System For Pesticides Spraying Using Colour Decoding

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Abstract- *The system vigorously describes the design of colour decoding pesticides spraying system with varying spray. The system is designed in a compact, portable and well-founded platform for automatic spraying of pesticides. This system is used for spraying pesticides with varying the timing of the spray, depending on decoding the colour of plant or a particular crop on which the pesticide is to be sprayed.*

Keywords- Nozzle, Sprayer, Pesticide, Microcontroller, Colour decoding

I. INTRODUCTION

The main business of Indian people is agriculture and the economy of the nation is decided by agriculture. The essential nutrients for plant growth are commonly generates in its surroundings. The plant development process depends on the conditions of the environment, where plant grows. In conventional methods, manually operated low and high-volume hydraulic sprayer and power operated hydraulic sprayer with long boom, long lances or spray gun are used to carry fluid at different targets. In this method, the time and labour required is more. It is difficult to spray the pesticide uniformly and effectively throughout the tree by conventional method of spraying. Though this method gives good pest control, it consumes large volume of liquid per plant, great amount of time and labour are required. In addition, drip losses are more. Owing to concern towards protecting environment from pollution by excessive use of pesticide and to economies, the spraying method suitable alternative should be identified. In India, diverse farm mechanization scenario in country due to varied size of the farm holdings and socio-economic disparities. Most of farmer in India are small and marginal land holder. The spraying operation done by Knapsack sprayer which consumes more time and energy. Tractor operated sprayers are difficult for adaption by the farmer due to existing cropping patterns, available field size, field condition during the rainy season.

In order to reduce the harm to the environment and people the research and development of plant protecting machine focus on improving the mechanical work efficiency and the effective availability of pesticide. One of the most common forms of pesticides application, especially in conventional agriculture, is the use of mechanical sprayers. Hydraulic sprayers consist of a tank, a pump, a lance (for single nozzles), and a nozzle (or multiple nozzles). Sprayers convert a pesticide formulation, of one containing a mixture of water (or another liquid chemical carrier, such as fertilizer) and chemical, into droplets, which can be large rain-type drops or tiny almost invisible particles. This conversion is accomplished by forcing the spray mixture through a spray nozzle under pressure. The size of droplets can be altered with different nozzle sizes, or by altering the pressure under which it is forced, or a combination of both. Sprayers are commonly used on farms to spray pesticides, herbicides, fungicides, and defoliants as a means of crop quality control. Robots can be used for other horticultural tasks such as pruning, weeding, spraying and monitoring. Robots can also be used in live stock applications (livestock robotics) such as automatic milking, washing and castrating. Robots like these have many benefits for the agricultural industry, including a higher quality of fresh produce, lower production costs, and a decreased need for manual labour. They can also be used to automate manual tasks, such as weed or bracken spraying, where the use oftractorsand other manned vehicles is too dangerous for the operators. There are rising concerns over the growing population and the decreasing labour available to feed them. Data collection is being developed as a way to increase productivity on farms.

II. REVIEW OF LITERATURE

Avital Bechar and Clement Vigneault [1] discuss developments, innovations and related concepts, principles, limitations and gaps in agricultural robots for field operations. Robots are quite complex, consisting of different subsystems that must be integrated and correctly synchronized in order to perfectly perform the tasks as a whole and successfully transfer the necessary information. Extensive research has been done on the application of robots and automation to various field operations and the technical feasibility has been widely demonstrated.

Kavita Zole and Sangharsevak Gedam [2] talk about electronic and mechanical (Mechatronics) platform-based design agricultural robot that performs the advanced farming process such as automated farming and seed dispersal. They have tried to present their work on agricultural robot, since the labor problem can be reduced compared to manual and tractor-based sowing time, since the energy required for this robot machine is less. And this spraying system covers the plants efficiently with the spray at the determined dosages. To reduce human effort and increase efficiency.

George Adamides et. al. [3] they discuss that teleoperation of an agricultural robotic system requires effective and efficient human-robot Interaction article explores the usability of different interaction modes for agricultural robot teleoperation. A modular user interface for remote operation of an agricultural robot sprayer was created and field tested. The results show that the most important factor for human-robot interface usability is the number and placement of views. Specific recommendations for mobile field robot teleoperation are offered to increase HRI awareness for the agricultural spraying task. Current autonomous robots face the limits of efficiency and effectiveness when dealing with agricultural tasks due to the unpredictable and unstructured field environment.

