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**RE:** EE4320; Acoustic Localization

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**Summary**

Develop a system that can track the direction of speech, with the use of a microphone array. To accomplish this the system will use cross correlation to determine the time difference of the signals received by each microphone in the array. The second part would take those time delays and calculate the distance and the direction of the signal.

**Proposed Solution:**

This project will have four main components: sensor setup and data collection, windowing, cross-correlation, and finally the direction/distance calculations. In the first part an Arduino Due will be used to sample four microphones at a minimum rate of 48 kHz. The second part will simply grab a window of each signal that will be passed to a cross-correlation function. The cross-correlation function will return three time delays that correspond to the time difference of each microphone. The final part/function will take the time delay and the systems physical measurements to determine the direction and angle. To increase the time delay between sensor the distance between them can be manipulated. This would allow lower sampling while still being able to see time delay.

**Progress Report:**

The arrangement of the microphones is a straight line across the breadboard. The Arduino stores the data recorded from the microphones. MATLAB code was written and tested using cross-correlation, however it was discovered that due to sampling constraints that using cross-correlation results in low accuracy. To fix the low accuracy requires much higher sampling frequency which are microphones are incapable of thus a new solution had to be found. That new solution was found by increasing the distance between each microphone. Thus allowing lower sampling frequencies to be used. This may result in need of a RC filter in order to remove noise signals generated over the longer wires. New MATLAB code was written to utilize discrete Fourier transform and analyzing the phase difference between the channels. This new method would provide better resolution and would not require changes from the current setup. However using this method is more complicated and each channel is picking up different parts of the phase spectrum.