ECE 153B Final Project Proposal
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Overview:
We are going to use multiple HC-SR04 Ultrasonic Distance Sensors to construct a proximity and location detector. We will have an external speaker attached to our sensors to output the sound. The detector will have multiple HC-SR04 Ultrasonic Distance Sensors to gauge the proximity of an oncoming object. The closer the object is, the longer the duration of the sound that will be outputted to the speaker. There will be three thresholds for the output sound for object distance --"long", "medium", and "short." Additionally, our sensors will be facing different directions which will be instrumental in the location aspect of our detector. Depending on which sensor is triggered, our detector will output three different sounds. A high pitch is representative of an object to the left of the detector. A medium pitch is representative of an object directly ahead of the detector, and a lower pitch is representative of an object to the right of the detector.

Peripherals:
HC-SR04 Ultrasonic Distance Sensor
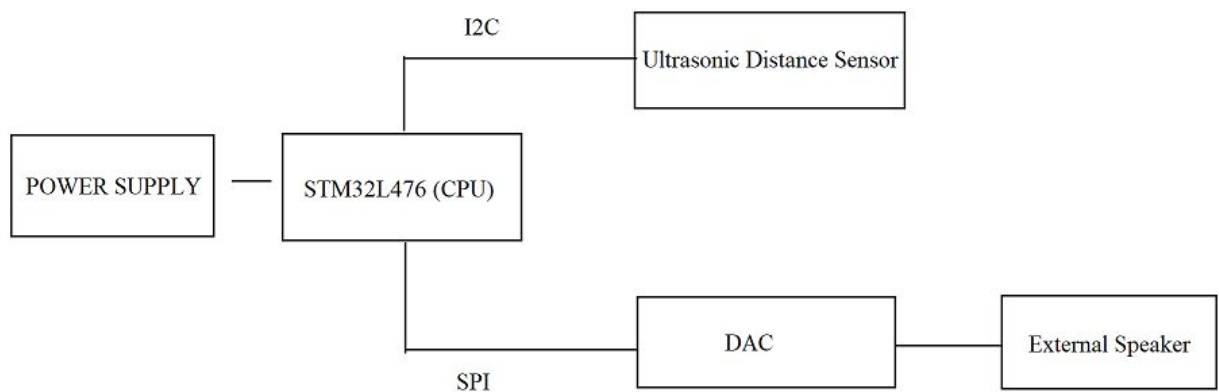Mini Metal Speaker w/ Wires - 8 oHm 0.5W
MCP48CB01-E/MG DAC

Serial Interface Protocols:
I^2C for the Ultrasonic Distance Sensor
SPI for the DAC and External Speaker

Block Diagram:

Goals:

1. Create a working interface that can accurately output sounds of different lengths based on proximity of object
2. Create a working interface that can accurately output sounds of different pitches based on location of object
3. Have our location sensor be accurate to within several inches

Software Design:

All the peripherals need to be connected to their respective ports. Our external speaker is connected to a DAC to convert the digital audio information from the STM32L476 into analog audio. The Ultrasonic Distance Sensor will be connected to a GPIO port on our STM32L476. We will use EXTI interrupts to calculate distance in inches. The ultrasonic sensor will return a pulse width that corresponds to the measured distance. Depending on the measured distance, the speaker will play a sound of varying duration. The further away an object is, the longer the duration of the note. Depending on which sensor is triggered, the note that is being output to the sensor will be of a varying pitch dependent on the location of the object in reference to the detector.

Link to Site:

https://sites.google.com/view/ece153b-derek-hill