International Journal of Advanced Technology in Engineering and Science
Vol. No. 11, Issue No. 05, May 2023
www.ijates.com
ijates
ISSN 2348 - 7550

Drone Jatayu

Ambika S Bhat#1, Pranav Rao J#2,
Spurthi J Hiremath#3, Prof. Abhishek D.G.#4

[4] Assistant Professor,
[1234] Department of Electronics and Communication Engineering,
[1234] Sambhram Institute of Technology, Visvesvaraya Technological University, Bangalore, India
[1234] ambikasbhat09@gmail.com, pranavraoj15@gmail.com, spurthijhiremath@gmail.com, abhishekdg06@gmail.com

Abstract

Drones are a future technology that will play an important role in industry, defense, and a variety of other disciplines. Agriculture dynamism and the need for new strategies are highly debated concepts in India because the agricultural environment is highly influential, and the field has witnessed various strategic plans by the nation, but improvement remains a pipe dream; as the hindrance faced is greater than the existing strategies. Increased demand for financial benefits and sector dynamism necessitate new financial and technology techniques. This report aimed to investigate the topic of drone technology in agriculture and analyzed farmer and lawmaker responses. It was determined that, because the notion is still in its infancy, new regulations and specialized experts are required to flesh out those principles. Small-scale farmers distinguish India. So drones, like modern technology, can be a solution for farming to reduce drudgery and report loads of data for research in less time, making it easier to bring sustainability to futuristic agriculture.

***Keywords* -** *dynamism, hindrance, infancy, drudgery, sustainability.*

1. INTRODUCTION

An unmanned aerial vehicle (UAV), sometimes known as a Drone is an aircraft that does not have a human pilot on board. UAVs got increasingly complex with the emergence of aerial robotics technology, leading to the invention of quad copter or quad copter, which gained appeal as small helicopters. Digital farming is the use of digital technologies to connect agricultural items from pasture farms to consumers. Digital farming also integrates the most advanced and powerful technologies into a unified system, allowing farmers and other agricultural value chain operators to enhance output. The drone can be flown automatically or manually using flight control software and a transmitter. Farmers are turning to agricultural drone technology to assist them deal with the issue of supply not meeting demand of crop production. The drone may be flown automatically or manually using flight control software. Using the transmitter, farmers are turning to agricultural drone technology to help alleviate the problem of crop output supply not meeting demand. An agricultural drone is an unmanned aerial vehicle that is used in agricultural operations, mostly for yield optimization and crop growth and crop output monitoring. Drones in agriculture collect data on crop growth stages, crop health, and soil differences. On agricultural drones, multispectral sensors are employed to image electromagnetic radiation beyond the visible spectrum, such as near-infrared and short-wave infrared.

2. LITERATURE SURYEY

C. Morales, D. Ovalle, and A. Gauthier presented a work in which they used "force and torque as control variables in a mathematical model." Finally, a nonlinear optimum control problem was used to evaluate the hexacopter's mobility, demonstrating the difficulty in shifting the x and y coordinate directions due to a lack of actuators on those axes. This work designed position control for a hexacopter. To reject the modeling error, an additional controller was introduced [1].

The most common method is to use the Failure Detection and Isolation (FDI) filter and then reconfigure the controller; however, the FDI is too complex for the hexacopter, so the controller was modified to use the Modified Linear Extended State Observer (LESO), which does not use the failure detection or reconfiguration strategy. The controller managed a safe flight, but there is certainly room for improvement in terms of flight performance [2].

"The compression of a low volume aerosol in an unmanned octocopter is possible," write Y. Huang, W. C. Hoffmann, Y. Lan, W. Wu, and B. K. Fritz. The primary rotor of the octocopter is 3 meters in diameter and can carry a payload of 22.7 kilogram's. A gallon of petrol wasconsumed every 45 minutes. This study paved the way for the development of aeronautical application systems for drones, enabling the manufacturing of products with higher target speeds and larger Volume Median Diameter (VMD) droplets" [3].

"An octocopter has 6 BLDC motors and 2Lipo batteries with 6 cells and 8000 mAh capacity," write D. Yallappa, M. Veerangouda, D. Maski, V. Palled, and M. Bheemanna. The size and density of the droplets, as well as the spray rate and pressure of the spray fluid, are all measured as part of their research. Using their project, they were able to create a drone that can deliver 5.5 litres of liquid with a 16-minute resistance [4].

The writers of S.R. Kurkute, B. D. Deore, K. Payal, B. Megha, and S. Mayuri noticed that some simple and inexpensive equipment is required to build an octocopter drone and its spray mechanism. The universal spray system is used to spray both liquids and solids. They examined a range of agricultural controllers throughout their inquiry and determined that the octocopter system with the Atmega644PA is the best suited due to its efficient implementation [5].

