IPRO 315

Improving user experiences with Mobile Devices and Intercoms: Optimizing audio quality & energy efficiency

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Teaching Assistants: Zhijing Hu, Tao Shen

Sponsor: Shure Inc.

Team:

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

Illinois Institute of Technology

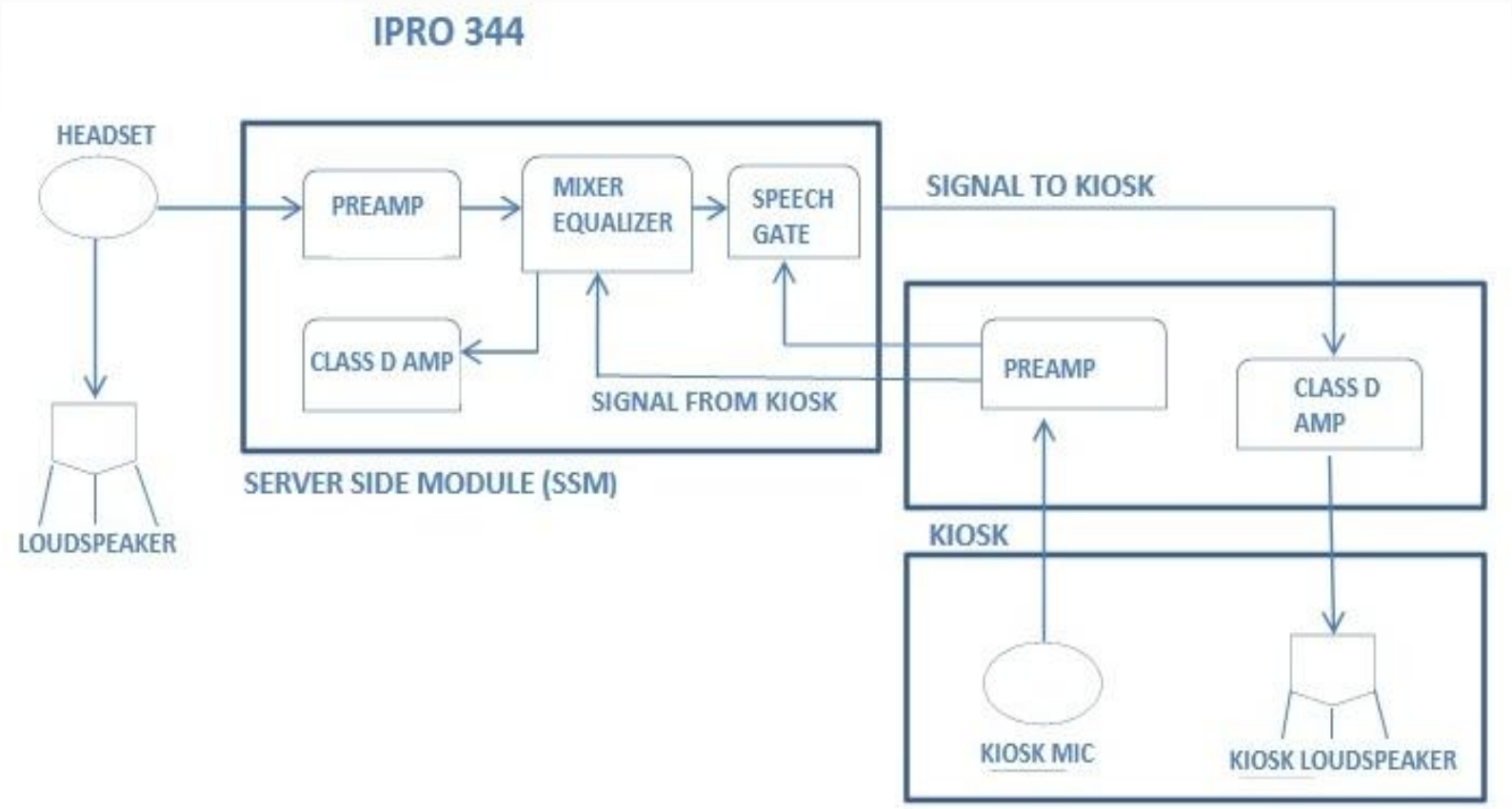
The Problem

Drive through order miscommunication costs the fast food restaurant industry both time and money

