SURVEILLIENCE AND DISASTER RELIEF DRONE

Prof. R. M. Sahu[1], Vishal R. Shirfule[2], Ravi T. Survase[3], Shubham B. Pawar[4].

Department of Electronics & Telecommunication Engineering
PDEA's College of Engineering (Manjari Bk.)
Pune, India, 412307

1. ABSTRACT

This paper presents a comprehensive review of recent advances in the field of surveillance and disaster relief drones. Unmanned Aerial Vehicles (UAVs) have emerged as pivotal tools in addressing a myriad of challenges, ranging from enhancing public safety to facilitating rapid responses in disaster-stricken areas. The review encompasses key components of these drones, including airframes, propulsion systems, and communication modules. Emphasis is placed on the integration of cutting-edge technologies such as high-resolution cameras, infrared sensors, and autonomous navigation systems, enabling drones to provide real-time data for surveillance and efficient disaster response.

The survey explores the versatility of surveillance and disaster relief drones across various sectors, including public safety, agriculture, healthcare, and infrastructure inspection. Specific use cases, such as search and rescue operations, crop monitoring, and bridge inspections, are examined to highlight the diverse applications of this technology. Furthermore, the paper discusses the advantages offered by these drones, such as rapid deployment, cost-effectiveness, and accessibility to remote or hazardous areas.

The literature review delves into recent studies, industry reports, and governmental policies, providing insights into the regulatory frameworks governing drone usage and emerging trends in the field. The integration of artificial intelligence and machine learning for data analysis, along with collaborative swarming capabilities, reflects the evolving sophistication of surveillance and disaster relief drone technology.

2. INTRODUCTION

• Unmanned aerial vehicles (UAVs), more commonly referred to as drones, are small aircraft that fly autonomously. Originally developed for military purposes, they are now a major focus of research. Apart from unmanned aerial vehicles, drones are also referred to as UAS (Unmanned Aerial Systems), Remotely Piloted Vehicles (RPV), and Remotely Piloted Aircraft Systems (RPAS). The term "drone" is commonly known publicly, whereas the other terms, like UAVs, RPA, RPAS and UAS are official names given to the drone technology depending on the jurisdiction.

• Previously, the term "drone" referred to an unmanned, radio-controlled military or target-towing aircraft. Nowadays, a drone is defined as an aircraft that flies without a pilot at the controls, but rather with the assistance of a ground operator or through automated flight with no human intervention. Drones are available for a variety of applications and can be used for crime scene surveillance.

• Drones were initially designed as a simple device, but have grown in complexity as defined missions have become more complex. The diversity of drones is a primary factor in defining their operational capabilities, which are determined by their size, power, and application conditions

• Disasters in any form are detrimental to the health and welfare of the affected population, but mass disasters disproportionately affect a large number of victims. Natural and man-made disasters are classified according to whether they are the result of an environmental, medical, industrial, or terrorist event.

• Accurate data collection may be extremely difficult in an emergency situation due to the lack of coordinated actions by various agencies during a disaster.

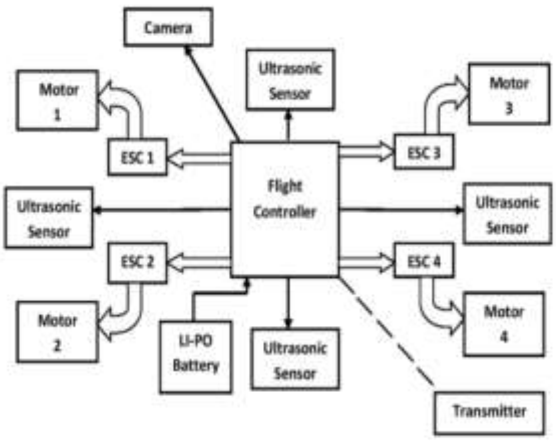
a seamless and interconnected environment for users.

