independence. Sonar devices technique being one of the very effective technologies used previously. The last I PRO Team Members used ‘Snorkel Devices’, which was found really effective. Snorkel in some extent has taken place of ‘End Tappers’ by giving signals to the blind swimmers with the help of receiver, process known as ‘Bone Conduction’.

Main issues which needs to be fixed from last few semesters will be: We should conduct more test to develop easy vibration language to communicate with swimmers in effective manner. This can be done trying different types of vibrations. After going through the pool test being conducted last semester, it shows that almost ninety nine percent people emphasized on using high intensity vibrations. So there should be a way to adjust the vibrating intensity as per the different swimmers need. Devices should be adjustable to user preferences as for example of vibration belt worn by the swimmers was coming off again and again because it was lacking multiple usage factor. Make device simple in operation and smaller in size. After looking through few tests held last semester, it shows that size of the device could have been further decreased.

Objectives:

The goal for IPRO 310 is to create a device to assist the blind so that the blind can have an opportunity to swim. Presently there is no device on the market to help a blind swimmer. There have been devices made for a blind swimmer formed by students, but haven't gotten any further than their schools pool.

Active team

1. Improve on past device by researching new technologies and ideas for active device.
 - a. Choose two most promising solutions to develop.
 - i. RC/RF
 - ii. LVDT
 - iii. Other alternatives
2. Develop and test methods of communicating with swimmers.
 - a. Sound
 - i. Tones
 - ii. Voice commands
 - b. Vibrations
 - i. Intensity
 - ii. Location
3. Design new housing for equipment that utilizes equipment non-blind swimmers use to prevent putting the swimmer at a disadvantage.
 - a. Swim cap
 - b. Goggles
4. Test and calibrate new equipment to determine the best solution.
5. Move toward a more independent device that does not require another person for assistance.
6. Consider the use of the device in other physical activities

Passive Team

1. Look at the previous data and decided how to alter the device to the specifications of what the blind swimmer prefer.
2. Test out the new device.
 - a. Get more feed back from the swimmers and decided what needs improving.

- b. Test out the device out again with a different group of people and collect feedback as well.
- 3. Decide whether the device is ready for the business market.
 - a. If the device is ready, contact companies to know whether they are interested.
 - b. If the device is not ready, group will decide the next plan of action.

