PESTICIDE SPRAYING AND GRASS CUTTING ROBOT

A PROJECT REPORT

Submitted by

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IN
ELECTRONICS COMMUNICATION AND ENGINEERING

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SCHOOL OF ENGINEERING AND TECHNOLOGY
VIZIANAGARAM CAMPUS
CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT
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BONAFIDE CERTIFICATE

Certified that this project report **PESTICIDE SPRAYING AND GRASSCUTTING ROBOT** is the bonafide work of " **I. AKHILESH (221801130006), G. THARUN (221801130019), S.V.S.RAKESH(221801131025), K.KUSHAL (221801130010),B.AJAY(221801131023),D.DORAMMA (221801130008)** who carried out the project work under my supervision. This is to further certify to best of my knowledge that this project has not been carrier out earlier in this institute and the university.

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Certified that the above-mentioned project has been duly carried out as per the norms of the college and statutes of the university.

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DECLARATION

We hereby declare that the project entitled **"PESTICIDE SPRAYING AND GRASS CUTTING ROBOT"** submitted to the fulfilment of the award of the degree of B.Tech(ECE) in Centurion University of Technology and Management, Vizianagaram. This project work in original has not been submitted so far in any part or full for any other university or institute for the award of any degree or diploma.

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ABSTRACT

This project focuses on the design and development of a dual-purpose agricultural robot capable of performing both pesticide spraying and grass cutting autonomously. The system aims to assist farmers by automating repetitive and hazardous agricultural tasks while improving efficiency, accuracy, and safety. Traditional methods of pesticide spraying and grass cutting expose farmers to harmful chemicals and require significant labor and time. The proposed robot integrates two primary functions: a pesticide spraying unit for uniform pesticide distribution and a grass-cutting module for maintaining field hygiene. With the inclusion of sensors, motor drivers, and microcontroller-based control, the robot ensures precision, minimizes wastage, and enhances productivity. This innovation promotes safer and more sustainable agricultural practices by reducing human involvement in potentially dangerous activities. The design and development of a dual-purpose agricultural robot capable of performing both pesticide spraying and grass cutting autonomously, aiming to address key challenges in modern farming through automation and intelligent control. Agriculture continues to rely heavily on manual labor for field maintenance and pest control, which often exposes farmers to hazardous chemicals and leads to inconsistent pesticide application and uneven grass cutting. These traditional methods not only pose serious health risks but also result in inefficiencies such as overuse of pesticides, high labor costs, and reduced productivity. The proposed robot integrates two major functional modules a pesticide spraying unit for precise and uniform chemical distribution, and a grass-cutting mechanism for maintaining clean and weed-free fields.

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INTRODUCTION

Agriculture is the backbone of many developing countries, and technological advancements are essential to increase productivity and reduce human effort. Farmers often face challenges such as exposure to harmful chemicals during manual pesticide spraying and the physical strain of repetitive field maintenance tasks like grass cutting. To overcome these issues, this project introduces a **Pesticide Sprayer and Grass Cutting Robot**, an automated system designed to perform both pesticide spraying and grass cutting efficiently. The robot integrates mechanical design, electronic control, and automation principles using microcontrollers, sensors, and motor drivers. It minimizes direct human contact with toxic substances, ensures uniform spraying, and reduces labor costs. By incorporating IoT or wireless control features, the system enhances precision, safety, and convenience in modern farming operations, thereby contributing to smart agriculture and sustainable crop management.

SCOPE OF PROJECT

The scope of this project includes:

The Design and development of a multifunctional robotic vehicle capable of both pesticide spraying and grass cutting in agricultural environments. The project integrates multiple sensors for navigation and obstacle detection, utilizes an automated control system based on Arduino Uno, and incorporates dedicated DC motors for movement, grass cutting, and spraying operations. Remote operation is enabled through a Bluetooth module, allowing for safe and flexible control from a distance.

Need: The existing manual approach to pesticide application and grass cutting exposes operators to harmful chemicals and requires continuous physical effort, raising concerns over safety and efficiency.

Existing Solutions: Currently, agriculture relies on separate machines for pesticide spraying and grass cutting, both requiring manual operation. This not only increases labour and operational costs but also adds complexity to farm management.

Improvement: The proposed solution merges both spraying and cutting functionalities into a single robot, reducing labour requirements, operational expenses, and the overall complexity of the system.

Target Population: This robotic system is designed for farmers, agricultural industries, and research institutions that advocate smart farming technologies. By simplifying core agricultural processes, the robot supports widespread adoption of automation across farms.

