Wind Sensor:
PDR Presentation
Advisor: Dr. Kuh

Creighton Chan • Jerry Wu • Scott Nishihara

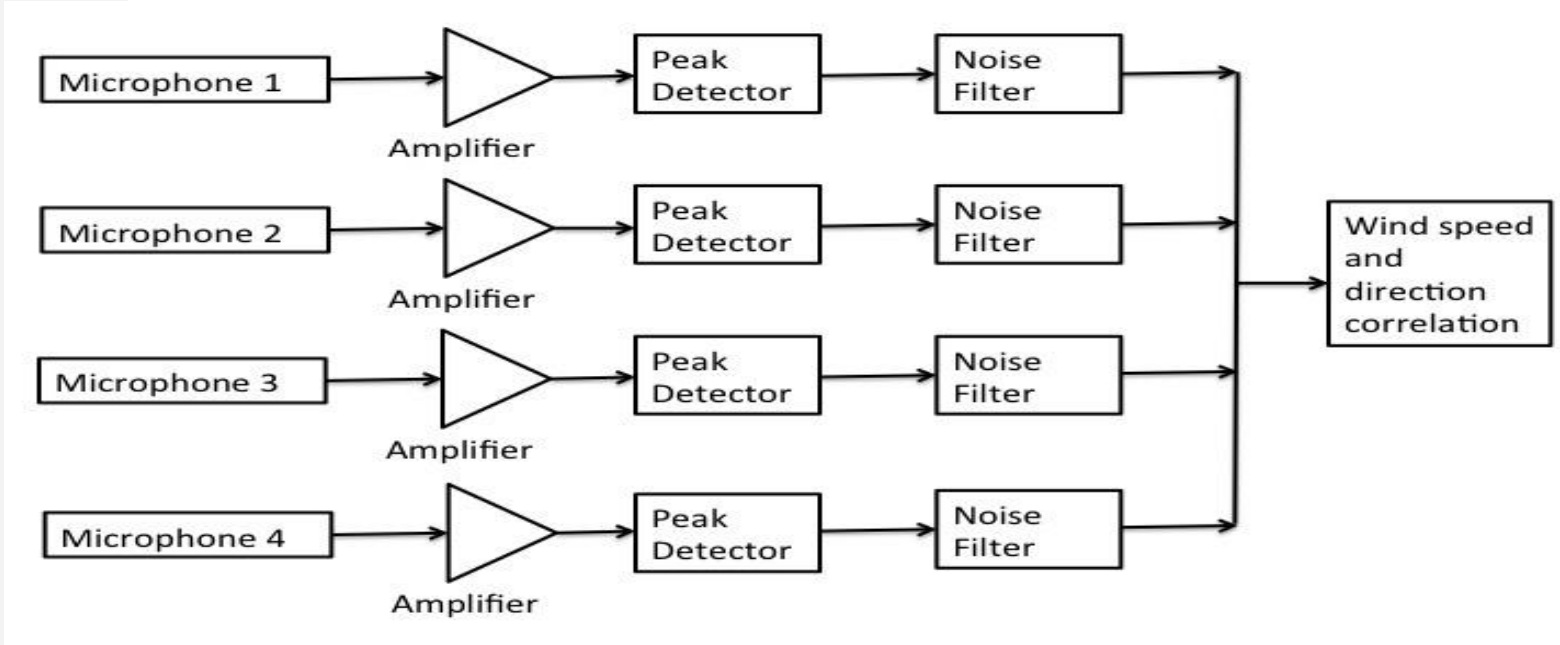
Summary

Acoustic & Ultrasonic:

