FERTILIZER SPRAYING WIRELESS ROBOT

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ABSTRACT

This project aims to develop a solar-powered agricultural robot vehicle designed to navigate autonomously through crops and apply pesticides without direct human intervention. The vehicle utilizes cost-effective components to ensure affordability The proposed system features an automatic mode, wherein the robot autonomously sprays fertilizer in a straight line along each row of crops before turning to cover the next row. This mode incorporates a color sensor equipped with color markers at the ends of each row to detect the row's conclusion. Additionally, a manual mode is included, allowing the farmer to remotely control the robot via a wireless RF-based remote while monitoring live camera feed from the robot's onboard camera on a mobile device. This dual-powered robot operates on a battery that is charged using both solar power and a DC adapter, ensuring eco-friendly and uninterrupted power supply. It is equipped with an adjustable spraying arm capable of height and angle adjustments, featuring two nozzles to spray fertilizer on both sides of the crops. The farmer has the flexibility to manually adjust the height and angle of the nozzles as needed.

Keyword: - *Electric Vehicles, Charging Stations, Transportation, Automation,*

1. INTRODUCTION

Agriculture has long been the backbone of human civilization, providing sustenance and livelihoods to communities worldwide. With the global population steadily increasing, there arises an urgent need for innovative solutions to enhance agricultural efficiency and productivity. One critical aspect of modern agriculture is the application of fertilizers, vital for promoting plant growth and maximizing crop yields. Traditional methods of fertilizer application often involve manual labor, which can be labor-intensive, time-consuming, and inefficient. Moreover, the indiscriminate use of fertilizers can lead to environmental degradation and waste. To address these challenges, there is a growing interest in the development of autonomous agricultural robots capable of precise and efficient fertilizer spraying. These robots offer a promising solution to automate the fertilizer application process, thereby reducing labor costs, minimizing environmental impact, and optimizing fertilizer usage. By leveraging advanced technologies such as robotics, artificial intelligence, and sensing systems, these robots can navigate through fields, identify crop areas in need of fertilization, and accurately apply fertilizers with minimal human intervention.

In this context, this paper presents the design and development of a fertilizer spraying robot tailored for agricultural use. The robot is equipped with state-of-the-art components and features, including autonomous navigation capabilities, precision spraying mechanisms, and real-time monitoring systems. By harnessing solar power and incorporating eco-friendly design principles, the robot aims to minimize its environmental footprint while ensuring uninterrupted operation in remote agricultural settings. Through this research endeavor, we seek to contribute to the advancement of sustainable agriculture by introducing innovative solutions for fertilizer application. By automating and optimizing the fertilizer spraying process, our robot endeavors to enhance agricultural productivity, reduce labor dependency, and promote environmental stewardship. This introduction sets the stage for the subsequent sections of the paper, which will delve into the design, operation, and performance evaluation of the fertilizer spraying robot, paving the way for its practical implementation in agricultural practices.

2. LITERATURE SURVEY

2.1 "Smart Agriculture Fertilizer Spraying Robot"

In this project hardware components have been successfully assembled, and the robot has been able to communicate with the nodemcu. The ability to control the robot's motion through wi-fi and an android applet has been achieved. As a result, the two control modules for the robot have been successfully tested and demonstrated. While controlling a robot with bluetooth limits the range of communication distance, it is a smart and simple way to direct a robot. One of the simplest ways to control the motion of a robot is to use the internet.

2.2 "Agricultural Pesticide Spraying Robot"

In this project, we have implemented a pesticide spraying robot. A robot for use in agriculture an agrobot is a concept for improving the product's performance and cost, which, once optimized, would show to be useful in agricultural spraying operations. Farmers' workloads are reduced, as are health issues. Successfully constructed a robot that can travel on rough surfaces as well as carry a sufficient load of compressor and other equipment. Successful in creating a robot with a strong enough structure to resist the field's challenges.

2.3 "Smart Pesticide Spraying Robot"

In proposed method, the bot will control by using 2.4ghz radio frequency wireless controller. It reduces the workload of the farmers by sprinkling pesticides by its own. Automation as a part of solution. The main concept of this bot is to make an autonomous robot with the help of an arduino controller to reduce the health issues of the farmers.

2.4 "Development of an Arduino-Based Autonomous Pesticide Spraying Robot"

This paper presents the development of an autonomous pesticide spraying robot utilizing Arduino microcontroller technology. The robot is designed to navigate fields and apply pesticides with precision, reducing labor costs and environmental impact. The system incorporates sensors for obstacle detection and GPS for navigation, allowing for efficient and accurate spraying operations.

2.5 "Design and Implementation of a Microcontroller-Controlled Pesticide Spraying System"

This paper presents the design and implementation of a microcontroller-controlled pesticide spraying system for precision agriculture. The system utilizes microcontroller technology to automate the spraying process, ensuring accurate application of pesticides while minimizing environmental impact. Sensors and actuators are integrated into the system to enable real-time monitoring and control of spraying operations.

