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A SURVEY ON THE DESIGN OF SEMI ATONOMOUS PESTISIDE SPRAYER ROBOT

Karthik R[1], Sathya M [2], Gowtham S [3], Karthikeyan B[4]

Faculty of Robotics and Automation, United Institute of Technology, Tamilnadu 641020, India

[2345]Robotics and Automation, United Institute of Technology, Tamilnadu 641020, India

karthikranganathgct@gmail.com , kumar917112@gmail.com , sathyamanickan4917@gmail.com , karthicit98@gmail.com

ABSTRACT :

The increasing demand for automation in agriculture has led to the development of intelligent robotic systems. This paper presents a survey and design of an autonomous pesticide sprayer robot integrated with IoT, sensor modules, and real-time control. The system aims to reduce human exposure to harmful chemicals, optimize pesticide usage, and improve agricultural efficiency. Powered by a lithium-ion battery and controlled via NodeMCU, the robot uses a DHT-11 sensor for environmental monitoring, a vibration sensor for obstacle detection, and L298 motor driver for navigation. It also features IoT capabilities for remote monitoring and control, and an automated pump system for pesticide spraying.

OVERVIEW

The optimisation of carbon dioxide enrichment, tem-perature, humidity, root moisture, fertiliser feed, pest and fungus control allow greenhouses to produce fruits, vegetables out of season and ornamental flow-ers all year round. For example, carbon dioxide levels within a greenhouse are approximately five times the normal atmospheric levels [11]. The optimal temper-ature and humidity levels of a greenhouse during the normal working hours of the day can be quite high (up to 38°C), making it very hot and uncomfortable for someone wearing the heavy protective equipment. This can subject the worker to risks such as heat stroke and other health hazards associated with such conditions.

1.INTRODUCTION

Agriculture is one of the most critical sectors contributing to the global economy. However, traditional methods of pesticide application pose health risks to farmers and lead to inefficient use of chemicals. With the advancement in robotics and IoT, there's a growing opportunity to develop automated solutions to address these challenges. The integration of sensors, microcontrollers, and communication modules enables the development of smart agricultural robots capable of autonomous operation and precise pesticide spraying. This paper focuses on the design and survey of such a system.

PROPOSED SYSTEM

- The proposed system is an IoT-enabled autonomous robot designed for pesticide spraying in agricultural fields. The architecture includes:
- NodeMCU as the central control unit.
- DHT-11 sensor to monitor temperature and humidity.
- Vibration sensor to detect terrain or obstacles.
- L298 motor driver to control robotic movement.
- Relay to control the pump mechanism.
- Tank and pump for pesticide storage and spraying.
- LCD display for status monitoring.
- IoT module for remote control and data monitoring.
- Lithium-ion battery as a power source.
- This system enables automatic pesticide spraying based on environmental data and user inputs via IoT

