Infrared and Visual Image Fusion Method Based on Discrete Cosine Transform and Local Spatial Frequency in Discrete Stationary Wavelet Transform Domain

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PII: S1350-4495(17)30117-2
DOI: https://doi.org/10.1016/j.infrared.2017.10.004
Reference: INFPHY 2399

To appear in: *Infrared Physics & Technology*

Received Date: 26 February 2017
Revised Date: 9 October 2017
Accepted Date: 10 October 2017

Please cite this article as: X. Jin, Q. Jiang, S. Yao, D. Zhou, R. Nie, S-J. Lee, K. He, Infrared and Visual Image Fusion Method Based on Discrete Cosine Transform and Local Spatial Frequency in Discrete Stationary Wavelet Transform Domain, *Infrared Physics & Technology* (2017), doi: https://doi.org/10.1016/j.infrared.2017.10.004

Infrared and Visual Image Fusion Method Based on Discrete Cosine Transform and Local Spatial Frequency in Discrete Stationary Wavelet Transform Domain

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Highlights:

This paper introduces a hybrid method for infrared and visual image fusion.

DSWT is employed to decompose the important features of source image into sub-images.

DCT is used to separate the significant details of the sub-images in DSWT domain.

LSF is applied to enhance the regional features of the DCT coefficients to fuse them.

The visual effect and evaluation indexes of this method are better than conventional methods.

Abstract: In order to promote the performance of infrared and visual image fusion and provide better visual effects, this paper proposes a hybrid fusion method for infrared and visual image by the combination of discrete stationary wavelet transform (DSWT), discrete cosine transform (DCT) and local spatial frequency (LSF). The proposed method has three key processing steps. Firstly, DSWT is employed to decompose the important features of the source image into a series of sub-images with different levels and spatial frequencies. Secondly, DCT is used to separate the significant details of the sub-images according to the energy of different frequencies. Thirdly, LSF is applied to enhance the regional features of DCT coefficients, and it can be helpful and useful for image feature extraction. Some frequently-used image fusion methods and evaluation metrics are employed to evaluate the validity of the proposed method. The experiments indicate that the proposed method can achieve good fusion effect, and it is more efficient than other conventional image fusion methods.

Keywords: Infrared and visual image fusion; Discrete stationary wavelet transform; Discrete cosine transform; Spatial frequency

1. Introduction

In recent years, image fusion has gradually become a hot research field [1][2][3]. With the development of imaging technologies, people can get plenty of images due to the reduction of the cost. The demands of comprehensive and reliable images propel the development of image fusion techniques; therefore, image fusion get more and more attentions, especially infrared image (IR) and visible image (VI) fusion [4]. The effective description of the complex scene urges IR and VI fusion techniques to be extensively applied to military surveillance[1][5], industrial applications[6], medical imaging [7],