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HUMAN DETECTION FROM AERIAL IMAGERY FOR SEARCH AND RESCUE OPERATIONS

by

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Abstract

Mountain recreation is becoming more popular, with mountaineering, rock climbing, skiing, mountain biking, hiking, and mushroom picking among the most popular sports. Despite this tendency, there is currently limited research available explaining the rise in search and rescue (SAR), as well as the injuries and illnesses that entail SAR aid in tourist-friendly mountain and desert areas. The objective of a SAR operation is to search the farthest area feasible in the shortest amount of time in order to locate a lost or wounded individual. In the past decade, several new and spectacular uses for drones, including search and rescue, surveillance, traffic monitoring, and weather monitoring, have been created and deployed. Current advancements in drone technology have resulted in major modifications that enable drones to conduct a vast array of tasks with an increasing degree of complexity. Missions such as search and rescue and forest surveillance need a vast camera coverage, making drones an ideal tool for performing complex tasks.

Meantime, the rising prevalence of deep learning applications in computer vision offers exceptional insight into these research areas. In SAR operations, the primary object is the person; however, recordings from a bird's-eye perspective are not included in the large data sets used to train these cutting-edge detectors. To attain the best potential accuracy of the detection model, the data set on which the model is trained must contain conditions comparable to those encountered while testing the model. Hence, it is required to train the model with data obtained from a bird's-eye perspective. A recent dataset (SARD) has been used to detect a person's presence in mountain spots. The research conducted in this work proposes a method for identifying the presence of human's mountain setting utilizing an algorithm for human object detection with a deep learning framework. Even if the individual is partially veiled, a trained deep learning system can recognize from a variety of perspectives. Existing state-of-the-art detectors such as Faster R-CNN, YOLO-v4, RetinaNet, and Cascade R-CNN have been investigated in previous research on various datasets to simulate rescue scenes. Although those algorithms achieve good recall, the other recent detector such as YOLO-v5 may be investigated for comparative performance. Thus, YOLO-v5 is trained on SARD dataset in this research to validate its speed and accuracy, as well as the small number of false detections. It turns out that it achieves the highest mean average accuracy of 96.9% compared with other detectors. Experimental results using YOLO-v5 conducted on SARD set are presented for comparison.

Keywords: Search and Rescue, Aerial Imagery, UAV, YOLO-v5