AUTOMATED PESTICIDE SPRAYING ROBOT

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Abstract—***Pesticide spraying is one of the risky and very essential tasks in agriculture to protect plants from harmful organisms. Many farmers use manual pesticide spraying devices that they carry on their shoulders and spray on the entire plant. Due to this, harmful pesticide chemicals spread into the air and may enter into the body of farmers and farm workers through the breathing system and mostly affect their body parts even(especially eyes), so many farmers lost their lives. Manpower is also needed. They may also get some skin diseases . For this serious problem, we present the best solution to perform this task without the intervention of man is to utilize a robotic system in agriculture. This paper analyzes the state-of-the-art reviews in the development of autonomous pesticide spraying robots that are divided into four main categories; platform mobility and steering, localization and navigation control, sensing and target detection, and pesticide spraying arrangement. This paper also focused on the efficient methodology that can be used for future perspectives to enhance pesticide spraying operations in agriculture. In this paper, to achieve target spraying operation, a suitable navigation control algorithm for platform movement and an efficient trajectory planning algorithm for shortest link movement are designed which covers the shortest distance to visit all targeted pests on the plant. This technique will help to reduce the overdose of toxic pesticides hence minimize the wastage of pesticides and also control its dangerous effects on the human being and on the environment.***

KEYWORDS: ***Automation, Agriculture, Pesticides***

I.INTRODUCTION

This paper presents the design and construction of an autonomous robot that seeks to address

some of the human health concerns associated with green-houses. This robot is designed as a base for developing systems to enable the One of the most frequent and important tasks in agriculture is the application of fungicides, herbicides and insecticides. It is frequent because diseases are a common occurrence on plants which affect the plant production, and it is important because it can have a significant spray of pesticide while wearing protective gear and walking from crop to crop. This method indeed inefficient practice and hazardous chemicals used in spraying can be fatal to the worker even wearing protective gear because research conducted found that the protective gears do not stop the chemical but only reduce the amount of exposure Based on the studies conducted also, The World Health Organization(WHO)The autonomous robot had been introduced in various application such is in underwater rescue, line following robot based on metal detection In agriculture field, the usage of robotics in agriculture operation able to help to increase the production process and improve efficiency. One of the types of the robot used in agriculture is for the purpose of pesticide spraying with the ability to navigate in the farm, recognize the target and regulate the spraying mechanism. The use of autonomous robot pesticide sprayer as the substitution of the worker who used conventional pesticide sprayer can be applicable.

. Farming is India's cornerstone. In our nation, approximately 215.6 million acres of soil is irrigated crop region. The Economic Survey says that there is a need to improve farm mechanization in the nation. Increasing Pest infestation productivity control plays a significant role.The pesticides have a vital influence on the agribusiness. Nearly 35% of crops have been safeguarded from the insects using pesticides. The pesticides are needed for agriculture to increase the efficiency but they are also injurious to humans and also to the environment. In the current methods, the farmers use the backpack sprayer which is manually operated by the human along the crop fields. They used to spray the pesticides in the targeted way manually. Here the sprayer is connected to the back of the tractor and this tractor was driven by the human. The pesticides were sprayed on the crops along the field. This method does not uses the selective spraying and the pesticides are spread to the field

automation processes of spraying pesticides. The system is designed to be as modular as possible, enabling the development and/or modification of any of the individual tasks

LITERATURE SURVEY : Dr. M.G. Sumithra, G.R. Gayathiri proposed in their paper ―Leaf Disease Diagnosis and Pesticide Spraying Using Agricultural Robot (AGROBOT)‖ that Plant diseases have created an immense post-effect scenario as it can significantly reduce agricultural products in terms of both quality and quantity. Early detection of pests is a big issue that concerns planting crops. First phase includes plant observation keenly and frequently. Then the affected plants will be identified and

photographs will be collected using scanners or cameras for the affected portion of the plants. Then these images are pre-processed, transformed and clustered. Then these images are sent to the processor as input, and the images are compared by the processor. If the picture is affected, an automated pesticide sprayer will be used to spray the pesticide to the found region of the plant. If not, it will be automatically discarded by the processors and the robot goes on. [2] Philip J. Sammons, Furukawa Tomonari, and Bulgin Andrew proposed in their paper

—Autonomous Pesticide Spraying Robot for use in a Greenhouse‖ That an engineering solution includes spraying potentially toxic chemicals in the confined space of a hot and steamy glasshouse to the current human health hazards. This is done by designing and building an independent mobile robot that can be used in commercial greenhouses for Tools to control insects and prevent disease.

control insects and prevent disease.

A. **Robot Movement:** 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 .

B. **Video Streaming :** With the aid of the USB webcam and Raspberry pi we stream the video to the operator PC. Video streaming can be achieved in many ways, i.e. by installing gstreamer software on both the raspberry pi and the operator PC or by installing VLC player on both the transmitter side and the receiver side [2]. We prefer to use VLC player to stream the video with https:// followed by raspberry pi's IP address, so it seems simple for operators to take snapshots from the streaming video to detect further disease.

