



Development of a Wind Measurement Tool Using a Hovering Drone



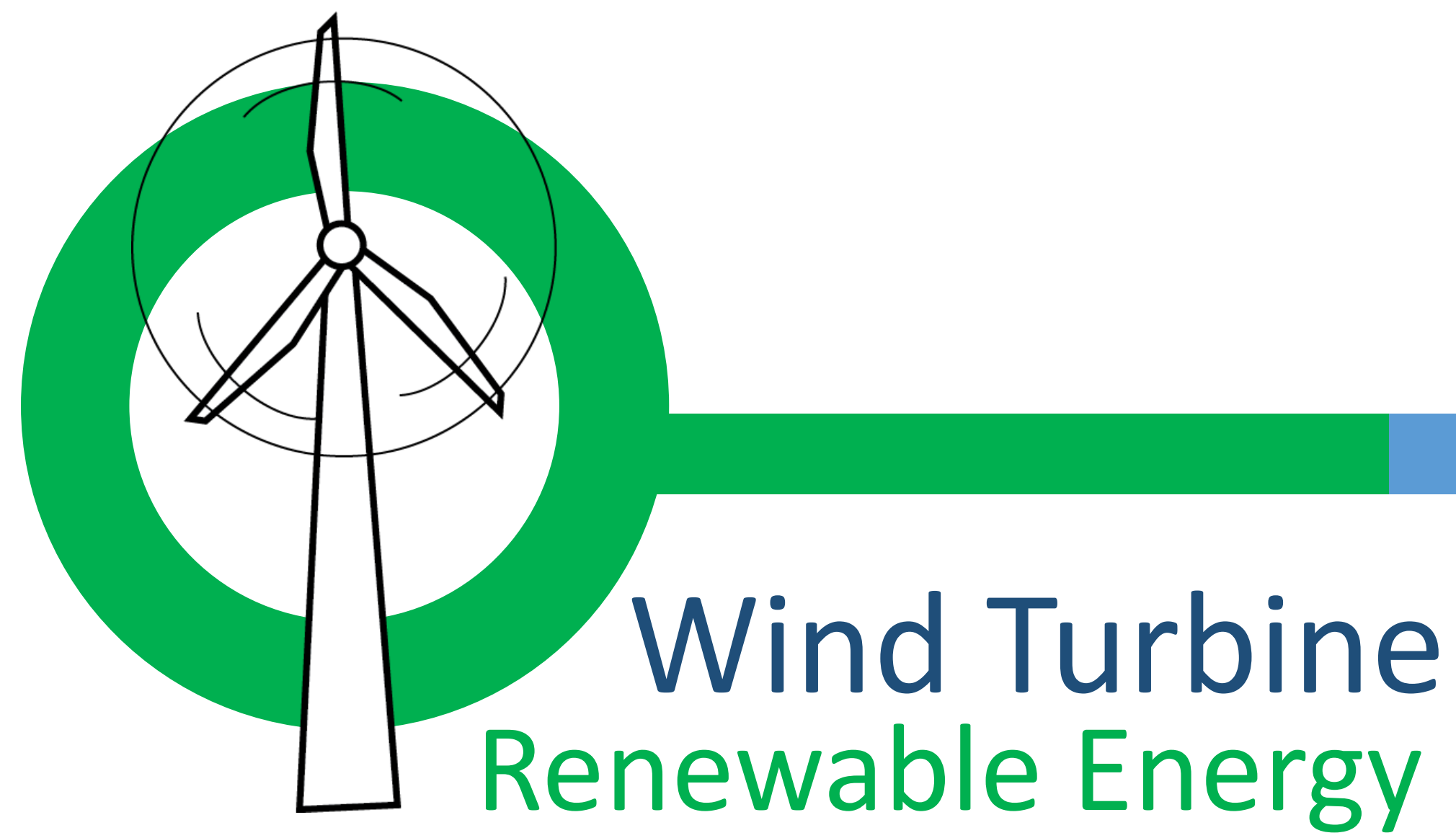
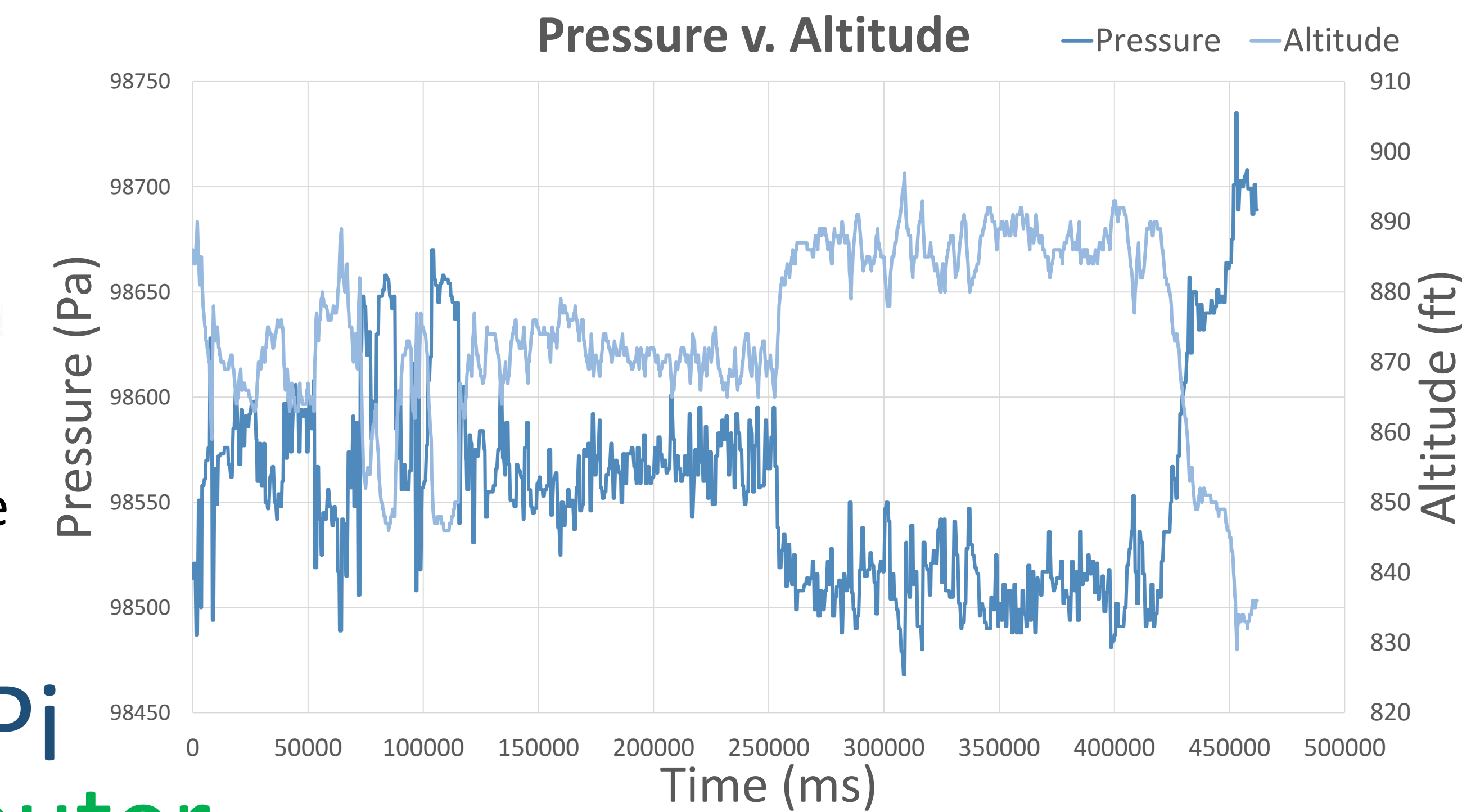
