WELCOME TO PRESENTATION

Drone Base Intelligent Magnetic Sensing System & Metallic Anomaly Detection System

TEAM
GEO-EXPLORER
PRESENTATION

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PROBLEM OBJECTIVE

MAGNETIC FIELD DETECTION

- Develop a Drone-based Intelligent Magnetic Sensing System to assess magnetic fields in specific areas (land or sea)..

OBJECT DETECTION

- Develop a methodology for identifying unidentified metallic magnetic anomalies within the selected region.

IDENTIFICATION & CLASSIFICATION

- Design a compensation methodology to account for the drone's magnetic field, ensuring accurate measurements.
- Utilize open-source geomagnetic anomalies data for a specific region to identify and classify metallic magnetic anomalies.

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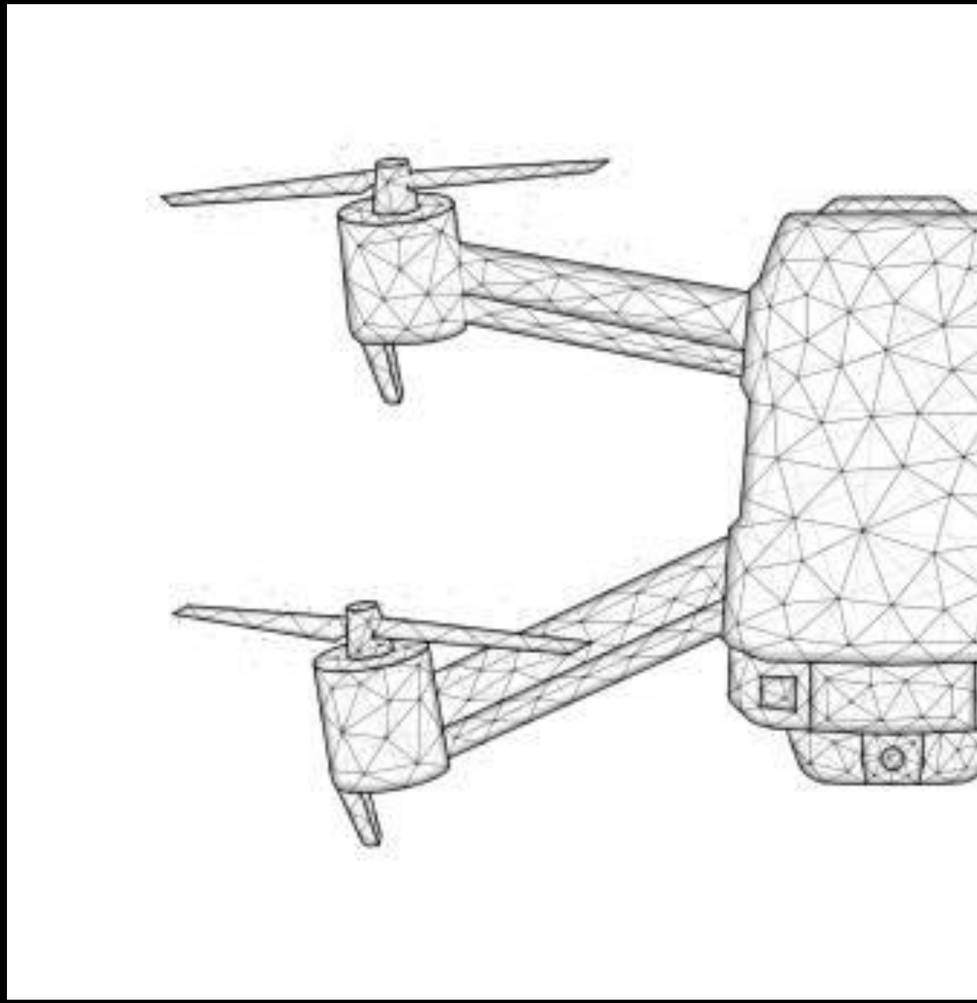
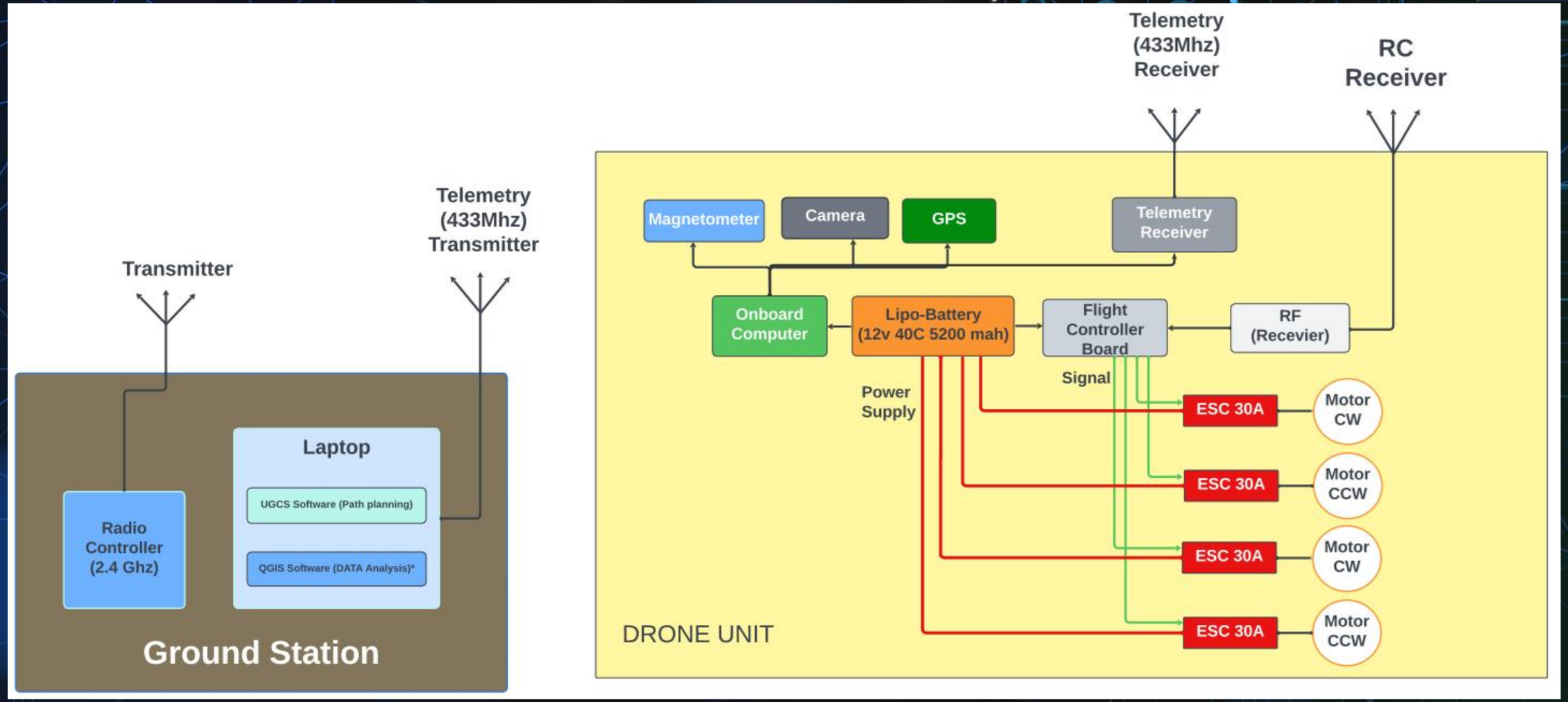
OUR PROPOSED SOLUTION

We aim to develop a Drone-based Intelligent Magnetic Sensing System, equipped with learning algorithms and magnetic compensation techniques, to detect, identify, and classify metallic objects using Earth's magnetic field anomalies.



