International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 04 Issue: 04 | April -2020 ISSN: 2582-3930

AGRICULTURE DRONE

Ms. Rima Prakash Khedekar[1], Ms. Prerana Vijay Jadhav[2], Ms. Nikita Raju Chavan[3], Ms. Siddhi Uday More[4]

[1,2,3,4] *Department of Electronics & Telecommunication Engineering, Finolex Academy of Management & Technology, Ratnagiri*

Abstract – Agriculture is oldest profession of mankind and in India about 70% of the population depends on agriculture for their livelihood. Indian farmers or agriculture needs the protective and very extremely production to improve the productivity. This technique is developed to spread fertilizers, pesticides on crop using UAVs (Unmanned Aerial Vehicles) or Drones. This will reduce the human efforts and bad impacts of chemicals on human health. The autonomous quadcopter designed is capable of self-controlled flight. The design uses an Arducopter Version 2.8 flight controller having an in-built microcontroller. GPS system is employed for route in this project. The quadcopter flight path is created with the help of mission planner software. The designed system can fly autonomously to cover the predefined path and spray the chosen area very nicely.

***Key Words*:** UAV (Unmanned Aerial Vehicle), GPS, Mission Planner, Quadcopter, Flight controller, Autonomous

1.INTRODUCTION

Agriculture is the backbone of economy of India. Almost two third of the population is depends on agriculture. This project focuses on spraying module for spraying pesticides and fertilizer with the assistance of drone. In recent few decades, the employment of chemical pesticides, fertilizers on agricultural land are increased in an exceedingly huge quantity, this increase in quantity not only affect the Environment that is towards land but also affect the human health. This technique has advantage of reducing labor workers, spraying time and resources like chemicals over conventional spraying methods and can also improve yield and crop health. The time required for spraying fertilizers by drone will be less than the time require to spray that manually with the assistance of any worker. Basically, this device is that the combination of the quad copter and also the spraying mechanism. The control of drone is autonomously or manually and gets operated by the operator which is able to make the drone fly over the sky. The UAV has the plus or X configuration of frames in quad copters, on which the propellers are placed, with the assistance of that propellers rotating motion the drone starts to fly. The spraying mechanism is connected to drone which is get programmed and by giving commands to it mechanism, the spraying system is get operated and we can spray the pesticides or fertilizers on the crops. The batteries and electronic speed controllers i.e. ESCs are also used to control the speed and for the other operations. Controlling the UAV is the main a part of the device and the spraying operation.

2. LITERATURE REVIEW

The proposed system is an embedded system which is able to closely monitor and control the microclimatic parameters of greenhouse on an everyday basis around the clock for cultivation of crops or specific plant species. The system consists of sensors, analog to digital converter, microcontroller and actuators. When any of the mentioned climate parameters cross a security threshold which has to be maintained to guard the crops, the sensors sense the change and also the microcontroller reads this from the data at its input parts after being converted to a digital form by the ADC. [1]

This system explains precision agriculture is an agricultural production system supported the knowledge and technology which is employed for the aim of determine, analyze and manage of the factors like temporal and spatial variability within the field to get maximum profit, sustainability and environmental protection. Drones provide real time and high-quality aerial imaginary compared to satellite imaginary small, lightweight camera on board drone and the research area is given plenty of attention world. [2]

This technique explains there is no need for the qualified pilot to fly it, within the future, unmanned Air Vehicle can stay within the air for up to 30 hours, doing the repetitive tasks, performing the precise , repetitive raster scan of the area, day-after-day, night-after-night within the complete darkness or inside the haze and under computer control. [3]

This paper explains farming management depends on observing, measuring and taking action supported real-time crop and domesticated animals' information. It erases the requirement for guesswork in

modern farming and rather enables farmers the power to maximize their yields and run more efficient organizations, all while enhancing crop production. In recent years the value of agriculture drones has rapidly declined, which has not only led to the explosion of drone use cases in agriculture but has made it a no brainer investment for contemporary farmers. [4]

OA technology of agricultural UVA's refers to the core intelligent technology whereby an agricultural drone can self-governingly identify the obstacles types and complete the specified avoidance actions. The best OA system can automatically and promptly avoid every kind of obstacles within the flight path, preventing accidents caused by operational errors, self-governing flight failures or other unexpected failures and effectively reducing unnecessary loss of property. [5]

3. PROPOSED SYSTEM

It consists of quadcopter and spraying module.

