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Super-Resolution Image Reconstruction Using Surface Fitting with Hierarchical Structure★

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Abstract

We propose a super-resolution image reconstruction method using multi-source low resolution images. The proposed method includes a hierarchical structure that combines a neighborhood expansion process with the surface fitting technique. In the proposed method, a series of nested neighborhoods are created to collect LR pixels, and a purification algorithm is put forward to remove the outliers. Then we fit with a surface in each neighborhood to obtain a value at the location of estimated high resolution grid site. These values are pooled to a MAP frame to reconstruct high resolution pixels. Therefore, a reconstructed pixel is associated with the pixel correlation, pixel intensity and the spatial structure. Moreover, our method is non-iterative and does not suffer from convergence problem. Comparing with the state-of-the-art schemes, the proposed method provides superior effect and computational efficiency. Experimental results demonstrate the superiority of the proposed method in both visual fidelity and numerical measures.

Key words: Super-resolution image reconstruction, Neighborhood expansion, Multi-surface fitting, Hierarchical structure, MAP estimation

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