The History of IPRO 344, iFideliity

- Constructed and improved kiosk and audio electronics system (class D amplifier)
- Extensive testing for ideal microphone type (cardioid), pre-amplification, and position
- Hardware encasement and physical interface

- Goal achieved: an increased probability of a correct order
- System left open for upgrades in future IPROs

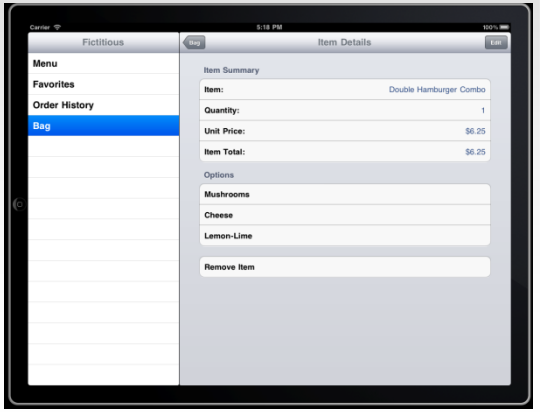


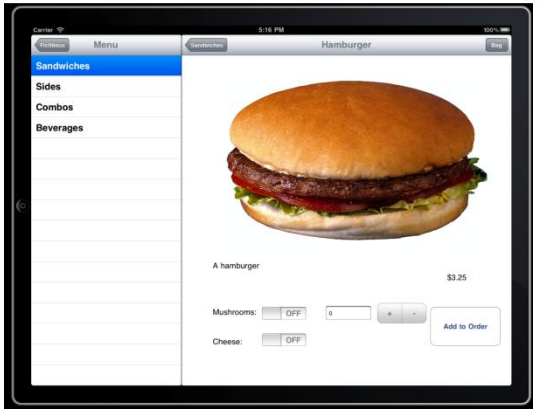
The IPRO 315 Team

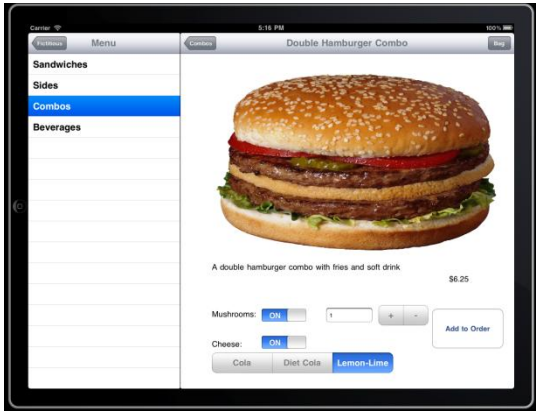
Carl Cochran (EE/CPE)	Shan Lu (MITO)	Tim Ranttila (EE/CPE)	Michael Olmos (CS)	Jaime Rodriguez (ArchE)	Joseph Taylor (PTC)	Tom Tsai (CS)
Documentation and Final Report	Purchasing	Team Leader	Meeting Minutes	Poster and Brochure	Poster and Brochure	Project Coordinator
Purchasing Video	Project coordinator Testing	Purchasing Electronics and testing	Web Page Programming	Inventory Video	Documentation and Final Report Video	Meeting Minutes Programming
WIRELESS IMPLEMENTATION	WIRELESS IMPLEMENTATION	WIRELESS IMPLEMENTATION	VOICELESS IMPLEMENTATION	VOICELESS IMPLEMENTATION	VOICELESS IMPLEMENTATION	VOICELESS IMPLEMENTATION

Voiceless

- Utilizes a mobile device application
- Removes a degree of human error from the order-taking process
- Speeds up the order- taking process by allowing preset menu choices and eliminating the server/customer dialogue
- Perfect for hearing-impaired drivers







