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# Design and Controlling of Unmanned Aerial Drone

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**ABSTRACT:** Drones are of different types and have different configurations for example, bi-copters, tri-copters, quadcopters, hexacopters, octocopters, etc. They have different uses and accordingly respective configurations are used. Hexacopters and Octocopters have better stability and yaw configuration. Control of motion of vehicle is achieved by altering the rotation rate of one or motor discs, thereby changing its torque load and thrust lift characteristics. The use of four rotors in a quadcopter allow the individual rotors to have a smaller diameter than the equivalent helicopter rotor, which allows them to possess less kinetic energy during flight. Quadcopters have different structures and designs according to the work needed to be done by it. Components like motors, batteries, electronic speed controllers also vary according to the power needed and work done by the quadcopter. Also enhancements like GPS trackers or cameras or infrared cameras are used so that they could add value to missions like disaster relief, search and rescue, agriculture and 3D mapping of the geography of an area. These widespread applications outshine the disadvantages which are rectifiable and hence this makes it a very productive technology in today's world. It is supposed to appear into full time existence in the coming years. But every technology has merits as well as demerits

**KEYWORDS:** Drones; following-drone models; drone models; UAV; unmanned aerial vehicle, Flight Controller

## I. INTRODUCTION

Unmanned aerial vehicles (UAV) are more properly known as Drone. Basically, drone is a flying robot . Working in combination with GPS, the flying machine may be remotely controlled or can fly autonomously by software controlled flight plans in their embedded systems. Drones are most often used in military services. However, it is also used for weather monitoring, firefighting, search and rescue, surveillance and traffic monitoring etc. In recent years, the drone have come into attention for a number of commercial uses. In late 2013, Amazon announced a plan to use unmanned aerial vehicles for delivery in the nearby areas future . It is known as Amazon Prime Air, it is estimated to deliver the orders within 30 minutes inside 10 miles of distance. So it is clear that domestic usage of UAV has vast future possibility in different fields rather than military usage. Drones for military use were started in the mid-1990s with the High-Altitude Endurance Unmanned Aerial Vehicle Advanced Concept Technology Demonstrator program managed by the Defense Advanced Research Projects Agency (DARPA) and Defense Airborne Reconnaissance Office (DARO). This ACTD placed the base for the improvement of the Global Hawk. The Global Hawk hovers at heights up to 65,000 feet and flying duration is up to 35 hours at speeds approaching 340 knots and it costs approximately 200 million dollars . The wingspan is 116 feet and it can fly 13.8094 miles which is significant distance . Motherland security and drug prohibition are the main needs Global Hawk was designed for . Another very successful drone is the Predator which was also built in the mid-1990s but has since been improved with Hellfire missiles. "Named by Smithsonian's Air & Space magazine as one of the top ten aircraft that changed the world, Predator is the most combat-proven Unmanned Aircraft System (UAS) in the world" .

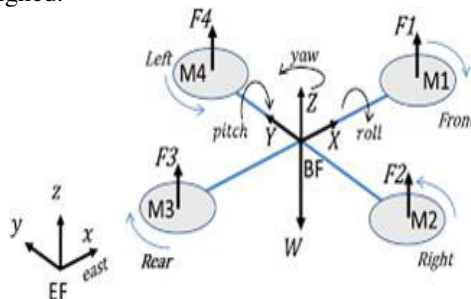
The original version of the Predator, built by General Atomics, can fly at 25,000 feet for 40 hours at a maximum airspeed of 120. Unmanned aerial vehicles (UAV) are known as Drone. Drone is a flying robot. With the help of GPS, the drone can be controlled remotely and can also be controlled automatically with the help of raspberry pi/software controlled flight plans. Earlier drones were mostly used in military services. Now a day it is used in many applications like search and rescue operations, surveillance, firefighting and traffic monitoring and especially in aerial view capturing, in agricultural fields, in emergency medicine/ medical accessories etc. In the year 2013, Amazon announced a project to use UAVs for delivery within short distance area. The project is named as Amazon Prime Air to deliver the



orders within 30 minutes inside 10 miles of distance. Thus the domestic usage of UAV has wide future possibility in several fields of application apart from military usage.

**II.SYSTEM MODEL OF THE DRONE**

The proposed quad copter is modeled and designed considering the following features. Mainly the focus was on aerial surveillance. The feature includes monitoring of captured images/object detection using IOT, auto landing to the launch pad, the flying of the quad copter using predefined path. Considering the altitude of Quad copter and area or battery capacity the Quad copter is designed.



