

Resolving The Problem Of Anomalies In Agriculture System Using Drone

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Abstract— Day by day, more than two hundred thousand are born all over the world, and by the year 2050, the total world population will reach 9.6 billion. As the population is increasing day by day the production of food also needs to be increased and the security of hygienic food free from chemicals is the major concern. The demand for extra food will get only be met by enhanced crop production. Therefore the modification in present technology is needed in the agriculture sector and becomes necessary for the hours. There are a lot of factors that have a bad impact on the production of crops, which can get resolved with the help of drone technology in agriculture systems. This paper shows an analysis of drone technology and its development with concerning time in the agriculture sector in previous decades. The drone used in the area of crop monitoring and pesticide spraying at a particular area for precise agriculture has been covered. The GPS will make the drone semi-automatic and stable the drone and also make it fly only at a defined section. With the help of GPS, farmers can keep track of the drone over the field.

Index Terms— Pesticide Spraying, Crop Monitoring, Precise detection.

Date of Submission: 19-05-2023

Date of Acceptance: 29-05-2023

I. Introduction

Indian agriculture is an important part of India. It is a worldwide powerhouse of agriculture. It is the backbone of our country's economy. Two-thirds of India's population is based in the agriculture sector and is also engaged in it. The Indian population, approximately 73%, relies on the agricultural business. The occupation of India is mostly in agriculture and 60% are farmers in it.

Farmers are continuously using traditional methods for cultivation with old techniques for composts, pesticides, spraying, etc. Due to the rising population of our country, we need to increase the production of crop yields, which proportionally increases agricultural efficiency. These traditional methods are less effective and require more time[1].

Spraying of pesticides is mandatory at the same time as it is an injury to the health of the farmers. When farmers sprinkle the fertilizer, they take too many precautions, like covering themselves with gloves and masks. It helps farmers to reduce harmful effects on them. During the COVID-19 pandemic, the food chain networks & crop cultivation were highly affected. A lot of Asian countries are in a developing phase and they are suffering from the issue of a high populace and their agrarian efficiency is much lower when compared with advanced technological countries. This is because of its low level of agricultural technology, unskilled farmers, and less power availability[2].

The use of drones in agriculture is the best solution to overcome these difficulties. Examining the correct information collected by drones, rural specialists, agronomists, and farmers may improve their functions to increase yields. The drone technology is time-saving, less expensive, and captures high-resolution photos and videos in a non-destructive way. The drone which we are using will help the farmers to take the survey of crops so any issue can be resolved quickly to save the earth.

The crop surveying system helps the farmer for seeing the aerial view of the harvest. This shows data related to fungal infestation, pests, water systems, and crop images. The collected information by the drone has information in high resolution. With the help of these, we can get information about plants' health in a certain way that can't be seen by the naked eye. The continuous availability of crop information helps farmers to take the most suitable action for better crop management. The two main functions of drones are

crop health monitoring and pesticide spraying. After the crops are monitored by the drone and the infected area is found in the field of crops with the help of drones we will spray the pesticides only on the damaged or infected crops. So the wastage of pesticides will get reduced almost and the health issue which farmers face due to toxic and highly concentrated pesticides will also get resolved[3].

II. Methodology

The drone frame is made up of carbon fiber material. It is a quad-copter drone. The components are as follows:-

BLDC (Brushless Direct Current) motor of 1000kv, ESC (Electronic Speed Controllers) of 30A, Propellers of 10*4.5*0.2 cm, APM 2.8 (Ardupilot Mega 2.8) flight controller, GPS, Battery, Remote (Transmitter) and Receiver, Connecting wires, Pipes, DC motor of 2-5v, Nozzle, Relay, Vessel to store pesticides, Wi-fi module camera[4].

Working

Frame:- Drone frame is the building block of a drone. It is the base on which every component is mounted and protects all the electrical parts inside the drone. We will use a four-wing drone frame which is made up of carbon fiber.

BLDC motor:- We are using four BLDC motors which are of 1000kv power. The BLDC motor controls the speed and it is very important for drone velocity determination and position.

ESC controller:- We are using four ESC controllers which are of 30A current. It manages the rotation of the motor by delivering timed electric signals that are translated into changes in speed.

