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Design of UAV for urea spraying in agricultural field

R.Ilakiya[1], M.Prabavathy[2], K.Sagadevan[3]

[1,2] UG Scholar, Department of ECE,IFET college of engineering, villupuram
[3]Associate professor, Department of ECE, IFET college of engineering, villupuram.

ABSTRACT: *Agriculture is the backbone of our Indian economy. Every day many new technologies are being launched in agriculture which may be expensive and require high power consumption. Every challenges in agriculture are faced by the farmers. In previous method the use of arduino as a flight controller board does not provide a specialized rotation and it is not efficient in rotation of a motor and to enhance the feature of motor rotation we are proposing a method of using ARM cortex m3 microcontroller as a flight controller board. This paper proposed a new strategy of quad-rotor model which is used for spraying the urea in the agricultural field. It reduces the work of the farmers and also increase the productivity of the field in short period of time. The UAV is 1.8m in diameter which can weigh maximum of upto 2Kgs. It also consists of a sprayer with the nozzle which can spray the urea according to the commands of the transmitter. This paper provides the improvement in weight lifting capacity of the UAV which can spray equally in sector-wise . The UAV operates based on the relay driver and the commands given by the transmitter*

Keywords: BLDC motor, sprayer, Nozzle, unmanned aerial vehicle, relay driver

I.INTRODUCTION:

UAV method is used to increase the crop productivity and to spray the urea in the agricultural field. The recent trends use the plant monitoring which has been motivated by the profits of many platforms especially in agriculture. Spraying the urea is important for plants growth management and landing of vehicle is based upon the commands offered. To reduce the time and cost UAV is used to estimate the volume densities of urea and to inspect the crops[1].It provides rich and practical function that can meet the multiple requirements of the current pesticide spraying drone. It also monitors the crop growth and also to provide the multiple features in the environment[2]. The plant monitoring may yield in good estimations in cost as well as in flying line. This implementation may increase the reliability of standard flying vehicle offering the possibilities of new development technologies. The main aim is to increase the quality and production of the field in terms of high efficiency, low power and high capacity[3]. The usage if Li Po batteries may discharge at only high rates.

2. PROBLEM DEFINITION:

The issue in the horticulture is happening for the most part in all parts of the world. The World Health Organization(WHO) has assessed the study that in excess of 2 million instances of pesticide harm happen every year which prompt 120,000 passing of individuals in creating nations. The introduction of pesticides may cause neurological wellbeing impacts, for example, memory misfortune, loss of co ordination , diminished reaction of boosts, decreased visual capacity, and so forth. To stay away from the introduction of the splashing the urea and wellbeing impacts the UAV is planned which gives high productivity to the ranchers and to the field. This task is for the most part intended to beat the terrible impacts of introduction to the urea by the rancher in the agrarian field. The agriculturist can simply send orders to the modified UAV so the automaton can pivot as per the bearing given . This can stay away from the evil impacts and can give a decent health state of the ranchers. Generally numerous substance are added to the urea which can give some hurtful impacts of introduction of the ranchers. So to stay away from those troubles it is adequate to improve the showering procedure by outlining an unmanned ethereal vehicle (UAV) easily stages. It can give elite and dependability.

3. EXISTING SYSTEM:

In the existing system the use of arduino as a flight controller board may does not offer high degree of specialisation in motor rotation and usage of temperature sensor cameras is highly requiring a high cost and less efficiency. It may require the radiometric and geometric calibrations together with the climatic correction which is available only from real time sensors. It also uses the method od how to make remote sensing products using auto rotate with fixed wing UAV's equipment along with commercial off-the-shell(COTS) technique.In that more than one lakh deaths in each year, especially in developing countries due to the pesticides sprayed by human being and handling of pesticides. The health effects of pesticides include asthma, allergies and hypersensitivity

