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A Survey Paper on Comparative Study of Autonomous Pesticide Spraying Robot

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Abstract: *This survey focuses on creating a smart farming solution that combines autonomous pesticide spraying and crop harvesting, all controlled through a user-friendly Android application. In simpler terms, it aims to develop a robot that can take care of two crucial tasks on the farm automatically. This innovative technology is designed to enhance efficiency in agriculture by automating the application of pesticides and the harvesting of crops. The Robot will be equipped with advanced features, such as autonomous navigation, allowing it to move around the farm independently. This not only saves time for farmers but also ensures that the pesticide spraying and harvesting processes are carried out with precision. The integration with an Android application adds a user-friendly interface for farmers to control and monitor the robot. The project envisions a sustainable and technology-driven approach to farming, reducing the manual labor required for pesticide application and crop harvesting. With the help of robot, farmers can expect increased productivity, improved crop yields, and a more streamlined farming experience. This project aligns with the goal of advancing agricultural practices by incorporating automation for the benefit of farmers and the overall farming ecosystem*

Keywords: Pesticide spraying , Harvest Transport Robot, Autonomous, Android application

I. INTRODUCTION

India's rural economy relies heavily on agriculture, but labor-intensive farming faces challenges due to labor shortages and India's rural economy relies heavily on agriculture, but labor-intensive farming faces challenges due to labor shortages and rising wages. Pesticides are important in agriculture, protecting 35% of crops, but using them manually with sprayers or tractors can harm health and the environment. Pesticide spraying is one of the toughest and labor intensive work for farmers. One More challenge for former is that, The farmer needs to harvest crops, such as tomatoes or papaya or bringle etc. from the farm and consolidate them in one location for export. To address this, we're developing " Autonomous Pesticide Spraying and Harvest Robot controlled by Android Application" that can enhance productivity and reduce labor dependence. The project presents an innovative approach to address key challenges in modern agriculture by introducing an autonomous agricultural robot with dual functionalities: autonomous pesticide spraying and harvest transport. The control and management of the Autonomous robot are facilitated through a user-friendly Android application. This application empowers farmers to remotely monitor, sand adjust the robot's tasks, offering convenience and flexibility in farm management. This project signifies a significant step towards smart and automated farming, aiming to empower farmers with efficient tools for crop care and harvest logistics. The synthesis of autonomous functionality and mobile application control positions Autonomous robot as a pioneering solution in the realm of sustainable and technologically advanced agriculture.

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Fig 1: Manual Pesticide Spraying

Fig 2:Manual Harvested Crop Transportation

II. PURPOSE OF THE PLAN SYSTEM

The purpose of the plan system aims to make farming easier by creating a smart robot. This robot can spray pesticides precisely and transport harvested crops without needing much help from farmers. The user-friendly Android application provides farmers with remote control and monitoring capabilities, empowering them to manage tasks effectively.The proposed system introduces an advanced agricultural solution featuring an autonomous robot designed for two primary functions: precise pesticide spraying and efficient harvest transport.

III. LITERATURE SURVEY

Numerous studies highlight the pressing need for innovative solutions to address challenges in modern farming, emphasizing the importance of efficient pesticide application and streamlined post-harvest processes. The literature review for the project looked at existing research in farming technology. Studies show a growing interest in using robots for task like spraying pesticides These robots can be autonomous, meaning they work on their own, and are controlled through user-friendly mobile applications. Industry demands rapid application prototyping and simulations of the protocols to save time, money and energy. Use of intelligent systems with high speed communication, the sector is moving towards the standardizations. So, we need also develop this in agricultural field too.

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Based on an Image Processing (IP) approach, this research proposes an autonomous pesticide controller and disease classification system. Improving the efficiency of production greatly benefits from having accurate information about the disease for classification and pesticide application. When compared to manual procedures, the suggested automatic pesticide controller and disease classification system may accurately and consistently determine crop disease and provide a foundation for appropriate regulation. Although the disease has been identified in this research, the spraying process is not described.[1]

The two-wheeled robot prototype system is made up of a mobile base, a spraying mechanism, a wireless controller that controls the robot's movement, and a camera that monitors crop development and health and looks for pests in the agricultural field. Experiments on the prototype system reveal that although the robot's output is somewhat less than a human worker in terms of crop coverage. Yet, this robot lacks complete autonomy.[2]

Wireless sensor networks are used in this project. This bot will be a great asset to the farmers. Using cell phones, this bot will use them to spray insecticides throughout the entire crop. It's easy to control this bot. The robot douses every plant on the farm with insecticides. The farmers can increase their profit margin by using this robot to lower their labor costs. The farmer's time and workload will decrease with the use of this bot. However, an upgrade is needed for this spraying boat because the solar power source has not been used. This is the least expensive option, assuming it can be implemented.[3]

The design and development of an autonomous pesticide sprayer for the fertigation system employing chili peppers is covered in this study. The project's objective is to apply pesticide beneath the crop's leaves using a flexible sprayer arm. The goal of this project is to create an autonomous, mobile, unmanned pesticide sprayer. However, the robot's spraying pressure will be checked because the autonomous pesticide sprayer uses a fluid pesticide, and the electrical circuits need a waterproof enclosure. It is crucial to appropriately isolate every electronic component inside the container box to prevent damage in the case of flooding or leakage.[4]

