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An adaptive three-term conjugate gradient method based on self-scaling memoryless BFGS matrix ☆

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Abstract

Due to its simplicity and low memory requirement, conjugate gradient methods are widely used for solving large-scale unconstrained optimization problems. In this paper, we propose a three-term conjugate gradient method. The search direction is given by a symmetrical Perry matrix, which contains a positive parameter. The value of this parameter is determined by minimizing the distance of this matrix and the self-scaling memoryless BFGS matrix in the Frobenius norm. The sufficient descent property of the generated directions holds independent of line searches. The global convergence of the given method is established under Wolfe line search for general non-convex functions. Numerical experiments show that the proposed method is promising.

Keywords: unconstrained optimization, conjugate gradient method, self-scaling memoryless BFGS matrix, global convergence

2010 MSC: 90C53, 49M37, 65F15

1. Introduction

The method involved in this paper is designed to solve the following unconstrained optimization problem:

$$\min f(x), x \in R^n, \tag{1}$$

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