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Agriculture pesticide spraying robot

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Abstract: This project involves designing and developing an autonomous robot for pesticide spraying in agriculture, aiming to enhance both the efficiency and precision of pesticide application. Traditional spraying methods can lead to uneven coverage and excessive chemical use, causing environmental harm and health risks. The proposed robot will leverage advanced machine learning algorithms to accurately identify and treat specific areas, reducing waste and optimizing coverage. The robot's effectiveness will be evaluated through field tests, focusing on its precision, efficiency, and overall impact on crop health and yield

Keywords:
Here are the selected keywords:
1. Autonomous Robot
2. Pesticide Spraying
3. Precision Application
4. Efficiency
5. Machine Learning Algorithms
6. Economic Stability
7. L298N Motor Driver
8. Water Pump Motor
9. ESP32
10. Labor Costs
11. Safety and Health
12. Crop Yield

I. INTRODUCTION

The agricultural sector is a cornerstone of global food production, yet it faces numerous challenges including pest infestations that threaten crop yields and quality. Traditionally, pesticides have been used to combat these pests, but the conventional methods of application—often involving manual spraying or mechanized systems—are fraught with inefficiencies. These methods can lead to overuse of chemicals, resulting in environmental pollution, health hazards for farmers, and increased production costs. Additionally, the non-uniform distribution of pesticides often fails to effectively target the Areas most in need of treatment, leading to suboptimal pest control and crop protection. In response to these challenges, the development of an autonomous agricultural pesticide spraying robot presents a promising solution. The purpose of this project is to design and implement a robotic system capable of autonomously navigating through fields, accurately identifying pest-affected areas, and applying pesticides with precision. This approach aims to enhance the efficiency of pesticide application, reduce the environmental impact of chemical usage, and improve the safety and health conditions for farm workers. The scope of this project encompasses several key components and objectives. Firstly,Alongside machine learning algorithms trained to recognize signs of pest infestation. Secondly, the navigation system of the robot will be designed to handle diverse agricultural terrains and crop layouts. while advanced path-planning algorithms will enable the robot to move efficiently through the fields, avoiding obstacles and ensuring comprehensive coverage of the target area. Thirdly, the spraying mechanism will be optimized to deliver pesticides accurately and uniformly. This involves the design of a variable-rate spraying system that adjusts the amount of pesticide based on the severity of the infestation detected. The aim is to minimize the use of chemicals while maximizing their effectiveness, thus promoting sustainable farming practices. Furthermore. This will allow for continuous assessment of the robot's performance and the health of the crops, providing valuable feedback to farmers and enabling informed decision-making. The implementation of this autonomous pesticide spraying robot is expected to bring about significant benefits. By automating the spraying process, labor costs will be reduced, freeing up farm workers for other essential tasks. The precision application of pesticides will lead to lower chemical usage, reducing costs and mitigating the environmental impact. Moreover, the improved targeting of pest-affected areas will enhance crop health and yield, contributing to food security and economic stability in the agricultural sector.

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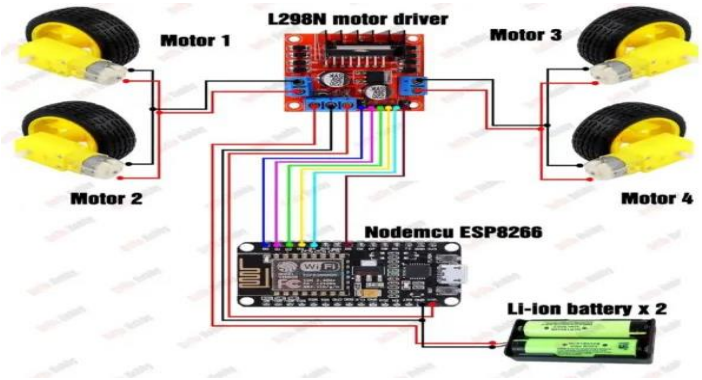
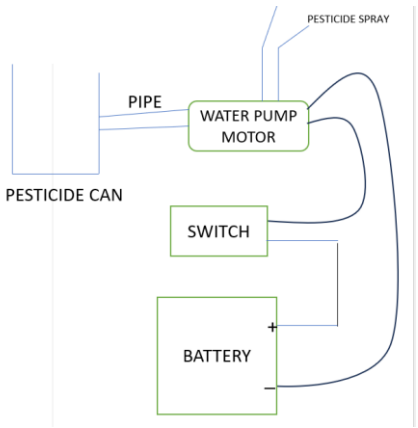
II. LITERATURE SURVEY

