Design of Surveillance Based Quadcopter using Arduino

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Abstract

In this modernist world with high increase in the technology there is equal growth and development in automobiles which creates traffic leading to some sound pollution, traffic jamming and air pollution. So it take more than required time to reach from one point of place to another point, thus we must look forward to some airplanes. Our Quadcopter is one of flying machine used to lift the object and materials from one point of place to another in less time or can be used for surveillance and security purpose. At industry level use applications, Quadcopter are made using flight controlling board module which comes with programmed Arduino nano light controller board and balanced gyroscope module for balancing the flight which is not economical for smaller applications. It cost is effective and useful method. To discover the Quadcopter efficient and fighter for small stage applications this project is proposed, which design and develop a Quadcopter using Arduino Nano board instead of pre programmed KK 2.1 flight Controller board. It has wide and many application like Quadcopter mounted with wireless camera and GPS tracker could be used for surveillance and security of wide and large areas such as forest, army base and coast guard applications etc.

Keywords — *MPU 6050, Arduino Nano Atmega328 microcontroller, Camera, BLDC Motor, Flight controller Board, ESCs (Electronic speed controller), Propellers, Transmitter and Receive*

I. INTRODUCTION

In the recent existing Quadcopters [1], they are compact rotor craft air vehicles that can be used for indoor and outdoor inspection tasks. Like a conventional helicopter they can hover. However, they have other advantages such as small size, low power consumption, vertical takeover without tail rotor and dynamic. In recent times, there has been an hugh growth of interest in quadcopters spurred by the availability of cheap and open-source copters.

Popularly, quadcopters are normally and locally called drones and we will use these terms interchangeably in this research. The quadcopter applied in this work, with a control driver ardruino autonomy, from ROS (Robot operating system). they recently used Parrot AR Drone 2 as it is a low-cost, o-the-shelf quadcopter with a large amount of software support available for its control[2].All the computation is performed over board on a ground-based laptop and no modification to hardware or on-board software are required. The Copter drone is equipped with a 1280x720 HD wireless video recording camera which can be used to record videos or capture pictures via smartphones externally insist on it. The drone communicates with external drivers (or in our case, the driver arduino autonomy) using Wi-Fi[3] . We can access the image stream sent by the drone through Wi-Fi, using ROS and the arduino autonomy driver, which is used by PTAM and other visual tracking methods.

A. Problem Statement

Wasting energy and time to climb up and down many times. There are many environments that humans and human-controlled aircraft cannot safety enter, such as the nuclear reactors etc. In Today's Journey, we have games which give the sense of immersivity with an artificial world like we have never observed before[4]. A human can play as a different race together and become the worlds most fearsome force warrior of the world. Video games and future games gives us chance to save the world millions of times over with millions of different types. However, video games are therefore based solely on the artificial. In recent fast growing world, we have the incredibly advanced feats of aerospace, electronics, megatronics, electrical and computer engineering to give the household toys for the new born of ability to fly with responsive controls[5]. We can use aeronautical airplanes, helicopters and quadcopters remotely and within few minutes without any form of professional training. The man lying the quadcopter can feel the significant sense of missing out on something. We hope that our design can overcome the current flying quadcopter or helicopters which is not limited only to the yield of games[6][5], and that it can place in various effective hobbies that could make use of this added level of immersion in the aim of life.

B. Scope

a) Weather detection Potentially, they could sample the atmosphere in difficult to reach, where weather data is scarce[5][1]. The data received from the copter could then be integrated into prediction models and modules improving their resolution, stability, ability

b) 3D mapping Analysts used stereoscopes to hunt for visual clues about enemy movements on photos and video that were snapped together to form mosaic and networked maps.

c) Monitoring wildlife In particular it would be very useful to help and large gull chicks that hide in the dense forest on the island, using an infrared wireless camera..It would be interesting to see if a small loudspeaker could be attached to use as a scarring method for playing alarm calls to frighten large sound from the island in spring and autumn weather and etc.

