e-ISSN: 2582-5208
International Research Journal of Modernisation in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume: 04/Issue:07/July-2022 Impact Factor- 6.752 www.irjmets.com

AGRICULTURAL PESTICIDE SPRAYING ROBOT

K. Sushma Priya*1, R. Praneetha Reddy*2, Y. Pradeep*3

*1,2Student, Department of Electronics and Communication Engineering, ACE Engineering College, Hyderabad, Telangana, India.

*3Associate Professor, Department of Electronics and Communication Engineering, ACE Engineering College, Hyderabad, Telangana, India.

ABSTRACT

The aim of this project is to create an intelligent spraying robot that will decrease pesticide use and human health damage, allowing farmers to be protected and labour intensity can be reduced. The robot will have full route planning and navigation systems, as well as driving control, spraying mechanism and system construction and obstacle avoidance with multi-sensor module integration. The spray robot will be designed, including obstacle avoidance, spraying, and sensor integration simulations and analyses. It is used not only to track motion and monitor orientation, but also to compensate for path errors in order to achieve good stability and reliability. Meanwhile, the spraying system will be improved to eliminate leaks and prevent repeated spraying, with automatic sprays varying according to the target. This project proposes a pesticide spraying system which will help farmers in field of agriculture.

KEYWORDS: Route planning, Navigation System, Intelligent Spraying, Multi sensor, Monitor orientation

I. INTRODUCTION

Agriculture is the primary source of revenue for India's population, which accounts for nearly 60% of the country's total. Farmers work in their fields to cultivate various crops based on the environment and resources available. Farmers must use large quantities of pesticides to increase food production in order to meet such high food demand for such a large population. Traditional manual pesticide spraying operations is full of direct exposure to the pesticide liquid work environment, great harm to human body and when this pesticide may come into contact with the farmer during spraying, which may trigger skin cancer and asthma illnesses. Increased pesticide spraying can impact consumer health as it enters the food chain. Pesticide spraying and fertilizer scattering are tedious applications. Despite the fact that pesticide spraying is now required, farmers still find it to be a hazardous process. This project is based on the development of an agricultural robot vehicle that navigates between crops using an Android application based on the farmer's instructions. This truck has lower-cost components, making it more cost-effective. To move the robot in the field, the farmer can use any Android smart phone with this application. Through an IoT application, farmers can control pesticide sprinkling devices. This low-cost robotic vehicle would increase efficiency, safety, and meet labour demand in agricultural applications.

II. METHODOLOGY

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. Once we connect Bluetooth, we can easily control this spraying rover. In this rover, we attached four brushless DC motors with L293D motor driver. The connection of the microcontroller, Arduino Uno, brushless DC motor through brushless motor driver and received the power supply from 12V battery. The motor drivers are able to manipulate the rotation of the motor using its phase connected to the gate driver MOSFET on its circuit. Another servo motors are also used here to control sprayer part of this rover. A servomotor is a rotary or linear actuator that can control angular or linear position, velocity, and acceleration with precision. The main purpose of this servo motors is to move the sprayer according to the user's requirement.

We used this servo motors as shoulder part move the sprayer accordingly. Arduino uno board receive commands from android application and works accordingly. In this system we used 6V pump, the pump is connected with Arduino and passes through buck convertor and relay module which helps to control high voltage pump. A relay is a switch that is regulated electrically by an electromagnet. A low voltage, such as 5 volts from a microcontroller, activates the electromagnet, which pulls a contact to make or break a high voltage

e-ISSN: 2582-5208
International Research Journal of Modernisation in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume: 04/Issue:07/July-2022 Impact Factor- 6.752 www.irjmets.com

circuit. Here, we used 12V battery that is actually high, so to convert that high voltage DC current to low voltage DC we used buck converter here. From the input to the output, a Buck converter steps down a DC voltage. The operation of the circuit is determined by the MOSFET's conduction state: On-state: The current flowing through the inductor rises, and the diode is turned off. As energy is transferred from the inductor to the capacitor, the inductor current decreases. In the rover, we have also added temperature and humidity sensors to predict weather before spraying pesticides.

