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Agricultural Pesticide Spraying Robotic System Controlled Using Android Application

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ABSTRACT: This system deals with the exposition of how robotics can be applied to various fields of agriculture. One of the most important professions in a developing country like India is agriculture. It is very important to improve the efficiency and productive capacity of agriculture by replacing laborers with intelligent solar-powered machines like robots using the latest technologies. The system proposes a new plan to put back humans in diverse agricultural operations like detection of the presence of pests, spraying of pesticides, spraying of fertilizers, etc. thereby providing safety to the farmers and accurate agriculture. The evolved system includes plotting a prototype that uses simple cost-effective equipment like microprocessors, solar panels, wireless, different motors and terminal equipment which helps the farmers in different crop field activities. The main feature of this system is Electrostatic spraying. This application is adopted in crop protection to prevent pest infestation, to improve product quality and to maximize yield. It involves a superposition of charges to pesticide spray droplets to attract substrate ions at hidden surfaces. The droplets wraparound effect lowers off-target deposition, increases on-target spray and invariably improves spray efficiency. Electrostatic spraying system works productively at best suitable parameters in union with charging voltages, spraying height arrangement, application pressures, flow rate, travel speed, electrode material, and nozzle orientation.

KEYWORDS: Pesticide Sprayer, Agriculture Vehicle, Robot, Stepper Motor, Solar, Electrostatic Spraying, Charged Droplet.

I. INTRODUCTION

Agriculture in India constitutes more than 60% of the occupation. It serves to be the backbone of the Indian economy. It is very important to improve the efficiency and productive capacity of agriculture by simultaneously providing safe cultivation of the farmers. Operations like spraying of pesticides, sprinkling fertilizers are very tedious. Though spraying of pesticides has become mandatory it also proves to be a harmful procedure for the farmers. Farmers, especially when they spray pesticides, take too many precautions like wearing appropriate outfits, masks, gloves, etc so that, it does not cause any harmful effects on them. Avoiding pesticides is also not completely possible as the required outcome must be met. So, the use of robots in such cases gives the best of the outcomes for these problems, along with the required production capacity and efficiency. Cost-effective technology using components such as ESP8266 / ESP32 Microcontroller for the control of agriculture robot, geared motors that facilitate the robot wheels to move and mobile application to guide the robotic movement are incorporated in this agriculture robotic vehicle to make all of the above feasible.

The advancement in the field of robotics has widened and the fields of its application extend from home automation to the military. Application of Robotics in the field of machinery design and accomplishments of tasks using agricultural vehicles had resulted in increased investment and research. Continuous administration of the agricultural field is possible with the automatic performance of such agricultural fields is possible with the automatic performance of such agricultural vehicles. Abilities of the agricultural vehicles can be classified as guidance, detection, action, and mapping. The way of map-reading by the vehicle is termed as guidance, extraction of environmental features is termed as detection and execution of the assigned task is termed as action and plotting the field with its features is mapping. All four categories are independent. This system is based on developing a robotic vehicle used in agriculture for spraying harmful pesticides. This project involves the usage of PIC ESP8266 / ESP32 microcontroller to control the movement of the robot with the help of a mobile application. This cost-effective robotic vehicle can improve productive capacity, safety in agricultural applications and meet the demand for labour.



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II. SIGNIFICANCE OF THE SYSTEM

Farmers are moving to technology to address several pressing problems, such as the growing global shortage of food and labour. wireless communication, field sensors, and data analytics are some of the advanced systems used in that endeavour, but the one area in which these technologies converge is robotics. Agricultural robots, sometimes known as Agri-bots, are seen as one of the key trends that will largely influence agriculture. For example, they will help farmers address the issue of a dwindling workforce and allow them to work more efficiently while saving money on labour. Advanced robotic systems will also help for harvest plants, as well as carry out on-farm data collection, increasing crop yields. but these robots are not cost-effective for the Indian market. so, we introduced an agriculture spraying robot that is cost-effective and easy to use for a farmer.

III. LITERATURE SURVEY

The uprising in agriculture has started in 1752 and ended in the year 1900 when agriculture has drastically changed in America. The main reason for the occurrence of a revolution in agriculture is due to the introduction of the machines. A well-known machine has been introduced at this time and its name was Eli Whitney's cotton gin. It is the first device that has been used in agriculture. This machine was introduced in the year 1974 on the 14th of March by Eli Whitney. This machine can isolate the cottonseed from the cotton fiber and it has the record of creating up to 50 pounds of cotton in one day. This fifty pounds per day is equal to almost hundreds of man-hours. The cotton gin is the first device that has given way to several modern machines in Agriculture. Robotics was first evolved in agriculture in the early times of the year 1920. The research has taken place to give a start to the automatic guidance to the vehicle and that was about to take a shape. This research has given rise to developments in the years between 1950 and 1960. The advancements happened to get autonomous agricultural vehicles. This particular concept has not been that perfect as the vehicles required a cable system for their guidance along the path they travel. Agricultural robots have continued their evolution in the form of technologies in multiple sectors as well. In the 1980s, after the computers were developed, the guidance for the vision of the machine was made possible. Other evolutions took place in the following years in the form of orange harvesting with the help of agricultural robots in countries like the USA and France. For decades, agricultural robots have been used for the indoor industries and the outdoors, it has always been tough to include as they are termed as the more complex ones to develop. The security concerns, difficulty in picking crops, varying conditions of environment leads to the unpredictability of the use of these robots.

