

Project Plan

IIPRO 350

Instructor: Jim Braband braband@iit.edu

September 2009

TEAM CHARTER

1. Team Information

A. Team Contact Information

Braband, Jim	braband@iit.edu	
Bubert, Casey	cbubert@iit.edu	
Fairall, Earl	efairall@iit.edu	
Hopkins, Dong	dhopkin1@iit.edu	
Hutchins, Sarah	shutchi1@iit.edu	
Kobayashi, Jonathan	jkobaya1@iit.edu	
McCluskey, John	jmclusk@iit.edu	
Pain, Muhammad	mpain@iit.edu	
Patel, Purvag	ppate29@iit.edu	
Roa, Carlos	croa1@iit.edu	
Spitler, Noah	nspitler@iit.edu	

B. Team Time Availability

	8a	9a	10a	11a	12p	1p	2p	3pm	4p	5p	6pm	7pm	8pm	9pm	after
Monday															
Bubery, Casey															
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Hutchins, Sarah															
Kobayashi,															
McCluskey, John															
Pain, Muhammad															
Patel, Purvag															
Roa, Carlos															
Spitler, Noah															

C. Team project information

Name	Major/Year	Skills and Strengths	Skills to develop	Project Expectations
Earl Fairall	4 th year aerospace and mechanical engineer	-Strengths: Technical Project Leader/Coordinator -Other: MATLAB, ProE, Solidworks, AutoCad, Excel	Fine tune leadership and management abilities.	Well Developed Business Plan, and functioning prototype by the end of the semester
Dong Hopkins	5 th Year Business Marketing	-Strengths: Easily work with others -Skills: Excel, Word Networking with people	Improvements in Business Marketing	
John McCluskey	5 th Year Mechanical	-Technical, Fabrication -Machining, Welding	Electronics, Solid Modeling	Construct a functional prototype
Carlos Roa	3 rd Year Mechanical	-Physicist -Low level C programming	-Business development and leadership.	-Construct a prototype and have a business plan.
Casey Bubert	4 th year CS	-coding -software design	Low level C coding	
Jonathan Kobayashi	3 rd year Electrical Engineer	-some coding experience --graphic design -electronic design	-Technical writing -Product design	-Successfully demonstrate a concept with a prototype
Noah Spitler	4 th Year Aerospace	-Leading small and large groups of 10-130 people -Mathematics -Graphic and mechanical design	-Technical fabrication, coding, and electronics	-Propose and test original idea that influences science and industry
Purvag Patel	4 th Year Mechanical Engineering	Strength: Business Project, Leader/coordinator, Pro/E, Excel, Presentation Skills	Market research, patent research	Working with the business team and gauging the size of target market

Muhammad ridzuan	3 rd year Electrical Engineer	-circuit design -coding experience	Business plan, IP, market research	Successfully demonstrate a concept of entrepreneur.
Sarah Hutchins	3 rd year Electrical and Computer Engineer	Skills: - C/C++ - some circuit design	- Electrical designs - Low-level C++ programming	Design a proof of concept prototype for an idea that solves a genuine problem.

D. Team Identity

- I. Name: Smart Specs
- II. Logo? (we will worry about it by ipro day)
- III. Moto: Changing the way you see the world

2. Team Purpose and Objectives

A. Team Purpose: Develop a system that provides hands-free networked navigation and tracking capabilities and assess the market opportunity.

B. Team Objectives:

- I. Develop a functional prototype to demonstrate the unique underlying concept being addressed by the IPRO.
- II. Provide a comprehensive study of the applications for which the technology can be further developed and implemented.
- III. Perform a formal opportunity analysis for the technology.

3. Background

GPS modules and tracking devices have influenced many advances in modern technology. The data GPS provides has replaced the map and compass, and can be crucial in many situations. Its current platform for use however requires the user to utilize a handheld device and direct his/her frame of view to a screen. In many situations there is a need to have eyes on and full awareness of surroundings, something that simply can't be done while holding and viewing a handheld device. To solve this dilemma, team Smart Specs has integrated ideas of GPS, heads-up displays, and datalink technology to form a design that will give the user full hands free capabilities. This device, worn like glasses, allows the user to track objects and even designate objects to be tracked, which are all shown through heads-up display.