PROPOSED SOLUTION

The proposed Pesticide Sprayer and Grass Cutting Robot combines two essential agricultural operations—pesticide spraying and grass cutting—into a single autonomous robotic platform. The robot is constructed on a mobile chassis, utilizing four 45 RPM DC motors for movement and a dedicated 1000 RPM DC motor for the grass-cutting mechanism, all controlled via dual L298N motor driver modules The pesticide spraying functionality is achieved using an electric pump, which draws chemicals from an on-board pesticide tank and distributes them uniformly through strategically positioned spray nozzles. The pump and spraying unit are actuated using relay modules controlled by the microcontroller to enable precise timing and dosage during application.

Grass cutting is performed by a high-speed motor driving rotating blades, engineered to deliver consistent and efficient trimming across varied terrain. The grass-cutting system operates in tandem with the spraying module, permitting simultaneous execution or independent operation as required. Both systems can be operated either autonomously or remotely through Bluetooth. Circuit diagrams include:

Power Supply → Motor Driver → DC Motors (Movement)

Sensor Module → Microcontroller → Control Logic (Navigation)

Pump and Sprayer → Relay Control → Nozzles (Spraying)

Cutting Motor → Blade Assembly → Power System (Grass Cutting

CIRCUIT DIAGRAM

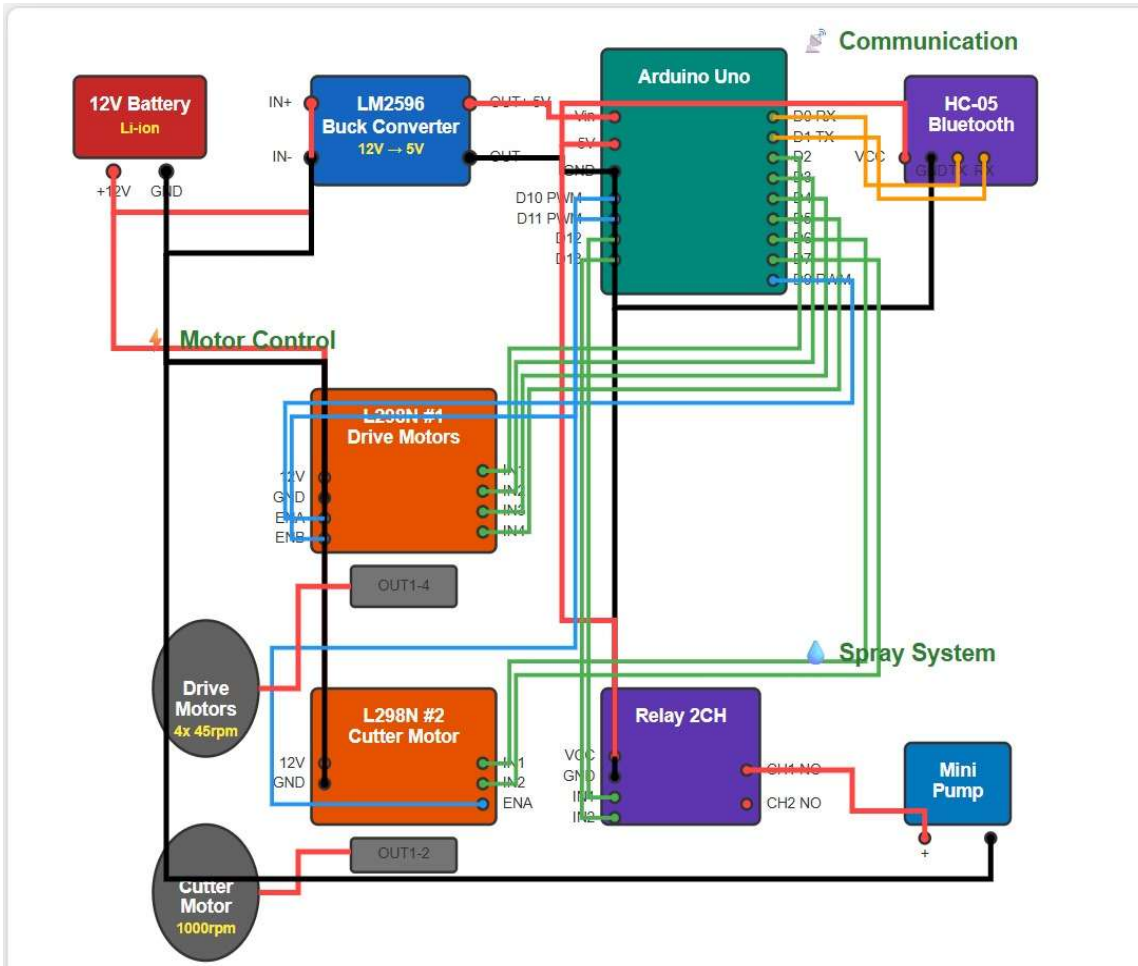

FIGURE 1: CIRCUIT DIAGRAM

IMPLEMENTATION STRATEGY

Systematic approach, beginning with the careful procurement of essential electronic and mechanical components such as the Arduino Uno, L298N motor drivers, DC motors, ultrasonic sensors, HC-05 Bluetooth module, voltage regulator, pesticide pump, spray nozzles, and materials for chassis fabrication. Once procured, the assembly process starts with the mechanical construction of a sturdy metal or acrylic chassis and the installation of wheels to ensure stability, balance, and sufficient ground clearance for agricultural terrain. DC motors for both movement and grass cutting are carefully integrated with the motor driver modules, which are interfaced to the Arduino Uno microcontroller for precise directional control.

