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LOW COST QUADCOPTER USING ARDUINO CONTROLLER

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ABSTRACT: The quadcopter device is an exceptionally maneuverable and flexible platform for plenty packages specifically surveillance and aerial images which may be used to screen and survey vital regions in addition to regions which might be generally very hard to get admission to or risky locations. This paintings is proposed to construct a quadcopter the usage of the Arduino nano. Arduino nano is an open supply bodily computing platform used for constructing virtual gadgets and interactive gadgets which could experience and manage gadgets in bodily world. Transmitter is used to govern the motion of the drone. Radio transmitter makes use of radio sign to remotely manipulate quadcopter in wi-fi way, the instructions given with the aid of using transmitter are acquired with the aid of using a radio receiver related to Arduino nano controller.

KEYWORDS: Accelerometer, Arduino nano microcontroller, BLDC Motor, ESC's (Electronic speed controller), Propellers, Transmitter and Receiver.

I. INTRODUCTION:

The industrial and surveillance sectors have a significant need for the assistance equipment known as the quadcopter. The quadcopter's range of applications is expanding daily. Applications for quadcopters can be found everywhere. Today, quadcopters are employed for a variety of tasks, including airborne surveillance, ground mapping, pesticide application, and delivery. Multirotor available in a variety of sizes, and we can build our drone based on the application and specifications. The design of the quadcopter using ATMEGA328 is part of the current effort. In our house, office, or any other location within its transmitter range, we will be able to operate this device via a remote control or transmitter. The maximum critical component is that it could be used for powerful surveillance at locations wherein person Low Cost Quad Copter Using Arduino Nano Controller. Evolution in statistics technology in current years leads now no longer most effective to a good sized development of hardware overall performance however additionally to imparting new hardware answers now no longer viable before, like unmanned aerial cars drones. Such gadgets at the moment are extensively unfold and usable now no longer handiest for enterprise and industrial utility however additionally free of charge time a laugh programs in a non-public usage. The intention of our utility is to layout and assemble a flying robotic successful of outside and indoor flight and hover. With an incorporated system, the automobile could be successful hover capabilities, through pre-programmed flight paths and bring positive payload.

- **Project Direction**
- **Yaw Rotation*:***

Each of the rotors at the quad-copter produces each thrust and torque. Given that the front-left and rear-proper cars each rotate counter-clockwise and the opposite rotate clockwise, the internet aerodynamic torque may be zero. The beneath determine display the torque sample. the following fig 1 shows associated movement diagram.

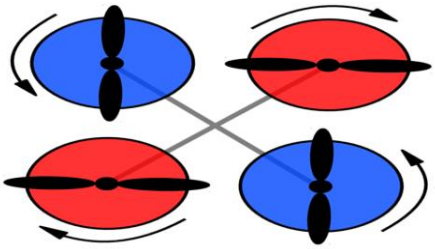

Fig 1: Torque styles and associated motion.

- **Hovering:**

For soaring a stability of forces is needed. If we need the quad-copter to hover, SUM(Fi) have to be identical m•g. To flow the quad-copter climb/decline the rate of each motor is increased/decreased. The fig 2 shows the beneath parent suggests the stability electricity whilst soaring diagram.

SUM(Fi) > m•g <=> climb
SUM(Fi) = m•g <=> hover
SUM(Fi) < m xss=removed> decline

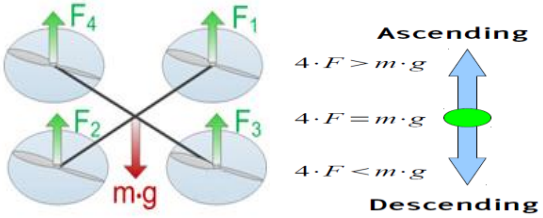

Fig 2: Balance of energy whilst hovering.

- **Tilting:**

Now allow us to take a glance on what's occurring whilst we tilt the quad-copter. For simplification best of the 4 rotors are shown. We see that the pressure is split in exclusive parts. FL1 and FL2 are the a part of the pressure used to raise the quad-copter. FT1and FT2 represents the element used for the translation. It is plain that the elevate element turns into smaller with growing φ. The beneath discern suggests the pressure distribution for tilting shown in fig 3.