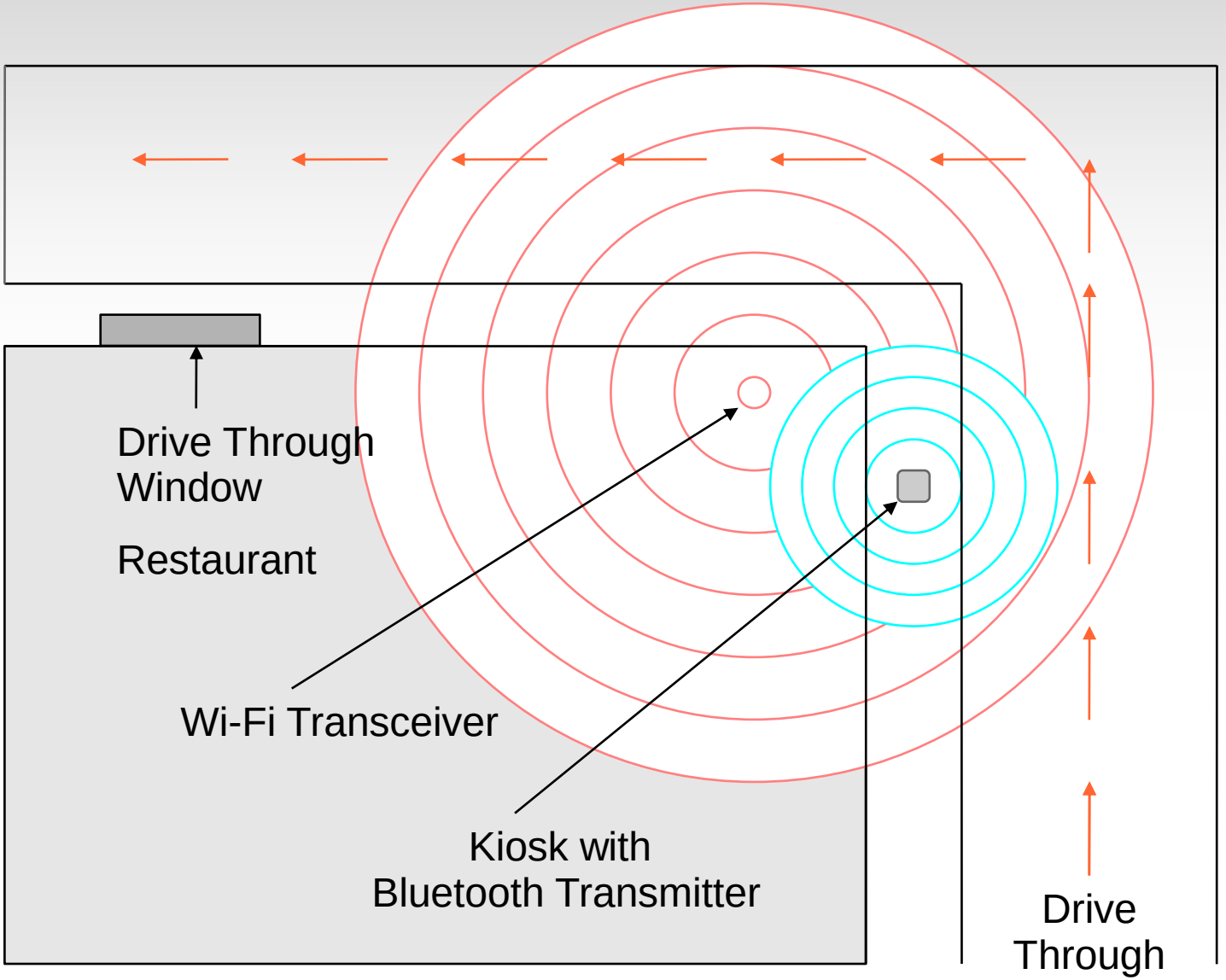
Voiceless: Problems

- Preventing ordering while driving
- First In, First Out Queue
- Simple and affordable database

Voiceless: Solutions

- Using kiosk as a synchronization point
  - Bluetooth proximity sensor
  - Proximity limit controls location of ordering
- Proximity limit controls queuing order
- Leverages Amazon Web Services
  - Low cost, high scalability, reliable database

