UNMANNED AERIAL VEHICLE FOR CRIME DETECTION AND RESCUE

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***Abstract*— In recent years, the application of Unmanned Aerial Vehicles (UAVs) has witnessed significant growth, expanding beyond recreational and military uses to encompass critical areas such as disaster management, search and rescue missions, and crime detection. This paper presents an innovative UAV system designed to operate autonomously in crime-happening areas, facilitate search and assist law enforcement agencies in crime detection. The proposed UAV system integrates advanced technologies, including GPS navigation, GSM communication, Raspberry Pi-based controls. The UAV employs GPS for autonomous flight, and camera for capturing high-resolution video of the designated area. These video files are transmitted via GSM to a server system for real-time monitoring. The server employs machine learning algorithms to process the imagery data, enabling the UAV to identify missing persons, and detect potential criminal activities. The UAV offers two operational modes: finding missing persons and crime monitoring. The Raspberry Pi onboard the UAV serves as the control unit, coordinating flight operations and data transmission to the server system. This research contributes to the development of UAVs for critical applications, enhancing the capabilities of search and rescue efforts, and law enforcement agencies. The integration of GPS navigation algorithms empowers the UAV to respond effectively to dynamic situations, saving lives and promoting public safety in challenging scenarios.**

***Keywords***—**UAV, raspberry pi, flight control,surveillance**

I. Introduction

In an era characterized by technological innovation and the growing need for efficient disaster management, search and rescue operations, and crime prevention, the development of an Autonomous Unmanned Aerial Vehicle (UAV) represents a significant leap forward in addressing these critical challenges. This project endeavours to harness the power of cutting-edge technology to create a versatile UAV system capable of autonomous flight, real-time data capture, and enhanced decision-making in certain scenarios.

Disasters, whether natural or man-made, often demand swift and precise responses to mitigate the impact and save lives. Search and rescue operations require efficient tools to locate missing persons in vast and sometimes treacherous terrain. Law enforcement agencies continually seek innovative methods to detect and deter criminal activities. This project's mission is to design an autonomous UAV that can adapt to these diverse demands, offering a comprehensive solution for search and rescue, and crime detection.

The UAV's core capabilities include autonomous flight planning using GPS navigation, on-board video capture, and seamless data transmission to a central server through GSM connectivity. To add a layer of intelligence to the system, machine learning algorithms are incorporated, enabling the UAV to operate in two distinct modes.

The UAV's hardware components, including a flight controller, rotor blades, Electronic Speed Controllers (ESC), brushless DC (BLDC) motors, a rechargeable battery, battery charger, Battery Management System (BMS), Raspberry Pi 3, Arducam Camera (12MP),a GSM and GPS module, form a robust system capable of executing these critical functions. The Raspberry Pi 3 serves as the central processing unit, controlling the UAV's flight operations, capturing and transmitting video/images depending on the mode, and executing machine learning algorithms for data analysis on the server for identifying missing persons.

This project represents a pivotal moment in leveraging autonomous UAV technology to enhance search and rescue efforts, and crime prevention. By combining cutting-edge hardware, software, and machine learning capabilities, we aim to deliver a UAV system that contributes significantly to public safety and rapid emergency response, ultimately saving lives and minimizing the impact of disasters and criminal activities.

II. Multi-Mode Autonomous Operation :

In response to the dynamic demands of modern search, rescue, and surveillance operations, a cutting-edge autonomous drone system has been developed, featuring two distinct modes of operation. These modes are meticulously designed to address critical scenarios and leverage advanced technologies to deliver highly efficient and effective solutions.

Mode 1: Vigilant Security Patrol

In Mode 1, the drone transforms into a vigilant security patrol vehicle, tasked with monitoring specific areas that are designated via GPS coordinates sent from a central server. This proactive approach to security surveillance is a game-changer, reducing risks to human personnel while enhancing overall security.

The system's Flight Controller plays a pivotal role in ensuring the drone's stability and precise navigation during surveillance missions. It interprets real-time commands and sensor data, making necessary adjustments to motor speeds and propeller orientations, ensuring smooth and controlled flight.

Mode 2: Facial Recognition and Search

Mode 2 of the autonomous drone system employs state-of-the-art computer vision and facial recognition algorithms to identify and locate individuals in designated areas. This mode is particularly invaluable for search and rescue missions, as well as for locating suspects in criminal investigations.

The Arducam Camera, boasting a high-resolution 12MP sensor, is a crucial component during Mode 2 operations. The Raspberry Pi, serving as the central processing unit, controls the camera, directing it to capture images or video footage as required by the mission. These visuals are processed in real-time, allowing the drone to identify efficiently.

Additionally, the Raspberry Pi serves as the system's control center, managing data transfer and communication. It communicates with the Flight Controller, providing commands for navigation and flight adjustments. Furthermore, it connects to a GSM Module, enabling real-time data transmission to and from a central server. This communication capability facilitates remote control and monitoring of the drone, ensuring its reliability and effectiveness.

Power management and safety are paramount in autonomous drone systems. The inclusion of a Battery and Battery Management System (BMS) ensures that the drone's power supply is efficiently and safely managed throughout its missions, guaranteeing prolonged and reliable operation.

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