A Review on Design and Development of Agricultural Fertilizer Spraying Drone and Multitasking System

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Abstract: - The vital source of income in India is Agriculture. The production of crops depends on certain factors like pests, disease, fertilizers, etc. which can be controlled by giving proper treatment to crops. Pesticides may increase the productivity of crops but it also affects human health. Therefore, the main aim of this paper is to design an agriculture drone for spraying pesticides and multitasking system. Pesticides affect the internal secretion and system of the body. The low levels of exposure throughout spraying might have ended up in health effects. chemical exposure will cause a large vary of medicine health effects in the body like the state of mind, reduced speed of response, reduced visual ability, altered or uncontrollable mood. An idea of design a multitasking drone which will help us not only in agriculture field but also in transportation work, security system and to locate the position through GPS. This paper mainly concentrates on designing a low weight aluminum structure for the drone that sprays fertilizer for farming and transportation system. The proposed system involves designing a prototype that uses simple cost- effective equipment like BLDC motor, ESC wires, etc.

Key Words: —*Unmanned Arial vehicles, Brushless motors, remote sensing, ESC wires, Li Pro wireless charger.*

I. INTRODUCTION

Agriculture has the significance role in the economy in India. It serves to be the backbone of the Indian economy. So it become mandatory increase the productivity of the crops. The various operations like spraying of pesticides and sprinkling fertilizer are very important. Though spraying of pesticides has become mandatory it also proves to be a harmful procedure for the farmers. Farmers especially when they spray urea, take to many precautions like wearing appropriate outfit masks and gloves. It will avoid any effect on human health the drone is to be design. Avoiding pesticides is also not completely possible as the required result has to be met. Hence fore, the use of robots in such cases gives the best of the solutions for this type of problem, along with the required productivity and efficiency of the product. [2]

According to a survey conducted by the World Health Organization was analyzed that each year three million employees area unit plagued by poisoning from pesticides from that 20000 dies.

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This comes aims to beat the unwell Effects of the chemicals on citizenry people in general person groups of people individuals personalities and conjointly wont to spray chemical over large areas briefly interval of your time compared to traditional spraying by an automatic aerial pesticide sprayer [4]. It is a multitasking drone, which can be used for transportation, security and GPS purpose.

II. NEED OF STUDY

This drone is used to carry pesticide and other product also reduces the work of farmers and get the work done soon. The agricultural fertilizer spray drone is a user-friendly interface for the farmers. As per as security concern. It is useful there too it can transport to the flung regions. Where there is a lack of transportation and it can locate the location of enemies near the border. This is the main reason behind studying this.

III. OBJECTIVES

The main objectives include:

- To get an efficient solution for payload carrying capacity using UAV (up to the weight of 5kg including vehicle).

- To build a suitable quadcopter with stable flight control.
- To directly increase the life of farmers by increasing the income per area of land.
- To design a mechanism for spraying and controlling various parameters like drone speed, spraying speed control, etc.
- To transport medical product such as blood product, vaccines and other supplies.[2,3,5,].

IV. PROPOSED DEVELOPMENT

A. Block Diagram

The following figure shows the block Diagram of Quad-copter [6].

