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Quadcopter (An Unmanned Arial Vehicle)

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Abstract - Quadcopter is an unmanned aerial vehicle, which can be implemented in different applications. In paper it will be represented a development of a quadcopter system and potential application in which it can be implemented. Quadcopter, is guided autonomously, by remote control, or both and that carries sensors, target designators, offensive ordnance, or electronic transmitters designed to interfere with or destroy enemy targets. As an emerging field of aerial robotics, Unmanned Aerial Vehicles (UAVs) have gained significant research interest within the wireless networking research community. The UAV ecosystem can benefit from existing 4G cellular networks, which can be exploited in different ways to enhance UAV communications. Because of the inherent characteristics of UAV pertaining to flexible mobility in 3D space, autonomous operation and intelligent placement, these smart devices cater to wide.

Key Words: UAV, Quadcopter, BLDC, ARM7, ESC, Propellers, Motion.

1. INTRODUCTION

A quadcopter is an aircraft heavier than air, capable of vertical take-off and landing (VTOL), which is propelled by four rotors, positioned in the same plane, parallel to the ground. Unlike standard helicopters, a quadcopter uses fixed-pitch blades in its rotors and its motion through the air is achieved by varying the relative speed of each propeller. The first quadcopter was the Omnichen 2, invented in 1920 by Etienne Omnichen. This craft made 1000 successful flights and flew a recorded distance of 360 meters. Then the convert a wings model a quadcopter designed by Dr. George E. Bothezat, appeared in 1956. Nowadays there is an incredible evolution in 21st century in quadcopters. To introduce more robust controller and modeling, techniques, Universities, studentes and researchers are working continuously, so that they can provide detailed and accurate representations of real-life quadrotors.

Personal Drones have been all the rage for the past few years, as toys, and primarily as new devices for capturing amazing aerial photography. As the technology has matured and become more mainstream, a number of practical and very interesting uses of Drone technology have emerged. In the past few months, we have seen some amazing developments in the flying drone industry. Amazon has announced a service, which will deliver your orders right to your door, and 3D Robotics, a commercial drone maker, has received $36 million in funding. The future of drones flying around everywhere is coming closer and closer to us.

1.2. LITERATURE REVIEW

A few researchers have published review papers regarding UAV applications in construction: Pajares (2015) presented an overview of the status of UAVs in remote sensing applications; Ham et al. (2016) discussed UAV application in the visual inspection of civil infrastructure systems; Duque et al. (2018a) presented UAV implementation for post-construction infrastructure inspection with specific focus on applications within the Departments of Transportations (DOTs). However, no prior reviews have examined the entirety of the AEC domain to identify and categorize UAV applications related to the design, engineering, and construction phases of a project. The goal of this paper is to systematically review peer-reviewed academic studies on UAVs across the entire AEC domain to identify trends in their application and technological components (e.g., UAV types, styles of control, sensor).

Nikita Guliaev (2017) explained view of quadcoter price. In department stores and specialized shops, the average consumer can now purchase a quadcopter of the approximate size. The prices for such aerial craft range is very high. The chief objective of this article is to give information of design, construction and demonstration of a quadcopter that could perform a variety of tasks in various fields so students can easily manufacture quadcopter at home with very less price. Anudeep et. Al. (2014) gives quadcopter classification. They are differentiated in two categories such as micro and mini air vehiles, this classification totally depends on size and weight. Stafford Jesse (2014) explains the procedure of working of quadcopter. It uses two pairs of identical fixed pitched propellers in which two rotate clockwise (CW) and remaining two counterclockwise (CCW).

2. PROPOSED SYSTEM

The project plan was divided into five major milestones each spaced approximately Ten days apart.

