Wind Sensor: Proposal Presentation Advisor: Dr. Kuh

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Summary

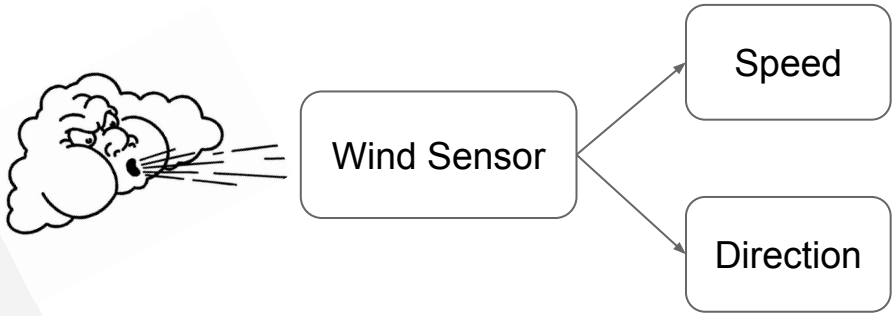
- Background
- Acoustic Wind Sensor
- Ultrasonic Wind Sensor
- Potential Problems
- Goals & Learning Expectations

Background

Background

Objective: To build a small, static, and inexpensive wind sensor that can:

- Accurately measure wind speed and direction in real time
- Be integrated into a weatherbox design