Voiceless: Layout



Voiceless: Future IPROs

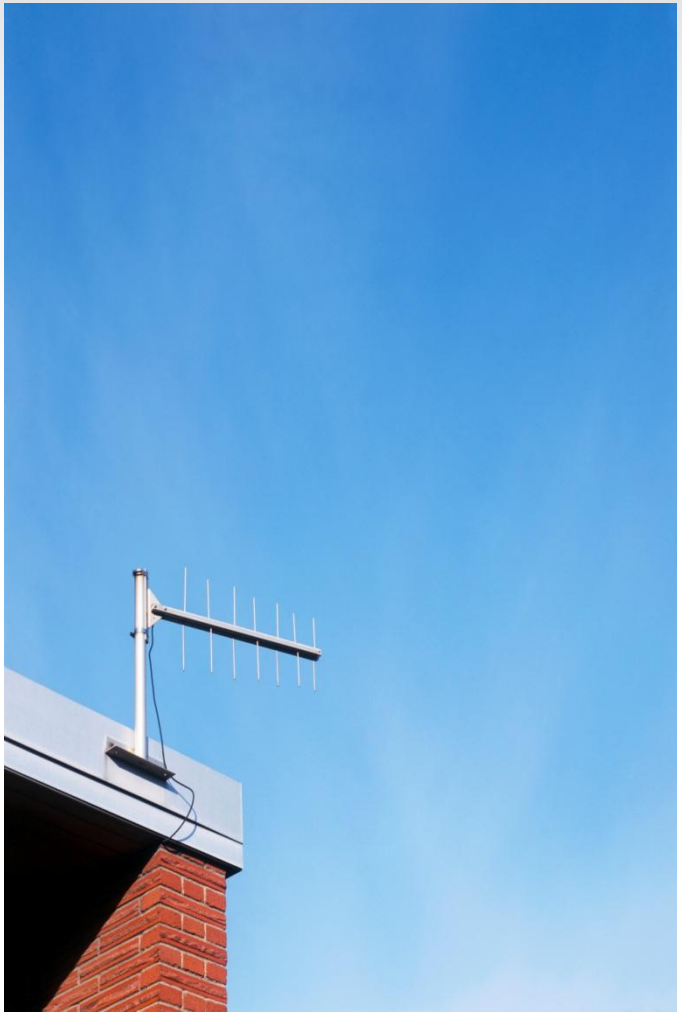
- Additional platforms (Android, etc)
- Automatic Bluetooth range adjustment system
- Point-of-sale system integration
- Remote menu updates/multi-restaurant support
- In App payment

