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**A preconditioned iterative method for solving systems of nonlinear equations having unknown multiplicity.** (English) [Zbl 1461.65082](#)

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Summary: A modification to an existing iterative method for computing zeros with unknown multiplicities of nonlinear equations or a system of nonlinear equations is presented. We introduce preconditioners to nonlinear equations or a system of nonlinear equations and their corresponding Jacobians. The inclusion of preconditioners provides numerical stability and accuracy. The different selection of preconditioner offers a family of iterative methods. We modified an existing method in a way that we do not alter its inherited quadratic convergence. Numerical simulations confirm the quadratic convergence of the preconditioned iterative method. The influence of preconditioners is clearly reflected in the numerically achieved accuracy of computed solutions.

**MSC:**

**65H10** Numerical computation of solutions to systems of equations

**Keywords:**

nonlinear equations; systems of nonlinear equations; singular Jacobian; roots with unknown multiplicity; nonlinear preconditioners; auxiliary function

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