This paper's primary goal is to create a multipurpose agricultural machine that will boost output and assist future farmers in overcoming obstacles including grass cutting, water spraying, and seeding. It is vital to build our idea to aid feature people and to aggregate them to advanced agricultural machinery powered by solar, a renewable energy source, as this helps to improve production and decrease production time, which allows the country to acquire the top position in the world. This solar electricity contributes to the nation's economy by powering machines that are less expensive.[5]

IV. PROPOSED METHODOLOGY

METHODOLOGY FOLLOWED A SYSTEMATIC APPROACH:

- Research: In-depth study of existing technologies.
- Design: Meticulous planning, focusing on load capacity and adaptability.
- Component Selection: Careful choice of components for efficiency.
- Fabrication: Robust chassis and load-carrying mechanism.
- Electrical Setup: Integration of motors, and dual power sources.
- Software Development: Custom Android app for control and algorithms for autonomy.
- Integration and Testing: Rigorous testing to ensure reliability.
- Calibration: Fine-tuning sensors and actuators for precision.
- Safety: Implementation of safety measures.
- User Interface: User-friendly Android app for remote control.

To operate this spraying robot, we develop an Android application. To operate every piece of the spraying rover's hardware, we must first connect the Android application to the esp8266 wifi module. This spraying rover is simple to operate once Wifi is connected. Two brushless DC motors and an L293D motor driver were installed in this rover. The Arduino Uno microcontroller is connected to a brushless DC motor via a brushless motor driver, and a 24V battery is used to supply power. The motor's phase connected to the gate driver on its circuit allows the motor drivers to control the motor's rotation. This rover's sprayer section is also controlled by additional servo motors. One rotary, one rotary, one rotary is a servomotor

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Working Mechanism:

- Chassis: Provides a stable and robust platform for the entire robot.
- Wheels or tracks: Facilitate movement across various terrains.
- Spraying mechanism: Consists of a spraying arm or nozzle assembly responsible for dispensing the chemicals or fluids.
- Harvest Transport Mechanism: As same Mechanism is used For Harvest Trasport like spraying but only need to remove pest tank from the robot and we will use robot for transportation.

Control Systems:

- Processors or microcontrollers: Oversee the robot's general operations.
- Actuators: Manage the motion of other mechanical parts, such as the spraying arm.
- Motor drivers: Control the direction and speed of the motors that move the robot.
- Power distribution and supply: Gives all electronic components the power they require.

V. MODULE ARCHITECTURE

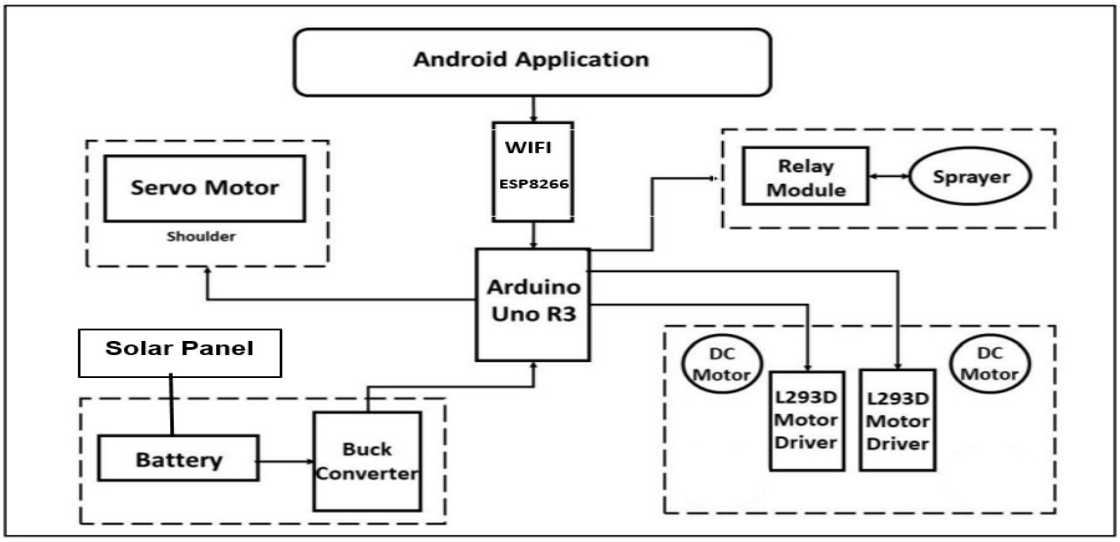

Fig 3: System Architecture

VI. CONCLUSION

This Research concludes with the successful development of an autonomous robot for precise pesticide spraying and harvest transport. Controlled by a user-friendly Android application, the system addresses critical challenges in farming, optimizing pesticide use, reducing manual labor, and enhancing overall efficiency. The project marks a significant step towards sustainable and smart agriculture, showcasing the potential of technology to revolutionize traditional farming practices.

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