Audio Data Transfer Over Commodity Embedded Devices

Cole Feely, Aidan Murray, Owen Lehron, Sash Rao

Introduction

Traditionally, Commercial Off-The-Shelf (COTS) Sensors (microphones and speakers) have lower sampling rates in contrast to expensive alternatives with custom front-end interfaces and high sampling rates. Google had previously created Google Tone that shares data between personal computers through sound, but this again requires devices with high-end hardware. Our goal was to embed information over sound like google chime but by using COTS hardware and to optimize signal demodulation and decoding at the receiver.

Technical Contribution

Our main technical contribution was that we were able to collect data over sound from varying distances with less hardware and a more affordable setup than previous works from Google Tone [2] and Anwar and Colleagues [1].

Use Cases

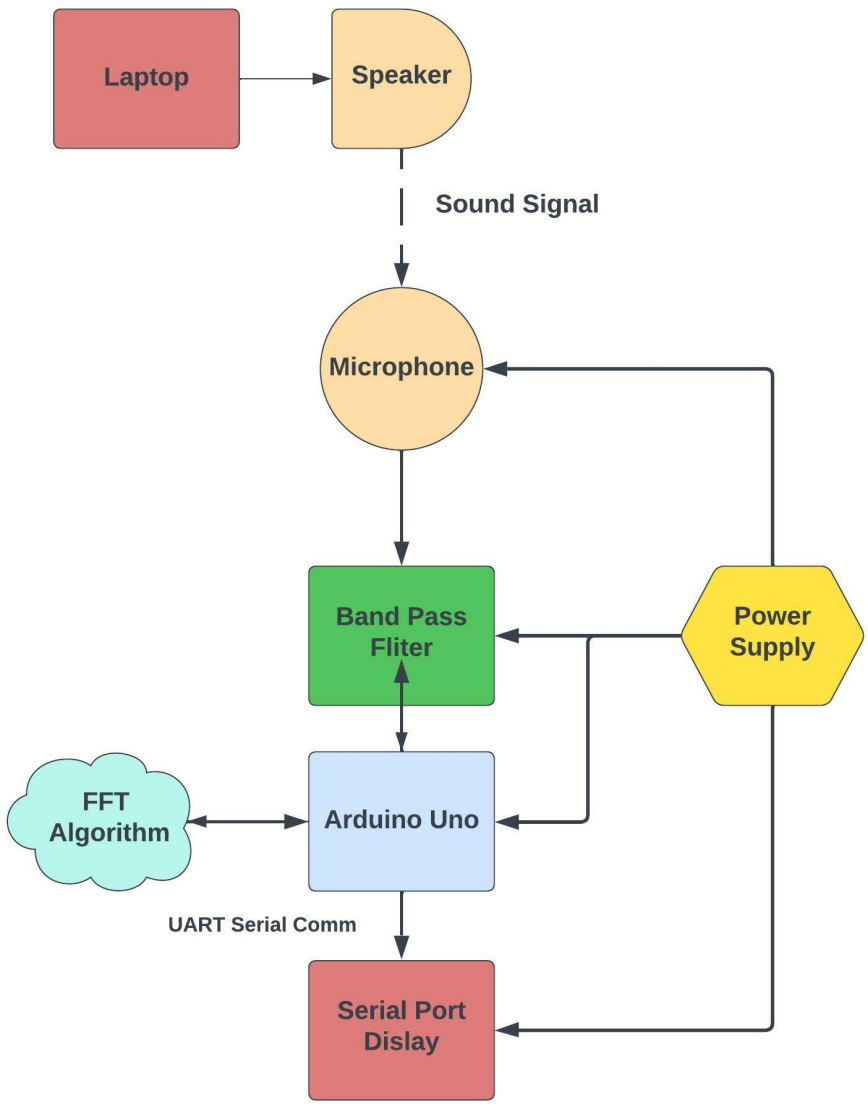
Quickly Sharing links at business meetings, conventions and more

Supplement for RFID or NFC Tags

References

Universal Timestamping with Ambient Sensing, SECON 2022
Google tone, 2015

System Diagram



Results

- Data rate of 1 digit per 2 seconds
- 100% success rate from 127mm distance with background noise
- Susceptible to 750 Hz Background noise
- 88% success from 279.4mm with background noise

Conclusion

We were successfully able to embed information in audio sensing signal and optimize signal demodulation and decoding at the receiver with people conversing with a 100% success rate at small distances and with decreasing success at longer. We were able to achieve this phenomena with significantly less hardware than related work on the subject.