IPRO 315 — Project Plan

Improving Drive Through Experience and Operation Economics via Wireless and Mobile Technologies

Mentors:

Dr. Thomas Wong & Tao Shen

Team:

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iFidelity

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I. Abstract

In the previous instances of this IPRO (IPRO 344) the team designed and built a kiosk to contain the electronic components of an intercom system. This system is used primarily at fast food restaurants for traditional drive-up and mobile order taking. The original objective was to improve upon the audio performance of such typical systems by using Class D amplifiers whose energy efficiency is greater than that of previous methods.

The following semesters made further improvements to ensure quality standards were met. This consisted of converting the kiosk audio interface (client-side) and the server-side modules into wireless systems. Additionally, mobile ordering was developed for mobile devices, specifically for the iPad.

The current semester will focus on integrating additional functionality to create a seamless ordering system for fast food restaurants. The team will also develop a point of sale service that will seamlessly integrate traditional and mobile orders, while improving upon the previous semesters systems.

II. Team Charter

1. Team Roster

The following is the current IPRO 315 team roster:

Team Member	Major	Email
Bai, Nan	Business	nbai@hawk.iit.edu
Chung , Haejun	Electrical Engineering	hchung4@hawk.iit.edu
Clauer, Harmony	Computer Science & Computer Engineering	hclauer@hawk.iit.edu
Dragomir-Daescu, Eugen	Biomedical Engineering	edragomi@hawk.iit.edu
Flowers, Kaleyhia	Biomedical Engineering	kflowers@hawk.iit.edu
Joseph, Carnot	Mechanical Engineering	cjoseph@hawk.iit.edu
Lemus, Andres	Architecture	alemus@hawk.iit.edu
Obiahu, Victor	Electrical Engineering	oobiahu@hawk.iit.edu
Sullins, Michael	Psychology	msullins@hawk.iit.edu
Wang, Ruoran	Computer Engineering	rwang27@hawk.iit.edu
Wang, Yan	Computer Engineering	ywang150@hawk.iit.edu

2. Team Information

The following is the breakdown of IPRO 315's skills, strengths, experience, academic interests, team leaders and team involvements:

Team Member	Skills & Strengths	Experience & Academic Interests	Team Leader	Team Involvements
Bai, Nan	Operating Management, Financial Accounting, Financial Management, & Decision Making	Business, Smartphone Development, Economic Analysis	Economics	Purchasing
Chung , Haejun	C/C++ Programming, Java Programming, & Assembly Circuit	Involved in Design & Automation Lab (ECE), Designing Chips		Server & Research and Development
Clauer, Harmony	Objective-C/C++/C/Java/ Python/Assembly Languages, Software Engineering, iOS & Android Application Development, & Design	Software Engineering, Application Development, Design, & Research	Server & Documentation	Web & Media Management
Dragomir-Daescu, Eugen	Matlab, Linux Shell Scripting, & Java	Bio Informatics & Internship at Mayo Clinic	Mobile Applications	Minute Taking & Project Coordination
Flowers, Kaleyhia	C++, Java Programming, &Circuit Assembly	Neural Engineering & Man/ Machine Interface	Purchasing	Web & Media Management & Kiosk
Joseph, Carnot	Matlab, C++, Communication, & Leadership	Tutoring Mathematics, Politics, & Religion	Project Coordination & Documentation	Minute Taking
Lemus, Andres	Verbal and Visual Presentations & Making Things	Construction, Social Art Projects, Urbanity	Web & Media Management	Kiosk & Mobile Applications
Obiahu, Victor	Web development, Java, & C++ programming	Web Development, Circuit Design	Research & Development	Kiosk & Web and Media Management
Sullins, Michael	Computers & Programming	Psychology & Law		Mobile & Research and Development
Wang, Ruoran	Web development, System Administration, Python, Java, & C	Business & Circuit Design		Economics, Server, & Research and Development
Wang, Yan	C/Java/Python Programming & Circuit Design	Web Development, Android Development, & Circuit Design	Kiosk	Server & Mobile Applications

3. Team Purpose

Incorrectly placed orders cost customers time and the fast food industry both time and money. In general, the primary cause of these mistakes is poor quality of speech transmission. Prior semesters, have had teams successfully implement effective audio quality improvements and a completely wireless transmission system without compromising audio quality. The current IPRO 315 team will develop a point of sale service that will seamlessly integrate traditional and mobile orders, while improving upon the previous semesters systems.