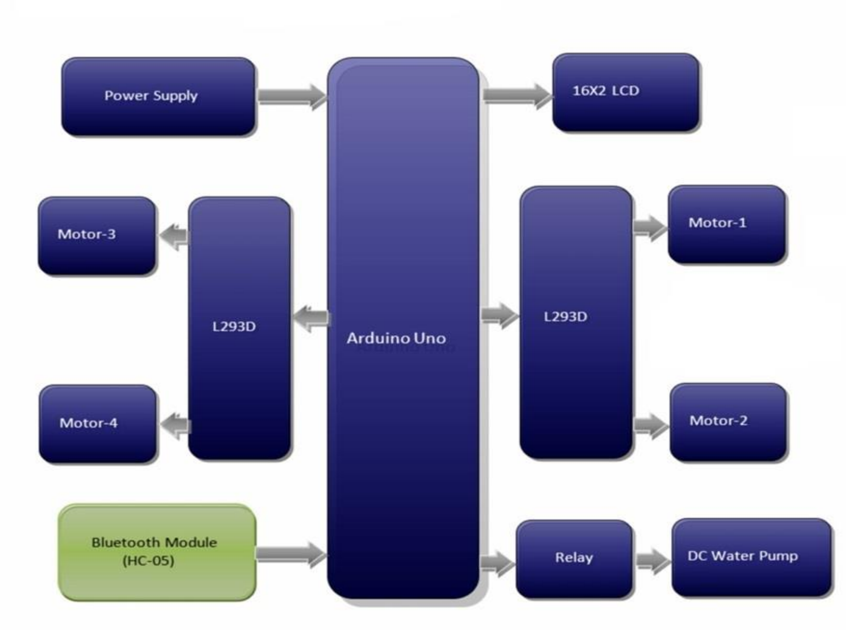
EXISTING SYSTEM

- Traditional pesticide spraying involves manual labor or semi-automated systems that lack environmental sensing and remote control. Current robotic systems may not integrate real-time environmental monitoring or IoT, leading to inefficient spraying, energy consumption, and increased operational risk. Some basic robots exist, but they are limited by manual programming and lack adaptability in complex field conditions.

2.LITERATURE REVIEW

- Several research works have explored the application of automation in agriculture:
- Studies have shown that autonomous robots reduce chemical exposure and improve field coverage.
- IoT integration in agriculture has enabled real-time data acquisition and remote operation.
- The use of sensors like DHT-11 and ultrasonic modules has improved obstacle avoidance and environment-adaptive behavior.
- Prior implementations, however, often neglect the combination of mobility, environmental monitoring, and IoT in a unified spraying system.

BLOCK DIAGRAM



Hardware Components Uses:

- Arduino UNO
- 2 DC Motors
- Bluetooth Module
- L298N Motor Driver
- Servo Motor
- Mosfet Module
- Water pump

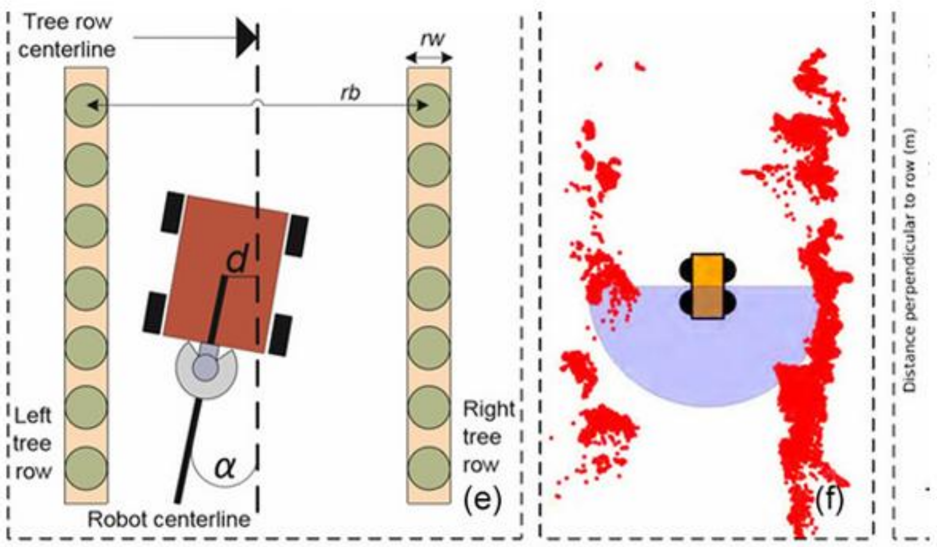
SLAM (SIMULTANEOUS LOCALIZATION AND MAPPING)

Navigation and Path Planning

Localization: The robot needs to determine its position accurately using GPS, SLAM (Simultaneous Localization and Mapping), or other sensor fusion techniques.

Path Planning: Algorithms to generate optimal paths through the field, considering obstacles, target areas, and efficiency.

Obstacle Avoidance: Sensors (like lidar or cameras) and algorithms to detect and avoid obstacles like crops, rocks, or other equipment.



CONCLUSION

The design of an autonomous pesticide sprayer robot using NodeMCU, sensors, and IoT presents a viable solution to modern agricultural challenges. This system improves pesticide application precision, minimizes human exposure to chemicals, and enhances field efficiency. Future work may involve incorporating AI for plant health detection and path planning to further enhance autonomy.

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