TRANSFLOWER SMART AGRICULTURE DRONE SPRAY SYSTEM

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ABSTRACT

The main objective this project is to design and manufacture a Quadcopter which can be used for the Smart agricultural purpose. The main aim of this project is to reduce human efforts in agricultural surveillance and spraying pesticides, fertilizer and herbicide on agriculture land. We propose an architecture based on Quadcopter for agricultural applications where Quadcopters are responsible for Autonomously spraying chemicals pesticides, fertilizer and herbicide on crops. An algorithm will be evaluated the Quadcopter route. Autonomously controlled drones are pre-programmed flight plans or more complex dynamic automation systems, where humans are not involved in the actual operation. These plans are developed in advance, but are individually realized afterwards. The technology needs to be involved to improve agriculture. Agricultural Business Performance is increase by using Smart Agriculture Drones.

Keyword : - *Quad-copter, GPS, Ultrasonic Sensors, IR Sensors, Raspberry pi.*

1.INTRODUCTION

In recent few decades, the use of chemical pesticides, fertilizers and herbicides on agricultural land have been increased in a huge quantity, this increase in quantity not only affect the Environment i.e. Mother Land but also affect the human health. This system has advantage of reducing labor workers, spraying time and resources like water and chemicals over conventional spraying methods and also can improve yield and crop health. In this paper, we have proposed a system by using the Respberry pi, Web Technologies and CLOUD COMPUTING with the use of drone for image Capturing, Processing and Analysing of soil and field analysis. They can be used to produce accurate 3-D maps that can be used to conduct soil analysis on soil property, moisture content, and soil erosion. Even after planting, such information is useful for both irrigation and the management of the nitrogen level in the soil.

The system can also be used for Automatic Agriculture spraying purposes. Drones are used to offer farmers a birds eye view of crops by flying at very low altitudes. This allows farmers to spray pesticides selectively on plants that actually need the pesticides. This helps to save a huge amount of money, and it also helps to minimize the damage to the environment from pesticide use as well. One of the largest obstacles in farming is crop monitoring of vast fields. This challenge is made worse by the rise of unpredictable weather patterns which lead to increased risks and maintenance costs. Drones can be used to develop time series animations to show precise crop development which reveals production inefficiencies hence better crop management. The purpose of this study is to make Smart Agriculture drone system that not only reduce the use of chemical pesticides, fertilizers and herbicides but also easily monitoring by use of drone and reduce time and cost.

2. MOTIVATION

The Excess use of chemical pesticides, fertilizers and herbicides for the Agriculture purpose affect the Environment that means it cause Soil and Water Pollution. Also chemical pesticides, fertilizers and herbicides has adverse effect on Human Health. Our aim is to provide a automotive controlled spraying Mechanism.

3. GOALS AND OBJECTIVE

To spaying Liquid pesticides, fertilizer and herbicides on agricultural land by using Drone.
To build a Automation Smart Agriculture Drone for surveillance and spraying pesticides, fertilizer and herbicide on agriculture land.

4. SYSTEM ARCHITECTURE

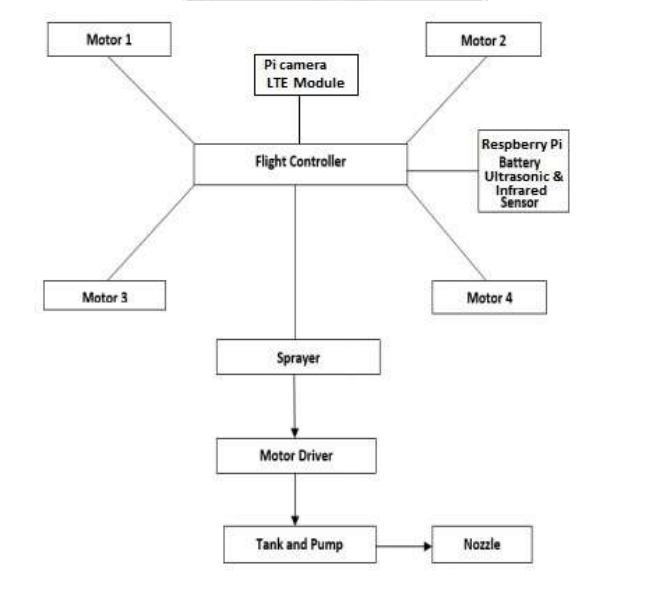

Fig. System Architecture

The proposed system design is based on different function such as obstacle detection, location mapping and image processing. All the task are complete by using the different software and hardware components.

