Fire Fighter Drone CO₂ Ball Dropping Mechanism using Arduino Uno

A G M S N Lakshmi[1], K. Poojitha [2]

[1]M.Tech Student, Dept of ECE, Sri Krishnadevaraya University College of Engineering and Technology,Anantapuramu, Andhra Pradesh, India

[2]Lecturer, Dept of ECE, Sri Krishnadevaraya University College of Engineering and Technology, Anantapuramu, Andhra Pradesh, India

ABSTRACT

Unmanned Aerial automobiles usually referred to as Quad copters are aerial vehicles operated via a remote manage gadget to fly independently. They are referred to as rotorcrafts as it work's with a fixed of revolving twisted chord aerofoil's. Quad copter is getting more excessively used because of many reasons including easy to build and bring together, complexity is much less. Normally in maximum of the instances drones are used in Transporting gadgets, military, spying, educational use, rescue and many others. The main target of this paper is to provide an explanation for the use of drone for fire combating and rescue. It additionally explains about the maximum weight lifting potential of the Quadcopter and the alternative diverse parameters relevant to transmitter-receiver, gyroscope, digital velocity controllers (ESCs), PID manipulate and many others. The paper emphasize on making Quadcopter fee-effective and dependable together with making it distinctly stabilized in windy and dusty environment.

Keywords : Transmitter-Receiver, Gyroscope, Digital Velocity Controllers

I. INTRODUCTION

The base utility of Arduino Uno in Quadcopter is an open supply physical computing platform used for building virtual devices and interactive gadgets that can sense and control gadgets in bodily world. It's a micro controller, based on AT mega 328P, Arduino IDE (included development surroundings) is use to upload packages to the Arduino boards and further those programmed boards can be used to perform meant tasks. This device will both use a GPS machine or it's going to use a camera for identity of course being travelled by it. This device will be controlled by way of a far flung machine or a transmitter by using sitting inside our home, office, or any place inside its transmitter range. The quadcopter is useful for in many situations. From the scope of the quadcopter, it's used for aerial photography, protection and rescue, industrial inspection and much greater. We are using Arduino based Quadcopter in an progressive way to

create a mechanism to launch a hearth extinguishing CO2 ball within the desired location with a view to save you hearth or directly extinguish them, it's miles specifically beneficial for hearth men to keep lifestyles in fireplace injuries.

II. PROPOSED DESIGN

Quadcopter is one of flying unit used to lift the object from one place to another in lesser time or can be used for surveillance purpose. Quadcopter is an assistive device which has a high call for within the commercial & surveillance sector. At industry level applications, quadcopter is made using KK board module which comes with pre-programmed KK board and balanced gyroscope module which is not economical for smaller applications. It's not a cost-effective method. To make the quadcopter economical and efficient for small level applications this work is proposed, which design and develop a quadcopter using Arduino Uno board instead of pre-programmed KK flight Controller board. we are using Arduino based Quadcopter in an innovative manner to create a mechanism to release a fire extinguishing CO2 ball in the desired location that will prevent fire or directly extinguish them it is mainly useful for fire men to save life in fire accidents. he quadcopter uses an Arduino microcontroller Atmel328 as the core controller and is designed and developed to achieve the real time operating system. The hardware consists of simple Arduino board with an At mega 328, propellers, ESCs & flight controller board (FCB), transmitter & receiver and gyroscope for a balanced flight.
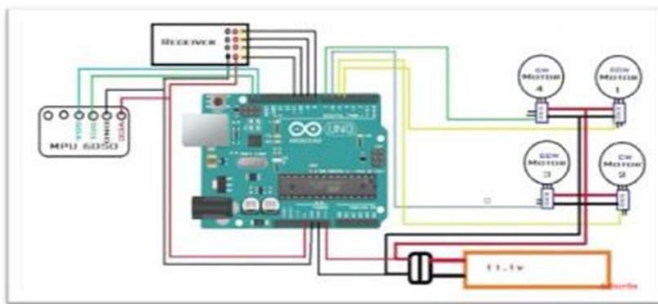

Fig 1: Hardware description of quadcopter

Hardware is programmed in C language. The controller board and ESC's work together. FCB gives the command to ESCs which is further connected to BLDC motors for the rotation.

