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Signal Processing with Gabor Frames: Variational Problems, Compression, and Noise Removal

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We present solutions for variational problems, compression and noise removal using gabor frames. For an appropriate window function, a signal $f \in \mathcal{L}^2(\mathbb{R}^d)$ possesses a non-orthogonal gabor frames expansions in terms of the dual frames with unconditional convergence in $\mathcal{L}^2((R)^d)$. We derive approximate minimizers of variational problems and compression in modulation spaces. Within the Gaussian white noise model we provide minimax bounds for rates of convergence over modulation spaces using soft-thresholding of the Gabor coefficients. Numerical experiments complement the theoretical results. Furthermore we extend our results onto α-modulation spaces, providing a flexible Gabor-wavelet transform of signals.

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