Fertilizer Spraying UAV- A Agriculture Drone

Prof. RiteshBanpurkar[*1], Prajwal Pralhad Ramteke[*2], Aniket Shivkumar Prajapati[*3], Amol Kishor Raut [*4], Akash Sevaklal Gautam[*5], Achal Siddharth Bambole[*6], Gayatri Arun Deshkar[*7]

[1]*Asst. Professor, Department of Mechanical engineering, TGPCET, Nagpur, Maharashtra, INDIA.*
[2,3,4,5,6,7] *Student Department of Mechanical engineering, TGPCET, Nagpur, Maharashtra, INDIA.*

ABSTRACT: Reducing Human efforts and using machines instead, In the world full of AI technology, we are so immersed in updating all the natural processes in mechanized process. And at the sametime, we need to take care from harmful chemicals present in pesticides. The chemicals can bio accumulate in the body over time. These Exposure effects can range from mild skin irritation to birth defects, tumours, etc., but atthe same time the use of pesticides in agriculture is important these pesticides in agriculture are essential to maintain the quality of large-scale production. It is very important to improve the efficiency and productivity of agriculture by replacing labour with many technology's involved in agriculture, out of which spraying pesticides using drone is one of emerging technology. Pesticides may increase the crop productivity but it also affects human health. The WHO estimated 1 million cases of ill affected when spraying the pesticides manually in crop. So, aim is to design a drone with pesticides with spraying mounted mechanism. This will reduce the human effort in various operations of agriculture like spraying of UREA, spraying of fertilizers etc. This pesticides drone reduces the time, cost, labor in agriculture application. This paper describes the development of hexa-copter and spraying mechanism. The discussed system involves designing a prototype which uses simple cost-effective equipment's like, BLDC motor, Arduino, ESC wires, etc. This type of drone can also be used to spray disinfectant liquid over buildings, water bodies and in densely populated areas by changing the flow discharge of pump.

KEYWORDS:AI Technology, Unmanned Aerial Vehicles (UAVS), Drone, Disinfectant, Hexa-Copter, Cost-Efficient, Spray, Equipment.

I. INTRODUCTION

Agriculture in India constitutes quite 60% of the Indian economy so, it's backbone of Indian economy. it's vital to enhance the efficiency and productivity of agriculture in India for better growth of economy and development. Pesticide application plays a crucial role in pest management. Proper technique of application of pesticide and therefore the equipment used for applying pesticide are vital to the success of pest control operations. the appliance of pesticide isn't merely the operation of sprayer or duster. it's to be including a radical knowledge of the pest problem. the utilization of pesticides involves knowledge not only of application equipment, but of pest management also, the most purpose of pesticide application technique is to hide the target with maximum efficiency and minimum efforts to stay the pest in check also as minimum contamination of non-targets. All pesticides are poisonous substances and that they can cause harm to all or any living things. Therefore, their use must be very judicious. the appliance techniques ideally should be target oriented in order that safety to the non-targets and therefore the environment is ensuring Building on lore, this production farming system integrates new technologies. The three key technological components are a foreign sensing platform like UAS (Unmanned Aerial System) that collects data, a geographic data system, where data analysis and visualization are performed using various techniques and tools and modern precision farming tools just like the variable rate applicator that permits the implementation of site-specific recommendation. UAV (Unmanned Aerial Vehicle) inbuilt pesticide sprayer is essentially prayer integrated into a hexacopter to spray pesticides and fertilizers in open crop fields. The appliance of fertilizers and pesticides in agricultural areas is of prime importance for crop yields. the utilization of aircrafts is becoming common in completing the task due to the speed, accuracy and effectiveness in spraying operation. The farmers are using the spraying bags to spray

pesticides everywhere the farm. The farmers need to carry the pesticide spraying bag which makes them get strained. Even then the farmers are unable to evenly distribute the pesticides everywhere the farm. And also, it'll be time consuming. The farmer can spray the pesticides using drone evenly everywhere the sector. It reduces the workload of the farmers and also completes the work in no time. The potential health effects of pesticides may include asthma, allergies, and hypersensitivity, cancer, hormone disruption and problems with reproduction and fatal development and lots of more health issued. Unmanned aerial vehicles became cheaper because many control functions are often implemented in software instead of having to depend upon expensive hardware. This even allows multiple UAVs to be used for one application. during this case, the UAVs must have communication facilities in order that they will communicate with one another. Precision agriculture (PA), the intelligent crop production system, may be a scientific and modern approach to agriculture production within the 21st century. the most objective of this project is to scale back the ill-effects to humans. The hexa-copter is employed to spray the contents under any climate. The UAV inbuilt sprayer contains a universal sprayer which is employed to spray the both Fertilizer and Pesticide on a same sprayer. The Universal nozzle is employed to manage the Liquid content also as solid contents. The pressure pump is employed on a Pesticide spraying and not on Fertilizer Spraying. Multispectral camera is employed to capture the remote sensing images which are wont to identify the green fields also because the edges of crop area. the most aim of this project is to fabricate and develop Unmanned Aerial Vehicle (UAV) for agricultural spraying. this is often the approach towards farmer's empowerment. during this project hand sprinkler is replaced by UAV sprinkler.