II. BLOCK DIAGRAMS

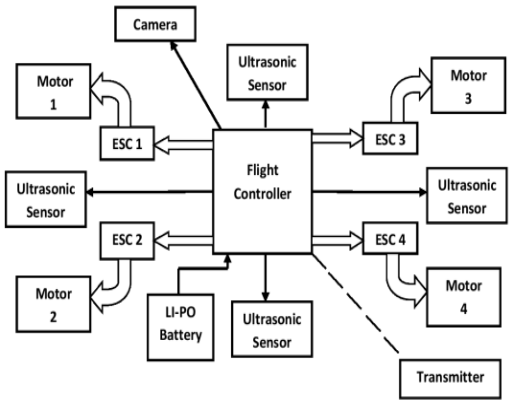
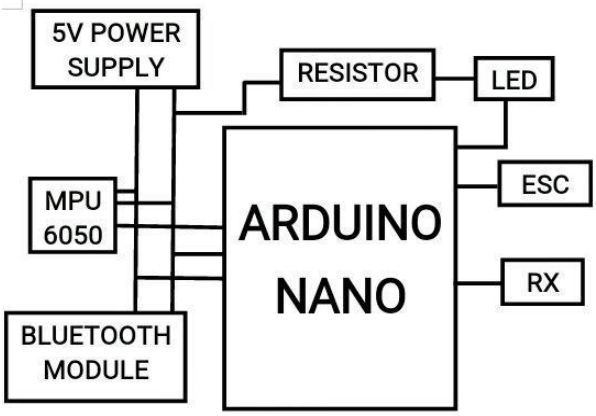


Fig1: Block Diagram of Quadcopter



. **Fig 2: Block Diagram of Flight Controller**

III. COMPONENTS REQUIREMENT

1. Arduino Nano.
2. MPU 6050.
3. Electronics Speed Controller – 30A
4. Brushless Motor – 2200KV/6T
5. Lithium Polymer Battery – 2200mah
6. Propellers – 10.5*4
7. Frame – 450quad
8. Ultrasonic Sensor.
9. Camera – Wireless

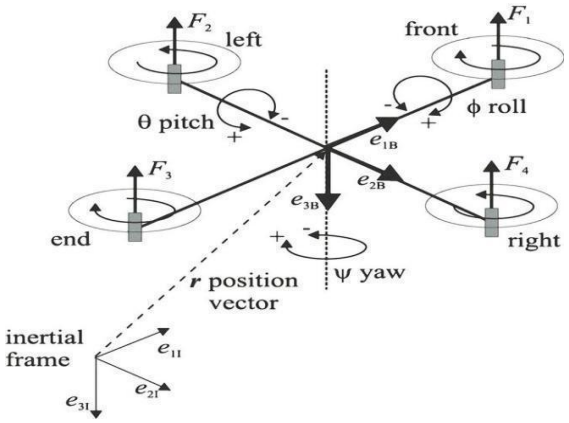
IV. OVERVIEW

Quadcopter system works on the principle of air lifting technique with high pressure. The propellers of the copter force the air in downward with high pressure due to which an uplift force is created and as a result action reaction law is applied on the entire system. When this uplift force dominates the earths gravitational force, the entire system start flying upside in the air. But there is an issue with the rotation of propellers. If we rotate the propellers in clockwise direction then due to this rotation, a torque will be applied over the entire system in one direction. and similarly if we rotate the propellers in anti-clock wise direction then also a torque will be produced over the entire system and the entire system will start rotating anticlockwise. To overcome this problem we rotate two propellers in clockwise direction and remaining two propellers in anticlockwise direction alternately. This technique produces torque in opposite direction and they get balanced and the system remains stable while flying up in air. Two basic technique are used for movement of quadcopter, thrust and torque. Quadcopter uses its four propellers attached to motors which creates thrust and help quadcopter to fly high in the air. Motion of quadcopter are defined based on the input values (x, y, z) given to it. Out of four motor attached with propellers, two motors rotate in clockwise (CW) direction while other two in counter clockwise (CCW) direction. Motion of quadcopter is thus controlled mainly by three movements. These movements are classified as,

Yaw Rotation: Yaw is defined as movement of quadcopter either to left or right and it is controlled by throttle stick of transmitter. Yaw decides the direction of quadcopter.