C. **Pesticide Spraying Mechanism :** Bluetooth module connects to the digital key of Arduino UNO, which receives the

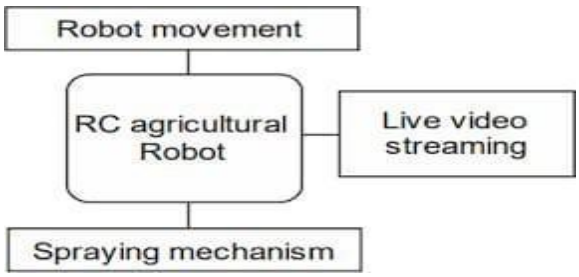
signal installed on the operator's Smartphone from the Android app. The floating sensor and submersible pump were mounted inside the pesticide tank. The submersible pump is linked to one end of the tiny diameter pipe and the other end is linked to the sprayer nozzle. The operator can use the Android app to spray a particular pesticide if the algorithm says the plant is affected by some disease.

This agricultural robot can display 3 processes:

(a) movement of machine

(b) uploading of video

(c) spraying process for pesticides.



Some Practical Highlights :

Improving productivity. ...

Protection of crop losses/yield reduction. ...

Vector disease control. ...

Quality of food. ...

Other areas – transport, sport complex, building.

How can we take advantage of Robotics In Agriculture :

- The robots are not getting sick or tired, and the time off is not needed.
- With higher speeds and closer tolerances, they can operate with fewer errors.
- They make fewer errors and operate at higher velocities and higher quality.
- The robots can reduce the use of pesticides by up to 80% of the farm.
- In different fields, robots are more efficient and can work around trees, rocks, ponds, and other obstacles easily.
- For technicians, the robots can create jobs that can fix the robots.
- The robots can deliver products of high quality and lower the cost of production.
- Robots gantry can function as both fertilizer or liquid sprays and, most importantly, as an automatic self-control system that meets weather conditions.
- They can be small in size, allowing them to accumulate near-crop data and perform mechanical weeding, mowing, spraying, and fertilizing.
- Robotic cameras and sensors are capable of detecting weeds,

identifying pests, parasites or diseases, and other stress. Usually, the sensors are selective and are only used to spray on the affected area.

- Robots provide an opportunity to replace human operators with a good return on investment by providing effective solutions.

Greenhouse farming: is often a suitable field for applying the technologies of automation, computing and robotics. Some examples of technologies implemented in productive greenhouses are the control of temperature and humidity, the soil preparation and the supply of water and nutrients. The robots can perform some tasks that humans cannot do due to the harsh conditions of greenhouses, such as environmental monitoring and control, crop monitoring, supply and treatment, and pest and disease detection.The environmental monitoring of greenhouses is interesting not only to control the growth of crops but also to determine the traceability of products. Nowadays, most of the systems used for environmental monitoring of greenhouses are based on wireless sensor networks . Nevertheless, the robots are starting to be applied as mobile platforms for sensors . Greenhouses can be considered complex multiple-input multiple-output systems . The literature collects multiple proposals for modeling and controlling the conditions of the greenhouse . Some of them obtain the models of greenhouses applying analytical equations (e.g. mass and energy balances), whereas the rest identify process models (e.g. neural networks or fuzzy sets). A review of these models determined the input, output, and disturbance variables described below. The input variables allow to actuate the greenhouses and change the environmental conditions.

The most relevant variables considered by literature are the ventilation, heating, fogging, shading and CO2 injection systems. The ventilation systems control the exchange of air between greenhouse and environment, which has an impact on the air temperature, humidity and composition. The heating systems are used to compensate for the heat losses and keep the temperatures in the adequate range. The fogging systems spray water into the air to increase the humidity and reduce the temperature. The shading systems control the irradiation of the covers to avoid the overheating of the greenhouse. Finally, the CO2 injection systems are used to promote the photosynthesis of the plants.

APPLICATIONS:

The main application of robots in the commercial sector has been concerned with the substitution of manual human labor by robots or mechanized systems to make the work more time efficient, accurate, uniform and less costly. One may argue the social implications of such developments, for example, the effects on employment through loss of blue collar jobs to address some of the human health concerns

associated with greenhouses. This robot is designed as a base for developing systems to enable the

automation of greenhouse processes such as the spraying of pesticides, picking of fruit and the caring for diseased plants. The system is designed to be as modular as possible, enabling the development and/or modification of any of the individual tasks

CONCLUSION: We conclude that the use of machine learning and image processing helped to overcome the plant disease diagnosis. By this we minimized diseases within leaf, stem, plant by efficiently spray pesticide. 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. Apart from that, it does not require any supervision for operating. It only needs pesticide level refilling, recharging the battery. It can be operated with

a rechargeable Mobile Power bank. Solar technology for self-recharge can also be imported in future.This paper suggests the effective use of technology to meet agricultural growth. This is a cost effective and one time investment project. It saves labor cost which also saves total cost for a farmer. By the removal of the disease from crops, a farmer gets more productive output which results in wealth maximization. This can be said as an efficient robotic counterpart; there are also ethical considerations that may be argued. Whilst there may well be some validity to the argument in some cases, this current project is unique in the number of stakeholders that are affected in a positive sense. The farmers' benefits are found in more efficient maintenance of the crops and either less work for themselves or a decreased need for the employment of others (arguably, an expensive process). Increased demand on growers has begun to be met with increased specific automation in many fields, as producers believe that automation is a viable and sometimes necessary method to ensure maximum profits with minimum costs . Indeed Hopkins argues that automation enables the expansion of a greenhouse without having to invest more financial resources on labor. Merchants may benefit from increased sales due to a lower cost product; the consumers will benefit, likewise, from a lower cost product of comparable quality. The stakeholders that benefit most, at least from an ethical or social perspective, however, are the greenhouse workers. This paper presents the design and construction of an autonomous robot that seeks to

advanced steps in the agricultural sector, which avoid food crises, attract youngsters, and show the fragrance of agriculture.

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