Pvr Chaitanya et. al. [4] in this paper talk about the management of food crops, especially very close surveillance with regard to the treatment of Diseases that will cause serious effects after harvest. In crops, disease is considered an alteration or lack of normal functions of plants that will produce certain symptoms. The disease that causes the agent in plants is basically defined as the pathogen of any agent. Most of these pathogenic agents appear on the leaves, stems and branches of plants. Consequently, disease diagnosis and the rate of disease produced in crops are imperative for effective and successful plant breeding. This can be done by taking input images using the camera, analyzing them using the machine learning process. This indicates disease presented on the leaf, stem or plant. This also indicates the area exposed to the disease and also predict remedies, turn on the pesticide sprayer that sprays the relevant pesticide on the area exposed to the disease. This is very necessary for effective spraying of pesticide.

Rubens Andre Tabile et. al. [5] shows that a current trend in agriculture is the development of mobile robots and autonomous vehicles for precision farming. One of the biggest challenges in the design of these robots is the development of electromechanical components. Another factor that is discussed is the customer's needs and how these needs are translated into project requirements

Philip J. Sammons et. al. [6] provide a technical solution to the current human health hazards associated with spraying potentially toxic chemicals indoors in hot and humid greenhouses. This is achieved by designing and building autonomous mobile robots for use in commercial greenhouse pest control and disease prevention. The effectiveness of this platform is demonstrated by the platform's ability to navigate greenhouse rows well while the pesticide spray system efficiently coats plants with a specified dose of spray.

Neal N. Xiong et. al. [7] Their literature shows that colour information plays an important role incolour image segmentation and real-time colour sensor, which accurately affects the result of video image segmentation and real-time temperature value. Their work presents a new colour image segmentation algorithm based on colour similarity in real-time colour image segmentation for cyber physical systems.

III. COMPONENTS USED

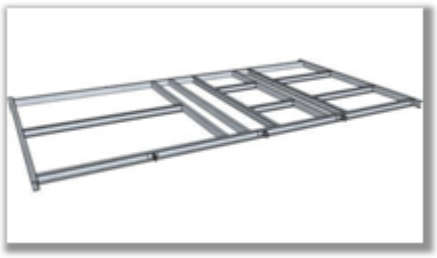
Nozzle:

A nozzle is a device designed to control the direction or properties of a fluid flow (especially to increase velocity) as it exits (or enters) a closed chamber or pipe. A nozzle is usually a pipe or tube of varying cross-sectional area and can be used to direct or change the flow of a fluid (liquid or gas). Nozzles are often used to control flow rate, velocity, direction, mass, shape, and/or pressure of the flow emanating from them. In a nozzle, the velocity of the fluid increases at the expense of pressure energy.

Arduino UNO Circuit:

An Arduino board is a one type ofmicrocontroller basedkit. The first Arduino technology was developed in the year 2005 by David Cuartielles and Massimo Banzi. The designers thought to provide easy and low-cost board for students, hobbyists and professionals to build devices.

Base Frame:



Base frames are used to support the entire unit. It should have strong rigidity to avoid distortion of frames during handling and installation.

Submersible Pump:

A submersible pump (or sub pump, electric submersible pump (ESP)) is a device which has ahermetically sealed motor close-coupled to the pump body. The whole assembly is submerged in the fluid to be pumped. The main advantage of this type of pump is that it prevents pump cavitation, a problem associated with a high elevation difference between pump and the fluid surface.

Colour Decoding Sensor:

xcluma Tcs3200 Colour Sensor Gy-31 Tcs230 Module

The TCS3200 Colour Sensor is a complete colour detector with a TAOS TCS3200 RGB sensor chip and 4 white LEDs. The TCS3200 can detect and measure an almost unlimited number of visible colours. Applications include test strip reading, sorting by colour, ambient light sensing and calibration, and colour matching the TCS3200 has an array of photodetectors, each with or without a red, green, or blue filter (on). The filters of each colour are evenly distributed throughout the array to eliminate positional aberration between colours. Inside the device is an oscillator that produces a square wave output whose frequency is proportional to the intensity of the selected colour.

