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Unmanned Aerial Vehicle For Pesticides Spraying

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Abstract- The aim of this paper is to design the drone that is unmanned aerial vehicle (UAV) for agricultural purpose for spraying pesticides . In India agriculture is the huge sector . But now a days its facing a lot of problems due to non-using of modern techniques . Also other problems are chemical contact with pesticides and danger from insects and animals . The drone can be useful for spraying pesticides and crop protection . this can be done by the single person standing at a safe distance and by controlling the UAV . This helps the farmer in reducing the time taken and also provide the safety to the farmer . this drone system mainly works on the principle of thrust . the drone contains four arms and each arm four motors are attached along with the propeller which provides the lifting effect . The movement of the drone is controlled by the radio controller and the speed of the drone is also controlled by it . The proposed work in the research paper is for the use of the unmanned aerial vehicle for spraying the pesticides in agriculture sector .

Keywords- Unmanned Aerial Vehicle (UAV) , Drone, Thrust, Propeller , Radio Controller, Sprayer .

I. INTRODUCTION

The application of the pesticides is very important for the better crop yields . the manual spraying of pesticides using hand pump is quite difficult and dangerous to health because of directly contact with those chemical contain. Also manual spraying causes the non-uniformly spraying , excess spraying and this may cause to reduce the crop yields . In this paper, we describe an architecture based on unmanned aerial vehicles (UAVs) which can be employed for agricultural applications where UAVs are used for spraying pesticides on crops [1]. the process of spraying is done by the drone by the controlling it by the radio controller using the wireless communication by means of the transmitter and the receiver [2].

II. PROBLEM DEFINITION

Up to the date, the pesticides are spraying by the conventional methods by using the handpumps on the back or by manually by throwing using hands. So this methods are very time consuming and dangerous for the health issues . Because there is continuously contact of the human with the pesticides and this very dangerous things for health . And also

sometimes it is not possible to reach to the each and every crop sapling for being pesticide. So this may lead to spreading a disease which can be observed due to insufficient supply of the pesticides and this may cause to the decrease in the yield.

III. LITERATURE SURVEY

Drone-tech start up Aarav Unmanned Systems which had raised an undisclosed amount funding in April provides crop monitoring, assessment, analysis and other agricultural and industrial applications for the general public. Apart from this, Chennai based ZUPPA provides farm, irrigation, and crop monitoring through use of drones and aerial mapping. Prof. S. Meivel M.E., Dr. R. Maguteeswaran Ph.D., N. Gandhiraj B.E., G. Srinivasan Ph.D. has published a paper entitled “Quadcopter UAV based Fertilizer and Pesticide Spraying System”. In this paper they give a brief idea about the UAV pesticides prayer[3].Aditya Natu and Prof S.C. Kulkarni published a paper on the adoption and utilization of drones for advanced precised farming . They give an idea about the scope and future strategies for improving the farming and guide to the farmers.

Design of the drone : The basic block diagram of the drones is as follows

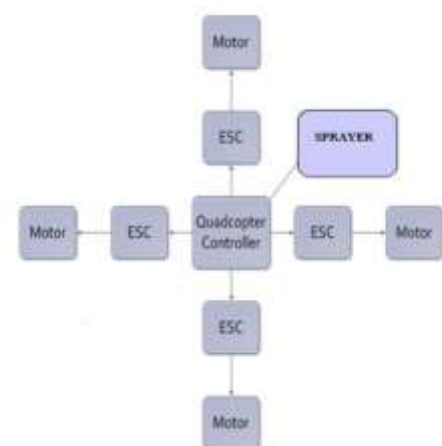


Fig.1 : Block Diagram of Drone

Components Description :

1. Frame :

The frame plays an important role in the drone for supporting all other components . It is important to take the weight of the frame in consideration because if weight is high then there can be difficulties in the lifting of the drone . by taking all the parameters in consideration we decide to use light weight pvc pipes for fabricating the drone. As these pipes doesn't undergo deformation easily .

