This research looks to determine the wind velocity in front of a wind turbine by observing the tilt from a drone. Drones come with stabilizing settings that allow the drone to react to incoming wind by tilting towards the wind. The greater the wind the larger the tilt.

Wind Turbine Renewable Energy

- Wind turbines extract kinetic energy from upcoming wind and convert it to electricity
- Wind turbines are continuously being structured with larger propellers which cause more fatigue load
- Wind fluctuations, or turbulence, are closely related to structure fatigue loads and turbine service life.
- It is essential to accurately measure wind information to assess resources available, predict wind power production efficiency and ensure timely maintenance of wind turbines.

Flight Logger Software

Flytrex

- Flytrex software allows for flight data such as GPS location, pressure, temperature, altitude to be collected and extracted for analyzing
- Observing the graphs shown display a flight logged with two instances of drone stabilization

DJI Phantom 2 Drone

Max Flight Time: 25 min
Max Flight Speed: 15 m/s
Max Tilt Angle: 35 degrees
Comm. Distance: 1,000 m (3280.84 ft)
- On-board sensor include a compass and Global Positioning System that allows for position holding, altitude lock and stable hovering.
- When in GPS mode, and the user is no longer controlling the vehicle, the quadcopter uses its GPS on-board to keep its position before its last read command from the controller

Raspberry Pi Microcomputer

Price: $5
Dimensions: 65mm x 30mm x 5mm
CPU: Broadcom BCM2835, run up to 1GHz
RAM: 512MB
Storage: MicroSD Card
OS: Linux (Raspian)
- The tool to run the processed code for the external sensors is a microcomputer Raspberry Pi Zero.
- The Zero was selected for its lightweight, low power consumption and minimal cost.

BME280 Sensor

- Temperature
  -40 C to 80 C
  0.01 C resolution
- Pressure
  300 to 1100 hPa
  0.18 Pa resolution
- Humidity
  0.008 %RH resolution

Magnetometer (3-axis)
This three axis sensor measures the magnetic field intensity of the area.

Accelerometer (3-axis)
This sensor measures the change in velocity of an object in three dimensions, along the x, y, and z axis.

Future Work

- Wirelessly connect raspberry pi
- Quantify the drone’s stabilizing mode
- Observe the drone with known wind velocities

Gyroscope (3-axis)
This triple axis gyro allows a user to measure the angular rotation of the gyro about the x, y, and z axis.

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