

e-ISSN:2582-7219



INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH IN SCIENCE, ENGINEERING AND TECHNOLOGY

Volume 7, Issue 1, April 2024



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.521



6381 907 438



6381 907 438



ijmrset@gmail.com



www.ijmrset.com



Agriculture Robots Based Plant Distance Detection for Pesticides Spray Mechanism

S.Anilkumar¹, V.Jeeva², S.Harikrishnan³, N. Mohananthini⁴, S. Saravanan⁵

UG Students, Department of Electrical and Electronics Engineering, Muthayammal Engineering College,
Tamil Nadu, India.^{1,2,3}

Associate Professor, Department of Electrical and Electronics Engineering, Muthayammal Engineering College,
Tamil Nadu, India.⁴

Professor, Department of Electrical and Electronics Engineering, Muthayammal Engineering College,
Tamil Nadu, India.⁵

ABSTRACT: The agricultural industry is continually evolving, driven by the need for increased efficiency and sustainability. To address these challenges, there is a growing interest in the development of agricultural robots that can perform tasks such as pesticide spraying with greater precision and reduced environmental impact. This paper presents a novel approach for perfecting pesticide application in agriculture using robotics and plant distance detection technology.

KEYWORDS: Robotic Platform, Sensors, Data Processing, Pesticide Delivery Mechanism, Control System.

I. INTRODUCTION

The accelerated population growth and the continuous shortage of labor in agriculture are two of the main motivations for the growing interest in robotics and precision farming. Here, agricultural vehicles play a very important role, and a lot of research activities related to navigation, path planning and control have been increasingly taking place in the past recent years. For instance, presents a new concept with a fleet of small robots providing a solution for soil compaction in a scalable and energy-efficient manner. In the same line of small vehicles, here we present a controller for a skid-steered robot used for corn seeding tasks.

II. LITERATURE REVIEW

Field variation characteristics of sprayer boom height using a newly designed boom height detection system [1]. To ensure boom sprayer safety and spraying efficiency, the sprayer boom height must be adjusted during pesticide. A boom height detection system based on ultrasonic sensors was designed. These findings can provide a theoretical basis for use in the development of an automatic boom height adjustment system.

A smart droplet detection approach with vision sensing technique for agricultural aviation application [2]. detection fields to realize intelligent detection tasks. Experimental results indicate that the proposed sensor can adapt to light changes in complex environments, and accurately measure the deposition parameters of different droplet density images. Furthermore, it is of great significance to detect the quality of drone sprays, master the rules of droplet deposition, and understand the effects of pesticide spraying. Precision detection of dense plums in orchards using the improved YOLOv4 model [3]. The precision detection of dense small targets in orchards is critical for the visual perception of agricultural picking robots. different intensity levels, and different types of occlusions were discussed in this strong robustness and high accuracy under the real natural environment, which can provide data reference for the subsequent orchard yield estimation and engineering applications of robot picking work.

Weed detection in maize fields by UAV images based on crop row preprocessing and improved YOLOv4 [4]. Effective maize and weed detection play an important role in farmland management, which helps to improve yield and save



herbicide resources. The results showed that the total number of labels for 1000 images decrease by half, from 33,572 to 17,126. The improved YOLOv4 had a mean average precision (mAP) of 86.89%.

Development of deep learning-based variable rate agrochemical spraying system for targeted weeds control in strawberry crop [5]. Agrochemical application is an important tool in the agricultural industry for the protection of crops. It is concluded that the advanced variable rate spraying system has the potential for spot application of agrochemicals to control weeds in a strawberry field. It can reduce the crop input costs and the environmental pollution risks.

III. EXISTING SYTEM

This project is part of an on-going research aimed to replace the traditional spraying methods with an agricultural robotic sprayer. The robot navigates autonomously along the vineyard rows and performs specific spraying toward detected targets. For site-specific spraying the target must first be detected and then sprayed. This research focuses on the spraying process so as to completely cover the target while minimizing the amount of material sprayed. Ongoing research focused on target detection (both autonomously and with remote human supervision) and on the development of a fully operational agricultural spraying robot. The diameter of the sprayer is set according to the shape and size of the target similar to the recently proposed patent that suggests a changeable nozzle aperture. However, in existing approach was designed, built, and implemented in real-world conditions and included experimental procedures and experiments for evaluation and validation of the spraying device for agricultural amorphous shapes and variable-sized targets.

IV. PROPOSED SYSTEM

An adjustable spraying robot with raspberry pi device (ASRPI) was designed and built as an experimental tool to implement the One Target–One Shoot (OTOS) spraying method. The device is mounted on a mobile robotic sprayer and supplies pressurized pesticide.

The operational concept of the ASD is as follows:

- Direct the pump to face the crop (perpendicular to the crop).
- Calculate the distance of source to distance object.
- Find the target's positions and diameters distance. For each target perform the following routine:
- Direct the ASD toward the target centre.
- Adjust the nozzle diameter to equal the closing circle diameter of the target.

