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Dictionary-learning based image deblurring for improving performance in nondestructive testing

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In conventional radiography, x-ray images are typically blurred, limiting the image performance of the system, mainly due to finite focal spot size of the x-ray tube, inherent the detector pixel size, and the detector resolution. Thus, the recovery of images from their degraded version is essential for improving the image characteristics. In this work, we investigated a dictionary-learning based image deblurring scheme for improving image performance in nondestructive testing (NDT), in which an x-ray image is represented as a form of patches and the patches are encoded with sparse coefficients using an overcomplete dictionary. The sparse constraints are able to recover the latent image from ill-posed deconvolution problem. Furthermore, the dictionary is learned from the updated image for encoding adaptive sparse constraints. Final deblurred image is iteratively obtained by using the sparse constraints with the learned dictionary to the updated image. We implemented the proposed algorithm and performed an experiment to demonstrate its viability. Our results indicate that the proposed deblurring method appears effective for improving the image characteristics in x-ray NDT.

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