February 2010

IIT
ENPRO
350

PROJECT PLAN

Smart Specs | Reducing Friendly-Fire Casualties in Combat Zones

IPRO 350
Instructor: Jim Braband
February 2010

Team Charter

Team Information

A. Team Roster

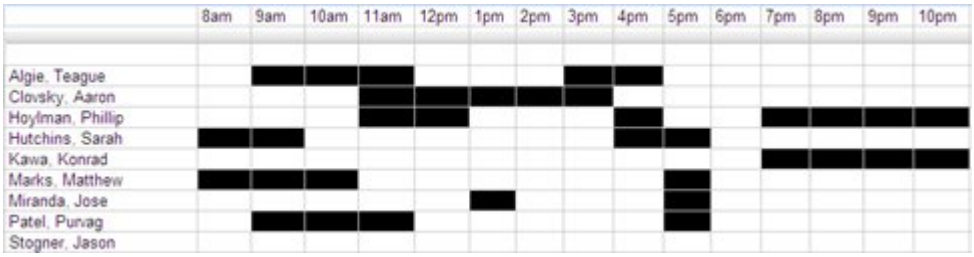
-Team Contact Information

Member Name	E-mail	Phone Number
Algie, Teague	talgie@iit.edu	815-540-3978
Braband, Jim	braband@iit.edu	312-567-5002
Clovsky, Aaron	aclovsky@iit.edu	425-760-3316
Hoylman, Phillip	phoylman@iit.edu	815-325-2435
Hutchins, Sarah	shutchi1@iit.edu	478-227-2631
Kawa, Konrad	kawakon@iit.edu	773-663-1717
Marks, Matthew	mmarks2@iit.edu	316-290-9632
Miranda, Jose	jmirand2@iit.edu	773-742-7573
Patel, Purvag	ppate29@iit.edu	312-890-9584
Stogner, Jason	jstogner@iit.edu	630-373-8506

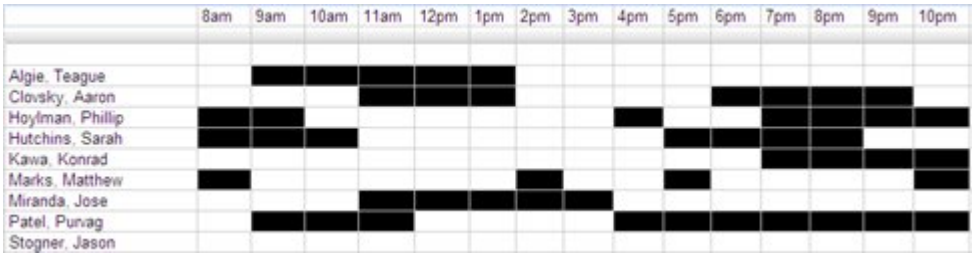
-Team Time Availability

MONDAY

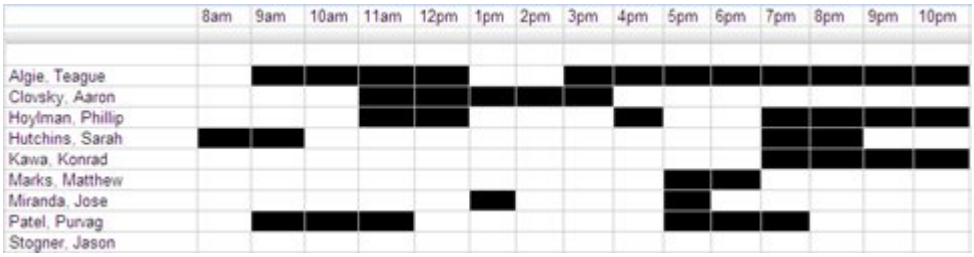
TUESDAY



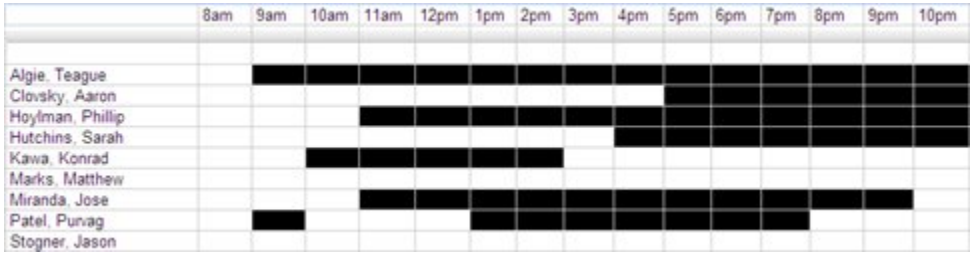
WEDNESDAY



THURSDAY



FRIDAY



SATURDAY

SUNDAY

B. Team Member Strengths, Needs and Expectations

Teague S. Algie
Major/Year: Computer Science 4th year
Skills and Strengths: extensive programming experience, leadership skills
Skills to develop: teamwork
Project expectations: A workable prototype for the smart specs project

