

A symmetric rank-one method based on extra updating techniques for unconstrained optimization.

ABSTRACT

In this paper, we present a new symmetric rank-one (SR1) method for the solution of unconstrained optimization problems. The proposed method involves an algorithm in which the usual SR1 Hessian is updated a number of times in a way to be specified in some iterations, to improve the performance of the Hessian approximation. In particular, we discuss how to consider a criterion for indicating at each iteration whether it is necessary to employ extra updates. However it is well known that there are some theoretical difficulties when applying the SR1 update. Even for a current positive definite Hessian approximation, it is possible that the SR1 update may not be defined or the SR1 update may not preserve positive definiteness at some iterations. We then employ a restarting procedure that guarantees that updated matrices will be well-defined while preserving positive definiteness of updates. Numerical results support these theoretical considerations. They show that the implementation of the SR1 method using extra updating techniques improves the performance of the SR1 method substantially for a number of test problems from the literature.

Keyword: Extra updating techniques; Hessian approximation; Symmetric rank-one update; Unconstrained optimization.