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WAVELET-BASED FAST IMAGE INPAINTING FOR LARGE SCALE MISSING REGIONS

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Abstract. *Films, paintings and photographs usually contain some undesirable or damaged objects which should be removed and reconstructed in a non-detectable way. Hence, image inpainting which aims to restore the damaged images visual plausibly has received considerable attentions in recent years. In this paper, a novel and fast inpainting algorithm is proposed to remove large image object from the original image and then reconstruct the missing areas. In the proposed method, the original image is firstly decomposed through the wavelet transformation. Then, the structure information of source region is used to determine the filling order. Thirdly, the coefficients of the missing patches are replaced by those coefficients of the optimal filling patches that are obtained by a matching pursuit strategy. Finally, the inpainted image is reconstructed through the inverse wavelet transformation. Experimental results on several testing images demonstrate that the proposed method can greatly speed up the inpainting process and efficiently reconstruct various large object missing cases even in complex background.*
Keywords: Digital image inpainting, Texture synthesis, Wavelet transform, Image matching

1. **Introduction.** Digital image inpainting was firstly introduced by Bertalmio et al. in 2000, which aimed to reconstruct missing or damaged portions of images automatically [1]. Now, image inpainting has broad applications, such as restoring corrupted aged photographs, films and paintings, removing occlusions and producing special effects in modern film or television works.

In recent years, inpainting has received considerable attentions and some inpainting methods have been proposed. These methods could be typically categorized into two groups: diffusion-based inpainting for repairing small missing regions and sample-based texture synthesis inpainting for reconstructing large missing regions.

Motivated by the intensive works on image processing and computer vision with partial differential equations (PDE), Bertalmio et al. proposed one method to smoothly propagate information from the surrounding areas in the isophote direction [1], which is the classical diffusion-based inpainting method. Chan and Shen proposed the total variation (TV) method [2] and the curvature-driven diffusion (CDD) method [3] to restore missing region, which assume that image inpainting belongs to the general category of image restoration [4]. Zhang et al. proposed another PDE-based inpainting method [5], which is based on minimization of the p-harmonic equation and the propagation process is an anisotropic diffusion in both gradient and isophote directions. These methods manage thin missing regions well, such as scratch, spot and character, but they bring blurring effect in the inpainted regions and can not inpaint large damaged regions.