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An infrared-small-target detection method in compressed sensing domain based on local segment contrast measure

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Abstract

Real-time performance is one of the key properties in infrared targets detection system which limits the applications of many algorithms. In this paper, a novel infrared-small-target detection method using compressed sensing technology is proposed to improve real-time performance by combining the images compressed and targets detection. Furthermore, dealing with images with both bright targets and dark targets, filter images for two kinds of targets separately is commonly for the image preprocessing. In this paper, a local segment contrast measure method is proposed to preprocess images uniform. Finally, the influence of certain vital parameters (e.g., the block size and the filter window size) on the detection and compression performance is discussed at length. Several guiding principles for the selection of those vital parameters are developed. The experimental results demonstrate that the proposed framework with an appropriate block size and filter window size provides a great balance between real-time performance and accuracy. The proposed local segment contrast measure method is efficient when applied to both bright and dark small targets.

Keywords: compressed sensing, modulation map, local segment contrast measure, bright and dark small targets,

1. Introduction

Forward-looking Infrared (FLIR) detectors are often used for surveillance and reconnaissance[1]. Such applications require the system to collect information at high speed[2] and transfer it to the control center in real time[3]. Then, an image processing algorithm is used to detect and identify the target information[4]. Thus, real-time and accurate performance is important to the system.

In recent years, technological breakthroughs in large-format infrared focal plane arrays[5] have increased the resolution of images. However, the improvement in the detection precision is accompanied by great amounts of communication data. To avoid overwhelming wireless communication channels, the data need to be compressed[6]. Compressed sensing[7] is highly suited to low-computing-power airborne equipment because it combines compression with sampling in hardware[8].

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