2. Motors :

Brushless DC Motors do not possess brushes, they have a permanent magnet . Its movements can be controlled via an electronic controller and speed feedback mechanism. These motors are energy saving as compared to the brushed dc motors. For our application we used the 1000 Kv rating motor which gives us approximately 980 gms thrust .



Fig.2 : BLDC Motor

3. ESC :

It stands for the electronic speed controller and it is used to vary the servo motor speed , its direction and also for applying the brakes . for our application we are using the 30 A rating ESC . we decided this as per motors , battery and propeller specifications .



Fig.3 : ESC

4. Propeller :

As per the frame size and motor rating the propeller should be selected . In this current scenario our frame size is about 480 mm . So the propeller size selected is about 8" , 9" , 10" . But we selected 9" size propeller .



Fig.4 : Propeller

5. Battery :

For our application as per the motor rating we are using 6500 mAh battery . cause this battery can give us a better flight time to fulfil the work proposed.



Fig.5 : Li-po Battery

6. Flight controller :

The flight controller helps to drive the drone by taking stability, speed, gyro, acceleration in consideration. The flight controller should be easier to mount and handled. For this purpose we select the KK 2.1.5 controller . The main features of these KK is it is easier for calibration . It has inbuilt firmware.

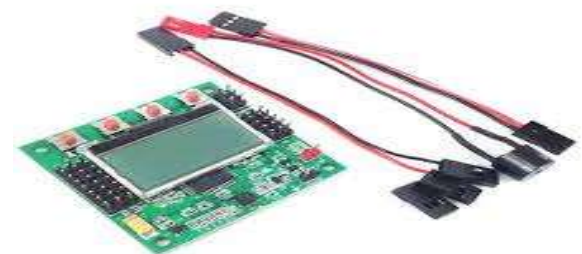


Fig.6 : KK 2.1.5 Flight Controller

7. Radio controller :

Firstly The transmitter should be calibrated with the flight controller using the receiver. After the calibration the transmitter is linked with the drone , as per command of the transmitter the drone will work .



Fig.7 : FlySky CT6B Transmitter

Spraying system:

1. nozzle :

The nozzle is a device with varying cross section area to control the flow of the fluid, direction, shape . In the nozzle the velocity of fluid increase due to pressure energy.



Fig.8 : Nozzle

2. submersible pump :

As per required flow velocity the 9V dc power supplied water submersible pump is used for spraying the pesticide through the nozzle.



Fig.8 : 9V pump

IV. WORKING

The quadcopter is the simple device with the frame on which motor and propeller are mounted with a controller. The flight controller is the heart of the drone . it controls the flying mechanism of the drone by adjusting the acceleration , gyro speed . The quadcopter having the four motors rotate at the different speeds providing the different thrust values . the basic concept about drone is if the weight of the quadcopter is

assume x kg then the thrust given by the motors must be $2x$ kg . So here the assembly of all the components is done as per the proper method and then the transmitter and receiver is calibrated with the flight controller and the drone is armed . so by changing the throttle stick the quadcopter is lifted .

Spraying arrangement is done for spraying the pesticides in the crops . For this tank filled with pesticides is used . There is a nozzle connected in that arrangement. Then from battery a supply is given to the pump which is placed in the tank and by switching ON the pump start pumping the pesticide and the pesticide liquid start flow through the pipe arrangement and sprayed through the nozzle on the crops .

Results :

The drone developed is the efficient and robust for the described application of spraying . it can fly as much time as calculated and as per the specifications of the components . this drone is not only for the spraying but also can be used for monitoring the fields by attaching the cameras . this drone is optimised as per the cost and weight .

V. CONCLUSION

The main use and advantage of this research paper is that drone will be helpful for farmers for spraying pesticides and crop protection while being controlled by a person operating from a safe position . We can vary the amount of the pesticides present in the sprayer . Currently the drone we have developed is for spraying pesticides only but there are a lot of future scope for this concept which are for crop surveillance for monitoring the farm from a safe position .

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