Given the example of a possible user, a US Soldier: Imagine being on the battlefield and in the middle of a firefight. There is ordinance going off around you and bullets whizzing around. You

have lost your fellow squad members and need to get to the waypoint. You don't have time to take out your GPS device and look at it, you have to have eyes on the field and have your weapon ready. This is where the Smart Specs come in. They are worn like glasses so your hands are free. Through the glasses you see everything in front of you, but you also see a real-time head-up display of information. The information is tracking the GPS in your teammates Smart Specs and there are small arrows in your field of vision that point to where they are. There is also another arrow pointing to your desired waypoint, which was preprogrammed. And even with all of that information, you still have more capabilities. Now you see a targeted area which was critical to the mission. The coordinates of that area weren't known before, and now you need your teammates to know where it is. You look directly at the point and simply push a button. The laser designator on your Smart Specs locates the point and instantly sends the information to GPS to determine the coordinates. An arrow now appears on your teammates screen and they are able to track the critical point that you designated. With all of these capabilities you have been able to determine where your teammates are, determine where you need to go, designate a location for all of your teammates to be aware of, and you have had your situational awareness and weapon ready the entire time. There are many other possible applications that would utilize this technology well. The example given shows how all of these features can be used.

A. Potential uses of our product could include:

- I. Military – Options for military include reconnaissance and battlefield awareness. Applications could be used in all aspects of personnel war-fighting efforts but would be targeted towards special operations units. Different interests groups would include, Marine Recon, Navy Seals, Air Force Para-rescue and Combat Control, and Army Delta Force, Rangers, and Green Berets.
- II. SWAT/Search and Rescue/ Fire – Options would include search and rescue, surveying, and critical point awareness. Applications could be used in locating critical points of interest and tracking features for high-risk scenarios. Different interest groups would include police forces, fire-fighting units, and emergency medical units.
- III. Sightseeing Specs – Options would include static function tourist's attractions for locating points of interest and dynamic model for outdoorsmen/outdoorswomen seeking tracking and GPS capabilities. Dynamic applications would be targeted towards outdoor recreation applications. Different interest groups could include hikers, campers, etc.

B. User Problems

- I. The user may encounter different problems with the application of Smart Specs such as failures to receive GPS information due to limited satellite information sources.
- II. The user may also encounter problems with potential damages to the device as they will use in rugged conditions and potentially dangerous situations.

C. Technology Involved

- I. Global Positioning System - The Global Positioning System (GPS) is made up of 3 parts: between 24 to 32 satellites that orbit Earth, 4 control and monitoring stations on Earth, and GPS receivers. GPS satellites broadcast signals to GPS receivers on Earth in order to provide latitude, longitude, altitude, and GPS time to the user.
- II. Heads-Up Display - A Heads-Up Display (HUD) is a transparent display that presents data to the user without having the user look away from his or her usual viewpoint. This is opposed to a Heads-Down Display (HDD) which requires the user to look away from his or her usual viewpoint to read information. An example of an HDD is the dashboard in a car.
- III. Digital Compass - A digital compass, sometimes called a magnetometer, is used to tell direction. Most digital compasses come in an integrated chip that can decode sensor data and send that data digitally through serial communication.
- IV. Microcontroller - A microcontroller is a small computer on a single integrated circuit that usually includes a central processing unit (CPU) combined with support for other functions like crystal oscillator, timers, serial and analog I/O, etc.
- V. Wireless communication - There are many types of wireless communication techniques from radio waves to lasers.

D. Historical Success and failure of similar systems

- I. Virtual Reality - Virtual reality allows a user to interact with a computer environment, usually through a visual experience.
 - II. Fighter jet helmet mounted display system - The F-35 Joint Strike Fighter (JSF) uses a Helmet Mounted Display System (HMDS) that gives the pilot the ability to operate effectively in day and night conditions. The HMDS projects images on the visor of the helmet to aid him in situational awareness and tactical capability. Because of the HMDS, the JSF is the first tactical jet fighter in 50 years to fly without a cockpit mounted HUD.
 - III. HUD unit for personal navigation - A wearable heads-up display unit has not been made for personal navigation.
 - IV. GPS navigation - A successful system used for personal navigation is GPS navigation. These devices can be found in electronics stores and included in some automobiles on the market today. GPS navigation uses your current GPS location, your destination, a compass, and algorithms that determine the best route for you to travel. However, these units are Heads-Down Displays requiring the user to look away from his or her usual viewpoint. They also do not have the ability to communicate with other units to guide multiple users towards a common location.
- E. Known Ethical Issues: Ensuring that the software being used for the project is licensed for appropriate purpose and not violating any copyright laws.

F. Business or Societal Costs of the Problem:

Military Application: For communication in the field, radios other tools are used to give commands or coordinates. Furthermore, by the time the information is given, the data may be too old of use. This cost soldiers and commanders time that can't be afforded. Every second counts in the field.

