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Abstract

The project focuses on designing a cost-effective drone to aid emergency services. The proposed drone will utilize affordable components to provide essential features such as real-time imaging, autonomous navigation, and reliable communication. By leveraging technologies like GPS, ultrasonic sensors, and Wi-Fi modules, the drone aims to enhance situational awareness and speed up response times during disaster scenarios. The project demonstrates the feasibility of deploying low-cost drones to perform critical surveillance and support operations in emergencies, ensuring safety and efficiency.

Background

Natural and man-made disasters necessitate rapid and informed responses to minimize harm and coordinate rescue operations. Traditional data collection methods often expose responders to danger and can be inefficient. Drones offer a modern solution, providing aerial views, real-time data, and operational flexibility. However, high costs often limit widespread adoption. This project addresses the need for an affordable drone solution, making advanced emergency response technology accessible to a broader range of emergency services, including those with limited budgets.

Methods

Design and Prototype Development: A compact, lightweight drone is built using durable yet low-cost materials like ABS plastic to ensure resilience. The drone's frame is designed to house all components securely while maintaining aerodynamic efficiency.

Navigation and Obstacle Detection: Basic GPS modules are implemented for precise positioning, while ultrasonic sensors are used for real-time obstacle detection and collision avoidance.

Imaging and Communication: A moderate-resolution camera is integrated for live video streaming, providing visual feedback to ground control. Wi-Fi modules facilitate real-time data transmission within a defined range, ensuring continuous communication.

Power Management: A standard LiPo battery provides energy, balancing flight time and weight. The drone is designed to achieve a flight time of 20-30 minutes per charge, suitable for short-duration

Expected Outcome

Enhance emergency response: By providing real-time situational awareness and high-resolution imaging, it will enable faster and more informed decision-making during disaster and rescue operations.

Improve operational efficiency: The drone will reduce response times by up to 50%, offering quicker access to disaster-affected or hard-to-reach areas.

Autonomous functionality: With autonomous navigation and geo-fencing capabilities, the drone will operate effectively in challenging environments without constant human intervention.

Broader applications: Besides emergency services, the drone can be utilized in areas like surveillance, wildlife monitoring, and infrastructure inspection

Conclusion

The development of a cost-effective support drone proves that emergency response technology can be both affordable and efficient. The prototype achieved its goal of providing real-time situational awareness and autonomous navigation capabilities.

Future Perspectives

The development of drones for emergency services offers promising future perspectives with a significant impact on society. These drones will enhance disaster response efficiency, reduce human risks in dangerous environments, and improve real-time situational awareness. The expected outcome includes faster response times, better resource management, and broader applications, such as surveillance and infrastructure monitoring, beyond emergency services. This innovation is expected to support government agencies, NGOs, and private sectors involved in disaster management and humanitarian efforts

Impact on Society

Saving lives: By providing rapid situational awareness and reducing response times, drones will enable faster rescue operations during disasters, directly saving lives.

Enhancing safety: Drones can access hazardous environments, such as chemical spills or collapsed buildings, reducing the risk to human responders.

Improving disaster management: Real-time communication and data transmission will improve coordination between emergency teams, leading to more efficient resource deployment during crises.

Expanding applications: Beyond emergency scenarios, the drone technology can aid in areas like infrastructure monitoring, wildlife protection, and security, positively influencing various sectors