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Image recovery via total variation minimization and related problems. (English)

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Numer. Math. 76, No. 2, 167-188 (1997).

Summary: We study here a classical image denoising technique introduced by L. Rudin and S. Osher a few years ago, namely the constrained minimization of the total variation (TV) of the image. First, we give results of existence and uniqueness and prove the link between the constrained minimization problem and the minimization of an associated Lagrangian functional. Then we describe a relaxation method for computing the solution, and give a proof of convergence. After this, we explain why the TV-based model is well suited to the recovery of some images and not of others. We eventually propose an alternative approach whose purpose is to handle the minimization of the minimum of several convex functionals. We propose for instance a variant of the original TV minimization problem that handles correctly some situations where TV fails.

MSC:

- 68U10 Computing methodologies for image processing
- 49J45 Methods involving semicontinuity and convergence; relaxation
- 94A08 Image processing (compression, reconstruction, etc.) in information and communication theory

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