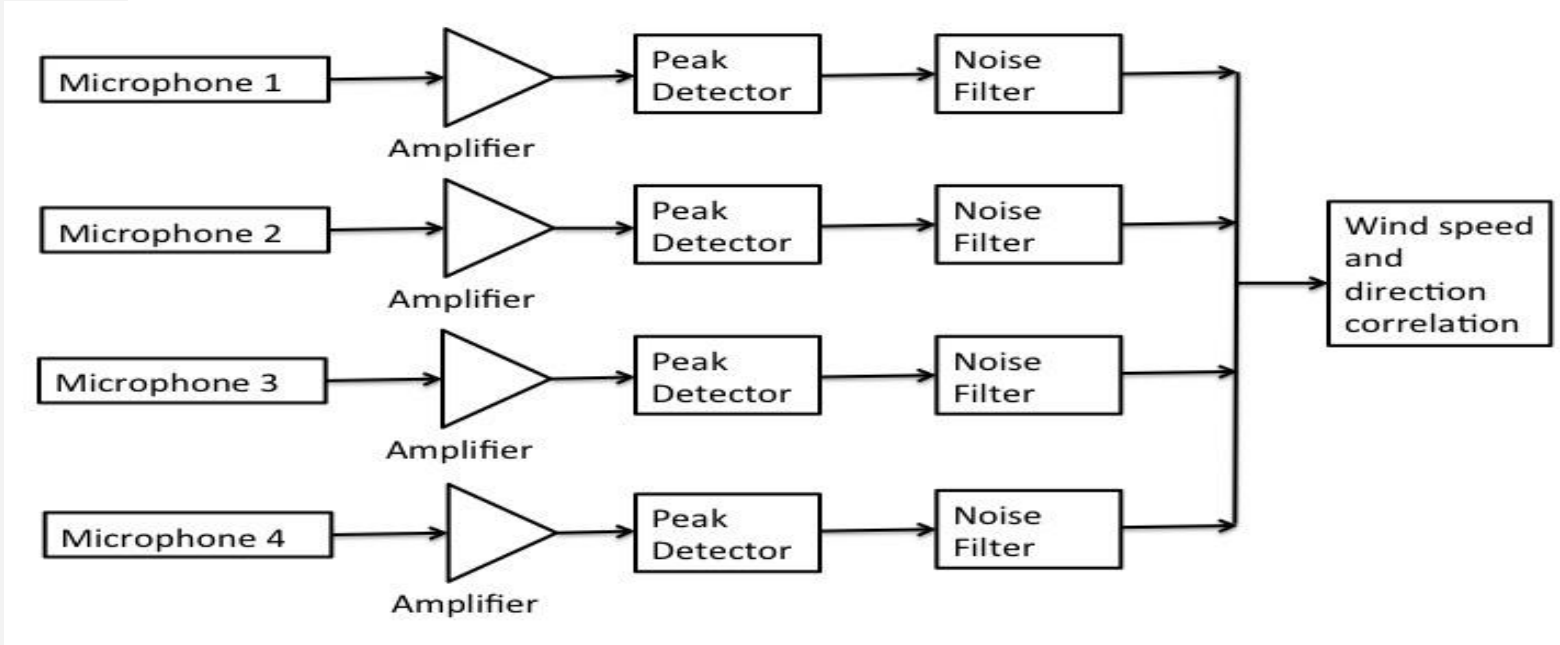
Motivation

- Knowing the wind patterns can be used to incorporate more natural ventilation in building designs
- Traditional wind sensors are large, have moving parts, and are generally expensive
- We want something that is small, has no moving parts, and is inexpensive to make

Some examples of traditional wind sensors

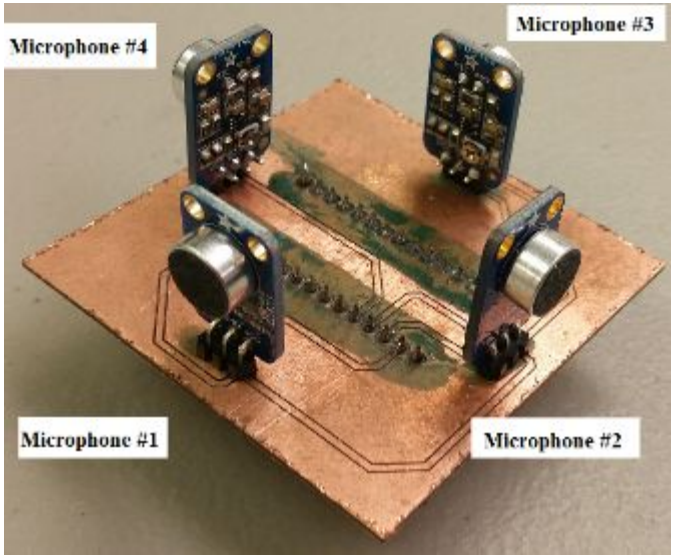
Acoustic Wind Sensor

Block Diagram



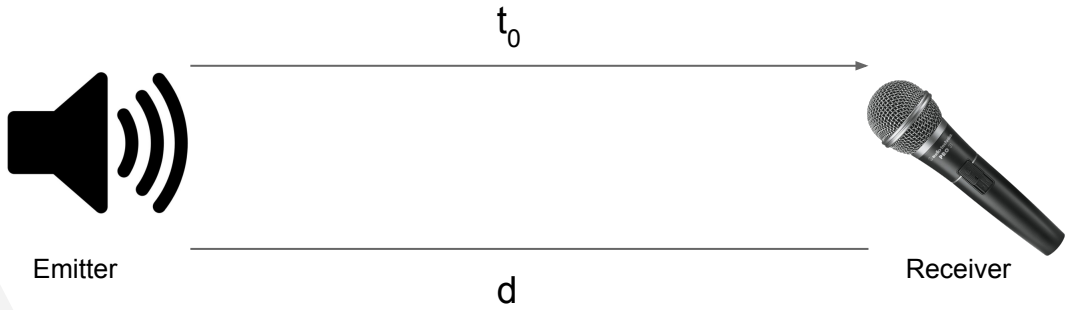
Current State of the Project

- Two revisions (Teensy and Arduino)
- Recreated previous team leaders' implementation to gain a better understanding
- Accurately determines wind speed in indoor conditions



