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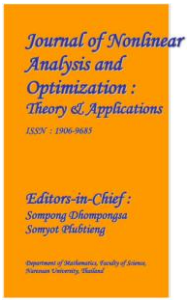

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DRONE BASED IMAGE CAPTURING

[#1]U N V. AKASH, UG Student,
[#2]B V. SAI MAHESH, UG Student,
[#3]P. VINOD KUMAR, UG Student,
[#4]Dr P. SEKHAR BABU, *Associate Professor*,
Department *of ECE*,
SAI SPURTHI INSTITUTE OF TECHNOLOGY, SATHUPALLI, KHAMMAM

Abstract: - Unmanned aerial vehicles (UAVs) are aircraft that may be operated from a distance. They can be remotely controlled in real-time or pre-programmed to fly independently over predetermined itineraries. This kind of aircraft, more often known as a drone, is being used more frequently across many industries. The demand and usage of drones are increasing every day due to their applications in various sectors. Drones are used for aerial surveillance and observation in the military. Armed forces are supplied with supplies and weapons via cargo drones. Commercial businesses, government agencies, professional photographers, and enthusiasts all employ small drones. Each year, thousands of small drones are sold.

Drones have many applications in our daily lives and can be employed for agricultural, military, commercial, disaster relief, research and development, and many other purposes. There has been a significant increase in the usage of small drones/unmanned aerial vehicles in recent years. Consequently, there is a rising potential for small drones to be misused for illegal activities, such as terrorism and drug smuggling. Hence, there is a need for accurate and reliable UAV identification that can be used in various environments. In this paper, different versions of the current state-of-the-art object detection model, i.e., YOLO models, are used, by working on the principles of computer vision and deep learning to detect small UAVs. To improve the accuracy of small UAV detection, this paper proposes the application of various image-processing techniques to the current detection model, which has resulted in a significant performance increase. In this study, a mAP score of 96.7% was obtained for an IoU threshold of 50% along with a precision value of 95% and a recall of 95.6%. Distance-wise analysis of drones (i.e., for close, mid, and far ranges) was also performed to measure distance-wise accuracies.

Key Words: *Drone/Quadcopter, Transmitter & Remote, Propellers, Electric Motors, Unmanned Arial Vehicle(UAV), ISP (In-system programming), BLDC (brushless DC) motor.*

I. INTRODUCTION

A Drone has the potential for playing several tasks wherever humans cannot enter, as an example, extreme temperature and high-altitude police investigation in several industries, rescue missions. A Drone has four propellers with motors that generate the thrust for lifting the craft. A drone is also called as the Quadcopter. The basic principle behind the quadcopter is, two motors can rotate within the clockwise direction the opposite two can rotate in Associate in nursing anticlockwise direction permitting the craft to vertically ascend. While taking the flight with the assistance a camera we are able to have live streaming and capture pictures.

For a past one decade, several researchers are done on the drone or quadcopter to implement it in new applications. It can survey the areas where human intervention is not applicable. They are the flying machines which can be controlled by using a remote controller. It is also used in weather forecasting, fire-fighting, search & rescue operations, surveillance and traffic monitoring etc.Generally, the drone faces the problem of the balancing due to the uneven weight distribution and atmospheric air flow. This can be avoided by using PID controller. It is not only used in military but also in industrial and commercial applications. The parts of the drone are brushless motors, propellers, electric speed controllers (ESC), battery etc.

In recent years, the drone has come into recognition for a number of materialistic uses. In late 2013, Amazon announced a plan for delivery of product in nearby areas within 30 minutes. They used unmanned aerial vehicle for delivery which is Called Amazon Prime Air. So it's clear that domestic usage of UAV as large future risk in several fields instead of military. Current aerial drones are expensive. Search and rescue operations are expensive as well as dangerous for the rescuers. This project aims to build a product that functions as an inexpensive assistance to rescuers searching for peopleand things, such as lost children's in crowded areas.

II. LITERATURE REVIEW

From [7], Ashfaq Ahmad Mian et.al. (2007) developed of nonlinear model and nonlinear control strategy for a 6-Degree Of Freedom quadcopter aerial robot. The nonlinear model of quadcopter aerial mechanism is predicated on Newton-Euler formalism.

The Wallenberg Laboratory for Information Technology and Autonomous Systems (WITAS) is conducting a basic research project on Surveillance Drone at the Linkoping University (LiU), Sweden [16]. The project is multi-disciplinary and in cooperation with a number of Universities in Europe, USA and South America. The goal of this project is to develop technologies for various geographical land containing road and traffic networks. It involves integration of autonomy with digital video and IR cameras, and a communication system.

From [15], Quadcopter is a remote-controlled aerial vehicle, which might be enforced in numerous

applications. In paper it'll be drawn a development of a quadcopter system and potential application within which it can be implemented. Quadcopter structure model, basic parts with diagram, hovering stability, dimensions, and outline of basic movements are going to be drawn and mentioned. Control algorithms with steps in practical research will also bepresented.

