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Agricultural Robot – A pesticide spraying device

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Abstract

A pesticide spraying ramble is the device for exact pesticide spraying equipped for managing nebulous shapes and variable article targets. The gadget incorporates a solitary splash siphon engine with a consequently separate flexible spraying utilizing ultrasonic sensors, all mounted on a pan tilt unit. The site-explicit spraying gadget plans to splash explicit targets while diminishing the utilization of pesticides. The proposed framework includes the advancement of an article explicit sprayer arrangement. The created gadget intends to diminish pesticide application by spraying singular targets explicitly by setting the item separation of the spraying as per the objective. The spraying device is equipped for decreasing the measure of pesticides connected. Real reserve funds rely upon the spraying lengths, target size, and appropriation. We trust that such a device can be utilized in present day farming and can be joined with an automated sprayer exploring independently along yield fields. Such a gadget will add to decreased pesticide application.

Keywords*: pesticides, adjustable robotic spraying, ultrasonic sensors*

I. INTRODUCTION

The pesticides has a vital influence of the agribusiness. Nearly 35% of crops have been safeguarded from the insects using pesticides. The pesticides are needed for agriculture field to increase the efficiency but they are also injurious to human and also to the environment. In the current methods, the farmers use the backpack sprayer [Fig. 1(a)], 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 to the crops along the field. This method does not uses the selective spraying and the pesticides are spread to the field.

Fig. 1 Pesticides spraying methods (Left) [Fig. 1(a)]
Backpack sprayer (Right) [Fig. 1(b)]Tractor sprayer

In spite of the utilization of pesticide assurance gear (individual head veil and focal filtration framework for the manual and automated spraying strategies, separately) the human is as yet presented to unsafe pesticides that can cause negative medical problems. Other than wellbeing concerns, automated and

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manual spraying strategies have different downsides. The motorized spraying isn't target explicit and is intended to splash a harvest strip with rearranged stature (e.g., for spraying only the grape bunches the rancher will show the shower spouts to shower a strip 0.5 m wide with no thought of the natural product area). Moreover, manual spraying is repetitive work, moderate, and restricted because of the absence of laborers horticulture.

A. SMART FARM

The production efficiencies and the quality of products in agriculture field can be bought to the high level by the way of integrating the advanced technologies into the smart farming application. It steadily improves the personal satisfaction for the ranchers by limiting substantial work.

“We have to give the solution to the populace development, environmental change and work issues. Furthermore, these has expedited a rise parcel important to innovation."

Fig 1.1 Smart Farming

Technological advancement helps to increase the every aspect of farming such as planting, watering for the purpose of crop health. Autonomous robotic systems, drones, the Internet of Things (IoT) alongside sensors are the principle three classes of agrarian advances today.

B. AUTONOMOUS AND ROBOTIC LABOUR

Automation replaces the human labor across multiple industries, also in the agriculture. In agriculture farming most of the tasks are labor where it consists of labor comprised of repetitive tasks.

Fig 1.2 Agricultural robots Agricultural robots or AgBots are already available in the agricultural field for performing tasks ranging from planting and watering, to harvesting

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and sorting. This new form of smart equipment will make the possible way of producing the more high quality food and also it reduces the human power.

C. REDUCING LABOR

The main motive of introducing the autonomous robots in agriculture field is to reduce the reliance on manual labour and the other hand increases the efficiency, production yield and the quality.

In olden days most of the time of farmers were spent on the field to manually increase the production. But in the future, the farmers will spend their time on repairing the machineries, debugging the robotics coding, analysing and planning the farm operation.

The fundamental spine of these Agbots were noted as sensors and IoT incorporated with the ranches framework which is basic. The machines and the sensors are the keys to the keen cultivating and they can speak with each the ranchers and furthermore with one another, even they work self-sufficiently.

D. CROP SPRAYING

The drones are currently available for the purpose of crop spraying application, which offers the chance to automate which replaces the another labour-intensive tasks.

The mix of sensors, GPS, laser the board helps in adjusting the ultrasonic situating, and the harves spraying rambles adjusts to the height and area effectively, this changes for different things, for example, wind speed, geology and topography.

Fig 1.4.1 DJI Agras MG-1 crop spraying drone

These thought empowers the automatons which plays out the effective and more noteworthy exactness of yield spraying and it lessens the wastage.