- **Block Diagrams**
- **Problems**
- **Progress**
- **Future Tasks**

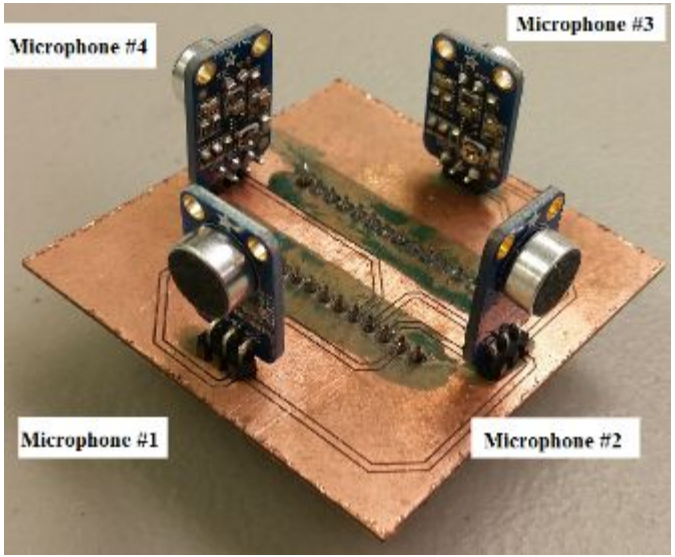
Acoustic Wind Sensor

Block Diagram



Progress

- Created a real time processing algorithm
  - Allows for continuous processing to calculate wind speed
  - For a single microphone
- Conducted several indoor tests
- Experimented accuracy with different means of linearizing data
  - Square root, natural log, logarithmic functions
- Began implementation of direction determination



Problems

- Syntax and algorithmic errors in code
  - Incorrect data type
  - Sign errors
- Greater inaccuracies at lower and higher wind speeds

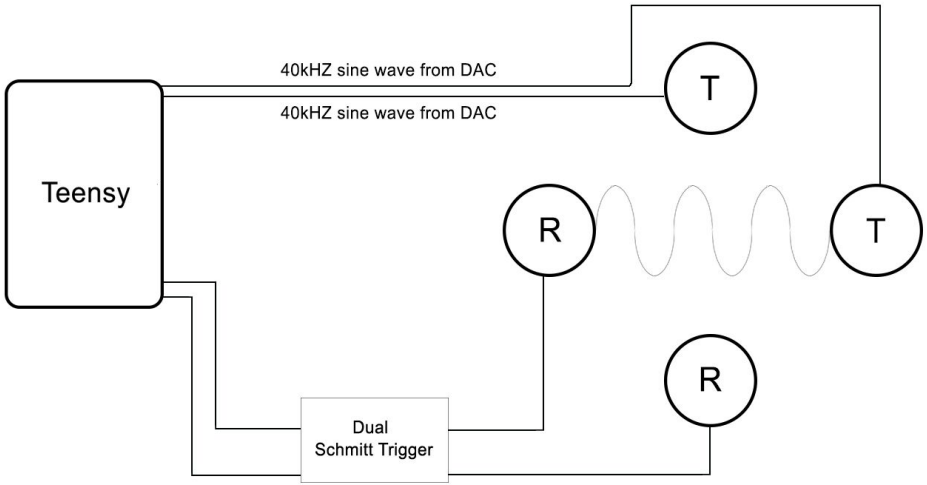
Tasks

- Work on determining wind direction with four microphones
- Explore methods to determine wind speeds outside of range
- Conduct outdoor tests to verify algorithm

Ultrasonic Wind Sensor

Block Diagram

- Generate a timed sine wave from Teensy to power the transmitter.
- Calculate tof between transducer pairs.



