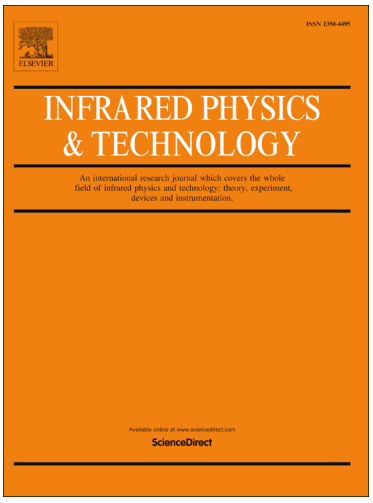

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Infrared image enhancement with learned features

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Abstract: Due to the variation of imaging environment and limitations of infrared imaging sensors, infrared images usually have some drawbacks: low contrast, few details and indistinct edges. Hence, to promote the applications of infrared imaging technology, it is essential to improve the qualities of infrared images. To enhance image details and edges adaptively, we propose an infrared image enhancement method under the proposed image enhancement scheme. On the one hand, on the assumption of high-quality image taking more evident structure singularities than low-quality images, we propose an image enhancement scheme that depends on the extractions of structure features. On the other hand, different from the current image enhancement algorithms based on deep learning networks that try to train and build the end-to-end mappings on improving image quality, we analyze the significance of first layer in Stacked Sparse Denoising Auto-encoder and propose a novel feature extraction for the proposed image enhancement scheme. Experiment results prove that the novel feature extraction is free from some artifacts on the edges such as blocking artifacts, "gradient reversal", and pseudo contours. Compared with other enhancement methods, the proposed method achieves the best performance in infrared image enhancement.

Keywords: image processing, image enhancement, Stacked Sparse Denoising Auto-encoder, learned feature, basis function

1 Introduction

The techniques extending the spectrum range of human visual sensing is powerful and meaningful for the commercial, medical, military and rescue fields. For instance, infrared imaging systems enable people to see in the dark and detect heat sources without extra illumination, are employed for weapon sitting, forest fire detection, surveillance systems, and night vision for drivers and pilots [1-5]. With the atmospheric variations and aerosol turbulence, infrared images in many applications are distorted with blurring edges, low image contrast and few details. Therefore,