International Journal of Advance Research in Science and Engineering
Volume No.07, Special Issue No.03, April 2018
www.ijarse.com
IJARSE
ISSN: 2319-8354

Multipurpose Quadcopter Drone

Chavan Vishnu[1], Indurkar Chaitanya[2], Nagargoje Pradip[3], Prof. Khonde S. S.[4]

[1,2,3,4]*Department of Electronics & Telecommunication,*
G. S. Moze College of Engineering, Pune, (India)

ABSTRACT

The usage of Unmanned Aerial Vehicles (UAVs) has grown drastically because of their ability to operate in dangerous locations while keeping their human operators at a safe distance. UAVs are widely used in military operations nowadays because of their reliability, cost effectiveness and multi-functionality. The problem we posed in this paper is Indian agriculture needed production and protection materials to achieve high productivity. Agriculture fertilizer and chemical frequently needed to kill insects and growth of crops. The WHO (World Health Organization) estimates there are more than 1 million pesticide cases in every year. In that more than one lakh deaths in each year, especially in developing countries due to the pesticides sprayed by human being. The pesticide affects the nervous system of humans and also leads to disorders in body. A remote-controlled UAV (Unmanned Aerial Vehicle) is used to spray the Pesticide as well as fertilizer to avoid the humans from pesticide poison. The UAV is operated by manual flight plans and the Sprayer is manually triggered by RF controlled Nozzle. The vertical take-off and landing quadcopter is used to spray the low volume pesticide in a small area. This project describes the development of quadcopter UAV and the sprayer module. And also discusses the integration of sprayer module to quadcopter system. This model is used to spray the pesticide content to the areas that can't easily accessible by humans. The Universal Sprayer system is used to spray the liquid as well as solid contents which are done by the universal nozzle. Camera is used to capture the remote sensing images which are used to identify the green fields.

Keywords: Unmanned Aerial Vehicle (UAV), Radio frequency (RF), Sprayer module, Remote sensing, Camera

I.INTRODUCTION

Agriculture is the key to the development of countries such as India, Japan, Israel, China and others. Trading of agricultural products is a crucial part of the economy. A developed agriculture employs a large number of people. Agriculture in India generates almost 52% of total number of jobs available. It contributes a share of around 18.1% of the GDP. Time and need has surfaced to increase the productivity of farming to feed the ever-growing population. The advent of technology might prove helpful in increasing productivity within the stipulated time. The use of fertilizers and pesticides was increased to improve the fertility of the land so as to improve productivity. The manual spraying of fertilizers and pesticides can affect the nervous system and can result in fatal diseases. The World Health Organization (WHO) statistics puts that there are more than 1 million

pesticide cases every year. Out of these At least 1 lakh deaths occur in the developing countries. The solution to these limitations has formed the basis for the development of smart irrigation. Using smart irrigation, one can irrigate the field. Effective agricultural methods were developed using smart irrigation. However, the excessive area that the smart irrigation consumes is chiefly used for hardware installations utilizing larger areas of cultivated land. This limitation formed the basis for the development of the UAV. UAV or unmanned aerial vehicle, as the name suggests, is an aircraft that does not require a pilot to operate it. The plane is usually operated using a remote control from the ground. It is also programmed to perform certain tasks using dynamic automation systems which the operator on the ground just needs to monitor to prevent the untoward incident from happening. A quadcopter is unique in the sense that the UAV performs Vertical Take-Off and Landing(VTOL). The use of quadcopters has an advantage over conventional helicopter because of its simple mechanical design. The main feature of an UAV is that individual motor control stabilizes the UAV instead of cyclic control. It can be applied in varied areas such as in military for rescue operations, in discovering mines and agriculture.

II.PREVIOUS WORKS

A. Design and control of Quadcopter with application to autonomous flying:

This project focuses on Vertical Take-Off and Landing (VTOL) system. It includes the specialized design of micro Quadcopter which is based on autonomous control system named as OS4. He applied mathematical modeling techniques such as linear or non-linear quadratic equations and/or inequations to design and simulate various controllers in his project. The author has developed two different platforms in his thesis. The first one is a 'Quadcopter like test-bench' with off-board data processing and power supply. It was used to test control strategies but was only capable of testing up to 3DoF. The second one, OS4, is a highly integrated Quadcopter with on-board data processing and power supply. It has all the necessary sensors for autonomous operation. In design the controller for his Miniature Flying Robots (MFR), five different controllers were developed to achieve the objective. The first one, based on Lyapunov theory, was applied for attitude control. The second and the third controllers are based on Proportional Integral Derivative (PID) and Linear Quadratic (LQ) techniques. These functions were compared for attitude control. The fourth and the fifth approaches use back-stepping and sliding-mode concepts that applied to control attitude. Finally, back-stepping is enhanced with integral action and proposed as a single tool to design attitude, altitude and position controllers.