3. METHODOLOGY, COMPONENTS, BLOCK DIAGRAM AND FLOWCHART

- The hardware module of the design as shown in Fig.1 includes the drone's structural design, a signal delivered from the transmitter that gets information from the flight controller, and an electronic speed control that determines the speed received by the motor to make the propeller spin faster.
- The signal will be sent by the transmitter and received by the drone's receiver. The signal is sent from the receiver to the flight controller, where it is analyzed with the help of an accelerometer.
- The signal will be analyzed and given to the Electronic Speed Controller (ESC), allowing the motor to receive a precise quantity of current based on the signal.
- The pump uses the Li-Po battery's electricity to pressurize the liquid in the storage tank, which then travels down the pipeline to the nozzle and is sprayed.

- The hardware module of the design in Fig.2 includes the structural design, a signal delivered from the transmitter that gets information from the flight controller, and an electronic speed control that determines the speed received by the motor to make the propeller spin faster.
- The signal is sent from the receiver to the flight controller, which processes it using accelerometer and gyroscope sensors.
- The signal will be analyzed and given to the Electronic Speed Controller (ESC), allowing the motor to receive a precise quantity of current based on the signal.
- The motors are mechanically coupled to the propellers, which revolve to create propulsion.
- The pump uses the Li-Po battery's electricity to pressurize the liquid in the storage tank.
- The flow rate of the pump may be changed by adjusting the input current, which is controlled by the transmitter.
- The suggested system flowchart, seen in Fig.3, operates as follows: the drone takes off using the RC transmitter and is controlled by flying it to a specified region to be sprayed.
- When it arrives at the target area to be sprayed, the servo motor activates the pesticide sprayer, and the pesticide is sprayed to the needed area, after which the pesticide sprayer is disabled by the drone pilot using the RC transmitter.
- After the spraying operation is completed, the drone pilot will return the drone to its original position. The suggested approach makes use of GPS data to identify where to spray pesticides and how much area to cover.
- Spraying using a nozzle on a drone creates tiny particle sizes, causing the surface to expand broader. This right is supposed to result in increased penetration of fertilizers and insecticides through the leaf surface.
- The longer the spraying activities, the larger the growth acceleration, such that after 49 days, standard fertilization and pesticide spraying methods cannot cover the growth leverages.
- Traditional pesticide and fertilizer spraying techniques are time-consuming and ineffective. Spraying on a paddy field is the most dangerous job since the operator is subjected to lengthy and frequent exposure to hazardous chemicals.
- The drone provides an efficient solution for such operations by lowering processing time to less than one-third of the time required by the traditional technique.