Aaron Clovsky
Major/Year: 4th Year Computer Engineering
Skills and Strengths: Electronics background, extensive programming experience
Skills to develop: Interpersonal relations
Project Expectations: Create and demonstrate a working prototype

Phillip Hoylman
Major/Year: 3rd year Business:
Skills and Strengths: Team Player, Business knowledge
Skills to Develop: Business Plan Development
Project Expectations: To meet all of the goals by the end date; have a working prototype and well written business plan

Sarah Hutchins
Major/Year: 3rd Year ECE
Skills and Strengths: Low-level programming, minor electronics
Skills to develop: teamwork, vocal projection
Project Expectations: Develop a functional prototype

Konrad Kawa
Major/Year: 4th Year Electrical Engineering
Skills and Strengths: Electronics
Skills to develop: Interpersonal relations
Project Expectations: Create and demonstrate a working prototype

Matthew Marks
Major/Year: Electrical Engineering 3rd year
Skills and Strengths: Circuit Theory, Electronics, Quick Learner
Skills to Develop: Specifics related to display drivers, wireless communications
Expectations: Cohesive subgroups

Jose Miranda
Major/Year: Electrical Engineering and Mathematics 4th year
Skills and Strengths: Mathematics, Machining, Welding
Skills to Develop: Electronics and Coding
Project Expectations: Develop a functional prototype

Purvag Patel
Mayor/Year: Mechanical Engineering 4th year
Skills and Strengths: Project Coordinator
Skills to Develop: Followup and track keeping
Project Expectations: Startup/LLC creation

Jason Stogner
Major/Year: INTM, Junior
Skills and Strengths: Leadership, innovative
Skills to Develop: engineering based skills
Project Expectations: I see the project being completed before the due date (IPRO presentation day) and the system functioning satisfactorily.

C. Team Identity

Name: Smart Specs

Logo:

Moto: Changing the way you see the world

Team Purpose and Objectives

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

B. Team Objectives:

- Develop a functional prototype to demonstrate the unique underlying concept being addressed by the IPRO.
- Provide a comprehensive study of the applications for which the technology can be further developed and implemented.
- Perform a preliminary business plan for the technology.

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 for our product include:

- 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.
- 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.
- 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

- 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.
- 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

- 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.
- 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.

- 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.
- 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.
- Wireless communication – Made possible through radio waves.

D. Historical success and failure of similar systems

- Virtual Reality - Virtual reality allows a user to interact with a computer environment, usually through a visual experience.
- 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 JFS is the first tactical jet fighter in 50 years to fly without a cockpit mounted HUD.
- HUD unit for personal navigation - A wearable heads-up display unit has not been made for personal navigation.
- 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

- Para-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 costs its users time that can't be afforded. Every second counts in the field.
- Civilian Application: In Scenario-based Paintball, coordination and teamwork is the key to victory on the field. Being able to identify friendly forces on the paintball field prevents the occurrence of fratricide.

G. Research About Similar Products or Ideas

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

Team Values Statement

A. Values

Accountability - Accountability is defined as being held responsible by someone for a certain activity. As a team, we are all held accountable by each other to get our work done, show up to class, and give our best effort all of the time. Accountability is a very important value, which if done right by the entire team, our Ipro will be very successful.

Cooperation - We can look at the term co-operation from various aspects. The dictionary definition of cooperation is "a joint operation or action". The team should be willing as a whole and its members in particular to agree on a solution and follow a particular course of action. Sometimes the situation or plan the team agrees on might not agree with one's personal belief but helping the team out in that situation is also essential for effective cooperation.

Integrity - Doing what is right legally and morally.
Integrity is a virtue, one that enables us all to base our actions off of the ethical framework we have set forth to establish. Another correlation between integrity and ethics can be related to the extent of which a person believes, follows, and exemplifies a group of core values. It is our moral and ethical responsibility to maintain our core values, it is for the benefit of the team that we set aside our ability to skate by, and dedicate ourselves fully to one class in one semester. Maintaining our integrity will ensure that our work is completed, that we divide up our tasks equally, and that the seams that bond our team together maintain intact throughout the remainder of this project.

Motivation
The will to participate in any activity is key to any team member's productivity. Without it there is no meaning in an individuals actions and consequently no reason to perform at the highest level. By fostering a motivational environment through teamwork and cooperation we ensure that every team member has a personal stake in the project and is willing to do their utmost to see the goal accomplished.