2.6 "Real-Time Control System Design for a Pesticide Spraying Robot Using Microcontrollers"

Abstract: This paper proposes a real-time control system design for a pesticide spraying robot using microcontrollers. The system leverages microcontroller technology to achieve precise control of spraying operations in real-time, enhancing the efficiency and effectiveness of pesticide application in agriculture. Experimental results demonstrate the effectiveness of the proposed control system in achieving accurate and consistent spraying outcomes.

2.7 "Autonomous Pesticide Spraying Robot with Arduino Microcontroller"

Abstract: This paper presents the design and implementation of an autonomous pesticide spraying robot utilizing an Arduino microcontroller. The robot is equipped with sensors for environmental monitoring and navigation, allowing it to autonomously navigate fields and apply pesticides with precision. Experimental results demonstrate the effectiveness of the robot in reducing labor costs and improving spraying efficiency in agricultural applications.

3. NEED OF PROJECT

Pesticides spraying is important to protect crops from diseases and insects. It helps to grow crops safe and improves production as well as quality of product. Unfortunately these pesticides are harmful when comes in direct contact of human being. So safety precautions are most important. In Bharat, where most of the population depends on agriculture, pesticides spraying is very regular task which is done in manual way conventionally. In conventional method, farmer's carries manual or motorized pumps on back and walk through the crop rows while directing the sprayer manually. Problem with conventional method is its very dangerous for health and needs much more efforts which makes it risky and difficult.

4. OBJECTIVES OF PROJECT

In this project, major design objectives of the project are as follows:

- Design of wireless pesticides spraying robot with manual as well as automatic mode.
- Design of Obstacle detection on path and provide sound alert
- Design of solar charge controller to charge the battery with solar panel.
- Design of adjustable spray arm

