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Two-stage approximation of nonsmooth solutions and restoration of noised images. (English. Russian original) Zbl 1072.65076

Autom. Remote Control 65, No. 2, 270-279 (2004); translation from Avtom. Telemekh. 2004, No. 2, 126-135 (2004).

The paper is concerned with the approximation of nonsmooth solutions to linear ill-posed equations $Au = f$ with noisy data. Let A be a linear bounded operator from $L_p(D)$ into $L_q(S)$, where $1 < p, q < \infty$ and $D \subset \mathbb{R}^m$, $S \subset \mathbb{R}^k$ are domains with piecewise-smooth boundaries. Suppose the original equation has a solution $\hat{u}$ in the space $U = \{u \in L_p(D) : J(u) < \infty\}$, $J(u) = \sup\{\int_D u(x)\,\mathrm{div} v(x)dx : v \in C_0^1(D, \mathbb{R}^m), |v(x)| \le 1\}$, and instead of true elements (A, f) their approximations (A_h, f_δ) are available. Let u^0 be an approximation to $\hat{u}$. The authors present convergence results for the Tikhonov regularization method $\min\{\|A_h u - f_\delta\|_{L_q}^q + \alpha(\|u - u^0\|_{L_p}^p + J(u)) : u \in U\}$ and discuss approaches to its numerical implementation.

Reviewer: Mikhail Yu. Kokurin (Yoshkar-Ola)

MSC:

65J10 Numerical solutions to equations with linear operators
65J20 Numerical solutions of ill-posed problems in abstract spaces; regularization
47A52 Linear operators and ill-posed problems, regularization
94A08 Image processing (compression, reconstruction, etc.) in information and communication theory

Cited in **2** Documents

Keywords:

nonsmooth solutions; linear ill-posed equations; convergence; Tikhonov regularization method

Full Text: DOI

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