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SYNOPSIS ON

RS3:AGRICOPTER

Submitted by

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1.2 Introduction

Over the last few years, we have seen massive growth in the manufacture and sales of remote control airborne vehicles known as Drones. There are so many types of drones based on their arms, preferences, etc. A quadcopter is an aircraft with four main propellers that provide lift. The four motors which drive the propeller are fixed onto the respective sides of the frame of the drone. A camera module is implemented for monitoring and survillance purpose.

One of main source of income in of India is Agriculture. The production rate of crops in agriculture is based on various parameters like temperature, humidity, rain, etc. Which are natural factors and not in farmers control. The field of agriculture is also depends on some of factors like pests, disease, fertilizers, etc which can be control by giving proper treatment to crops. Pesticides may increase the productivity of crops but it also affects on human health. So the main aim of this paper is to design agriculture drone for spraying pesticides. In this paper, we are going to discus different architecture based on unmanned aerial vehicles (UAVs). The use of pesticides in agriculture is very important to agriculture and it will be so easy if will use intelligent machines such as robots using new technologies. This paper gives the idea about various technologies used to reduce human efforts in various operations of agriculture like detection of presence of pests, spraying of UREA, spraying of fertilizers, etc. This paper describes the development of quad copter UAV and the spraying mechanism. In this paper we also discuss integration of sprayer module to quad copter system.

The discussed system involves designing a prototype which uses simple cost effective equipment like BLDC motor, Arduino, ESC wires, etc.

1. Problem Statement and Formulation

The problem that hobbyists, growers, farmers, and business entities have with UAV technology is that there seems to be some absence of potential market knowledge on such a new and sometimes controversial product. Agriculture in India constitutes more than 60% of occupation. It serves to be the backbone of Indian economy. It is very essential to improve the productivity and efficiency of agriculture by providing safe cultivation of the farmer. The various operations like spraying of pesticides and sprinkling fertilizer are very important. Though spraying of pesticides has become mandatory it also proves to be a harmful procedure for the farmers. Farmers especially when they spray urea, take to many precautions like wearing appropriate outfit masks and gloves. It will avoid any harmful effect on the farmers. Avoiding the pesticides is also not completely possible as the required result has to be met. Hence fore, use of robots in such cases gives the best of the solutions for this type of problems, along with the required productivity and efficiency of the product.

According to survey conducted by WHO (world health organization) it is estimated that every year about 3 million workers are affected by poisoning from pesticides from which 18000 die.

This projects aims to overcome the ill-effect of the pesticides on human beings and also use to spray pesticides over large area in short intervals of time compare to conventional spraying by using automatic fertilizer sprayer. This device is basically combination of spraying mechanism on a quad copter frame .This model is used to spray the pesticides content to the areas that cannot easily accessible by humans. The universal sprayer system use to spray liquid as well as solid contents which are done by the universal nozzle.

Objective of the project work

- To select the required material for increasing the flying time of drone by structural, model, dynamic, and crash and others analysis of its materials by element method.
- To fly the drone by using the stability and control the drone by using a remote and monitoring the structural environment by using an image processing camera for surveillance purposes by using yield optimization and monitor crop growth and crop production.
- To obtain the physical enviormental conditions and structural behaviour of crops and using that providing the suitable crop optimization.

2. Literature review

2.1 Akturk E, Altunel AO (2019) Accuracy assessment of a low-cost UAV derived digital elevation model (DEM) in a highly broken and vegetated terrain.

Description: To build a drone which can feasible for any conditions and fly on any air terrian in any conditions. Which will help the drone to fly in any situation based conditions. It is mainly deals with the terrians that helps the drone to move in any conditions based on the architecture. According to the project work it consist of advance technology that help the drone to perform in challenging conditions. The drone is mainly deals with the image processing part that will detect the 3D objects that will next coded as digital signal.

2.2 Alzahrani B, Oubbati OS, Barnawi A, Atiquzzaman M, Alghazzawi D (2020) UAV assistance paradigm: State-of-the-art in applications and challenges. J Netw Comput Apple.

Description: To assist the drone to coverage , assistant , monitor and Relay conditions . The outcome of this paper is to assist the drone to control coverage the area so the drone can easily tranform it position. It will help the drone in heavy terrians to face challenges that requires for application purpose. The drone UAV is control using the satellite communication which will control the drone in all 3 transform positions.