Fig 1.4.2 Agriculture Field of crop spraying drone

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For instance, an automaton offered by the DJI called Agras MG-1 was planned explicitly for the yield spraying application, with the tank having a limit of 2.6 gallons(10 liters) of fluid pesticide, herbicide or compost, and a flight run that ranges from seven to ten sections of land for each hour. The upkeep of right separation from the harvests and furthermore to guarantee the inclusion, microwave radars are utilized and this empowers the separation and inclusion. As per DJI, the framework can worked naturally, self-loader or even physically.

To get a customized visit viably from the automaton, the strategy for working related to the next sort of Agbots are utilized, which the main indication of inconvenience. So as to give individualized observing to all piece of the field when, it could stop numerous issues before they spread.

I. *RELATED WORKS*

[1] A method in agricultural system, where the image registration technique was used. This technique was used to align the images, that images are taken from the two or more images of the same plant by using

different sensor and from different viewpoints. The researchers use the automatic image registration method in agricultural system based upon the multimodal sensory system. They also used distance dependent transformation matrix(DDTM) method. The DDTM was used to calculate a varying distance between sensors and targets the detection algorithms of Artificial control points(ACP) are used between the sensors. This approach used for different experiments.

[2] The variable spray technique also used in the agricultural system. Based on the weed data source, it could be divided into map based and real time sensor based. The image processing is used to detection of plant or weed. Based on the information, the speed of the spraying technique is increased or decreased. The spraying technique is based on three different ways, they are direct injection, system pressure and the pulse width modulations(PWM).The spraying is varied from one weed to another weed. This technique was mainly used to reduce the usage of pesticide and savings of herbicide.

[3] The easy path for building up the agrarian framework, they utilized some direction framework, for example, fluffy control and machine vision. The machine direction framework was intended to accomplish precise entomb columns weeding. This framework comprises of shading camcorder, GPS collector, parallel uprooting controller, pressure driven framework, modern board pc.

The strategy for direction line recognition and technique for controlling is utilized to deliver exact and unwavering quality for direction framework. For preparing a pictures, they utilized HIS(Hue, Intensity, Saturation).The edge calculation is utilized to extend the grayscale pictures. The qualities of harvests in the picture was recognized dependent on the direct checking strategy. This technique additionally locate the moving position of the yields. The fluffy control used to control the usage. This calculation viably control the usage of following rule. The normal speed for corn in blustery days are 0.6,1.0,1.4m/s. The direction framework was embraced to the progressions on normal light and dynamic execution for all rates.

[4] An effective spraying system, they used target point spray robot mechanism. This mechanism was based on the monocular scene version and monocular eye in hand version. This approach used scene camera for locating target crop and image processing method used for background segmentation.

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The hand camera mainly used for finding the target of the crop. They used another method was called as the Minimum enclosing circle(MEC).It is used to determine the spray time and spray position. The mechanical arm processing is divided into three main stages, they are alignment, reset, hovering spray. The performance test was carried in different environment. This approach was achieved the accurately spray targeting.

[5] The way for maintaining the agricultural system, the vehicle is used to control the spraying pesticide. This vehicle reduce the human work in spraying the pesticide. The intelligent vehicle consists of vehicle automation, communication system, console automation, security of communications and states encoding. This vehicle works based on the commands from the console or people.

The security system used to protect against unknown persons or outsiders. The vehicle system was affected by loss of communication from the console. The intelligent vehicle system is 10 times cheaper than manual work. The spraying task was done by intelligent vehicle based on the commands. Normally the pesticide was harmful to human and it takes large amount of time by doing manually. The intelligent vehicle avoided the wastage of pesticide and human health issues.

[6] In most of the area, the pesticide spray by manually. By doing manually, the farmer spray the pesticide uniformly through all the fields even in unaffected plant. It leads to wastage of pesticides and it also harmful to human. For avoiding those defects, in some other countries use automatic robot.

The automatic robot worked without human commands. This robot initially select the affected plants and spraying the pesticide on the specific plants or affected plants. This robot worked based on R-G-NIR multispectral image system. The robot find the different diseases among the plants. The robot was able to find defects and spraying the pesticide by 85 to 100% accuracy. It reduce the wastage of pesticide from 65 to 85% compared by manually.

[7] In European countries, they used autonomous robot mainly for vineyards. They called the robot as vine robot. Compared to Australia, south Africa, Chile countries European yield lower production at vineyards, so they focused towards vine robot. The vine robot consists of combination of robotics, information technology, precision farming. Initially they test the field with 5m wide and 8m height between the crops. They used stereoscopic vision camera as primary sensor for finding the distance between the vine crops. The pesticide spraying row by row. European commission mainly focused on the designing, developing, deploying the vine robot.

