

Positive-definite memoryless symmetric rank one method for large-scale unconstrained optimization.

ABSTRACT

Memoryless quasi-Newton method is exactly the quasi-Newton method for which the approximation to the inverse of Hessian, at each step, is updated from a positive multiple of identity matrix. Hence, its search direction can be computed without the storage of matrices, namely $O(n^2)$ storages. In this paper, a memoryless symmetric rank one (SR1) method for solving large-scale unconstrained optimization problems is presented. The basic idea is to incorporate the SR1 update within the framework of the memoryless quasi-method. However, it is well-known that the SR1 update may not preserve positive definiteness even when updated from the positive definite matrix. Therefore, we propose that the memoryless SR1 method is updated from the positive scaled of the identity, in which the scaling factor is derived in such a way to preserve the positive definiteness and improves the condition the scale memoryless SR1 update. Under some standard conditions it is shown that the method is globally and R-linearly convergent. Numerical results show that the memoryless SR1 method is very encouraging.

Keyword: Large-scale unconstrained optimization; Symmetric rank one method; Memoryless method; Optimal scaling.