3.1 REQUIRED HARDWARE

3.1.1 Brushless motor:

Fig-1: Brushless motor

These motors don't have a brush on the shaft which takes care of switching the power direction within the coils, and then it's called as brushless motors. Rather, the brushless motors have three coils on the inner of the motor, which is fixed to the mounting. For a small-scale quadcopter, the DC brushless motor we've used is of 1000KV rating. It can operate at 7.4-14.8 volts. Confirm to test the RPMs (revolution per minutes) the motors can generate through the 'KV-rating'. As referenced before the motors should rotate anti-clockwise to counteract the torque of the propeller.

3.1.2 ESC

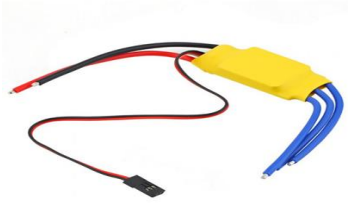

Fig-2: ESC

The brushless motors are multi-phased, normally 3 phases, so direct supply of DC power won't turn the motors on. That is where the Electronic Speed Controller (ESC) comes into play. The ESC generating three high frequency signals with different but controllable phrases continually to stay the motor turning. The ESC is additionally ready to source plenty of current because the motors can draw a lot of power. An electronic speed control will have 3- arrangements of wires. One wire will plug into the main battery of a drone. The second wire will have a typical servo wire that connects the receiver's throttle channel. And lastly, a 3rd of wire is utilized for powering the motor. Here we've used 30A ESCs.

3.1.3 LiPo Battery

Fig-3: LiPo Battery

The power source for the full device is the that battery. The recommended battery is LiPo (Lithium Polymer) battery due to its light weighted nature. It's basically due to the development and enhancement of the Li-Ion Batteries. These are extremely efficient kind of batteries available today which offer impressive power to weight ratio. LiPo Battery 2200mAh/11.1V has three cells and yields 11.1V putting away 2200mAh of charge. This is often a good Li-po battery for radio-controlled projects. It has high discharge rates and big capacity. This high-power output battery has very special internal structure, which needs charger to charge. Battery Charger is required to recharge this module.

3.1.4 Transmitter and Receiver module

Fig-4: Transmitter & Receiver module

Device that uses radio signals to transmit commands wirelessly via a bunch frequency over to the tuner that is connected to a quadcopter being remotely controlled. In other words, it's the device that interprets pilot's commands into movement of the multirotor. RC 2.4 GHz receiver is employed for the receiving signal which is transmitted from RC transmitter. The receiver is additionally connected to the flight controller. It's

attached to the vehicle. So, it will be getting signal in an extremely certain range from ground station.

3.1.5 GPS module

Fig-5: GPS

The GPS module frequently combines GPS collector and magnetometer to give scope, longitude, height, and compass heading from a solitary gadget. GPS is a significant prerequisite for waypoint route and numerous different self-sufficient flight modes. Without GPS, drones would have extremely limited uses, to explore the situation of the quadcopter. It is additionally used to fly the quadcopter as independent. By utilizing GPS, we can make the waypoint (predefined way) to fly the quadcopter independently. It contains a 2-meter scope of exactness at all 360 degrees.

3.1.6 Telemetry module

Fig-6: Telemetry module

This Telemetry radio set permits to connection to a flight controller by means of a USB prepared gadget, for example, a PC, PC or tablet supporting a USB association (OTG). The Radio set not just lets you see live information, for example, live GPS position overlaid on a to framework voltage, heading, waypoint route even aviation instrument thus considerably more, utilizing open source MAVlink based ground station programming. The framework uses the 433Mhz band and gives a full-duplex connection. Firmware redesigns and design are completely bolstered in the APM Mission Planner Interface to the module.

