AGRICULTURE DRONE SPRAYER

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Abstract - We live in a nation which is agriculture based. Progressive growth of the agriculture field is the need of this country. Indian farmers or agriculture needs the protective and very good production to increase the productivity. For the crops, to protect them from the insects and to increase their growth we need pesticides and fertilizer to spray on them. There are more than 1 million pesticide cases every year which is get declared by (WHO) World Health Organization. In developing countries like India the fertilizers are get sprayed by human beings, which affects the nervous system of human beings and there are more than 1 lakh deaths in a year. A remote control drone or unmanned vehicles will help the people to spray pesticides on crops without handling it. The Unmanned Aerial Vehicles (UAV) reduces the direct handling of pesticides by human beings and helps to protect them from any injury which will give to them by pesticides. Also the whole area which is get selected by the drone is get sprayed and covered very well.

Keywords - Unmanned Aerial Vehicles (UAV), drones, quad copter, sprayer, ESC.

I. INTRODUCTION

India’s main source to increase the economy of the nation is agriculture. The products which are get produced by the farmers, depends on the various environmental conditions like rain, temperature, weather conditions etc. The crops in farms also get affected by biological factors. Pests or any diseases on crops will damage the crops which reduces the productivity and quality of the product. The pesticides or fertilizers help to avoid the damage of crops which will do by the biological factors. Handling the pesticides manually will not be safe to the human beings as it effects on the nervous system of human beings. The drones or UAVs will always help to the farmers to spray the pesticides or fertilizers on crops by avoiding direct handling. The agriculture drone sprayer is aims to reduce the ill effects of the pesticides on human beings and also to spray it in short time interval for the large area. The large area is also get covered by the drone to spray the pesticides in short timing. As if we observe that, the time require for spraying fertilizers by drone is very less than the time require to spray that manually with the help of any worker. Basically this device is the combination of the quad copter and the spraying mechanism. The UAV helps to fly over the device on crops and the spraying mechanism will help to spray the pesticides on the crops. The control of drone or UAV is manually and gets operated by the operator which will make the drone fly over the sky. The UAV has the plus or X configuration of frames in quad coters, on which the propellers are placed, with the help of that propellers rotating motion the drone starts to fly. The spraying mechanism is connected to that drone which is get programmed and by giving commands to that mechanism, the spraying system is get operated and we get able to spray the...
pesticides or fertilizers on the crops. The batteries and electronic speed controllers i.e. ESCs are also used to control the speed and for the other operations. Controlling the UAV is the main part of the device and the spraying operation.

II. PROJECT METHODS AND DESCRIPTION

The figure shows the systematic block diagram of the agriculture sprayer drone. As we know that the drones are used for various applications like military, camera shooting etc. We are using drone here for the agriculture purpose which is combination of drone or UAV and the spraying mechanism which will help the farmers to spray pesticides on crops safely. The figure shows the block diagram of drone or UAV in which there is an arrangement is shown. If we consider the design for the quad copter then there will be a four legs with the + or X arrangement of that legs are done. On that four legs frame of the drone there is an four ESCs that is Electronic Speed Controllers are connected to the each side of the leg. Brushless DC that is BLDC motors are also connected to each side of the leg with the arrangement of the propellers on that BLDC motors. The Flight controller, Fertilizer controller, Pesticides controller, Accelerometer sensor, Gyroscope sensor are all programmed in the electronics chip which is fully programmed with all kind of the controllers. The radio receiver is separately connected which receives the signal from transmitter and works on it. Transmitter is connected in the remote which contains the various channels as per the requirement. The UAV or drone is get controlled or operated by the channel remote which have the various channels, on that channels the movement of the drone is depended. There are two knobs on that remote in which one knob is deciding the directions of the drone it means that the drone when flies in the sky on which direction it will fly is get decided by that knob’s control. Another knob is used to adjust the speed of the drone which helps to control the drone speed and because of that the stability is get controlled.

III. HARDWARE DESCRIPTION

1. ATmega328
   - 8 Bit Microcontroller with high performance and low power
   - Most single clock cycle execution which have 131 Powerful Instructions.
   - 10 bit ADC in PDIP package.
6 PWM channel.
- SPI Serial Interface which is Master/Slave.
- Advanced RISC Architecture.
- Programmable Serial USART

2. BLDC Motors
- 3000mAh, 25C
- Also known as electronically commutated or synchronous motors.
- Powered by DC electric source via integrated inverter produces AC electric signal.
- Multi-phased, normally 3 phases.
- Constructed with permanent magnet rotor and wire wound stator for quad copters.

