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# A sparse representation-based method for infrared dim target detection under sea-sky background

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**Abstract:** Automatic detection for infrared (IR) dim targets under complex sea-sky background is a challenging task. To explore an effective solution to the problem, this paper develops a sparse representation-based method by learning a sea-sky background dictionary. This framework is mainly composed of three modules: background dictionary learning, preliminary target localization, and accurate target identification. In the first module, a sea-sky background dictionary is learned from a large number of training samples, which has a good ability to model the cluttered sea-sky background. In the second module, given a test image, it is first divided into a set of patches; then, for each image patch, its sparse representation coefficients are computed over the learned dictionary. By analyzing the sparse reconstruction errors for the image patches, the target candidate areas can be predicted. In the third module, an infrared dim target recognition scheme is applied to those areas to recognize the true dim IR targets. Based on a set of comprehensive experiments, our algorithm has demonstrated better performance than several other infrared dim target detection methods.

**Key words:** Infrared image; target detection; sparse representation; dictionary learning

## 1. Introduction

Infrared (IR) dim target detection under complicated sea-sky background is a key technology for a wide range of applications such as security surveillance, navigation, defense, etc. With the development of infrared imaging technology, infrared sensors have provided high resolution images, which facilitate the detection of targets. However, it is still a challenging problem to reliably detect dim IR targets with complex sea-sky background not

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