

A fast wavelet algorithm for image deblurring

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We present an algorithm which combines both Fast Fourier and Fast wavelet transforms and can recover a blurred image ($n \times n$) observed in white noise in $O(n^2(\log n)^2)$ steps. In the periodic setting, our method exploits both the natural representation of the convolution operator in the Fourier domain and the typical characterisation of Besov classes in the wavelet domain. Particular feature of our method includes “cycle-spinning” band-limited non-linear wavelet approximations over all circulant shifts. Our algorithm produces an estimator which is translation invariant and fully adaptive over a wide class of error measures and blurring kernels.