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Iterative methods for ill-posed problems and semiconvergent sequences. (English)

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Summary: Iterative schemes, such as LSQR and RRGMRES, are among the most efficient methods for the solution of large-scale ill-posed problems. The iterates generated by these methods form semiconvergent sequences. A meaningful approximation of the desired solution of an ill-posed problem often can be obtained by choosing a suitable member of this sequence. However, it is not always a simple matter to decide which member to choose. Semiconvergent sequences also arise when approximating integrals by asymptotic expansions, and considerable experience and analysis of how to choose a suitable member of a semiconvergent sequence in this context are available. The present note explores how the guidelines developed within the context of asymptotic expansions can be applied to iterative methods for ill-posed problems.

MSC:

65F10 Iterative numerical methods for linear systems

65F22 Ill-posedness and regularization problems in numerical linear algebra

Keywords:

iterative method; stopping criterion; L-curve; large-scale ill-posed problems; semiconvergent sequences; asymptotic expansions

Software:

Regularization tools

Full Text: DOI

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