IV. METHODOLOGY

In our System, We are using cost-effective components such as ESP8266 / ESP32 Microcontroller for the control of agriculture robot, geared motors which facilitate the robot wheels to move and mobile application to guide the robotic movement, DHT11 sensor to measure ambient temperature and humidity, Capacitive soil moisture sensor to measure moisture level of soil, motor driver – L298 and relays to operate wheels and sprayer. The complete system is to monitor and control by the android application from a remote place with or without the internet. The last and main feature of our system is electrostatic charged spraying nozzles which generates high voltage.

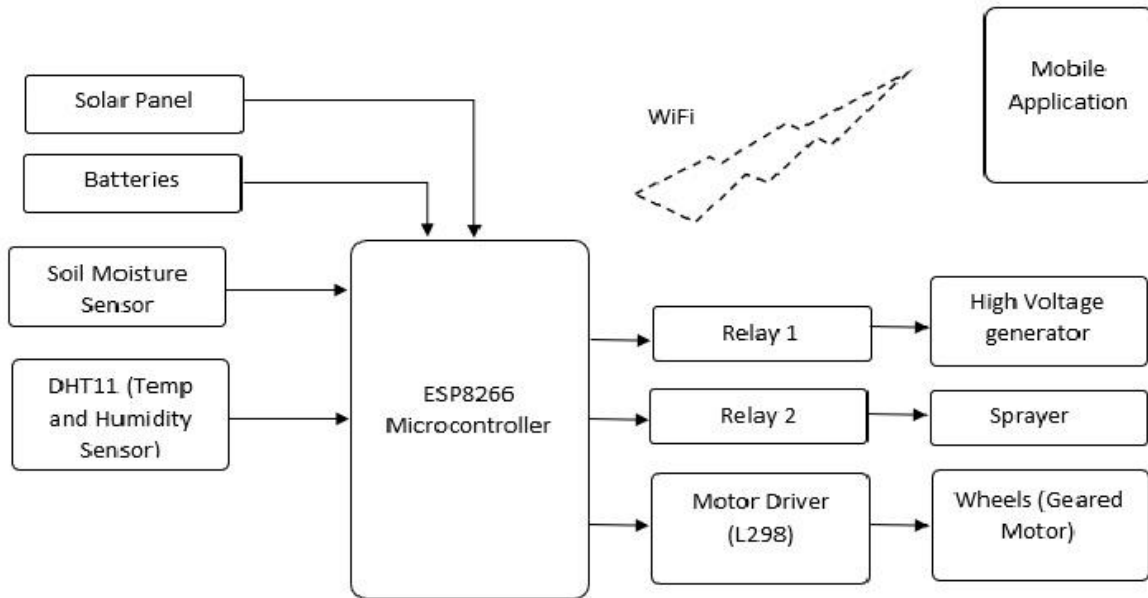


Fig 1: System Architecture

V. EXPERIMENTAL RESULTS



Fig2: Proposed Model

**Fig3:Proposed Model**

VI. CONCLUSION AND FUTURE WORK

This agriculture-based vehicle proves to be an effective and efficient machine that can be easily navigated and controlled. The robot can move through different types of terrains and soil. Precise navigation is possible using Johnson's geared motor as it moves exactly according to the pulses received and it is inertia free, unlike a normal DC motor. Remote control of the robot is possible through wireless technologies (BLE, Wi-Fi). The command for controlling the robot movement and spraying of pesticides is done by using a mobile app. Hence control of the robot is user-friendly and is not very complicated; hence farmers can easily control this intelligent vehicle. Pesticide spraying is a tedious job in agriculture as it requires various protection equipment to protect the farmer. This robot mainly emphasizes on pesticide spraying by farmers from a remote location without directly meeting it. This feature will encourage more people to take up agriculture as the complexity of the task is reduced and the manned task is converted to an unmanned task.

We will add the feature of automatic thinning in our robot. In the Thinning procedure, the seeds are fairly arranged away from each other during sowing to allow for ideal crop growth. It can also be a time-consuming process. We will also add Artificial intelligence and machine learning algorithm to automatically control the robot. We can also use a drone for spraying instead of the vehicle. Drones are acclaimed as useful flying farmhands because they can, in theory, improve the precision with which fertilizers, pesticides or fungicides are applied. This is due to their capability to spray specific volumes on GPS-defined routes through a field.

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