Propeller:- We are using two pairs of propellers. The dimensions used are 10*4.5*0.2 cm. The propeller is used to generate the thrust to fly the drone.

Flight controller:- We are using an Ardu-pilot Mega 2.8 flight controller, which controls the drone and GPS too.

Battery:- We will use the Li-Po battery in the drone for power supply. It is 2200mAh.

Pump:- DC-powered pump uses direct current from the motor and battery to move fluid in a variety of ways. We are using a pump of 3v-5v.

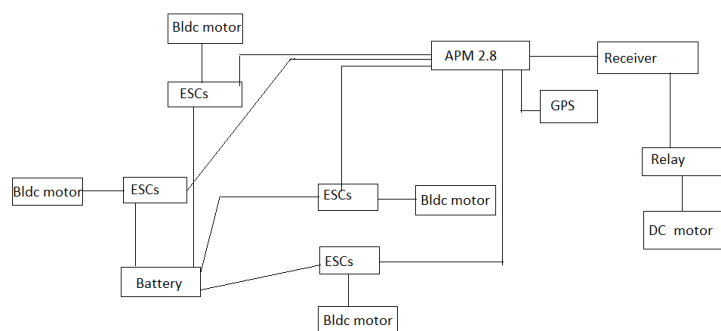
Relay:- It is used to operate the direct current motor.

Nozzle:- The nozzle is used to manage the flow of fertilizer from the pipe.

Pipe:- It will connect the pump to the nozzle.

Connectivity

First, we will fix the wings of the drone. Now we will attach all four BLDC motors to the wings and propellers over the BLDC motor. Then they connect all four ESCs to all four BLDC motors but one ESC is connected to one BLDC motor and they plug ESCs into the power distribution board which is already inbuilt into the frame. Connect the ESCs to the APM 2.8 and also GPS to the APM. The receiver will also get connected to the APM. For the spraying mechanism, the DC motor is connected to the relay, and the relay is connected to the receiver so that the transmitter gives proper instructions to the DC motor. The connection of the relay to the APM makes the spraying part semi-automatic. Attach the WI-FI module camera to the drone frame so that it monitors the crop[5] – [6].



Drone & Spray mechanism diagram

(a)



(b)

Fig. 1: (a) Block diagram of drone with spray mechanism (b) Actual image of the drone with spray mechanism system

III. Result

The anomaly detection drone has the capability to improve the quality of the crops. This drone for agricultural purposes has the potential to help farmers to transform the agricultural industry. In today's era, farmers use hand-spraying bottles for pesticide spraying, it may take a large amount of time to spray the pesticides over the crops. Therefore, it causes uneven distribution of pesticides throughout the crops. By using modern techniques, we can overcome the problem of time consumption. Drone technology takes less time in comparison to continuously using old rigid technology methods. The agricultural drone which we made will spray the fertilizer only on the areas which are affected by insects, fungus, and any other kind of anomalies, so the wastage of fertilizer is reduced.

IV. Conclusion

The drone is solving the time-consuming problem of farmers. It helps to improve crop yields and reduces health issues of the farmer. With fewer resources, we get high production of crops, which will increase and generate employment opportunities. The paper includes two important fields of drone usage in the area of precise agriculture, which are crop monitoring and pesticide spraying. It is concluded that there will be an improvement in drone applications for precision agriculture after 2016. This is because of the lightweight increment in the payload capacity of the drone, and the cost of UAVs decreased. Crop health monitoring drones are typically multi-copter & fixed wing types. Day by day, the cost of drones and their size are decreasing. Drone technology is now shifting from semi-automatic to fully automatic systems because of advanced research in embedded systems, data analysis, and data transmission. The drones become farmer friendly, which is possible through machine learning in the drone system. An unmanned helicopter has a higher payload capacity, which is why it is mainly used in fertilizer spraying, but the usage of multi-copters is increasing in pesticide spraying as it is more stable in flight, which is why it is considered a better option for spot spraying. There are still a lot of problems and issues related to the application of drone technology in the agriculture sector, which is important to get resolved to increase the adoption rate of drones.

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