Voiceless: Ethical Considerations

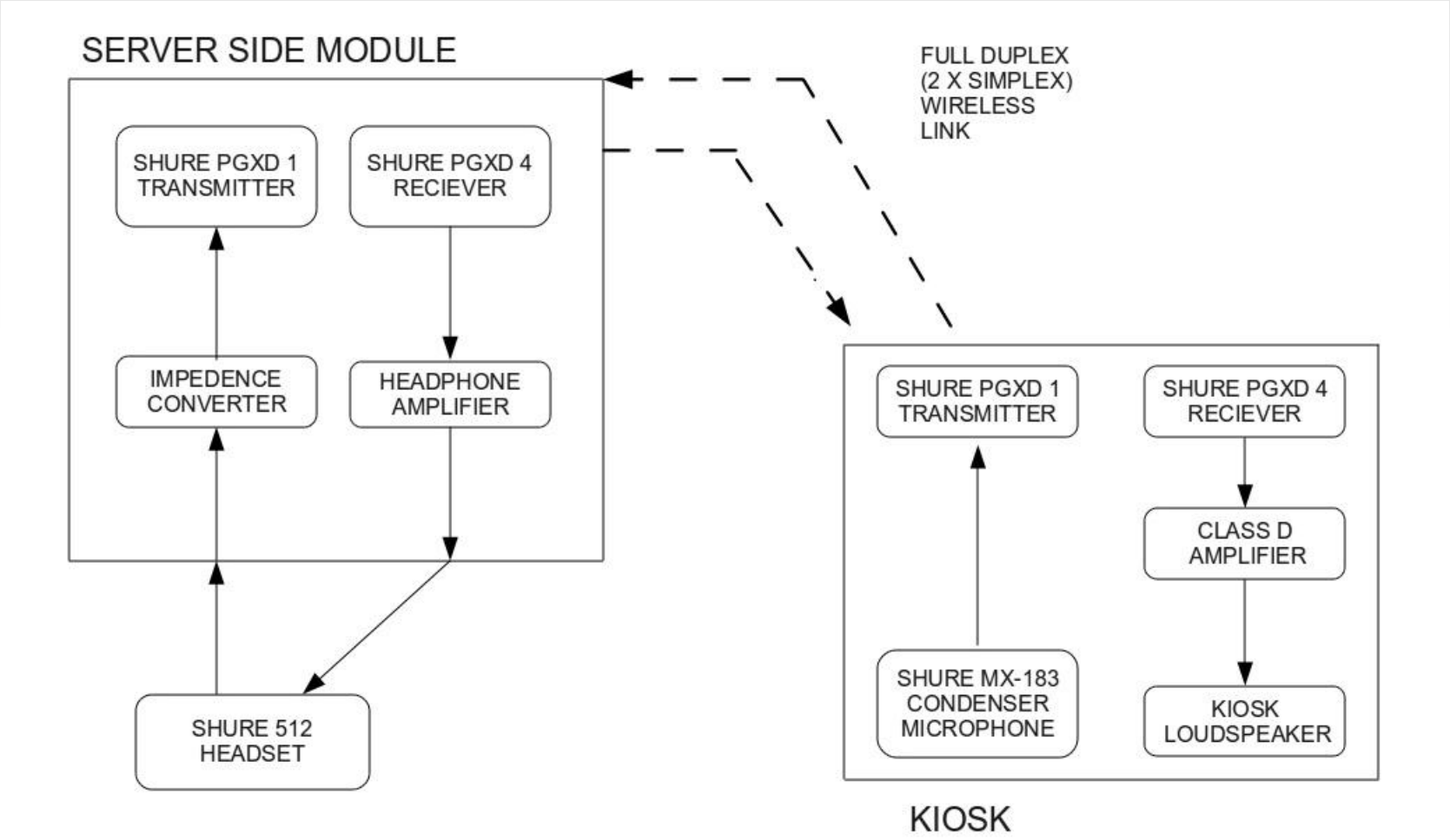
- System caters to deaf community
- User information confidentiality
- Ordering while driving
- Not eliminating voice system entirely
  - For those without ability to use voiceless system

