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Review on Different Method used in Spraying for Farming

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Abstract – *In the worlds second populated county i.e. India, one of the major income source is farming which includes corps and food production. Farming heavily depends upon conditions of nature like, rain, temperature, humidity etc. Now a day's nature of nature is changing drastically and badly affecting the conditions of corps and food farming. Sometimes taking control over it not in the hand of farmers and leads to loss of production of farming and money. Sudden changes in climate, causes the rise in insects like whiteflies, grasshoppers, aphids, rootborer, pod sucking bugs etc. that harms the farming products which will be controlled by using different insecticides which consists of pesticides that are used to kill these insects. This paper gives brief discussion different methods that are adopted for spraying insecticides.*

Key Words: Helper Aerial Vehicle, insecticides spraying, farming, pesticide mechanism

1. INTRODUCTION

Insecticide spraying plays vital role in the farming which protects the farming products like corps, vegetables, fruits etc. from attack of insects and in turns increases the overall productivity. Spraying insecticides is tricky work and need to be executed properly otherwise applicator will face the issues like skin problems, unconsciousness, breathing problems, stinging eyes, nausea, dizziness, hormone disruption etc. There are different methods of insecticides spraying that includes both conventional and non-conventional methods. Some conventional methods used to spray are hand pump, tractor spraying, blower spraying where as non-conventional methods includes unmanned aerial vehicle based spraying. Drawback of conventional methods are it needs skilled labor as well as it takes more time. Comparatively non-conventional methods are faster and time saving.

2. DIFFERENT INSECTICIDE SPRAYING EQUIPMENTS

Most of the insecticides are applied as sprays and either diluted with water, oil or applied as drops to crop by sprayer.

Insecticide sprayers are generally classified on the basis of power sources used as follows

1) Hydraulic energy based:

   Syringes, slide pump, Stirrup pumps, Knap sack or shoulder-slung, Compression sprayer, Stationary type, High pressure sprayer, Lever operated K.S. sprayer, Piston pump type, Tractor mounted/ trailed sprayer, Foot operated sprayer, Rocker sprayer, Air craft, aerial spraying

2) Gaseous energy based

   Hand held type, Knap sack, motorized type, Hand/ Stretcher carried type, Tractor mounted

3) Centrifugal energy based

   Hand held battery operated ULV sprayer, Knapsack motorized type, Tractor/ vehicle mounted ULV sprayer, Aircraft ULV sprayer

Some other sprayers includes aerosol sprayers, liquefied-gas type dispensers, fogging machines, exhaust nozzle sprayer

2.1 Foot operated spraying

Fig 1. - Foot operated spray

Foot operated sprayer is operated with pedal lever by the foot of the operator and need at least two persons. Insecticide liquid to be used is kept in container sucked by a suction hose. Ball valve present in piston assembly worked as suction valve. Liquid to hydraulic nozzle is delivered from pressure chamber via pump cylinder.

Typically hydraulic pressure of around 10 kilogram per centimeter square can be required to project the jet of spray.

The range of spray jet can be up to height of 15 to 20 feet. The foot operated sprayer is generally used for wood and tree spraying and avoided in spraying to corps because it is ground based. Design of foot operated spay is generally strong and sturdy.

2.2 KNAPSACK SPRAYER

Fig2. - Knapsack Sprayer

Knapsack sprayer is lever operated and applicator of insecticides carries it on back with help of straps. Lever us used to actuate the sprayer by moving lever up-down. Knapsack sprayer consist tank, pump, pressure chamber, nozzle, delivery hose and operating lever. Generally continuous 15 to 20 strokes per minutes are required use knapsack sprayer which results in pressure of 40 psi. For low volume spraying motorized knapsack sprayers/mist blowers are used and can be converted into power dusters easily.

Fig3.- Motorized knapsack sprayer

Motorized knapsack sprayer employs gaseous energy nozzles for spraying liquid. The force of throwing air is used to cut down the spray liquid in to fine spray droplets.

