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Enhancing Security and Oversight with Public Meeting Monitoring Drone

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ABSTRACT

This paper proposes the utilization of drones equipped with advanced surveillance capabilities to enhance security measures and oversight during public meetings. The drone's ability to capture real-time video footage and provide aerial reconnaissance enables authorities to detect potential threats, crowd disturbances, and unauthorized activities with greater efficiency and accuracy. This drones are equipped with a variety of sensors, including cameras, LiDAR, thermal imaging, and obstacle detection systems. These sensors provide the drone with environmental awareness, allowing it to detect and avoid obstacles, maintain stable flight, and capture high resolution data. Motors and propellers are wired. These components determined space available for the electronics as well as decide the weight that can be kept on the helicopter and still have to lift. A sensor board called the IMU Shield is interfaced. This board included all of the major sensors that is needed to achieve flight which are needed to work together to make sure the Quadcopter maintains stable flight while moving or hovering. Finally a Lithium-ion polymer (Lipo) battery is purchased because they have the best ratio of weight to power. The quadcopter is made to move in desired direction with the help of Electronic Speed Control (ESC). As you can see, drones are becoming increasingly popular in education and on college campuses. By embracing drones, educators can provide students with valuable skills and prepare them for the future and keep them safe in the present. While concerns regarding privacy, safety, and regulation persist, the potential benefits of these autonomous aerial platforms continue to drive research and development efforts, making them a transformative force in modern

industries and society.
By leveraging drone technology, stakeholders can proactively mitigate security risks, safeguard public safety, and ensure adherence to regulations, thereby fostering a more secure and transparent environment for public gatherings.
Keywords: — Security enhancement, Public meeting monitoring, Drone surveillance, Real-time monitoring, Crowd surveillance

I. INTRODUCTION

In an era characterized by evolving security challenges and the imperative for enhanced oversight, the convergence of technology and surveillance has emerged as a pivotal strategy for addressing these concerns. Public meetings, ranging from political rallies to community gatherings, serve as vital forums for democratic discourse but also present inherent security risks and the potential for disruptive incidents. Traditional methods of monitoring such events often fall short in providing comprehensive oversight and timely response to emerging threats. However, the advent of drone technology offers a transformative solution to augment security measures and bolster oversight during public gatherings.

This paper explores the paradigm shift facilitated by the integration of drones equipped with advanced monitoring capabilities in the context of public meeting security. By leveraging the aerial vantage point and sophisticated surveillance features of drones, authorities can proactively monitor events in real-time, detect potential security breaches, and swiftly respond to emergent threats. In this introduction, we provide an overview of the need for enhanced security and oversight in public meetings, discuss the limitations of traditional monitoring methods, and outline the potential benefits and challenges associated with the deployment of public meeting monitoring drones.

Enhancing security and oversight with public meeting monitoring drones involves utilizing unmanned aerial vehicles (UAVs), commonly known as drones, equipped with advanced surveillance technologies to monitor public gatherings, such as political rallies, protests, concerts, or sporting events. This approach offers several key benefits:

Real-time Monitoring: Drones provide a bird's-eye view of the entire event area, enabling real-time monitoring of crowd behaviour, identifying potential security threats, and detecting any unauthorized activities as they occur.

Improved Situational Awareness: By capturing high-resolution video footage and images from various angles, drones enhance situational awareness for security personnel on the ground, allowing them to respond more effectively to incidents and maintain public safety.

Rapid Response: Drones can quickly navigate through crowds and reach remote or inaccessible areas, facilitating rapid response to emergencies, medical incidents, or security breaches.

Aerial Reconnaissance: Drones can conduct aerial reconnaissance before, during, and after the event, providing valuable intelligence on crowd size, movement patterns, and potential hazards, which aids in strategic planning and resource allocation.

The organizational framework of this study divides the research work in the different sections. The Literature survey is presented in section 2. In section 3 and 4 discussed about Existing and proposed system methodologies. Further, in section 5 shown Simulation Results is discussed and Conclusion and future work are presented by last sections 6.

II. LITERATURE SURVEY

Aldhaher et al. the use of a wirelessly powered receiver in order to decrease the weight of UAV's [1].

