Magnetic Navigation

Red-Orange

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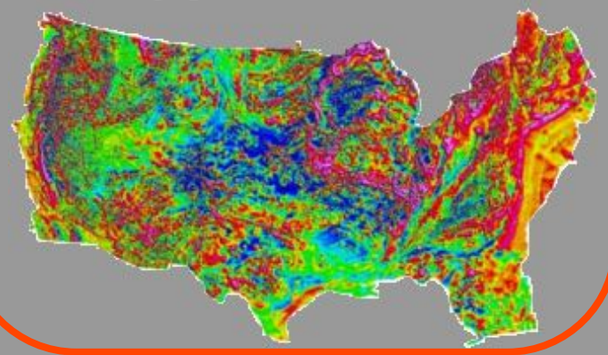
Background

- Gps signals are jammable, and can be affected by poor satellite coverage
- Magnetic anomalies are caused by large ferrous deposits, far enough beneath the Earth's crust that they are nearly impossible to interfere with and don't change in time
- Maps of magnetic anomalies already exist for the entire US and large parts of the world

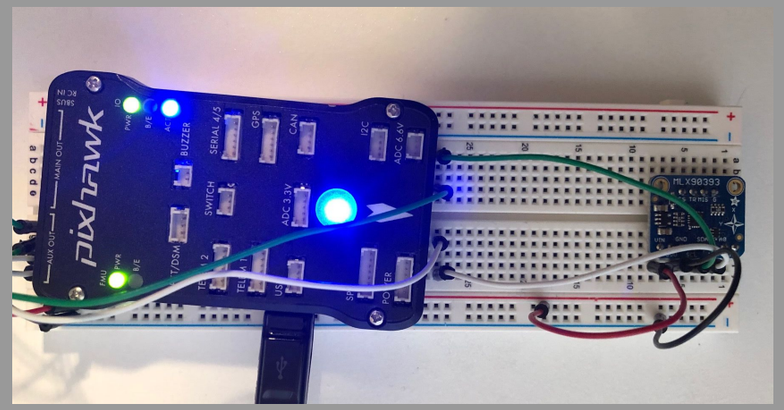


Goal

Magnetic navigation will be a system to use magnetic anomaly data to determine the location of an aircraft, providing an alternative to GPS navigation.

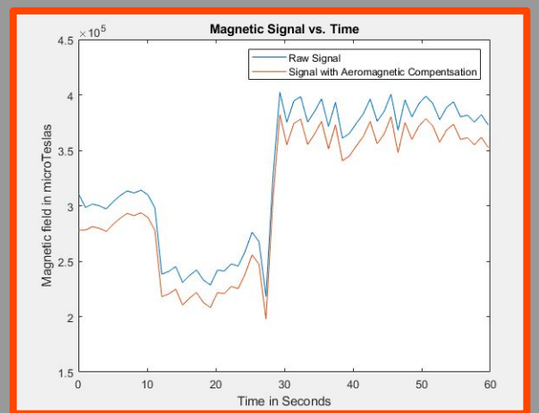
System Design and Components

- Raspberry Pi 3
- Adafruit Magnetometer
- AKM Magnetometer
- (Insert Type of) magnets
- PixHawk Flight Computer



- **Data Collection:** The Pixhawk flight controller and magnetometer relay sensor readings to a Raspberry Pi over USB serial and I2C
- **Signal Conditioning**: Using the Tolles-Lawson algorithm we are able to eliminate interference due to outside magnetic noise, and the Earth's geomagnetic field.
- **Particle Filtering:** By utilizing IMU data, we are able to continuously predict the location of the aircraft, correct that information with magnetic data, all using a Particle Filter

Results and Next Steps



- **Full system integration:** The Data Collection, Signal Conditioning, and Particle Filtering systems were developed separately and have not been integrated yet. The next major step would be to ensure that collected data runs through each stage and produces expected results
- **Moving to 2D:** The current particle filtering algorithm is designed for 1 dimensional measurements (i.e. distance along a line). Developing it (and adjusting the data collection to match) for 2D would be a large step forward.