Santos et.al. (2010) work on intelligent fuzzy controller of Quadcopter. A fuzzy management is meant and enforced to manage a simulation model of the Quadcopter. The inputs are the required values of the peak, roll, pitch and yaw. The output are the ability of every of the four rotors that's necessary to succeed in the specifications. Simulation results prove the potency of this intelligent management strategy isappropriate. Figure 1 portrayed the fuzzy controller duringthis analysis.

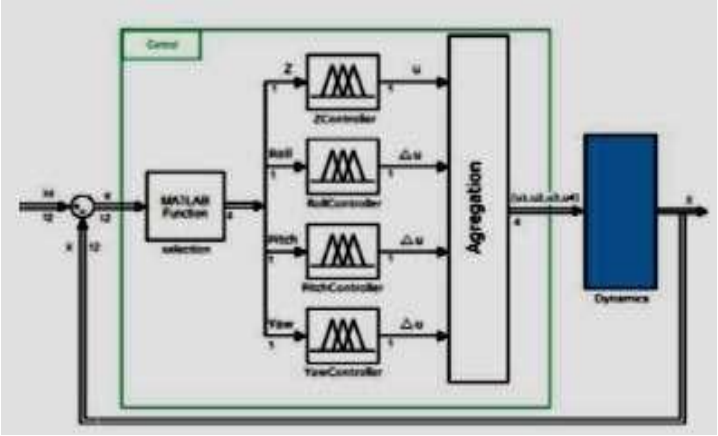

Fig -1: Control diagram using Fuzzy controller

For past one decade, several researches were conducted onquadcopter for various applications extending from militaryto traffic surveillance [3].

III.PROPOSED METHOD

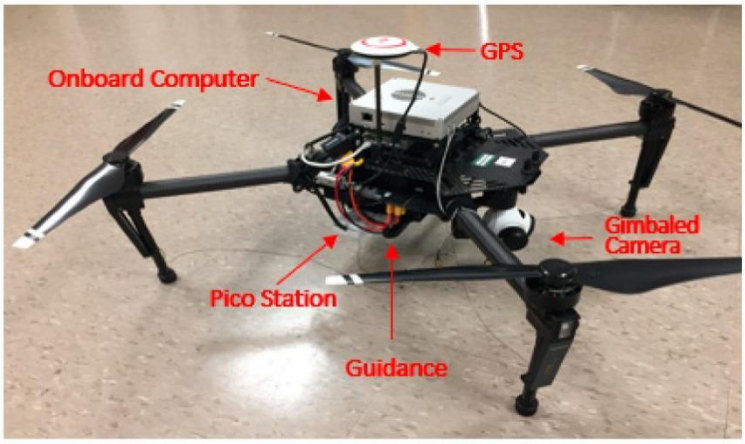

Fig -2: Proposed Block Diagram

Generally, a quadcopter made up of four arms and four motors which help to lift. Motors are connected to the ESC (Electronic Speed Controller) for varying its speed. These ESC's are connected to KK2.1.5 controller board which is connected to the fly sky receiver. The flysky receiver is connected to Flight controller board gets signal from RC Transmitter which is controlled manually.

KK 2.1.5 board comes with ATMEL mega 664PA, 8- bit AVR architecture primarily based microcontroller with 64K of memory. It is straightforward for the beginner to start out with and has microcode pre-defined in it. While activating or deactivating the board there's associate degree audio warning from the piezo buzzer of KK 2.1.5. It is the most stable board because it has inbuilt gyroscope, 6050 MPU, and auto level function. This board has eight motor outputs, five management inputs, associate degree liquid crystal display, polarity protected voltage device input, associate degree ISP header, six-axis accelerometer or gyroscope, and a fuse protected piezo output. The user- defined signals from K.K. board are processed by ATMEL 644PA IC and these control signals are passed to the ESC's installed on the frame of the drone.

The KK2.1.5 Multi-Rotor controller is a flight control board for multi-rotor aircraft (Tricopters, Quadcopters, Hexacopters). The Atmega644PA IC unit then processes these signals according the users elite microcode and passes management signals to the put in Electronic Speed Controllers (ESCs). These signals instruct the ESCs to make fine adjustments to the Brushless DC motors rotational speed which in turn stabilizes your multi-rotor craft

The KK2.1.5 Multi-Rotor panel to boot uses signals from your radio systems receiver (Rx) and passes these signals to the Atmega644PA IC via the surface, elevator, throttle and rudder inputs. Once this info has been processed the IC can send varied signals to the ESCs that successively regulate the movement speed of every BLDC motor to induce controlled flight (up, down, backwards, forwards, left, right). ESC module is the interface between BLDC motor and the controller. Remote transmitter is connected wirelessly using RF frequency of range 2.40 to 2.47 GHz. Receiver receives the wireless signal and the flight is controlled.

