Review Paper On Solar Powered Pesticides Spraying Robot With Wireless Camera

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Abstract- *India is the farmland with a population of three-fourths in agriculture. In accordance with the climate and other resources accessible to them, farmers will grow multiple plants in their field. But some technical abilities along with technological assistance are required to achieve high output and excellent quality. The management of food crops includes very close surveillance, particularly with regard to the treatment of Illnesses, which will cause severe effects after harvest. This is very necessary for effective spraying of the pesticide.. The spraying system is operated by wireless remote control. The robot is designed to spray pesticide/insecticide directly onto individual lesions minimizing wastage leading to reduced consumption of chemicals hence making the system cost effective and environmentally friendly. The targeted pesticide delivery prevents dispersion of chemicals in the environment. A prototype is developed and tested on different terrain conditions and is found to operate efficiently. The movement of robot is done solutions to enable precise and targeted pesticide application. In this context, the integration of robotics and IoT technology presents a promising avenue for revolutionizing with wireless remote, motor driver and the processor or embedded system is done through microcontroller.*

Keywords- Soalr Power, Agriculture, IoT, Aurdino, Control System

I. INTRODUCTION

Agriculture is the backbone of human civilization, providing sustenance and livelihoods to billions worldwide. However, traditional agricultural practices, including pesticide application, have often been associated with challenges such as overuse of chemicals, environmental degradation, and reduced biodiversity. In response, the agricultural industry has been undergoing a transformation towards more sustainable and efficient methods, with precision agriculture emerging as a key paradigm shift. Precision agriculture aims to optimize resource utilization, minimize environmental impact, and maximize crop yield through the integration of advanced technologies such as robotics, and artificial intelligence. One of the critical aspects of precision agriculture is the targeted application of pesticides, herbicides, and fertilizers. Traditional spraying methods, which involve blanket coverage of entire fields, often result in wastage of chemicals, environmental pollution, and unintended harm to beneficial organisms. Recognizing these challenges, researchers and farmers alike have been exploring innovative solutions to enable precise and targeted pesticide application. In this context, the integration of robotics and IoT technology presents a promising avenue for revolutionizing pesticide spraying practices. By equipping autonomous robots with sophisticated sensors, actuators, and intelligent algorithms, it becomes possible to identify specific plant species, detect pests or weeds, and precisely apply pesticides only where needed. This approach not only reduces chemical usage and environmental impact but also enhances the effectiveness of pest management strategies. Central to the success of such robotic systems is the ability to accurately identify target plants amidst complex and varied foliage. Computer vision, a branch of artificial intelligence, plays a pivotal role in this process by enabling machines to interpret and analyze visual data from cameras mounted on the robotic platform. By leveraging advanced image processing algorithms, coupled with high-resolution cameras, robots can distinguish between crops and weeds or identify signs of pest infestation with remarkable accuracy.

II. OVER VIEW OF SYSTEM

India is the farmland with a population of three-fourths in agriculture. In accordance with the climate and other resources accessible to them, farmers will grow multiple plants in their field. But some technical abilities along with technological assistance are required to achieve high output and excellent quality. The management of food crops includes very close surveillance, particularly with regard to the treatment of Illnesses, which will cause severe effects after harvest. This is very necessary for effective spraying of the pesticide. In recent years the agricultural industry is revolutionized by automation and robotics that has resulted in reduction of labor and production costs with increased agri produce to meet the market demand. Manual spraying of pesticides and herbicides to crops and weed inhibitors onto the field are harmful to both humans and the environment. This project proposes a solar powered, flexible, semi-automated

pesticide spraying robot with wireless camera interface. The spraying system is operated by wireless remote control. The robot is designed to spray pesticide/insecticide directly onto individual lesions minimizing wastage leading to reduced consumption of chemicals hence making the system cost effective and environmentally friendly. The targeted pesticide delivery prevents dispersion of chemicals in the environment. A prototype is developed and tested on different terrain conditions and is found to operate efficiently. The movement of robot is done with wireless remote, motor driver and the processor or embedded system is done through microcontroller. Since this can be controlled from anywhere without working in the field and being exposed to pesticides, it will be a profit for the farmer. He will stay unaffected by his health condition

III. BACKGROUND

The Industrial Revolution introduced mechanized equipment, transforming agricultural practices and improving efficiency. In recent decades, the advent of robotics and IoT has further revolutionized farming, enabling automation in sowing, irrigation, and harvesting.

Solar power offers a sustainable energy source for rural areas with limited access to electricity. Solar panels convert sunlight into electrical energy, which can power various farming equipment. The adoption of solar technology in agriculture has been driven by its cost-effectiveness and minimal environmental impact.

The use of wireless cameras in agricultural robotics enhances real-time monitoring and ensures accurate pesticide application. These cameras can capture high-resolution images, providing farmers with valuable insights into crop health and pest infestations.

Arduino Uno is a microcontroller board widely used in DIY and academic projects. Its ease of programming, compatibility with sensors, and cost-efficiency make it an ideal choice for agricultural robotics. In this project, it serves as the central control unit, managing the spraying mechanism and wireless communication

IV. FRAMEWORK OF PROJECT

A solar panel is installed to charge a battery, providing continuous energy for the robot. Energy storage ensures operation during low sunlight hours. A pump controlled by the Arduino Uno ensures consistent spraying. Adjustable nozzles allow for customization of spray patterns. The Arduino Uno microcontroller manages inputs from sensors and outputs to the pump and motors. Sensors include proximity sensors for obstacle avoidance and a soil moisture sensor for smart pesticide use. A camera module streams live video to a smartphone or PC, aiding real-time monitoring and operation. A lightweight but durable chassis houses all components. DC motors powered by the solar battery provide mobility.

V. CONCLUSION

This project demonstrates the feasibility of integrating solar energy, robotics, and wireless communication into agricultural practices. The Solar-Powered Pesticides Spraying Robot is a step forward in modernizing farming, offering a sustainable, efficient, and safe solution for pesticide application. While the current design addresses several challenges, future enhancements could include AI for pest identification, GPS for navigation, and higher-capacity batteries for extended operation.

The robot has the potential to significantly reduce labor costs, improve crop yields, and minimize environmental and health risks, marking a significant milestone in the journey toward sustainable agriculture.

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