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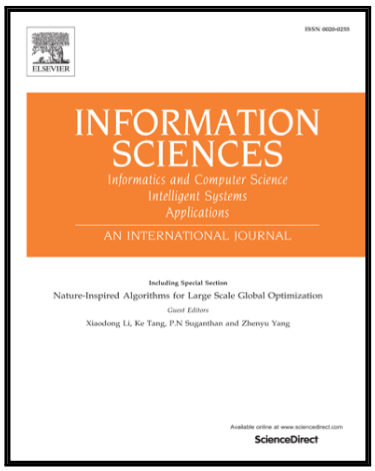

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An Efficient Denoising Framework using Weighted Overlapping Group Sparsity

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Abstract

In group sparse signal applications, components within each group experience different scales of magnitude. This is due to the fact that the components of each group exhibit a large, but not isolated range of values. In this paper, weights are introduced to balance the different scales of the components within each group. These added weights improve the accuracy and the stability of the reconstruction. The proposed method, weighted overlapping group sparsity (WOLGS), uses the weighted L_2 norm within each group and the L_1 norm across the groups. It is observed that the introduction of weights in convex and non-convex penalty functions produces smaller root mean square errors (RMSE) of the reconstructed signal when compared to the case of not using weights. The method is extended to image denoising using only weighted convex penalty function and an improved quality of the reconstructed image is evaluated using BRISQUE, SSIM and PSNR. Furthermore, the proposed algorithm produces a RMSE smaller than that of the two state-of-the-art methods, which do not use overlapping group sparsity (OLGS).

Keywords: Signal denoising, Inverse problems, Majorization-minimization, Quality metrics.

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