3. ESC
- Electronic Speed Controller. Controls the BLDC motor.
- After taking signal from microcontroller, breaks into 3 parts which sends to BLDC motor.
- No. of BLDC motors equal to No. of ESCs used.
- Controlled independently, used for optimal stability.
- 3 high frequency signals are get generated by ESC and are also be able to source a lot of current as the motors can draw a lot of power.

4. LIPO Battery
- Get selected for power sources of most electric modelers.
- High energy storage ratio with high discharge rate.
- Can be found in a single cell (3.7V). Popular choice is 3SP1 batteries which have the meaning is 3 cells connected in series and 1 in parallel.

5. Radio Receiver
- 2.4 GHz signal which comes from the transmitter side.
- 6 independent channels to receive the signal.
- Signal is further send to the microcontroller and gets processed.
- Current consumption is less than 40mA & works on 5 volt power supply.

6. Accelerometer Sensor
This is the sensor which measures the acceleration and force and because of these the downwards gravity is also get sensed. This sensor has the 3 axis, and we can work out the orientation of the device. The full scale range of ±2g, ±4g, ±8g, ±16g is programmable with digital output triple axis accelerometer.
- Integrated 16 bit ADCs.
- 500μA normal operating current.
- Low power mode current: 10μA at 1.25Hz, 20 μA at 5Hz, 60 μA at 20Hz, 110 μA at 40Hz.
- Tap & orientation detection.
- User programmable & high-G interrupt.
- User self-test.
7. Gyroscope Sensor
It measure angular velocity, in other words the rotational speed around the three axes. It is the device that uses earth’s gravity to help them determine orientation.

- Full scale range of ±250, ±500, ±1000, ±2000º/sec.
- Integrated 16 bit ADCs.
- Digitally programmable low pass filter.
- Operating current is 3.6mA.
- Standby current is 5µA.
- User self-test.
- Factory calibrated sensitivity scale factor.

8. Frame
It is the glass fiber frame which is easy to build. It is relatively inexpensive and also the famously durable. The center doubles as a power distribution board. The design is well explained and compact. More space to build the receiver, control board, ESCs and battery with mounting arrangements. There is a different variety of spare parts along with the accessories with landing gears, gimbals, etc.

IV. SOFTWARE DESCRIPTION

1. ARDUINO
To sense and control more physical quantity than your desktop computer the Arduino is a thing for marketing. This is also the open source physical computing platform based on simple board of microcontroller and a good developing environment for software writing on a board. Interactive objects, inputs from switches or sensors, controlling variety of lights, motors etc. for developing this Arduino is used. Programming language is an implementation of writing the arduino is. This is based on the processing multimedia programming environment.

2. Multi wii
- Open source software to provide brain of RC controlled multi rotor flying platform.
- Compatible with several hardware boards.
- Portable, no installation required.
- Popular for multi-rotor craft.
- Has number of advanced features such as GPS position hold and return to home.

V. THE SPRAYING MECHANISM
For spraying pesticides on crops we use the spraying arrangement which helps us to spray the fertilizers or pesticides on the crops. For this we use the tank to collect the pesticide in that and the sprayer is technically connected to that tank which will help to spray the pesticides. There is a nozzle is also connected in that arrangement. When switch is ON, motor placed in tank started to pump the pesticide through pipe with the help of battery. And to avoid the wastage of pesticide there will be a uniform pressure is applied on the tank and because of that the pesticide is correctly get sprayed on the crops.

VI. RESULTS
✓ Spraying time is depends on how much pesticide is available in the tank of fertilizer. If we want to increase the quantity of pesticide available in tank then weight of the tank is get increase. As
the weight is get increase then weight handling capacity should be increase. This can be done by taking higher ratings of BLDC motors.

✔ If we want to increase the flight timing of the quad copter then we should select the high rated LiPO Battery.

✔ This requires less capital cost.

✔ Safe to human beings because it avoids the direct contact of human beings to pesticides.

✔ This reduces the requirement of human being.

✔ It also reduces the time require for spraying the pesticide on the crops.

REFERENCE


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