Next, sensors are installed and calibrated to allow reliable obstacle detection and navigation feedback. The pesticide spraying system is set up by mounting the tank, connecting the pump, and integrating spray nozzles, all of which are operated via relay modules linked to the microcontroller for automated application. The grass-cutting blade, powered by a high-speed motor, is securely mounted for efficient trimming. Control software is developed and uploaded to the microcontroller, ensuring synchronized operation of movement, spraying, cutting, and remote control via Bluetooth. The entire system is thoroughly tested in both laboratory and real field conditions, with post-testing optimization for stability, coverage, and reliability.

Each stage of development and operational results is documented for performance analysis and future improvements, resulting in a fully integrated robotic solution optimized for smart agriculture.

PROJECT TIMELINE

Week 1–2: Literature review and component selection

Week 3–4: Chassis and motor assembly

Week 5: Sensor setup and motor driver integration

Week 6: Spraying and cutting mechanisms installation

Week 7: Programming, control logic, and testing

Week 8: Final evaluation, report preparation, and presentation

The development of the Pesticide Spraying and Grass Cutting Robot is planned over an eight-week period, following a structured and goal-oriented timeline to ensure efficient execution and timely completion of all project milestones. During this period, the focus is on conducting a comprehensive literature review to understand the principles of agricultural robotics, pesticide spraying mechanisms, and grass-cutting systems. This phase also includes component selection and procurement, ensuring that all electronic, mechanical, and control elements such as microcontrollers, motors, sensors, and chassis materials are compatible and meet project requirements.

BILL OF MATERIALS

Component	Quantity	Total Cost
Arduino UNO	1	750
L298N Motor Driver	2	400
Motors	5	1800
HC-05 Bluetooth Module	1	350
Voltage Regulator (12V to 5V)	1	150
One port Relay Module	2	200
Chassis Frame	1	250
Wheels	4	800
Cutting Blades	2	350
Pesticide Tank	1	450
Water Pump	1	600
Jumper Wires	Set	300
Rechargeable Batteries	Set of 3	1200