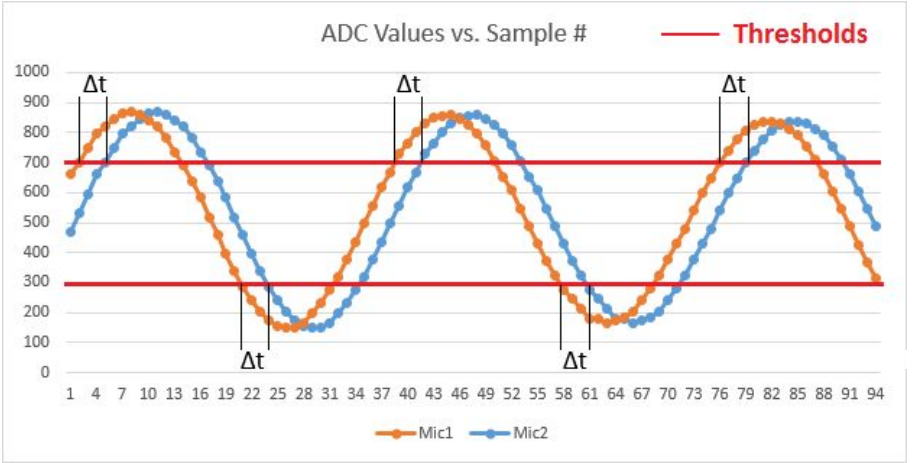
Progress

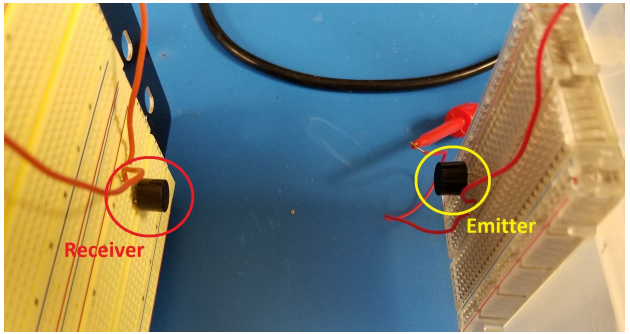
Software:

- Implemented an algorithm to save the threshold crossing times for a number of periods, then process the differences to derive an average propagation time

Hardware:

- Tested the ultrasonic emitter & receiver using a function generator and oscilloscope





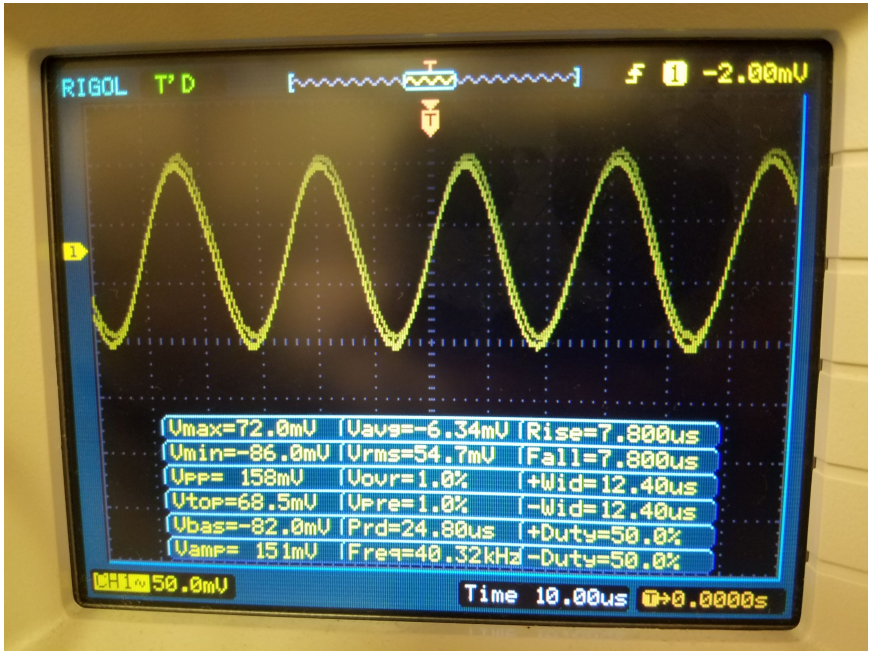
Problems

Software Problems:

- Thresholding algorithm is error-prone (noise, skipping threshold crossing), which significantly affects the results
  - Need error filtering code

Hardware Problems:

- Received signal is very weak: driving the transducer with a 3.3V input, the received signal only had a voltage of 158mVpp
  - Need amplifier



Future Tasks

Software:

- Implement error-filtering code for thresholding algorithm
- Test out current software with new parts
- Look into a high speed ADC library for Teensy

Hardware:

- Incorporate the new parts into our current design
- Look into methods of driving the 40kHz transducers -- may need additional power or an amplifier circuit
- Create a better testbench (instead of holding the breadboards up)

The end.

Any questions?