4.1 BLOCK DIAGRAM OF PROPOSED SYSTEM

A pesticide spraying mechanism with the help of current robotics technology is the main purpose of this project which would help the farmer in his day-to-day spraying activity. This project is basically a robot with an attached spraying mechanism and is divided into two parts.

1. Robotic Mechanism.
2. Pump motor with steering ECU mechanism.

First, we started by designing the chassis for our robot. Our main challenge was to design an adjustable chassis which could carry a load of 2 Kgs, so for it we used iron as the metal for chassis. But the chassis itself weighed 1Kgs, so to avoid excessive weight of the device, iron has not been used as the only metal in the chassis of the device; whereas aluminum is used in most part of the chassis and iron has been used only in some places instead of aluminum as a brittle metal.

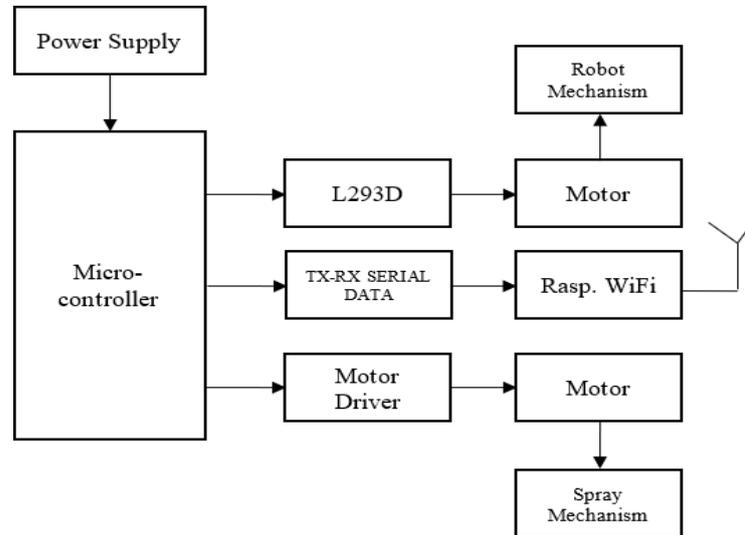


Fig 1 Transmitter Module – Robotic Module

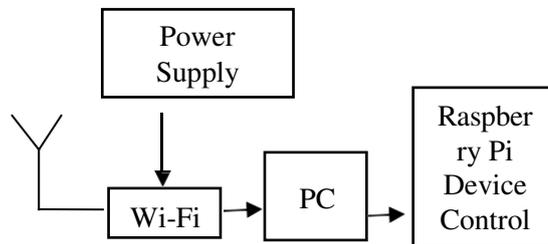


Fig 2 Receiver Module

V. RESULTS AND DISCUSSION

5.1 SIMULATION RESULTS

Thus, the DC motor pump also gives very powerful spray for the height plants up to 2-3 ft. In this way, the remotely controlled multi-nozzle pest sprayer is going to be a very which results in less pollution. Muscular problems are removed and there is no need to operate the lever. This pump alone can be used for multiple crops. In this project, we are using an ultrasonic Distance sensor. It generates sound waves these waves to hit an obstacle and travel back. This is like the principle used by bats and cruise. These waves hit an obstacle and travel back. This is like the principle used by bats and cruise beyond the scope of human hearing and measures distance by calculating the time required in this section, we report an overview of the developed PC based application and the handy and viable product for farmers. The suggested model has a greater number of nozzles, the sprayer will cowl most places of spraying in minimal time & at the most rate. The proper adjustment facility within the model helps to avoid excessive use of pesticides. Eexperimental results were carried out to evaluate the performance of the URAS located in a roomand in presence of several objects made by different materials and having different shapes and sizes.

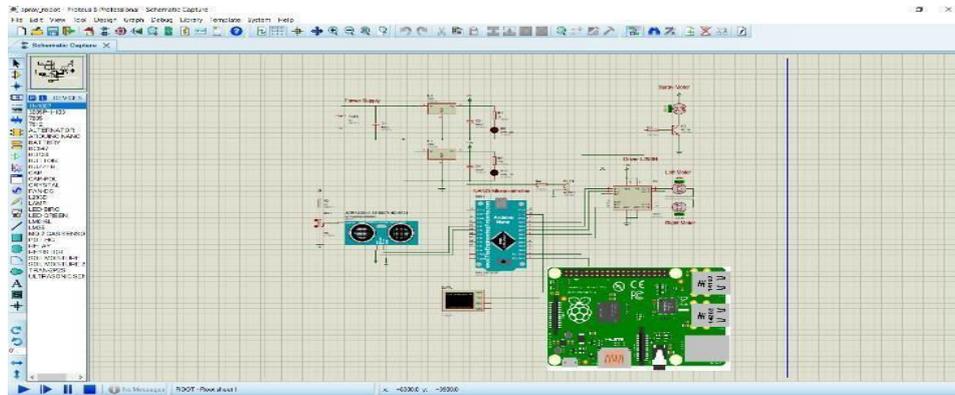


Fig 3 Proposed Simulation Diagram

HARDWARE RESULTS

Turn on the circuit, we use 9v Battery to power the circuit. Arduino nano will turn on, thenano Automatic in Arduino nano Automatic, Manual.

