An interior-point algorithm with a new iterative scheme for semidefinite optimization problems

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Abstract

In this paper, a new interior-point algorithm is presented for semidefinite optimization (SDO) problems. The algorithm is based on a new class of search directions and Ai-Zhang's wide neighborhood for linear complementarity problems. Although, the algorithm belongs to the class of large-step interior-point algorithms, its complexity is coincide with the best iteration bound of short-step ones for SDO problems.

Keywords: Semidefinite optimization, Wide neighborhood, Interior-point method, Polynomial complexity
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1 Introduction

Semidefinite optimization (SDO) problems are one of the most important classes of optimization problems which has become a popular research area in mathematical programming. Among various methods for solving this class of problems, interior-point methods (IPMs) are one of the most efficient and applicable classes of iterative algorithms which solve SDO problems in polynomial time complexity.
The first IPMs for SDO problems were developed by Alizadeh [1] and Nesterov et al. [2]. After that, several authors such as Helmberg et al. [3], Vandenberghe et al. [4], Wang et al. [5] and Mansouri et al. [6, 7] have proposed some interior-point algorithms for solving the SDO problems. Most of these mentioned interior-point algorithms are based on a small neighborhood of the central path (short-step IPMs) and their complexities coincide with the best obtained iteration bound for solving the SDO problems.
In this paper, using Ai-Zhang's wide neighborhood for linear complementarity problems [8], we propose a large-step interior-point algorithm for SDO problems. Although, the algorithm belongs to the class of large-step algorithms, we prove that its complexity coincides with the best iteration bound obtained by the short-step interior-point algorithms for SDO problems.

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