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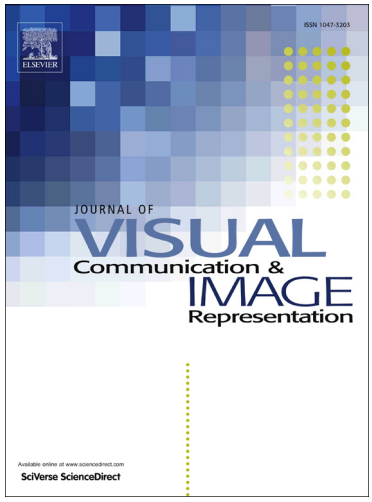

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An image denoising algorithm for mixed noise combining nonlocal means filter and sparse representation technique

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Abstract

Nonlocal means (NLM) filtering or sparse representation based denoising method has obtained a remarkable denoising performance. In order to integrate the advantages of two methods into a unified framework, we propose an image denoising algorithm through skillfully combining NLM and sparse representation technique to remove Gaussian noise mixed with random-valued impulse noise. In the non-Gaussian circumstance, we propose a customized blockwise NLM (CBNLM) filter to generate an initial denoised image. Based on it, we classify the different noisy pixels according to the *three-sigma* rule. Besides, an overcomplete dictionary is trained on the initial denoised image. Then, a complementary sparse coding technique is used to find the sparse vector for each input noisy patch over the overcomplete dictionary. Through solving a more reasonable variational denoising model, we can reconstruct the clean image. Experimental results verify that our proposed algorithm can obtain the best denoising performance, compared with some typical methods.

Keywords: Image denoising, mixed noise, nonlocal means, noise classification, complementary sparse coding, sparse representation

1. Introduction

Image denoising is a classical inverse problem in the field of low level image processing. In the process of image acquisition or transmission, the unsatisfactory photography environment or the noisy transmission channel is the main cause for noisy images. In order to remove the noise and recover the real information hidden in the corrupted image, some denoising algorithms are applied to guarantee an accurate understanding of image contents and a good performance of subsequent image processing algorithm such as edge detection or object identification. So far, there are lots of denoising methods to solve the inverse problem and some researchers offered a good summation [1]. Actually, how to

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