3.1.7 Flight Controller APM 2.8

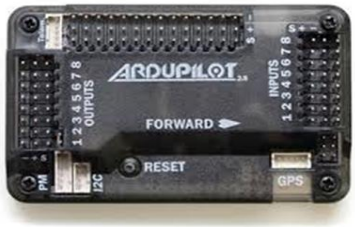

Fig-7: APM 2.8

The APM 2.8 is a complete open source autopilot framework. It permits the client to turn any fixed, revolving wing or multirotor vehicle into a completely self-sufficient vehicle; fit for performing modified GPS missions with waypoints. Accessible with top or side connectors. This update of the board is intended for vehicles (particularly multi-copters and wanderers) where the compass ought to be set as a long way from force and engine sources as conceivable to stay away from attractive impedance. On fixed wing airplane it's frequently simpler to mount APM far enough away from the engines and ESCs to dodge attractive impedance. APM 2.8 has a locally available compass so this is intended to be utilized with the 3DR uBlox GPS with Compass so the GPS/Compass unit can be mounted further from noise sources than APM itself. It includes 3-Gyro, accelerometer and magnetometer, along with a high-performance barometer. It has Onboard 4 Megabyte Data flash chip for automatic data logging.

3.2 REQUIRED SOFTWARE

3.2.1 Mission Planner

Fig-8: Mission Planner

Mission Planner is a full-highlighted ground station application for the ArduPilot open source autopilot venture. Mission Planner is a ground control station for Plane, Copter and Rovers. It is good with Windows as it were. Mission Planner can be utilized as a setup utility or as a powerful control supplement for your self-governing vehicle. Mission planner is the product which assumes a fundamental job in the activity of the quadcopter. This software is essentially used to make waypoint which will coordinate the quadcopter and using RC transmitter and receiver we can control quadcopter

manually. But with the help of GPS and utilizing mission planner software, we make the quadcopter as autonomous one.

3.2.2 Tower Beta

Tower is an amazing and natural flight control program. It gives all that you have to plan, fly and track any ArduPilot controlled automaton. Tower conveys a straightforward however include rich flight understanding. It's likewise an open-source application, which implies the code is accessible to any individual who needs to incorporate new highlights with Tower or alter existing ones. It makes trips by drawing the ways on your tablet or dropping waypoints. It effectively makes 3D outputs of enormous structures with our mechanized structure mapper.

4. SYSTEM WORKING

4.1 QUADCOPTER MECHANISM

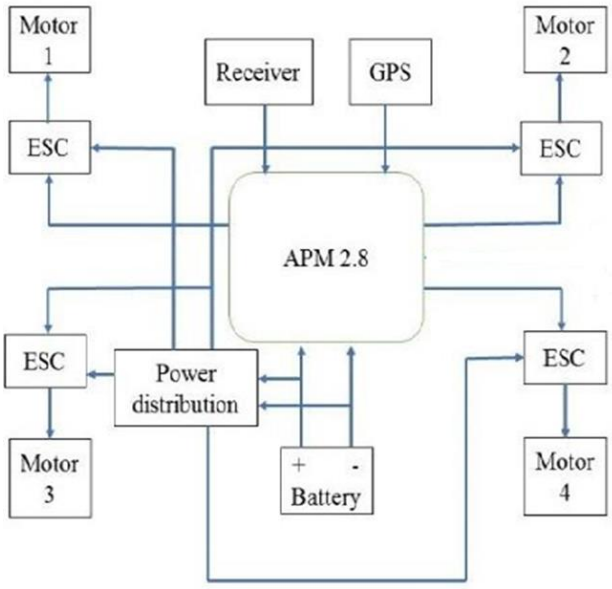

Fig-9: Block Diagram of Quadcopter

The working of framework begins with the transmitter-receiver segment. The initial step is to turn on the APM 2.8 by Arm and Disarm in the controller. On the off chance that Arm choice is chosen, at that point the Quadcopter is prepared to work by turning on the APM 2.8, and on the off chance that Disarm is chosen, at that point the entire circuit goes off. A similar transmitter-receiver module can be to control the quadcopter physically. When this gets over, the GPS recovers the present area of the quadcopter, and by utilizing the 'Mission Planner' programming the predefined way is set by utilizing way focuses. At that point the APM 2.8 subtracts the area of current message understood (from the GPS) from the waypoint which is given by the Mission Planner programming. After this progression is done, as per the outcome, the quadcopter is made to move wanted way with the assistance of Electronic Speed Control (ESC). The ESC is an interfacing gadget to control the speed of the engine by the sources of info given by the controller. In view of the yield of the subtracted position, the APM 2.8 module imparts signs to all the 4 ESCs to move the quadcopter specifically heading.

