

QUADCOPTER FOR AGRICULTURE

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Abstract-The project goal was to design a semiautonomous Quad copter for the purpose of agricultural use. The Quad copter was designed to be small enough so that costs would be minimized. It is used for agricultural spraying, viewing and surveillance. The aerial Quad copter used for agricultural surveillance is an unmanned vehicle used for proper and accurate surveying of the crops and leaves reducing the human effort. The agricultural farm is surveyed by an infrared camera which will show the color image displaying the difference between infected or diseased crop and matured crop. The innovative foldable frame design developed will allow the Quad copter to be transported safely and with ease in a cylindrical shaped cushioned box packing. A tank is placed above the quad copter. By the use of tube the solution is supplied to sprayer. This paper introduce a quad copter which is used for pesticide spraying in agriculture field is handle by android application. Here the quad copter can be control through android phone for fertilizer spraying. This system reduces the problem related to the agricultural field and also improve the agricultural productivity.

I. INTRODUCTION

A Quad copter is a multi-copter that is propelled and lifted by four propellers (rotors). Opposed to fixed-wing aircraft (most common example is an airplane), a Quad copter's lift is generated by revolving narrow-chord airfoils, symmetrically placed, are adjusted as a group. Control of motion is attained by altering the pitch and/or rotation rate of one or more propellers. The Quad copter can have other applications instead of just a fun recreational model. One use is for the military, instead of sending someone into a dangerous area, the Quad copter equipped with a camera would fly in and gather valuable reconnaissance information. A unique framework is offer by automated agriculture for robotic developments. Precision agriculture can be automated for primary and secondary agricultural tasks. The primary goal is to improve the agriculture production. The coupling between field workers and robots should be done in such a manner that humans should feel comfortable in the presence of robots. HRI system is introduced to face issues such as regulations, safety and comfort. Flexible automation is focused in this work. This paper introduce a quad copter which is used for pesticide spraying in agriculture field is handle by android application. Here the quad copter can be control through android phone for fertilizer spraying. This system reduces the problem related to the agricultural field and also improve the agricultural productivity. Each rotor

produces both a thrust and torque about its Centre of rotation, as well as a drag force opposite to the vehicle's direction of flight. Quad copter achieves lift, yaw, roll and pitch simply via a manipulation of the thrusts of four motors relative to each other. This way, fixed rotor blades can be made to man oeuvre the quad rotor vehicle in all dimensions. Applications of quad copter are in, agricultural surveying, weather forecasting, traffic forecasting, scenic photography, weapon for war crisis, post natural disaster analysis, civil surveying, for chemical leaks and amusements.

II. METHODOLOGY

The kk controller is chosen as the basis for this project because of its open source nature and readymade code availability. This project uses kk 5.5. It is chosen because of the ability to use full sized shields like the aero quad shield.

The controller can be powered by either by feeding a dc voltage into the 2.1mm jack or by supplying that same voltage to the Vin and ground pins on the board. It is recommended to use a voltage in the range of 7v to 12v. The board can accept voltages anywhere from 6v to 20v but anything above 12v will cause the regulator to heat and may cause damage after a prolonged time [6-7]. The project uses a 12v battery connected to the 2.1mm port to power the board. The aero quad toolbox is used to configure and calibrate all of the sensors attached to the aero quad shield. This allows us to adjust sensor reading to work in different locations and altitudes. It also allows us to configure the ESCs. This makes sure that each of the motor will spin at the same speed when the same speed signals are sent to them.



Fig1. Full View of quad copter

Operating the Drone -

Ascending and descending: - Push up the throttle stick, and the spinning speed of the main blades will increase. The aero quad begins to ascend and if pull down the throttle stick, and the spinning speed of the main blades will decrease. The aero quad begins to descend.

Turn right and left: - On pushing the rudder stick to the left, the aero craft will turn to left and on pushing the rudder stick to the right, the aero craft will turn to right.

Forward and backward motion: - When the rudder stick is pushed upward, the aero craft swash plate will down tilt and it advances wherever when the rudder stick is pushed downward the aero craft will up tilt and it recedes.

Taking off: - Press the key, the motors will start and the quad copter will automatically position itself at an altitude of between 50cm and 1m. Slide the joystick up/down to make the quad copter climb/descend. Press and hold the joystick in the up/down position to make the quad copter continuously climb/descend.

III. IMPLEMENTATION PROCESS

In the implementation section, we will discuss the steps that were followed to build the quad copter for agriculture. Furthermore this chapter will also focus the reasons behind choosing specific components used in the controlling. Following steps were taken to build the system selecting the right component, choosing the programming language and appropriate software to simulate the designs.