B. A wireless multivariable control scheme for a Quadcopter hovering robotic platform

Some of Quadcopter researchers had a problem with a result of the difficulties of controlled flight. Z. Al-khatib, J. Yu, H. G. Al-khakani, and S. Kombarji presented the Micro Air Vehicle (MAV) concept to non-technical users by developing a hovering robotic Quadcopter platform that communicates with the main workstation and a number of controllers and peripherals. The main goal of this project is to develop an abstract flexible autonomous robot according to different levels of control and provide users of different backgrounds access to the functions they want to work with. The system used to connect the platform QX4, workstations and

controllers uses a wireless mesh network or commonly known as Radio Frequency (RF) Zig Bee module. The casing of the Quadcopter is using carbon fibers frame and at its center, it houses three microcontroller boards, ten proximity sensors, and three 3-axes inertia sensors. To protect the Quadcopter, a circular shape is created and was placed on propeller made out of foam and mesh wire to protect the vehicle and its surroundings. The workstation is a set of software applications that was executed on a PC and connected to the wireless mesh network. It acted as a controller of the vehicle and provided the operator a simple set of buttons that will make the robot conduct an action such as move forward and move backward. This was done for cases where manual control was desired. It also allowed the operator to take control in cases where the platform behaved in an abnormal way. The use of Wii Nun chuck as secondary manual controller gave the operator more choice in the maneuverability of the Quadcopter. The other part of Quadcopter controller was the administrator panel that controlled the robot and the main interface on the workstation. It was designed using Java as the cross-development platform, where the program was compiled on PC and execution was done on the host machine.