Civilian Application: In search and rescue, coordination and teamwork is the key in finding casualties on time to save lives. In searching for people, how fast a person is found determines the outcome of the situation. Furthermore, in finding a lost person with volunteers, a risk may be present where more people would be lost. Searching in a pattern may not be enough to increase the chances of finding the person.

G. Research about similar products or ideas

- I. Similar products exist such as GPS devices which allow users to track the corresponding distance and direction to other sources.
- II. Heads-Up Displays also exist for fighter jet aircraft and allow the pilot to track targets similar to the function of the Smart Specs.

H. Attach any critical documents that provide a particularly useful framework for the problem (see Addenda B)**4. Team Values Statements****A. Expected Team Behaviour**

- I. Team members should show up for all classes, show up on time and stay for the entire duration of the class. Any absences or early leaves should be brought up with the team (other than emergency situations). In the case of an excused absence the proper procedure will be to notify the team well in advance.
- II. Team members should meet with their sub team members other than the class time at a mutually convenient sub team meeting time.
- III. Team members should regularly read follow up email about the IPRO as well as keep track of concerned project updates on iGroups.
- IV. Team members should prepare a short report of each week's progress to be presented at the beginning of each class to the rest of the team members. This can also be integral part of any sub team reports that the team members is a part of.
- V. All team members should commit to meet the set objectives by IPRO day and shall show up for the same to represent the team on IPRO day.

B. Team Dynamics and Ethics Discussion

- I. All team members should actively take part in class discussion and voice their opinions.
- II. Each team members should be committed to promote a healthy argument atmosphere and hence should not call out on other team members by making personal remarks or ethical criticisms.
- III. Extremely debatable and controversial issues should be tabled until the next meeting and further discussion shall be promoted on forums (discussion threads in iGroups) following further introspection/research and a decision shall be made in sub team meetings or the next all class meeting.
- IV. If Inter-team member conflicts cannot be resolved by the individual involved parties, team members should bring up any conflicts with other team members to the IPRO instructor or the appropriate team/sub team leaders.
- V. All team/sub team members should make sure that all the members on their team/sub team are showing equal commitment towards the efforts put in.

