ABSTRACT

IMPROVING THE COMPUTATIONAL EFFICIENCY OF FIXED POINT ALGORITHMS

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This paper proposes two kinds of techniques which improve the computational efficiency of the restart methods, including the (n+1)-, 2n-, 2^n-, (3^n-1)- and Merrill's methods, which have been developed in the field of the fixed point and complementarity theory for approximating solutions of a system of nonlinear equations:

$$f(x)=0.$$

Here we assume that f is a continuously differentiable mapping from the n-dimensional Euclidean space into itself. The one of the techniques which will be proposed is concerned with a grid size control of simplicial subdivisions which are used in each cycle of the restart methods. This aims at saving function evaluations in earlier cycles of the global convergence from a given initial point to a rough approximate solution. The other technique is concerned with combination of the restart methods with the quasi-Newton method. So far the quasi-Newton method has been used to improve the local convergence of the restart methods. In this paper, we assert that it should be used as much as possible even in earlier cycles of the restart methods unless its use does not destroy the global convergence. We show the necessity of introducing these techniques into the restart methods to improve the computational efficiency by using some numerical examples, and then report some computational experiences which support that they work very effectively.