Selfless Service - Teamwork is defined by the Random House Dictionary as "cooperative or coordinated effort on the part of a group of persons acting together as a team or in the interests of a common cause." When we say selfless service, we emphasize the last part of that definition, the interests of a common cause. When working on this project, one must put the interests of the team above one's own interests. This means that team members should take on tasks and responsibilities even if it's a little inconvenient, because they need to get done. Unacceptable behavior would be failing to cooperate with and contribute to the

team. This includes refusing to accept tasks, or assigning excessive work to one team member.

Expected Team Behavior

- 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.
- Team members should meet with their sub team members other than the class time at a mutually convenient sub team meeting time.
- Team members should regularly read follow up email about the IPRO as well as keep track of concerned project updates on iGroups.
- 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.
- 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.

Team Dynamics and Ethics Discussion

- All team members should actively take part in class discussion and voice their opinions.
- Each team members should be committed to promote a healthy atmosphere for debate; henceforth, should not call out other team members by making personal remarks or ethical criticisms.
- 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.
- 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.
- 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.

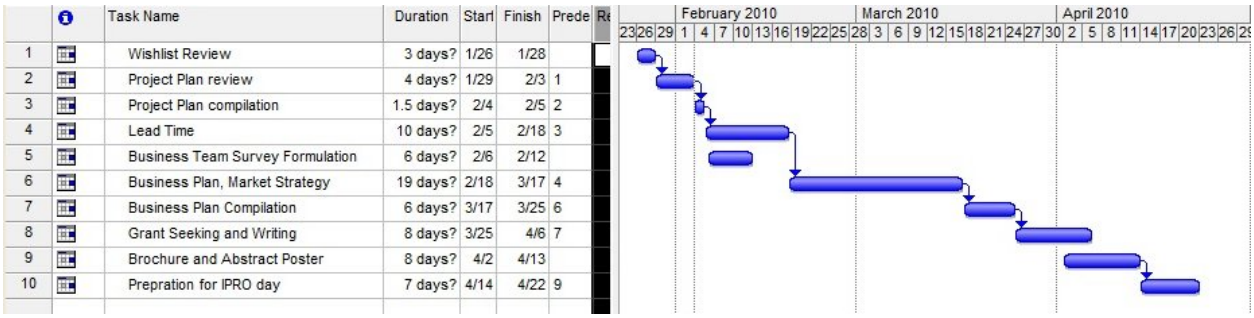
Project Methodology

Work Breakdown Structure

A. Problem Solving

- As this project will be largely business and technical development, much of the tasks preformed will be development and marketing related. 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.
- Major Tasks
    1. Identified in the Gantt chart below.
- Any Legal or patent inquires will be contracted to a third party group at IIT Chicago-Kent Law School
- 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 anticipate this product to develop further in any following EnPRO.