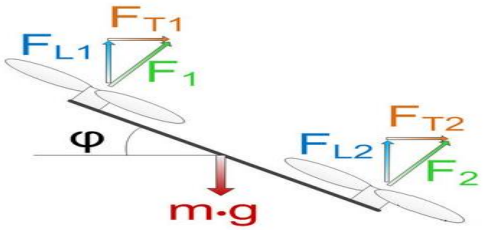

Fig 3: Force distribution for tilting.

II. LITERATURE SURVEY:

[1] M. Khan, **"Quad Copter Flight Dynamics,"** International Journal of Scientific & Technology Research Volume 3, Issue 8, August, 2014.

From This Paper this project is to build a quad copter that can accomplish a variety of practical tasks like delivery of drugs and medicines with parallel video surveillance. Once the appropriate rules are established by the government, the market for multipurpose drones has the potential to grow significantly. Once the appropriate rules are established by the government, the market for multipurpose drones has the potential to grow significantly. Low-power microcontrollers now perform better for less money thanks to technological advancements, enabling fans to build their own quad copters. The purpose of this project is to construct a quadcopter with the ability to fly steadily, collect and store data, and execute semi-automatic commands, like auto-homing, using a wireless remote and gps tracking to deliver medical aid, like blood and emergency medications, to those in need during busy city hours.

[2] **Low-Cost Microcontroller-based Hover Control Design of a Quadcopter**, by B. T. M. Leong, S. M. Low, and M. Po-L. Ooi, International Symposium on Robotics and Intelligent Sensors, 2012.

This paper presents a self-tuning fuzzy proportional integral derivative controller was used to autonomously track a chosen reference trajectory. The quadrotor is stabilised, the attitude is controlled, and the trajectory is tracked using a proportional integral derivative controller and fuzzy system tuning benefits from a proportional integral derivative controller.

Based on data from experimental studies, it has been determined that while both the self-tuning fuzzy proportional integral derivative controller and the classical proportional integral derivative controller have been successful at tracking a specific trajectory with the aircraft, the latter has been able to control with fewer errors.

[3] Quasi-Journal of Scientific & Technology Research, vol. 3, no. 8, August 2014; M. Khan, **"Quad Copter Flight Dynamics".**

In this paper created a quadcopter as a result of technological advancements in remote package delivery systems and monitoring. The quadcopter's flight controller was created using an Arduino nano R3-based microcontroller board, and a transmitter-receiver configuration may be used to control the flying motions. While the magnetometer module shows the direction of motion, the coupled gyro cum accelerometer module provides the precise coordinate location of where the quadcopter is positioned. A LIPO battery is provided for the microcontroller. Electronic speed controllers are used to instruct the microcontrollers to activate the quad rotors (ESCs).

[4] **"Development of arduino based quadcopter,"** International Advanced Research Journal in Science, Engineering and Technology, vol. 3, no. 6, pp. 252-259, 2016. A.S. Rajpoot, N. Gadani, and S. Kalathia.
This project, which designs and develops a quadcopter utilising an Arduino Nano board rather of a pre-programmed KK 2.1 flight controller board, is suggested as a way to learn about the most effective and fighter quadcopters for tiny stage applications. It has a broad range of uses, such as the quadcopter equipped with a wireless camera and GPS tracker that may be used for coast guard applications, army bases, and other large-scale surveillance and security operations.

III. DESCRIPTION OF THE PROPOSED SYSTEM:

A quadcopter is an aerial craft that may be piloted to fly on its own. It is a specific kind of miniature Unmanned Aerial Vehicle (UAV). And an R3 assisting device, an aircraft hoisted and driven by four horizontal rotors, which is in great demand in the industrial & surveillance sector. There are two rotor blades on each rotor. The quadcopter employing ATMEGA32 is designed as part of the current effort. A hand-held radio control transmitter is used to manually control the quadcopter's propellers. The block design of the low-cost quadcopter employing an Arduino controller is shown in the fig 4 below on the transmitter side.

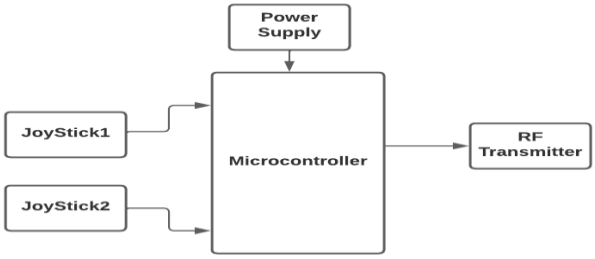

Fig 4. Transmitter side Block Diagram

The transmitter can track radio signals and transmit them across the air to the receiver. Once the information from the transmitter has been accepted by the receiver, it is passed to the Arduino nano controller, which causes the quadcopter to move in accordance. The quadcopter utilising an Arduino controller is seen in the figure 5. The block diagram of the inexpensive quadcopter employing an Arduino controller is seen above on the receiver side. A flight stability sensor is necessary for quadcopters so they can be stabilised while flying. Radio transmitters employ radio signals to wirelessly operate quadcopters from a distance.