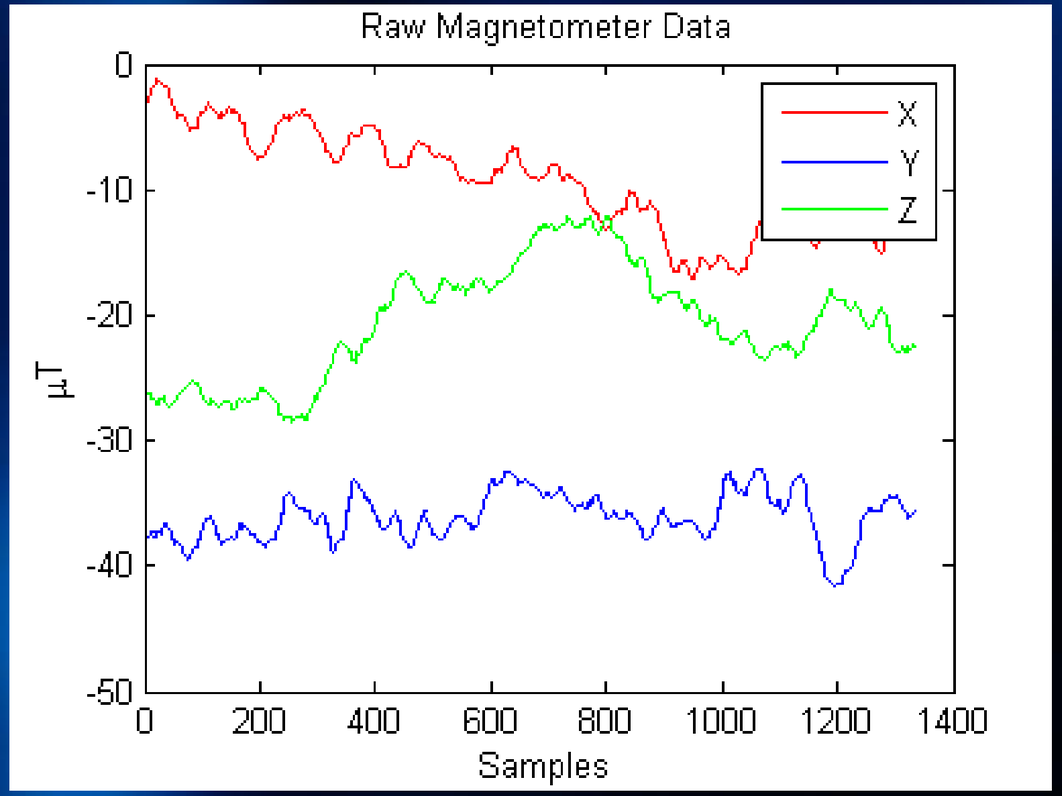
BASIC BLOCK DIAGRAM



MAGNETIC FIELD DETECTION

MAGNETIC FIELD DETECTION

Magnetic field detection will be accomplished by equipping the drone with a precision magnetometer, GPS, and Raspberry Pi for real-time data collection and processing. By continuously measuring and analyzing magnetic field data and utilizing established algorithms, we can identify magnetic anomalies and disturbances in a specific geographic region.



COMPONENTS IN DRONE

FLIGHT CONTROLLER To control drone motor with the help of receiver of Remote Controller. And for Autonomous Flight	**GPS** Precision navigation and location tracking. Covers up to 10 kilometers above the Earth's surface.	**MAGNETOMETER** Precision magnetic field intensity measurement. Fiend Magnetic Signature of an area
RASPBERRY PI ON BOARD COMPUTER Central control hub managing data acquisition, preprocessing, and telemetry	**PI CAM** Visual data capture for comprehensive analysis High-resolution imaging for detailed object recognition	**TELEMETRY RADIO** Vital communication link for real-time drone data transmission. Ensures data security through encryption protocols

OBJECT DETECTION

GPS & MAGNETOMETER SENSOR DATA

1. Introduction
2. Collecting GPS & Magnetometer DATA
3. DATA Integration
4. DATA transformation
5. .CSV Format
6. Benefits of .CSV Format
7. Data Analysis

TELEMETRY COMMUNICATION

SENDING

This is the process where the drone transmits various data, including telemetry (like GPS coordinates, altitude, and speed), and magnetometer readings to the ground station. It's like the drone sharing its status and sensor information.