K. Sushma Priya, R. Praneetha Reddy, Y. Pradeep Agriculture is the primary source of revenue for approximately 60% of India's population. Farmers work diligently in their fields to cultivate various crops based on the environment and available resources. To meet the high food demand of such a large population, farmers often use substantial amounts of pesticides. Traditional manual pesticide spraying exposes farmers directly to harmful chemicals, posing risks such as skin cancer and asthma. Additionally, increased pesticide use can impact consumer health as residues enter the food chain. Pesticide spraying and fertilizer application are labor-intensive tasks. Although pesticide spraying is essential, it remains a hazardous process for farmers. This project focuses on developing an agricultural robot vehicle that navigates between crops using an Android application based on the farmer's instructions. The robot features low cost components, making it more affordable. Farmers can control the robot using any Android smartphone equipped with the app. Through an IoT application, farmers can manage pesticide spraying operations remotely. This low-cost robotic vehicle aims to enhance efficiency, improve safety, and address labor demands in agricultural applications. Pvr Chaitanya, Dileep Kotte, A. Srinath, K. B. Kalyan Farming is the cornerstone of India's economy. The nation irrigates approximately 215.6 million acres of crop land. The Economic Survey highlights the need for improved farm mechanization in the country. Effective pest management plays a crucial role in increasing productivity. Farmers face significant challenges in managing pest infestations, which can damage crops, ruin food plants, and complicate their work. Early detection and prevention of pests are vital for effective crop management. Farmers currently spray pesticides around their fields to control pests.

ASHUTOSH B. ADHAV, VIVEK D. JAGTAP, RUSHABH R. SONAWANE Agriculture Agriculture in India is the primary occupation for over 60% of the population and forms the backbone of the country's economy. To boost efficiency and productivity while ensuring farmer safety, it's crucial to improve agricultural practices. Tasks such as pesticide spraying and fertilizer application are labor-intensive and hazardous. Farmers often need to take extensive precautions, including wearing protective clothing and gear, to avoid health risks associated with pesticide exposure. Despite these measures, avoiding pesticide use is often impractical due to the necessity of achieving the desired agricultural results. Employing robots in these scenarios offers a promising solution by enhancing both production efficiency and safety. This approach integrates cost-effective technology, including components like the ESP8266 microcontroller for robot control, geared motors for movement, and a mobile application for navigation, to make these improvements achievable.

III. IMPLEMENTATION OF SYSTEM





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Agriculture pesticide spraying robots are specialized machines designed to automate the process of applying pesticides to crops. These robots can vary in size, design, and functionality, but they all aim to improve the efficiency, precision, and safety of pesticide application.

IV. COMPONENTS USED

1]LS 232 WI-FI MODULE

The L298 is a popular dual H-bridge motor driver IC that allows you to control the speed and direction of two DC motors independently. It's widely used in robotics and other projects that require motor control. Here are some key features and specifications.

2]Motor driver[L298N]

The L298N motor driver is a versatile dual H-bridge IC used to control the speed and direction of DC and stepper motors. It supports up to 2A per channel and includes built-in diodes to protect against back EMF, ensuring reliability and durability. Its ability to control two motors independently makes it ideal for applications like robotics, where precise motor control and manoeuvrability are essential. Its ease of interfacing with microcontrollers adds to its popularity in various motor-driven projects.

3)Battery

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Rechargeable batteries play a pivotal role in the advancement of modern technology and sustainability efforts. They offer the convenience of reusability and cost-effectiveness over time, reducing the need for frequent replacements compared to primary batteries. Here are some expanded points on the importance and impact of rechargeable batteries.

4) connecting wire

Connecting wires are fundamental components in electrical and electronic circuits, used to establish electrical connections between different components or devices. They come in various types, materials, and specifications to suit different applications. Here is a detailed overview of connecting wires.

5)Water pumping motor

Water pump motors operate on specific electrical voltages and currents. Common ratings include 230V AC, 50 Hz or 120V AC, 60 Hz, depending on the region and application requirements. The power rating of a water pump motor is crucial as it determines the motor's ability to drive the pump effectively. It is typically specified in horsepower (HP) or kilowatts (kW).

