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REMOTE CONTROLLED FERTILIZER SPRAY DRONE

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Abstract--- *The farming sector is the biggest sector of India it comprises around 60% of all sector, as compare to its size the technologies which are developed for improving the condition of farmer and to increase the production of a farm are very less. So, in this paper a drone is discussed which is capable of spraying the fertilizer on field. The Drone helps the farm owners for spraying fertilizer on farm land efficiently and effectively. The drone comprises several units the first unit is communication unit comprises radio a transmitter and receiver for controlling, a microcontroller and sensors for processing and compiling user commands. A spray unit for spraying fertilizer on crops.*

Index Terms--- *Drone, fertilizer, microcontroller, transmitter, receiver, control, crops, farm.*

I. INTRODUCTION

Spraying fertilizer on crop field is one of the most time taking and labours work of farming it require accuracy as well as efficiency[1]. So, for achieving this target a drone is discussed in this paper which is capable for this. The drone have a transmitter which is a radio wave remote control and a receiver which receives signal from transmitter[2]. The receiver is connected with Arduino Uno for processing user's command, several sensors also connected with control unit which provide accuracy and stability to drone. A container is attached with frame of drone for storing fertilizer on board which is pumped out by a motor pump and nozzle for spraying fertilizer upon receiving command from the user.

II. TECHNOLOGIES USED

Arduino Uno: Arduino Uno is a type microcontroller which is used for controlling different electrical and electronic unit. The Arduino Uno have a programmable Atmega628P IC for performing controlled functions. The Arduino Uno have digitalwrite pins for receiving and sensing digital input and output and also have analogwrite pins for receiving and transmitting analogue input and output signal. The Arduino Uno have PWM pins for generating PWM signal[3][4].

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Figure 1: Arduino Uno

BLDC motor: The Brush less Direct current motor also known as BLDC motor, the other names of BLDC are electronically commuted or synchronous motor. The BLDC motor have high RPM and this is a multiphase motor generally three phase[5].

Figure 2: BLDC motor

ESC: The electronic speed controller is used for controlling BLDC motors. The ESC takes input form microcontroller and divides the signal in three parts for each phase for controlling motor. Each BLDC motor require a different ESC motor and control motor optimal stability. The ESC helps BLDC motor by supplying high current when required by the motor[6].

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Figure 3: ESC

Battery: The battery is a device which is used for storing electrical energy in form of chemical energy. In this project we used a LIPO i.e. Lithium polymer battery due to its small size and high charge density. The LIPO battery is capable for releasing current instantaneously if required[7][8].

Figure 4: LIPO battery

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Communication module: In this project we used a radio receiver and a transmitter for controlling the drones operation. A radio receiver is installed on drone for receiving command from the user by a transmitter in form of remote. This module provides remote control to the drone[9][10].

Figure 5: Drone receiver

Figure 6: Drone Transmitter

Sensors: The drone uses a plurality of different sensors for providing better stability to drone. The first sensor used is accelerometer which is used for measuring acceleration and forces acting on the drones. The accelerometer tracks three axial data of drone[11]. The second sensor used is gyro sensor for sensing the angular velocity of the drone for

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providing better control to the drone. The gyro sensor uses earth's electromagnetic field for reference and provides optimal results[12].

Figure 7: Accelerometer Sensor

Figure 8: Gyro sensor

Nozzles: Nozzles are installed in device for delivering fertilizer equally and in a uniform manner on farm field. The nozzle sprays the fertilizer by a created pressure on nozzle by a pump.

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Figure 9: Nozzle spray

Fluid pump: Fluid pump is electrical device which is used for pumping the fertilizer out of the container and the fluid pump creates the pressure into the nozzle. The fluid pump uses a motor and a pumping unit which is connected together by a shaft[13].

Container: A container is associated with the frame of motor for providing storage space for fertilizer fluid. The fertilizer is mixed with water for reducing the concentration of fertilizer and the container is filled with the fluid.

III. PROPOSED MODEL

The proposed model of drone includes basically three units first is communication unit, second is processing and control unit, and third is output unit. The communication unit includes a transmitter which transmits radio waves and a receiver which is installed in drone and connected with second unit i.e. processing and control unit. In this unit a Arduino Uno is installed for performing arithmetic and logical operations. Different sensors are connected with Arduino Uno and all four ESC with motors are connected with Arduino Uno, when user sends signal Arduino Uno process and act accordingly. And third unit is connected with the Arduino Uno which is a pump and a nozzle which sprays fertilizer on crops on receiving commands from the user.

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Figure 10: Prototype 1

IV. PROPOSED MODEL WORKING

The drone is manual controlled which is used by user by controlling through a 2.4GHz transmitter with a range of 100 meters. When user plugs the battery into the system the drone is ready for functioning.

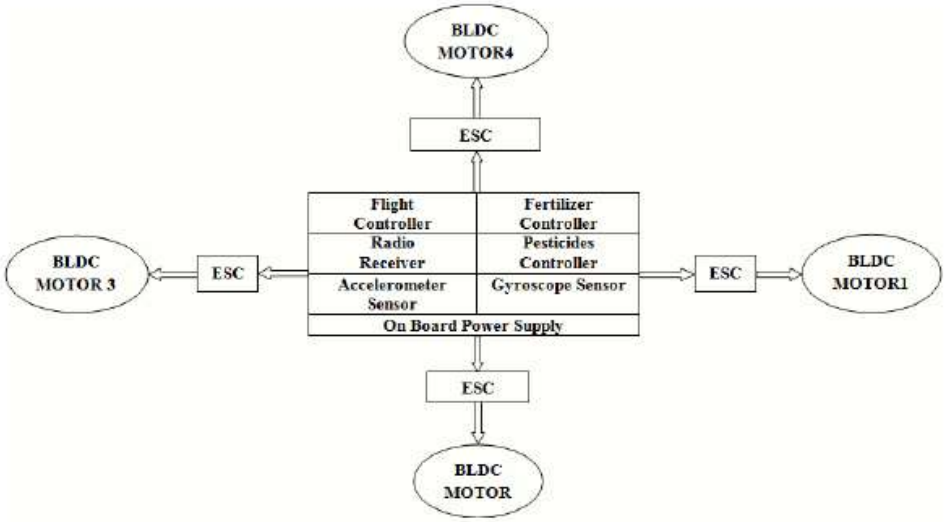

Figure 11: Proposed model control block diagram

When user gives the command to drone it follows a path, firstly the remote/transmitter sends a radio signal, secondly receiver receives the signal and send the receiver signal to controlled unit, and afterward control unit compile the signal and act upon the command given by the user.

The command includes,

Lift-off and land on ground

Move forward-backward

Move left-right

Start/stop fertilizer spray

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V. RESULT

The drone is tested in an open farm field, the drone took 24 minutes for fertilizing one acer of farm land, while we have to replace the battery which only last for 15 minutes. The drone perfectly worked as designed.

VI. CONCLUSION

The drone worked as planned and designed no unit malfunctioned which improve teams confidence. The drone hover over field for 24 minutes and provided fertilizer of 1 acer of land, we refiled the tank of drone twice and replace the discharge battery once with charged battery. In future the battery life of drone will be improved by implementing high power battery and the load carrying capacity will be improved in next prototype.

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