OUTPUT SCREENSHOTS

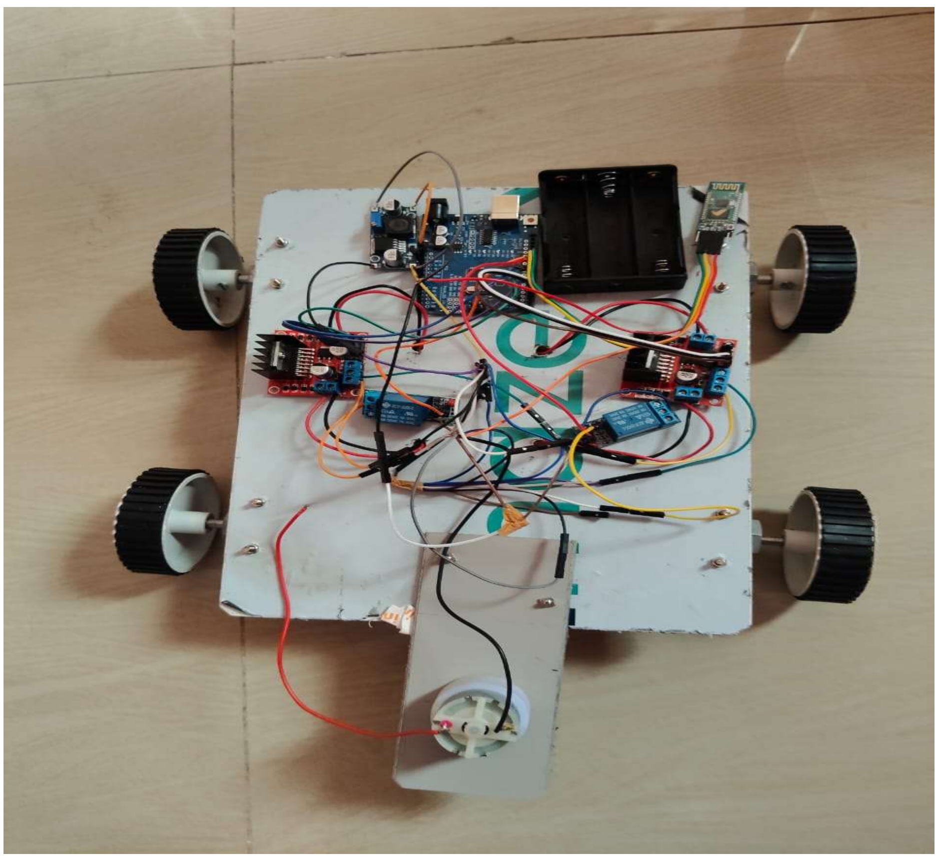

FIGURE 2.1: OUTPUT

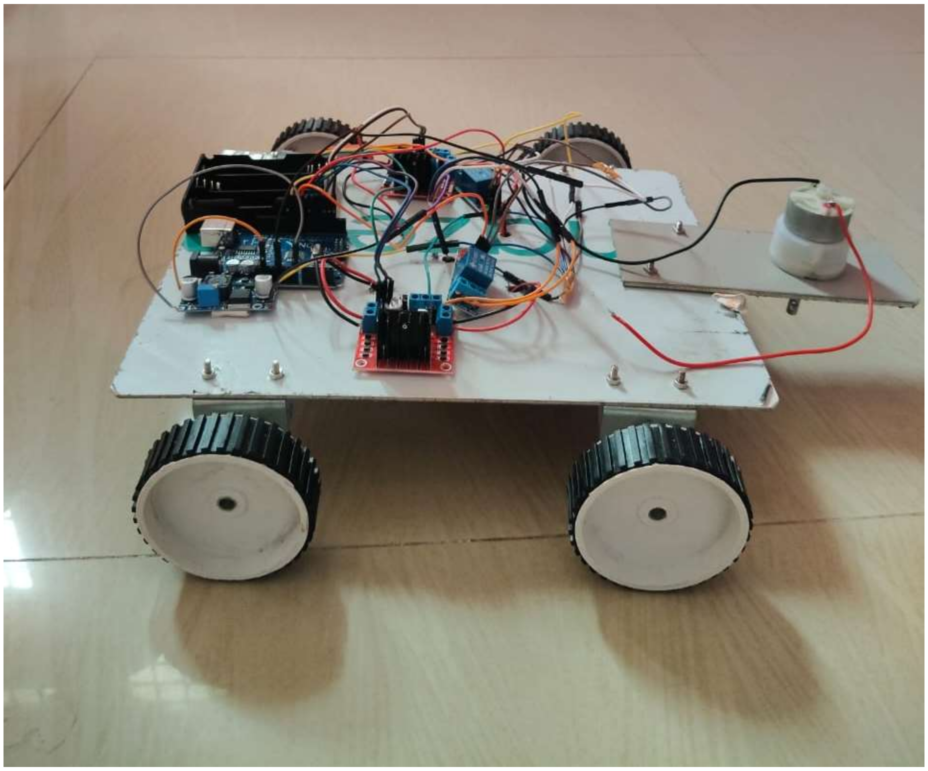

FIGURE 2.2: OUTPUT

CONCLUSION

The Pesticide Spraying and Grass Cutting Robot represents a major advancement in the field of agricultural automation, offering a cost-effective, efficient, and environmentally sustainable alternative to conventional farming methods. By integrating dual functionalities pesticide spraying and grass cutting—within a single robotic platform, this project successfully addresses two critical agricultural challenges: safe pest management and effective field maintenance. The robot significantly reduces manual labor and minimizes direct exposure of farmers to harmful chemicals, thereby improving safety conditions in rural agricultural communities. Furthermore, its automated spraying mechanism ensures uniform pesticide distribution, which not only enhances pest control efficiency but also prevents chemical overuse, contributing to healthier crops and reduced environmental contamination..

FUTURE SCOPE

The future scope of the Pesticide Spraying and Grass Cutting Robot is extensive and promising, aligning with the rapidly growing field of agricultural robotics. With advancements in artificial intelligence, machine learning, and sensor technologies, this robot can evolve into a fully autonomous system capable of precise navigation and targeted intervention in diverse farming environments. Integration with smart farming platforms and Internet of Things (IoT) devices could allow real-time monitoring and remote management, optimizing pesticide use and grass cutting based on crop health and soil conditions.

Further enhancements may include the addition of multi-tasking abilities like automated fertilization, weed detection, and harvesting to create a multifunctional agricultural assistant. The adoption of such robots is expected to rise significantly, driven by the need for sustainable and labour-efficient farming practices. Moreover, models based on shared-use or subscription services could make these technologies accessible to small and mid-sized farms, promoting wider adoption. Ultimately, this project contributes to the future of precision agriculture that aims to increase productivity, reduce environmental impact, and support farmers in meeting the challenges of global food demand.

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