

Audio data transfer over commodity embedded devices

Project Proposal

Members: Cole Feely, Aidan Murray, Sashank Rao

Date: Sept. 27, 2022

Due Date: Sept. 29, 2022

Background

There are some communication methods of data transfer using sensing signals with low-cost sensors but these systems produce low sampling rates which are not as efficient than high cost solutions with high sampling rates. We will investigate how we can improve sensing signal data transfer with low-cost sensors with low sampling rates by minimizing the error and noise rates commonly encountered.

Goal

Encode data into an audio sensing signal and send it to a receiver where decoding algorithms will be performed to interpret the data.

Deliverables

1. Demonstrate our goal with a modulation that best circumvents noise from audio channels, human speech or other background interference.
2. Demonstrate better a reduction in the error rate from these interferences than off the shelf solutions
3. Minimize decoding errors in the absence of symbol frame synchronization between the sender and receiver

Hardware

Receiver/ Sender: SBC for IoT (either RPI 4, Arduino Uno or Pico W) & Laptop Computer

Speaker: Either laptop speaker or Adafruit Arduino Speaker

Microphone: either laptop microphone or Adafruit Arduino Microphone

Other: Power Supply, Breadboard, Amplifier, Resistors, Jumpers, etc.

Team Roles

Hardware: Aidan Murray

Software: Sash Rao

Logistics and Budget: Cole Feely

Notes for Professor Anwar

1. We only have three members but this is a four person team. Would it be possible to either get another teammate or reduce the complexity of deliverables for our project due to this hindrance?
2. Additionally, this project requires us to purchase parts. Will parts or a budget be supplied?

Timeline

October 12, 2022: Get something working HW

- Have speaker send sound and Microphone working

October 20, 2022: Get something working SW

- Get 'Hello World' version of the software for interpreting sound as information

November 2, 2022 : Midway Design Review

- Have system finished which combines the components of the previous two milestones

December 8, 2022: Presentation Day

Resources

Universal Timestamping with Ambient Sensing, SECON 2022

Google tone, 2015.

(<https://ai.googleblog.com/2015/05/tone-experimental-chrome-extension-for.html>)