1) Project Description and Plan of Work
2) System Model
3) Components Purchasing
4) Implementation / Hardware / Software
5) Project Demonstrations

The sequence that we met these milestones was out of sequence with the required milestones. Experience told us to get the hardware done as soon as possible as this is often requires a lot of time. By doing so, and because of unforeseen difficulties, we fell behind slightly with the System Modeling and flight Controller. After working closely, we were able to complete the milestones

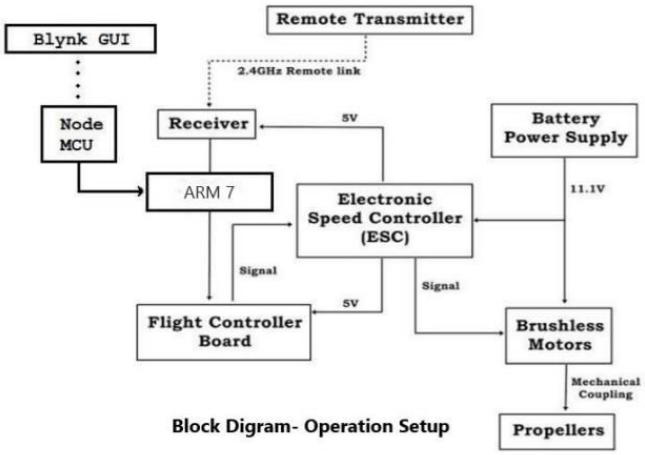

Fig -1: Block Diagram

This project uses ARM as the Brushless motor controller of the Quadcopter. The operation and control of the UAV'S are performed by the ARM. The different operation or functions of the UAV is carried out by fetching the programs in the ARM by using the ARM. The Quadcopter will take reference at start of hardware where he will take reference of path as zero then will get ready to fly, Once the all brushless motor get signal of ready by ARM, then by cordless transmitter, we can control arm 7 and whole loop system which also includes ESC 30amp and APM 2.8. Hence all motor will take same speed at same time, by which collaboration the Quadcopter get to fly from surface.

2.1 ARM7 LPC2148 microcontroller:

Control board is connected to ESC& receiver, whereas control board is the main system. Then it is pre-loaded with different set option from single copter to octocopter. This board is used to different operations performed by the quadcopter like roll, pitch and yaw. The microcontroller provides a set of digital and analog I/O pins that can be interfaced to various expansion boards (shields) and other circuits. The boards feature serial communications interfaces, including USB on some models for loading programs from personal computers.

The LPC2141/42/44/46/48 microcontrollers are based on a 16-bit/32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combine the microcontroller with embedded high-speed flash memory ranging from 32 kB to 512 kB. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at the maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30 % with minimal performance penalty. Due to their tiny size and low power consumption, LPC2141/42/44/46/48 are ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale.

Fig -2: ARM7 LPC2148 Microcontroller

2.2 Brushless DC Motor:

The 1000 Kv BLDC Motor for Drone equips shaft of 3.7mm. This Motor is equipped with the solid metal case which makes it reliable and durable in the crash. This A2212 1000 KV BLDC Motor comes with open wire end for your customize connections. Has an in-built aluminum mount for quick and easy installation on your quadcopter frame.

Fig -3: BLDC motor

2.3 Propellers:

Light UAVs use plastic propellers, which resist breaking on impact because they are flexible, and they are safer. Heavier models use carbon fiber or other more rigid materials (planes frequently use wood or nylon/glass). Carbon fiber propellers are dangerous, even deadly, and should be used only by experienced pilots and well away from people. Unless extreme performance is a concern, the benefits of carbon fiber over plastic are marginal on multi-rotors

Fig -4: Propellers

2.4. Rechargeable Battery:

Lithium Polymer (LIPO) rechargeable batteries are used for quadcopters because they have high specific energy and light in weight. Electric power is provided to motor and all electronic components of quadcopter by the batteries. The capacity rating, in milliamp-hours (mAh) indicates how much current the battery may output for one hour. Discharge rating indicated by the letter "C", show how fast the battery may be safely discharged. LIPO batteries can be found in packs of everything from a single cell (3.7V) to over 10 cells (37V). The cells are usually connected in series, making the voltage higher but giving the same amount of Amp in hours.

2.6. ESC's (Electronic Speed Controller):

Four 30A ESCs (electronic speed controllers) are used in proposed Quadcopter. It convert the PWM signal received from flight controller or radio receiver and then drives the brush less motor by providing required electrical power. Thus ESC is an electric circuit that controls the speed and direction of electric motor by varying the magnetic forces created by the windings and magnets within the motor.

