RESEARCH ON VEHICLE DETECTION BASED ON VISIBLE LIGHT AND INFRARED FUSION

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Abstract: *combining the gamma transform with Sobel edge detection method, an image enhancement method is designed. The improved Mask R-CNN infrared target detection algorithm based on image enhancement network is proposed. This algorithm is introduced into the Mask R-CNN network based on the decrease of learning rate. Aiming at the limitation of image captured by single sensor, a new target detection algorithm based on decision-level fusion is proposed. This algorithm combines visible light detection with infrared detection. Experiments show that the infrared target detection accuracy is improved by 4.48% after the improved algorithm. The target detection results at decision level are 5.49%~33.80% higher than those of single sensor imaging.*
Key words: *infrared image, object detection, gamma transformation, Sobel operator edge detection, Mask R-CNN.*

Vehicle type detection is one of the key technologies of smart city. Accurate vehicle type detection is the important premise of traffic flow and road maintenance. In essence, the traditional vehicle type detection method uses man-made features as vehicle information representation tools, which cannot meet the needs of mass traffic data processing. The convolutional neural network can extract deep features of objects in the images, and has the advantages of high generalization and processing large amounts of data. Since the limitation of the image captured by a single sensor, the visible light equipment cannot clearly image the vehicle target under the condition of insufficient illumination or dense fog and smoke, the infrared equipment in the environment and the target temperature difference or the target thermal radiation intensity is low, it will lead to the shooting of the target imaging mode. Visible and infrared fusion monitoring can effectively combine the advantages of visible and infrared imaging equipment. In this project, data fusion method and deep learning target detection algorithm are combined and studied.

The structure of the improved Mask R-CNN infrared target detection network is shown in figure. The experimental results show that the improved algorithm improves the detection accuracy by 4.48%.

Aiming at the problem that the clarity of image captured by a single sensor is greatly affected by environment, the Mask R-CNN method is combined with the decision-level fusion method. A decision-level fusion strategy is designed according to the confidence of the visible and infrared images. The experimental results show that the decision-level detection results are 5.49% ~ 33.80% higher than the single sensor imaging detection results.