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Real Imaging System "Snapper"

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Abstract: ***In this paper an improved version of quad-copter "snapper" has been presented. This project is designed to monitor or collect data in specific region. This system can perform multiple operations. When we require to monitor garbage, the information of garbage is analysed using sensor (methane gas present in the garbage). Also it takes snap of garbage through infrared cameras and transmitted to user through gsm. The coordinate's location of garbage sent via gps. Similarly it can sense fire using fire sensor and give information to user. This project we using aero quadcopter kit that includes a frame motors electronic speed controller kk5.5 controller gas detector temperature sensor.***

The goal of this project is to build, modify existing quadcopter and can add value to mission like disaster relief search and rescue agriculture and 3d mapping of geography. By using the snapping concept we named this project as snapper.

Keyword: quadcopter kit, transmitter and remote, propellers, electric motors, battery, gps, gsm module.

I. INTRODUCTION

A snapper is a multi-rotor copter that is lifted and propelled by four rotors. All the four arms have a motor and a propeller at their ends each. The lift is generated by a set of rotors and vertically oriented propellers.

A quadcopter uses two sets of identical fixed pitched propeller in which, two clockwise and two anti-clockwise [1-2]. This helps the machine to hover in the stable form. Control of motion is achieved by alteringthe rotation rate of one or more rotor discs, thereby changing its torque load and thrust/lift characteristics.

The main difference between the helicopter and quadcopter is that helicopter has one big rotor to provide all the lifting power and a little tail rotor to offset the aerodynamic torque generated by the big rotor [3-5], but as a quadcopter all four rotors work together to produce upward thrust and only ¼ of the weight is lifted by each rotor. So that, less powerful motors are used, making its cost efficient. The quadcopter is more stable than the helicopter, making it ideal for such as, surveillances, aerial photography, deliver medicine in remote areas.

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 a12v battery connected to the 2.1mm port to power the board. The aeroquad toolbox is used to configure and calibrate all of the sensors attached to the aeroquad 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 Snapper

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A. Operating the Drone

1) *Ascending and descending:* Push up the throttle stick, and the spinning speed of the main blades will increase. The aeroquad begins to ascend and if pull down the throttle stick, and the spinning speed of the main blades will decrease. The aeroquad begins to descend.
2) *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.
3) *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.
4) *Taking Off:* Press the key, the motors will start and the snapper will automatically position itself at an altitude of between 50cm and 1m. Slide the joystick up/down to make the snapper climb/descend. Press and hold the joystick in the up/down position to make the snapper continuously climb/descend.

III. IMPLEMENTATION PROCESS

In the implementation section, we will discuss the steps that were followed to build the snapper. 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 snapper. The design of the snapper 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.

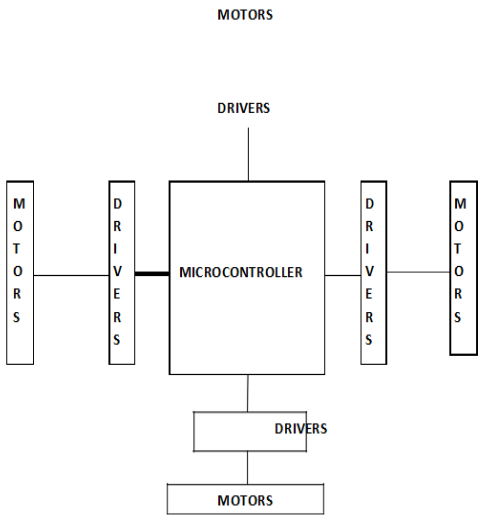

Fig.2. Block Diagram of Snapper

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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. Therefore assembly language was chosen to build the snapping system. 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.

IV. COMPONENTS USED

A. 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 snapper

B. 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 snapper

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C. 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 snapper

D. 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 snapper

E. 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 snapper

F. Battery

finally to power the quadcopter 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.

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Fig.8.Features of battery used in snapper

G. 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 transreceiver 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 snapper

V. FUTURE SCOPE

At first look quadcopter looks a futuristic toy. But large corporation are planning on utilizing a quadcopter for their needs. One of the biggest shopping stores in the world is planning to use small quadcopter for delivering products like pizza or other. It can easily implement in India by linking it with aadhar card because it is a unique identity. It is used as effective weapon in present and future war face.

