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SURVEY OF AGRICULTURAL FIELDS USING DRONE CONTROLLED BY BLUETOOTH

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ABSTRACT :

Drones, or Unmanned Aerial Vehicles (UAVs), have transformed modern agriculture by offering efficient, high-precision data collection for crop monitoring, field analysis, and resource management. This paper covers drone applications in agriculture, such as crop health monitoring, pesticide spraying, soil analysis, and yield estimation. The use of drones when combined with technologies such as the Internet of Things (IoT), Artificial Intelligence (AI), and Machine Learning (ML) has also improved their effectiveness.

Keywords: Drones, Unmanned Aerial Vehicles (UAVs), Precision Agriculture, Crop Monitoring, Soil Analysis, Pesticide Spraying, Yield Prediction, IoT in Agriculture, AI in Farming, Smart Farming, Agricultural Automation, Remote Sensing, Multispectral Imaging, Farm Management, Sustainable Agriculture, DM002 Drone, Real-Time Monitoring, Aerial Imaging, Agricultural Robotics, Drone Assembly.

INTRODUCTION

To make farming easier and more efficient with new technology, one of the most useful inventions is drones, it is also known as Unmanned Aerial Vehicles (UAVs). The farmers have to walk through their fields to check for problems like pests, diseases, or dry soil, which takes a lot of time and effort. Sometimes, they do not find problems early enough to prevent damage. So to help farmers and make their work more efficient and easier the best option is a drone . Drones can fly over farms and take clear pictures, helping farmers see issues quickly and make better decisions about watering, fertilizing, and protecting their crops. Some drones have special sensors that can detect problems that are not visible to the human eye, allowing farmers to act before crops are harmed. Drones also help reduce waste by making sure water, fertilizers, and pesticides are used correctly, which protects the environment. As drone technology improves, it will continue to help farmers to work faster, save money, and grow more food in a better and more sustainable way.

This research focuses on the role of drones which is useful for modern agriculture, particularly for crop monitoring, soil analysis, pesticide spraying, and yield prediction. It explores how integrating drone technology with AI, IoT, and precision farming enhances efficiency, reduces costs, and improves decision-making for farmers. The study also examines existing challenges, such as regulatory restrictions, high costs, and data management issues, while highlighting future advancements needed to make drones more autonomous, energy-efficient, and accessible for sustainable farming.

LITERATURE REVIEW

Drones are revolutionizing agriculture by improving crop monitoring, soil analysis, pesticide application, and yield prediction. Vardhan and Swetha (2023) [1] found that drones enhance disease detection using multispectral imaging, enabling early interventions. Tsouros et al. (2019) [2] highlighted their role in monitoring crop health and optimizing resource use. Mogili and Deepak (2018) [3] showed UAVs improve soil mapping, aiding efficient fertilization and irrigation. Zhang et al. (2023) [3] found drone spraying reduces pesticide waste and enhances efficiency. Rohe et al. (2024) [4] reported UAVs improve yield forecasting accuracy. Patel et al. (2024) [5] note challenges like costs and regulations, but advancements in AI and automation will enhance adoption. Gopal Dutta and Purba Goswami (2020) [11] This review examines the role of drones in agriculture, highlighting their benefits in crop health monitoring, weed management, evapotranspiration estimation, and spraying. The authors advocate for increased adoption of drone technology to improve agricultural productivity and quality. The integration of drones in agriculture has been shown to increase productivity by enabling more precise farming techniques, improving yield prediction, and allowing early intervention when problems are detected. Istiak et al. (2023) [12] This survey explores the integration of drones with Internet of Things (IoT) technologies in agriculture. It discusses the use of drones for crop health monitoring, pest management, and precision spraying, emphasizing the importance of data-driven decision-making in modern farming..This paper explores the diverse applications of drone technology in agriculture, including water management, pest and disease detection, crop yield estimation, weed identification, workforce monitoring, livestock maintenance, and logistical concerns. The integration of drones enhances operational efficiency, precision, and cost-effectiveness by reducing inputs such as land, water, seeds, agro-chemicals, and manual labor. Alberto Pretto, Stéphanie Aravecchia, Wolfram Burgard, et al. [14] This paper presents an adaptable robotic solution for precision farming that combines the aerial survey capabilities of small autonomous unmanned aerial vehicles (UAVs) with targeted interventions performed by multi-purpose unmanned ground vehicles (UGVs). The study introduces multi-spectral perception algorithms and systems developed for monitoring crop density, weed pressure, and nitrogen nutrition status, aiming to optimize agricultural practices through collaborative aerial and ground-based systems.

PROBLEM STATEMENT

Traditional farming methods take time and effort, making it hard for farmers to detect pests, diseases, or dry soil early. Delays in spotting these issues can reduce crop yields and waste resources like water and fertilizers. Our drone helps solve this problem by providing real-time aerial monitoring, allowing farmers to make quick and informed decisions.

METHODOLOGY

Assembly Guide for DM002 Remote Control Quadcopter

The components used for the design are as follows:

- **Frame / Main Body**
- **Remote Controller**
- **Mobile Phone Fixed Mounting**
- **Motor A and Motor B**
- **Receiver Board**
- **Wi-Fi Camera**
- **Battery**
- **USB Charging Cable**

Flow of Assembling

Step 1: Install the Circuit Board

- Securely attach the **receiver board** to the frame.
- Make sure the board is aligned correctly according to the installation direction.

Step 2: Install the Motors

- Identify **Motor A** and **Motor B** (these must be placed diagonally).
- Match the motors to the corresponding interface colors on the circuit board.
- Secure the motors properly in their designated slots.

Step 3: Attach the Protective Cover

- Align the **protective cover** with the main frame.
- Snap it into place securely using the designated bayonet positions.