Methodology

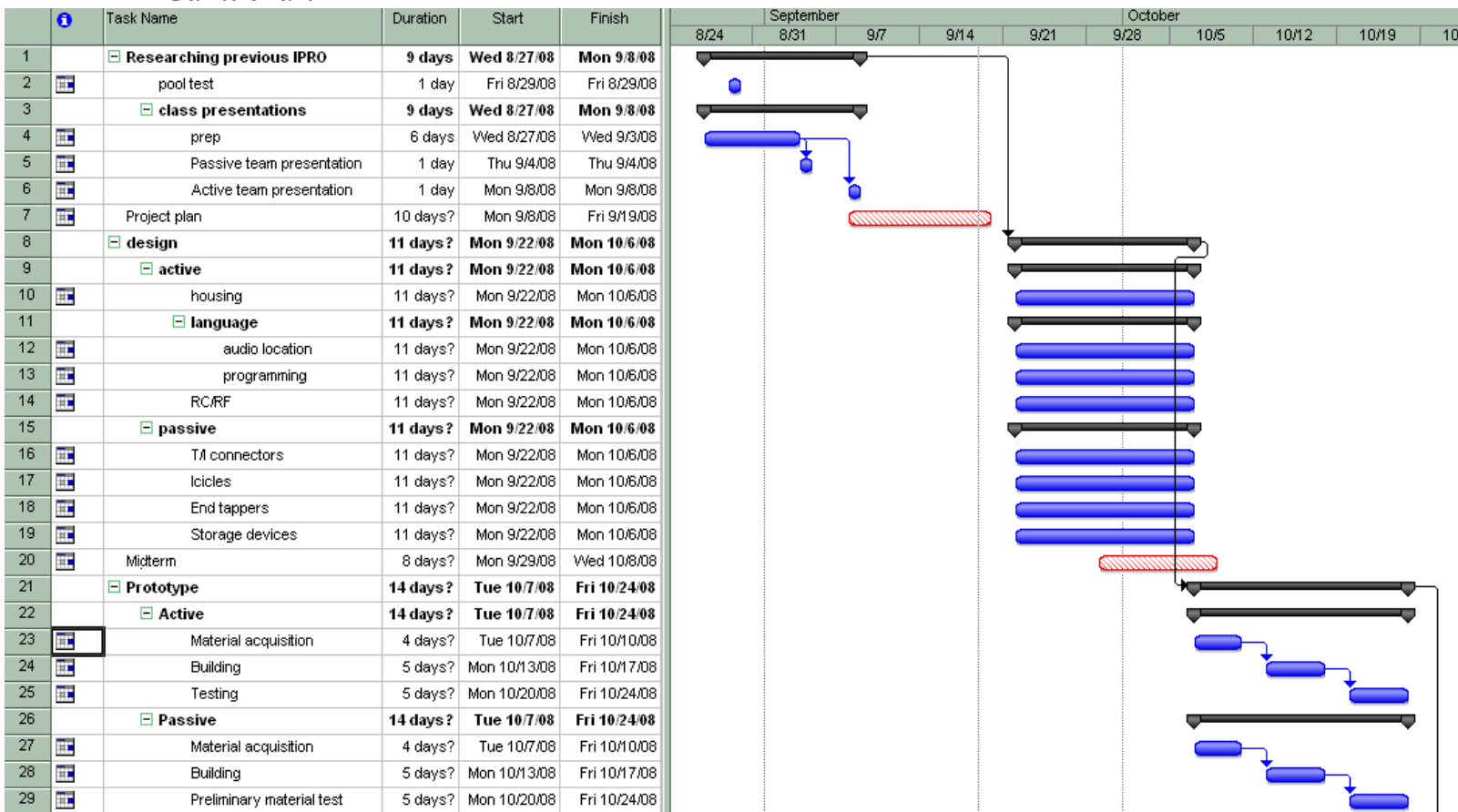
● Project management	
○ Research of previous IPRO semesters	177
	HOURS
● Class presentations	30
● Prep	50
● deliver	22
● Engineering notebooks	25
● Pool test	20
● Assessing current devices	50
○ Design	180
	HOURS
● Active	80 hours
● housing	20
● language	40
○ audio location	20
○ programming	20
● RC/RF	20
● Passive	80 hours
● T/I connectors	20
● Icicles	20
● End tappers	20
● Storage devices	20
○ Prototype	560
	HOURS
● Active	330 hours
● Building	200
● Testing	80
● Material acquisition	50
● passive	230 hours
● Material acquisition	15
● Preliminary material test	15
● Building	200
○ Testing	250
	HOURS
● IIT pool test	50 hours
● Swim team members	
● Wisconsin School for Blind	150 hours
● November 7-9	
● Analysis	50 hours
○ Deliverables	120
	HOURS
● Project plan	20

