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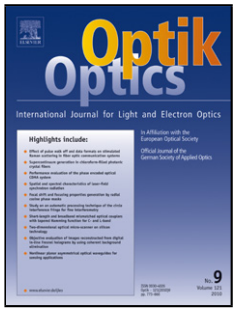

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Energy-efficient Multi-focus Image Fusion Based on Neighbor Distance and Morphology

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***Abstract*—To solve the problem of the discontinuity of focus region in fused image based on traditional multi-scale analysis and reduce the complexity of fusion method, a energy-efficient multi-focus image fusion algorithm based on multi-scale neighbor distance analysis and morphology is proposed. First, relative to traditional multi-scale analysis, multi-scale neighbor distance analysis can also effectively extract the details of images. The lowpass subband coefficient and highpass subband coefficient are produced based on it, and, then, all of coefficients are divided into blocks with the same size. Second, a coefficient in the highpass subband is seriously related to corresponding one in the lowpass subband. Based on this, block is compared with pair-based scheme in transform domain by using some new fusion rules. As a result, the focused region of source images are determined, and the initial map is acquired. The mathematical morphology is used for post-processing. Finally, the fused image is obtained with the guidance of the decision map. The experimental results demonstrate that the proposed method is effective and can provide better performance in both fusing multi-focus image and the computational complexity than some state-of-art multi-scale analysis-based methods, such as the nonsubsampled contourlet transform (NSCT), contourlet transform, wavelet transform and lifting stationary wavelet transform (LSWT).**

Index Terms—Image fusion; multi-focus image; energy-efficient; neighbor distance; mathematical morphology.

I. Introduction

In wireless multi-media sensor networks (WMSNs), images captured by different nodes which focus on the same scene are often complementary and redundancy. Whereas comprehensive information is

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