IJFEAT

INTERNATIONAL JOURNAL FOR ENGINEERING APPLICATIONS AND TECHNOLOGY

"DESERVE DRONE"

Dr. Rajkishor Tugnayat[1], Prof. Imran Khan[2], Bhavna Vitanklar[3], Shubham Shillare[4], Pallavi Sakure[5], Monika Pimpale[6], Shradha Bhedurkar[7], srushti Vyas[8]

[1].*Professor, E&Tc, SSPACE, Maharashtra, India,* ***tugnayatrm@rediffmaill.com***
[2].*Professor,E&TC, SSPACE, Maharashtra, India,* ***imranskhan.206@rediffmail.com***
[3]*Student, E&Tc, SSPACE, Maharashtra, India,* ***bhavna.vitankar143@gmail.com***
[4]*Student, E&Tc, SSPACE, Maharashtra, India,* ***shubham.shillare16@gmail.com***
[5]*Student, E&Tc, SSPACE, Maharashtra, India,* ***pallavisakure14@gmail.com***
[6]*Student, E&Tc, SSPACE, Maharashtra, India,* ***monikapimpale1997@gmail.com***
[7]*Student, E&Tc, SSPACE, Maharashtra, India,* ***shraddha.bhedurkar@gmail.com***
[8]*Student, E&Tc, SSPACE, Maharashtra, India ,* ***shrushtivyas777@gmail.com***

Abstract

A Drone can achieve vertical flight in a stable manner and be used to monitor or collect data in a specific region such as loading a mass. Technological advances have reduced the cost and increase the cost and increase the performance of the low power microcontroller that allowed the general public to develop their own drone. The goal of this project is to build modify and improve an existing drone kit to obtain stable flight, gather and store GPS data, and perform auto commands, such as auto landing. The project used an aero quad drone kit that include a frame motor electronics speed controllers, Ardunio Mega Development board and sensor board and used with the provided are quad software. Batteries a transmitter a reliever a GPS module and a micro SD card adopter were interfaced with the kit. The aero quad software was modified to properly interface the components with the drone kit. Individual component were tested and verified to work properly. Calibration and tuning of PID controller was done to obtain proper stabilization on each axis using custom PID test benches. Currently the drone can properly stabilize itself, determine its GPS location, and store and log data most of the goals in this project have been achieved resulting in a stable manoeuvrable Drone.

KEYWORD Drone/Drone, Transmitter and Remote, Propellers, Electric Motors, Battery.

---------- *** ----------

1. Introduction

A Drone or a Quad copter is vehicles have large potential for performing task that is dangerous or very costly for humans. Examples are the inspection of high structures, humanitarian purpose or search and rescue mission. One specific type of Drone is becoming increasingly more popular lately: the quad copter (Fig.1.1). When visiting large events or parties professional drones can be seen that the number of possibilities grows even further. For example a group of drone would be

able to efficiently and autonomously search a missing person in a large area by sharing data between, Or the combined load capacity of a group of drone can be use to deliver medicine in remote areas. This bachelor thesis focuses on the use of a commercially available quad copter platform, the Drone to perform a task that requires physical coloration and interaction: moving a mass. In this way a clear interaction between the drone and their surrounding is present. As preliminary step towards the view of collaborating aerial robots the choice was made to perform this task in an indoor scenario where position feedback is present. Starting off with position control, additional controller logic can be implemented to counteract the forces imposed by a mass connected to the drone. The choices are made for the Drone a generalized approach is chosen where possible to encourage reuse of this research outcome and deliverables.

are used to capture videos for promotional or surveillance purposes.

Recreational use is increasing as well: for less than 50 Euros a small controlled drone can be bought to fly around in your living room or garden. In these situations the quad copter is usually in free flight. There is no physical contact between the surroundings and the drone and no cooperation between the drone if would have the capabilities to collaborate

About the project.

Drone, also known as quadrotor helicopter or quadrotor, is a multirotor helicopter that is lifted and propelled by four rotors. Drones are classified as rotorcraft, as opposed to fixed-wing aircraft, because their lift is generated by a set of rotors. In a drone, two of the propellers spin in one direction (clockwise) and the other two spin the opposite direction (counter clockwise) and this enables the machine to hover in a stable formation.

Firstly the motors which we used have an obvious purpose: to spin the propellers. Motors are rated by kilovolts, the higher the kV rating, the faster the motor spins at a constant voltage. Next the Electric Speed controller or ESC, is what tells the motors how fast to spin at any given time. We need four ESCs for a drone, one connected to each motor. The ESCs are then connected directly to the battery through either a wiring harness or power distribution board. Many ESC1s come with a built in battery eliminator circuit (BEC), which allows you to power things like your flight control board and radio receiver without connecting them directly to the battery. Because the motors on a drone must all spin at precise speeds to achieve accurate flight, the ESC is very important.