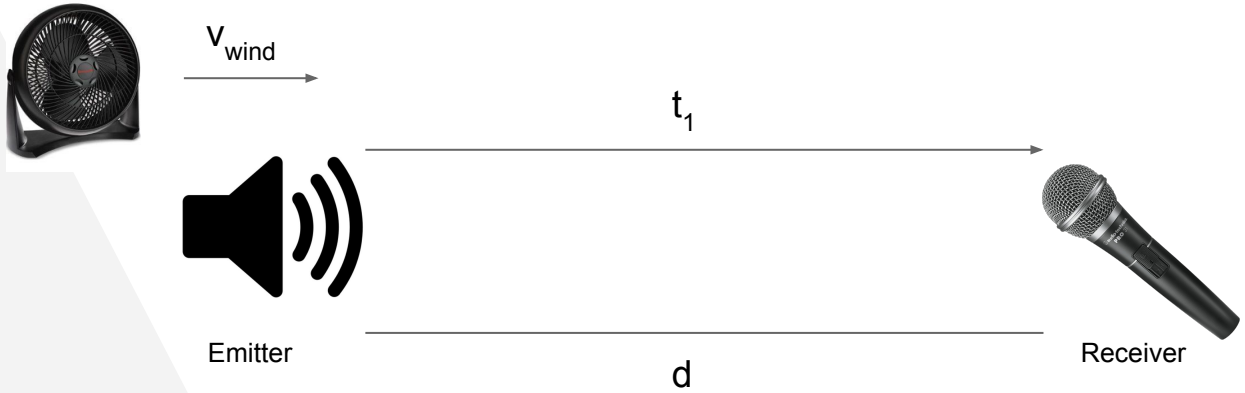
Ultrasonic Wind Sensor

The Idea



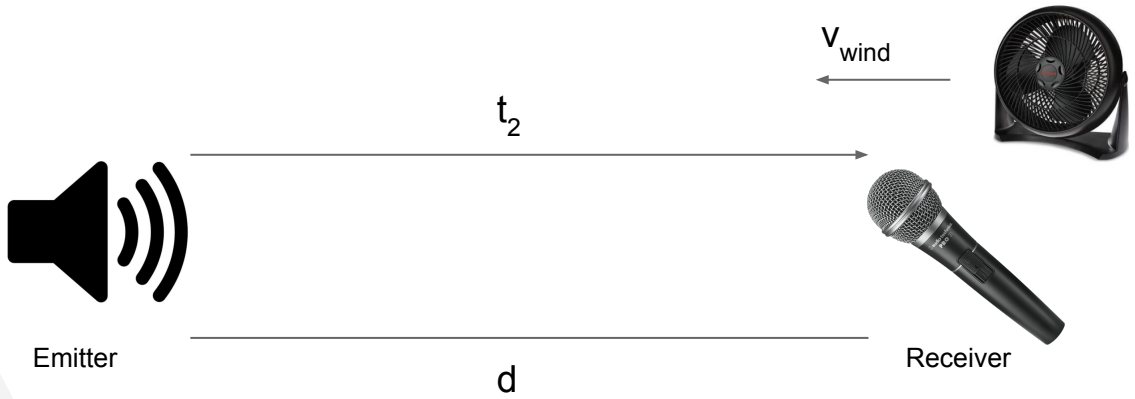
1. With no wind present, propagation time from emitter to receiver is t_0

The Idea



1. With no wind present, propagation time from emitter to receiver is t_0
2. Wind blowing in the **same direction** as the sound wave will increase sound wave velocity and **decrease** propagation time, $t_1 < t_0$

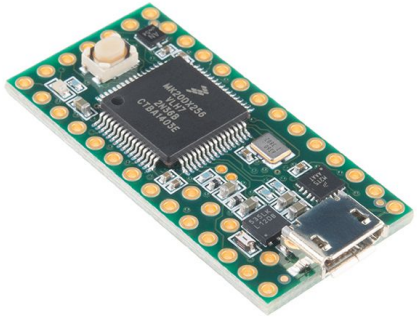
The Idea



1. With no wind present, propagation time from emitter to receiver is t_0
2. Wind blowing in the **same direction** as the sound wave will increase sound wave velocity and **decrease** propagation time, $t_1 < t_0$
3. Wind blowing in the **opposite direction** of the propagation of sound will decrease sound wave velocity and **increase propagation time,** $t_2 > t_0$

The Idea

- Utilize the Teensy 3.2 development board to measure these differences in propagation times and derive the wind speed and direction.



