Computer Vision and Hardware Integration in SAR drones

Surge Project

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Introduction

Search, and Rescue (SAR) operations are crucial for various natural disasters, missing persons, accidents, etc. A rescue scenario primarily involves two problems: locating an injured person and delivering supplies and resources. In such situations, drones are beneficial as it might be hazardous to conduct any such operation without knowing the environmental conditions. With the help of Computer Vision and the integration of various types of cameras on the drone, we can determine the location of a person, animal, etc., or even provide a scene reconstruction.

Generally, a Ground Station runs detection algorithms on the video feed transmitted by the drone. However, this is a challenging task due to some limitations, such as poor Human Detection (HD) due to people taking different postures and poor scene reconstruction due to adverse weather conditions such as snow, dust, fog, low visibility, and altitude illumination. Thus, this research aims to increase the accuracy and efficiency of drones by examining the various components and integration of Computer vision, cameras, and sensors into the drone.

Objectives

1. Investigate Computer Vision algorithms used to enhance SAR operations with drone technology.
2. Understanding Thermal or Infrared Imaging to detect heat signatures and locate missing people or animals in dense areas or at night.
3. Analysing High-Resolution Cameras and using Computer Vision in Scene Reconstruction, tracking, Autonomous flight, etc., for planning Rescue Operations.
4. Develop best practices for integrating cameras with SAR drones, including Camera Selection, Integration, data storage and transmission, and image analysis and interpretation.
5. Integration of multiple cameras on the drone such as RGB (Captures images in the visible spectrum), IR (Infrared for thermal vision), LiDAR (Laser technology to capture 3D images of the environment), Multispectral Cameras (Captures images in multiple spectral bands), Night Vision Cameras (For low light conditions), etc.
6. Identifying the limitations of SAR drones and studying various parts.

Methodology

The research would include a comprehensive review of existing literature on the use of Computer Vision and drone technology in SAR operations, including state-of-the-art and best practices. The accuracy of Computer Vision algorithms for object detection and tracking, image analysis, autonomous flight, scene reconstruction, and post-event analysis will be tested. Data obtained from multiple cameras will be integrated for various operations. The data obtained from the various simulations will be analyzed to assess Computer Vision's and drone technology's impact on SAR operations. Based on the data obtained, best practices will be developed to integrate cameras and sensors with SAR drones and use the most effective algorithms in SAR operations.

Expected Outcomes

1. A comprehensive understanding of the use of Computer Vision and drone technology in various SAR operations

2. Improved performance and accuracy of computer vision algorithms
3. Best practices for integrating cameras with SAR drones.

Conclusion

This research project will contribute to the advancement of SAR operations by exploring drone technology. The results obtained from this research will provide valuable insights into the potential benefits and limitations of Computer Vision and drone technology for SAR operations.

References

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