A Working principle

Quadcopter device works on the principle of air lifting phenomena with excessive stress. The propellers pressure the air in downward with excessive strain because of which an uplift force is created and as a result action response law is carried out on the complete machine. While this uplift pressure dominates the earth's gravitational pressure, the entire machine starts flying within the air. But there is a hassle with the rotation of propellers. If we rotate the propellers in clock smart route then due to this rotation, a torque can be applied over the complete machine in a single route. Andsimilarly, if we rotate the propellers in anti-clock clever route then additionally a torque can be produced over the complete machine and the complete machine will start rotating anticlockwise. To conquer this hassle, we rotate propellers in clockwise route and closing propellers in anticlockwise direction. This phenomenon produces torque in opposite course and that they get balanced and the device remains strong at the same time as flying. Two primary phenomena are used for movement of quadcopter,thrust and torque. Quadcopter makes use of its four propellers connected to motors which creates thrust and help quadcopter to raise high. Motion of quadcopter are defined based totally on the input values (x, y, z, θ, ɸ, ψ) given to it. Out of 4 motor connected with propellers, two automobiles rotate in clockwise (CW) course while other two in counter clockwise (CCW) direction. Movement of quadcopter is therefore managed specifically via three movements. These movements are classified as

Yaw Rotation (ψ)

Yaw is defined as movement of quadcopter either to left or right and it is controlled by throttle stick

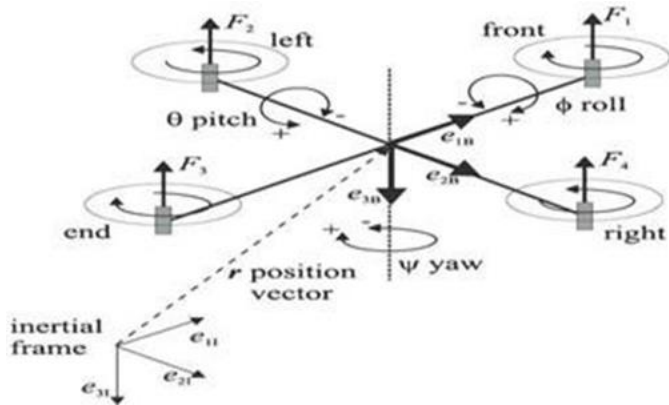of transmitter. Yaw decides the direction of quadcopter.

Fig.2: Yaw, Pitch & Roll rotation

Pitch Rotation (θ)

Pitch is described as the entire motion of quadcopter both in forward course or in backward direction It's also controlled by throttle of receiver. Moving the throttle inforward direction moves quadcopter in forward direction while moving throttlebackward moves quadcopter in backward direction [5].

Roll Rotation (φ)

The movement about the longitudinal axis of quadcopter is known as roll motion. Left or right movement of throttle stick is followed with the aid of quadcopter, it movements in towards right when throttle pass to right and movements to left while throttle stick moves in left path.This parameter thus makes quadcopter tofly in left or right direction. [5].

B Design and Methodology

The circuit design and methodology adopted in designing Arduino based quadcopter is shown in below fig:
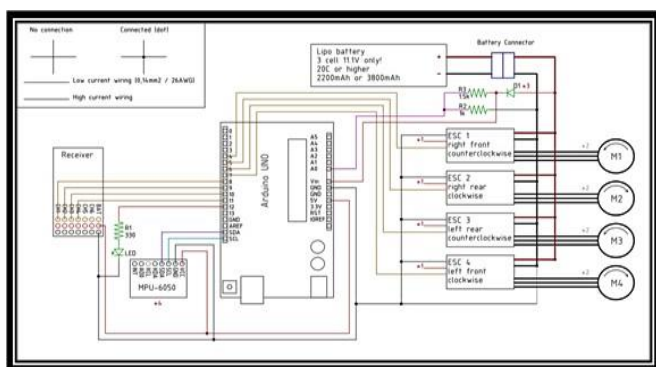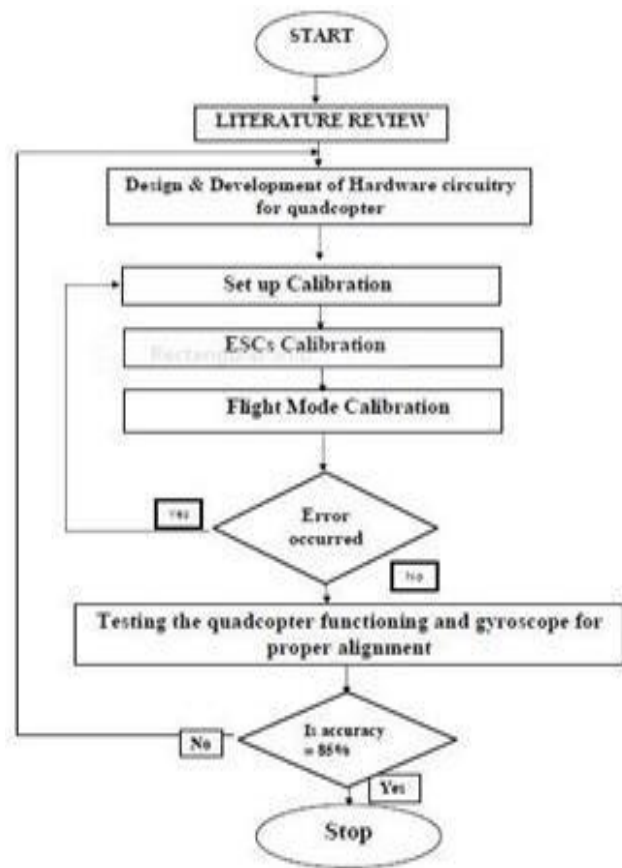

