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Fabrication of Customized Surveillance & Night Vision Patrolling Drone

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Abstract - *This paper presents the development of an affordable and efficient autonomous quadcopter equipped with a night vision camera for enhanced surveillance purposes. The drone is controlled wirelessly and utilizes high-performance flight controller technology to navigate pre-planned missions without human intervention. The use of drones in security surveillance provides real-time monitoring and control of specific areas, particularly in high-risk situations. The mission planner software enables the drone to perform and monitor its flight, providing accurate and reliable information for critical decision-making. The paper discusses the practical aspects of drone surveillance and proposes the implementation of real-time flight control systems to enhance drone performance. Overall, this project aims to provide a better and safer security surveillance system through the use of drones.*

Key Words: Night vision camera, Flight controller, Security surveillance, Quadcopter, pre-planned missions, etc.

1. INTRODUCTION

Drones, also known as unmanned aerial vehicles (UAVs) or unmanned aircraft systems (UAS), have become increasingly prevalent in various industries. These flying robots can be controlled remotely or through software with the help of GPS, APM 2.8 Flight Controller and other sensors. With their ability to cover large areas and provide real-time monitoring, drones are being utilized for a wide range of applications, including security surveillance and crowd monitoring. In this paper, we present the development of an autonomous quadcopter equipped with a night vision camera and high-performance flight controller for advanced security surveillance. This drone is a cost-effective tool for security services to control and monitor large areas in real-time.

1.1 Working Principle of Quadcopter

The working principle of a drone involves the use of various components such as a flight controller, motors, propellers, sensors, and a camera. The flight controller is the brain of the drone and controls its movement in the air. It receives signals from the remote controller or mission planner software and sends commands to the motors to adjust the speed and direction of the propellers. The motors generate thrust that lifts the drone off the ground and keeps it in the air. Sensors such as GPS, gyroscope, and accelerometer provide information about the drone's position, orientation, and movement. This data is used by the flight controller to maintain stability and adjust the drone's altitude, speed, and direction. The camera mounted on the drone captures images or videos of the surrounding area, which can be transmitted in real-time to a ground station or stored on a memory card. The camera can also be equipped with additional features such as night vision, thermal imaging, or zoom capability. Overall, the working principle of a drone involves the integration of various components that work together to enable it to fly, navigate, and capture images or videos.

Figure No. 01 Quadcopter

1.2 Objective

The main objective of our project is to fabricate a low cost surveillance drone. The next objective is to calibrate the mission planning in our APM flight controller with GPS. It will provide us the ability to switch to auto pilot mode.

2. IMPLEMENTATION METHOD

In this proposed system, APM 2.8 Flight Controller is installed with the night vision camera which help the system to go for the automation and help to find the human or any problem detected. According to the mission planning produced it automatically goes to that area and capture the image and send it to user using FPV Transmitter. Patrolling involves regularly monitoring an area by traveling a designated route. It is a method of maintaining surveillance and ensuring security. The

quadcopter captures the images with the help of camera. These images are then sent to the user in a real time, user will analysis it and if there are any problem observed then triggered manually. Patrolling drone is mostly used in Highway surveillance, Military area, Restricted Zones, Industrial area, etc.

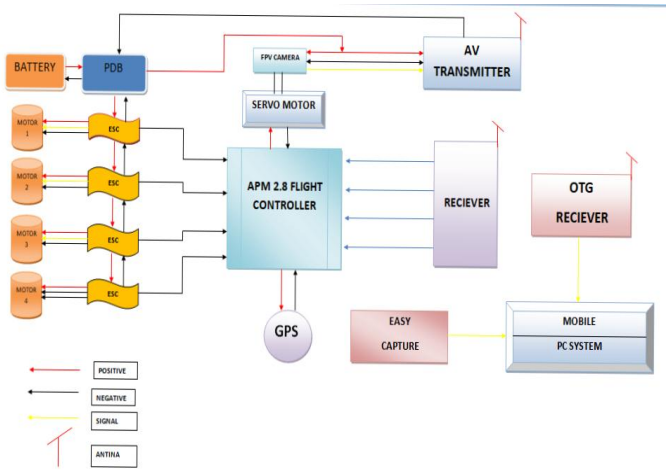

Figure No. 02 Block Diagram

Table -1: List of Components:

S. NO.	NAME OF COMPONENTS	SPECIFICATION	QUANTITY
1	APM 2.8 Flight Controller	Model= APM 2.8, Input voltage= 12-16V	1
2	GPS	Model= NEO-M8N	1
3	BLDC Motor	KV= 1000KV,Current capacity= 12A, Shaft Diameter= 3.17mm	4
4	ESC	Current= 30A, Battery Eliminator Circuit= 5V 3A	4
5	Lithium Polymer Battery	Voltage= 22.2V, Power= 3300mah	1
6	Servo Motor	Voltage= 4.8V, Max. Angle= 180o , Small Torque=2kg/cm, Operating Speed=0.11Second/60	1
7	Camera	Zoom= 4X	1
8	Transmitter	Model= FS i6, Frequency= 2.4GHz	1
9	Receiver	Model= FS-Ia6B, Range= 2.4GHz	1
10	Propeller	Material= ABS, Shaft Diameter=9mm	4
11	Frame	Model= INVENTO F450, Material= Brass	1
12	OTG Receiver	Model= ROTG01	1
13	Easy Capture	USB2.0 Video Adapter	1

3. RESULT & DISCUSSION

A prototype drone was created for the project. It can fly to a specific location and provide live surveillance through real-time video. Pictures of the outcome can be seen below.

Figure No. 03 Picture of Outcome

We successfully flew our drone autonomously after extensive practice and research. This photo was captured during our quadcopter flight. Our project heavily relies on surveillance. To achieve this, we utilized the APM 2.8 Flight Controller. The FPV camera captures video and transmits it to the FPV transmitter.

After the simulation accomplished through mission planner. In the Google map shown through the venture planner all the waypoint which we preferred for our drone to fly autonomously were mapped.

After mapping of waypoint the drone will follow that waypoint and will circulate closer to destination following such waypoint.

Figure No.04 Mapping of waypoint

During flight these are the telemetry logs that are displayed on the mission planner screen when the aircraft is in flight. All flight-related data are displayed during flight in the mission planner. Such the roll, yaw, and pitch, our quadcopter altitude, the GPS signal, and the number of active satellites while in flight. Failsafe modes, etc.

4. FUTURE SCOPE

Some potential future scope for surveillance drone projects may include:

1. Increased autonomy: Advances in artificial intelligence and machine learning could enable surveillance drones to operate with greater autonomy, reducing the need for human operators.

2. Longer flight times: Improvements in battery technology and energy efficiency could allow surveillance drones to stay in the air for longer periods, increasing their effectiveness and range.

3. Enhanced sensor capabilities: Developments in sensor technology could enable surveillance drones to gather more detailed and accurate data, improving their ability to monitor and analyze activities in a given area.

4. Integration with other technologies: Surveillance drones could be integrated with other technologies such as facial recognition software or geospatial mapping tools to enhance their capabilities and provide more comprehensive data.

5. Increased use in civilian applications: As the cost of surveillance drones decreases and their capabilities improve, they may become more widely used in civilian applications such as search and rescue, environmental monitoring, and agriculture.

6. Improved safety features: Advances in collision avoidance systems and emergency landing capabilities could make surveillance drones safer to operate, reducing the risk of accidents and damage to property.

7. Regulatory developments: As the use of surveillance drones becomes more widespread, there may be increased regulation and standardization of their use to ensure privacy and safety concerns are addressed.

5. CONCLUSIONS

In conclusion, the proposed autonomous UAV surveillance system has the potential to revolutionize the security surveying system. By deploying a real-time video streaming system on a robust and rigid UAV, it can efficiently improve the surveillance of open spaces and areas. With the guidance of GPS, the UAV can fly autonomously, making it an efficient and cost-effective option. Extensive flight tests have verified the overall performance of the UAV and its camera subsystem. With the continuous advancement of technology, the system can be further improved and implemented in various security applications.

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