4. Project Objectives

The current semester will focus on:

- Creating a simple and consistent user interface for both traditional and mobile ordering systems.
- Developing a low cost back-end system for the restaurant.
- Developing cost projections for company use.
- Creating custom Bluetooth transmitter hardware.
- Supporting additional mobile platforms.

5. Background

A. History

IPRO 315 is the seventh instantiation in a series of projects, formerly identified as IPRO 344. Previous iterations were primarily concerned with audio quality and energy efficiency with the application of fast food restaurant drive-through intercoms.

IPRO 344 constructed and improved a kiosk and an audio electronics system over two semesters. Through multifarious testing and data collection, they were able to determine ideal conditions for microphone type, positioning, depth and distance. They produced a hardware encasement with a simple interface. This led to an improvement in the sound quality and a higher fidelity in the reception and transmission of the customer's voice, such that the probability of interpreting the order correctly is increased.

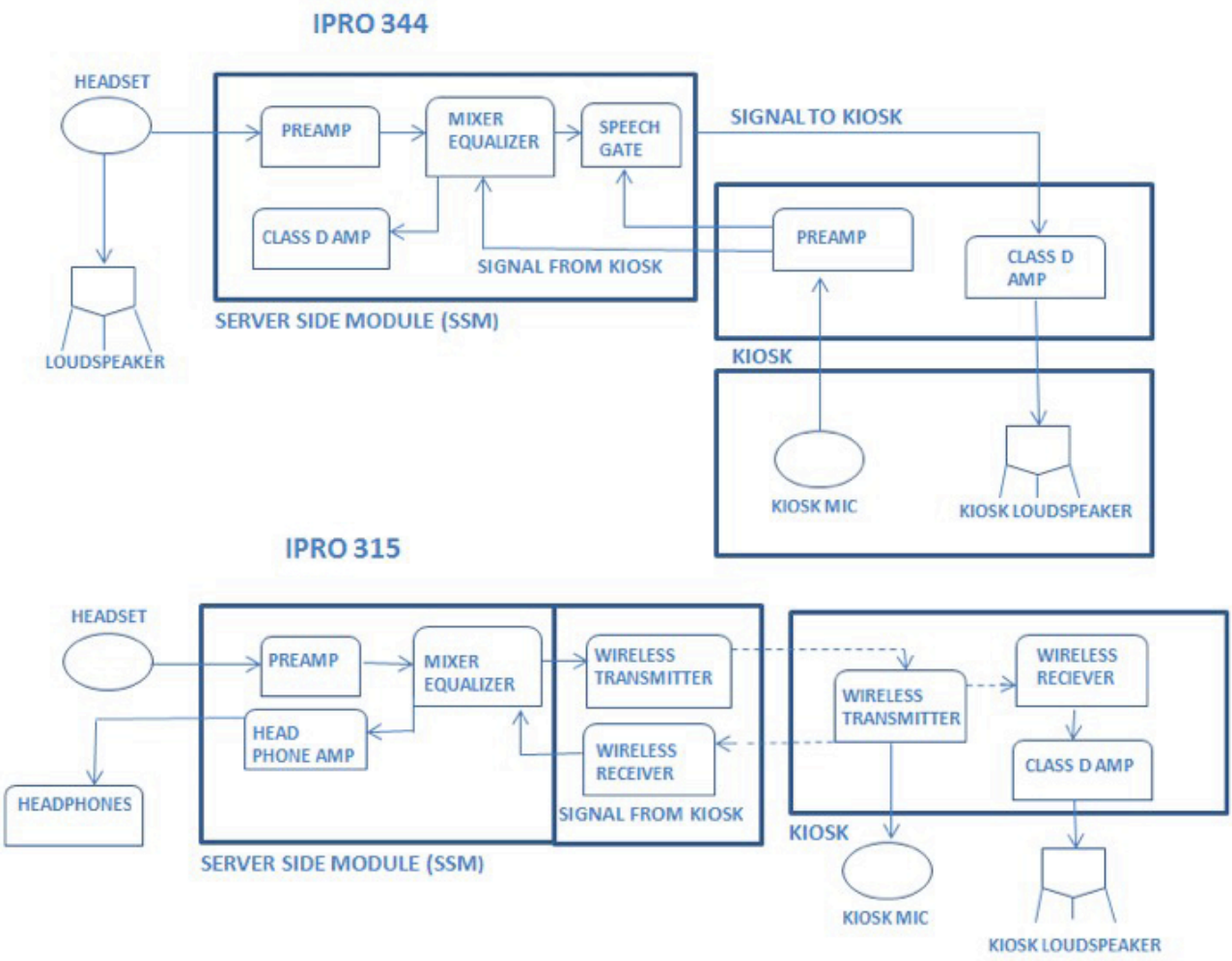
These research and design efforts culminated in a working model intercom system: a server side module inside the restaurant for the order-taker, for use with a headset, and a client side module within a kiosk containing a speaker and condenser microphone for the customer. Using class D amplifiers for energy efficiency the teams collected data on audio intelligibility to optimize the system and to reduce the likelihood of an order being taken incorrectly due to errors in speech transfer.