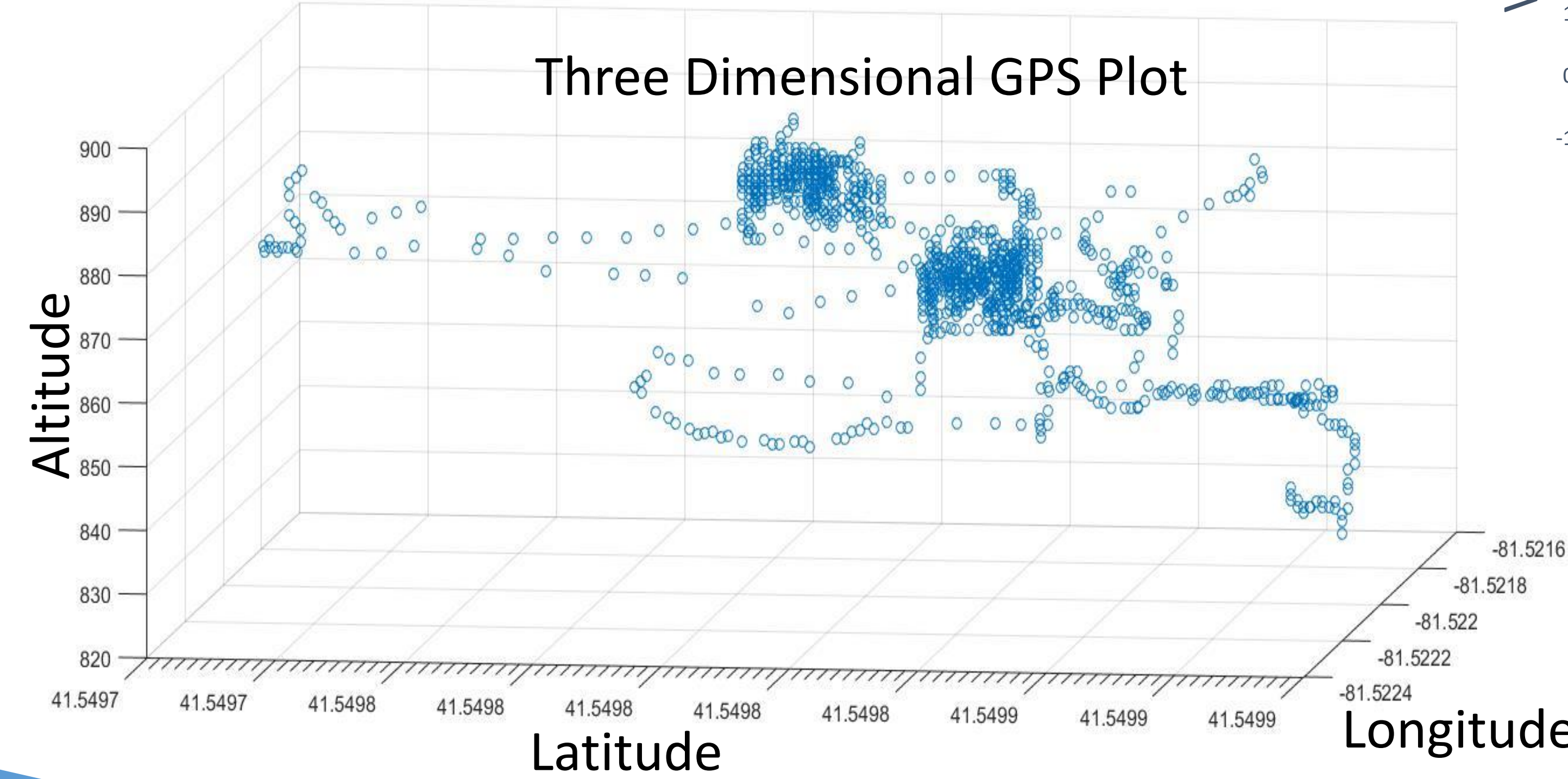
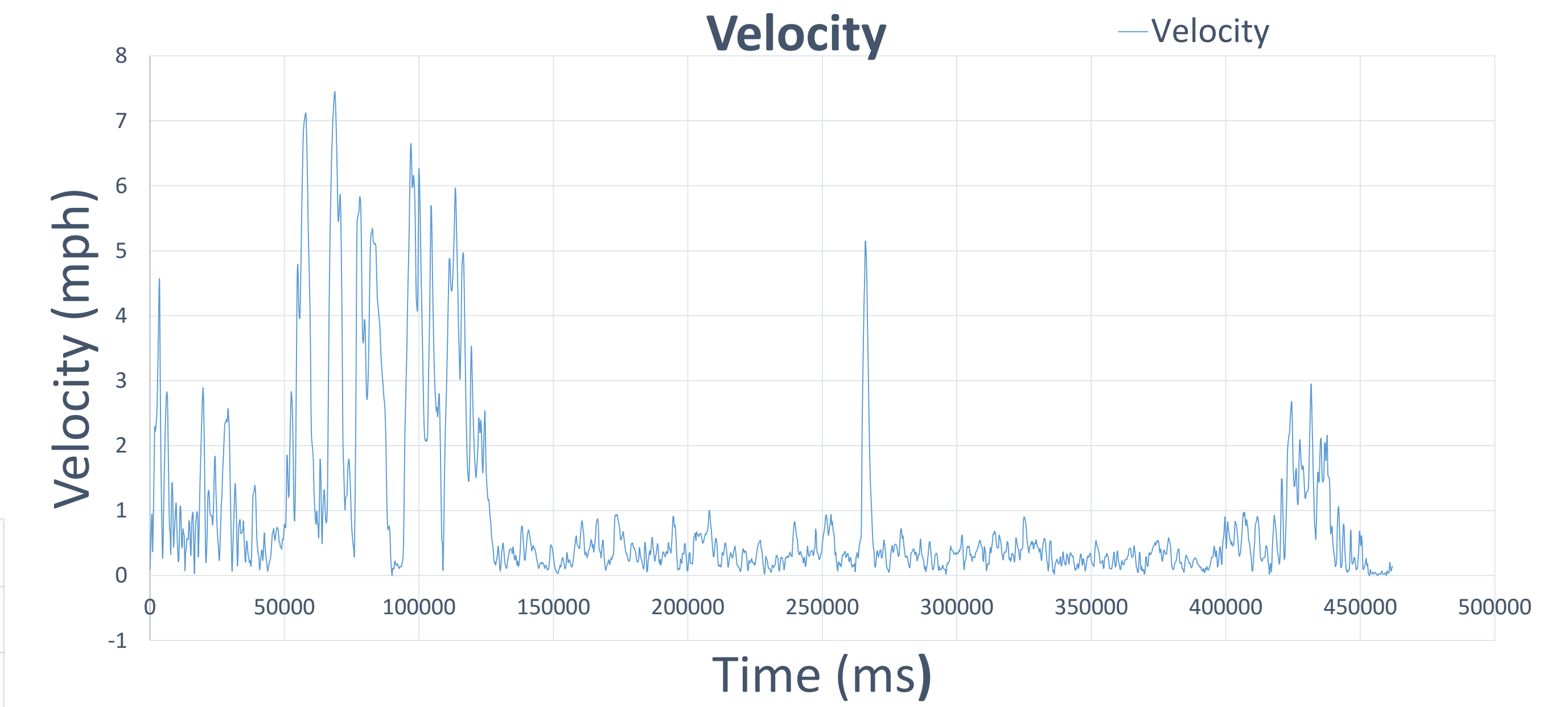
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This research looks to determine the wind velocity in front of a wind turbine by observing the tilt from a drone. Drones come with stabilizing settings that allow the drone to react to incoming wind by tilting towards the wind. The greater the wind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