4. BLOCK DIAGRAM OF EXISTING SYSTEM:

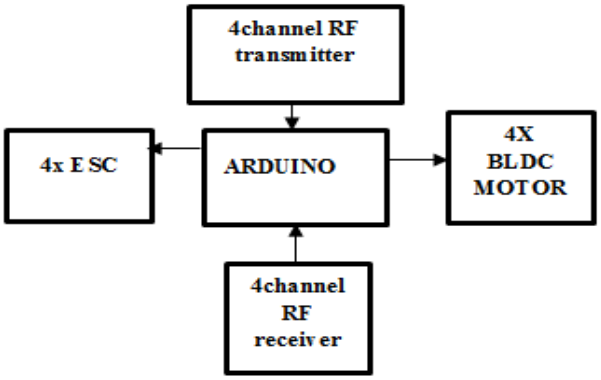

Fig.1 Block Diagram of Existing System

5. PROPOSED SYSTEM:

In this paper the ARM Cortex M3 microcontroller is used as a flight controller board since it is specialised for motor rotation. The implementation of this paper uses the concept of relay driver which can act as a switch. The commands are sent to the controller and finally to the relay driver. When the relay is ON the nozzle will spray the urea and when it is OFF the nozzle will be closed and the urea spraying is not done. It mainly works upon the uplift thrust and air pressure that is created in the propellers. The ARM cortex microcontroller has high efficiency and performance which can also be used in real time applications. It helps the farmers to transform the agricultural field easily by improving the soil fertility and growth of the crops. This implementation may require less cost and high efficiency compared to the previous ideas and technology

6. BLOCK DIAGRAM OF PROPOSED SYSTEM

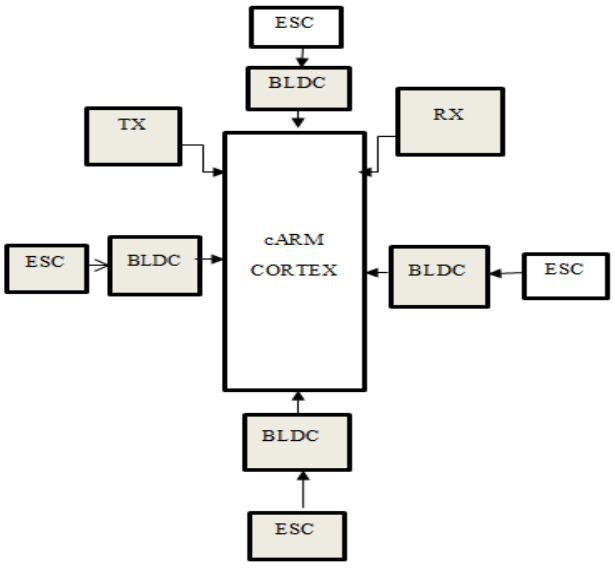

Fig 2. Block diagram of proposed system

7. WORKING PRINCIPLE:

Quad copter framework chips away at the standard of transporting marvels with high weight. The propellers drive the air in descending with high weight because of which an inspire constrain is made and accordingly activity response law is connected in general framework .These four propellers are appended to the engines which makes push and causes the quad copter to raise high. Radio transmitter utilizes radio flag to remotely control quad copter in remote way, the summons given by transmitter are gotten by a radio collector associated with flight controller. The no of directs in transmitter decide what number of activities of flying machine can be controlled by pilot.