At that point fitting the quad with a versatile GPS that can be controlled from the beginning is finished. We have utilized the engine as brushless engine, since they can accomplish high torque. The airplane must have a satisfactory payload ability just as adjustment and restriction capacity. Close by with the airplane, there is a requirement for a GPS that ready to play out the procedure at the opportune spot and time.

4.2 SPRAYING MECHANISM

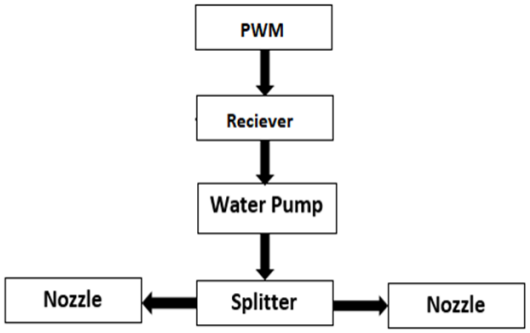

Fig-10: Block Diagram of Spraying Mechanism

The spraying system of agricultural drones for the most part incorporates plastic tank, water pumps, hoses and nozzles. The readied pesticide is placed into the plastic tank, the water pump gives power waste, and afterward the pesticide passes hose and arrives at the nozzle to equitably shower the pesticide onto the outside of the harvest. The connection system is intended to limit its effect on the flight strength. At the point when switch is ON engine set in tank began to pump the pesticide through with the assistance of battery. Furthermore, to maintain a strategic distance from the wastage of pesticide there will be a uniform weight is applied on the tank and in view of that the pesticides is accurately get showered on the harvests.

5. RESULT

The GPS module initially recovers the present area of the quadcopter in the Google map utilizing mission planner programming. At that point the waypoint is plotted and the way is made utilizing APM 2.8 in a similar Google map itself. The quadcopter is then trial

and checked for the activity. Spraying time is relies upon how much pesticide is accessible in the tank of manure. On the off chance that we need to expand the amount of pesticide accessible in tank, at that point weight of the tank gets increment. It is protected to individuals since it keeps away from the immediate contact of people to pesticides.

Fig-11: Drone

6. CONCLUSION

According to the plan determinations, we collected and tried the independent quadcopter for showering pesticides and fertilizers. By interfacing GPS, we made the waypoints to fly the quadcopter self-sufficiently. By utilizing this quadcopter, we can improve crop efficiency and stay away from awful impacts of synthetic substances on farmers wellbeing. The introduction of exceptionally harmful pesticides to human can be prevented. It is easy to operate, thereby providing flexibility in its movement. This task is additionally time and cost effective. The framework can additionally be improved for future possibilities.

7. FUTURE SCOPE

Drones don't seem to be only confined to the agriculture sector but can successfully be used across several industries like Military and for others. By using camera, we are able to use it for soil and field analysis. Satellite imagery offered the foremost advanced sort of monitoring. But there have been drawbacks. Services were too costly and the images' quality typically suffered on more days. So, it is used for crop monitoring. Also, drones are helpful in irrigation system.

REFERENCES

1. Drones for Smart Agriculture: A Technical Report S.R. Kurkute1, B. D. Deore2 , Payal Kasar3 , Megha Bhamare4 , Mayuri Sahane5 1, 2 Assistant Professor, Department of E&TC, SIEM, Nashik, India 3, 4, 5 Student, Department of E&TC, SIEM, Nashik, India

2. A review on using drones for precision farming applications* liker UNAL1, Mehmet TOOPAKCI2 Vocational school of Technical science, Akdeniz University, Anatalya TURKEY ilkerunal@akdeniz.edu.tr

3. Application of drone in agriculture S. Ahirwar*, R. Swarnkar, S. Bhukya and G. Namwade college of Agricultural Engineering and Technology, Anand Agricultural University, Godhra, Gujarat-389001, India

4. Agriculture drones: How Drones Are Revolutionizing Agriculture and How to Break into this Booming Market BY JEREMY JENSEN

5. Appliication and prospects of agricultural Unmanned Aerial Vehicle Obstacle Avoidance Technology in China. Linlin Wang,1,2 Yubin Lan,1,2,3,* Yaaaali Zhang,1,2,* Huihui Zhang,4 Muhammad Naveed Tahir,5 Shichao Ou,6 Xiaotao Liu,6 annnd Pengchao Chen1,2