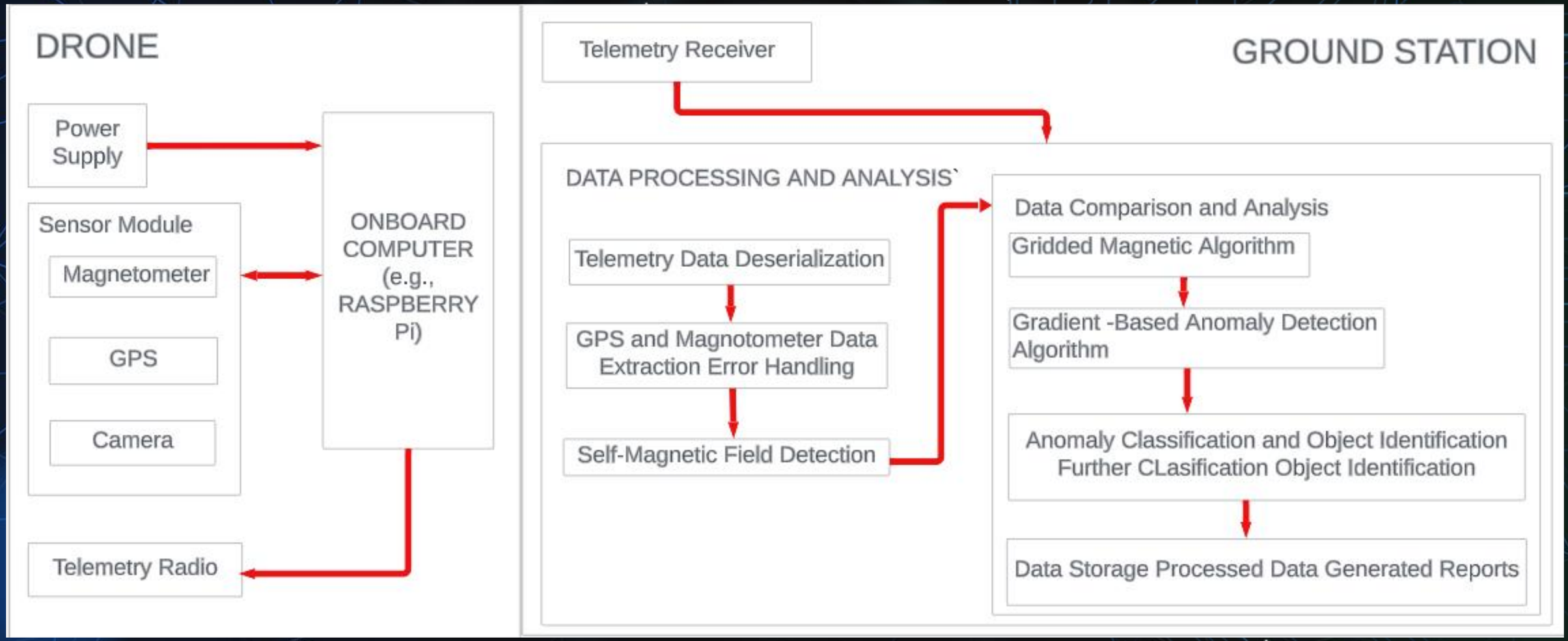
RECEIVER

The receiver is the ground station or software that listens to the data sent by the drone. It collects this data from the drone's telemetry system and magnetometer. The receiver plays a crucial role in processing and making sense of the data.