8. METHODOLOGY:

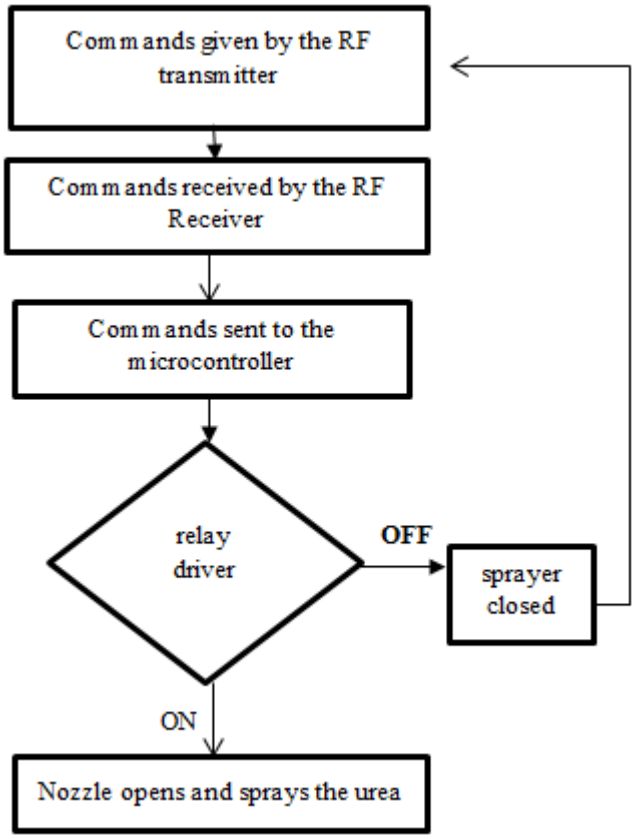

Fig.3 Methodology

9. COMPONENTS:

A.ARM CORTEX M3:

The Cortex-M3 processor is particularly created to empower accomplices to grow superior .It is utilized as a part of Low-cost stages in extensive variety of gadgets including microcontrollers, car body systems, wireless systems administration and sensors

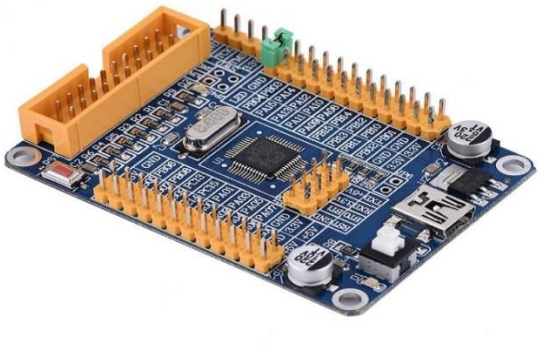

Fig.4 Arm Cortex M3

B.4XBLDC (BRUSHLESS DC) MOTOR:

It is otherwise called electronically driven engines (i.e. ECMs engines). BLDC engine are synchronous engine fueled by DC power. Appraised in 3.7 KV, where it pivots 50000rpm for every 1 volt .It offers a few favorable circumstances over brushed DC engines like greater unwavering quality, low commotion, diminishment in EM Interference (EMI), high torque per watt

C.4XESC (ELECTRONIC SPEED CONTROLLER):

ESC is an electric circuit that control the speed and direction of electric motor by varying the magnetic forces created by the windings and magnets within the motor.

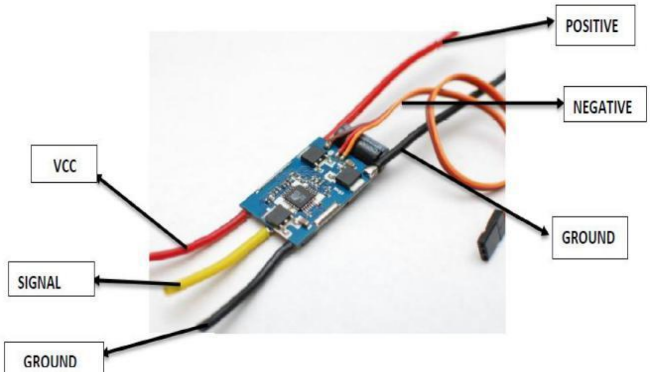

Fig.4 ESC Controller

D.FRAME AND PROPELLERS:

The F-450 quad copter frame is used as it's suitable for the propellers and the payloads which have to be lifted

E.LI-PO BATTERY:

Li-Po (Lithium Polymer battery) is a rechargeable battery of lithium ion technology. They provide higher specific energy .It also provide high voltage and long run time as they hold huge power in small package and have high discharge rates

Fig.5 Li-Po Battery

F.SPRAYER AND NOZZLE:

The sprayer is used to spray the urea in the field according to the commands. It may be opened according to the nozzle functioning.