VI. 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 quadcopter 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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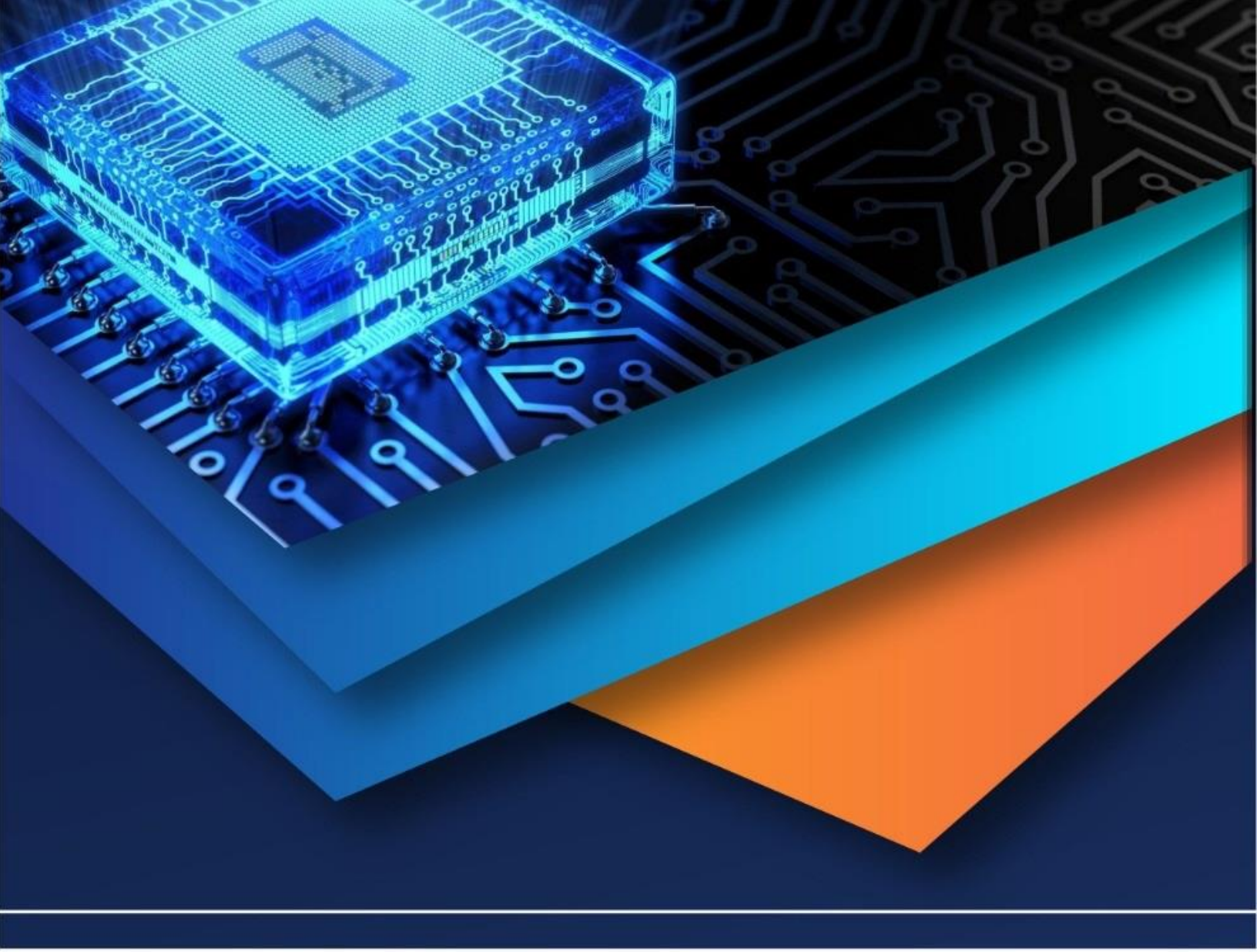

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