A) Selecting the right component:-

An extensive research has been carried out to find the right components to build the quad copter. The design of the quad copter was built and design is based on the weight and size that would best provide stability, speed and accessibility during flight. The design uses several key hardware components such as accelerometer, electronic speed controller, motors and propellers etc. The motor was chosen for our platform were brushless dc motor that are specifically made for autonomous or remote controlled devices. The size and specifications of these motors are made perfectly proportional for the needed thrust and size of the structure. The propellers and motors are connected and controlled by electronic speed controller. The ESCs are devices that acts as an electric circuit to vary the motor speed, direction and dynamic braking. The lithium polymer battery pack used to operate all components and the major source of weight is 12 volts and 50 mill ampere in power. The battery pack will allow 25 minutes of continue flight time.

The AR 700 wireless receiver is used to receive commands from a radio controller. This receiver is a 7 channel receiver allowing for up to 7 commands to be sent at once. All sensors we have installed with our microcontroller such as accelerometer gyroscope and magnetometer etc. An

accelerometer is an electromechanical device used to measure the changes in velocity. The gyroscope is a device used to measure angular velocity and whose main purpose is for navigation. The magnetometer is a measuring instrument used to determine the strength of magnetic field. Once all sensors and ESCs are connected to the controller, the motor receive the signal from the ESCs.

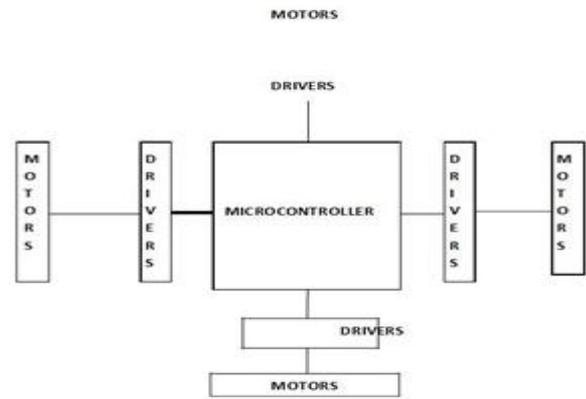


Fig.2. Block Diagram of quad copter

B) Choosing the right programming language:-

Although, there are lot of programming language that could be used to program MCU unit, the most common ones are assembly language. The program written in the assembly language can execute faster, while program written in the C-programming are easier to develop and maintain. I have used the assembly language in 2nd year and 3rd year of my engineering project. So I have better command and knowledge of assembly language. The google maps are embedded in my webpage so, that the user can input the longitude and latitude to view the location.

C) Appropriate software to simulate my designs:-

Although there are varieties of software packages, which can be used to simulate the circuit. The most commonly used are the circuit wizard. In order to test the circuit, proteus design suit is used. It is very powerful tool for the electronic circuit simulation. By combining ISIS schematic capture and proteus design suite (software) provides an integrated and GPS based aerial vehicle control system.

COMPONENTS USED

Frame: - It is skeleton of a quadcopter. It provides mechanical support. It is about 500gram, a vague x-shape carrying motor, camera, ESCs and propellers.



Fig.3. frame of quad copter

Motor: - It is rated in KV unit, which equate to the number of revolution per minute. The motor speed is about 1000rpm.



Fig.4. Motor used in quad copter

Propeller: - It largely effects the speed at which quadcopter fly. Longer propeller can achieve stronger lift at lower rpm. Two propeller are used to move in clock wise direction and two are moving in counter clockwise direction.



Fig.5. Propeller use in quad copter

ESCs: -A ESCs supplies the proper modulated current in the motors, which in turns produce correct rate of spin for both lift and manoeuvring.



Fig.6. ESC circuit used in quad copter

Radio Transmitter and Receiver: - Radio transmitter transmit the signal and radio receiver receive the signal. Actually the flight controller receive signal from transmitter (remote control). That's the radio receiver job.



Fig.7. radio transmitter and receiver circuit used in quad copter

Battery: - finally to power the quad copter you have a power source, which typically given by a lipo 3500mAh battery. A lot of battery types can be fully discharged, but the lipo's have a minimum voltage requirement, which if gone beyond can cause damage to the battery. In most cases its 3v, but can vary from battery to battery.



Fig.8.Features of battery used in quad copter

Flight Controller (kk 5.5):- It is the brain of the quadcopter, the flight controller is basically the little computer which controls the craft and interprets the signals and trans receiver send to guide the quadcopter. Its purpose is to stabilize the aircraft during flight. To make it, the signal from the three gyros on the board (roll, pitch and yaw) to feed the information into the integrated circuit (AT Mega IC). It is easily interface able, power supply 5v through ESCs.



Fig.9. Flight Controller circuit used in quad copter

FUTURE SCOPE

From the future perspective, agriculture drone can assist farmers to reduce excessive use of water 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 agriculture sector but can successfully be used across several industries such as Military and for delivering pizza. Government of developed countries are focusing on setting out the favorable strategy for enhancing the use of such drones by increasing the funding and commercialising agriculture technologies.

CONCLUSION

In this paper, we have proposed a novel method of aerial vehicle. From the project evaluation we conclude that, it seems feasible to design and build a quad copter capable of mission support. However, the finally capability and scope depend on the progress and goal established throughout the entire year.

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