III.BLOCK DIAGRAM

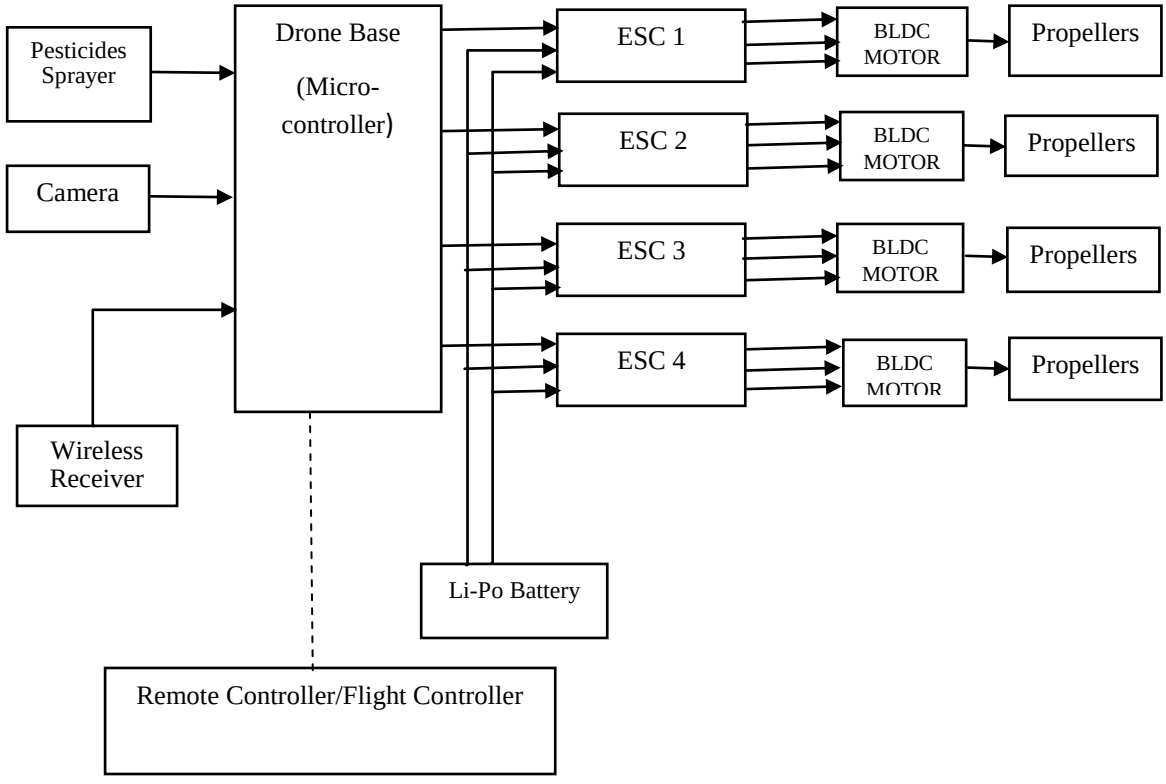
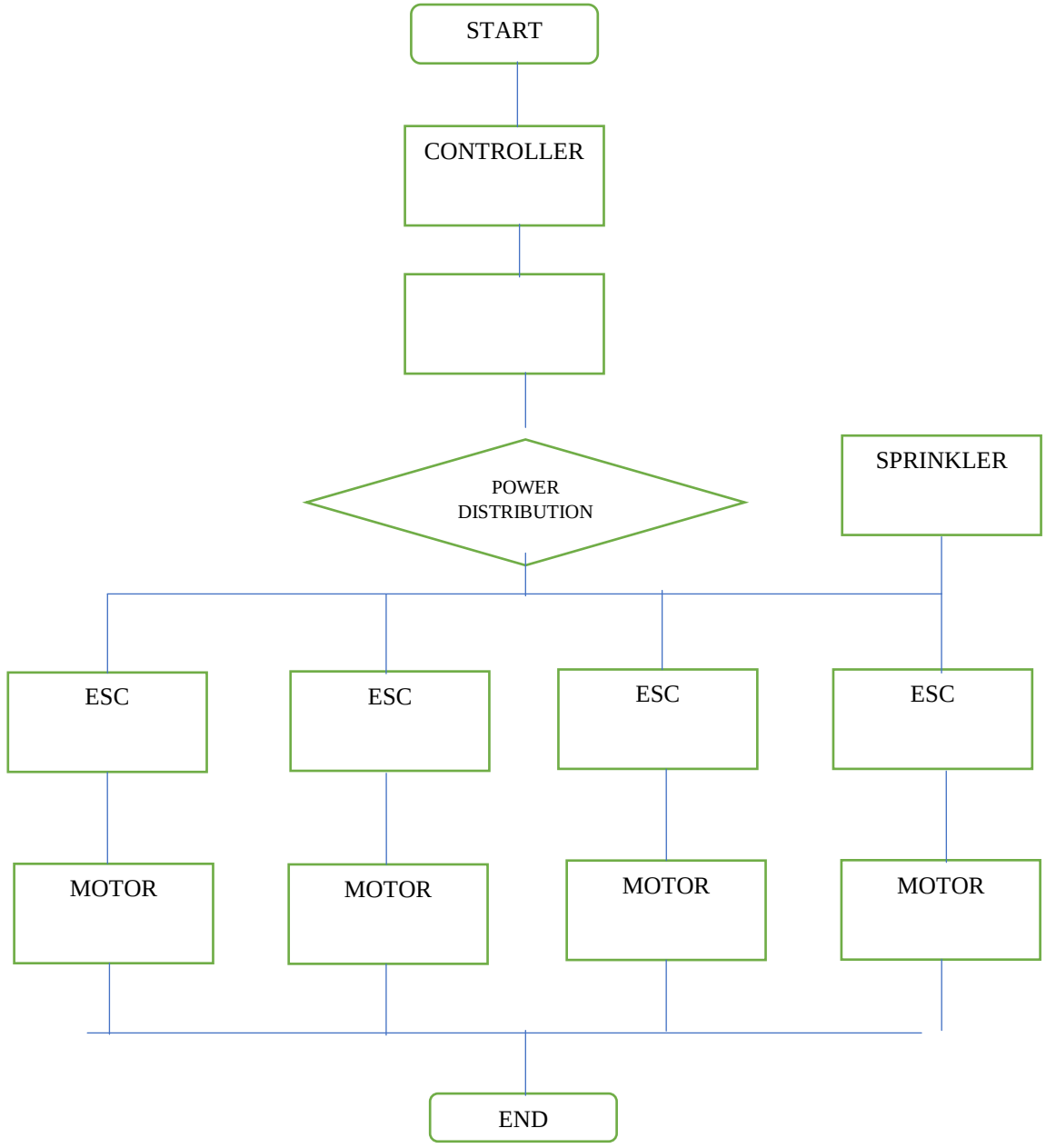