[8] For avoiding economic and environmental burdens, they approach site specific weed management (SSWM).This management was efficiently worked in ground based surface compared to hole based surface. For mounting a vehicle on the surface, they used near range sensor technologies. These approach easily identify the weed plant by using near range sensor technology.

The PA application use sensors for cameras, spectrometers, fluorometers and distance sensors. The main objective of this approach is finding the weed plant in ground based surface effectively. During last three decades, the PA applications has been used for mounting a vehicle on a ground based surface.

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II. EXISTING SYSTEM

The proposed system is a bit of an advancing exploration expected to override the standard spraying procedures with a cultivating mechanical sprayer. The robot investigates self-rulingly along the vineyard pushes, and performs express spraying toward distinguished targets. For site-unequivocal spraying the goal ought to at first be perceived and after that showered. This examination revolves around the spraying technique so as to thoroughly cover the goal while restricting the proportion of material sprinkled. Ceaseless research focused on the target area and on the progression of a totally operational cultivating spraying robot.

The width of the sprayer is set by the shape and size of the target like the starting late proposed patent that prescribes a variable gush hole. In any case, in existing technique was organized, produced, and executed in evident conditions and included exploratory frameworks and investigations for evaluation and endorsement of the spraying contraption for agrarian amorphous shapes.
The assessed spraying strategies were as per the following,

1. Fixed Nozzle Spacing: In this methodology, a great deal of spouts are created vertically on a showering area with destined isolating. The gush position and the sprinkle estimation are set going before the showering methodology paying little regard to the target's shape and size. While the sprayer vehicle comes the collect push, the spouts sprinkle synchronously (using an electric valve) in order to cover the goal.

2. Optimal Spray Coverage: In this procedure, the splashing is performed using a lone showering gush associated with the dish tilt unit (PTU) and is prepared for organizing the gush. The shower width of the gush is set before the splashing system. Since the sprinkle separate crosswise over is fixed, every target will require a couple of showers for full incorporation.

3. One Target-One Shoot (OTOS): In this system, a showering gush is associated with a PTU and can change the splashing broadness subsequently. Using this method every goal is sprinkled once with an expansiveness that covers the entire target.

The logical evaluation of these systems on 129 pictures got from a business vineyard showed that the best methodology for showering these destinations is the OTOS splashing strategy.

A. DISADVANTAGES

In the present Indian farms the farmer has to spray the pesticides manually. The manual way of spraying makes them less hazardous to the diseases mostly like air borne and water borne.

- The process of pesticide spraying involves large amount of human labour thus making more number of -humans to get prone by the diseases. There is no any other alternative ways are available for manual spraying in Indian open farms.

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The more usage of the pesticides in agriculture field can cause degradation in the soils. And this happens mostly because the farmers follow the manual labour work as they are unskilled.
Until now the technologies used in farms are outdated and the present farming needs revolutionary technique of farming.

In the current arrangement of pesticide spraying, the manual method for spraying makes the ranchers effectively tumble to risky infection generally like air borne and water borne. Here we accept that a spraying spout is connected to a PTU and can change the spraying width naturally and in this strategy each objective is splashed once with a distance across which covers the whole targets. So in the proposed framework the component of pesticide spraying alongside the apply autonomy innovation are the fundamental reason which could help the ranchers in their normal existence of pesticide spraying movement and it is essentially a robot with an appended spraying system.

III. PROPOSED SYSTEM

A movable spraying gadget (ASD) was structured and worked as a trial instrument so as to execute the One Target-One Shoot (OTOS) spraying strategy. The gadget is mounted on a versatile mechanical sprayer and supplies pressurized pesticide.

The operational idea of the ASD is as per the following:

- Direct the siphon spout to confront the harvest (opposite to the yield)
- Calculate the separation of harvest object
- Find the objective's positions and widths remove;
- For each objective play out the accompanying daily practice. Direct the ASD toward the objective focus;

Alter the spout measurement to approach the end hover distance across of the objective; and
Open the sprayer electric valve for a particular predefined term

Pesticide spraying system alongside the present mechanical technology innovation is the fundamental motivation behind this undertaking which would help the rancher in his everyday spraying action. This task is fundamentally a robot with a joined spraying instrument and is isolated in two sections.