2.3 Tractor mounted spraying system

Fig4.- Tractor mounted spraying system

Tractor based spraying is used for spraying almost all types of insecticides, fertilizers and herbicides which helps to protect the farming products from insects, weed killers etc. The system consists of container to hold spraying liquid, nozzle and pipe. Tractor mounted spraying system is suitable for small to medium farms and is widely used in India.

2.4 Aerial vehicle based spraying

Fig5.-Aerial vehicle based spraying

Aerial vehicle based spraying is widely used in small and medium farms where low volume spraying of

insecticides is sufficient. Manned aerial vehicles are generally petrol fueled and controlled by operator of vehicle where unmanned aerial vehicles are battery powered and controlled by remote controls. This kind of spraying will save time and material at great extent.

3. LITERATURE REVIEW:

Koriahalli et. al. [1] explains a system automatically controlled drone, where quadcopter is made up with flight controlled board, GPS, and wireless transmitter was used for communication. Arduino System can be controlled by Spraying pump that are mount on groud station. Chavan et. al. [2] developed a Quad copter using At mega 328 where ESC, magnetometer, gyroscope and water pump is connected and controlled signal is send using RF technology.

Sadhana et. al. [3] done with Quad copter system using Arduino Uno in which gyroscope and accelerometer is used for balancing the quadcopter. For spraying pesticide radio transmitter is used. Denel Gheorghita and Lonut Vintu et. al. [4] present two types of approach for mathematical modeling of quadcopter i.e. kinematics and dynamic. First is based on equation of classical mechanics and other one is design from Denavit – Hartenberg. In that dynamic quadcopter was discussed. The model was simulated in math works. Simulation model was used to tune the parameter of PID controller that ensures the response to step input point.

Igor Gaponov and Anastasia Razinkova et. al. [5] present in that paper main objective is design and implementation of quad rotor helicopter system. This intended the both theoretical and practical knowledge about quadcopter. It provides knowledge areas based on mechanical engineering and design, system integration, hardware programming, control system design and implementation. From that paper we gain design and practical implementation of highly dynamic mechanical system which is important for robotics, mechatronics, automation and control.

Luke Kamarth and James Hereford et. al. [6] design swarm of autonomous drone that can fly and hover with no input from user. They used crazy file 2.0 as the based platform then added sensor and made software revision for it operated autonomously. It overcomes unexpected issue such as noisy sensor data that disrupted control loop, weight imbalance. They were able to fly the single PAQ (programmable autonomous quadcopter) and make some measurement of speed and battery life.

Vergouw and et. al. [7] states chapter provided an overview of the different technological aspects of drones. This overview includes the different types of drones currently used and their technical specifications, potential payloads and applications, frequency spectrum issues and the current and near-future technological development in drone technology. The first important distinction made is that between the actual drone (the platform) and the attached equipment (the payload). The different types of drones can be differentiated by the type (whether it is fixed-wing, multirotor or something else), the degree of autonomy, the size, weight, and the power source. These technical specifications are determining factors for the drone's capabilities, for example it's range, flight duration, and loading capacity. The payload can consist of almost anything. Some examples include all sorts of sensors (like cameras, sniffers, and meteorological sensors) and different kinds of freight (like parcels, medicine, fire extinguishing powder, and flyers). In this chapter, we also described a number of applications for drones and their different payloads. These applications illustrate the potential of drones and of their payloads.

Nemathi and Kumar et. al. [8] In this paper, the dynamic modeling and control of a tilting rotor quadcopter was presented. The relationship between the tilting-rotor angles and the quadcopter orientation was derived using the dynamic model. It was shown that such this design makes the quadcopter a fully-controlled system which can track any arbitrary trajectory. Hovering with controlled pitch and roll angle, and motion with desired orientation are some of the features of the presented quadcopter system. The paper presents the dynamic model, and suggests a simple PD based control to achieve the desired motion. The model and the controller are verified with the help of numerical simulations. The paper presents the method for achievement of desired orientation of the quadcopter in only one direction (pitch or roll at a time). Future work would involve solving the dynamic model to allow the desired orientation to be achieved in any arbitrary combination of pitch and roll angles.