Gannt Chart: Project Task Breakdown

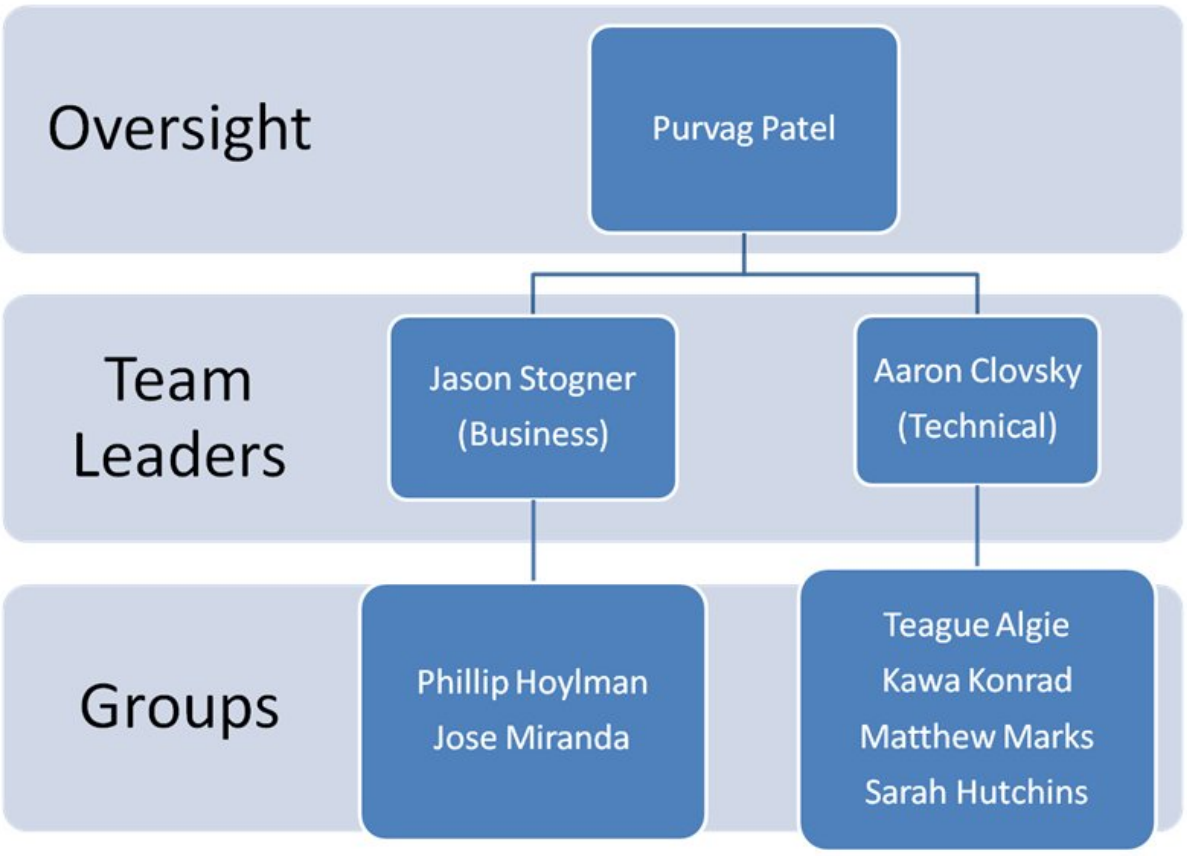


	Task Name	Duration	Start	Finish	Predecessors
1	Wishlist Review	3 days?	1/26	1/28	
2	Project Plan review	4 days?	1/29	2/3	1
3	Project Plan compilation	1.5 days?	2/4	2/5	2
4	Lead Time	10 days?	2/5	2/18	3
5	Business Team Survey Formulation	6 days?	2/6	2/12	
6	Business Plan, Market Strategy	19 days?	2/18	3/17	4
7	Business Plan Compilation	6 days?	3/17	3/25	6
8	Grant Seeking and Writing	8 days?	3/25	4/6	7
9	Brochure and Abstract Poster	8 days?	4/2	4/13	
10	Prepration for IPRO day	7 days?	4/14	4/22	9

PS: Project Timeline (PDF) attached with this file.

B. Team Structure

- Team Hierarchy Chart



Sub-team Breakdown and Responsibilities

- **The Hardware Team** is going to be in charge of determining and developing electrical components and interfaces, which will be necessary for a functioning prototype.
- **The Software Team** will be in charge of writing and debugging the code used in getting the prototype to function correctly.
- **The Business Team** will be involved in developing a business plan, a marketing strategy, and a forecast of revenues and costs of our EnPRO.

Expected Results

A. Expected Activities

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

- Hardware and software
- Demonstration of the concept in action

-Business Side: Research and Marketing of the Product

- Research of potential applications
- Target market
- Size and needs of market
- Financial forecast
- Compilation of market strategy
- Compilation of business plan

B. Expected Data

-Technical Side

- A networked tracking system capable of communication with a central node
- Meet the need of the target market

-Business Side

- Target Market: Para-Military, Civilian, Recreational
- Size of target market
- Competitor analysis
- Customer needs analysis
- Forecast of revenues and costs

C. Potential Products

- Augmented reality heads-up display with integrated geo-tracking device

D. Potential Outputs

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

E. Expected Results of Deliverables Produced By Team

- A working prototype that conveys the basic functionality of the product
    - 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, which leads to hardware and software interfacing issues. 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.

Project Budget

Electrical Components - $680

- Wii Motion Plus
- GPS Shield
- SANAV FV-M8 (EB-85A) 5Hz GPS Engine Module
- XBP24-ACI-001 Wireless chip
- KCD-QDNF-AA LCD Screen
- KCD-A210-BA Display Driver
- Spartan 3E
- Fabrication Materials
- Webspace

LLC Setup Fee - $930

Project Total: $1610

Designation of Roles

Minute Taker: Sarah Hutchins
Responsible for recording meeting information and posting it on iGroups in a timely manner.

Agenda Maker: Purvag Patel
Responsible for creating an agenda for each team meting, which provides structure to the meetings and offers a productive environment. Agendas should be posted on iGroups some time before meeting.

Time Keeper: Team Leaders
In charge of moderating meetings, and making sure important tasks get covered during meetings.

IGroups Moderrator: Purvag Patel and Jason Stogner
Responsible for organizing emails, uploaded files, and file systems on iGroups.

SMART SPECS — IPRO 350

TIME LINE