Potential Problems, Goals & Learning Expectations

Potential Problems

Acoustic:

- May not be enough time to complete goals
- May be unforeseen design flaws

Ultrasonic:

- May be additional overhead we didn’t consider in our calculations/algorithms
- May not be enough time to implement all our design features

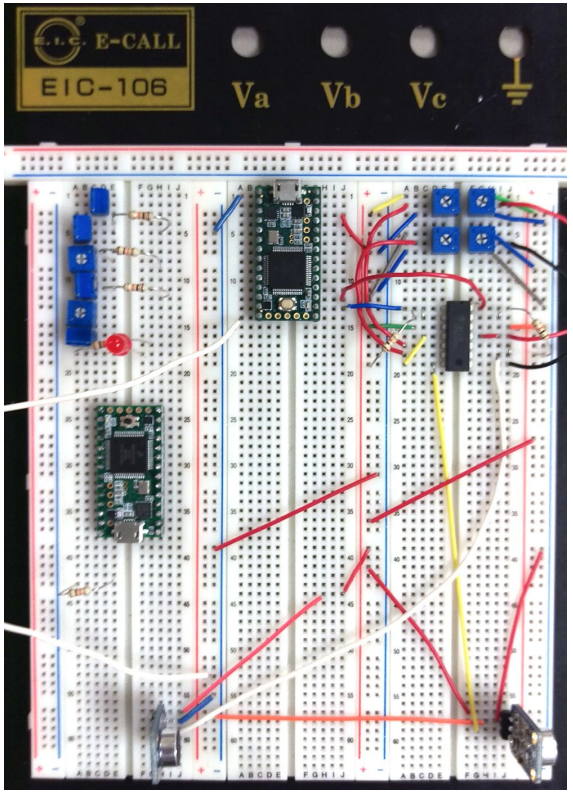
Goals

Acoustic:

- Create a new standalone board
- Conduct testing outdoors

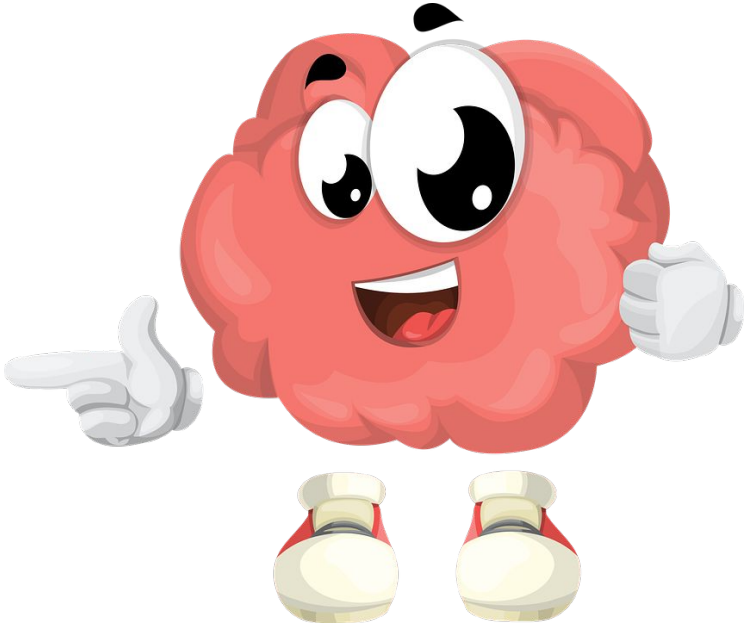
Ultrasonic:

- Implement wave-counting algorithm using improved thresholding techniques
- Run tests & gather data



Learning Expectations

- Arduino programming
- Digital and hardware-oriented filtering methods
- Automating data collection and tests (MATLAB testbench)
- Digital Signal Processing
- 3D Printing and Etching
- Circuit Board Design



The end.

Any questions?

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