ERROR HANDLING

Error handling is a safety net. Sometimes, during data transmission, errors or glitches can occur. Error handling mechanisms in the communication system ensure that if there are any problems or missing data in what the drone sends, they are identified and corrected or reported. This is vital for reliable and accurate data interpretation.

BASIC BLOCK DIAGRAM



GRIDDED MAGNETIC ALGORITHM

WHY THIS ?

Used to analyze magnetic field data from magnetometers.

HOW THIS ?

Calculates expected magnetic field values at grid points, compares with measured data, and detects anomalies.

ALTERNATE OPTION ?

Specialized software or custom algorithms.

INPUT & OUTPUT

Measured magnetic field (XYZ), grid parameters, Earth's magnetic model, thresholds. Anomaly map highlighting magnetic variations, anomaly details, for geophysics and exploration.

IDENTIFICATION & CLASSIFICATION USING ML

GRIDDED

- Purpose: Identifying Anomaly
- I/P:
  - Geospatial Data
  - GPS + Magnetometer
  - Parameter of grid size threshold value
- O/P:
  - Anomaly map
  - Characteristic: Size, Intensity & Orientation.

GRADIENT

- Purpose: Classification
- I/P:
  - Geospatial Data
  - GPS + Magnetometer
  - Parameter Gradient Calculating & threshold
- O/P:
  - Anomalies: Size & Intention
  - Classification: Type & Score

PATH PLANNING : UGCS SOFTWARE

UGCS (Unmanned Ground Control Software) is a comprehensive and versatile software platform designed for the control and management of unmanned aerial vehicles (UAVs) or drones. It offers a wide range of features and capabilities that make it a valuable tool for drone operators and researchers.

Features:

- Flight Planning
- Real Time Monitoring
- Mission Automation
- Safety Features
- User Friendly Interface
- Commercial

PATH PLANNING : UGCS SOFTWARE

GEO-MAPPING : QGIS SOFTWARE

QGIS is known for its versatility, ease of use, and extensive features, making it a popular choice in various fields that involve spatial data and mapping. QGIS is a widely-used open-source Geographic Information System (GIS) software. It is designed to help users create, edit, visualize, analyze, and manage geographical data and maps

Features:

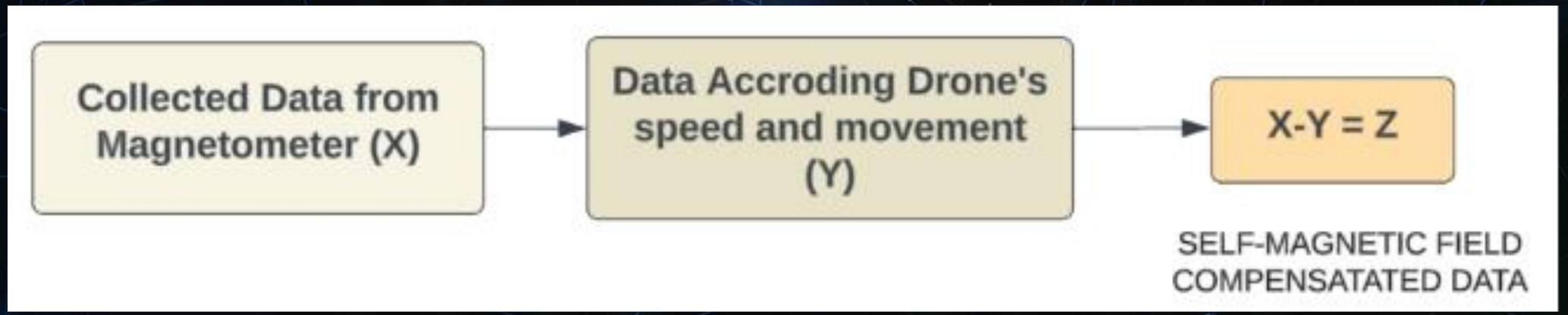
- Analysis tools
- 3D Map Creation
- Open Source
- Cross-Platform
- User Friendly Interface
- Data import & edieting