Pitch Rotation: Pitch is defined as the whole movement of quadcopter either in forward direction or in backward direction. Its also controlled by throttle of receiver. Moving the throttle in forward direction moves quadcopter in forward direction while moving throttle backward moves quadcopter in backward direction.

Roll Rotation: The movement about the longitudinal axis of quadcopter is known as roll motion. Left or right motion of throttle stick is followed by quadcopter, it moves in towards right when throttle move to right and moves to left when throttle stick moves in left direction. This parameter thus makes quadcopter to fly in left or right direction.



V. SOFTWARE IMPLEMENTATION

The micro controller ATMEGA328p is programmed using C language with arduino IDE software. Its a development environment that simply uses an user interface for adding and editing in the arduino coding language in the controller IC on the Arduino board. These program are utilized in such various calibration steps which includes:

A. Setup Calibration

Setting up calibration illustrates the interconnections of different hardware components used in quadcopter. First step to go by program is uploaded on arduino board using IDE Software and then some motor arming routine. Calibration of ESC varies with the brand of ESCs used in quadcopter. The calibration of ESC is done on priority basis with the help of a radio system for each rotor and corresponding ESC. It includes the following steps as follows: First upload the program on arduino controller board, then turn ON the transmitter and put the throttle stick to its maximum. Now connect the battery The auto pilots red, blue and yellow LED will light up in cyclic pattern that indicates ESCs are ready for calibration mode. By keeping the transmitter throttle stick on high, disconnect and then reconnect the battery. Regular no of beeps on transmitter will then indicates the battery cell count and additional two beeps specify that maximum throttle has been captured. Now by setting the transmitter throttle stick down to its minimum position. ESCs should now emit a long tone that indicates minimum throttle has been captured and calibration is complete. For a balanced flight these parameters of gyroscope must be set to -0,-0 0 respectively.

B. Flight Calibration Mode

Flight calibration mode is a field testing mode. By placing quadcopter on flight mode and then test the quadcopter on field. After tuning the gyroscope parameters on the test stand, we began to test the quadcopter in free flight. These tests were performed outdoors in a large open area space, while maintaining safe distance from the quadcopter. We were confident after the single-axis tests that the quadcopter would be fairly stable in the roll and pitch axes, but it drifted significantly in the yaw direction. After performing the stabilizing control on the yaw axis with proportional control only, the quad drifted much less in yaw and became much more controllable. Then by increasing the proportional control term in the yaw PID until the quad was fairly responsive to yaw control inputs. We found that the quadcopter made is small, fast oscillations in the roll and pitch axes in flight. To x this, we reduces the vibration on quadcopter by balancing the propellers, we isolated the sensor board from the remaining vibration using vibration absorbing mount. Now quadcopter flight mode was much stable.

VI. ADVANTAGES

1. It can be Effective for Surveillance and Security for this growing and developing world.
2. It can be Remotely-Controlled from the ground station.
3. This Module can Deliver the Information and Things easily from one point to another.

VII. CONCLUSION

Nowadays, there has been a lot of increasing interest in Quadcopter due to its high endurance and more lifting payload. Different various videos have been published on the Internet by many Different research groups and have attracted much attention from the public and growth. This Paper is proposed the overview of Arduino platform and the basic of Arduino based flight control system, Ultrasonic effective sensors are also being included. The effective changes in hardware and software can give high stability in UAV system. The stability of Quadcopter will depend on the PID Tuning. It is to be needed tuned the flight controller with each different body frame.

Our research work yielded a successful development of Arduino Nano based Quadcopter at a cheaper and affordable amount. Quadcopter which can be easily made and available shelf components. Now this can be used as a cheap cost alternative to many applications which includes pesticide spraying, end to end delivery within the transmitter's RF range, surveillance in defense and other important places

like nation border, mapping through remote sensing, etc. with very high level of precision.

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