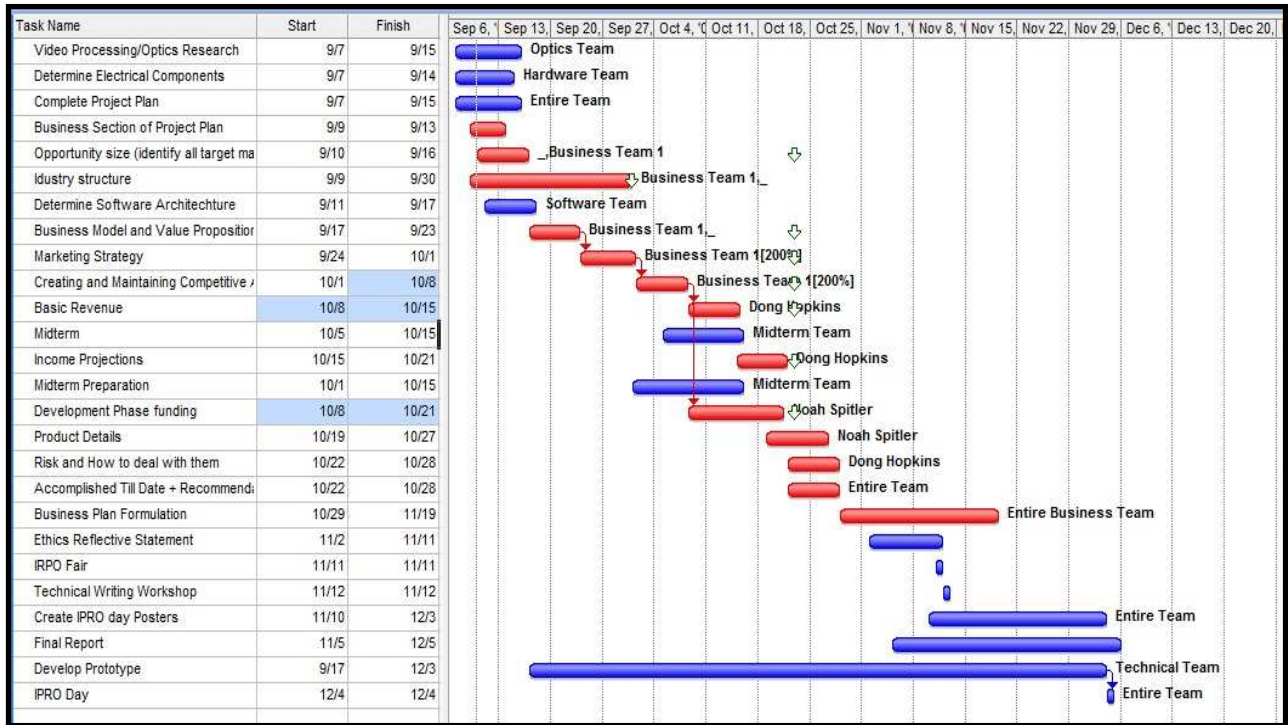
PROJECT METHODOLOGY

5. Work Breakdown Structure

A. Problem Solving

- I. As this project will be largely business and product development, much of the tasks preformed will be research based. Any topics researched will have documentation with a predefined format posted on iGroups. People doing any research will be expected to give a short update in class on the information they have discovered.
- II. Major tasks
 1. Identified in the gantt chart below.
- III. Any Legal or patent inquires will be contracted to a third party group at IIT Chicago-Kent Law School
- IV. We feel that the goals we have set forth in the gantt chart (see INSERT SECTION below) are able to be fulfilled by the end of the semester. We do expect to see an initial business plan and product prototype by the end of the semester, we do not believe that will be the final business plan or final prototype or final product concept. We fully expect to expand our business plan and product ideas if the EnPRO continues to future semesters.

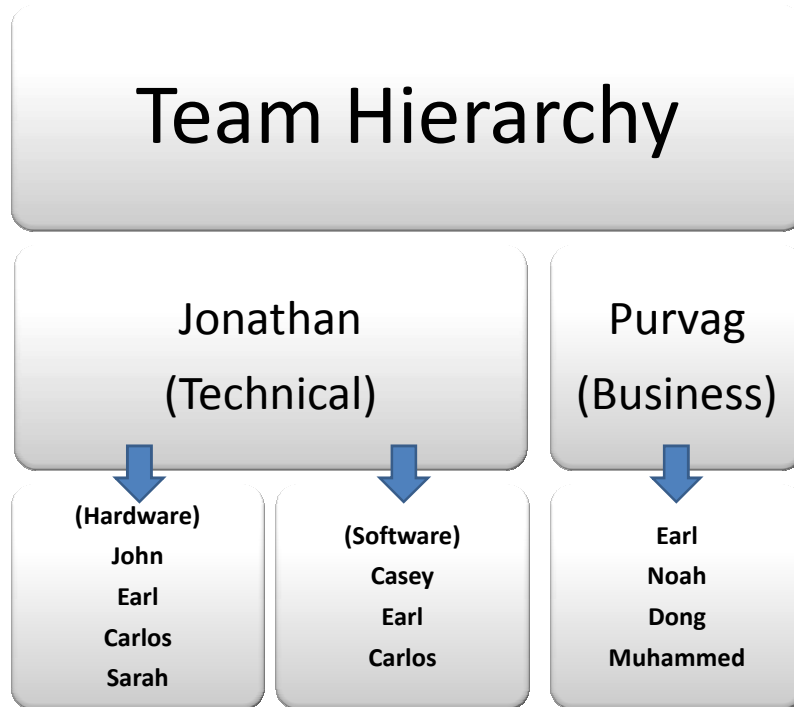
V. GANTT CHART – Project Task Breakdown



B. Team Structure

Team Hierarchy Structure

- I. Team Leaders: Purvag Patel and Earl Fairall
- II. Team structure hierarchy chart



- III. Sub-Team breakdown and responsibilities

Business Team	Technical Team		
	Hardware	Software/Logi	Optics
Purvag	Jonathan K.	Casey	Carlos
Earl	John M.	Earl	Casey
Noah	Earl		
Dong	Carlos		
Muhammed	Sarah		

Sub-Teams will be expected to change as project dynamics change throughout the course of the semester. Currently foreseen sub-teams including their membership are shown above. Definitions of these teams are found below.

The Hardware Team is going to be in charge of determining which physical electronic components and interfaces are necessary to make our prototype function

The Software/Logic Team will be in charge of the code used in getting the prototype to function correctly

The Optics Team will only exist during the early days of the semester. They will be doing research on video processing and cameras, which the intention of potential integration to this project in the future.

The Business Team will be solely involved in strengthening, developing, and branching out the business plan of our EnPRO.