Building upon the previous semesters' work, IPRO 315's first iteration was devoted to improving fast food drive-through order accuracy through modern technology. It was divided into two teams, Wireless and Voiceless, with separate and specific goals.

The Wireless team implemented Shure transmitters and receivers into the server and client modules to make the connection between the restaurant and kiosk wireless. They also ensured that the audio fidelity did not degrade from the wired connection.

The Voiceless team designed and programmed an iPad application used to place mobile orders. They ensured the traditional first-in-first-out queue was remained in-tacked by using proximity detection within the exiting kiosk.

The following diagram shows the major differences in system implementations between IPRO 344 and IPRO 315.



B. Current Issues

Current issues that the Fall 2011 IPRO 315 team faces are developing a custom Bluetooth proximity detector for Apple devices as well as other mobile devices. This is challenging because Apple devices only link with specific devices. The team will have to research how to develop hardware for Apple products.

The custom ordering application provides its own set of issues. Other mobile operating systems will provide a difficult challenge for the mobile development team. Unlike Apple who has a limited number of devices, other operating systems work on a variety of smart phone systems, which provides a multitude of decisions that need to be made regarding which systems will be develop for specific devices.

In previous semesters, there were concerns about the lack of economical discussion. Therefore, this semester an economical team has been formed and will provide reports analyzing the benefits and cost of the voiceless system. The team will also provide, if possible, a business plan including a marketing and operational plans for the product.

6. Team Values Statement

The Fall 2011 IPRO 315 Team has decided to believe in **RESPECT**, **RESPONSIBILTY,** and **ENCOURAGEMENT**.

RESPECT — respect for one another will prevent individuals from being late and/or missing classes. **RESPECT** for the team pushes an individual to uphold their responsibilities. Each member will **RESPECT** others' opinions, refute them politely, and provide constructive criticism. Thus -with **RESPECT** in our team- peace and harmony can reign, which will, with no doubt, lead to a great result.

RESPONSIBILITY — Every member will be committed to finishing, documenting, and submitting their tasks in a timely fashion. Every member is also **responsible** for upholding and maintaining a conducive work environment. Every aspect of this project is key to the success of the group, and thus each member is **responsible** to work on it.

ENCOURAGEMENT — we are all **encouraging** each other to give the best of them, and also help them to give their potential. We believe everybody needs some assistance in their work, so we have decided to not let anyone by themselves in their tasks. Then, the person will be motivated to finish his work.