5. BLOCK DIAGRAM

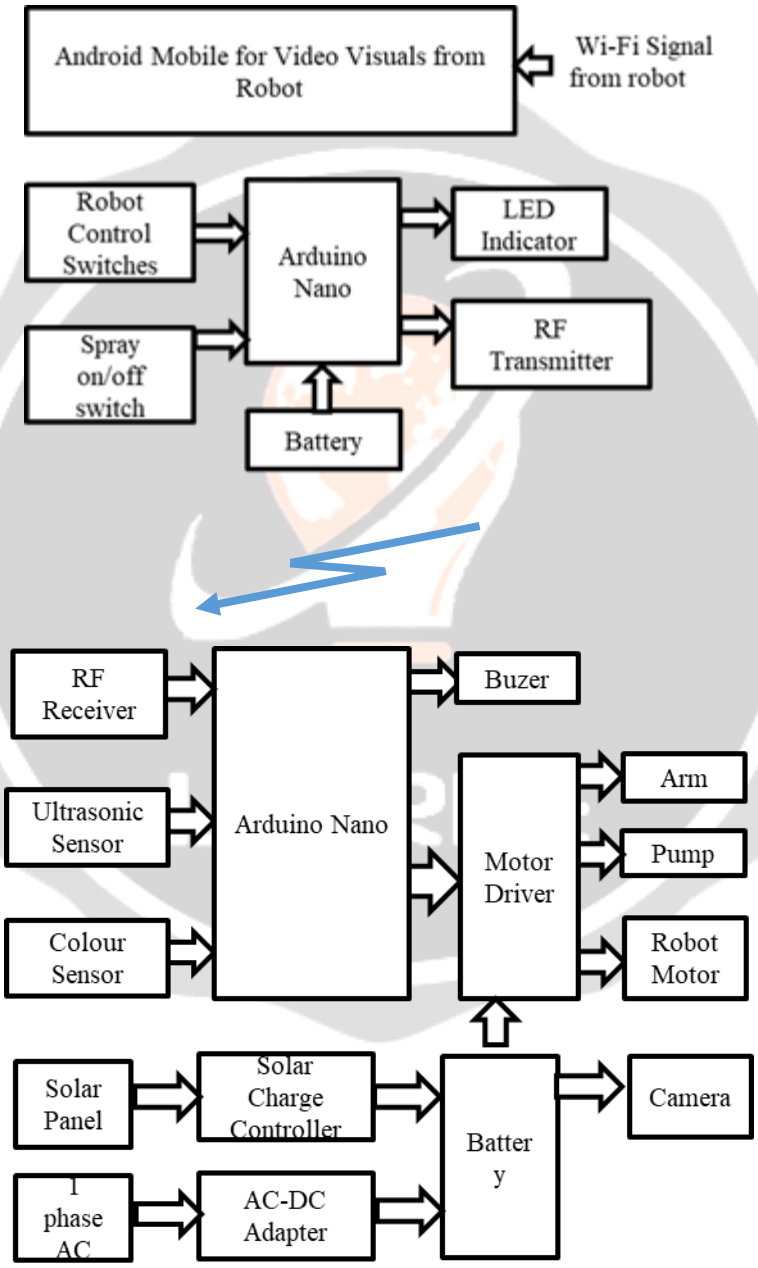

Fig -1: Block Diagram of System

6. CONNECTION DIAGRAM

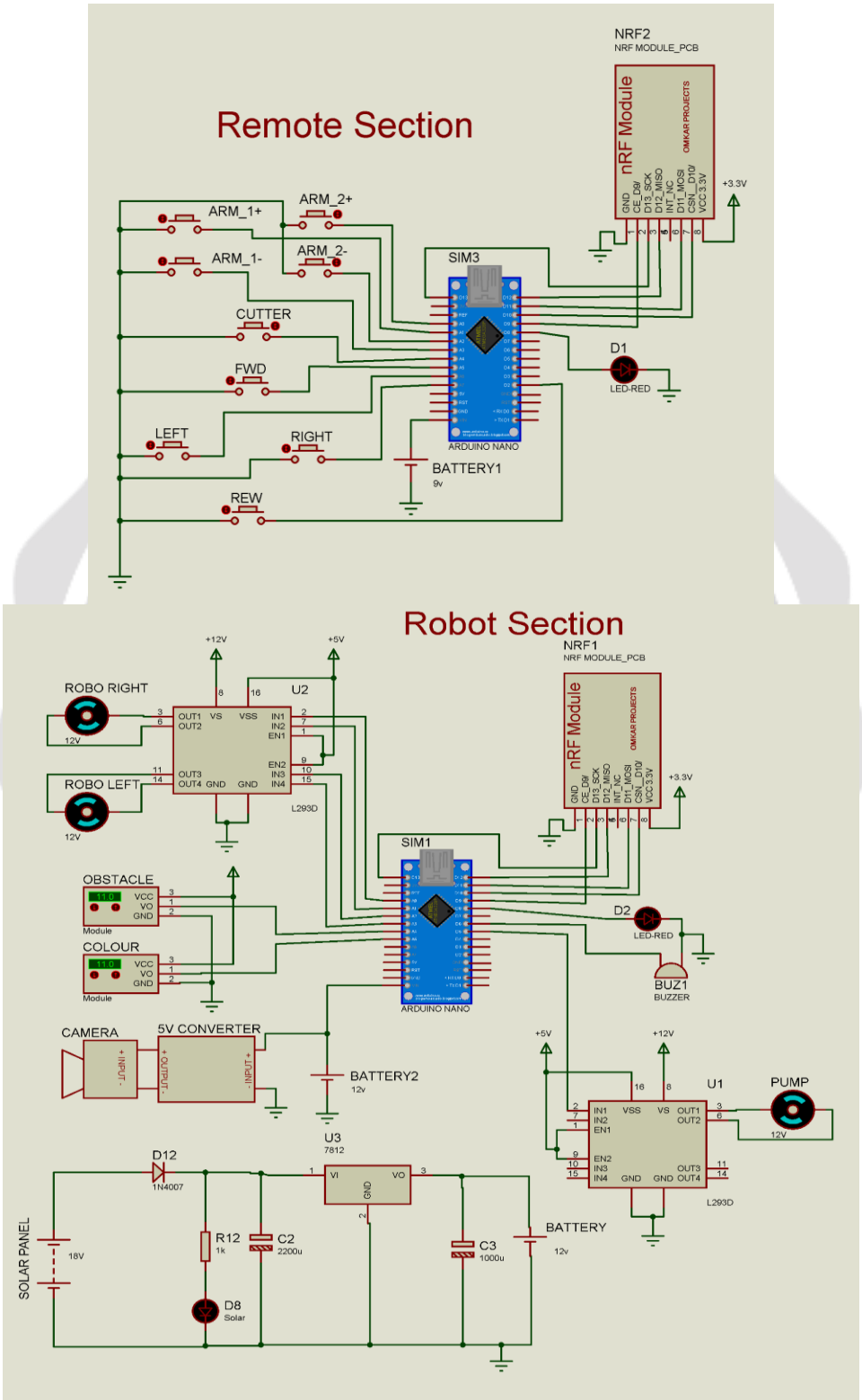

Fig -2: Connection Diagram

7. RESULTS

By testing the robot on field, there are some parameter which actually work for robot are given bellow in table
Table 6.1: Results:

Sr. No.	Parameter	Values
1	RF remote range	10ft
2	ESP Camera Range	10ft
3	Fertilizer Storage Capacity	2 Liter
4	Maximum Height cover by robot from ground	2ft
5	Battery Backup	30 minutes

8. CONCLUSION

In summary, the solar-powered fertilizer spraying robot, controlled via RF wireless remote and operated by Arduino, marks a significant advancement in agricultural technology. Its integration of renewable solar energy ensures sustainable operation, reducing environmental impact. With Arduino microcontroller technology, the robot offers precise control and automation, optimizing fertilizer application for improved crop yields. The inclusion of RF wireless remote control enhances convenience for farmers, allowing remote monitoring and adjustment of the robot's operations. Overall, this innovative solution promises cost-effective and efficient fertilization, revolutionizing farming practices for increased sustainability and productivity.

9. REFERENCES

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