RESEARCH ARTICLE OPEN ACCESS

Unmanned Aerial Vehicles

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Abstract:

Unmanned Aerial Vehicles are designed to serve as aerial robotic vehicles to perform task independently. Computer vision is applied in UAVs to improve their autonomies both in flight control and perception of environment around them. They are generally used to carry out tasks in which manned flight is considered to be risky. This paper focuses on the design and fabrication of UAVs. The various advantages and disadvantages of UAVs have been studied.

Keywords — **Unmanned Aerial vehicles,Drones.**

I. INTRODUCTION

Drones have been around for years and they are used for different purposes and can be of help in numerous occasions. However, these devices have become more popular in recent times and their application increased rapidly in various fields.

Drones are the most specialized equipment and have increasingly found its way into the area of robotics, aeronautics and electronics and have been established as powerful equipment for Military and rescue operations. The technical name of drones is "Unmanned Aerial vehicles".

UAVs can be directed by a controller or be pre-programmed.

Further aiding ease of use, modern drones have begun incorporating a range of new technology, including electronic sensors that stabilize them, with some models even controllable via a smart phone app instead of bulky controllers. Some models can even be programmed to fly set paths or patterns.

Drones especially come in all shapes and sizes. There are commercial drones, which are typically having more features and there are drones which vary to a greater extent in size. Size of the drones depends upon the purpose it is used for.

A typical drone is made up of light materials to reduce its complexity, weight and increase maneuverability. The composite material strength allows it to cruise at extremely high altitudes. They are equipped with state of the art infra-red cameras, Global Positioning Systems (GPS), laser or GPS guided missiles and other top secret systems.

II. WORKING

A. *Standard prop*

The "Standard "propellers are usually located at the front of the UAV. These props pull the quad copter through the air like a tractor. Most drone propellers are made of plastic and the better quality made of carbon fibre. This is also an area where we are seeing plenty of innovation. Better prop design will assist with giving a better flying experience and longer flight times. There is also some big innovation towards low noise UAVs props.

B. *Pusher prop*

The Pusher props are usually located at the rear side and push the UAV forward hence the name "Pusher props". These contra-rotating props exactly cancel out motor torques during stationary level flight. Opposite pitch gives downdraft. It can be made of plastic with the better pusher props made of carbon fibre.

C. *Brushless motors*

Brushless motors are a type of synchronous motors powered by DC electricity either by an inverter or switching power supply which produces an AC electric current to drive each phase of the motor via a closed loop controller. Brushless motors are more efficient, more reliable, and quieter than a brushed motor. Motor design is important and plays an important role in deciding drone efficiency. More efficient motors save battery life.

D. Motor Mount

Sometimes built into combination fittings with landing struts or can be part of the UAV frame.

E. Landing gears

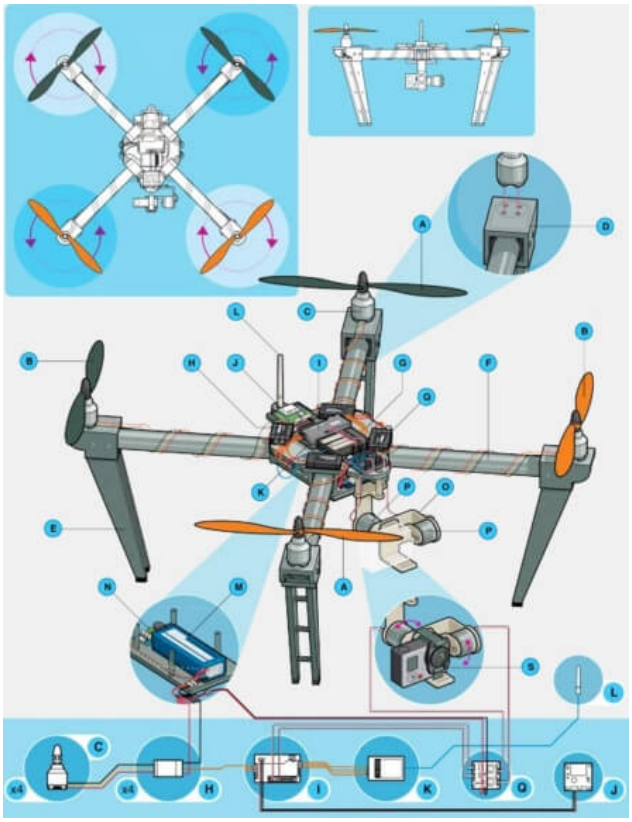
Landing gears are the most important component for aerial Vehicles. Drones which need high ground clearance may adopt helicopter-style skids mounted directly to the body, while other drones which have no hanging payload may omit landing gear altogether. Most drones have a fixed landing gear. However, the best drones will have retractable landing gear giving a full 360 degree view.

F. Booms

Shorter booms increase maneuverability, while longer booms increase stability. Booms must be tough to hold up in a crash while interfering with prop downdraft as little as possible. In many drones the boom is part of the main body. Other drones have a definite boom as a separate part.

G. Main Drone Body Part

This is the central hub from which booms radiate like spokes on a wheel. It houses battery, main boards, processors avionics, cameras, and sensors.