2.3 Anwar N, Najam FA, Izhar MA (2018) Construction monitoring and reporting using drones and unmanned aerial vehicles (UAVs). Paper presented The Tenth International Conference on Construction in the 21st Century (CITC-10). AIT; Colombo, Sri Lanka.

Description: To control the drone using wireless devices and monitor and send report using UAV technology that related with wireless communication. In image processing part the drone will monitor and detect the sorroundings and create a 3D model in order to form a suitable planning structure. It will help in building , constructions etc.

2.4 Arfaoui A (2017) Unmanned aerial vehicle: Review of onboard sensors, application fields, open problems and research issues. Int J Image Processing.

Description: To perform wireless communication based on the antenna transmission and receive on the radio waves. The control will pass through the antenna which help the drone to move and perform certain operations. In this part the drone will perform photogeometry and remote sensing activities. It will perform monitoring operation and send the data to the user using remote signals.

2.5 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" (2017).

Description: The precautions that farmer should have to use to avoid harmful effects of pesticides and fertilizing effects as well as cost effective technology using components such as PIC microcontroller for the control of agriculture robots.

3. Methodology

After building the drone mainly the flight control contains 3 built in sensors which helps the drone to fly in stability and move from one place to another place with a certain distance to avoid da crash with collision of propellers or body. These sensor acts as actuator in drone . If any object is found infront or ant side it will alert the user and stop or move away from the object. During take off condition the drone should provide high power to the motor so that is can fly. In this process there will be a equal power for all the motors. If any motor gets low power the drone will be crash . When the drone takes off the weight of the drone will be lesser than the motor speed. In this condition only the drone will be takes off.

After take off , when it reaches to a certain level the wieght of the drone will be equal to the motor speed. To maintain the balance the all the motor are given eqaul amount of power. In case of tranformation , To move forward the drone will increase the speed of the rear end motor. For move backward the front motor will given high power . For different movement the motor speed will be change.

All this will be controlled by flight controller which controlled direct by remote by the user. According to the user instruction the flight trasnmitter and reciever will send message to the flight controller and the flight controller will perform certain operations. A camera module is implemented for live footage and image processing purpose.

The camera will detect the objects or behaviour of thr crops from the application. This will be transmited to the user for further inspection. According to the crops behaviour , the user can take required actions that will helps the crops to grow well. This project is mainly about agricultural and fundamental needs . It will helps the user to monitor the crops remotely , and based on the monitorization the user can take the action.
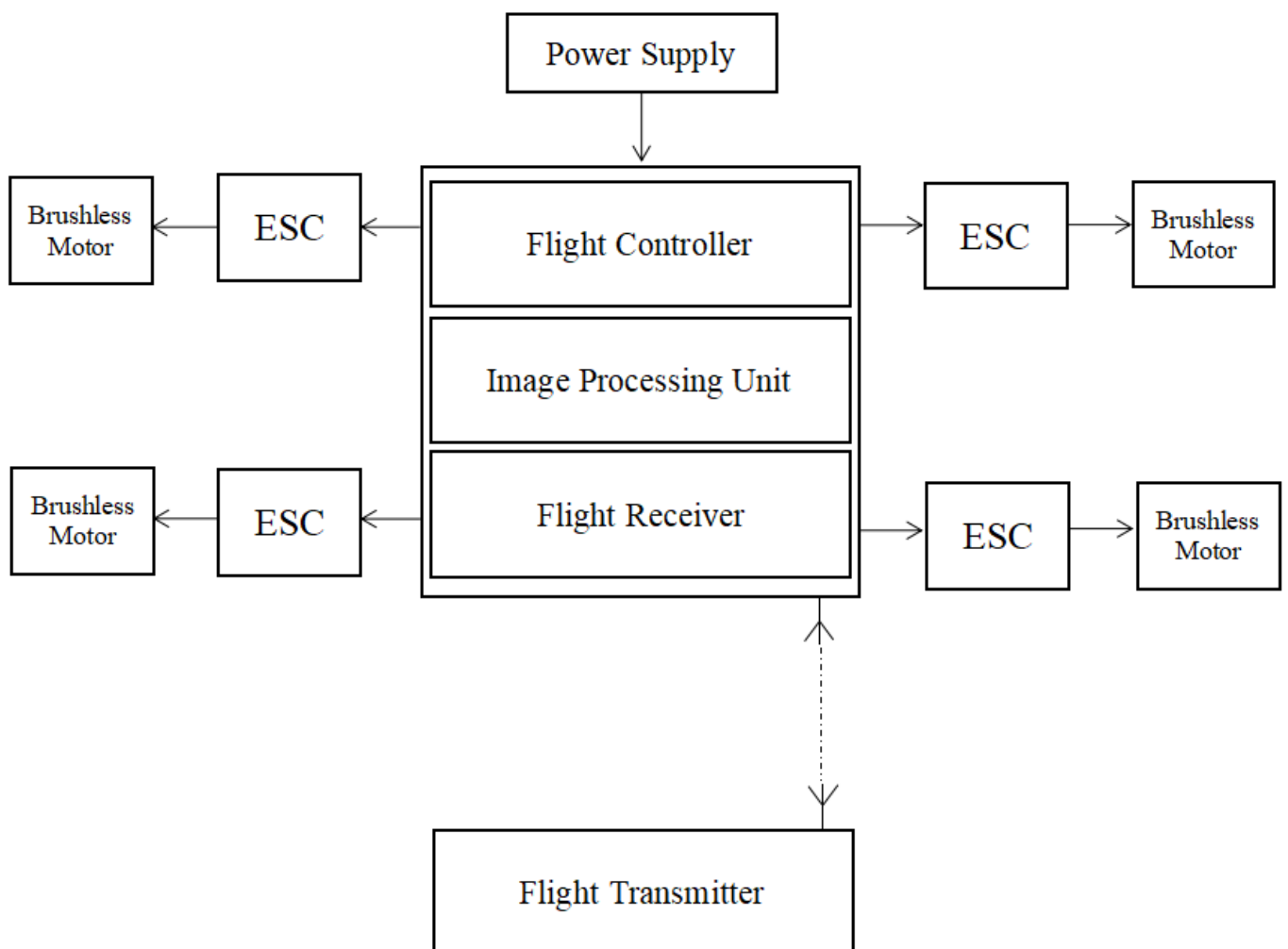

