DESIGN AND FABRICATION OF SURVEILLANCE DRONE IN CAVES

Rajarathnam.DRP[1], Arunbabu.R[2] , Suresh Kumar.M[3], Dineshwaran.S[4], Dhilip.A[5], NandhaKumar.S[6]

[1] *Associate professor, Mechatronics Department, Paavai Engineering College , Tamilnadu , India*
[2] *Assistant Professor, Mechatronics Department, Paavai Engineering College , Tamilnadu , India*
[3] *Student, Mechatronics Department, Paavai Engineering College , Tamilnadu , India*
[4] *Student, Mechatronics Department, Paavai Engineering College , Tamilnadu , India*
[5] *Student, Mechatronics Department, Paavai Engineering College , Tamilnadu , India*
[6] *Student, Mechatronics Department, Paavai Engineering College , Tamilnadu , India*

ABSTRACT

There are several advancements within the field of region and aeronautics. Scientists have more and more began to concentrate on VTOL (vertical take - off and landing) aircrafts. we've got engineered a miniature VTOL twinrotor UAV. UAVs have begun to grab plenty of attention nowadays because of its various applications like police work and relief. Twinrotor may be a quite a eggbeater having 2 main propellers rather than one and no tail fin. All 3 vital motion of the craft i.e. roll, pitch, yaw are controlled by thrust vectoring exploitation servo motors and dynamical the magnitude of thrust using physics speed controllers. The paper deals with the look of a basic UAV supported application and therefore the construction keeping in mind the various ideas that govern its motion.

Keyword : - *VTOL, UAV*

1.INTRODUCTION

1.1. Unmanned Aerial Vehicles

Unmanned Aerial Vehicles (UAV) are unmanned flying aircrafts. They are completely different from the industrial aircrafts associate degreed jets in a very method that it doesn't have an on board pilot. Generally the pilot in a very UAV controls the motion from the bottom through a far off. Advanced development within the field has resulted in autonomous UAVs and therefore the would like of a pilot is eliminated. Such UAVs have an on-board controller that takes care of the stability and the trajectory motion of the UAV. Applications are often focused on the military areas, surveillance, inspection of transmission lines and power distribution; low cost filming and panoramic picturing for the movie industry, sport events, crop and herd monitoring, among others.

Over the past years several teams have worked on the event of UAV. The book Unmanned Aerial Vehicles by Randal and Beard [7] and Rogelio Lozana [8] give a very extensive explanation about the different types of UAVs and its modelling. The work done on quad rotors [1 2] gives a good idea on the design and stability of the four rotor system. [3 4] provides a sensible plan concerning the system and model of a quad rotor UAV. The model of a twinrotor can be related to this work.

Sundarapandian et al. (Eds) : ICAITA, SAI, SEAS, CDKP, CMCA-2013 pp. 369–377, 2013. © CS & IT-CSCP 2013

A smaller version of the UAV is termed as a small Air Vehicle (MAV). A MAV is a class of unmanned aerial vehicles (UAV) that has a size restriction and may be autonomous. Modern craft may be as little as fifteen centimetres. Development is driven by industrial, research, government, and military purposes; with insect-sized aircraft reportedly expected in the future. The small craft permits remote observation of dangerous environments inaccessible to ground vehicles. A MAV weights much less than a UAV. A major advantage of a MAV over the UAV is that it consumes less power to do a similar application due to its less weight. A MAV conjointly has higher latent period than a UAV as a result of a smaller model would be additional agile. [5 6] provides a sensible description concerning the analysis and development in MAVs.

Another class of UAVs area unit fastened winged UAVS .These are popular when it comes to large size and long distance applications primarily used by the military. Fixed wing UAVs have enhanced payload carrying and delivering capabilities. Fixed wing UAVs area unit typically remote controlled and majority of them don't support vertical take-off and landing (VTOL).

2.DETERMINING A UAV BASED ON APPLICATION

Choosing a UAV depends upon the appliance it's being employed for:

- Fixed winged UAVS are used where large forward speed and long distance applications are required.For steady surveillance or small applications the quad-rotor type UAV should be used.
- When the UAV has critical applications in which it carries costly sensors or an application where fail-safe is required, then a redundant system is required hence hex-rotor or oct-rotor is used.
- Usually twin rotors are used for medium distance applications and low power consumption applications.
- Much research is going on the tailsitter UAV or the single rotor UAV. It is very useful for low power application. The UAV supports VTOL and additionally mounted wing mode once it reaches a specific altitude.