Fig 3: schematic diagram of quadcopter

Fig 4: Flow chart for quadcopter designing

III.   EXPERIMENTAL RESULTS

The initial flight test the usage of kk board proved that this board can't be used for precision applications and accordingly turned into discarded in initial stages of improvement. The crius aiop was made the platform of choice for developing ISR system, multiwii is used instead of mega pirate as it is more refined and better support is available in case things go wrong.

Fig 5: Final Arduino Uno based fire fighter drone dropping mechanism

The multiwii device has a completely interactive graphical consumer interface that can be assessed in flight the usage of telemetry for lengthy distance and Bluetooth for brief distance flights.

Fig 6 : Top view of Arduino Uno based fire fighter drone dropping mechanism.

The GUI (fig 6) gives real time information of the quadcopter performance, battery level, position on map and other necessary details which are not provided by the kk board and the megapirate system.

IV. CONCLUSION

Our research work yielded a successful development of Arduino Uno based fire fighter drone co2 ball dropping mechanism at a cheaper and affordable amount. Quadcopter which can be easily made from shelf components. It is very helpful for fire men's in fire accidents at towns, forest places at where we cannot reach. 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 defence and other sensitive places like nation border, mapping via remote sensing, etc. with very high level of precision.

Our team dreams have been to layout, test, and construct a quadcopter package with co2 losing mechanism. There are numerous feasible up-gradation in future based on its application which includes:
· adding a sonic sensor module to controller board for extra accurate altitude determination. · enforcing a GPS module on kit for monitoring &secret agent-based totally programs.
· This design can employ Motor driver of high rating or Relay driving force can be used for its commercial applications.
· can be used for real estate images by using employing camera on it. Other programs include inspection, surveillance and monitoring a huge location by digicam equipped quadcopter.
· pesticides sprinkling · digicam is used to drop co2 ball at specific vicinity to forestall fire.
· hearth sensor to track exact area.
· based totally on the weight lifting calculations we are able to use our single in your price range Quadcopter to raise those special modules enjoyable the weight lifting standards.
· convey things from one area to another.
· hearth evidence materials to avoid damages.
· The cage layout from another opportunity nevertheless stays attached to the quadcopter and just the rails are delivered. The rails will serve to manual the hearth extinguishing ball to its target while on the identical time keeps the quadcopter at a secure distance from the flames. A servo motor controls the angle at which the railing machine goes to rotate. This could offer manage over the rate at which the fireplace extinguishing grenade is released.

V. REFERENCES

[1]. Stafford, Jesse, "How a Quadcopter works Clay Allen". University of Alaska, Fairbanks. Retrieved 2015-01-20.

[2]. SandeepKhajuria, Vaibhav Surwade, Vivek Badak, "Quadcopter Design and Fabrication," International Advance Research Journal in Science, Engineering and Technology (IARJSET), Vol. 3, Issue 2, February 2016.

[3]. Quadcopter Dynamics, Simulation, and Control, January 26, 2010.

[4]. David Roberts, "Construction and Testing of a Quadcopter," California Polytechnic State

University, San Luis Obispo, CA, 93407, June, 2013.

[5]. S. Bouabdallah, P. Murrieri, R. Siegwart, "Design and Control of an Indoor Micro Quadrotor", Robotics and Automation 2004. Proceedings. ICRA '04. 2004 IEEE International Conference on, vol. 5, pp. 4393-4398, 2004.

[6]. J. Engel, J. Sturm, D. Cremers, "Camera- based navigation of a low-cost quadrocopter", IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), pp. 2815-2821, Oct. 2012, ISBN 21530858.

[7]. J. Valvano, "Embedded Microcomputer Systems: Real Time Interfacing", Brooks-Cole, 2000, ISBN 0534366422.

[8]. Spanoudakis, P., Tsourveloudis, N. C. and Valavanis, K. P. Design Specification for an Unmanned VTOL. 2004 IEEE International Conference on Robotics and Automation. April 26- May 1, 2004. 36163621. New Orleans, IA: IEEE. 2004. 3616-3621.

[9]. Gibb, Alexandra Suzanne. "Droning the story." PhD diss., University of British Columbia (Vancouver, 2013).

[10]. (2013)Firefighting.Retrievedfrom http://en.wikipedia.org/wiki/Firefighting#Use_o f_wat er

[11]. (2013)ElideFire.Retrievedfrom http://www.idttrade.com/en/ozellikler.php.

Cite this article as :