

An efficient solver for systems of nonlinear equations with singular Jacobian via diagonal updating

Abstract

It is well known that the quadratic rate of convergence of Newton method for solving nonlinear equations is depends on when the Jacobian is nonsingular in the neighborhood of the solution. Disobeying this condition, i.e. the Jacobian to be singular the convergence is too slow and may even lost. In this paper, we report on design and implementation of an efficient solver for systems of nonlinear equations with singular Jacobian at a solution. Our approach is based on approximation of the Jacobian inverse into a nonsingular diagonal matrix without computing the Jacobian. The proposed algorithm is simple and straightforward to implement. We report on several numerical experiments which shows that, the proposed method is very efficient.

Keyword: Nonlinear equations; Diagonally updating; Approximation; Non singular Jacobian; Inverse Jacobian