COST EFFECTIVE MULTIFUNCTIONAL AGRI ROBOTRONE TECHNOLOGY FOR VEGETABLE PLANT LEAF DISEASE IDENTIFICATION AND PREVENTION

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2024 10th International Conference on Communication and Signal Processing (ICCSP) | 979-8-3503-5306-8/24/$31.00 ©2024 IEEE | DOI: 10.1109/ICCSP60870.2024.10543319

***Abstract* - In the development of digital agriculture, agricultural robots play a unique role. In India, 50 percent of the farmers are comes under small level. Agriculture robot and drone technology has revolutionized the agricultural industry by automating various processes and tasks involved in farming. With the advent of Internet of Things- IoT and advancements in image processing and machine learning- ML, the integration of these technologies in agriculture has become more efficient and effective. This project explores the use of robotics and drones in agriculture, with vegetable plant leaf disease management. Robotrone is one of new technique of farming for Vegetable plant leaf disease management.**

***Keywords*- Agriculture Tech, Robotrone System, Cost-Effective Solutions, IoT, Vegetable Plants, Leaf Disease Detection, Wireless Connectivity, Sustainable Agriculture, Renewable Energy Integration.**

I. INTRODUCTION

Modern agriculture is facing unprecedented challenges, including the need for increased productivity, resource optimization, and sustainable farming practices. In response to these challenges, this research introduces a groundbreaking solution – a cost-effective, multi-functional agriculture tech robot and drone system. Leveraging the power of Internet of Things (IoT), image processing, and machine learning technologies, this system is designed to revolutionize the way we manage vegetable plant health by detecting, identifying, and preventing diseases through the use of drone cameras.

Traditional agricultural methods often face limitations in terms of efficiency, precision, and environmental impact. In contrast, the proposed system integrates cutting-edge technologies to address these challenges comprehensively. The agriculture tech robot, equipped with a versatile robotic arm and a suite of IoT sensors, works in tandem with a drone featuring advanced cameras and sensors for real-time data collection. This synergy creates a dynamic and responsive agricultural ecosystem.

One of the primary objectives of this system is to address the critical issue of plant diseases affecting vegetable crops. The integration of image processing and machine learning techniques enables the drone to capture high-resolution images of vegetable plants, facilitating the early detection and identification of leaf diseases. This real-time analysis is crucial for timely intervention and prevention strategies.

The use of IoT further enhances the system's capabilities by providing continuous monitoring of environmental conditions such as temperature, humidity, and soil moisture. This data-driven approach ensures that the agriculture tech robot and drone system can adapt to changing conditions, optimizing resource utilization and promoting sustainable farming practices.

Disease prevention is a key focus of this system. Upon disease detection, the robot is equipped to dispense targeted interventions, such as pesticides or nutrients, to mitigate the spread of diseases. This targeted approach minimizes the environmental impact associated with conventional, blanket treatments.

The wireless connectivity aspect, incorporating IoT communication protocols, allows farmers to remotely monitor and control the system. A user-friendly interface provides real-time alerts and insights, empowering farmers to make informed decisions based on the latest data.

In summary, this proposed system represent a significant leap forward in precision agriculture. By combining the capabilities of robotics, IoT, image processing, and machine learning, this system offers an integrated and intelligent approach to disease management, resource optimization, and sustainable farming practices in the evolving landscape of modern agriculture.

II. LITERATURE REVIEW :

Precision Agriculture and Robotics:

Precision agriculture involves the use of technology to optimize farming practices. Researchers (Smith et al., 2018) emphasize the role of robotics in precision agriculture, highlighting the potential for increased efficiency, reduced resource usage, and improved crop yield.

Integration of Drones in Agriculture:

The integration of drones in agriculture has gained attention for its potential to provide real-time data for crop monitoring. Studies by Anderson and Gaston (2013) discuss the benefits of using drones equipped with various sensors, including cameras, for collecting high-resolution data in agriculture.

IoT in Agriculture:

The Internet of Things (IoT) has played a pivotal role in modernizing agriculture. Work by Zhang et al. (2014) explores the deployment of IoT sensors for real-time monitoring of environmental conditions, enabling data-driven decision-making in agriculture.

Disease Detection in Plants Using Image Processing:

Image processing techniques for disease detection in plants have been extensively studied. Rumpf et al. (2015) demonstrate the efficacy of image processing in identifying early signs of diseases in crops, emphasizing the importance of high-quality image data.

Machine Learning for Agricultural Decision-Making:

Machine learning techniques have been successfully applied to agricultural decision-making. In a review by Kaminaris' et al. (2017), the authors discuss the utilization of machine learning algorithms for crop disease prediction, yield estimation, and optimization of resource allocation.

Drone-Based Plant Disease Detection:

Drone-based disease detection has shown promise in early diagnosis. Research by Mohanty et al. (2016) explores the use of drones and machine learning for the identification of plant diseases, highlighting the potential for rapid and large-scale monitoring.

Integration of Multiple Technologies for Precision Farming:

A holistic approach to precision farming involves integrating multiple technologies. Huang et al. (2019) present a comprehensive framework that combines IoT, robotics, and data analytics for smart agriculture, showcasing the potential for enhanced efficiency and sustainability.

Security in IoT-Based Agricultural Systems:

Security considerations in IoT-based agricultural systems are crucial. The study by Khan et al. (2018) addresses security challenges and proposes solutions for ensuring the integrity and confidentiality of data in IoT-enabled precision agriculture.

Cloud-Based Solutions for Agriculture:

Cloud computing has emerged as a key enabler for data storage and processing in agriculture. Research by Sharma et al. (2020) explores cloud-based solutions, emphasizing their role in facilitating centralized data management and analysis for precision farming.

