Zenith Soar X-4: Autonomous Drone for Autonomous Drone for Disaster Relief and Detection

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Background: Escalating natural disasters demand rapid, efficient, and safe response solutions. This project introduces a cost-effective autonomous drone system designed for disaster relief and emergency response. Objective: To develop a drone that enhances response times, increases safety for rescue teams, and provides real-time crisis data. Methods: The Zenith Soar features cameras, sensors, dual GPS, and magnetic positioning systems, connecting with up to 40 satellites for precise navigation. Its advanced algorithms support reliable detection and mapping, while a 24,000 mAh battery allows for extended flights. The drone body, designed for cost-efficiency and ease of replacement, is 3D-printable in under 10 hours with components mounted on a removable tray for quick transfer. Key capabilities include live video streaming, thermal imaging, automated target detection, 3D mapping, and autonomous operation. After three redesigns, the drone was optimized for durability and lightweight construction using high-temperature ABS. It was initially trained to detect and map human presence but can be adapted for various targets and tasks. Results: Testing showed the drone can accurately map locations and autonomously detect individuals from 150 feet, with a flight duration over an hour and a range of nearly 500 meters. Its design and autonomous nature enable effective operation across diverse environments. This drone system promises significant advancements in disaster response efficiency and safety, leveraging cutting-edge technology to meet critical challenges.