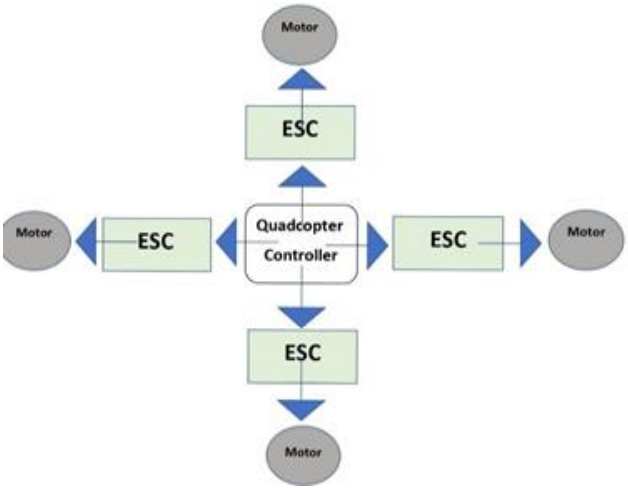

Fig.1. Block Diagram of Quad- copter

B. Agriculture Drone System Using GPS

The Agriculture Wonder Drone System is designed by making use of GPS and was automatically controlled drone based on aerial pesticide sprayer mainly consisting of two parts the quadcopter and spraying mechanism and locate the position for transportation product where it's land . Initially, the quadcopter is assembled using necessary components such as flight-controlled board (FCB), GPS, BLDC motor, ESC controller and battery, etc. Where the drone behaved at required altitude, and then it is switch to altitude hold mode, which maintains the same altitude until it is switched back. The stability of drone maintain by sensors. GPS is used in only autonomous mode. According to the changes in the values of sensors the motor speed is vary [4,7].

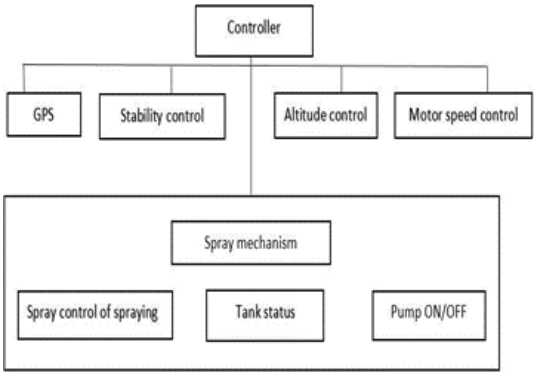

Fig.2. Block Diagram of the GPS System

C. Power Supply

Li-Polly batteries are fully charged when they reach 4.7v/cell, and their minimum safe charge. 3.7v is pretty much in the middle, and that is the nominal charge of the cell [6]. The capacity of the battery is 2200 mAh this is 3-cell high power battery having a high discharge rate. The voltage of the battery is11.1v and the current of the battery is 5.5 Amp.

Fig.3. Diagram Showing Li-Polly Battery

D. Flight Controller

KK 2.1.5 Controller:

KK 2.1 Flight Controller Board W/ 6050 MPU Board with Atmel 644PA is the next big evolution of the first generation KK flight control boards. The KK 2.1 was engineered from the ground up to bring multi-rotor flight to everyone, not just the experts.

The LCD screen and built-in software make install and setup easier than ever. Hosts of multi-rotor craft types are pre-installed simply select your craft type.

The KK gyro system has been updated to an incredibly sensitive 6050 MPU system making this the most stable KK board ever and allowing for the addition of an auto-level function. At the heart of the KK 2.1 is an Atmel Mega644PA 8-bit AVR RISC-based microcontroller with 64k of memory.

Fig.4. Diagram of flight controller

E. Transmitter

FS CT6B Transmitter:

Flysky CT6B 2.4Ghz 6CH Transmitter with FS-R6B Receiver is the popular six Channel Radio CT6B manufactured by Flysky. Flysky CT6B 2.4 GHZ 6CH transmitter is an entry-level 2.4 GHz radio system offering the reliability of 2.4 GHz signal technology and a receiver with 6 channels.

CT6B 2.4 GHZ 6CH transmitter radio is a value for money, entry-level 6 channel transmitter, ideal for quadcopters and multicopters that require the 6ch operation.[6]

Fig.5. Diagram of the Transmitter

F. Receiver

FS CT6B Receiver:

RC 2.4 GHz receiver is used for the receiving signal, which is transmitted from the RC transmitter. The receiver is also connected to the flight controller. It is attached to the vehicle. Therefore, that it can receive a signal in a certain ring from the ground station [9].

Fig.6. RC Receiver

G. BLDC Motor

Brushless DC electric motor (BLDC motor, BL motor) also known as electronically commuted motor or synchronous DC motor, are synchronous motor powered by DC electricity via an inverter or switching power supply which produces an AC electric current to derive each phase of the motor via a closed-loop controller. The controller provides a pulse of current to the monitor windings that control the speed and torque of the motor.

H. Brushless ESC

A brushed ESC is used for controlling the 12V D water pump. At the output of the ESC, the water pump is connected.