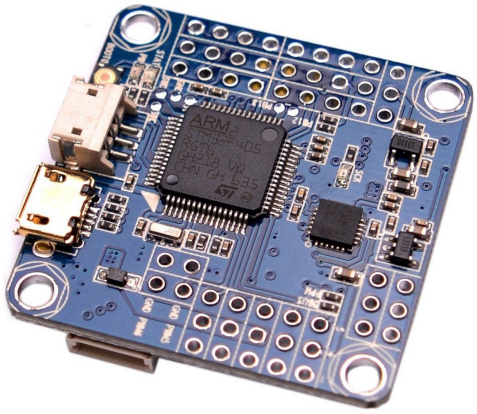
Name	Description
A	Standard prop
B	Pusher prop
C	Brushless Motors
D	Motor Mount
E	Landing gear
F	Boom
G	Main drone body
H	Electronic speed controllers
I	Flight controller
J	GPS Module
K	Receiver
L	Antenna
M	Battery
N	Battery Monitor
O	Gimbal
P	Gimbal Motor
Q	Gimbal Controller Unit
R	Camera
S	Sensors

H. Electronic Speed Controllers

Electronic Speed Controllers are an essential component of modern quadcopters (and all multirotors) which offers high power, high frequency, high resolution 3-phase AC power to the motors in an extremely compact miniature package.

I. Flight Controller

The flight controller interprets input from receiver, GPS module, battery monitor, IMU and other onboard sensors. Regulates motor speeds, via ESCs, to provide steering, as well as triggering cameras or other payloads. It also controls autopilot, waypoints and many other autonomous functions.



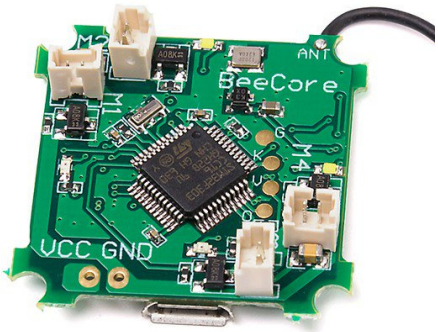
J. GPS Module

GPS receiver and magnetometer are employed to provide latitude, longitude, elevation, and compass heading from a single device. GPS is an important requirement for navigation and many other autonomous flight modes. Without GPS drones would have very limited uses. Along with FPV, drones can navigate long distances and be used for existing applications such as lidar and photogrammetry.

GPS stands for Global Positioning System. It is an American standard which provides location and time information in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites.

K. Receiver

Receivers are the component that allows the pilots to control the aircraft wirelessly. The signal/commands are then received by a radio receiver (RX) which is connected to a flight controller.



L. Antenna

Antenna is an electrical device which acts like a transducer. It converts electrical power into radio waves and vice versa. Antenna generally depends upon the receiver that has been used.

M. Battery

Lithium polymer (LiPo) batteries offer the best combination of energy density, power density, and lifetime on the market.

N. Battery monitor

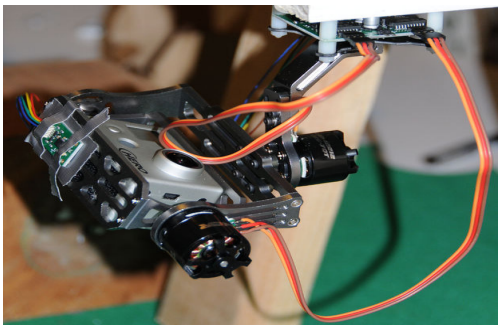
It provides in-flight power level monitoring to flight controller. The battery is critical to fly safely. If quad copter runs out of battery then it will either make an emergency landing or will crash. To prevent this Battery monitor is installed to check the battery levels.

O. Gimbal

The drone gimbal is the pivoting mount that rotates about the x, y, and z axes to provide stabilization and pointing of cameras or other sensors. A set of three gimbals, one mounted on the other with orthogonal pivot axes, may be used to allow an object to remain independent of the rotation of its support.

P. Gimbal Motor

Brushless DC motors can be used for direct-drive angular positioning, too, which requires specially wound coils and dedicated control circuitry.



Q. Camera

Camera helps to capture aerial images and video so that the purpose of drone can be fulfilled. Aerial images or videos help the controller to analyze the environment and act accordingly.

R. Sensors

- Three axis accelerometer

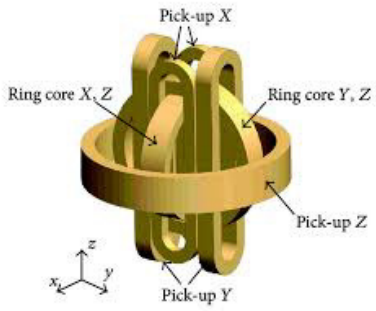
  This sensor is very useful to stabilize the drone. This accelerometer provides linear acceleration in all three axes.

- Three-axis gyroscope

  This sensor is used to provide angular motion to the drone. Three axis gyroscopes provide angular acceleration in three axes.

- Magnetometer:

  This drone sensor type is present in the drone which has GPS functionality. Magnetometer is basically a magnetic compass which can measure magnetic field of the earth. This feature is used to determine direction of compass used in the drones. Compass direction is determined with respect to magnetic north.



- GPS Sensor

  This drone sensor type uses satellite launched around the Earth to determine specific geographic locations. Unmanned Aerial Vehicles (UAV) use GPS sensors to determine the specific router without the presence of pilot. It can also return back to its original position with the use of GPS sensor.

- Distance Sensor

  These types of sensors are used to sense the obstacles.
  The distance sensors are based on ultrasonic, laser based or LIDAR based.

III. CONCLUSIONS

- World's Advancement towards automation makes UAVs as a definite choice in future.
- Unmanned aerial vehicles have enormous advantages that justify its use in the world.
- Surveying, Security surveillance, Mining, Agriculture are some of the notable advantages of drones which makes it as important equipment in the world.

IV. REFERENCES

[1] Adam Juniper : Complete guide to Drones ,May 2016

[2] Brown,T.Doshi,S Jadhav and himmel-Stein J:*Test bed for a wireless network on small UAV's*,pp. 20-23, September 2004

[3] Website: http:// www.google.com/