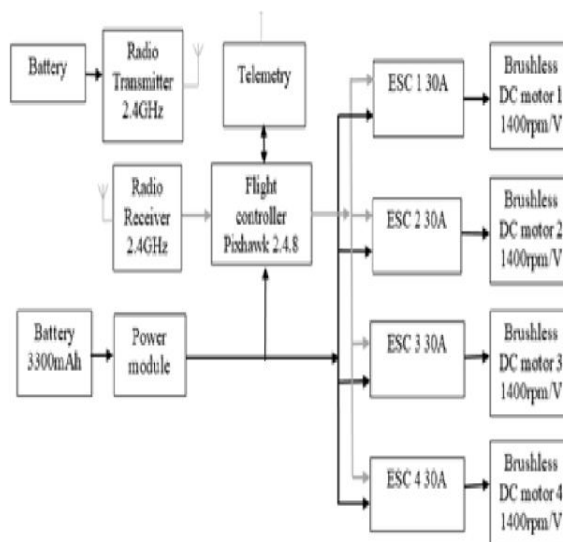
The torque will be induced on quad copter frame when motor is turned on. The torque can be assumed that the magnitude of generated torque is proportional to the rotational speed squared with proportionality constant K1.

$$||\tau_i|| = k_1 \phi_i^2$$

Induced torque direction is always opposite to that of motor shell spinning. If the motor shell is rotating clockwise then the induced torque will be counter clockwise, which acts on the quad copter frame.

**III.HARDWARE MODEL**

The designed Quad copter is assembled and interfaced as per the required objective.



Block diagram

**Mission planner**

The designed Quad copter can be controlled in two ways by remote control another is by giving the GPS path through mission planner application.



After construction of Quad copter the calibration is done to stabilize the pixhawk flight controller and system by connecting via USB cable. In mission planner select the install firmware in hardware configuration then select the type of Quad copter frame. Then the mandatory hardware configuration like accel calibration, compass, radio calibration, flight modes and failsafe.

**Modes of flight controller**

In flight mode select the six modes like stabilize mode, auto mode, RTL, loiter mode, sports mode and circle mode.

**Stabilize mode:** This mode allow to fly qudcopter manually. The Quad copter will automatically level out after make directional corrections. When manually roll or pitch of Quad copter, it causes the Quad copter to lean the device in order to move in that direction. In this mode, when the external GPS is not connected inbuilt GPS is giving more stability of Quad copter.

**Auto mode:** In auto mode Quad copter will fly according to the pre-programed mission planner script is stored in the autopilt which makes navigation to the Quad copter flow in waypoints.

**RTL(return to launch):** When the battery error or disconnected from the transmitter this mode will activate and Quad copter will automatically return to launch coordinate is shown in fig 4.1. In this mode first Quad copter rise to minimum height if the height is more than minimum, then maintain same altitude until reach to home. The minimum altitude is 15 meters.

**Sports mode:** In sports mode response of Quad copter is faster than normal, this is used to capture the fast moving objects. A particular angle can be set to the vehicle and it will maintain that angle. The Quad copter is not lean more than 45 degrees.

**Loiter mode:** In this mode drone itself maintain the current location automatically, heading and altitude. In manual mode sticks are relesed loiter mode activated motor speed is gradually slow down and make Quad coptermove slowly and makes hold position.

**Circle mode:** In this mode Quad copter is rotate in circle manner in their orbit. Setting the circle radius to zero will cause the copter to simply stay in place and slowly.

**Position Mode:** In this mode the Quad copter is make the consistent location and heading, while allowing the operator to control the throttle manually.

**Object detection:** With the help of this feature detection of interference in the proposed surveillance area can be seen using camera interfaced with raspberry pi and with the help of Open CV library.



Surveillance.



Routing of Quad copter through mission planner

Drones are not able to cover wide range due to limited ability to fly. So, surveillance is done only selected region where we required the necessity of continues monitoring.



We are using Flight controller Camera module to capture the video and by using the python programming in raspberry pi video is processed to detect the moving object video is upload to website by using internet.

IV. RESULTS

- Unmanned aerial vehicles are more properly known as Drone. Basically, drone is a flying robot .
- Working in combination with GPS, the flying machine may be remotely controlled or can fly autonomously by using software called flight controller.
- Drones are most often used in military services.
- However, it is also used for weather monitoring, firefighting, search and rescue, surveillance and traffic monitoring ....etc
- In recent years, the drone have come into attention for a number of commercial uses.

Height	15 to 100 meters	
GPS based monitoring	Latitude and Longitude	
Auto landing	when auto land switch is on  when battery is low automatically return to launch point ( fail safe)	



Duration of flight	26 minutes	
Surveillance	Object detection[19]	
		

### V. CONCLUSION

The designed Quad copter can be used for surveillance of a particular area. Quad copter is mounted with camera which can provide the live video of the surveillance area. The video can be live streamed from the raspberry pi through local configured network. The detected moving object of the given area can be seen. The designed quad copter also has the features that enables drone to land automatically whenever battery voltage level falls below a certain given limit. After implementing and testing the Quad copter, the Quad copter met its weight lifting requirement. It was 1.334kg. The requirement of best minimized size was met; and communication from raspberry pi to Pixhawk flight controller was achieved.

