Development of Unmanned Aerial Vehicle (UAV) for agricultural spraying- Approach towards farmers' empowerment

[1]**Vrushabh Mohane**[2]**Vikrant Butle**[3]**Shubham Papadkar**

[123]*UG Scholars, Department of Mechanical Engineering, Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur.*

[1] **Prof. Ashwadeep Fulzele (Guide)** [2] **Dr. Prashant Kadu (Co-Guide)**

[1] *Professor, Department of Mechanical Engineering, Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur*
[2] *Principal, Abha Gaikwad- Patil College of Engineering*

Abstract—*The use of pesticides in agriculture is essential to maintain the quality of large-scale production. The purpose of agricultural sprinkler drone is to develop a quad-copter which carries pesticides to spray all over the farm which reduces the work of farmers as well as it finishes his work soon. . This is to develop a user friendly interface for the farmers. The agricultural sprinkler drone is a pesticide spraying quad copter for agricultural purpose which helps the farmer to spray the pesticides all over his land so that it reduces his work which can evenly spray all over his farm. A remote controlled UAV (Unmanned Aerial Vehicle) is used to spray the Pesticide to avoid the humans from pesticide poison. The UAV is operated manually triggered by RF controlled nozzle. The vertical take-off and landing quadcopter is used to spray the low volume pesticides in small area. This project describes the development of quadcopter UAV for agricultural spraying. This model is used to spray the pesticide content to the areas that can't easily accessible by humans. Multispectral camera is used to identify the green fields as well as the edges of crop area. The remote sensing images are analyzed by QGIS software.*

Keywords— *Unmanned Aerial Vehicle (UAV), Remote Sensing, GPS, Multispectral Camera, Spraying system, BLDC.*

I. AIM

The main aim of this project is to fabricate and develop Unmanned Aerial Vehicle (UAV) for agricultural spraying. This is the approach towards farmer's empowerment. In this project hand sprinkler is replaced by UAV sprinkler.

II. OBJECTIVE

To design and development of Unmanned Aerial Vehicle (UAV) for agricultural spraying.

III. MOTIVATION FOR SELECTING THIS RESEARCH

UAV inbuilt pesticide sprayer is basically Sprayer integrated into a quad copter to spray pesticides and fertilizers in open crop fields. The main objective of this project is to reduce the ill-effects to humans. The quadcopter is used to spray the contents under any climatic conditions. The UAV inbuilt sprayer contains a universal sprayer which is used to spray the both Fertilizer and Pesticide on a same sprayer. The Universal nozzle is used to regulate the Liquid content as well as solid contents. The pressure pump is used on a Pesticide spraying and not on Fertilizer Spraying. Multispectral camera is used to capture the remote sensing images which are used to identify the green fields as well as the edges of crop area.

IV. COMPONENTS DESCRIPTION

A.   ADRUINO MEGA 2560:

It is a micro controller which has 54 digital I/p O/p pins out of which 14 pins can be used as PWM pins. It allows inserting a new code

B.   ACCELEROMETER ADXL335:

The three axis accelerometer IC used to read X, Y, Z acceleration as the voltages. It will measure the amount of acceleration due to gravity and with the help of it we can find out the tilting angle.

C. WIFI MODULE ESP 8266:

The WIFI module uses the software serial port and the hardware serial port for uploading and debugging. The ESP 8266 is a transceiver module. It is of small size and low cost and will work on 3.3V and consumes current Upto250mA.It is not usually powered on battery it should be powered with 3.3V not with 5V so we use the level conversion to communicate with Arduino.

D. LI-PO BATTERY:

Lithium batteries are the preferred power resources for most electric modelers today. They offer high discharge rates and a high energy storage/weight ratio. However, using them properly and charging them correctly is no trivial task.

E. GPS MODEL 6050:

The MPU 6050 sensor contains accelerometer and MEMS gyro in a single chip. It has 16-bits analog to digital and has a sensor 12c-buss to get interface with Arduino. It contains both accelerometer and gyro.

F. HMC5883L 3 AXIS MAGNETOMETER:

It is a three axis digital compass magnetometer which gives the direction of the drone it is interfaced using I2C with Arduino.

G. SERVO MOTOR:

Servo Motor are used to control positions of objects, rotate objects. This can be used as a switch also. This is small in size and they have built-in circuitry to control their movements so that it can be directly connected to Arduino board also. It has three colored wires brown (GND), red (5V), and yellow (PWM). The PWM input will be connected to one of the Arduino's digital output pins.

H. ESC:

ESC is used to control BLDC motor. It takes signal from microcontroller and breaks into 3 parts and sends it to the BLDC motor. We would require 4 ESCs as we are using 4 BLDC motor. The ESC generates three high frequency signals with different but controllable phases continually to keep the motor turning. The ESC is also able to source a lot of current as the motors can draw a lot of power

V. SCOPE OF WORK

In this paper we develop agricultural unmanned aerial vehicle (UAV) for spraying. Drone is a pesticide spraying quad copter for agricultural purpose which helps the farmer to spray the pesticides all over his land so that it reduces his work which can evenly spray all over his farm. It reduces the workload of the farmers and also completes the work very fast.Due to development of UAV for agricultural spraying, farmers does not comes in contact with hazardous pesticides.

VI. PROPOSED METHODOLOGY

The quadcopter system is first switched on and this in turn causes the quadcopter to switch on. The joystick is kept at position zero. Once it is at position zero the gyroscope starts calibration and the indication light turns on, later blinks. After the light turns off the joystick is moved to position start 1. The throttle then is moved. After that even if there is no input from joystick the readings from the gyroscope is taken and the quadcopter moves according to the readings of the gyroscope. When quadcopter moves to the desired location, the sprayer module can be turned on. After that the joystick is moved back to start 0 position. Once the joystick is in start 0 the motor gets turned off. Thus, the system gets turned off.

VII. CONCLUSION

The scope of the project is to develop a user friendly interface for the farmers. The agricultural sprinkler Drone is a pesticide spraying drone for agricultural purpose which helps the farmer to spray the pesticides all over his land so that it reduces his work which can evenly spray all over his farm. Here the farmer can control the drone using an android app and he can connect to the app using Wi-Fi module which is interfaced in the drone. It will precisely route the land area of that particular famer's land using GPS no matter shape of the field and type of the crop the pesticide spraying drone will get the job done.

VIII.   FUTURE SCOPE

From the future perspective, agricultural sprinkler drone can assist farmers to reduce excessive use of pesticide and will contribute to reducing the chemical load on the environment by spraying on the plant that require attention. Therefore, it future this can be called as the green-tech tool. Drones are not only confined to the agricultural sector but can successfully be used across several industries such as Military and for delivering purpose.

Governments of developed countries are focusing on setting out the favorable strategy for enhancing the use of such drones by increasing the funding and commercializing agriculture technologies.

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