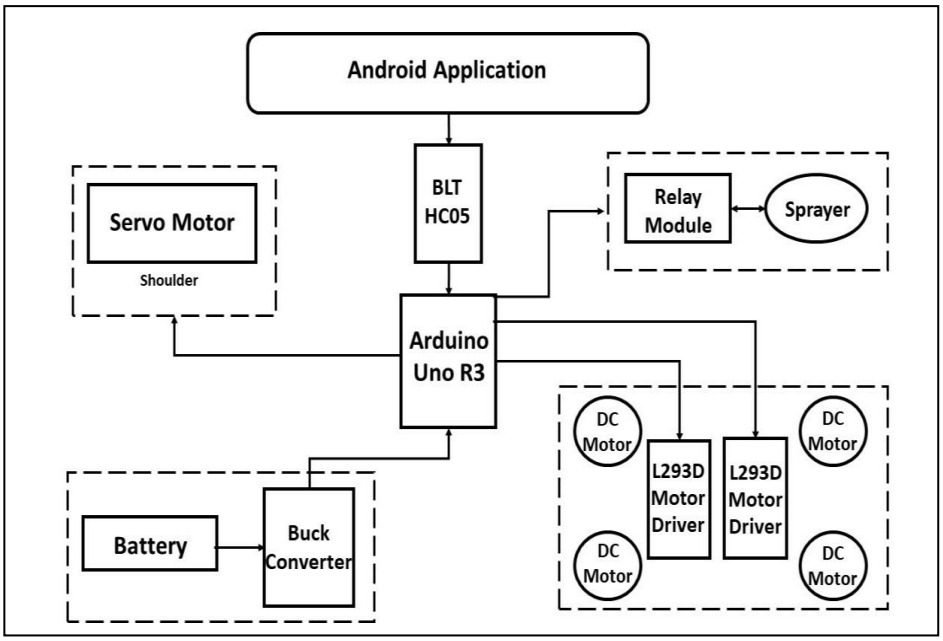

Figure 1: Block Representation 1

Hardware Components Used:

1. Arduino UNO: The Arduino Uno contains a set of analog and digital pins that are input and output pins which are used to connect the board to other components.
2. Relay Module: A relay is an electromechanical switch. It is electrically operated.
3. L293D Motor Drivers: L293D is a basic motor driver integrated chip (IC) that enables us to drive a DC motor in either direction and also control the speed of the motor.
4. DC Motors: An electric motor is a machine, which converts electrical energy into mechanical energy.
5. Bluetooth Module: connect the Bluetooth HC-05 module to the PC via serial to USB converter. Before establishing communication between two Bluetooth devices, 1st we need to pair HC-05 module to smartphone for communication
6. Water Pump: These pumps are used for pumping the huge amount of water from one place to another
7. Servo Motor: A servomotor is a closed-loop servomechanism that uses position feedback to control its motion and final position.

III. MODELING AND ANALYSIS

Before spraying the pesticides with this robot, the farmer must follow the steps:

1) Fill the required pesticides into tank
2) Start spraying rover
3) Login with android application
4) Connect app with Bluetooth
5) Send commands using application
6) Move rover on field
7) Change direction of sprayer

e-ISSN: 2582-5208
International Research Journal of Modernisation in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume: 04/Issue:07/July-2022 Impact Factor- 6.752 www.irjmets.com

8) Switch sprayer/pump on/off

9) Charge the battery

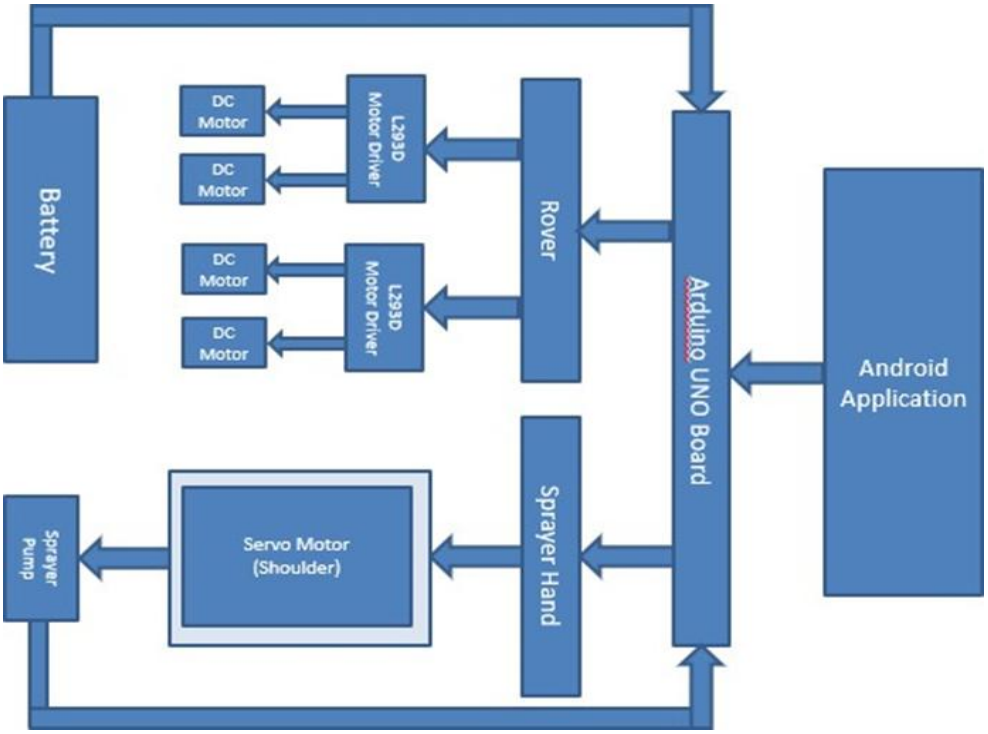

Figure 2: Block Representation 2

The robot is installed in the farm and is operated by an Android application and is powered by IoT. DC motors are used for the robot's motion that are governed electronically by Arduino UNO with the assistance of L293D. The HC-05 Bluetooth module receives signals from the input and sends them to the controller, which in turn spins the engine. By obtaining the signal, DC motors are switched ON and OFF by allowing Arduino to have a specific pin. An adequate velocity is provided by 300rpm DC motors. Bluetooth module connects to the digital key of Arduino UNO, which receives the signal installed on the operator's Smartphone from the Android app. Pesticide spraying, which can be done with the assistance of a pesticide sprinkling pump, can be done on a regular basis if the relay switch is turned on. The agricultural robot is used to control functions such as pesticide spraying, and it is controlled using a Bluetooth module that communicates between an Android application and the robot for a low cost.

