Team 7 Project Ideas

Group Members - Joshua Consenz, Jack McMahon, Cullen Sharp, Edward Tsoi

1. Electronic Parrot

Brief: We will build an embedded system that listens for an identifiable tone, processes that tone, and responds with an imitation of that tone after a suitable amount of time. It should also display an estimation of the tone's fundamental frequency.

Sensors: microphone
Controllers: STM32 series MPU or MCU
Actuators: Powered speakers, LEDs, LCD display

High risk items
Electromagnetic and acoustic interference
Real-time scheduling
Algorithmic complexity

2. Etch-a-Tune

Brief: We will build a handheld embedded system that allows users to draw spectrograms. The system then computes the inverse of the spectrogram and outputs it as an audio signal.

Sensors: touch screen, potentiometers, encoders, buttons,
Controllers: STM32 series MPU or MCU
Actuators: capacitive/resistive touch display, 3mm audio jack

High risk items
Electromagnetic and acoustic interference
Real-time scheduling
Algorithmic complexity

3. Rat-oids

Brief: A hive of robots that try to move together and towards each other. Either based on call and response with directional mics, or possibly connected to each other over wireless and using signal strength

Possible scale up is having them go to a thing of interest (a person, sound, or bluetooth device like a tile) and have them swarm it.

Controllers: ESP32 module
Sensors: Microphone, possibly bluetooth
Actuator: Motors, speaker

High risk items
Electromagnetic and acoustic interference
Scale of number of robots to see behavior
Feature creep or risking the complexity of bluetooth/wireless signal tracking enhancement
Algorithm if we want them moving towards something and not ramming each other

Project Discussion and Decision

Of the three project ideas we came up with we ultimately have decided to go with #2 Etch-a-Tune. This is primarily because we feel that the signal processing of the parrot would be too complex for the time we have to do this project. The Rat-oids, while fun in concept, need excess manufacturing time to create the proper "swarming" behavior we are looking for. Additionally, we will need to design some sort of method to avoid collisions that may require communication between each Rat-oid which increases complexity.

As such, we decided that the Etch-a-Tune will be the most interesting and fun project for this group to work on. While the complexity of graphics and a touchscreen is a point of difficulty, we are confident in our ability to accomplish this task. Additionally, converting a drawn spectrogram into an audio output poses computational complexity that might be too much for our proposed chip, thus we will be ensuring our proposed chip is rigorous enough for the task. We also discussed reducing complexity by changing from drawing a spectrogram to drawing a single period of a waveform and selecting the frequency of the signal. If the computational complexity is too high for the chip we purchase, we plan on using a connected laptop to communicate necessary information over USB.