IPRO 315
Audio Quality & Energy Efficiency for Mobile Devices and Intercoms
Project Plan

Instructor: Dr. Thomas Wong

Teaching Assistants: Zhijing Hu, Tao Shen

Sponsor: Shure Inc.

Team:

Carl Cochran   Shan Lu   Michael Olmos   Timothy Ranttila
Jaime Rodriguez   Joseph Taylor   Tom Tsai

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Abstract

In the previous instances of this IPRO (known then as IPRO 344) the team designed and built a kiosk to contain the electronic components of an intercom system, used primarily at fast food restaurants for drive-up order taking. Their primary goal 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. Having completed their tasks, they also looked toward the further improvements that are the subject of IPRO 315, upgrading to wireless technology for both the link between the kiosk and the store, and between a customer in his or her car and the restaurant's computer via any number of wireless devices. Advantages for the wireless link between kiosk and store include simpler and less time-consuming installation as well as simpler maintenance. Advantages for wireless ordering include improved order accuracy and time saved from waiting in line.
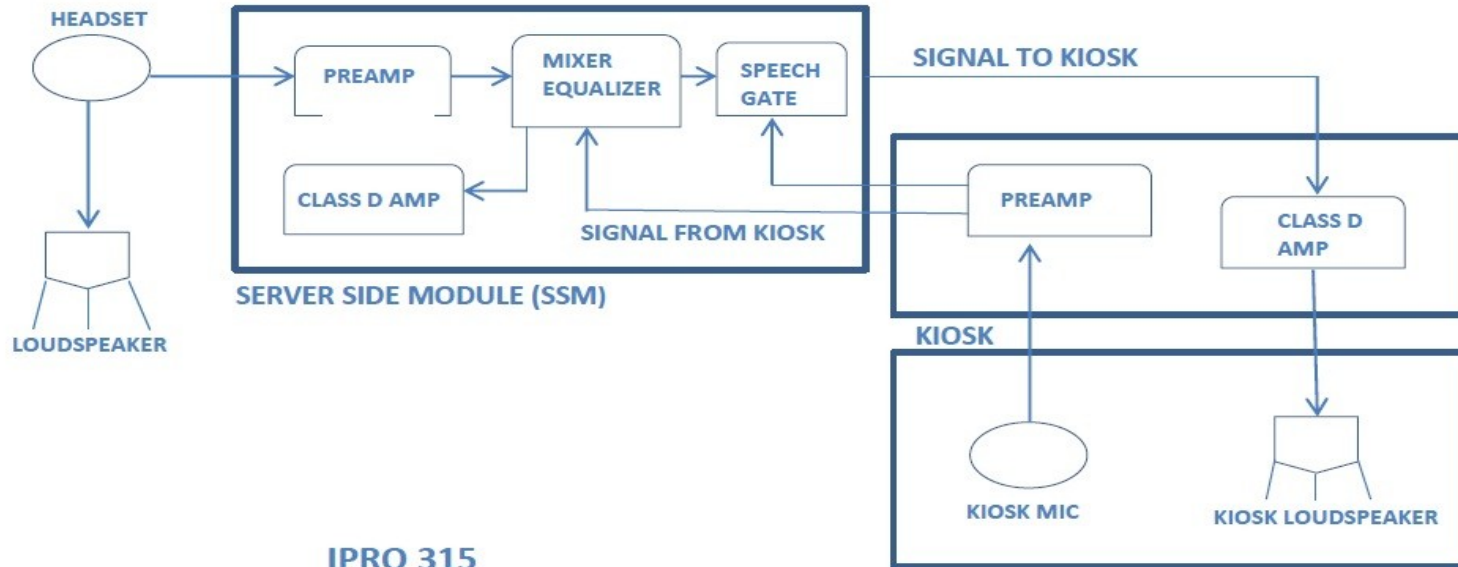
Objectives