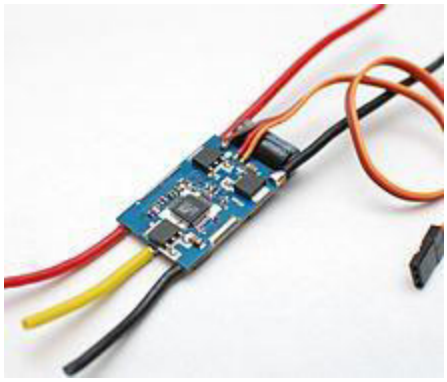

Fig -6: ESC

3. ADVANTAGES, LIMITATION AND APPICATION:

The Quadcopters are having so many applications due to its advantages are as:

- Gearing is not required between the motor and the rotor
- Variable propeller pitch is not required for alternating quadrotor
- Minimal mechanical complexity
- Low maintenance cost
- less loads on the center plates
- Payload augmentation

Privacy of human being is disturbed because of quadcopter. This is the only major limitation compare to other major advantages quadcopter as used in various fields. A quadcopteris not merely a pilot's flying toy. It has other beneficial uses as well which are given as below:

- Research Field
- Military, law enforcement and community agencies
- Commercial use and aerial photography
- Augmented reality games
- Solving problems with motion
- Delivering food and medicine
- Journalism and Sports

4. CONCLUSIONS

Our research work yielded a successful development of ARM7 based Quadcopter(an unmanned Arial Vehicle) at a cheaper and affordable amount. Quadcopter which can be easily made from shelf components. It can be used as a low cost alternative to various applications which includes pesticide sprinkling, end to end delivery within the transmitter's RF range, surveillance in defense and other sensitive places like nation border, mapping through remote sensing, etc. with very high level of precision.
This article present mechanical structure and describe all parts of quadcopter which gives good solution for a quadrotor design when its dimension and cost are the main constraints. The quadcopter configuration has a greater stability as compared to the other configurations and it is able to hover close to its target, unlike its other counter parts. This type of project plays a major role in civilized countries for surveillance of the terrestrial areas, film industries, managing traffics and city planning. The core intention of this work is to study complete designing and manufacturing process of quadcopter from the engineering prospective and improving their balance and stability system.

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REFERENCES

[1] Nikita Guliaev (2017), The Design, Construction and Implementation of an Autonomous Outdoor Quadcopter using an RPi microcomputer and a MultiWii flight controller, Saimaa University of Applied Sciences, Finland.

[2] Anudeep M., G. Diwakar, Ravi Katukam(2014), Design of A Quad Copter and Fabrication, International Journal of Innovations in Engineering and Technology, Volume No.4 Issue: 1, pp: 59-65.

[3] W., Hlaing, Thepphaeng, S., Nontaboot, V., Tangsunantham, N., T., Sangsuwan, & C. , Pira, "Implementation of WiFi-based single phase smart meter for Internet of Things (IoT)", In 2017

International Electrical Engineering Congress (iEECON), IEEE, pp. 1- 4, March, 2017.

[4] Duque, L., Seo, J., and Wacker, J. (2018a). Synthesis of Unmanned Aerial Vehicle Applications for Infrastructures. Journal of Performance of Constructed Facilities, 32(4), 04018046. https://doi.org/10.1061/(ASCE)CF.1943-5509.0001185

[5] Ham, Y., Han, K. K., Lin, J. J., and Golparvar-Fard, M. (2016). Visual monitoring of civil infrastructure systems via camera-equipped Unmanned Aerial Vehicles (UAVs): a review of related works. Visualization in Engineering, 4(1), 1. https://doi.org/10.1186/s40327-015-0029-z

[6] Pajares, G. (2015). Overview and Current Status of Remote Sensing Applications Based on Unmanned Aerial Vehicles (UAVs). Photogrammetric Engineering and Remote Sensing, 81(4), 281–330. https://doi.org/10.14358/PERS.81.4.281.

[7] Park, J. S., Kim, P., Cho, Y. K., and Fang, Y. (2018). Automated Collaboration Framework of UAV and UGV for 3D Visualization of Construction Sites. In 18th International Conference on Construction Applications of Virtual Reality. Auckland. Retrieved from https://www.researchgate.net/publication/329252869.