Convergence analysis and parameter estimation for the iterated Arnoldi-Tikhonov method

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Abstract

The Arnoldi-Tikhonov method is a well-established regularization technique for solving large-scale ill-posed linear inverse problems. This method leverages the Arnoldi decomposition to reduce computational complexity by projecting the discretized problem into a lower-dimensional Krylov subspace, in which it is solved. Our study considers the iterated Arnoldi-Tikhonov method and provides a thorough analysis that considers all approximation errors. Additionally, we propose a new strategy for choosing the regularization parameter. This choice yields more accurate approximate solutions than the standard Arnoldi-Tikhonov method. Moreover, the proposed method is robust with respect to the regularization parameter as confirmed in the numerical results.

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