Wiper Motor:

The wipers helped in many ways, especially when rainy conditions began, drops of water fell on the window sill. Seeing the wiper blades slide the window seems simple as a simple mechanism, but you'd be surprised how it clearly works. These smooth movements are possible or only with the key mover on the windshield wipers and these are the wiper motors. Wiper motors are devices in the wiper system that work on a power source to move the wiper blades in a smooth motion. Like other motors, the wiper motor rotates

continuously in one direction, which is converted into reciprocating motion. Its composition includes many mechanical links, each of which plays a role in initiating movement. Gearmotor is a type of wiper motor known for its abundance in terms of torque.

IV. STUDIES AND FINDINGS

From the observations and calculations, the result obtained was that in traditional method 150ml of pesticide solution was sprayed on the plant by the farmer, it was found that the recommended dose by the company for a yellow plant was 102ml so in tradition method it was observed that 48ml of pesticide solution was sprayed in excess. To reduce this, an automatic pesticide spraying robot using colour decoding was designed, which reduced the usage of pesticide from 150ml to 112ml that is a total reduction of 38ml per plant considering all plants to be yellow. Also, taking into consideration that the robot will spray 70ml per plant for green and healthy plant will be a direct reduction of 80ml per plant.

Sr No	Parameter	Pesticide (in ml)	Pesticide and Water Solution	No. of Plants Per/ Acre	Pesticide Solution Used Per Plant
1	Traditional spraying	8 ml	15 Lit	100	150 ml
		560 ml	1050 Lit	7000	150 ml
2	Recommendation by the pesticide company on yellow plant	400 ml	720 Lit	7000	102 ml
3	Actual spray on yellow plant	435 ml	784 Lit	7000	112 ml
4	Actual spray on green plant	272 ml	490 Lit	7000	70 ml
5	Average actual spray with green and yellow plants	353 ml	637 Lit	7000	91 ml

The average of both comes to reduction of 59ml of pesticide spraying per plant.

This converts to a reduction of 25.3% pesticide usage.

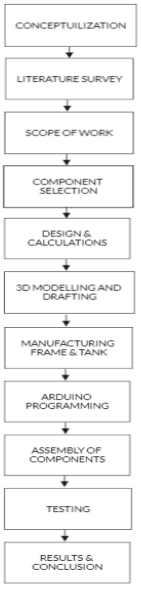
The robot also focuses on farmers spraying pesticides remotely without direct contact thus reducing the ill effects on health of farmers caused due to pesticide.

Trails & Findings

Plant spacing in row	64 cm
Spacing between row	90 cm
No. of acre	1
No. of plants per acre	7000

Calculations of Plants Per Acre

Pesticides spraying robot consists of hydraulic sprayers which consist of a tank, a pump, a lance (for single nozzles) or boom, and a nozzle. Sprayers convert a pesticide formulation, of one containing a mixture of water and chemical, into droplets, which can be large rain-type drops or tiny almost invisible particles. This conversion is accomplished by forcing the spray mixture through a spray nozzle under pressure. The size of droplets can be altered through the use of different nozzle sizes, or by altering the pressure under which it is forced, or a combination of both. Thewheels were attached to the rear andfront at the appropriate mounting. The tank was made of steel sheets, of perfect dimensions and welded properly. The tank was fitted on the frame. Body was made of lightweight aluminium composite sheets. We programmed the Arduino to spray pesticide for 4 seconds for green colour detection and 8 seconds for yellow colour detection of plants.



V. CONCLUSION

With help of our model we were able to reduce the pesticide usage and also efficiently spray the pesticide according to the requirement of the plant. Spraying pesticides is a daunting task in agriculture as earlier there was lot of

labour work required for this task. This robot completely eliminates the spraying of pesticide by farmers without getting in direct contact with it. This feature will encourage more people to take up farming as the complexity of the work, manual labour and risk factor to the health is reduced. The efficient spraying of pesticide also reduces ill effects on the consumer caused by over spraying of toxic pesticides.

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