

A SPRAYER DRONE IN AGRICULTURE

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Abstract - Agriculture is the backbone of the Indian Economy. The application of fertilizers and pesticides in agriculture is of essential importance for the good yield of crops. The use of drones has become a convenient way of achieving the task because of its speed, effectiveness, and accuracy in spraying operations. This paper talks about the use of a remote-controlled based fertilizer/pesticide spraying octocopter, which helps the farmer to spray fertilizer/pesticide over his land in a uniform fashion, thereby reducing the work of the farmer.

Key Words: Drone, Octocopter, Spraying crops, Agriculture, Sprayer

1. INTRODUCTION

Drones can be used for many applications in agriculture namely seed plantation, crop monitoring, real-time livestock monitoring, crop spraying and so on. The drone application focused by our paper is crop spraying. Fertilizers help to maintain the health of the crop, and pesticides help to avoid the damage inflicted by the pests. The farmers use spraying bags to spray fertilizers/pesticides all over the farm. But this does not ensure the uniformity in the distribution of fertilizers/pesticides for every nook and corner. Moreover, it is very straining for the farmer and is also a tedious job for him. With the help of drones, these obstacles can be overcome easily. We consider an octocopter with its spraying mechanism to spray fertilizers/pesticides on the crop. The octocopter with sprayer module will be controlled manually by the operator on ground.

2. LITERATURE SURVEY:

Spoorthi S et al [3] have built an android app for the farmer to control the drone. The farmer can connect to this app using a Wi-Fi module that is interfaced to the drone. It will route the land area of the farmer's using GPS no matter what the type of crop or the shape of the field. They have used an Arduino board which is interfaced with GPS and Wi-Fi module. They have used accelerometer, gyro (MPU 6050), magnetometer (HMC 5883L)

M. Reinecke and T. Prinsloo [1] have given about the advantages of drones in agriculture, and their limitations, illustrated certain examples on how drones operate on farms. Different features of drones are discussed, specially on how they assist farmers in maximizing their harvest by

detecting problems early and managing the crops by using specific cameras to detect pests and water shortages.

3. PROPOSED SYSTEM

In India, in general, a farmer holds approximately 1 hectare of land. Therefore, we consider our octocopter to be flown over an area of 1 hectare. The system is simple to design and easy to use by the farmer. The octocopter is controlled manually using RC. The land covered with the spraying of fertilizer/pesticides will be more. The fertilizers/pesticides are sprayed in a horizontal line to ensure uniform distribution of the fertilizers/pesticides. Therefore the time required to spray the land will be reduced since the area of land covered for spraying is more. Major components are drone, sprayer, battery, controller. This drone can be widely applied to spray liquid pesticide and fertilizer on vegetables, tea, coffee, potato, wheat, rice, corn, sugarcane, grape, cherry, banana, coconut, etc. and achieve good result.

The proposed model has,

Load=6L [6L of fertilizers/pesticides required]

Self-Weight=7.5kg

Total weight=18.82kg

Total Thrust=36 kg half throttle

Thrust per motor=36/8 = 4.5kg

Thrust to weight ratio=2:1

Flying Speed=0-12 m/s

Flight time=15.9 min

No. of Nozzles=2

Spray area =3m²

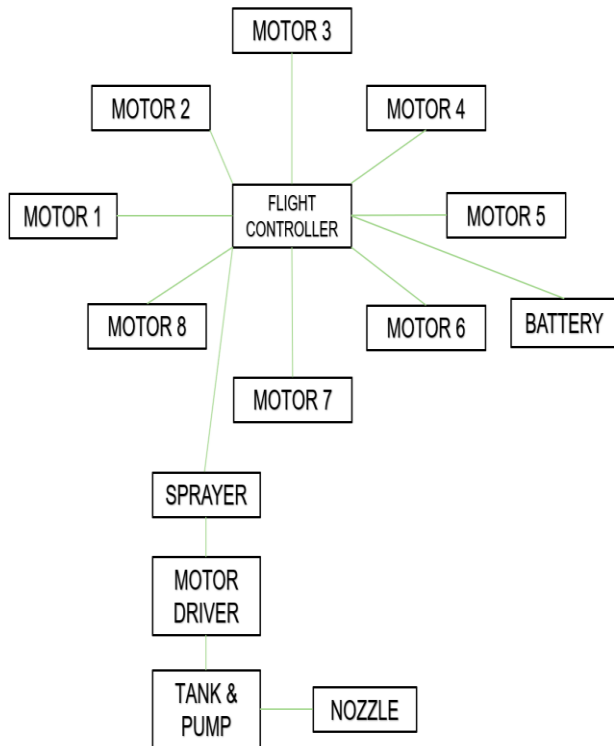
Altitude=0-600m

No. of motors =8

For the octocopter, each motor should provide= 36/8=4.5 kg of force.

It is used to control the speed of the motor based on the instructions received from the flight controller.

3.1. Block Diagram



➤ SPRAYER MODULE:

It mainly consists of a tank to carry the load. We use a 6L tank and a pump attached to 2 nozzles that are inserted in the tank to spray the content. The pump is driven by a motor driver connected to flight controller which can be turned ON and OFF with the help of a radio controller.

4.1. Technical Specifications

COMPONENT NAME	SPECIFICATION
Brushless DC Motors	4880 KV
Flight Controller	-
Transmitter & Receiver	2.5 GHz
ESC	20A -30A
Propeller	Diameter=12” =304.8mm Pitch=5” = 127mm No. of blades=3
Battery	12000mAh-6s/100c

4. COMPONENTS USED

The Components used are:

➤ PROPELLERS AND MOTORS:

For a propeller with Diameter=12 inch, Pitch=5 inch and thrust of 36kg, a motor of 4880KV is chosen.

➤ FLIGHT CONTROLLER:

A Flight Controller is like the brain of the drone or any other aircraft. It consists of a circuit board consisting of a range of sensors which can detect the movements of that drone and it also consists of user commands. It then controls the speed of the motors to make the craft move as instructed using the data. It is included with an inbuilt gyro sensor and accelerometer sensor, that can automatically stabilize the flight of the drone.

➤ TRANSMITTER & RECEIVER:

2.5 GHz transmitter and receiver is used to fly the drone.

➤ ESC:

5. ADVANTAGES OF THE PROPOSED SYSTEM:

- Feasible
- Reliable
- Scalable
- Economical
- Easy to design
- Stable

6. FUTURE WORK:

This concept can be further improvised by equipping the drone with the cameras to detect the infected plants, which can be monitored by the farmer from a safe and distant place. The captured images can be processed, and crop diseases can be identified, and it can suggest the appropriate fertilizers to be used by the farmer. Thereby, the yield can be enhanced even further.

7. CONCLUSION:

This paper talks about the use of a remote-controlled based fertilizer/pesticide spraying octocopter, which helps the farmer to spray fertilizer/pesticide over his land in a uniform fashion, thereby reducing the work of the farmer. It

is a single-point controlled sprayer system. The octocopter with sprayer module will be controlled manually by the operator on ground. All parts of the land do not require pesticides; therefore, the octocopter is controlled manually with RC. It reduces the time taken to spray the crop without human intervention and ensures uniform spraying of the fertilizers/pesticides onto the field. It is widely applied to spray liquid pesticide and fertilizer on vegetables, tea, coffee, potato, wheat, rice, corn, sugarcane, grape, cherry, banana, coconut, etc. and achieved good effect.

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