Step 4: Install the Camera

- Insert the **WiFi camera** into the protective cover.
- Ensure the camera is securely positioned for stable recording.

Step 5: Load the Battery

- Place the **battery** in its designated compartment.
- Connect it securely to the circuit board.

Step 6: Attach the Propellers

- Match the **propellers** to their respective motors (Motor A and Motor B).
- Secure the propellers tightly to avoid loosening during flight.

Step 7: Mount the Mobile Phone Holder

- Attach the **mobile phone fixed mounting** to the remote controller.
- Ensure a firm attachment for stable phone support.

Connecting to the Visual Interface

- Power on the drone and ensure the battery is fully charged.
- Use the WiFi UAV application to connect the drone via Bluetooth**.**
- Follow the app instructions to access the live video feed and control settings.

Final Checks Before Flight

- Verify that all components are securely installed and properly connected.
- Check motor and propeller alignment for balance and stability.
- Test the remote controller for proper responsiveness.
- Confirm that the camera feed is working via the WiFi UAV app.

V. BLOCK DIAGRAM

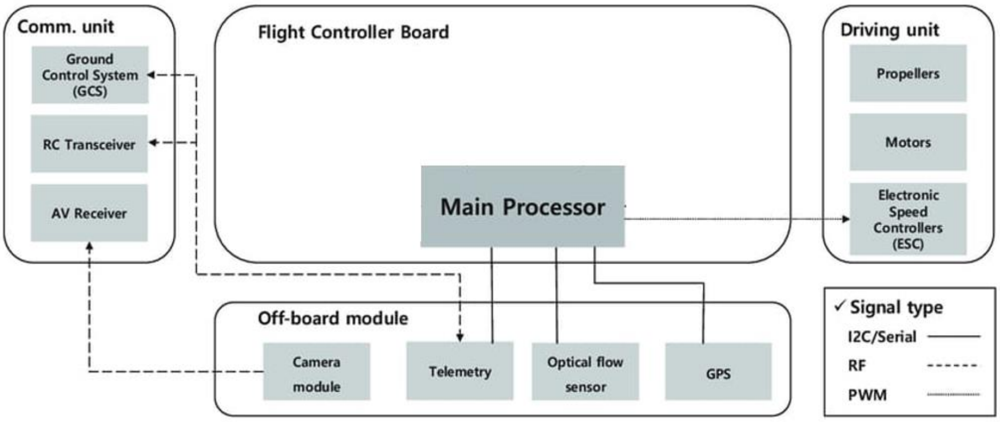

Fig. 1. Block Diagram

The block diagram represents the architecture of a drone system, detailing its main components and their interactions. Here's an explanation of the different units and their roles:

1. Ground Control Unit

- **Ground Control System (GCS)**: Acts as the interface for the operator to control and monitor the drone.
- **RC Transmitter**: Transmits commands from the operator to the drone using RF (Radio Frequency) signals.
- **RF Receiver**: Receives commands from the RC transmitter and sends them to the Flight Controller Board for processing.

2. Flight Controller Board

- **Main Processor**: The core computational unit of the drone that processes inputs from the ground control unit and various sensors. It also generates appropriate control signals for the driving unit.
- **Connections**:
  - Inputs from the ground control unit (commands).
  - Data from the off-board modules like camera, telemetry, optical flow sensor, and GPS.
  - Outputs to the driving unit for controlling propellers and motors.

3. Driving Unit

- **Propellers** and **Motors**: Provide the necessary thrust and direction control for the drone's movement.
- **Electronic Speed Controllers (ESC)**: Regulate the speed of the motors based on PWM (Pulse Width Modulation) signals received from the flight controller board.

4. Off-board Modules

- **Camera Module**: Captures visual data for navigation or monitoring.
- **Telemetry**: Transmits data back to the ground station for real-time updates.
- **Optical Flow Sensor**: Measures the movement of the drone relative to the ground for stability and position control.
- **GPS Module**: Provides location and navigation data for autonomous or semi-autonomous flight.

5. Signal Types

- **RF (Radio Frequency)**: Used for wireless communication between the ground control unit and the drone.
- **Serial Communication**: For data exchange between the flight controller and off-board modules like GPS or telemetry.
- **PWM (Pulse Width Modulation)**: Used to control the motors via the ESC

VI. RESULT AND ANALYSIS

The integrated 720p HD camera supports real-time video streaming over Wi-Fi. The camera's angle is adjustable, ranging from straight ahead to straight up, allowing users to customize their viewing perspective. A setting button on top of the camera enables users to change transmission frequency bands and channels, making it compatible with various 5.8 GHz FPV displays. The camera delivers commendable quality for its price point, suitable for basic aerial photography and FPV experiences. The DM002 offers stable flight characteristics, attributed to its 6-axis gyroscope. It features multiple speed modes, accommodating both novice and experienced pilots. The quadcopter is relatively quiet and demonstrates stability during maneuvers. However, flight times are limited, averaging around 2 to 3 minutes per charge, which is below the advertised 7 minutes. Upgrading to a higher capacity battery with a better discharge rate is recommended to enhance flight duration. The drone can fly up to height of 100 m.

VII. CONCLUSION

In this study, we investigated the possibilities of the DM002 drone as a useful tool in modern agriculture. The drone's built-in 720p HD camera and real-time video transmission make it an effective tool for basic crop monitoring and field assessment. Its flight steadiness, aided by a 6-axis gyroscope, allows for easy operation even by inexperienced pilots.

Overall, the DM002 demonstrates potential capabilities for assisting farmers in early detection of pests, dry patches, and nutrient deficits. Drones like this could become even more valuable for efficient, data-driven, and sustainable farming when technology such as IoT and AI improves and is integrated. This study demonstrates how a relatively modest drone may have a significant influence on agriculture when used correctly.

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