IV. Sub-Team Leadership is highlighted in green in the sub-team chart above.

6. Expected Results

A. Expected Activities

Technical Side: Creation of a functional prototype based on the concept

- Hardware and Software
- Demonstration of the concept in action

Business Side: Research and Marketing of Product

- Attractive name of device
- Research of potential applications
- Target Market
- Size and need of the Market

B. Expected Data:

Technical Side:

- A networked tracking system capable of communication among the devices
- Different versions to meet the need of the target market

Business Side:

- Target Market: Military, Civilian, Recreational
- Size of target market
- Competitor analysis

- Customer needs analysis

C. Potential Products:

- Wrist mounted interactive tracking communication device
- Heads-up display specs

D. Potential Outputs

- Functional Prototype
- Opportunity assessment on:
 - Who would use the product
 - Where it should be marketed
 - How big the target market is
 - Other potential applications

E. Expected Results of Deliverables Produced by team

- A functional prototype that conveys the concept
 - Software and Hardware
- A model or depictions of how it will be applied
- Feedback from potential target markets

F. Challenges

In this EnPro, many challenges arise that would affect the group. One would be a similar product already being developed. Another would be the time constraints. The time constraints would strain the development of the hardware and software. Another impact would involve the research returning data that may not be applicable.

Trying to create a unique product and obstacles of researching similar technology is classified.

7. Project Budget

A. Electrical Components - \$600

- I. Micro-controllers
- II. GPS module
- III. Wireless communication module
- IV. Digital compass module

B. Product design/enclosure - \$100

- I. Enclosures for electronics
- II. Wearable headpiece

8. Designation of Roles

- **Minute Taker** (entire team via schedule) Responsible for recording meeting information and posting it on iGroups in a timely manner. The schedule for minute takers is Addenda A.
- **Agenda Maker** (team leaders) The team will be expected to submit items to the team leaders to put on the agenda. Agendas should be posted on iGroups by team leaders sometime before the meeting.
- **Time Keeper** (team leaders) In charge of moderating meetings, and making sure important tasks get covered during meetings.
- **Igroups Moderator** (Casey Bubert) Will be responsible for organizing emails, uploaded files, and file systems on iGroups

Addenda A

Instructor: Jim Braband (braband@iit.edu)

Meets: Thursdays 6:25-9:00

Meets at 4C4-1 3424 South State

This is the tentative order in which we will go around taking minutes for the IPRO class.

<i>Meeting Minutes Owners</i>	
9/10/2008	Bubert, Casey
9/17/2008	Fairall, Earl
9/24/2008	Patel, Purvag
10/1/2008	Hutchins, Sarah
10/8/2008	McCluskey, John
10/15/2008	Pain, Muhammad
10/22/2008	Hopkins, Dong
10/29/2008	Roa, Carlos
11/5/2008	Spitler, Noah
11/12/2008	Kobayashi, Johnathan
11/19/2008	Bubert, Casey
12/4/2009	IPRO Day

Addenda B:**Source: Associated Press & other sources**

Based on our research we found that the military is currently funding technologies to develop smarter binoculars and guidance systems. Three such projects which include brainwave binoculars shimer binoculars and data link binoculars are under development. The AP news webpage talks more about this story. The sources are cited as below:-

Dominguez, Alex. "Military developing brainwave binoculars". Associated Press. 9/10/2009
<http://www.msnbc.msn.com/id/25374031/ns/technology_and_science-innovation/>

Specific questions we hope to get answers to before initiating research:

- What kinds of technological advancements are being made in modern military binoculars?
- Are these technologies similar to our ideas or can they be used in conjunction?

- After researching:

Two questions that I have about what I just read that I will share in class for discussion:

- Are these technologies in any way related to ours and if yes how so?
- Can we use any of these technologies or ideas in our research?
- Do any of these existing technologies make our research outdated or unoriginal?

The most important points of our research were:

- The military is paying money for 2 companies to research technologies that would allow binoculars to read and utilize brainwaves to mimic human intelligence capabilities and identify critical components in image processing.
- The military is paying DARPA to research and develop capabilities for binoculars to utilize light refraction and lense-like qualities of "heat haze" to produce clearer images at further distances and readings.

(Addenda B contd...)

- Rumors circulate of the military requesting binoculars that utilize laser communication technology to send information from one set of binoculars to another. This would allow images viewed by one set of binoculars to be viewed by an operator utilizing another set of binoculars in a different location.

Implications or recommendations for our project:

Many of these findings are very interesting and show a military interest in binocular technologies. The last finding seems to show a similar concept to ours but the source does not look too reliable. I could not find any confirmed evidence that the government has a contract for this kind of technology but it seems like an interest is there. I believe the military avenue should be looked into further.