- Main aim of this project was to develop a Drone which can be used in several surveillance purposes.
- For controlling the Drone, 2.4 GHz radio frequency transmitter, receiver, microcontroller, electronic speed controller, brushless DC motor and servo motor have been used.
- The proportional, integral controller action shows the better performance of controlling the Drone.
- For live GPS tracking is also demonstrated. Demonstration shows the successful operation of Drone tracking .

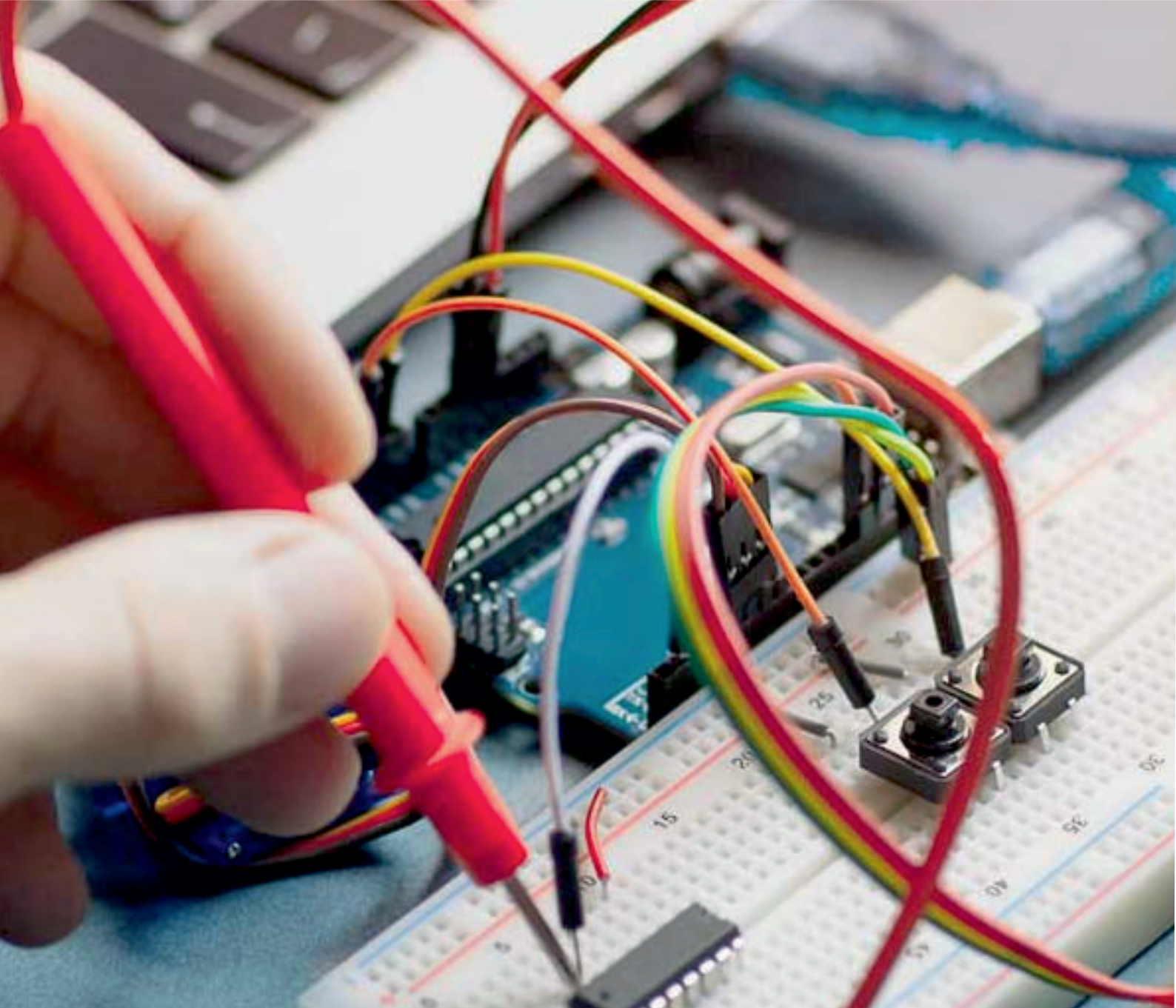
### VI. FUTURE SCOPE

This can be further modified with additional features like gesture control through artificial intelligence, also capable of carrying a future payload of 800 grams. For the given area by using the AI it can be modified for detection of infected area in plants through Open CV and it can be configured for spraying the pesticides and we can use for automatic wall painting application etc.



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