III. Project Methodology

1. Work Breakdown Structure

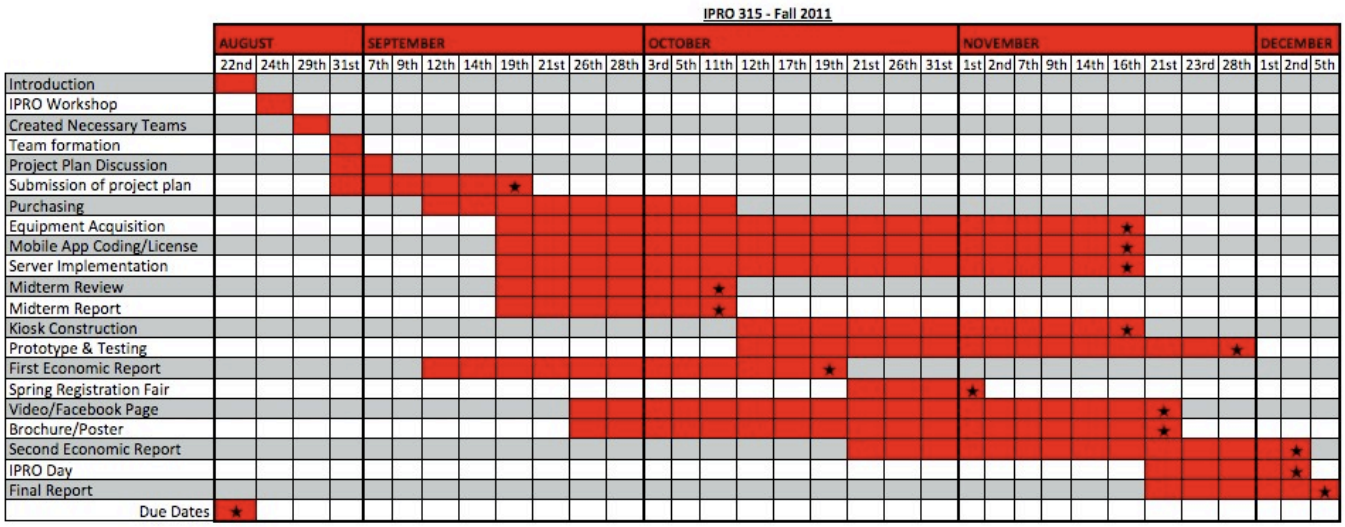
A. Problem Solving Process

Each sub team has its leaders which will collaborate with its members to solve the issues that may arise. If the issue cannot be solved by these members, it will be given to the research and development team, which will hopefully be able to provide additional insight after the appropriate research. From hear if a solution can not be reach, the entire IPRO team will regroup and discuss and solve the issue at hand, and determine possible work-a-rounds if necessary.

B. Team Structure

Teams Name	Purpose/Description	Members
Minutes Taking	Write & publish a report about each lecture	Carnot Joseph & Eugen Dragomir
Purchasing	Manage team's budget & order the necessary materials	Nan Bai & Kaleyhia Flowers
Project Coordination	Coordinate meeting & Ensure adherence to deadline	Carnot Joseph & Eugen Dragomir
Web & Media Managements	Create video, facebook page, poster and Brochure	Harmony Clauer, Andres Lemus, Victo Obiahu, Haejun Chung, & Kaleyhia Flowers
Documentation	Write the project plan and final report	Carnot Joseph & Harmony Clauer
Presentation	Present the project on the Ipro day	N/A
Research & Development	Researching possible implementations for the systems, accepted policies & procedures for product development, & possible solutions to roadblocks	Victor Obiah, Haejun Chung, Mike Sullins, & Ruoran Wang
Implementation		
a) Server	Seamlessly integrate the traditional & mobile ordering systems into one user friendly point of sale service	Harmony Clauer, Haejun Chung, Ruoran Wang, Mike Sullins, & Yan Wang
b) Kisok	Install display to improve the user experience of kiosk & implement additional imforcement	Andres Lemus, Yan Wang, Victor Obiahu, & Kaleyhia Flowers
c) Mobile Device	Integrating new mobile devices into the voiceless ordering system	Nan Bai, Andres Lemus, Eugen Dragomir, & Yan Wang
Economics	Conduct series of simulations to determine the economic benefits of using the voiceless system	Nan Bai & Ruoran Wang

C. Project Timeline



2. Expected Results

The Fall 2011 IPRO 315 team expects the near completion of the fast food ordering system. This would include the development and creation of:

- A custom Bluetooth proximity detector for Apple devices as well as other mobile devices.
- A custom ordering application for additional mobile devices and smart-phones.
- A Point of Sale System integration for traditional and mobile orders.
- Improvement of kiosk display systems.