G.RF TRANSMITTER AND RF RECEIVER (2.4GHZ):

Radio transmitter uses radio signal to remotely control quad copter in wireless way, the commands given by transmitter are received by a radio receiver connected to flight controller. The no of channels in transmitter determine how many actions of aircraft can be controlled by pilot. Minimum of four channels are needed to control a quadcopter (which includes pitch. Roll, throttle, yaw). RC receiver used operates on 2.4GHz of radio frequency

10. SPRAYER MODULE:

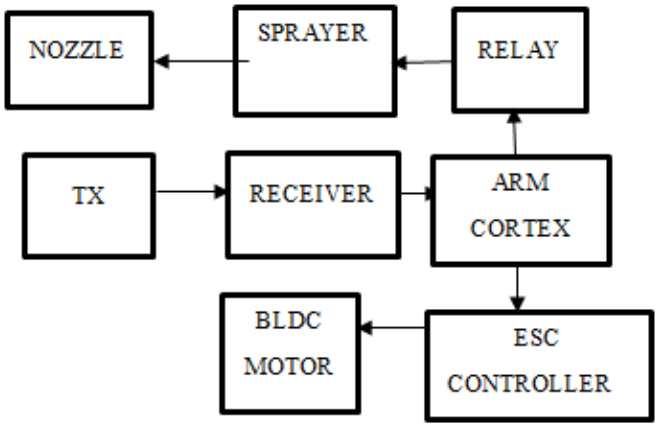

Fig.6 Sprayer Module

11. CHANNELS:

In this 6 channels are used

- One channel for throttle
- Second channel for turning right and left
- Third channel for pitching forward and backward
- Fourth one for rolling left and right

A.PITCH:

Pitch is defined as the whole movement of quadcopter either in forward direction or in backward direction

Fig.7 Pitch

B.YAW:

Yaw is characterized as development of quadcopter either to left or right. The development about the longitudinal pivot of quadcopter is known as move motion

Fig.8 Yaw

C.ROLL:

The movement about the longitudinal axis of quadcopter is known as roll motion.This parameter thus makes quadcopter to fly in left or right direction

Fig.9 Roll

12. RF MODULE:

It ought to work under certain separation and furthermore exchange certain data inside an adequate information rate. The working reach is around 3V to 12V.Data is sent serially from the execution of a RF module will rely upon a few components like by expanding the transmitter's energy a vast correspondence separation will be gathered

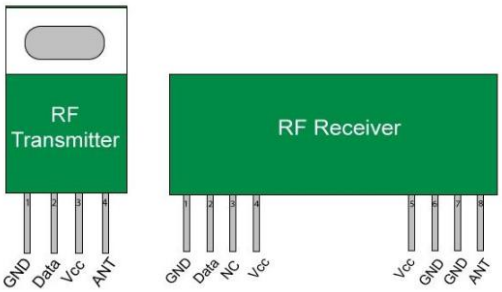

Fig.10 RF Module

A.FEATURES:

- Receiver frequency 433MHz
- Receiver typical frequency 105Dbm
- Receiver supply current 3.5mA
- Low power consumption
- Receiver operating voltage 5v
- Transmitter frequency range 433.92MHz
- Transmitter supply voltage 3v~6v
- Transmitter output power 4v~12v

B.PERFORMANCE OF RF MODULE:

The execution of a RF module will rely upon a few components like by expanding the transmitter's energy a vast correspondence separation will be gathered. It brings about high electrical power deplete on the transmitter gadget, which causes shorter working existence of the battery fuelled devices

13. CONCLUSION:

Our venture usage has effectively expanded the harvest profitability, yield of the product by showering the urea. It likewise lessened crafted by the ranchers and furthermore keeps away from the different sick impacts that may corrupt their wellbeing. It can be utilized requiring little to no effort stages which gives end to end scope of the transmitter. It likewise gives superior in different parameters and is satisfactory by the majority of the agriculturists. It is exceedingly dependable and can be additionally utilized as a part of future situations with different strategies and usage.

14. Future works:

The up-degree later on depends on the application and parts utilized as a part of plan. The extra sensors execution may give the screening of soil ripeness and furthermore is to decide the precise elevation assurance. For following and spy applications GPS module on the pack can be actualized. It can be utilized as a part of land

photography and in different related works in agribusiness.

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