SELF-MAGNETIC FIELD COMPENSATION

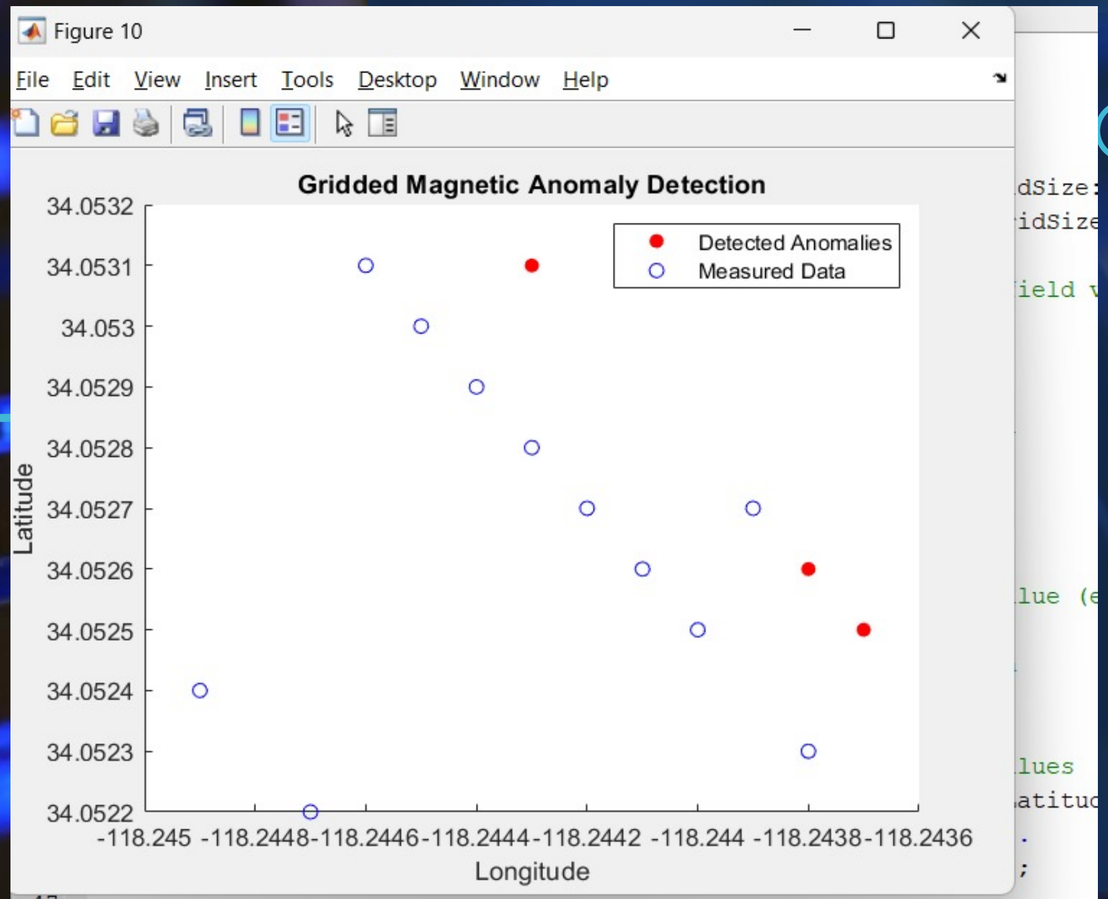
STEPS FOR SELF-MAGNETIC FIELD COMPENSATION