Figure 5.1 Block Diagram of AGRICOPTER

4. Functional partitioning of project

The technique of system or program decomposition in which the primary criterion is to identify the problem statement and work for the solution that is based on agricultural applications.

6.1 Control Unit

The quadcopter is controlled by adjusting the angular velocities of the rotors which are spun by electric motors. Quadcopter is a typical design for small unmanned aerial vehicles (UAV) because of the simple structure. The flight controller uses the data gathered by the sensors to calculate the desired speed for each of the four motors. The flight controller sends this desired speed to the Electronic Speed Controllers (ESC's), which translates this desired speed into a signal that the motors can understand.

There are four main drone controls:

- *Roll*: Done by pushing the right stick to the left or right. Literally rolls the drone, which maneuvers the drone left or right.

- *Pitch*: Done by pushing the right stick forwards or backward. Tilts the drone, which maneuvers the drone forwards or backward.

- *Yaw:* Done by pushing the left stick to the left or to the right. Rotates the drone left or right. Points the front of the copter in different directions and helps with changing directions while flying.

- *Throttle:* To increase, push the left stick forwards. To decrease, pull the left stick backward. This adjusts the altitude, or height, of the drone .

6.2 Image Processing Unit

The acquired images endure multiple platforms of processing to end up with the desired results. Combination of images for occlusion detection; filtering for noise reduction; thresholding the images to determine gray value; segmentation or edge detection to find objects; pattern recognition for template matching; blob detection to count the number of blobs segmented; color analysis and deep learning processing are some image processing methods for machine vision system. The position and orientation measurements are provided to robots through machine vision for axis control and locomotion. In this project the image processing is mainly deals with crop health detection by using micro python langauge.

It detect the crop , identify it , monitor the structural and enviornmental behaviour , and convert into user format so that the user can easily detect the issue or problems that will harm the agricultural enviornment and try to solve it .

It has a wide range of applications in almost every field. Python is one of the widely used programming languages for this purpose. Its amazing libraries and tools help in achieving the task of image processing very efficiently. An image is a visual representation of something, while a digital image is a binary representation of visual data. These images can take the form of photographs, graphics and individual video frames. For this purpose, an image is a picture that was created or copied and stored in electronic form.

Image Processing systems focus on transforming images from one form to another, and Computer Vision systems help the computer to understand, and get meaning from an image. Many Computer Vision systems employ Image Processing algorithms.