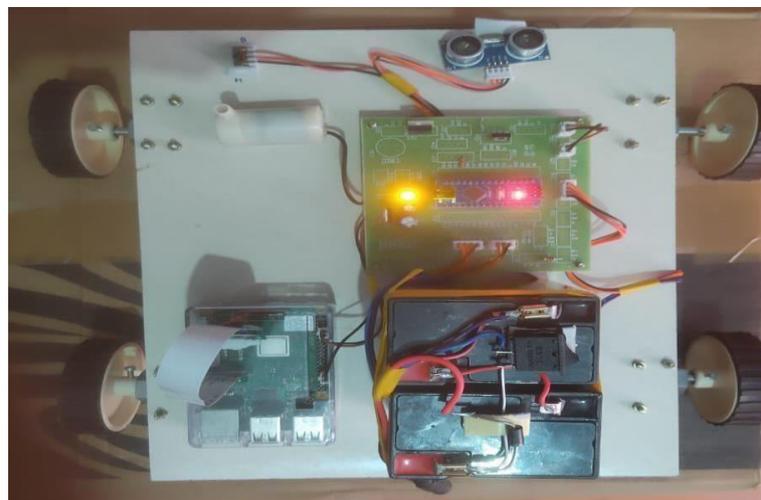


Fig 4 Hardware Results

Automatic

In this mode there are two 9 v DC gear motors used. It is used to move the kit forward, backward, left, right. 9v sub marine used to pump and spray the water. There is an ultra-Sonic sensor which is used to detect the object before 20 cm, and it automatically turns on the pump and sprays the water.

Manual

We connect the system with raspberry Pi, the Arduino nano will control the raspberry pi for movements. There is an ultra-Sonic sensor which is used to detect the object before 20 cm, and it automatically turns on the pump and sprays the water.



5.2 ADVANTAGES

- Wireless operation will eliminate the health issues and would even save them from tedious work.
- It will have less use of manpower.
- Efficient and health-conscious operation due to remote sensing.
- This Robot is expected to be an all-terrain robot.

5.3 APPLICATION

- Precision Irrigation Robot
- Mobile Robot Application
- Unmanned Area Application

VI. CONCLUSION

In agriculture, the opportunities for robot-enhanced productivity are immense –and the robot is appearing on farms in various guises and in increasing numbers. One of the advantages of the smaller machine is that they may be more acceptable to the non-farm community. Agriculture is a drag, dangerous, requires intelligence and quick though highly repetitive decisions hence robots can be rightly substituted with human operators. An intelligent robot system spraying pesticides, to control the robot through a wireless alternative to manual completion of crops spray test, reducing direct exposure to pesticides and the human body, reduce pesticide harm to people, and improve production efficiency. By good, can be different terrain, different heights crop by spraying operation tests show that a certain protective, practical, mobile robot, better spray effect at the right working environment, such Its low cost, ease of handling and easy maintenance and other characteristics of individuals with a broad market in agricultural production.

REFERENCES

1. Dou, Hanjie, Changua Zhai, Liping Chen, Sangin Wang, and Xiu Wang. "Field variation characteristics of sprayer boom height using a newly designed boom height detection system." *IEEE Access* 9 (2021): 17148-17160.
2. Wang, Lihua, Weeping Song, Yubin Lan, Huihui Wang, Xuejian Yue, Xingdong Yin, Entao Luo, Bin Zhang, Yan Lu, and Yayuan Tang. "A smart droplet detection approach with vision sensing technique for agricultural aviation application." *IEEE Sensors Journal* 21, no. 16 (2021): 17508- 17516.
3. L. Wang, Y. Zhao, S. Liu, Y. Li, S. Chen, and Y. Lan, "Precision detection of dense plums in orchards using the improved YOLOv4 model," *Frontiers Plant Sci.*, vol. 13, Mar. 2022, Art. no. 839269.
4. H. Pei, Y. Sun, H. Huang, W. Zhang, J. Sheng, and Z. Zhang, "Weed detection in maize fields by UAV images based on crop row preprocessing and improved YOLOv4," *Agriculture*, vol. 12, no.7, p. 975, Jul. 2022.
5. J. Liu, I. Abbas, and R. S. Noor, "Development of deep learning-based variable rate agrochemical spraying system for targeted weeds control in strawberry crop," *Agronomy*, vol. 11, no. 8, p. 1480, Jul. 2021.
6. V. Patrell, S. C. Kakarla, and Y. Amperozide's, "Development and evaluation of a low-cost and smart technology for precision weed management utilizing artificial intelligence," *Compute. Electron. Agricult.*, vol. 157, pp. 339–350, Feb. 2019.



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH IN SCIENCE, ENGINEERING AND TECHNOLOGY

| Mobile No: +91-6381907438 | Whatsapp: +91-6381907438 | ijmrset@gmail.com |

www.ijmrset.com