Our Drone uses four propellers, each controlled by its own motor and electronic speed controller. Using accelerometers we are able to measure the angle of the Drone in terms of X<Y and Z and accordingly adjust the RPM of each motor in order to self -stabilize itself. the Drone platform provides stability as a result of the counter rotating motors.

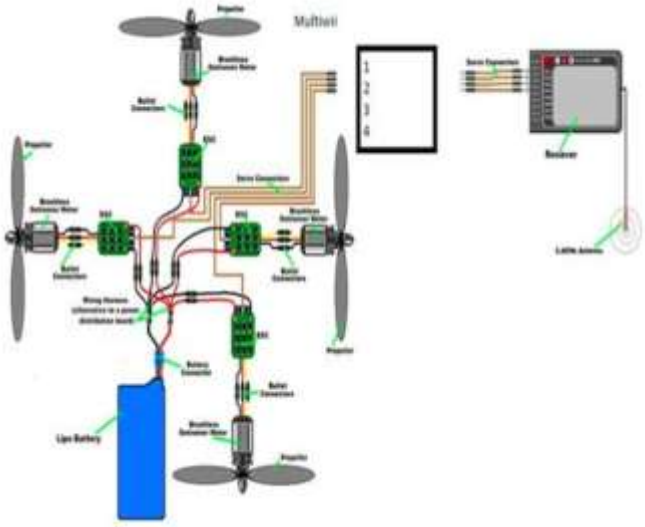
For Hovering over the skies the flight controller which is used is the 'brain' of the drone. It houses the sensors such as gyroscopes and accelerometers that determine how fast each of the drone's motors spin. Its purpose is to stabilize the aircraft during flight and to do this, it takes signals from on-board gyroscopes (roll, pitch and yaw) and passes these signals to the Atmel644PA processor, which in-turn processes signals according the users selected firmware (e.g. Drone) and passes the control signals to the installed Electronic Speed Controllers (ESCs) and the combination of these signals instructs the ESCs to make fine adjustments to the motors rotational speeds which in-turn stabilizes the craft.

Current Development.

In the past 10 years many small drones have entered that include the DJI phantoms and parrot

AR Drone. This new breed of drone are cheap , light weight . In the 20th century military research precipitated many widely used technological innovations. Surveillance satellites enable the GPS –system and defence researchers developed the information swapping protocols that are the fundamental to the Internet Drone fall into a similar category designed initially for reconnaissance purposed their Para-military and commercial development was often out of sight of the public

2 Block diagram Fig



Block diagram of drone

Name of material

1. HJ450 frame
2. Electronic Speed Controller
3. Brushless DC Motor
4. Propeller
5. Flight Controller
6. Fly sky transmitter and receiver
7. LIPO Battery 2200 mAh
8. Procus rush 4k action camera

3. Principal of operation

Frame principle: Frame is the structure that holds all the components together. The Frame should be rigid, and be able to minimize the vibrations coming from the motors. Drone frame consists of two to three parts which don't necessarily have to be of the same material:

- The centre ate where the electronics are mounted
- Four arms mounted to the centre plate
- Four motor brackets connecting the motors to the end of the arms Most available materials for the frame are:
- Carbon Fibber
- Aluminium
- Wood, such as Plywood or MDF (Medium-density fibreboard)

Carbon fibber is most rigid and vibration absorbent out of the three materials but also the most expensive.

Hollow aluminium square rails are the most popular for the Drones' arms due to its relatively light weight, rigidness and affordability. However aluminium could suffer from motor vibrations, as the damping effect is not as good as carbon fibber. In cases of severe vibration problem, it could mess up sensor readings.

Wood board such as MDF plates could be cut out for the arms as they are better at absorbing the vibrations than aluminium. Unfortunately the wood is not a very rigid material and can break easily in Drone crashes.

As for arm length, the term "motor-to-motor distance" is sometimes used, meaning the distance between the centres of one motor to that of another motor of the same arm in the Drone terminology. The motor to motor distance usually depends on the diameter of the propellers. To make you have enough space