- ➢ Primary: to convert the current wired link between kiosk audio interface (client-side) and the server-side module into a wireless system. Ensure quality standards are met and complete extensive performance testing.
- ➢ Secondary: to enable the customer to place orders remotely, within a short range from the kiosk, via mobile device. Generate a sample food menu and test ordering procedure.
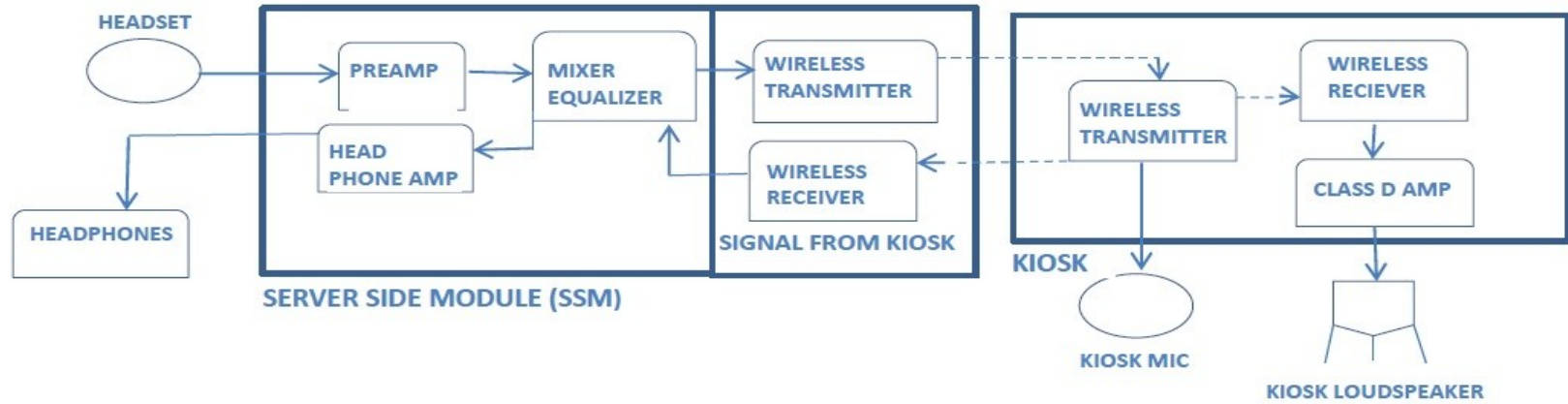- ➢

Background

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. According to their initial project plan, they kept in mind future teams' goals and left their system open for the particular upgrades that will be addressed in IPRO 315. A graphical comparison of IPRO 344's system is compared to the planned improvements, shown on the next page.

IPRO 344

HEADSET

SERVER SIDE MODULE (SSM)

PREAMP → MIXER EQUALIZER → SPEECH GATE

CLASS D AMP

SIGNAL TO KIOSK

SIGNAL FROM KIOSK

LOUDSPEAKER

KIOSK

PREAMP

CLASS D AMP

KIOSK MIC

KIOSK LOUDSPEAKER

IPRO 315

HEADSET

SERVER SIDE MODULE (SSM)

PREAMP → MIXER EQUALIZER → WIRELESS TRANSMITTER

HEAD PHONE AMP

WIRELESS RECEIVER

SIGNAL FROM KIOSK

HEADPHONES

KIOSK

WIRELESS TRANSMITTER

WIRELESS RECIEVER

CLASS D AMP

KIOSK MIC

KIOSK LOUDSPEAKER

Projected Timeline

Feb 14: Evaluation of network connectivity and topology options. Choose and purchase hardware interfaces

Feb 16: Complete interface unification evaluation of iOS/Android. Repair server-side module to full functionality without CPG

Feb 21: iPad/Android interface prototype ready. Design approach for integrating wireless system.

Feb 23: iOS interface prototype ready. Evaluate headphone amplifiers for server-side module.

March 2: Complete software and hardware interface evaluations, determine necessary changes for first revision of interface

March 9: Revised interface prototypes ready

March 21: Complete software and hardware interface evaluations, determine necessary changes for second revision of interface

March 28: Finalize UI, Begin performance tuning/validation test

April 6: 1st round of performance tuning/validation testing complete, determine objectives for 2nd round

April 18: Second round of performance tuning/validation testing complete, determine objectives for final round of testing

April 22: Final round of performance tuning/validation testing complete, compile list of recommendations for future work

Budget

The currently known budget overview is as follows. This does not include any equipment expected to be supplied by our sponsor Shure Inc. Breakdown into sub-categories has yet to be developed, which is one of the steps along this IPRO's progress.

Description	Amount
Equipment	500
Materials/supplies	800
Publication/stationery	100
Prototyping	100
Total	1500

Sub-Team Organization

Sub-Team 1: Minutes
Purpose: This team will record meeting discussions and post them to iGroups and make corrections as necessary. Duty will alternate between the two responsible members for each class meeting.

