AUTOMATED REGULARIZATION PARAMETER SELECTION FOR TOTAL VARIATION BASED IMAGE RESTORATION

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ABSTRACT

A general total variation regularization based model for gray-scale and color image restoration is introduced. The model contains an L^τ-data fidelity term for $\tau \in [1, 2]$ and uses a spatially dependent regularization parameter in order to enhance image regions containing details while still sufficiently smoothing homogeneous regions. The regularization parameter is locally adapted according to local statistical estimators, such as a local variance estimator or a local expected absolute value estimator. In order to accelerate the updating process of the regularization parameter a generalized hierarchical decomposition of the restored image is used. The numerical solution of the resulting minimization problems are obtained by a locally superlinearly convergent algorithm based on Fenchel-duality and inexact semismooth Newton techniques which are stable with respect to noise in the data.