Raciti et al. reported a charging system empowered by a wireless power transfer (WPT) system. This study also highlights misalignment losses and associated mitigation solutions [2].

Rohan et al., proposed an intelligent drone charging system empowered by WPT [3].

Zhang et al.have focused on mobile charging features for drones to enhance their battery life [4].

Amarjot Singh "Eye in the sky: Real- time Drone Surveillance (DSS) for Violent Individuals Identification using Scatter Net Hybrid Deep Learning Network". The paper proposed the real-time Drone Surveillance System (DSS) framework that can detect one or more individuals engaged in violent activities from aerial images [5].

K.VV.Mani Sai Kumar, M d Sohail and Dr. Usha Rani "Crowd Monitoring and Payload Delivery Drone using Quadcopter based UAV System". Quad copter is designed in this project was used to carry the payload of 250g m cover from one place to another with 6min flight was tested. By mounting high resolution wireless camera, and used for monitoring the crowd in the campus. It can be used for surveillance application [6].

Velan Y,Musica"Cost Effective Design and Development of Manned Drone". Unmanned Aerial Vehicles, referred to as drones are aerial platforms that fly without a human pilot onboard. UAV's are controlled autonomously by a computer in the vehicle or under the remote control of a pilot stationed at a fixed ground location [7].

Pooja Srivastava, Tejaswi Ninawe, Chitral Puthran, Vaishali Nirgude "Quadcopter for Rescue Missions and Surveillance". For developing a small and compac t sized quadcopter which can be used to carry out resc ue operations and provide audio/video aid to the peop le in distress. It saves human pilots from flying in dan gerous conditions that can be encountered not only in military applications but also in other scenarios involv ing operation in bad weather conditions, or near to bu ildings, trees, civil infrastructures and other obstacles [8].

Mr. Kalpesh N. Shah, Mr. Bala j. Dutt, Hardik Modh " Quadrotor-An Unmanned Aerial Vehicle". To study t he complete designing process of quadrotor from the e ngineering perspective and to fabricate working mode l of UAV-Quadrotor with improvement in its weight carrying capacity [9].

Rajeshwari Pillai Rajagopala "Drone: Guidelines, Regu lations and policy gaps in India" (ISBN journal).'
This paper examines drone operations in India and an alyses the major policy gaps in the country's evolving policy framework. It argues that ad-hoc measures take n by state and central agencies have been ineffective, whether in addressing issues of quality control, or res ponse mechanisms in the event of an incident, questio ns of privacy and trespass, air traffic, terrorist threat management, and legal liability [10].

III.EXISTING METHOD

Existing methods of enhancing security and oversight with public meeting monitoring drones typically involve a combination of hardware, software, and operational procedures tailored to the specific requirements of monitoring public gatherings. Some of the key methods include:

Surveillance Drones:

Utilizing drones equipped with high-definition cameras, thermal imaging sensors, and other specialized surveillance equipment to capture real-time video footage and imagery of the event area from an aerial perspective.

Real-time Monitoring:

Employing ground-based control stations or mobile command centers to receive and analyze live video feeds transmitted by drones, enabling security personnel to monitor crowd behaviour, detect potential threats, and respond promptly to emergent situations.

Communication and Coordination:

Establishing robust communication networks between drones, ground-based personnel, and other security stakeholders to facilitate real-time information sharing and dissemination of alerts or warnings to attendees.

Crowd Management:

Leveraging drone-mounted loudspeakers or communication systems to broadcast announcements, instructions, or warnings to the crowd, helping to manage crowd behavior, mitigate potential conflicts, and maintain public order.

IV. PROPOSED METHOD

The block diagram for enhancing security and oversight with public meeting monitoring drones involves breaking down the system into its essential components and illustrating how they interact. The block diagram of a drone system is shown in figure 1. It shows the different components of the drone and how they are connected. The diagram is made up of different shapes and lines, with labels on each shape to explain what it is.

