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AI Enabled Drone for Automatic Detection of Human Movements in Disaster Situation

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Abstract: The concept of an innovative drone system designed to revolutionize search and rescue operations in disaster scenarios. This system aims to harness the power of artificial intelligence (AI) for automatic human detection, alongside advanced technologies such as cameras, processors, and payload mechanisms. By integrating these components, the drone system will autonomously survey disaster areas, identifying individuals in need of assistance with precision and speed. Upon detection, the system will generate alarms to alert rescue teams promptly. Furthermore, the drone will be equipped with efficient payload dropping mechanisms, enabling it to deliver essential supplies to remote or inaccessible locations within the disaster zone. Through the seamless integration of AI and advanced technologies, this drone system represents a significant advancement in disaster response capabilities, with the potential to save lives and mitigate the impact of disasters on affected communities.

Keywords: Artificial intelligence, Search and rescue operations, Automatic human detection.

I. INTRODUCTION

The primary objective of the project is to create an intelligent drone system that utilizes artificial intelligence (AI) to automatically detect human movements within areas affected by disasters. This system is designed to improve search and rescue operations by offering timely and accurate information about human presence and movements to response teams. By integrating AI algorithms into the drone's functionality, the system can analyse visual data captured by onboard cameras in real-time, enabling it to identify individuals who may require assistance amidst the chaos of a disaster. This automated detection process streamlines the search effort, allowing rescue teams to focus their resources more efficiently on areas where human presence is confirmed. Additionally, by providing real-time updates on human movements, the drone system enables response teams to adapt their strategies dynamically, ensuring a more effective and targeted rescue operation. Overall, the development of this intelligent drone system represents a significant step forward in leveraging AI technology to enhance the capabilities of search and rescue teams in disaster situations, ultimately saving more lives and minimizing the impact of such events on affected communities.

II. LITERATURE SURVEY

Recent research in the field of AI-assisted UAVs for human detection in search and rescue missions has witnessed significant advancements, leveraging various deep learning techniques and methodologies. Rizk et al. [1] proposed a framework utilizing Convolutional Neural Networks (CNNs) for real-time human detection, contributing to the operational efficiency of UAVs in rescue scenarios. Building upon this, Rohan et al. [2] introduced a CNN-based approach specifically tailored for the Parrot AR Drone 2, enhancing object detection and tracking capabilities. Dousai and Lončarić [3] explored ensemble learning techniques for human detection in search and rescue operations, showcasing promising results in challenging environments. Additionally, Yang [4] presented an improved version of the YOLOv5 model for drone-view object detection, offering enhanced accuracy and efficiency. Furthermore, Deng et al. [5] introduced a Global-Local Self-Adaptive Network, which demonstrated remarkable performance in object detection tasks from drone viewpoints, thus addressing crucial challenges in aerial surveillance and rescue missions. These studies collectively underscore the growing significance of AI-powered UAVs in augmenting search and rescue efforts, offering valuable insights and methodologies for further research and development in this domain.

EXISTING SYSTEM

Challenges in Traditional Operations: Traditional search and rescue operations encounter difficulties in efficiently detecting and locating individuals within disaster-stricken areas. These challenges arise due to factors such as the vastness of the affected area, the presence of debris obstructing visibility, and the urgency to locate survivors swiftly. Limitations of

Manual Efforts: Manual search and rescue efforts, while crucial, are often time-consuming and may not cover large areas effectively. Human rescuers face risks and limitations in accessing hazardous or inaccessible terrain, which can impede their ability to reach survivors promptly. Moreover, manual searches rely heavily on human perception and may overlook individuals hidden under debris or in remote locations.

Introduction of AI-enabled Drone System: To address these limitations, the project proposes an AI-enabled drone system for automated human movement detection. By integrating artificial intelligence with unmanned aerial vehicles (UAVs), the system can autonomously survey disaster areas, identify human presence, and relay real-time information to rescue teams. This approach aims to enhance the efficiency and effectiveness of search and rescue operations by leveraging the capabilities of AI for rapid and accurate detection of individuals in need of assistance. Additionally, using drones reduces the risk to human rescuers and enables coverage of larger areas in a shorter time frame, thereby improving the overall response to disaster situations.