Denel Gheorghita and LonutVintu et. al. [9] present two types of approach for mathematical modeling of quadcopter i.e. kinematics and dynamic. First is based on equation of classical mechanics and other one is design from Denavit – Hartenberg. In that dynamic quadcopter was discussed. The model was simulated in math works. Simulation were used to tune the

parameter of PID controller that ensure the response to step input reference.

Hussein and et. al. [10] presented experimental work of a low-cost quadcopter "Parrot AR-Drone 2.0" to achieve autonomous indoor navigation. For any given occupancy grid map, a generic optimization approach is applied to solve the path planning problem. The algorithm is optimized by SA met heuristic technique to reach the minimum traveling path from starting position to the goal position. The output path is divided into several waypoints, which the drone controller read and sends the flying commands accordingly. The drone is controlled via Simulink model with PID, which manipulates the drone internal controller for the pitch, roll, yaw and vertical speed. The main contribution is the ability of the drone to follow the waypoint generated from the path planning algorithm with minimal error. Experimental results illustrated the differences in the quad-copter's maneuvering abilities through different scenarios. The pose and the distance errors were minimal, which indicated the high performance of the proposed algorithms and their applicability in various navigation applications, despite the low-cost of the sensors used. Future aspects of this research include performing further test experiments with a visual-based method for the localization feedback and compare it to the obtained results. Moreover, handling complicated environments with dynamic obstacles, which requires extending the problem from path planning to trajectory planning problem.

Population of India and all over world is increasing as time lapses. Increasing population also leads to increased needs of basic things needed which includes food, clothes and shelter. Food and cloths demands can be fulfilled only by agricultural sector and it means agricultural sector must grow in proportion with increasing population. On contrary due to increasing shelter demands, agricultural land and forests lands are reducing rapidly and which due two which we need to increase the output of farming which is having less area. Another problem with farming is, it got often attacked by insects and migrants like whiteflies, grasshoppers, aphids, rootborer, pod sucking bugs etc. which almost destroys the whole corps if precautionary measures are not taken timely. Now a day's environmental conditions are changing drastically which leads to unhealthy environment and more population of such kind of insects. Insecticides are used to kill the insects, rodents, fungi, unwanted plants and taking control over the insect eggs and larvae. But insecticides are toxic and need to take care while spraying in the farm. There are many cases in which careless spraying of insecticides affects spraying persons like skin problems, unconsciousness, breathing problems, stinging eyes, nausea, dizziness, hormone disruption and in some cases death also.

As per the report of World Health Organization (WHO), more than 1 million case of insecticide are being recorded and from which around 1 Lakh peoples are suffering from heath problem.

To save the peoples from these health problems arising from careless spraying of insecticides, we suggested using unmanned helper aerial vehicle which saves man hours, money and material. It also helps to speed up the whole process of farming. The unmanned helper aerial vehicles we are using have multi rotors devices and ability to take off in vertical direction. It can be controlled remotely with the help of remote.

3. SYSTEM DEVELOPMENT

In the quad-copter, term quad means four that means four motor are used in this system. Mainly there are two types are available in quad-copter, one is '+ type configuration' and second is 'x type configuration'. For our model, we used x type configuration .The Quad-copter module turns on by remote which is remotely located far away. The system mainly divided into two part i.e. transmitter and receiver. Objective of our system is to spray insecticide in 100 meter square area with the help of quad-copter and it is activated by module which is in placed in user location advantage of this system is quad-copter is activated by user with help of module and wireless communication is done between transmitter and receiver