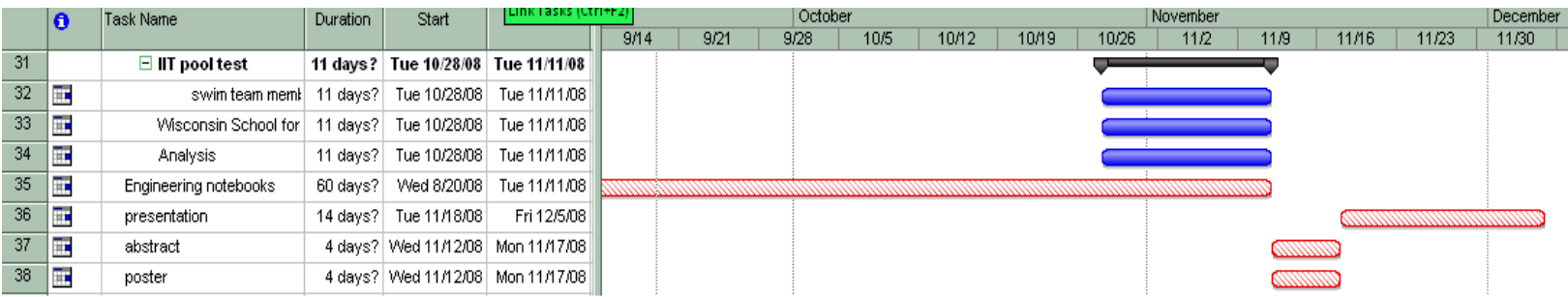
- Midterm 50
- IPRO day 50
 - presentation
 - abstract
 - poster

Task Durations

8/29/08→ 8/29/08	Pool Test
8/29/08→ 9/24/08	Analyze Previous IPRO information
8/27/08→ 9/3/08	Passive Team Presentation
8/27/08→ 9/8/08	Active Team Presentation
9/8/08→ 9/19/08	Project Plan
9/12/08→ 9/12/08	Chicago Lighthouse Trip
10/06/08→ 10/08/08	Midterm Review
9/24/08→ 10/6/08	Design of Prototype (Active and Passive Team)
10/6/08→ 10/13/08	Engineering Notebook
10/07/08→ 10/28/08	Prototyping
10/28/08→ 11/11/08	Testing
11/11/08→ 11/18/08	Analysis and Engineering Notebook Update
11/18/08→ 11/26/08	Posters
11/18/06→ 12/05/08	IPRO Presentation Practice
11/24/08→ 11/26/08	Future plans and suggestions of next IPRO

Gantt chart





Budget

	Passive Team	Active Team	Whole Team
Building costs	\$150	\$150	
Prototype Materials	\$400	\$500	
IIT Pool Tests			\$100
Wisconsin Pool Tests			\$250
Travel			\$100
Volunteering Incentive			\$80
		Total Budget	\$1,730

Team Structure and Assignments

Name	Major	phone number	Year	Subteam	Skills
Sunny Sajjad	Biochemistry	██████████	4th	Passive	Biochem lab tech experience, MS Office, Sales, Manager
Hsuen Yew	BME	██████████	4th	Active (leader)	Ms Office, Basic C language, Matlab, Bio lab technique, Foreign Languages
Jodi Warns	BME	██████████	4th	Passive (TeamLeader)	MS Office, matlab, chem & bio lab techniques
Arun Sood	Biochemistry	██████████	4th	Passive (leader)	Microsoft Office, C++, Organized, chem & bio lab techniques
Neha Padwal	BME	██████████	4th	Passive	MS Office, chem & bio lab techniques
Lorne Turrentine	ME	██████████	4th	Active	Matlab, AutoCAD, Basic C++, Maple, MS Office
Sikander Soleja	ME	██████████	4th	Active	Mechanical design, MS office, AutoCAD, Matlab
Jan Teves	ME	██████████	3rd	Active	AutoCAD, Pro Engineer, MATLAB, Maple, MS office, Access, C++, Labworks, Solidworks
Daniel Chiu	AeroE	██████████	3rd	Active	C++, Qbasic, Woodworking, Riveting, Matlab, MS office, AutoCAD, Cad Key, Manual drafting
Lisa Reed	Psychology	██████████	3rd	Passive	MS Office, C++, Physic, Bio & Chem lab
Vaibhav Gupta	EE	██████████	4th	Active	MS Office, Matlab, Macintosh, electrical concept
Fiona Daay	Architecture	██████████	5th	N/A	
Shital Patel	EE	██████████	4th	N/A	
David Gatchell	BME	██████████	ph.D	N/A	
Frank Lane	Psychology		ph.D	N/A	
Ken Schug	Chemistry	██████████	51st	N/A	

	Available
	Tentative
	Not available