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Assessment of non-local similarity methods for electron microscopy image denoising. PETRU FODOR, Cleveland State University, ALINA LAZAR, Youngstown State University — Electron microscopy imaging has been one of the critical material characterization tools, when very high spatial resolution is required. However, when the electron doses used have to be kept small due to the possibility of sample damage or to speed-up the acquisition process, the image quality tends to be poor. This is due to both the typically low signal levels, as well as the complex noise profile associated with this type of instrumentation. In this work we explore the use of state-of-the-art image reconstruction techniques based on exploiting non-local similarities in the acquired images to extract high quality data from low electron exposure acquisitions. The viability of the methods are evaluated by comparing reconstructed results from noisy images acquired at low electron doses with imaging data obtained at high electron doses (i.e. with high signal-to-noise-ratios). The assessment is based both on standard image processing analysis measures, such as peak-signal-to-noise-ratios (PSNR), as well as the ability of automatic algorithms to extract the features of interest from denoised images. Our results indicate that this type of post-processing is a viable strategy to improve feature recognition from noisy electron microscopy image data.

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