Team Members:

Tom Tsai
Michael Olmos

Tasks:
1.   Record minutes.
2.   Post minutes to iGroups.
3.   Make corrections as necessary.

Sub-Team 2: Documentation and Final Report
Purpose**:** Gather pertinent information and archive on iGroups; format into a deliverable form to provide a thorough instruction manual for the product and provide complete progress reports.

Team Members:

Carl Cochran – Team Leader
Joseph Taylor

Tasks:
1.   Organize information and media into correct form for presentation
2.   Support Poster and Presentation teams
3.   Generate project plan and final project report

Sub-Team 3: Project Coordination

Purpose: The Project Coordination team is responsible for monitoring the progress of each sub team and taking necessary steps to ensure tasks are completed on or ahead of schedule. In addition, the Project Coordination team is responsible for facilitating communication between sub teams, updating shared project management resources (e.g. project calendar), and sending out reminders as due dates approach.

Team Members:

Tom Tsai – Team Leader
Shan Lu

Tasks:

1. Monitor the progress of sub teams toward their respective tasks
2. Facilitate communication between sub teams
3. Update shared project management resources
4. Send periodic reminders to sub teams as deliverable due dates approach

Sub-Team 4: Purchasing

Purpose: The objective of this team is to get all equipments and parts needed to conduct our project. Also, this team is in charge of the team's budget.

Team Members:

Shan Lu – Team Leader
Carl Cochran

Tasks:

1. Acquire items list from each team
2. Research and finalize budget
3. Research suppliers for best prices
4. Use proper channels through IPRO office to make purchases
5. Track all orders for timeliness and completeness

Sub-Team 5: Web

Purpose: To produce and maintain the IPRO 315 web page

Team Members:

Tim Ranttila – Team Leader
Michael Olmos

Task:

1.	Getting address redirection to indicate class number change
2.	Moving Current site to the archives
3.	Making new site for current semester
4.	Take pictures during the semester to show our group's progress and post these to the web page.

Sub-Team 6: Poster and Brochure

Purpose: to create a visual aid to illustrate IPRO 315's progress to a general audience.

Team Members:

Joseph Taylor – Team Leader
Jaime Rodriguez

Task:

1.	Step by step analysis of project and completed tasks
2.	Gather pictures of prototypes, equipment,etc
3.	Support visual aids with basic descriptions, graphs and diagrams to better explain
4.	Organize all this information into a poster which is both visually appealing and as informative as possible.

Sub-Team 7: Presentation Team

Purpose: The purpose of the presentation team is to deliver a power point presentation for the judges over the semester. The power point presentation will accurately and concisely summarize the activities and findings of IPRO344 over the semester.

Members and tasks will be determined during the course of the semester based on aptitudes and division of labor.

Sub-Team 8: Design and Implementation

Purpose: To integrate the electronics and software systems necessary for completing the primary and secondary objectives.

Members and tasks will be determined during the course of the semester based on aptitudes, and as ideas and goals are developed and modified throughout the semester.

Team Structure and Assignments

Name	Major, Year	Skills and Strength	Experience and Academic Interest	Team Responsible	Other Team involvements
Cochran, Carl	CPE/EE, 5th Year	C/C++, Intel/Motorola assembly, soldering, organization and leadership	Signal Processing, audio production, programming and electronics	Documentation Final Report	Purchasing
Tsai, Tom	CS 4th Year	Object oriented design, iOS development experience, Software engineering	Server/database development experience, networked application development experience	Project Coordination	Minutes

Lu, Shan	MITO, 1st Year	Soldering basic circuit analysis, some Matlab Some PLC programming Some PCB layout	Working experience in China Telecom	Purchasing	Project Coordination
Ranttila, Tim	CPE/EE, 5th Year	Soldering, prototyping, Unix, electronic design, C/C++, Java	Unix administration, electronics debugging	Web	Team Leader
Olmos, Michael	CS 3rd Year	Unix, Web Design, Programming	Unix administration, programming	Web	Minutes
Taylor, Joseph	PTC, 5th Year	Graphic Design; Indesign, Photoshop	Linguistics, CSS, PHP, Javascript, XHTML Designed Ohio Museum Association Brochure	Poster	Documentation Final Report
Rodriguez, Jaime	Arch Eng 4th Year	AutoCAD, IB Wave, Photoshop	Internship w/ Moshe Calamaro, Rizzo Consulting	Poster	