3.TWINROTOR UAV

A twin rotor-type UAV may be a sort of whirlybird that is propelled by 2 rotors. The blades rotate in opposite directions and a anti-torque rotor isn't needed so as to counter act the momentum of the propellers. As a coupled phase space, by altering the motor speed, the position is also changed. The system is underneath motivated and really dynamically unstable. In several things it's fascinating that the system is to be as little as attainable to realize giant movements, being able to move both vertically and horizontally. Specific characteristics, such as vertical flight ability and flying at low speeds, allow the model to perform tasks which are difficult to implement through other mechanisms and structures. With demand of applications for this sort of aerial vehicle speedily increasing, also increases the interest in research, both in industry and academics. Several studies square measure being conducted on the dynamics and describing ways management} their flight by adding automatic stability management through a diversity of hardware and code control schemes.

The objective of this work is to explain the planning and therefore the construction of the structure of the twinrotor device that may carry additional payloads. It is controlled by a foreign transmitter that sends commands via radio to a microcontroller present on the twinrotor. This microcontroller is chargeable for causing values of the speed for every rotor.

4.CONCEPTUAL DESIGN

There is no explicit style for a kind of UAV. With new developing research, new designs are proposed. The reason for the on-going research in new designs is the unstable nature of the conventional designs. Every new style is aimed to be a lot of stable and complicated than the previous one. A good style is that the one that is a lot of stable and mobile. Lower stability of style ends up in quality in planning the system. The stable flight of a UAV heavily depends on the look. The motion of a UAV depends on the resultant forces and moments about the centre of gravity. The Newton-Euler Model offers United States a decent magnitude relation of the force and torsion regarding the centre of gravity of a rigid body. For example, if a UAV needs to hover at a particular height, the moments about the centre of gravity need to be zero. The forces and moments applied at the centre of gravity rely on the structure and also the style.

5.STRUCTURE

We have projected a basic and a sophisticated structure. The advanced structure will solely be enforced once stability is obtained within the basic structure. The advanced structure is a lot of agile and might carry bigger payloads.

The structure we propose consists of two brushless DC motors (BLDC), two servo motors, controller board, battery, two ball bearings, a hollow aluminum U channel, an aluminum shaft, two sand boxes, and a light rectangular frame. The two ball bearings area unit concentric to every different through a typical Al shaft that runs right underneath the hollow Al channel. The sandboxes area unit mounted at the 2 ends of the channel with the ball bearings. The aluminum channel is rigidly attached to the main-frame which is a simple minimalistic rectangle having two shelves one for the controller board and one for the battery. The motors area unit organized with parallel axis of rotation and rest on the 2 ends of the 2 sandboxes. The two servo motors area unit mounted at the ends of the Al channel. The servo arm is connected to the sand box with a Z link. The rectangular box was constructed using balsa planks.

In figure one, the shaded part on the bottom shelf is the battery and the shaded part on middle shelf is the board. Motors and also the propellers area unit mounted on the frame.

In any traditional craft there's a mechanical device at the tail finish to stay the copter in balance however within the projected style there's no want of a tail fin to stay the craft in balance because the 2 propellers area unit counter turn which can keep the craft in balance.

As we will see the form is unbroken rectangular to change the middle of Gravity (C.G) concerns. All the components like the board and also the battery area unit placed specified their weight is distributed equally regarding the middle of gravity. The battery was placed on the lower shelf therefore on lower the C.G thence increasing stability.

The motors area unit placed equal from the middle on opposite sides. The distance between the motors is specified there's no mechanics interaction between the mechanical device blades.

6.CONCLUSION

In this paper we have a tendency to conferred the mechanical structure and represented all the components comprising the event of a tiltrotor-type unmanned aerial vehicle. Such a style are an honest answer for a tiltrotor style once its dimension and price square measure the most constrains. Thrust vectoring is clearly explained and illustrated. The principals involved are realized and proven accurately .An optimal motor and propellers orientation design is proposed to obtain the rolling, pitching and yawing movements. A few flight tests are applied to verify the finding.

We are working on the mathematical model and control system design of the twinrotor UAV at present and hope to get good results soon in the future.

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