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Flying Machine Aerial Using Servillance Purpose

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Abstract - Unmanned Arial Vehicles (UAVs), commonly known as "drones" are aerial systems that can be remotely controlled for short and long range military and civilian purposes. Drones are usually equipped with a camera and can also be armed with missiles. This paper will focus primarily on the use of armed drones. Quad copters is an aerial vehicle operated to fly independently and is one of the representations of a UAV (Unmanned Aerial Vehicles). They are controlled by [5] pilots on ground or simultaneously driven. They are called rotorcrafts because unlike a fixed wing aircraft, here lift is generated by a set of revolving narrow-chord aero foils. Drones are actually very fascinating and in this project we are going to study about them, their components and about its widespread applications that determine its scope for the future. They are a mixture of streams of Electronics, Mechanical and especially Aviation.

1. Introduction

Engineers are problem solvers. Their job is to uphold the safety and health of the public and to create new techniques in their specific field. Military engineers develop new weapons and vehicles to give us the most advanced army in the world. Throughout the last twenty years, the United States has been at war with various countries in the Middle East. During these wars, pilots in the Air Force are given recon missions to survey land or spy on enemy forces. These recon missions can be very helpful, but they are also very dangerous for the pilots. In come unmanned aerial vehicles, or UAVs. UAVs, also known as drones, are aircraft that have no pilot. The military uses drones for recon missions and to target enemy officials. Every once in a while a story will come out about a drone killing innocent people who were thought to be important enemy officials. For this reason, UAVs get a bad reputation.

2. Components of a Quad Copter

The main components used for construction of a quad copter are the frame, propellers (either fixed-pitch or variable-pitch), and the electric motors. [2] For best performance and simplest control algorithms, the motors and propellers should be placed equidistant. Recently, carbon fiber composites have become popular due to their light weight and structural stiffness. The components are elaborately described as follows:

1) Frame:

It is the structure that holds or houses all the components together. [3] They are designed to be strong and lightweight. To decide the appropriate frame for the copter 3 factors, i.e. weight, size and materials used are considered. The frame should be rigid and able to minimize the vibrations from the motors. It consists of 2-3 parts which are not necessarily of the same material:

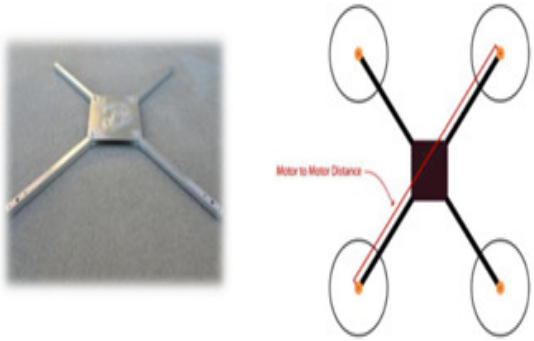

Fig. 1: Frame

The center plate where the electronics are mounted four arms mounted to the center plate four motor brackets connecting the motors to the end of the arms Strong, light and sensible configuration including a built-in power distribution board (PDB) that allows for a clean and easy build is highly recommended. [2] Parts and accessories that are 100% compatible and interchangeable are always preferred.

2) Rotors or Motors:

The purpose of motors is to spin the propellers. Brushless DC motors provide the necessary thrust to propel the craft. Each rotor needs to be controlled separately by a speed controller. They are a bit similar to normal DC motors in the way that coils and magnets are used to drive the shaft. [2] Though the brushless motors do not have a brush on the shaft which takes care of switching the power direction in the coils, and that's why they are called brushless.