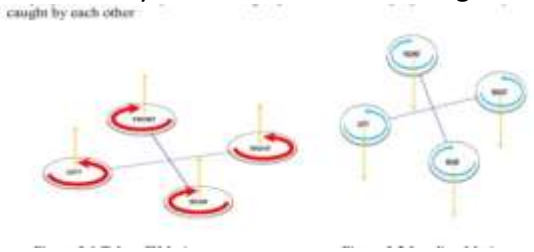


Figure 3.2 Landing Motion **Figure 3.1 Take off Motion**

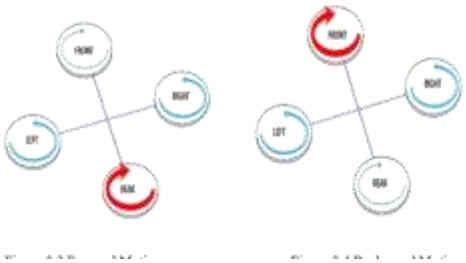


Figure 3.3 Forward Motion **figure 3.4 Back ward Motion**

Principle and Working

The principle and working of a propeller is based on Bernoulli's Principle and Newton's Third Law Bernoulli's principle states that for an in viscid flow, an increase in the speed of the fluid occurs simultaneously with a decrease in pressure or a decrease in the fluid's potential energy. Newton's third law states that every action has an equal and opposite reaction.

An aero foil of a propeller is shaped so that air flows faster over the top than under the bottom. There is, therefore, a greater pressure below the aero foil than above it. This difference in pressure produces the lift. Lift coefficient is a dimensionless coefficient that relates the lift generated by an aerodynamic body such as a wing or complete aircraft, the dynamic pressure of the fluid flow around the body, and a reference area associated with the body.

Taking-off and landing motion mechanism

Quad copter can be described as a small vehicle with four propellers attached to the root located at the cross frame. This aim for fixed rotors is used to control the vehicle motion. The speeds of these four rotors are independent. By independent pitch, roll and yaw attitude of the vehicle can be controlled easily. Pitch, roll and yaw attitude of Drone.

Hovering or static position The hovering or static position of the Drone is done by two pairs of rotors, by rotating in clockwise or counter-clockwise respectively with the same speed. By two rotors rotating in clockwise and counter-clockwise position, the total sum of reaction torque is zero and this allows the Drone to be in a hovering position.

Forward and backward motion

Forward (backward) motion is controlled by increasing (decreasing) speed of rear (front) rotor. Decreasing (increasing) rear (front) rotor's speed simultaneously will affect the pitch angle of the Drone.

4. Applications.

- Civil and commercial application
- Military application
- Environmental application
- Industrial application
- Agriculture application

5. Conclusion

As per the design specifications, the quad copter self stabilizes using the array of sensors integrated on it. It attains an appropriate lift and provides surveillance of the terrain through the camera mounted on it. It acts appropriately to the user specified commands given via a remote controller .Its purpose is to provide real time audio/video transmission from areas which are physically in-accessible by humans. Thus, its functionality is monitored under human supervision, henceforth being beneficial towards military applications. It is easy to manoeuvre, thereby providing flexibility in its movement. It can be used to provide surveillance at night through the usage of infrared cameras. The system can further be enhanced for future prospects. The GPS data logger on the drone stores its current latitude, longitude, and altitude in a comma separated value file format and can be used for mapping purposes. This project required members not only to interface and program the components of the drone, but also exposed them to mechanical components and reality of project management to accomplish the project objectives.

6. Future Scope

Future of a quad-copter is quite vast based on various application fields it can be applied to. Quad-copter can be used for conducting rescue operations where it's humanly impossible to reach. In terms of its military applications it can be more widely used for surveillance purposes, without risking a human life. As more automated quad-copters are being developed, there range of applications increases and hence we can ensure there commercialization. Thus quad-copter can be used in day to day working of a human life, ensuring their well-being.

7. References

[1]. Hoffmann, G.M.; Rajnarayan, D.G., Waslander, S.L., Dostal, D., Jang, J.S., and Tomlin,

C.J. (November 2004). "The Stanford Test bed of Autonomous Rotorcraft for Multi Agent

Control (STARMAC)"

[2]. Leishman, J.G. (2000). Principles of Helicopter Aerodynamics. New York, NY:

Cambridge University Press.

Technology .NASA

[3]. Anderson, S.B. (1997). "Historical Overview of V/STOL Aircraft

Technical Memorandum 81280.

Quad-

[4]. Pounds, P.; Mahony, R., Corke, P. (December 2006). "Modelling and Control of a

Rotor Robot".

[5]. Hoffman, G.; Huang, H., Waslander, S.L., Tomlin, C.J. (20–23 August

2007)."Drone

Helicopter Flight Dynamics and Control: Theory and Experiment

[6] http://www.as.northropgrumman.com/products/ghrq4a/index.html

[7] http://www.ga-asi.com/products/aircraft/predator.php

[8] http://www.sciencedaily.com/releases/2011/07/110701203725.html

[9] http://www.uavforge.net/

[10] **http://diydrones.com/**

[11] **http://dlnmh9ip6v2uc.cloudfront.net/images/products/10061-01b_i_ma.jpg**

[12] **]http://www.digi.com/products/wireless-wired-embedded-solutions/zigbee-rf-modules/pointmultipoint-rfmodules/xbee-pro-xsc#overview**