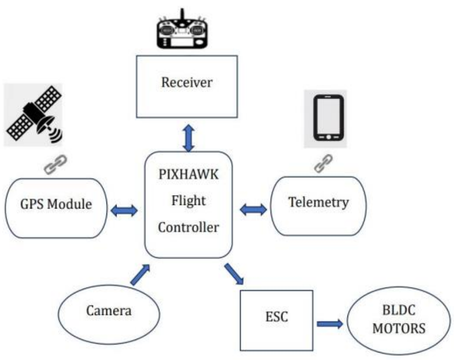

Figure 1. Block diagram of Proposed method

The components of the drone system include a receiver, GPS, camera, ESC, BLDC motors, telemetry, and a Pixhawk flight controller. The receiver is connected to the Pixhawk flight controller, which is connected to the ESC and BLDC motors. The GPS and camera are also connected to the Pixhawk flight controller.

The receiver is a device that receives signals from the remote control and sends them to the flight controller. These signals typically include commands for various drone functions, such as throttle, pitch, roll, and yaw. The receiver then relays these commands to the flight controller. The GPS is used to determine the drone's location and altitude. It relies on signals from multiple satellites to calculate the drone's position with high accuracy. This information is crucial for features like waypoint navigation, return to home, and Geo fencing. The camera is used to capture images and video. Drones can be equipped with various types of cameras, including RGB cameras for photography, and specialized cameras for tasks like thermal imaging or multispectral analysis. The camera's feed is often transmitted to the operator's ground station for real time monitoring or recording. The ESC (Electronic Speed Controller) controls the speed of the motors. An electronic speed controller or ESC is a device installed to a remote-controlled electrical model to vary its motor's speed and direction. It needs to plug into the receiver's throttle control channel. The BLDC motors (Brush-less DC motors) are used to power the drone and provide lift. They are more efficient and durable compared to brushed motors. BLDC motors are often used in combination with propellers to generate thrust and lift, allowing the drone to move in different directions. The telemetry is used to transmit data between the drone and the ground station. It can include information such as battery voltage, GPS coordinates, altitude, and more. Telemetry data is crucial for real-time monitoring, mission planning, and ensuring the drone's safe operation. The Pixhawk flight controller is the brain of the drone, which processes all the data from the sensors and controls the drone's movement. It processes data from various sensors, including GPS, accelerometer, gyroscopes, and barometers. The flight controller uses this data to stabilize the drone, control its movement, and execute flight plans. It also manages communication with other components like ESCs, GPS, and telemetry.

V. METHODOLOGY

Requirements Analysis:

Define the operational requirements and mission objectives for the medical emergency drone, considering factors such as surveillance range, payload capacity, flight endurance, and environmental conditions.

Component Selection:

Research and select appropriate components including Pixhawk flight controller, GPS module, high-resolution camera, receiver module, telemetry system, BLDC motors, and electronic speed controller based on their compatibility, reliability, and performance characteristics.

System Integration:

Integrate the selected components into the drone's airframe, ensuring proper wiring, mounting, and compatibility between different subsystems. Configure the Pixhawk flight controller to communicate with the GPS module, camera, receiver, telemetry system, BLDC motors, and electronic speed controller.

Software Development:

Develop and customize software algorithms for the Pixhawk flight controller to enable autonomous flight capabilities, waypoint navigation, and mission planning. Implement image processing algorithms to enable real-time video streaming and analysis from the onboard camera system. Develop software interfaces for telemetry data transmission and reception between the drone and ground control station.

Testing and Calibration:

Conduct comprehensive testing of the drone's subsystems, including flight control, navigation, camera, telemetry, and propulsion systems. Calibrate sensors, actuators, and communication modules to ensure accurate and reliable operation under various operating conditions.

Flight Testing:

Perform flight testing in controlled environments to evaluate the drone's performance, stability, and reliability. Validate autonomous navigation capabilities, waypoint following, and mission execution under realistic scenarios. Collect data on flight parameters, sensor readings, and system behavior for analysis and optimization.

FLOW DIAGRAM

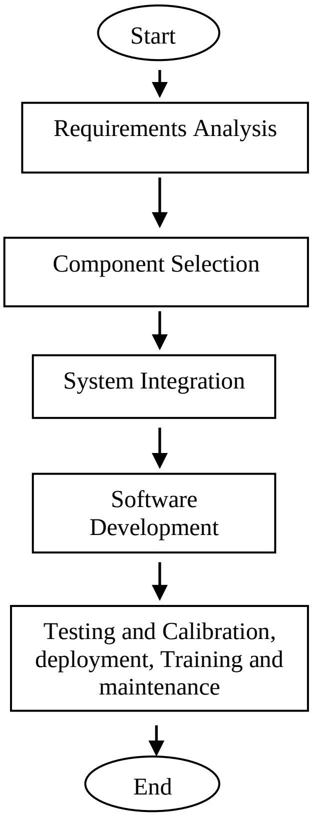

Figure 2. Flow Diagram

The flow diagram is given in figure 2. It contain a sequence of steps for requirement of drone.