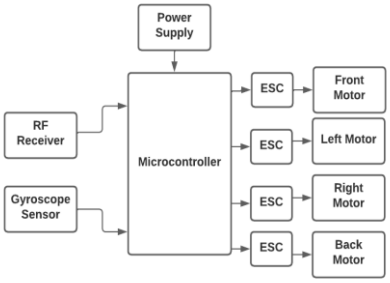

Fig 5. Receiver side Block Diagram

Radio receivers attached to Arduino nano controllers pick up the radio transmitter's orders. Synchronous motors fuelled by DC energy are known as BLDC motors. It is employed to turn the quadcopter's propellers.

IV. SYSTEM DESIGN AND IMPLEMENTATION

A. Hardware Requirement:

The selection of low cost components was the primary goal for the design of low cost drone. The components used are, Arduino nano microcontroller, joysticks, NRF24L01 transmitter and receiver pair, MPU6050 gyro sensor, BLDC

motors, ESC(Electronic Speed Controller) and lipo battery.

B. Implementation:

The implementation of the drone is divided into 3 parts.

1. Body construction
2. Transmitter Design
3. Receiver Design.

1. **Body Construction:**

For building drone frame I have used aluminum material and made quad-x style design, the following fig 6 shows the drone frame.

Fig 6. Drone frame

2. Transmitter Design:

For controlling movements of the drone we required transmitter device. Here I have designed transmitter, it includes Arduino nano, two joysticks and RF transmitter device.

The below fig 7 shows the Transmitter device.

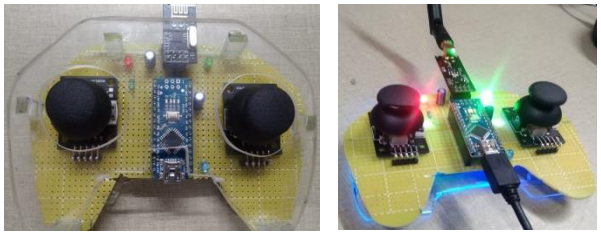

Fig 7. Transmitter Device

3. Receiver Design:

In this section I have build the drone with low cost components. The components are

Arduino nano, RF receiver, BLDC motors, ESC's and lipo battery. The below fig 8 shows the receiver device.

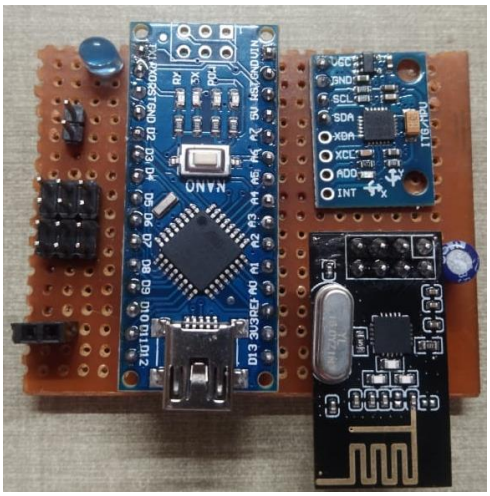

Fig 8. Reciever

Fig 10. Drone setup

V. FUTURE UPDATE

- The Wi-Fi camera can be used to transfer live video stream.
- In addition to tracking the drone, the GPS can also be used to deliver items automatically, such as heart transportation.

VI. CONCLUSION

- The suggested Arduino-based quadcopter may be constructed at a lower cost, is lightweight, and is quickly fabricated using components that are readily available. The developed quadcopter is inexpensive and simple to design in comparison to other drones or multirotor.
- This development platform may be used as a low-cost substitute for numerous applications, including remote sensing mapping, end-to-end delivery inside the transmitter's RF range, and monitoring in sensitive areas like the military**.** Even in the absence of a well-established infrastructure to control the low-altitude airspace, drone use is growing quickly

- The development of a system to guarantee secure and effective operations will be essential for the continued expansion and sustainability of drone technology as the skies become more congested.

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