The system contains four modules:-
1) Obstacle detection.
2) Image processing.
3) Location Mapping.
4) GPS system

1.Obstacle detection:- The proposed system uses two type of sensors i.e. Ultrasonic sensor and IR sensor. Ultrasonic sensor used for the obstacle detection and IR sensor used for Disease detection on plant.

2. Image processing:- In this system Raspberry pi used for the image processing. Image capturing camera, Raspberry Pi board to run plant image recognition programs on it.

3. Location Mapping:-
Location Mapping is the process of taking the input from user to describe the area with computer program.

4. GPS system:-
When global positioning system is usedto the current location of drone can be determined. Also find path from source to destination.

5. WORKING

Our main focus was on Following drone, which detects plant and avoids obstacles, coordinate with Google Maps API, get route and follow the route. For another application, it checks plant and automatically spray on it.
System Module:

The system consists of three subsystems: input unit (camera, ultrasonic sensor), processing unit (computer) and Drone control unit. These all task are completed by using the Global positioning system for source to destination.
1. System Design: The system consists of three subsystems: input unit (camera, ultrasonic sensor), processing unit (computer) and drone control unit.

2. Input unit:- A Raspberry Pi board (model B+), attached with a pi camera module and an HC-SR04 ultrasonic sensor is used to collect input data. Two client programs run on Raspberry Pi for streaming color video and ultrasonic sensor data to the computer via local connection.

3. Processing unit: The processing unit (computer) handles multiple tasks: receiving data from Raspberry Pi, plant detection, obstacle detection and sending instructions to Flight Controller through USB connection.

4. Control unit: The drone used in this project has an on/off switch type controller. Thus, an flight controller board is used to simulate button-press actions. The Flight Controller is connected to the computer via USB. The computer outputs commands to Flight controller using serial interface, and then the Flight controller reads the commands and writes out LOW or HIGH signals, simulating actions to drive the drone.

6. HARDWARE AND SOFTWARE REQUIREMENTS

A pre-built Drone is used as a base on which following hardware components are :-

1. Raspberry Pi:- :- The Raspberry Pi is a credit card-sized single-board computer. There are currently five Raspberry Pi models in market i.e. the Model B+, the Model A+, the Model B, the Model A, and the Compute Module (currently only available as part of the Compute Module development kit). All models use the same SoC (System on Chip - combined CPU & GPU), the BCM2835, but other hardware features differ.

2. Sensors: - Ultrasonic and IR sensor are used for Obstacle detection. Ultrasonic sensors (also known as transceivers when they both send and receive, but more generally called transducers) evaluate attributes of a target by interpreting the echoes from radio or sound waves respectively. In this project, they are used to detect the distance of obstacles from the drone.

3. Pi camera: - It is the camera shipped along with Raspberry Pi .Pi camera module is also available to which can be used to take high-defination videos as well as still photographs.

4. LTE Module:- LTE Module are used for the internet connectivity of Drone.

5. Flight Controller: Pixhawk Flight Controller.

6. SD card:16 GB memory.

7. BLDC motors: Four BLDC motors are required for the drone. BLDC motors are high speed motors and they will start to rotate at specified speed which is controlled by the respective ESC.