Figure: Block Diagram

The basic block diagram for a simple quadrotor application is as shown in the figure. It consists of RF/Zig-Bee transceiver for transmission and reception. In main circuit its task is to receive signals from remote control. The quadrotor will be fueled by lithium ion power batteries (Li-Po). The purpose behind preferring Li-Po battery is primarily power outsourcing which is higher than any other batteries like aluminum ion power batteries. Other advantages are high MAH (milli-ampere-hour) rating which is sufficient enough to run a small BLDC motor,

and low discharging time. A low weight container attached with container attached with a valve is put on boar of quad rotor. Opening of valve is controlled by the use of ON/Off controller & closing switches of Remote control. Brushless DC motors used for rotating propeller blades. 4 BLDC motors are used and evenly spaced around a central fuselage. The speed of these motors will decide the altitude of flight of UAV. Two of them will rotate clockwise and rest will rotate anticlockwise. This combination will be decided by direction control switch of remote control. The geared motors are available in market. DC motors require 12V power supply for their operation. Whereas microcontroller provides only 5V output. Hence there is a need to step up this voltage. The ESC provides various levels of voltages due to which process of shifting gears of DC motor takes place.

IV.FLOW CHART



V.CONCLUSION

Agriculture is the backbone of Indian economy. At present development of technology in agriculture is important for better crop yield. Especially in country like India this is important since 70 percent of the country's population depends on agriculture. Numerous trends were developed to enhance technology in agriculture like the flood, drip, sprinkler and smart irrigation and smart agriculture. But these were used for irrigational purposes only moreover they use most of the cultivated land. A remedy to this solution is to use an aircraft mechanism to conduct agricultural activities. So, this project demonstrates the same. The project develops a quadcopter as a fertilizer and pesticide sprinkler, controlled remotely. The result is the functioning of the quadrotor according to the commands given by the operator. The drone responds to the commands**.**

APPLICATIONS

- News Making
- Agriculture
- Delivery
- Photography/Videography
- Military
- Security

VI.ACKNOWLEDGEMENT

This project was conducted using resources provided by G.S. Moze College of Engineering, Pune 411045. The support of Prof. F. B. Sayyad, Principal, G. S. Moze College of Engineering, Prof. S. S. Khonde, Head of Department, Department of Electronics and Telecommunication, Prof. S. S. Khonde, Project Guide is appreciated.

REFERENCES

[1] Moulesh Kumar, Nitish Kumar, Dr.Sreenivas.T.H.(2015)"Autonomo us Navigation of Flying Quadcopter", IJRITCC, Volume:3 Issue:6.

[2] D. R. M. N. G. G. S. S.Meivel, "Quadcopter UAV based fertilizer and pesticide spraying system," International Academic Research Journal of Engineering Sciences, vol. 1, no. 1, pp. 812, February 2016.

[3] S. Bouabdallah, "Design and control of quadrotors with application to autonomous flying," IEEE/RSJ International conference on Intelligent robotics and systems, vol. 3727, october 2007.

[4] J. A.-K. S. K. Z.Al-Khatib, "A wireless multivariable control scheme for a quadrotor hovering robotic platform using IEEE 802.15.4," Concordia University Canada, 2009.

[5] A. Sato, "The R-Max helicopter UAV.," YAMAHA MOTOR CO, LTD, Japan, Shizuoka, september 2003.

[6] P. Pounds, R. Mahony and P. Corke, "Modelling and control of aquadcopter robot" in Proceedings of the Australasian Conference on Robotics and Automation, Auckland, New Zealand, 2006.

[7] S. Bouabdallah, P. Murrieri, and R. Siegwart, "Design and control of an indoor microquadcopter" in Proceedings of the IEEE International Conference on Robotics and Automation, ICRA'04, New Orleans, USA, vol. 5, pp. 4393–4398, 2004.

[8] K. Weng and M. Abidin, "Design and control of a quad-rotor flying robot for aerial surveillance" in Proceedings of the 4th IEEE Student Conference on Research and Development, Shah Alam, Malaysia, pp. 173–177, 2006.

[9] C. Zhang, J. M. Kovacs, "The application of small unmanned aerial systems for precision agriculture: a review", Precision Agriculture, Springer, 2012