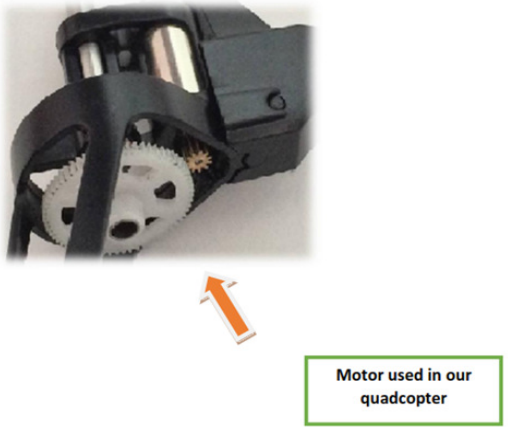

Fig.: 2 Motor

3) Battery

Power Source: LiPo (Lithium Polymer) batteries are used because it is light. NiMH (Nickel Metal Hydride) is also possible. [2] They are cheaper, butt heavier than LiPo. LiPo batteries also have a C rating and a power rating in mAh (which stands for milliamps per hour). The C rating describes the rate at which power can be drawn from the battery, and the power rating describes how much power the battery can supply. [3] Larger batteries weigh more so there is always a tradeoff between flight duration and total weight.

4) ESC-

Electronic Speed Controller: The electronic speed controller controls the speed of the motor or tells the motors how fast to spin at a given time. [3] For a quad copter, 4 ESCs are needed, one connected to each motor. The ESCs are then connected directly to the battery through either a wiring harness or power distribution board. Many ESCs come with a built in battery eliminator circuit (BEC), which allows to power things like the flight control board and radio receiver without connecting them directly to the battery.

Fig. 3 ESC

5) Propellers:

A quad copter has four propellers, two "normal" propellers that spin counterclockwise, and two "pusher" propellers that spin clockwise to avoid body spinning. [3].

FIG. 4 Propellers

The propellers come in different diameters and pitches (tilting effect). The larger diameter and pitch is, the more thrust the propeller can generate. [2] It also requires more power to drive it, but it will be able to lift more weight. When using high RPM (Revolutions per minute) motors, the smaller or mid-sized propellers. [2] When using low RPM motors the larger propellers can be used as there could be trouble with the small ones not being able to lift the quad copter at low speed.

6) Radio Transmitter and Receiver:

The radio transmitter and receiver allows to control the quad copter. Four channels for a basic quad copter is required .Using a radio with 8 channels, so there is more flexibility is recommended. Quad copters can be programmed and controlled in many different ways but the

most common ones are by RC transmitter in either Rate (acrobatic) or Stable mode. [2] The difference is the way the controller board interprets the orientations feedback together with the RC transmitter joysticks. In Rate mode only the Gyroscope values are used to control the quad copter. The joysticks on the RC transmitter are then used to control and set the desired rotation speed of the 3 axes, though if the joysticks are released,

FIG. 5 Transmitter

7) Flight Controller:

The flight control board is regarded as the „brain" of the quadcopter. [2] It houses the sensors such as the gyroscopes and accelerometers that determine how fast each of the quadcopter"s motors spin. Flight control boards range from simple to highly complex. An affordable, easy to set up, having a strong functionality controller is always recommended.

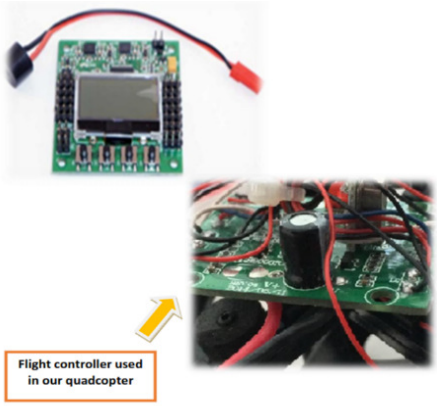

FIG. 5 Flight Controller

3. Circuit Details

3.1 Block Diagram

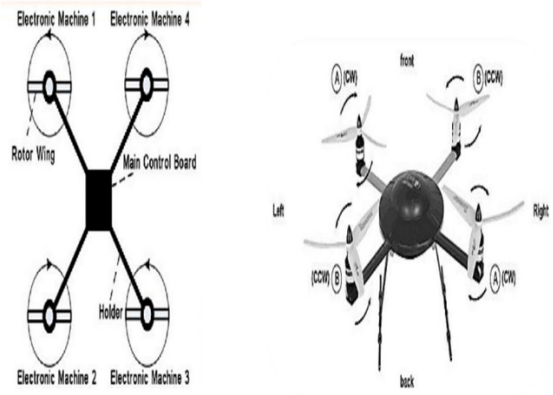

FIG. 6 Block Diagram

3.2 Applications of Quadcopters

Quadcopters have variety of applications in the field of research, military and many more. Quadcopter designs have become a cynosure as to most research fields as they are an important concept of unmanned aerial vehicle (UAV). [4] They use an electronic control system and electronic sensors to stabilize the aircraft. Their small size and agile maneuverability prove a great strength to these quadcopters and they can be flown indoors as well as outdoors.

