MIT | Academy of Engineering

(An Autonomous Institute Affiliated to Savitribai Phule Pune University)

Soil and Field analysis

F.Y.Btech Emerging technology

SUBMITTED BY

Abhijit Jadhav(821)

Satyam Bankar(804)

GUIDED BY

Prof. Rahul Patil

MIT ACADEMY OF ENGINEERING, ALANDI (D), PUNE-412105

MAHARASHTRA (INDIA)

June, 2023

CONTENTS

ACKNOWLEDGEMENT

We would liket to express our gratitude towards our respected Prof. Rahul K Patil sir for his constant encouragement and valuable guidance during the completion of this project work.
We would be failing in our duty if we do not thank all the other staff and faculty members for their experienced advice and evergreen co-operation.

ABSTRACT :

This project report provides a comprehensive overview of the development and implementation of an agriculture drone for enhanced farming practices. The report highlights the objectives, methodology, key findings, and recommendations based on the research and experimentation conducted.

INTRODUCTION

- Drone technology has revolutionized various industries, including agriculture, by providing innovative solutions to traditional practices.
- In the field of soil and field analysis, drones have emerged as powerful tools that enable farmers and researchers to gather accurate, real-time data on soil health, crop conditions, and overall field management.
- This report aims to explore the advantages and benefits of utilizing drone technology in soil and field analysis.

Benefits

The utilization of drones for soil and field analysis offers several benefits to farmers and agronomists

a. Precision and Efficiency: Drones provide highly precise and efficient data collection, eliminating the need for manual labor and time-consuming field visits. They can cover large areas quickly, facilitating faster decision-making.

b. Cost-Effectiveness: Traditional soil and field analysis methods can be expensive. Drones offer a cost-effective alternative, reducing the need for extensive laboratory testing and optimizing resource allocation.

c. Improved Data Quality: The high-resolution imagery and sensor data captured by drones provide detailed insights into soil and crop conditions. This improved data quality enhances the accuracy of analysis and decision-making processes.

d. Timeliness: Drones can be deployed at any time during the growing season, allowing for timely monitoring of crops and identification of issues. This helps prevent potential losses and take corrective actions promptly.

COMPONENTS

Hardware requirerments :

Frame: Mark4 5 inch carbon fibre frame This frame has
arm thickness of 5mm, and weight of 130gm.

: T - motor U15 motor

: Pixhawk Flight controller Board

It is integrated the newest 32- bit chip technology and high end sensors, this is absolutely one of the best flight controllers for quadcopters.
Comes with Advanced 32-bit cortexM4 ARM high-performance processor, and 32 bit STM32STMF100 failsafe co – processor. Processor : 168Mhz, 256KB RAM, 2MB Flash

Radio Transmitter : Zorro ELRS Radio Transmitter with RP1 ExpressLRS 2.4ghz Receiver
Operational current is of 160mA@8.4V, and voltage of 6.6-8.4vDC having weight of 355gm.

Camera : Run cam Pheonix 2 Camera module

Runcam Phoenix 2 Nano is both great daylight and low light FPVcamera, equipped with an improved ½" WDR image sensor and high quality M8 lens. Having low latency and high performance.

GPS : BN-220 GPS Module

Supports rate for 4800bps to 921600bps, single GNSS : 1Khz- 10hz, Default of 1Hz
Tracking of 167dBm and reaquisition of 160dBm

Antenna : 5.6ghz 60 mm SMA Antenna

Propellers : 51433 propeller 2 clockwise and 2 counterclockwise

Battery : Tattu 1550mAh Lipo battery

Software requirements :

Ardupilot
Cloud
Python

• The Amazon Web Services (AWS) cloud computing platform does not directly monitor or combat illegal fishing activities. However, organizations can utilize AWS cloud services to develop applications and systems to address illegal fishing. AWS provides services for data storage, processing, machine learning, analytics, real-time monitoring, and data sharing. These services can assist in storing and analyzing data from various sources, detecting

patterns and anomalies, creating real-time monitoring systems, and facilitating collaboration among stakeholders. It's important to note that AWS services should be part of a broader strategy and efforts by relevant authorities and organizations to combat illegal fishing.

- Utilizing OpenCV and TensorFlow in a cloud computing environment, an algorithm can be developed to combat illegal fishing activities. By harnessing the power of these sophisticated technologies, the algorithm integrates advanced computer vision techniques with deep learning capabilities. Through the collection and preprocessing of diverse data sources, such as satellite imagery and sensor readings, OpenCV enables the extraction of pertinent features and regions of interest. TensorFlow, on the other hand, facilitates the training of a machine learning model, such as a convolutional neural network, enabling the algorithm to detect instances of illegal fishing with high accuracy. Deploying this algorithm on a cloud platform empowers real-time monitoring, precise inference, and timely alerting, leading to swift and effective responses against illicit fishing practices.

Cost of the components :

1.	Frame	2,000
2.	Motor	1,000
3.	Radio transmitter	14,000
4.	Camera	3,200
5.	GPS	1,235
6.	Antenna	800
7.	Propeller	249
8.	Battery	2,586
9.	Flight controller	11,699
Total		36769

CALCULATIONS :

Battery capacity = 1550 mAh = 28.6Wh

Thrust : Approximately, 78.5N is the thrust for T-motorU15

Total thrust is 4*78.5 = 314N

Total weight : 1kg

Challenges

l challenges need to be addressed:
a. Regulatory Considerations: Operating drones for commercial purposes requires compliance with aviation regulations. Authorities may impose restrictions on flight altitudes, operating areas, and certifications. Ensuring compliance with these regulations can be a challenge.
b. Data Analysis and Interpretation: The large volume of data collected by drones needs to be processed and interpreted effectively. Agronomists and farmers may require training or assistance to derive meaningful insights from the data.
c. Weather and Environmental Factors: Adverse weather conditions such as strong winds, rain, or low light can affect drone operations. Environmental factors like vegetation density or uneven terrain can also impact the quality and accuracy of data collection.
d. Initial Investment and Maintenance: Acquiring drones, sensors, and data analysis tools involves initial investment. Furthermore, regular maintenance and software updates are necessary to ensure the drones operate optimally.

CONCLUSION

The project portfolio demonstrates the wide-ranging applications and benefits of using drone technology in soil and field analysis. Drones provide precise data collection, efficiency, cost-effectiveness, and remote sensing capabilities that enable informed decision-making and improved agricultural practices. By integrating drone technology into soil and field analysis workflows, farmers can optimize resource management, enhance crop productivity, and promote sustainable farming practices