• Thus, the use of drones in a disaster has the following benefits: they reduce the time required to locate victims and the time required for subsequent intervention by searching a large area in a short period of time.

To make it work, you need some software: the CHAT-GPT tool itself, a system for connecting to smart devices called an IOT framework, and a way for you to interact with it, like a screen or buttons.

3. METHODOLOGY

Block Diagram:



The hardware required for the proposed system includes an Flight Controller, Electronic Speed Controller, Brushless Motor, Transmitter and Receiver.

Brushless Motor: The brushless motor serves as the propulsion system for the drone, converting electrical energy from the battery into mechanical motion. It provides the necessary thrust to lift the drone off the ground and maintain flight.

Electronic Speed Controller (ESC): The ESC regulates the speed and direction of the brushless motor by adjusting the voltage and current supplied to it. It receives commands from the flight controller and translates them into precise control signals for the motor, enabling the drone to manoeuvre smoothly and respond to pilot inputs or autonomous commands.

Battery: The lithium polymer (LiPo) battery is a vital component in the proposed surveillance and disaster relief drone system, serving as the primary power source for the aircraft. Its high energy density and lightweight design enable extended flight times and maximize operational range. The LiPo battery powers all essential drone components, including brushless motors, flight controllers, ESCs, transmitters, receivers, and onboard cameras. Proper battery management is crucial for safe and reliable operation, encompassing charging, discharging, and monitoring battery health. The LiPo battery directly influences flight duration, payload capacity, and overall drone performance. Ensuring secure mounting and protection within the drone chassis is essential to prevent damage or thermal issues during flight. Ultimately, the LiPo battery plays a critical role in supporting the drone's mission objectives, whether conducting surveillance, disaster relief efforts, or search and rescue missions.

Flight Controller:

The flight controller acts as the brain of the drone, coordinating its flight operations and ensuring stability, control, and navigation. It integrates data from onboard sensors such as accelerometers, gyroscopes, and GPS receivers to maintain the drone's orientation, stabilize its flight, and execute autonomous flight modes. Additionally, the flight controller interprets pilot inputs from the transmitter or commands from a ground control station, orchestrating the drone's movements and flight paths.

Transmitter: The transmitter is the handheld device used by the drone operator (pilot) to control the drone remotely. It sends control signals to the drone via radio frequency (RF) communication, allowing the pilot to manoeuvre the drone, adjust its altitude, speed, and direction, and activate various flight modes or features.

Receiver: The receiver is installed onboard the drone and receives the control signals transmitted by the pilot via the transmitter. It relays these signals to the flight controller, enabling real-time communication between the pilot and the drone. The receiver plays a crucial role in ensuring responsive and accurate control of the drone during flight.

Camera: The camera is an essential payload onboard the drone, used for capturing high-resolution images and video footage for surveillance, reconnaissance, and disaster assessment purposes. It may be equipped with features such as pan-tilt-zoom (PTZ) functionality, thermal imaging, or night vision capabilities to enhance its versatility and effectiveness in various scenarios. The camera's output can be transmitted live to a ground control station or stored onboard for later analysis and decision-making.

4. CONCLUSION

There is currently insufficient evidence to justify a systematic review of drone use in disasters. We propose that future reviews incorporate settings, populations, and a variety of drone applications that were not considered in this scoping review. It is obvious that drone applications should be further explored; with a particular emphasis on drone assistance to humans, particularly in victim identification. As demonstrated in this review, drones are an excellent tool for mapping, search and rescue, transportation, and training. However, an assessment of drones' ability to identify victims should be conducted, as this is critical in a disaster scenario. Additionally, the lack of validation in determining the efficacy of drones in assisting with disaster victim identification is evident, which could be a result of ethical concerns associated with conducting research in real disaster situations. Numerous primary studies have reported on disaster simulated events with significant variation, necessitating the development of a standard disaster simulation checklist to minimize biases.

5. REFERENCES

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