II. IMPORTANCE OF PROJECT

Drone technology has got more of its popularity within the industry due to its diversity and thought of the longer term for the agriculture community. The military initially used them. However, other sectors quickly embraced UAVs once they learned about its widespread applications.

• How can drones support Indian agriculture? Drones don't merely enhance overall performance but also encourage farmers to unravel other assorted barriers and receive many benefits through precision agriculture. With the marketplace for agricultural drones reaching a whopping $1.3 billion, UAVs (unmanned aerial vehicles) fill the gap of human error and inefficiency by traditional farming methods. The purpose of adopting drone technology is to exclude any guesswork or ambiguity and instead specialize in accurate and reliable information.

• External factors like weather, soil conditions, and temperature play a critical role in farming. Agriculture drone empowers the farmer to adapt to specific environments and make mindful choices accordingly. The gained data helps regulate crop health, crop treatment, crop scouting, irrigation, and perform field soil analysis and crop damage assessments. The drone survey helps boost crop yields and minimize time and expenses.

• consistent with experts, the anticipated world population are going to be 9 billion by 2050. Agricultural consumption is additionally said to increase simultaneously by nearly 70%. Drone technology, equipped with AI (AI), machine learning (ML), and remote sensing features, are rising in demand thanks to its advantages. The central government has acknowledged the importance of unmanned aerial vehicles (UAVs), machine learning, and AI with their 'Digital Sky Platform' online. Drone startups in India have used this chance to accomplish better technological capacities.

III. OBJECTIVE

One of the main sources of income in India is agriculture. The production rate of crop in agriculture is based on various parameters like temperature, humidity, rain, etc. Which are not in farmer control but also depends on some factors like pests, disease, fertilizers, etc. Which can be control by giving proper treatment to crops. UAVs are getting increasingly popular in agricultural sector so the main aim of this project is to design agriculture drone for spraying pesticides. The process of applying robotics, automatic control and artificial intelligence techniques at all levels of agricultural production, including farm bots and farm drones to reduce human effort in various operations of agricultures. This project aimed to generate georeferenced weed infestation maps of selected annual crops (wheat, sunflower and maize) and permanent woody crops (olive-tree and poplar orchards) by using aerial images collected with an Unmanned Aerial Vehicles (UAV) or drone. The specific objectives of this project were concentrated on:

☐ To define and evaluate the technical specifications of the Unmanned Aerial Vehicle and the multispectral camera needed for capturing high-quality imagery of each proposed crop-weed systems.

☐ To determine the best flight configuration (UAV altitude, area covered and imagery resolution) for each crop in different crop-weed phenological stages (temporal study).

☐ To georeferenced, mosaic and orthorectification the frames to generate a unique image (mosaicked) that completely covers the fields of study. ☐ To develop and evaluate Object-Based Image Analysis (OBIA) algorithms for crop assessment and weed mapping.

☐ To generate georeferenced weed infestation maps for making in season site-specific herbicide treatments in early crop stages (post-emergence) that, consequently, lead to considerable decrease in the use of herbicide, a reduction in farm costs and an increase in agro-environmental benefit.

IV. LIST OF DRONE COMPONENTS
a. MOTOR:
Outer runner BLDC motors in which thereare no brushes, they have a permanent magnet. The RPM of the motor can be controlled by varying the input current.

Fig:1] A2212 1000 KV BLDC Brushless DC Motor for Drone

b. PROPELLER.
The propeller is of 12 inches length and has 6 inches pitch. It is made up of carbon fiber which possesses high strength to weight ratio when compared to the propellers made up of plastics.

Fig: 2] Carbon Fiber Propeller 12x6 Black

c. ESC:
It stands for Electronic Speed Controller and it is used to vary the Revolution Per Minute (RPM) of the motor. 30A rated ESC is used as per the motor and battery specifications.

FIG:3] SIMONK 30A

d. BATTERY:

Battery are used for power for our hexa-copter flight time of our hexa-copter depends on battery capacity. Battery is the single heaviest component of drone. According to its size, capacity, voltage etc. We choose battery.