Operational Deployment:

Deploy the military security drone in operational environments, adhering to safety protocols and regulatory requirements. Conduct field trials and exercises to assess the drone's effectiveness in fulfilling mission objectives such as surveillance, reconnaissance, and security monitoring. Gather feedback from operators and stakeholders to identify areas for improvement and refinement.

Training and Maintenance:

Provide training to operators and maintenance personnel on the operation, maintenance, and troubleshooting of the military security drone system.

Software Requirements:

QGround Control:

QGround Control is open-source ground control station software that supports a variety of unmanned systems, including drones equipped with Pixhawk flight controllers, which is consistent with your component list. QGround Control provides a versatile and intuitive interface for mission planning, vehicle setup, and real-time telemetry monitoring.

Mission Planner:

Mission Planner is a ground control station (GCS) software used in conjunction with unmanned aerial vehicles (UAVs), commonly known as drones. It plays a crucial role in planning, monitoring, and controlling the flight operations of the drone. Its user-friendly interface, real-time monitoring capabilities, and support for autonomous flight contribute to its popularity among drone operators.

VI. RESULTS AND DISCUSSIONS

Below are the images captured by the developed proposed model of drone in various stages. The figure3 shows drone in standby mode. The parameters set in the Qground control software are:

a) Flight speed – 11.2 m/s

b) Altitude – 4m

c) Hold – 3 sec

Latitude: 13°39’30.59”

Longitude: 79°29’11.63”

Figure 3. Drone in standby mode.

The below diagram 4 shows drone in Take-off mode.

Latitude: 13°39’30.59”

Longitude: 79°29’11.63”

Figure 4. Drone in Take-off mode.

The below diagram 5 shows drone in flight mode.

Latitude: 13°39’30.02”

Longitude: 79°29’10.84”

Figure 5. Drone in Flight mode.

The below diagram 6 shows drone in landing mode

Latitude: 13°39’30.66”

Longitude: 79°29’11.62”

Figure 6. Drone in Landing mode.

The below diagram 7 shows drone in operating mode.

Latitude: 13°39’30.47”

Longitude: 79°29’11.53”

Figure 7. Drone in operating mode.

The various images which are captured using drone are shown in figure 8, figure9.

Latitude: 13°39’30.02”

Longitude: 79°29’10.84”

Figure 8 Image 1

Latitude: 13°65’83.84”

Longitude: 79°48’64.26”

Figure 9 Image 2

VII. CONCLUSION AND FUTURE SCOPE

The surveillance functionality is monitored under human supervision, henceforth being beneficial towards civilian applications. It can also be utilized for aerial photography of any geographic region. It is easy to maneuver, thereby providing flexibility in its movement. It can be used to provide surveillance at night through the usage of infrared cameras. The system can further be enhanced for future prospects. The GPS data logger on the quadcopter stores its current latitude, longitude, and altitude in a comma separated value file format and can be used for mapping purposes. Thus the proposed drone can help in surveillance and monitoring of different locations and terrains. There are many places like mines, industries, radiation places where human has to risk their life. They have to face high degree temperature, heavy radiation, change in climate condition, toxic gases which can harm their lives.

FUTURE SCOPE

The future scope of enhancing security and oversight with public meeting monitoring drones encompasses several potential advancements and areas of development:

Privacy-Preserving Technologies:

Research and development of privacy-preserving technologies, such as encryption, anonymization, and selective blurring of sensitive information in captured footage, can address concerns regarding the potential infringement of individual privacy rights while maintaining the effectiveness of drone surveillance.

Enhanced Communication and Networking: Implementing advanced communication systems, such as 5G connectivity and mesh networking, enables drones to relay real-time data to ground-based command centres and other drones, facilitating coordinated response efforts and information sharing among multiple stakeholders.

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