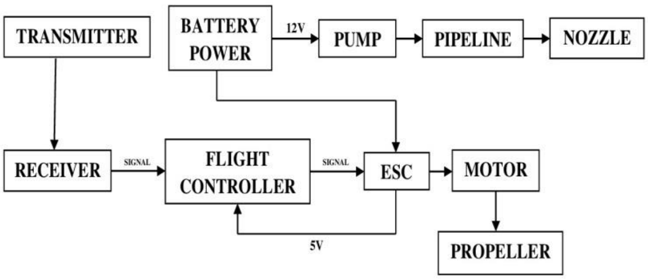

Fig.1: Block diagram of the drone hardware

ijates
ISSN 2348 - 7550

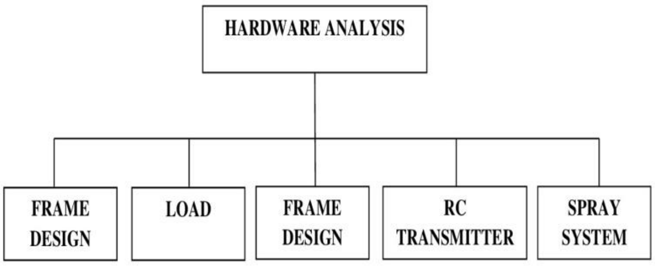

Fig.2: Block diagram of the hardware design analysis

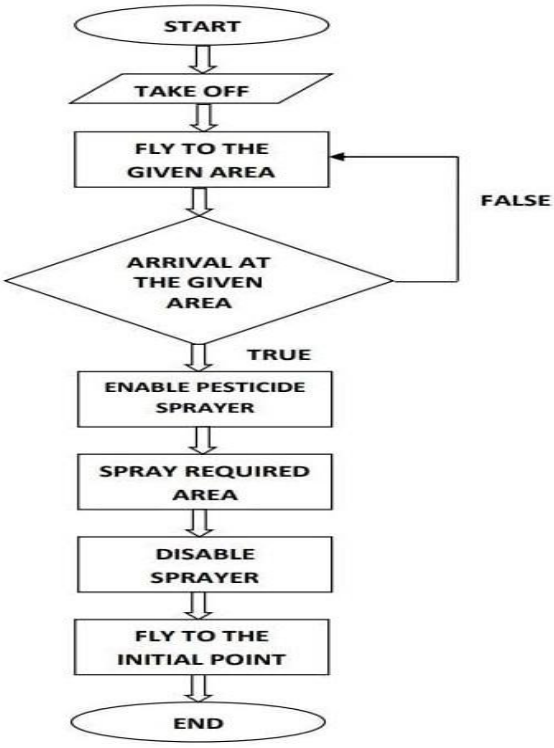

Fig.3: Flowchart of spraying system

Fig.4: Final model

Fig.5: Top view

4. RESULTS

The drone was designed for agricultural purposes as in Fig.4 and is equipped with a spraying system consisting of a 2-litre spraying tank, a 12v dc water pump, a nozzle, and a servo motor for switching the pump ON or OFF. Agricultural drones have been increasingly popular in recent years because to their capacity to give farmers with real-time data on crop health, yield estimation, and other critical variables. These drones can also identify and prevent crop illnesses, monitor soil moisture levels, and even spray pesticides or fertilizers on crops. The top view is shown in Fig.5.

One of the primary advantages of employing agricultural drones is that they can swiftly and efficiently cover a wide area of farmland, saving time and labour expenses. Drones may also give extensive information on crop health and productivity, allowing farmers to make better decisions regarding irrigation, fertilization, and other management practices.

CONCLUSION

The development and deployment of a drone system for spraying pesticides and fertilizers on farms, with the goal of minimizing farmer community health concerns. In this project, we built a drone-mounted spraying mechanism for agricultural uses and disinfection spraying. This method of spraying pesticides on agricultural fields decreases the number of labours, time, expense, and risk to the persons spraying the liquids. This drone may also be used to spray disinfectant substances over buildings, bodies of water, and densely inhabited regions. However, there are some challenges associated with the use of agricultural drones. For example, the cost of purchasing and maintaining the drones can be high, which may limit their use to larger farms. Additionally, there are regulatory issues related to the use of drones, particularly around privacy concerns and airspace regulations.

REFERENCES

[1] C. Morales, D. Ovalle and A. Gauthier, "Hexacopter manoeuvrability capability: Anoptimal control approach," 2017 7th International Conference on Modeling, Simulation, and Applied Optimization (ICMSAO), 2017, pp. 1-6, DOI: 10.1109/ICMSAO.2017.7934920.

[2] S. Guo, J. Li, W. Yao, Y. Zhan, Y. Li and Y. Shi, "Distribution characteristics on droplet deposition of wind field vortex formed by multi-rotor UAV", PLoS ONE, vol.14, no. 7, Jul. 2019.

[3] Y. Huang, W. C. Hoffmann, Y. Lan, W. Wu and B. K. Fritz, "Development of a spray system for an unmanned aerial vehicle platform", Appl. Eng. Agricult., vol. 25, no. 6, pp. 803-809, Mar. 2009.

[4] D. Yallappa, M. Veerangouda, D. Maski, V.Palled and M. Bheemanna, "Development and evaluation of drone-mounted sprayer for pesticide applications to crops," 2017 IEEE Global Humanitarian Technology Conference (GHTC), 2017, pp.1-7, DOI: 10.1109/GHTC.2017.8239330.

[5] S.R. Kurkute, B. D.Deore, K. Payal, B. Megha and S. Mayuri, “Drones for SmartAgriculture: A Technical Report, International Journal for Research in Applied Science and Engineering Technology 6, no. 4, pp. 341-346, 2018.

[6] FAN Jianbin, YU Yongqing, LIU Zehong et al., "Introduction of ±800 kV HVDC transmission standards system [J]", Power System Technology, vol. 30, no. 14, pp. 1-6, 2006.

[7] G. M. Hoffmann, H. Huang, S. L. Waslander, & J. Tomlin (2007). Quadrotor Helicopter Flight Dynamics and Controller and experiment in Inst. Aeronaut. Astronaut, vol. 4, pp. 1–20.

[8] S. Yang, X. Yang, and J. Mo, "The application of unmanned aircraft systems to plant protection in China," Precision Agriculture, vol. 19, no. 2, pp.278–292, 2018.

[9] J. Primicerio, S. F. Di Gennaro, E. Fiorillo, L. Genesio, E. Lugato, A. Matese and F. P. Vaccari, F. "A flexible unmanned aerial vehicle for precision agriculture". Precision Agriculture, vol. 13, no. 4, pp. 517-523.

[10] T. Merz and S. Chapman, "Autonomous Unmanned Helicopter System for Remote Sensing Missions in Unknown Environments", International Archives of Photo grammetry Remote Sensing and Spatial Information Sciences, 2011.

[11] G. P. Falconí, C. D. Heise and F. Holzapfel, "Fault-tolerant position tracking of a hexacopter using an Extended State Observer", 6th International Conference on Automation Robotics and Applications, 2015.

[12] S. Shaikh, M. Jadhav, N. Nehe and U. Verma, "Automatic animal detection and warning system", Int. J. Adv. Found. Res. Comput., vol. 2, pp. 405-410, Jan. 2015.