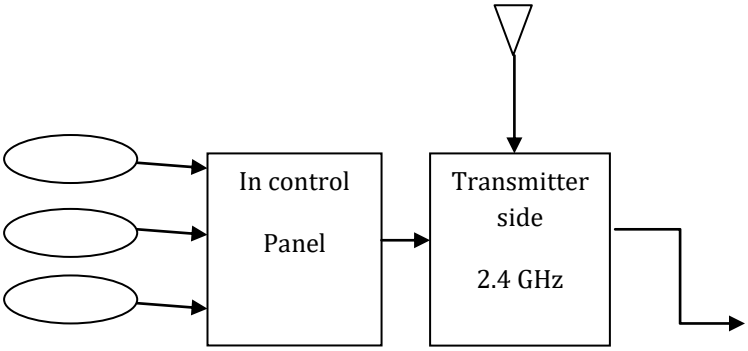

Fig -6.- Block diagram of transmitter section

Figure 6 shows the block diagram of transmitter section In the transmitter section user have a remote to control the system which generated a signal according to movement of switch on remote. In the input side potentiometer is varies between 0 to 5 kΩ It gives signal to the ADC i.e. Analog to digital converter. It has 10 bit resolution. As per input given to the ADC the value is convert into 1 byte, Transmitter transmits the signals in the form of channels. No. of channels are transmitted through transmitter the transmitter section consist of control panel in which mechanical switches, joystick is including. Transmission rate of the transmitter is 2.4 GHz.

Figure 6 shows the block diagram of radio receiver section which consists of RF 2.4 GHz, BLDC, GPS, Compass, ATMEGA 2560 and water spray unit. It receives the signal through 2.4 GHz RF signal in form of string. In that string the channel is separate by 5 bytes. The channel is pitch, roll tthrottle, yaw, pump, an inertial measurements unit recognizes the difference in pitch, roll and saw used by gyroscope. IMU unit consist of gyroscope and accelerometer sensor.

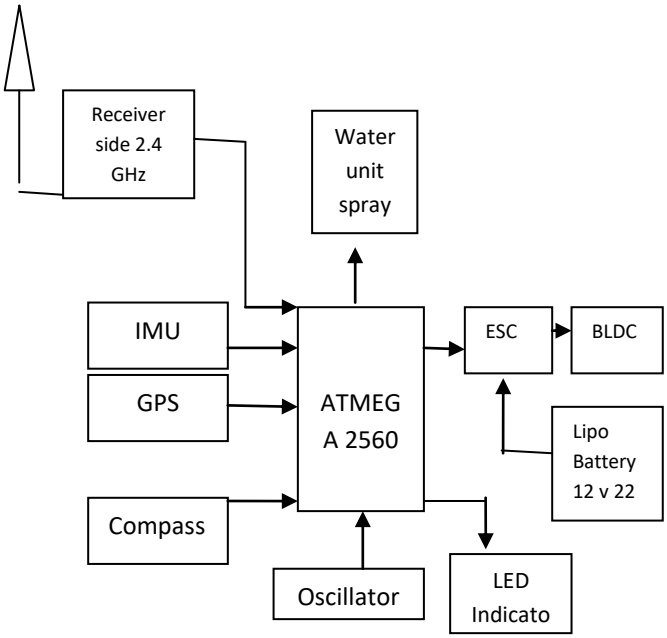

Fig -7: Block diagram of Receiver

Transmitter control assists the measurement sensor like gyroscope and accelerometer as per input send to signal to the electronics speed controller GPS is used to show the location and compass sensor shows direction It hold the position x,y axis Sensor give the signal to the controller It controls System .Controller gives 20 Ma current and single phase PWM to the electronics speed controller

In this system we lift 2kg weight hence ESC gives 30 A current and 3 phase PWM signal to the motor .ESC give the power to control the speed of motor

For the pesticide spraying mechanism we use pesticide tank of capacity 300 -400 mg. 12 V dc water pump single inlet 1.5 A battery switch pipes fitted to T- split and nozzles. When the brushless motor is turned on, pesticides through the pipe with the help battery spread through the nozzles on define particular agricultural area

5. CONCLUSIONS

This proposed project can development in agricultural field which help the farmer to improves quality of work spraying . In conventional method like food pump ,blower with motor all system have some disadvantage so In this paper we will implement the system that gives us better result .Pesticides have lots of harmful content which dangerous to human body . Various quad- copter system are very easy operation and low cost product. This project required not only to interface and program the components of the Spraying Machine

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