Globally Convergent Methods for Large Sparse Systems of Nonlinear Equations

Lukšan, Ladislav
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ACADEMY OF SCIENCES OF THE CZECH REPUBLIC

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Globally Convergent Methods for Large Sparse Systems of Nonlinear Equations [1]

L. Lukšan   M. Rozložník

Abstract

The paper is devoted to globally convergent methods for solving large sparse systems of nonlinear equations with an inexact approximation of the Jacobian matrix. These methods include diferrence versions of the Newton method and quasi-Newton methods like the Broyden and the Schubert ones. We propose two classes of Armijo-type descent methods and one class of trust region methods together with proofs of their global convergence. The considerable attention is concentrated on the application of conjugate gradient-type iterative methods to the solution of linear subproblems. We prove that both the GMRES and the smoothed CGS method can be used for the construction of the trust region methods for solving large sparse systems of nonlinear equations.

Keywords
Nonlinear equations, Armijo-type descent methods, trust region methods, global convergence, inexact Jacobians, nonsymmetric linear systems, conjugate gradient-type methods, residual smoothing

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