Tracking of Small Infrared Targets Based on Convolutional Neural Network

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Introduction

As an important application of computer vision, visual tracking has been studied more and more. However, there are still many problems to be solved for infrared target detection, especially for weak infrared target detection and tracking. In this paper, a infrared weak target detection and tracking method is designed. Based on the criteria of visual saliency, the real target can estimate by calculating the Euclidean distance between the target and its neighbours. The detected position of the target is sent to a fully convolutional siamese network DeepCF for tracking. A tracking confidence T is proposed to judge whether the target is lost. The motion trajectory of the target is continuously estimated if it is lost. The experimental results show that the above method can effectively detect and track infrared weak targets.

Method

Detection is performed on the first input frame and tracking is performed on the subsequent frames. In the initial frame, Gauss filter is used to remove the discrete noise points. After removing the mean value of the filtered image, the Euclidean distance between the pixel and the surrounding neighbourhood is calculated. As the result, saliency map of the target is achieved. Through the dynamic threshold, the saliency map is segmented. The subsequent input frame is tracked based on the position obtained from the initial frame. Meanwhile, tracking confidence T is computed during tracking to determine whether the tracking is lost.
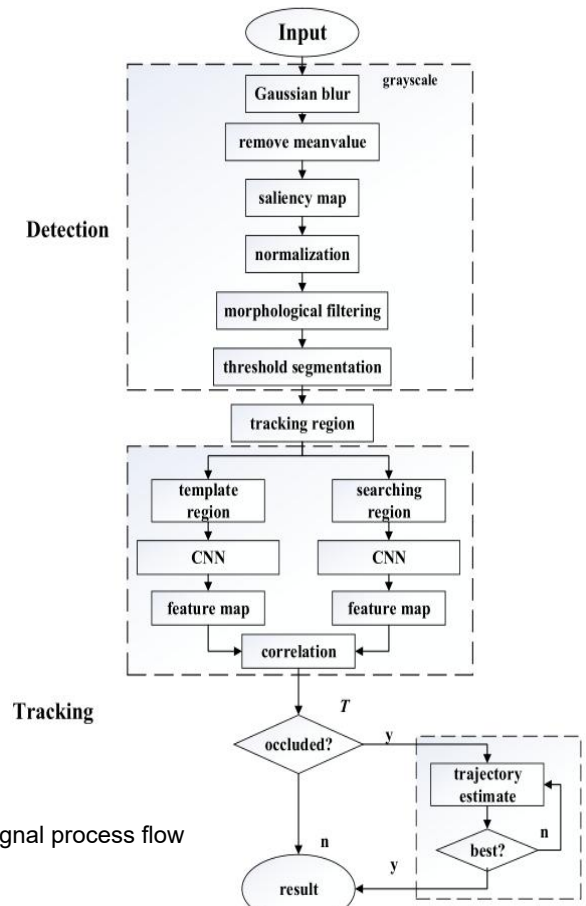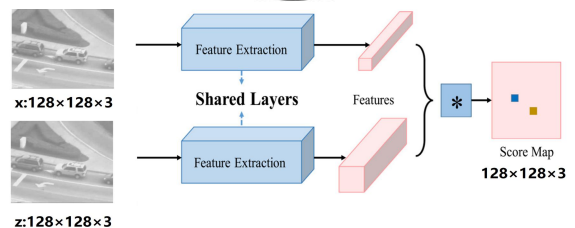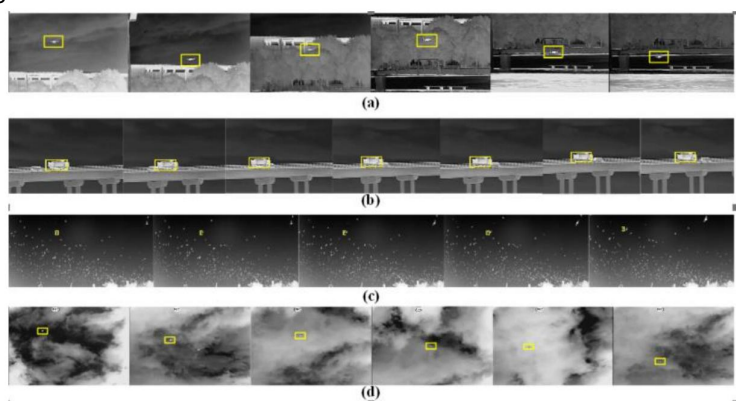

Fig. 1 Signal process flow

Fig. 2 Siamese Network

Fig. 3 Results

Conclusion

A fast and accurate tracker DeepCF for dim infrared target is proposed. This tracker can effectively suppress the surrounding and highlight the contour edge of the real target with less computation. Since the target is occluded or lost, the anti-occluded algorithm is utilized to update the trajectory. Compared with the current engineering methods, this method can meet the real-time requirement and facility to deploy on the embedded system.