Flight Logger Software



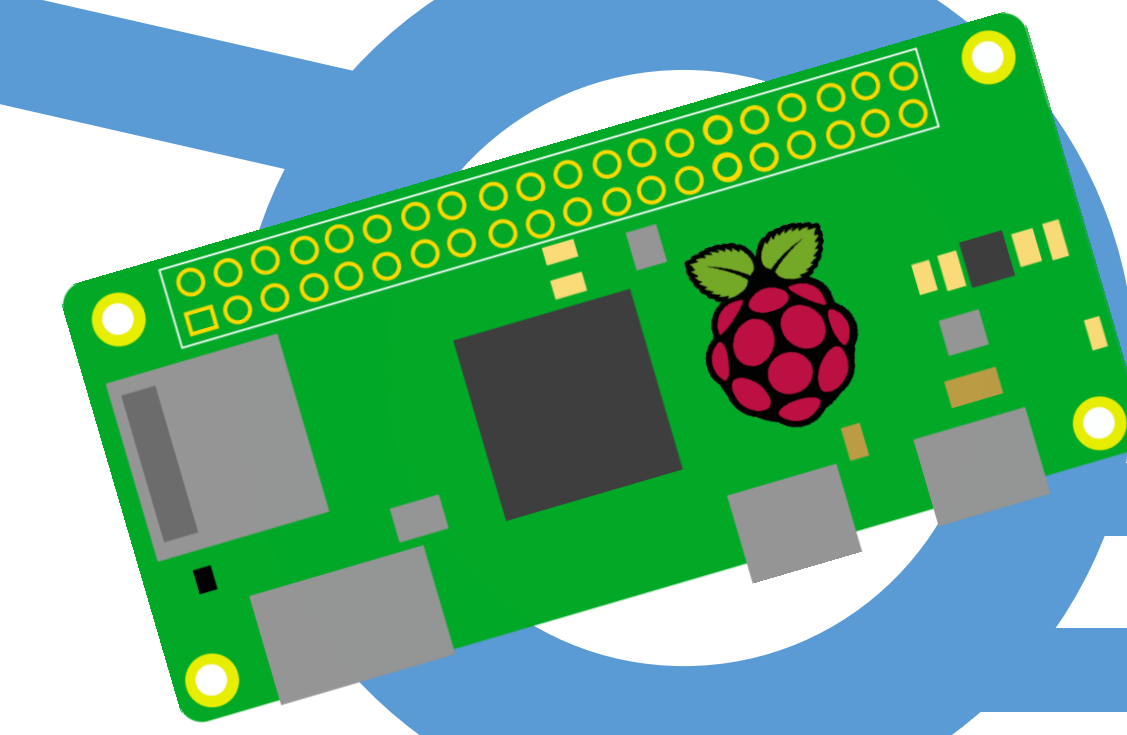
- Flytrex software allows for flight data such as GPS location, pressure, temperature, altitude to be collected and extracted for analyzing
- Observing the graphs shown display a flight logged with two instances of drone stabilization



DJI Phantom 2 Drone

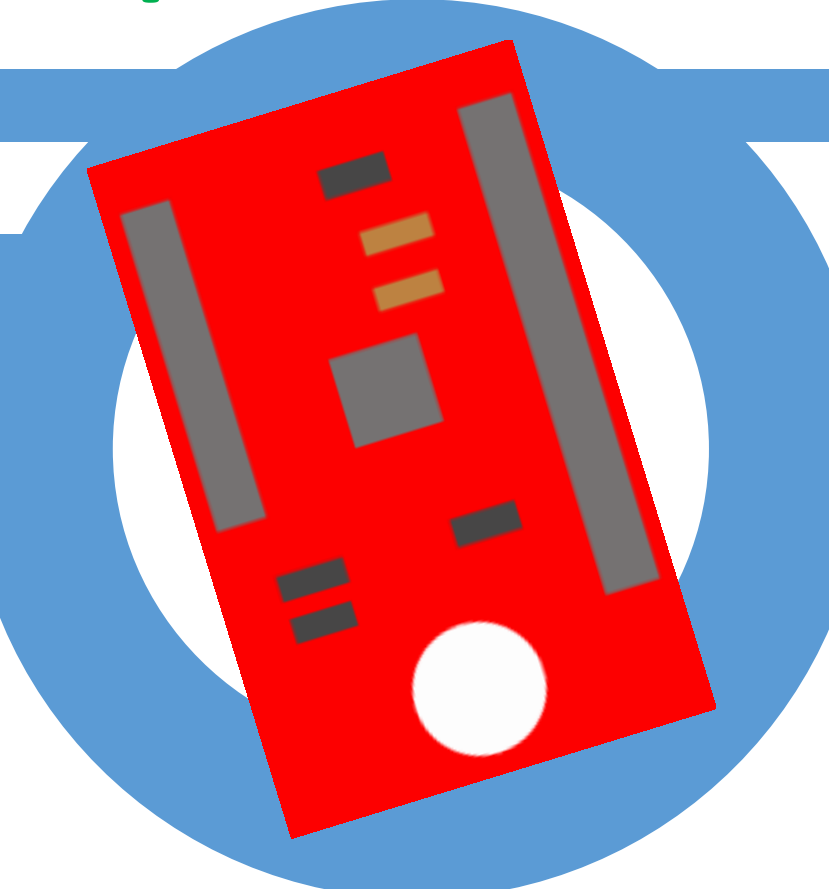
Max Flight Time: 25 min
 Max Flight Speed: 15 m/s
 Max Tilt Angle: 35 degrees
 Comm. Distance: 1,000 m (3280.84 ft)

