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SALIENCE PRESERVING MULTIFOCUS IMAGE FUSION WITH DYNAMIC RANGE COMPRESSION

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Abstract. *This paper proposes a novel multifocus image fusion method. Different from most state-of-the-art approaches, e.g., multiscale decomposition (MSD), region selection (RES) and learning based methods, our proposed method is based on salience preserving gradient and it can better emphasize the structure details of sources. We firstly measure the salience map of the gradient from each source, and then use the saliency to modulate their contributions in computing the global statistics. Gradients with high saliency are properly highlighted in the target gradient, and thereby salient features in the sources are well preserved. Furthermore we handle the dynamic range problem (DRC) by applying range compression on the target gradient. In this way, halo effect is effectively reduced. In addition, we show that the method can be easily extended to color domain by exploiting the relationships among each chromatic channels using importance-weight based trigonometric average (ITA). Extensive experiments on several datasets of multifocus images have demonstrated the superiority of our method, both in terms of visual effect and objective evaluation criteria.*

Keywords: Multifocus image fusion, Salience map, Dynamic range compression, Halo effect, Trigonometric average

1. **Introduction.** Recently image fusion has become an important research topic in image analysis and computer vision. It is well known that multifocus image fusion is a promising approach to deal with the sensor's limitation of commercial cameras. Thus it has drawn the attentions of many researchers in the computer vision community. Generally multifocus image fusion algorithms aim at extending the depth of defocus images and enhance the images via the fusion process [1]. Thus algorithms that can extend the depth field of sources while emphasizing the structure details are highly desired.

Up to now, plenty of multifocus image fusion methods have been presented. Simple techniques, in which the fusion operation is directly performed on the source images (e.g., weighted average method), often bring side effects such as the reduction of contrast in the fused result. Aizawa *et al.* [2] studied this problem and presented an algorithm based on camera point spread function (PSF). But it requires prior knowledge of the system (e.g., camera PSF). Bloch *et al.* [3] proposed a probabilistic method, which involves huge computation using floating point arithmetic and thus requires a lot of time and memory-space. Learning based methods use training machines, which learn to segregate between sharp and blurred regions [4]. The training machine selects the regions used for fusion. This process typically has high computational cost. In addition, training is performed on prescribed focused and unfocused training datasets. When a region under analysis has no sharpness in the entire set, misclassification occurs and learning based methods perform averaging or compel one arbitrary region into the fused image. More algorithms