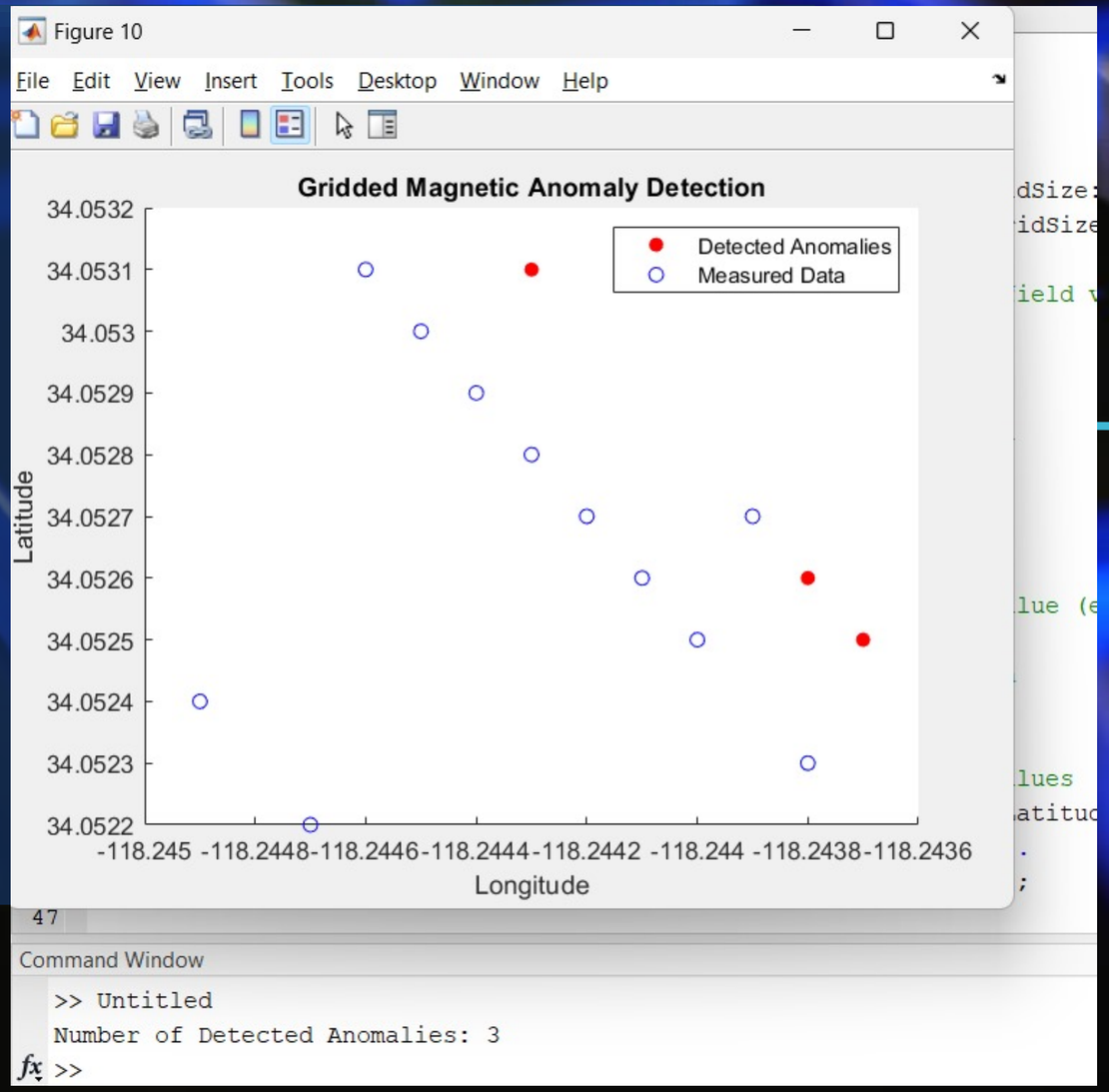
1. Initialization
2. Data Acquisition Loop:
3. Orientation Estimation
4. Magnetic Field Model
5. Compensation Calculation
6. Combine Components
7. Data Logging/Usage

BLOCK DIAGRAM



MATLAB SAMPLE DATA



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47
Command Window
>> Untitled
Number of Detected Anomalies: 3
fx >>
```

```
47
Command Window
>> Untitled
Number of Detected Anomalies: 3
fx >>
```

THANK YOU!