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Modulus-Based Iterative Methods for Constrained Tikhonov Regularization

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Abstract

Tikhonov regularization is one of the most popular methods for the solution of linear discrete ill-posed problems. In many applications the desired solution is known to lie in the nonnegative cone. It is then natural to require that the approximate solution determined by Tikhonov regularization also lies in this cone. The present paper describes two iterative methods, that employ modulus-based iterative methods, to compute approximate solutions in the nonnegative cone of large-scale Tikhonov regularization problems. The first method considered consists of two steps: first the given linear discrete ill-posed problem is reduced to a small problem by a Krylov subspace method, and then the reduced Tikhonov regularization problems so obtained is solved. The second method described explores the structure of certain image restoration problems. Computed examples illustrate the performances of these methods.

Keywords: Discrete ill-posed problem, Regularization method, Constrained minimization
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