Two-step derivative-free diagonally Newton's method for large-scale nonlinear equations

ABSTRACT

In this study, we extend the technique of Waziri et al. (2010a) via incorporating the two-step scheme in the framework of the diagonal Jacobian updating method to solve large-scale systems of nonlinear equations. In this approach we used points from two previous steps unlike one step approach in most Newton's-like methods. The anticipation has been to improve the current Jacobian approximation into a diagonal matrix. Under mild assumptions local convergence of the proposed method is proved. The results of numerical tests are provided to demonstrate the distinctive qualities of this new approach in contrast with other available variants of Newton's method. The method proposed in this paper has out performs some Newton-like methods in terms of computation cost and storage requirements.

Keyword: Large systems; Multi-step; Jacobian approximation; Newton's-like methods