- 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.

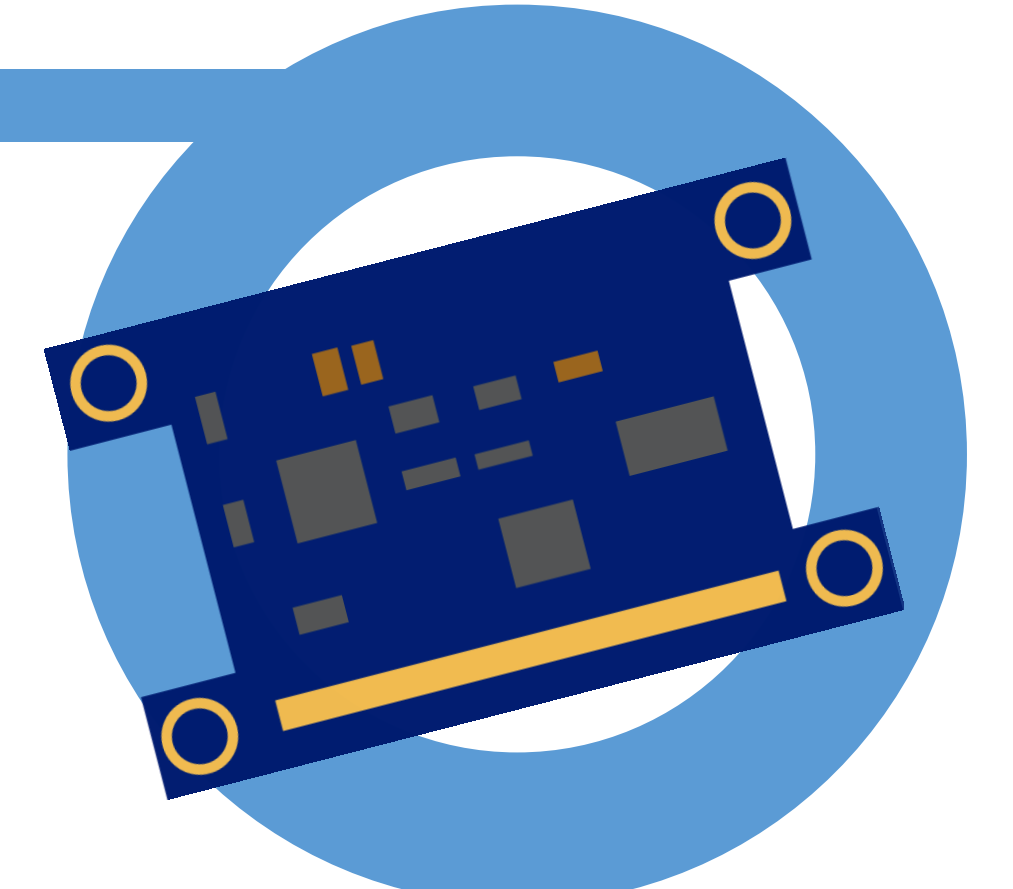


BME280 Sensor

Temperature
 -40 C to 80 C
 0.01 C resolution

Pressure
 300 to 1100 hPa
 0.18 Pa resolution

Humidity
 0.008 %RH
 resolution



10 DOF Sensor

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.

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

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

- Wind turbines extract Kinect 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.

Future Work

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