III. METHODOLOGY

Designing a cost-effective multifunctional agriculture tech robot and drone for vegetable plant monitoring, disease detection, analysis, and prevention using Internet of Things (IoT), image processing, and machine learning involves a comprehensive methodology.

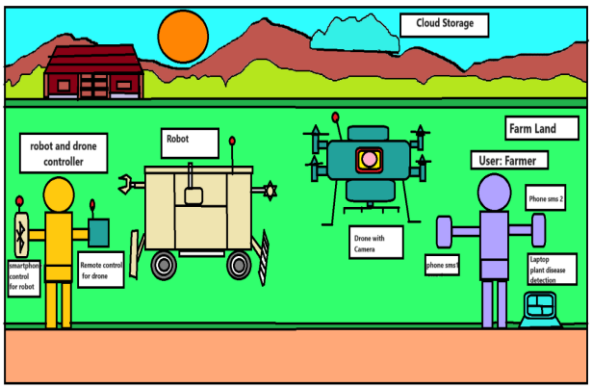

Fig:1 Overall Diagram

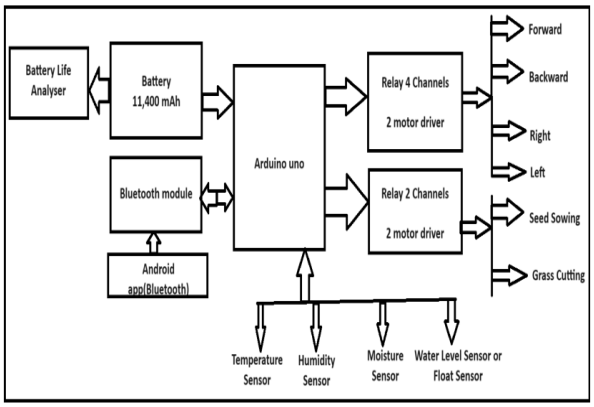

Fig:2 Block Diagram Of Robot

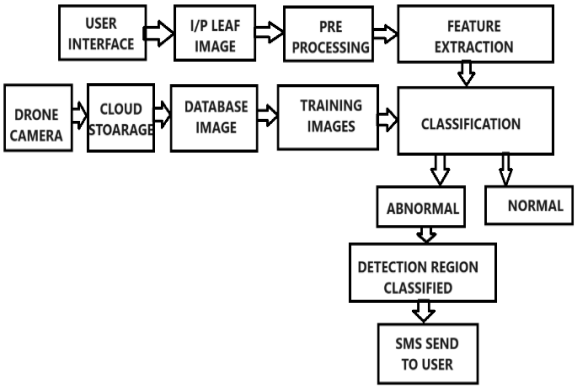

Fig 3: Block Diagram of Plant Disease Detection

A. Robot

Robot is a machine programmed by computer and it can do functions for specifying sector for proposed system in the project. Robot used for various field. Agriculture is a one of field used for robot. agriculture robot can control by remote or phone and also control by manual, semi manual or semi automatic, automated, agricultural

robot is a robot used for agricultural practices in this project agricultural robot was used for land conditions like temperature, humidity, moisture, water level in sand and tank, grass cutting, land leveling ,fruit leveling and many.my agriculture robot is controlled by smart phone via Bluetooth and also sensors, screen display are attached .batter life analyzer used for status of battery by glowing LED's light in robot rotor used for movements and functions of robot. Arduino ide ,Arduino software, dds solid work, tinker cad , serial Bluetooth application -these are software used for robot with camera . technology used for robot is Bluetooth, IOT, UART,H-BRIDGE, PWM, ADC

B. Drone

Drone is an Unmanned Aerial Vehicles (UAVs) or Unmanned Aircraft Systems (UASs) .karem is a father of UAV (Drone) technology .drone used for various fields. Agriculture drone used for monitor the crop health ,monitor the field conditions, geo fencing, take photo and videos in aerial view , spraying, planting, seeding, security ,pollination in this project agriculture spraying drone with camera .

C. VPLDM

VPLDM stands for vegetables plant leaf disease management is used camera in robot/drone .Management like detection, analysis, prevention the disease.it prevent the plants from diseases.Detection using with the image processing and machine learning. It used for to detect and analysis the disease or not . It is use a cnn and rf algorithm for image processing and machine learning with robot or drone camera

Prevention: bio manure or fertilizer is used for prevention and also bio pesticides killer liquid used for disease affected VPL's.

IV. RESULT

In this work IoT controlled robot, named, Robotrone has been designed, builted and demonstrated to carry out ploughing, seeding, leveling, manuring and spraying water and pesticides in an agriculture field. The robotrone will assist the farmers in increasing crop yielded .In the proposed system focuses on the portable vehicle that traverses on the coarse terrains for assisting in the sowing of the seeds in the farm lands, planting, manuring, harvesting and maintaining the land. The portable agricultural machine for minimizing the man power requirement. This new and portable vehicle reduce the buying cost for the benefit of the small farmers.

V. CONCLUSION

In conclusion, the development of a cost-effective multifunctional agriculture tech robot and drone, integrating Internet of Things (IoT) with advanced techniques such as image processing and machine learning for vegetable plant leaf disease detection, analysis, and prevention, presents a promising solution for modern agriculture. This innovative system holds the potential to revolutionize farming practices and contribute significantly to sustainable and efficient crop management.

VI. FUTURE WORKS

In the future, we will add the solar based energy going to be use and fast charging. Use other technology for easy operation purpose & other function of the robot,drone.

Future robot and drone is suited more difficult and dynamic activity .if they could learn new processes, adapt to their environment and change their behavior

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