8. ESC Device: Four 30 Amp Esc contoller are required for drone they control the speed of BLDC motors.

9. Lipo Battery: 5000 mAH Battery are require for powerup the drone.

7. LITERATURE SURVEY

[1] Prof. S. Meivel M.E., Dr. R. Maguteeswaran Ph.D., N. Gandhiraj B.E., G. Srinivasan Ph.D. has published a paper entitled as "Quadcopter UAV based Fertilizer and Pesticide Spraying System".
In this paper the authors has given detail information about implementation of Agriculture wonder drone. They gave detail about Quadcopter UAV and sprayer module and also discuss pesticide content to the areas that can't easily accessible for human beings. They explained the used of multispectral cameras which is used to capture remote sensing images to identify the green field as well as the edges of crop area. Total pay load lift of their quad copter is 10 kg. They used QGIS software for the purposed of analyzing the remote sensing images. The published paper is available at International Academic Research, Journal of Engineering Sciences, Volume 1, Issue 1, February 2016.

[2] Prof. P. P. Mone, Chavhan Priyanka Shivaji, Jagtap Komal Tanaji, Nimbalkar Aishwarya Satish has published a paper entitled "Agriculture Drone for Spraying fertilizer and Pesticides".
In this paper authors have given detail information about the implementation of Agriculture drone for automatic spraying mechanism, they gave problem statement of WHO where it estimates that there are 3 million cases of pesticide poisions in each year and upto 220,000 deaths, primarily in developing countries. In this paper they also explain what precautions the farmer should have to use to avoid harmful effects of pesticides, fertilizing and herbicide effects as well as cost effective technology using components such as PIC microcontroller for the control of agriculture robots. This paper is available at IJRTI, Volume 2, Issue 6, 2017.

[3] Prof. K. B. Korlahalli, Mr. Mazhar Ahmed Hangal, Mr. Nitin Jituri, Mr. Prakash Frances Rego, Mr. sachin M. Raykar have published a paper entitled "An Automatically Controlled Drone based Aerial Pesticide Sprayer".
In this paper authors has given detail information about implementation of Agriculture Wonder Drone System. In this paper, the wireless drone system based on flight controller, GPS, BLDC motor, electronic speed control (ESC), wireless transceiver, frame, propellers and battery, etc. They used flight controller board for controlling the drone such as movement, lifting, positioning, etc. flight controller is programmed in this project for handling different sensors such as GPS, Barometer, Accelerometer, Gyroscope, etc. and components such as motors. This drone was programmed for specially two modes first is manual mode and second is autonomous mode. This paper was published by K. L. E. Institute of Technology, Hubballi.

8. METHODOLOGY

In this system, We are using Breadth First Search (BFS) algorithm for path finding which is one of the best graph theory algorithm. In this algorithm all the nodes of the graph get traversed in breadth wise order and it return the path if it finds the destination node. BFS algorithm then sends the path along with crop, plant coordinates to Smart agriculture drone and then we can successfully traverse the path and reach to crop, plant coordinates and spray the pesticides, fertilizer and herbicide on it, similarly it perform this action on other plant coordinates till it reach it's Final destination.

9. ADVANTAGES

1. Reducing cost on labour workers for spaying.

2. Reduce time for spaying Liquid pesticides, fertilizer and herbicides on agricultural land.

3. Protecting farmers from poisoning and heatstroke, while spraying liquid pesticides, fertilizer and herbicides on agricultural land.

4. Environment Protection by reducing the use of pesticides, fertilizer and herbicides on agricultural land.

10. CONCLUSION

The goal was to achieve in the system which will reduce the human efforts in agricultural surveillance and spraying pesticides, fertilizer and herbicide on crop. We propose an architecture based on Quadcopter for agricultural applications where Quadcopters are responsible for Autonomously spraying chemicals pesticides, fertilizer and herbicide on crops.
The implementation of drone will reduce the time and efficiency of the production which leads the higher production. This will enable the small farmers to utilize the smart agriculture.

11. FUTURE WORK

1. Weight lifting capacity of quadcopter can be increase by increasing the total numbers of Brushless Motor and increasing size of propeller.

2. Total flight time can be increased by extending the battery capacity.

3. large surface area can be sprayed by using more nozzle which may arrange in sequencial manner.

4. Tank size can be increase for increasing carrying capacity of Chemical liquid pesticides, fertilizer and herbicide.

5. Area to be spraying Chemical liquid pesticides, fertilizer and herbicide can be provided to Smart Drone by the use of mobile using GPS map.

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