1) Robotic Mechanism
2) Pump engine with spraying instrument

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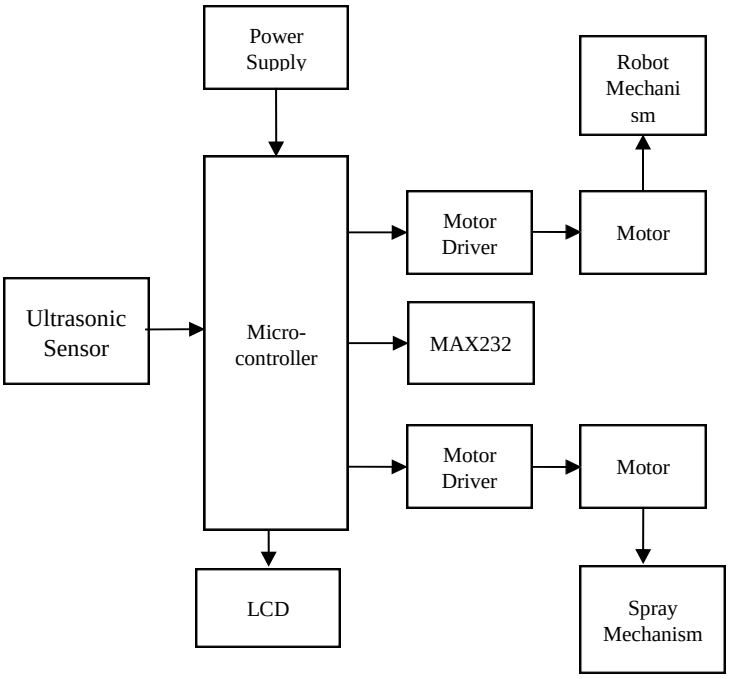

Fig. 4.1 Transmitter Module

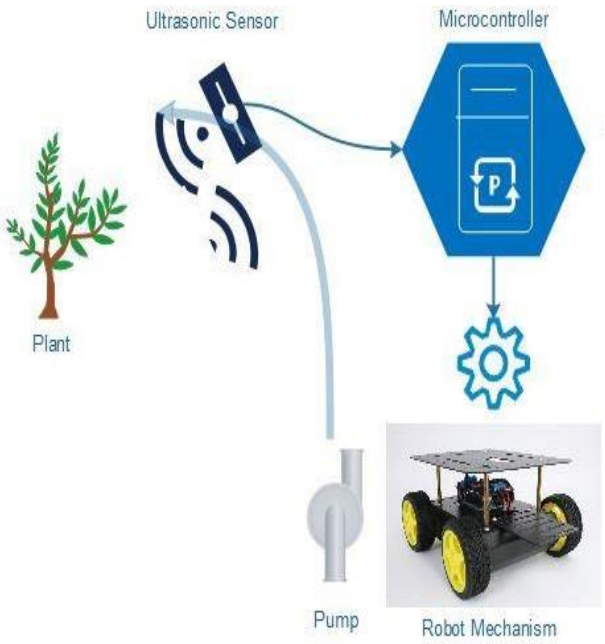

Fig. 4.2 Architecture Diagram

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At first the plan of case or undercarriage for the robot was begun. Our primary test is to plan a case which would convey a heap of up to 2-5 Kgs. So for we have utilized the iron as the metal for skeleton. Yet, the frame or case is weighing about 1Kg.
So as to evade the intemperate load of the gadget, iron was not utilized as the metal in the skeleton of the gadget; tough aluminium is utilized in most piece of the suspension and iron has utilized just in certain spots rather than aluminium as a fragile metal.

The proposed system gives the response for the spraying issue is revolved around finding a spraying answer for these vague variable-shape and size articles importance to sprinkle solitary targets expressly by setting the detachment of the spraying as shown by the shape and moreover the degree of the goal.

IV. CONCLUSION

The prescribed contraption and spraying method enable to play out the spraying undertaking profitably and financially. The central duty of this endeavour is in structure up a novel spraying contraption that ensures full incorporation of the recognized article with least shower. Pesticide application is decreased by spraying every goal independently. This is cultivated by planning the spraying device toward the point of convergence of the goal and setting the thing detachment of the spraying as demonstrated by the shape and size of the goal.

A sharp mechanical structures for spraying pesticides in cultivation field for controlling the robot by the use of a remote choice rather than manual completion of yields shower tests, reduces the prompt prologue to pesticides and the human body, moreover decrease pesticide harm to people, and improve age adequacy.

There can be diverse landscape and statures of yields for the spraying activity tests that demonstrates that a viable, portable robot, and gives the better splash impact at the workplace, for example, its low costs, simplicity of dealing with and simple support and different qualities of people with an expansive market in rural creation.

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