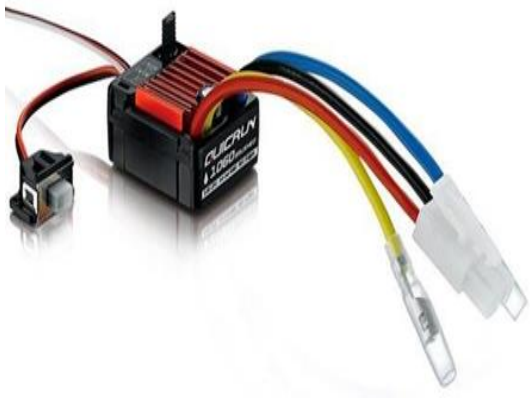

Fig.7. Diagram of Brushless ESC to control the water pump

I. Brushless ESC:

Brushless ESC is used for controlling BLDC motor. At the output of the ESC, the BLDC motor is connected.

Fig.8. Diagram of Brushless ESC to control BLDC motor

J. *Propeller*

An aircraft propeller, or airscrew, convert's a rotary motion from an engine or other power source, into a swirling slipstream which pushes the propeller forwards or backward [10].

V. SPRAYING MECHANISM

The spraying mechanism mainly consists of a microcontroller that is programmed to perform various functions. It also contains a tank of 3000ml capacity to which a water pump is connected [5]. To this pump, a splitter is connected that spits the chemical to the three nozzles that square measure connected at the 3 opposite ends, and spraying is achieved. It additionally contains a motor driver circuit to manage the speed of spraying and chemical level indicator circuit with buzzer, for indicating once the chemical is empty [3].

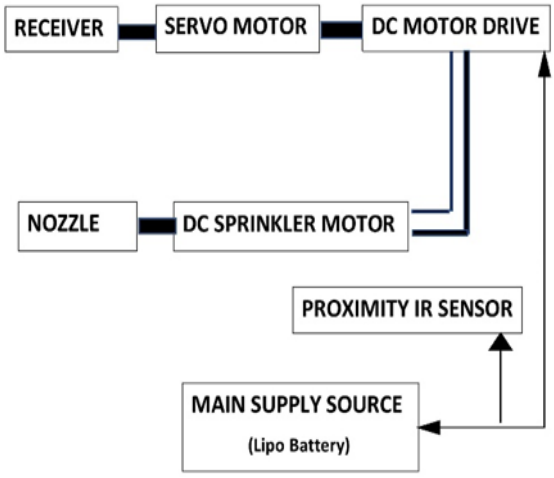

Fig.9. Flowchart showing the spraying Mechanism

The spraying mechanism performs the following functions [1].

Pump ON/OFF Control:

It is used to turn On/Off the water pump which is used to spray. This is done by sending a 5V control signal to the Brushed ESC From the transmitter.

Spraying Speed Control:

The speed of spraying is achieved by sending a PWM signal to the motor Brushed ESC. Based on the ON time of this signal, the speed of spraying can be controlled.

Tank Status:

The status of the tank will be monitored using the water level sensor. If the pesticide level reaches below the threshold, say 20ml in the prototype it can be notified to an operator by sending a control signal to the controller which in return turn on the buzzer. Hence when the buzzer is heard by the operator he can land the quadcopter for refilling.

VI. BENEFITS

- It is a time saving, i.e. reducing the workforce by one management staff and own worker.
- Can transport to the region where other transport system can hardly reach.
- Improve farm live rate and reduce growth period as well as improve product volume significantly.
- Used for security purpose due to GPS location.

VII. CONCLUSION

Main moto of the paper is to focus on the selection of best design for drone system for agriculture purpose, security system, transportation system and GPS. The observations from this study is as

- Weight lifting capacity can be minimized by increasing the number of motor.
- Flight time can be increased by increasing the battery capacity.
- Pesticide time can be increased by increasing tank size.
- A larger area can be covered by using more nozzles, which can be arranged in the form of an array.
- Location of position can be made better by GPS system.
- To transport medical product such as blood product, vaccines and other supplies.

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