Wireless

- Create a Wireless link between the Server Side Module and the Kiosk
- Eliminate any errors that could result from faulty wiring or line interference
- Lower installation costs



Wireless: Layout



Wireless: Equipment

Shure, Inc. provided IPRO 315 with two sets of PGXD transmitters and receivers as well as a headset, which complemented previous semesters' Shure microphones

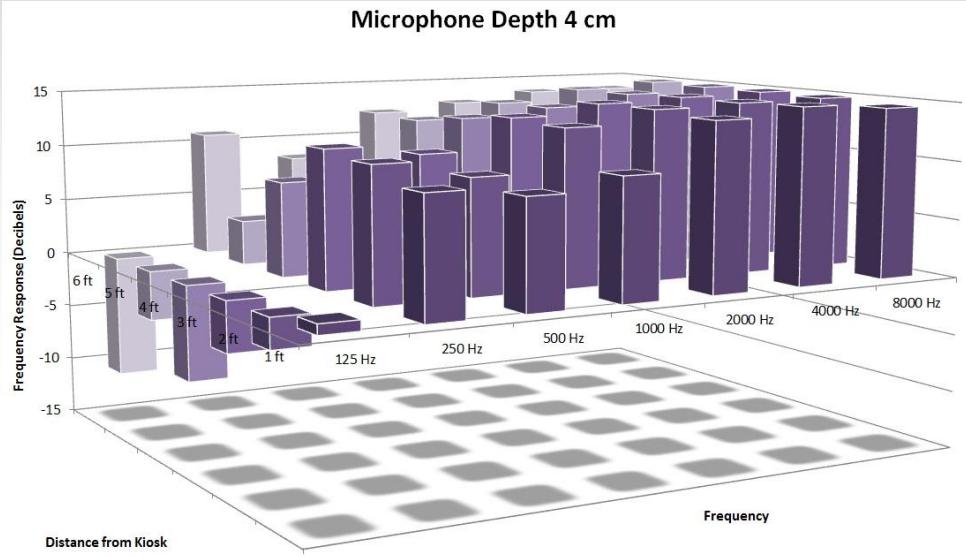
Wireless: Design Considerations

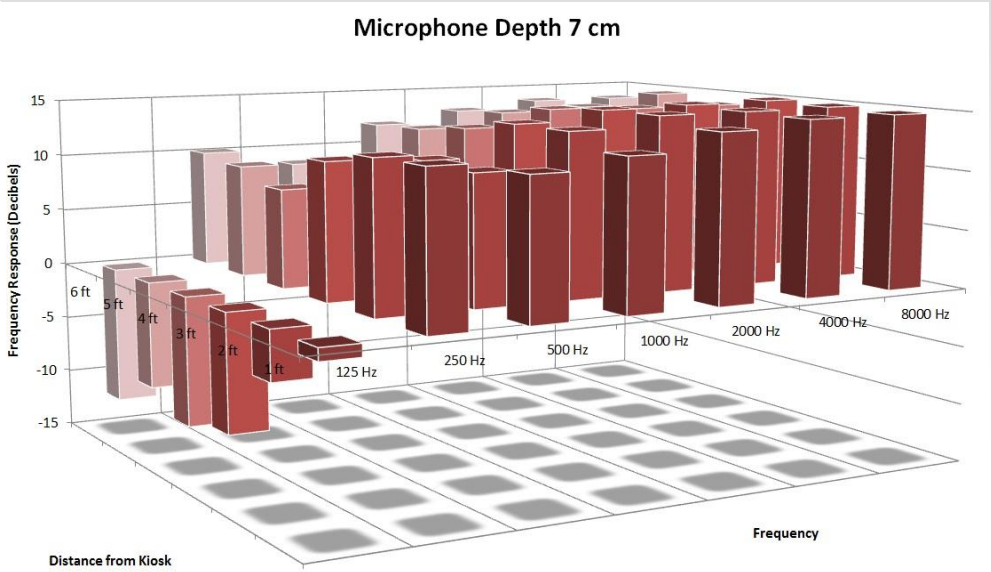
- Previous design required modification
  - New Shure equipment needed different audio levels than previous design
  - Fabricated a headphone amplifier
  - Built a new server-side module
- Wireless Module Mounting
  - Preventing signal attenuation from within the Kiosk and Server Side Module

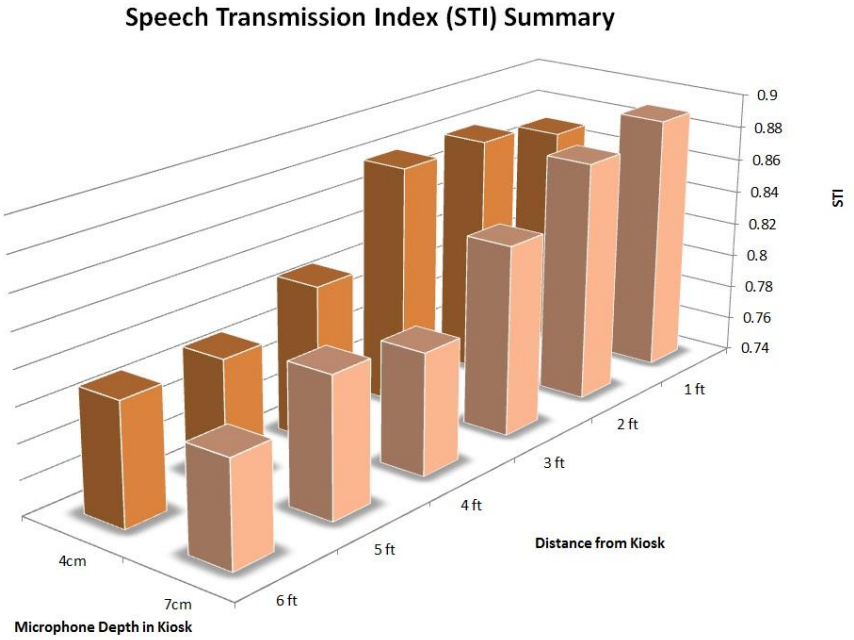
Wireless: Challenges

- Audio Testing
  - Recreated previous semesters' audio quality tests ensuring no signal quality deterioration
- Documentation
  - Provide documentation so that all of the tests of our system can be faithfully reproduced by following semesters

Wireless: Test Results







Wireless: Future IPROs

- Push to talk
- Dynamic range compression
- Re-implementing equalizer
- Laying out PCB for headphone amplifier

Questions?