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A new denoising model for multi-frame super-resolution image reconstruction

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Abstract

Multi-frame image super-resolution (SR) aims to combine the sub-pixel information from a sequence of low-resolution (LR) images to build a high-resolution (HR) one. SR techniques usually suffers from annoying restoration artifacts such as noise, jagged edges, and staircasing effect. In this paper, we aim to increase the performance of SR reconstitution under a variational framework using adaptive diffusion-based regularization term. We propose a new tensor based diffusion regularization that takes the benefit from the diffusion model of Perona-Malik in the flat regions and use a nonlinear tensor derived from the diffusion process of weickert filter near boundaries. Thus, the proposed SR approach can preserve important image features (sharp edges and corners) much better while avoiding artifacts. The synthetic and real experimental results show the effectiveness of the proposed regularisation compared to other methods in both quantitatively and visually.

Keywords: Super-resolution, Multi-frame, Image restoration, Variational regularization, Tensor diffusion.

1. Introduction

Currently, image multi-frame super-resolution reconstruction [1, 2, 3, 4, 5] is one of the relevant inverse problems research in image processing. The aim