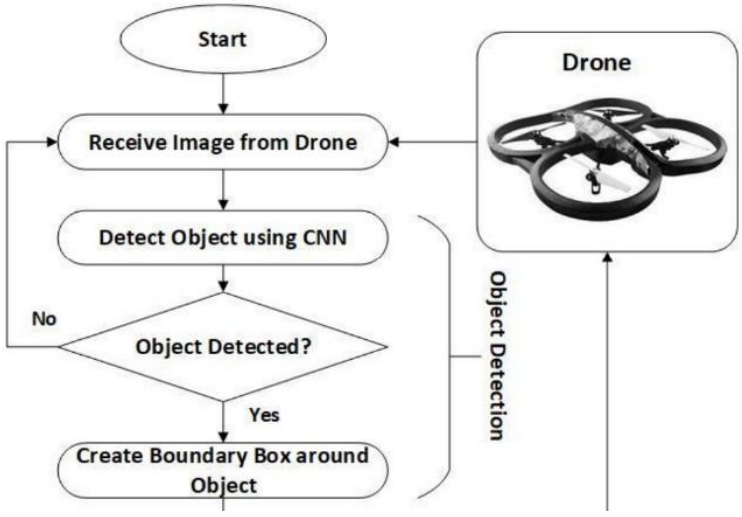
III. METHODOLOGY

Proposed Methodology

Integration of Computer Vision Algorithms: The proposed method involves incorporating sophisticated computer vision algorithms into a drone system. These algorithms are designed to process visual data captured by cameras mounted on the drone, enabling real-time analysis of the environment.

Utilization of Drone Sensors: In addition to cameras, the drone will be equipped with various sensors, including GPS, to enhance its capabilities. These sensors will provide critical data such as location, altitude, and orientation, enabling precise navigation and data collection.

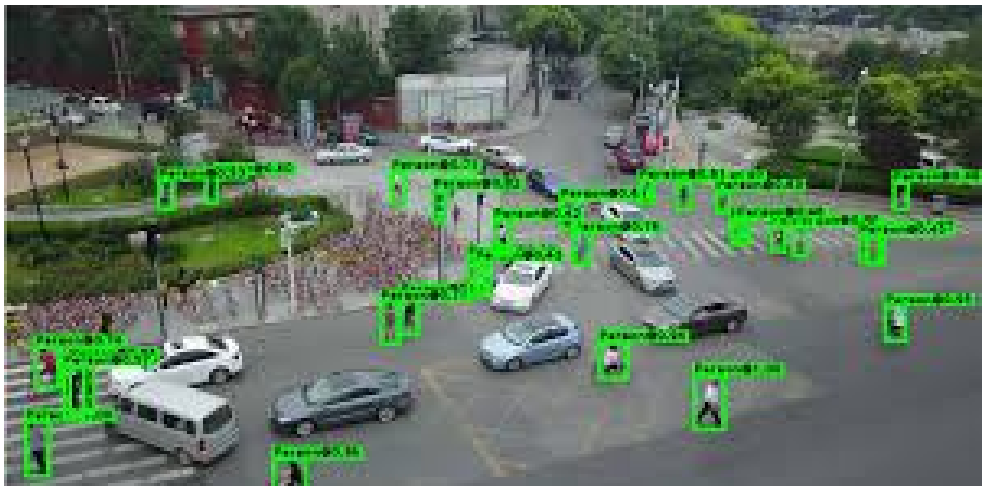
Training AI Algorithms: The heart of the system lies in the AI algorithms trained to recognize human movements amidst complex surroundings. Through machine learning techniques, the algorithms will learn to differentiate between various objects and activities, focusing specifically on identifying human presence and movements.



Implementation of Alarm Mechanism: To ensure timely response, the system will feature an alarm mechanism triggered upon detection of human presence. This alarm will serve as an immediate alert to rescue teams, notifying them of the location and potential needs of survivors.

Autonomous Operation and Information Transmission: Once deployed, the drone will operate autonomously, conducting systematic surveys of the disaster area. Upon detecting human presence, it will activate the alarm and promptly transmit relevant information, including location coordinates and live video feed, to the rescue teams stationed nearby. By combining cutting-edge technology with autonomous operation, the proposed method aims to streamline search and rescue efforts, enabling swift detection and response to emergencies while minimizing the risks and limitations associated with manual operations.

IV. RESULTS AND OUTPUT



V. CONCLUSION AND FUTURE WORKS

There are several avenues for future work to further enhance the proposed method. Firstly, refining and optimizing the computer vision algorithms to improve accuracy and speed in detecting human movements could enhance the system's performance. Additionally, exploring advanced sensor technologies and integrating them into the drone system could provide more comprehensive data for analysis, leading to better decision-making capabilities. Furthermore, enhancing the autonomy of the drone system to adapt to dynamic and complex environments could increase its effectiveness in disaster response scenarios. Finally, conducting field tests and collaborations with emergency response organizations to validate the system's effectiveness and address real-world challenges would be crucial steps in advancing the proposed method for practical deployment in disaster scenarios.

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