Some of their applications include:

1) 3-D Mapping-
Small and lightweight drones help in surveying large landscapes with thousands of digital images that can be stitched together into a string of 3-D maps. Though military and other government satellites produce similar maps, but the stupendous outcomes of UAV technology outshines them repeatedly.

2) Search and Rescue-
Drones are a widespread application to rescue patients during injury or any calamity, manmade or natural. [4] Drones have the ability to help assist, locate and save victims, faster with more efficiency than any other option. There are campaign missions to provide a string product line of Search and Rescue (SAR) Drones.

3) Farming-
In agriculture technology helps in great precision to monitor fields, increase yields and also save money. Moreover, drones also help precise applications of

pesticides, water, or fertilizers by identifying exactly where such resources are needed and delivering them there too. [4] Cameras in drones are able to spot nitrogen levels (low or high) or watch the growth of a particular section. Infrared light cameras inform about plant health by measuring the efficiency of photosynthesis in various plants.

3.3 Advantages of Quadcopters

The main merit of quadcopters and similar unmanned aerial vehicles is their small size, due to which they could traverse in narrow conditions.

The use of drones has tremendously grown in a short span of time owing to the long flying time in contrast to the manned aircrafts. [6] Without a human pilot, drones can operate for significantly longer without fatigue than airplanes. Moreover, drone operators can easily hand off controls of a drone without any operational downtime. They are remote controlled, so no danger will be there to the crew. They contain a whole lot of widespread applications, in day to day lives, domestic purposes and national to international purposes.

Some more of their advantages include:

1 does not require mechanical linkages to change the pitch angle at the blade as it spins.
2 Four small rotors have smaller diameter than one large helicopter rotor.
3 takes less damage to rotors.
4 No need for a tail rotor which generates no lift.

FIG. 7 Application

3.4 Disadvantages of Quadcopters

Though drones possess a lot of advantages there are some concerns which should be thought about. [6] They include:

1) Drones also contain limitations. For instance, they cannot communicate with civilians for more detailed intelligence. Drones cannot capture surrendering military personnel, abandoned hardware, or military bases. They cannot go from door to door (at least till now this facility is not yet available). [6] Drone warfare causes collateral damages in civilian lives and property, as well as traditional warfare too.

2) According to civilians drones are viewed as an invasion force. The mere presence of drones has been known to convert civilians into military combats. Furthermore, when drones cause collateral damage, such as killing civilians and damaging civilian property, the opinions of civilians decrease even more so. [6]

3) Some drone pilots or operators have difficulty switching between combat mode at work and civilian mode while not working. This is especially difficulty when drone pilots have minimal transition periods between work and personal.

4) The worst scenario is when drones or a fleet of drones have been commandeered or taken control by the enemy. [6] While security measures help make this possibility more difficult, it will never be impossible.

4. Conclusion

Drones will soon take on be an imperative existence in the coming future. They will be seen taking up larger roles for a variety of jobs including business in the immediate future They could become a part of our daily lives, from smallest details like delivering groceries to changing the way farmers manage their crops to revolutionizing private security, or maybe even aerial advertising. Today, quad copters are capturing news video, recording vacation travel logs, filming movies, providing disaster relief, surveying real estate and delivering packages. They are categorized according to their corresponding uses. They have a few demerits but those can be rectified. Today most drones are controlled by either software or other computer programs. The components of a drone also vary based on what type of work needs to be done and how much payload needs to be carried. Out runners, batteries, electronic speed controllers all come in different ranges according to the type of work needed to be done by the quad copter. Quad copters are a great provisional craft that could get in between airplanes and helicopters and are hence easier to fly all the time.

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Dipti Sinha student ,final year ,Electronics and Communication, Poornima Group of Institution , Presented a paper on Image Processing in National conference, current research interests signal processing and biomedical science

Divyanshi Gautam student , final year , best student award