6) Spraying nozzle

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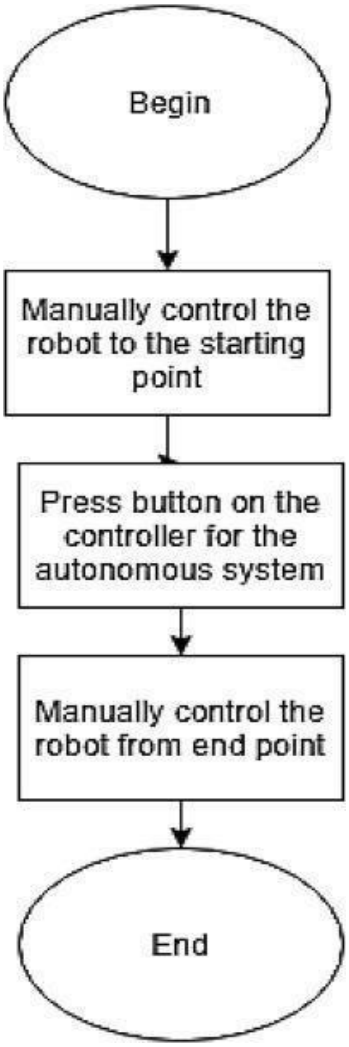
Spraying nozzles can have various features depending on their intended application. Some common features include. Nozzles that allow you to adjust the shape and size of the spray pattern, such as from a narrow stream to a wide fan.

Flowchart



V. PROJECT IMPLEMENTATION

Implementing an agriculture pesticides spraying robot involves a systematic approach to ensure functionality, efficiency, and safety in crop management practices. The project begins with a thorough assessment of agricultural requirements, including crop types, field size, and environmental conditions. This initial phase helps define the specifications and design parameters crucial for the robot's development.

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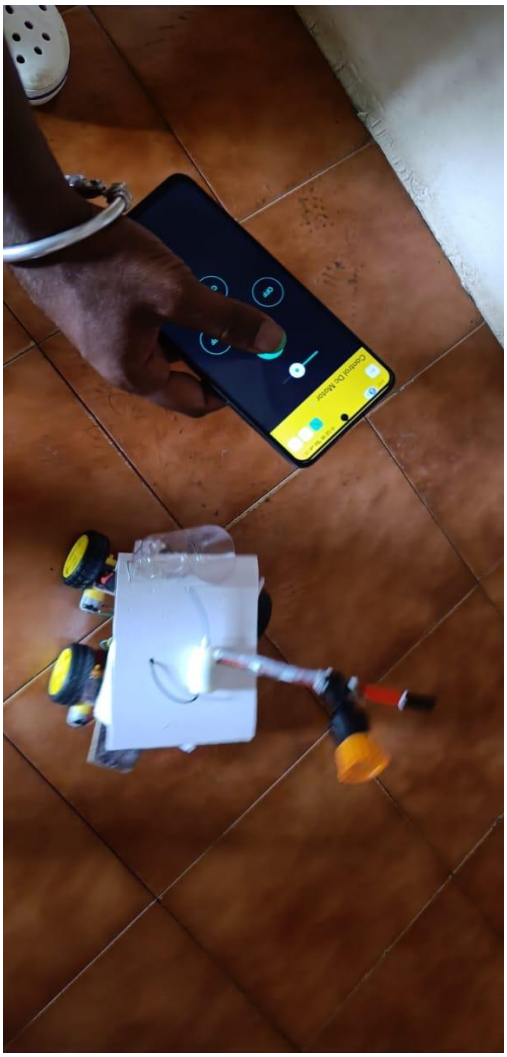

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VI. CONCLUSION

In conclusion, the development of an agriculture pesticides spraying robot represents the ultimate fusion of technology and agriculture, promising efficient and precise application of chemicals while minimizing human exposure and environmental impact. This innovative approach not only enhances productivity but also ensures sustainable farming practices for future generations.

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[2]. **Pvr Chaitanya, Dileep Kotte, A. Srinath, K. B. Kalyan,** Development of Smart Pesticide Spraying Robot On the basis of configuration embedded software studies,Smart control simulation model is proposed for the spraying of pesticides

[3]. **K. Sushma Priya, R. Praneetha Reddy, Y. Pradeep,** Agricultural pesticide spraying roboat We build the android application to control this spraying rover. Firstly, we have to connect the android application with HC05 Bluetooth module to control all hardware components of spraying rover.