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Multi-window visual saliency extraction for fusion of visible and infrared images

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Abstract: Fusion for visible and infrared images aims to combine the source images of the same scene into a single image with more feature information and better visual performance. In this paper, the authors propose a fusion method based on multi-window visual saliency extraction for visible and infrared images. To extract feature information from infrared and visible images, we design local-window-based frequency-tuned method. With this idea, visual saliency maps are calculated for variable feature information under different local window. These maps show the weights of people's attention upon images for each pixel and region. Enhanced fusion is done using simple weight combination way. Compared with the classical and state-of-the-art approaches, the experimental results demonstrate the proposed approach runs efficiently and performs better than other methods, especially in visual performance and details enhancement.

Key words: Image fusion, visual saliency extraction, multi-window, dual-band, human visual system

1 Introduction

Image fusion has been an active research topic in optical image processing. The research aims at combining the useful information from two or more images, which are usually obtained by multiple sensors[1, 2]. Especially, the visible and infrared sensors are commonly used.

Infrared (IR) image records particular target information corresponding to thermal radiations emitted by the objects which one can't find in visible scene. However, IR image has low contrast with weak details. Since the visible (VI) sensor appears sensitive to the reflection of scene, visible one usually has abundant details for each objects in image. Fusion of visible and infrared images aims to combine both information of VI and IR images into fused result as much as possible [3, 4].

Lots of methods are developed for image fusion. Among these ideas, multi-resolution-based algorithms are most popular. Wavelet-based approaches are commonly used. For example, using discrete wavelets transform(DWT), Pajares and other researchers [5] study image fusion, systemically providing the guidelines about the use of wavelets in fusion. Curvelet is another multi-resolution method, and it is utilized in image fusion[6]. In their method, based on Curvelet decomposition, they get different coefficients, and the approximation of the source images and the detail coefficients are fused separately. In their fusion rule, they also make use of the local variance weighted strategy. The shearlets-based fusion method has also been studied[7], and this multi-resolution-based transform performs well. Another kind of multi-resolution method is developed, which is based on pyramid

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