7. Expected outcome of the project

It can be concluded that the Quadcopter is successfully implemented and work with a stabilized architecture. The image processing unit can easily monitor and process the image for crop optimization. Other applications like industrial inspection, package delivery, and military operations are evolved and are expected to get better in the future.

8.Tools required

To develop the robo spider we require some tools or components. The required components are given as follows:
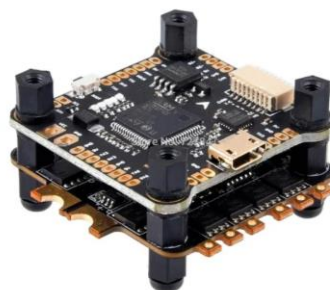
8.1 Flight Controller

Figure 8.1 Flight Controller

The flight controller uses the data gathered by the sensors to calculate the desired speed for each of the four motors. The flight controller sends this desired speed to the Electronic Speed Controllers (ESC's), which translates this desired speed into a signal that the motors can understand.

8.2 Brushless Motor

Figure 8.2 Brushless Motor

In a brushless motor, the rotor has permanent magnets affixed to it, and the stator has windings. Brushless motors can be constructed with the rotor on the inside, as shown above, or with the rotor on the outside of the windings.

8.3 ESC Module

Figure 8.3 ESC Module

An electronic speed control (ESC) is an electronic circuit that controls and regulates the speed of an electric motor. It may also provide reversing of the motor and dynamic braking. Miniature electronic speed controls are used in electrically powered radio-controlled models.

8.4 Flight Transmitter and Receiver

Figure 8.4 FlySky 6 channel radio transmitter and receiver

FlySky FS-i6 Transmitter Receiver. This radio system uses a high gain and high quality multi directional antenna,it covers the whole frequency band. Associated with a high sensitivity receiver,this radio system guarantees a jamming free long range radio transmission. Works in the frequency range of 2.405 to 2.475GHz.

8.5 Power Supply

Figure 8.5 11.1V Lipo battery

A 11.1V 2200mAH Lipo battery is capable of maximum continuous discharge rates up to 25C, placing this battery among the most powerful Li-Po battery packs in its class. It offers an excellent blend of weight, power and performance. Charge capacity(C) :2200mAh. High energy density - potential for yet higher capacities.

8.6 Image processing unit

Figure 8.6 Camera Module

Image processing technique has been proved as effective machine vision system for agriculture sector. Imaging techniques with different spectrum such as Infrared, hyper spectral imaging, Remote sensing were useful in determining. the vegetation indices, canopy measurement, land mapping etc with greater accuracies.

It is important to monitor the plant during its growth period, as well as, at the time of harvest. In this paper image processing is used as a tool to monitor the diseases on fruits during farming, right from plantation to harvesting. For this purpose artificial neural network concept is used. It can provide insightful information about crops without even touching them. Processing the data using software installed on a local desktop computer or network, Uploading the data to a cloud-based system for automated processing, Giving the data to experienced professionals who will handle the processing. It helps to improve images for human interpretation.

Information can be processed and extracted from images for machine interpretation. The pixels in the image can be manipulated to any desired density and contrast. Images can be stored and retrieved easily. The widely used algorithms in this context include denoising, region growing, edge detection, etc. The contrast equalization is often performed in image-processing and contrast limited adaptive histogram equalization (CLAHE) is a very popular method as a preprocessing step to do it .Python is one of the widely used programming languages for this purpose.

9. Software Used

An Android mobile device has been installed in our Drone's payload system for live video stream, live position tracking and real time voice communication. By the aid of two android software, we have manipulated audio video transmission and GPS position tracking system.

10. Scope of the project

The main objective of project is to design and develop a stable flying drone as a model for general purposes that can be used for agriculture applications. The drone should be able to support lifting a phone or similar weight, and some minor modifications should be applied to it.

The drone could be replaced in such a way that would fit any other application. It started the introduction of report by defining what a quadcopter is, simply because drone's flying 15 system will be in that form in which a brush less motor will be inserted in each arm. As for the control part, we will be using a remote controller in which a transmitter will be inserted inside that would communicate the receiver placed in the drone. Besides, if time allows, It will investigate the feasibility of using the image processing technology in order to enable the drone to avoid obstacles and recognize people's faces.

11. References

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