Fig 1 shows the block diagram of Surveillance Drone Which contain the components and connections used in the experimental device. Table 1 shows the specifications of components with their specification that were used for creating this particular quadcopter.

Table -1: Component Specification

Sr. No.	Parts	Specification
1.	Frame	450mm
2.	DC motor	1400kv
3.	Propellers	10×4.5”
4.	ESC	30A

5.	KK 2.1.5 Board	IC:ATmega644PA
6.	Li-Po Battery	2200mAh, 25C
7.	RC Transmitter	Flysky FS-i6
8.	Battery Checker	36V displayrange
9.	Power Module	17 × 5 × 3 cm

Wireless Camera is used to capture the image and live video streaming while flying and the control of camera is at ground. Camera transmitter and receiver are connected by Wi-Fi module through a mobile application.

IV. PHYSICS BEHIND FLYING DRONE

Quadcopter use for motors with four propellers to make thrust to offer the craft carry. Two of the motors rotate counter clockwise and the other two rotate clockwise. This configuration causes the force from every motor to cancel by the corresponding motor rotating the other direction. The different about Quad copters from other vertical takeoff and landing aircraft (VTOL) is that in order to control pitch, yaw, and roll the pilot uses variable thrust between the four motors.

Each rotor produces a thrust and force concerning its center of rotation, as well as a drag force opposite to the vehicle's direction of flight. If all rotors are spinning at an equivalent angular rate, with rotors 1 and 3 rotating clockwise and rotors 2 and 4 rotate counter clockwise and hence the angular acceleration concerning the yaw axis, is precisely zero, that mean there is no need for a tail rotor as on standard helicopters. Yaw is elicited by mismatching the balance in mechanics torques. Schematic of reaction torques on each motor of a quadcopter aircraft, due to spinning rotors. Rotor 1 and 3 spin in one direction which is clockwise, where as rotor 2 and 4 spin within the wrong way, produce opposing torques to control aircraft. A Quad rotor adjusts its altitude by applying equal thrust to all four rotors. A Quad rotor adjusts its yaw by applying more thrust to rotors rotating in one direction. A Quad rotor adjusts its pitch or roll by applying more thrust to one rotor and less thrust to its diametrically opposite rotor.

V. PROBLEMS AND ITS SOLUTION

The Li-Po battery gets drained because of uneven power supply to ESC and motors of Surveillance Drone. To solve this problem I have used battery checker which is **1- 8s Li-Po battery voltage tester**. This device continuously display battery display the total voltage of your battery, then

cycle through and display the voltage of each individual cell. The unit will monitor your battery. When one of it cell fall setvoltage level battery checker sound an alarm.

For even supply from Li-Po battery I have used **APM (Advance Power Management) power module**. The APM 2.5.2/2.6/2.8 Power Module is a simple way of provide clean power from a Li-Po battery. Current consumption is also maintained and battery voltage measurements, all through a 6-pos cable. The regulated output is 5.3V and maximum of 2.25A from 2S-6S Li-Po battery. The deans connectors are provided with Power Module Which make iteasy to connect with battery and wrapped in shrink tubingfor protection.

VI. LIMITATIONS

- We need to get a license from the office of THE DIRECTOR GENERAL OF CIVIL AVIATION TECHNICAL CENTRE, NEW DELHI and to seek permission from the local Authorities before the take off of the drone as per specified area andlocation of confined assets of rules and regular.

  - ✓ This licence is valid exclusively for two years.
  - ✓ People feel conscious about they're being watched by the government.
  - ✓ Less aviation jobs are needed to fly Unmanned Ariel Vehicle.
  - ✓ Li-Po battery are highly dangerous, there is a chance for it to explode if they are overcharged.

VII. RESULTS

The proposed system of Surveillance Drone is shown in figure 3 with wireless remote controller (flysky Fs- i6). Camera is attached to the system for surveillance. Camera gives live feed on mobile app and we can also record videos and capture images.

Fig -2: Surveillance Drone

VII. FUTURE SCOPE

Future of a quad-copter has very large amount of application in various fields. The places where not possible to reached by humans Drone can be used for surveillance. It will used to carry heavy weights in rescue operations or for delivery. The range of application is increased because of more computerized drone and hence commercialization can also be increased.

Four ultrasonic sensors are connected to Arduino and programmed for detecting obstacle in all four directions.

When an obstacle is detected the quadcopter takes the other path to avoid collision by varying the motor speed. Thus quad-copter may be utilized in day to day working of a human life.

VIII. CONCLUSIONS

There are many places like industries, mines human has to risk their life. They have to face high temperature condition, high altitude work, poisonous gases these are unbearable by humans. There are many people losing their lives. So the solution to this problem can be brought up by using a remote-controlled Drone for surveillance.

This project plays a majorly part at boarder and defense area for surveillance. It will help to reduce the loss of human lives by intimating the soldiers about the target.

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