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Structure Tensor Total Variation-Regularized Weighted Nuclear Norm Minimization For Hyperspectral Image Mixed Denoising

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Abstract

Several band-by-band TV-regularized low rank based models have been proposed for Hyperspectral image (HSI) mixed denoising, which can exploit the spectral and spatial information simultaneously. However, these methods may lead to large fluctuations due to the noise and also create oil painting effects. Moreover, they only exploit the spatial information in a separated manner, which may negatively affect the performance of removing the noise with obvious structure, e.g., the deadline noise. To cope with the above problems, a novel Structure tensor Total Variation (STV)-regularized Weighted Nuclear Norm Minimization (STWNNM) model is proposed. To obtain the desired performance, three issues are included. First, the Weighted Nuclear Norm Minimization (WNNM) is adopted to utilize the spectral information by shrinking different eigenvalues with different weights. Second, the structure tensor is used to exploit the global spatial structure information within all bands simultaneously. Third, a convolution kernel is incorporated to obtain more local structure information from neighborhood pixels. Then, two different optimization strategies are proposed to solve the derived optimization problem. Both simulated and real data experiments illustrate the higher performance of the proposed STWNNM for HSI mixed denoising, by comparing with other state-of-the-art

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