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Adaptive Charbonnier superresolution method with robust edge preservation capabilities

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Abstract

Superresolution (SR) is known to be an ill-posed inverse problem, which may be solved using some regularization techniques. We have proposed an adaptive regularization method, based on a Charbonnier nonlinear diffusion model to solve an SR problem. The proposed model is flexible because of its automatic capability to reap the strengths of either linear isotropic diffusion, Charbonnier model, or semi-Charbonnier model, depending on the local features of the image. On the contrary, the models proposed from other research works are fixed and hence less feature dependent. This makes such models insensitive to local structures of the images, thereby producing poor reconstruction results. Empirical results obtained from experiments, and presented here, show that the proposed method produces superresolved images which are more natural and contain well-preserved and clearly distinguishable image structures, such as edges. In comparison with other methods, the proposed method demonstrates higher performance in terms of the quality of images it generates.

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