3. Budget

The following is the current budget for IPRO 315 Fall 2011:

Activities	Cost	Description
Arduino Board	$35.00	Store and process data received from ultrasonic distance compenent for statistical analysis
Ultrasonic Distance Component	$35.00	Vehicle detection at kiosk for accurate data collection
Server	$1,200.00	One desktop & monitor needed to build the central server of the turnkey system.
Kiosk	$700.00	One iPad or other tablet with accessories for integrating display into existing kiosk.
Mobile Device	$700.00	One smartphone and additional hardware and/or software for mobile ordering tests.
Components	$400.00	Components and tools for building the customized Bluetooth proximity sensor.
Machine Shop	$100.00	Prototyping Services
PCB Fabrication	$150.00	Prototyping Services
Miscellaneous Items	$100.00	
TOTAL	**$3,420.00**	

4. Designation of Roles

Minutes:

Eugen Dragomir and Carnot Joseph are charged to prepare a report after each lecture. This report should underline the main points of the day lecture. Also, it should announce the different subjects that we are going to attack for the next class. It is a way for absent students to get in touch with the information of the day and be prepared for next class. It also serves as a reminder for everyone. Every other meeting, Joseph and Dragomir rotate their role as minute takers.

Purchasing:

Kaleyhia Flowers and Nan Bai are responsible to manage the team budget as well as well as to order all the necessary materials. The tasks of the Purchasing Team consist of

- Obtaining a list of items from each sub-team
- Researching suppliers for the best prices
- Researching and finalizing the budget
- Contacting the IPRO office to make purchases
- Tracking and picking up all orders

Project Coordination:

In their roles as project coordinators, Eugen Dragomir and Carnot Joseph, main missions are coordinating meetings and ensuring adherence to deadlines. Additionally, they ensure project advancement by distributing equitable tasks and keep track of the teams activities in order to facilitate the writing of the final report.

Web and Media Management:

Andres Lemus, Harmony Clauer, Victor Obiahu, Haejun Chung, and Kaleyhia Flowers have the following tasks:

- Creating a video which encapsulates and promotes the project
- Creating and maintaining a Facebook page
- Creating and maintaining a project website
- Creating a project poster
- Creating a brochure which encapsulates and promotes the project

Documentation:

This team has the co-team leaders Harmony Clauer and Carnot Joseph. Both are responsible for collecting and accurately documenting the methods used, activities, and progress of each of the teams. Addtionally, Clauer and Jospeh are tasked with creating the project plan and final report.

Presentation:

We have not decided yet who presenters are for midterm review. These people will be known and will be based upon the knowledge of the information covered in the presentation.

Research and Development:

Victor Obiahu, Haejun Chung, Michael Sullins, and Ruoran Wang create the research and development team. The are responsible for researching possible implementations for the systems, accepted policies and procedures for product development, and possible solutions to roadblocks. There roles are to help provide the necessary backgrounds for the implementation teams.

Implementation:

The implementation teams are responsible for the creation of the systems and devices necessary for the IPRO:

1. *Server:*

Harmony Clauer, Haejun Chung, Ruoran Wang, and Yan Wang have to create a server that stores the ordering information and sales. The primary objective is to seamlessly integrate the traditional and mobile ordering systems into one user friendly point of sale service. Specifically:

- Creating an order database
- Integrating the traditional and mobile orders into a FIFO queue to be fulfilled by company
- Creating a web based software that can input traditional orders, confirm mobile orders
- Developing a user friendly the point of sale for the company

2. *Kiosk:*

Yan Wang, Andres Lemus, Victor Obiahu, and Kaleyhia Flowers compose the kiosk implementation team. They are tasked with improving the kiosk design and order displays. They are also responsible for creating the kiosk's custom Bluetooth proximity detector.

3. *Mobile device:*

Eugen Dragomir, Nan Bai, Andres Lemus, and Yan Wang have to create a custom application for mobile sales. Integrating new mobile devices into the voiceless ordering system. Additionally, researching and purchasing a suitable Android device(s) for proper implementation and testing.

Economic:

Nan Bai and Ruoran Wang are tasked to conduct a series of simulations and calculations to demonstrate IPRO 315's benefits from an economical perspective. They are tasked with determining manufacturing costs, effects on queue time, effects on queue size, as well as determining the average ordering time using voiceless and traditional ordering system. Additionally, they will research current methods used by other restaurants, and the amount of time it takes for ordering and serving.