Battery, we used for our hexa-copter is (3000mah)

Weight of battery is 215gm

Voltage: -11.1 V

Dimension: - 17*43*136mm

Fig: 4] 3S 3000mAh battery

Sr.no	Parts Name	Quantity
1	Drone Frame (F550)	01
2	Transmitter/ Receiver (Flysky)	01
3	Flight Controller (APM)	01
4	Electronic Speed Controller (ESC)	06
5	BLDC Motors (1000kv)	06
6	Battery (3000MAH)	01
7	Propeller	06
8	Pump	01
9	Servo motore	01
10	Water Tank	01

Table:1 Required Quantity of Drone Component

e.   FLIGHT CONTROLER:

The flight controller helps in the maneuvering operations and also it provides Auto level function. The accelerometer and gyroscope sensors in the Flight controller processes the signals from the receiver and gives the output to the ESC.
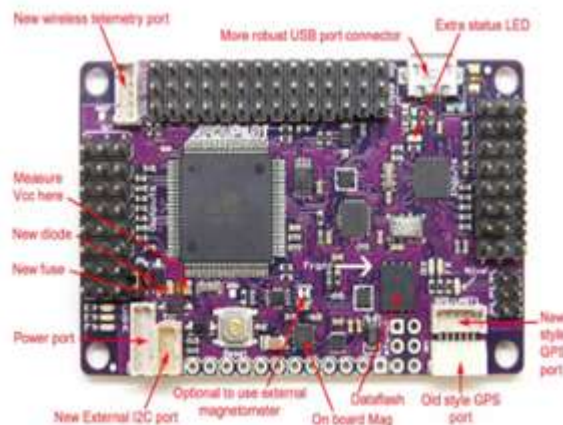

Fig: 5] APM flight controller

V.   WEIGHT BUILDUP

Parts	Quantity	Weight (grm)
Drone Frame (f550)	1	620
Flight controller (APM)	1	50
Electronic Speed Controller (ESC)	6	140
BLDC Motor (1000kv)	6	400
Battery (3000MAH)	1	215
Propeller	6	120
Pump	1	25
Servo Motor	1	10
Water Tank	1	520
TOTAL		2100 grams

VI. CONCLUSION

The market for Drones is expanding day by day from the last two decades and they have brought a significant revolution in the area of Industry, Military, Agriculture and many more. This study investigated the importance of drones in Agriculture and has highlighted the various drones available for diverse agriculture applications along with technical specifications. The paper is regarded as eye-opener for Industry and Agriculture for development and integration of more drones for making Agriculture tasks better and in turn yielding best crop quality in near future.

This technology is very useful where human interventions are not possible for spraying of chemicals on crops including rice fields and orchard crops as well as crops under terrain lands. It helps in improves coverage, boosts chemical effectiveness and makes spraying job easier and faster.

SOME OF THE BENEFITS OF THIS DRONE:

As innovators introduce new technologies, their commercial uses increase day by day. The government has been easing restrictions for drone usage and is supporting start-ups to come up with novel ideas. As drone surveys become more common, they also become more cost-effective. In agriculture, they have a plethora of advantages. Some are as follows:

~ Enhanced Production - The farmer can improve production capabilities through comprehensive irrigation planning, adequate monitoring of crop health, increased knowledge about soil health, and adaptation to environmental changes.

~ Effective and Adaptive Techniques - Drone usage results in regular updates to farmers about their crops and helps develop strengthened farming techniques. They can adapt to weather conditions and allocate resources without any wastage.

~ Greater safety of farmers - It is safer and more convenient for farmers to use drones to spray pesticides in terrains challenging to reach, infected areas, taller crops, and power lines. It also helps farmers prevent spraying the crops, which leads to less pollution and chemicals in the soil.

~ 10x faster data for quick decision-making - Drone surveys back farmers with accurate data processing that encourages them to make quick and mindful decisions without second-guessing, allowing farmers to save the time invested in crop scouting. Various sensors of the drone enable capturing and analyzing data from the entire field. The data can focus on problematic areas such as infected crops/unhealthy crops, different colored crops, moisture levels, etc. The drone can be fixed with several sensors for other crops, allowing a more accurate and diverse crop management system.

~ Less wastage of resources - Agri-drones enables optimum usage of all resources such as fertilizer, water, seeds, and pesticides.

~ 99% Accuracy rate - The drone survey helps farmers calculate the precise land size, segment the various crops, and indulge in soil mapping.

~ Useful for Insurance claims - Farmers use the data captured through drones to claim crop insurance in case of any damages. They even calculate risks/losses associated with the land while being insured.

~ Evidence for insurance companies - Agricultural insurance sectors use Agri-drones for efficient and trustworthy data. They capture the damages that have occurred for the right estimation of monetary payback to the farmers.

FUTURE SCOPE

a. Unmanned aerial vehicles have become cheaper because many control functions can be implemented in software rather than having to depend on expensive hardware.

b. This even allows multiple UAVs to be used for a single application.

c. In this case, the UAVs must have communication facilities so that they can communicate with each other. Precision agriculture (PA), the intelligent crop production system, is a scientific and modern approach to agriculture production in the 21st century.

d. The main objective of this project is to reduce the ill-effects to humans. The hexa-copter is used to spray the contents under any climatic conditions.

e. The UAV inbuilt sprayer contains a universal sprayer which is used to spray the both Fertilizer and Pesticide on a same sprayer.

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