Figure 3: Working Module of Robot

e-ISSN: 2582-5208
International Research Journal of Modernisation in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume: 04/Issue:07/July-2022 Impact Factor- 6.752 www.irjmets.com

IV. RESULTS AND DISCUSSION

This agriculture vehicle proves to be an effective and efficient machine which can be easily navigated and controlled. The robot can traverse a variety of terrains and soils. The android application is used to control the robot's movement as well as spray pesticides.

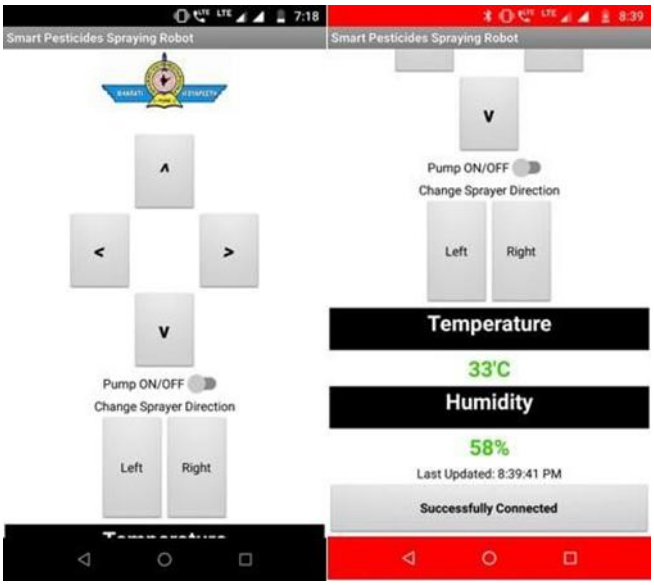

Figure 4: Sample Output of Android application

As a result, the robot's control is simple, and farmers can easily operate this intelligent vehicle. The application was built by using MIT app Inventor. This robot focuses on farmers spraying pesticides from a distance without coming into direct contact with them. Because the task's complexity is reduced and the manned task is converted to an unmanned task, this feature would encourage more people to take up agriculture.

Advantages:

- Reducing direct exposure to pesticides and the human body and improve production efficiency.
- They can operate with closer tolerances
- They produce fewer errors and at higher speeds, and the machines can reliably detect higher-quality goods.
- The robots can reduce up to 30% of farm's use of pesticide
- Robots have the potential to create jobs for those who must build and repair them

Disadvantages:

- Robot can work in wet crops, only works at dry crops.

V. CONCLUSION

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. Sure, once this idea is presented in a way that is appropriate for the Indian market, it will undoubtedly aid in lowering the 15% molality rate found in Indian formers associated with agricultural spraying operations. Projects like this inspire people to pursue agriculture as a full-time or part-time occupation. This is critical in developed countries, particularly India, where agriculture is the economic backbone

ACKNOWLEDGEMENTS

We are grateful to our guides Associate Prof. Mr. Y. Pradeep and Prof. B. GIRI RAJU for their continuous support and guidance. Through their guidance, we were able to successfully complete our project. Sincere thanks go to Dr. P. SATISH KUMAR, Head of the department of Electronic and Communication Engineering at ACE

Engineering College, for his support and time. We are very grateful to my family and friends for their constant support and encouragement during the project period

VI. REFERENCES

[1] Aishwarya. B. V, Archana G., C. Umayal, 2015 IEEE International Conference on Technological Innovations in ICT for Agriculture and Rural Development, "Agriculture Robotic Vehicle Based Pesticide Sprayer" (TIAR 2015).

[2] Amrita Sneha. A, Abirami. E, Ankita. A, Mrs. R. Praveena, Mrs. R. Srimeena, 2015 IEEE International Conference on Technological Innovations in ICT for Agriculture and Rural Development, "Agricultural Robot for Automatic Ploughing and Seeding" (TIAR 2015).

[3] Pvr Chaitanya, Dileep Kotte, A. Srinath, K. B. Kalyan, "Development of a Smart Pesticide Spraying Robot," Volume 8, Issue 5, January 2020, ISSN: 2277-3878, International Journal of Recent Technology and Engineering (IJRTE).

[4] Peng Jian-sheng, "Intelligent Robot System for Spraying Pesticides", The Open Electrical & Electronic Engineering Journal, 2014, 8, 435-444.

[5] Ege Ozgul, Ugur Celik, "Design and implementation of Semi-Autonomous Anti-Pesticide Spraying and Insect Repellent Mobile Robot for Agricultural Applications", 2018 5th International Conference on Electrical and Electronics Engineering.