Master's Thesis

A stabilized SQP-type method for nonlinear second order cone programming problems

Guidance

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Abstract

Optimization problems with second-order cone constraints are called nonlinear second-order cone programming (NSOCP). They extend the well-known nonlinear programming (NLP) problems, and have applications in important fields like robust optimization, combinatorial optimization and finance. Some methods have been proposed to solve NSOCP problems, i.e., where the involved functions are nonlinear and possibly nonconvex. In particular, the sequential quadratic programming (SQP) type method has been proposed recently, and its local quadratic convergence was shown under the strong second-order sufficient condition (SSOSC) and the nondegeneracy condition. This SQP-type method has a practical advantage when comparing to other methods for NSOCP. In fact, each iteration of the method consists in solving a linear SOCP, and efficient solvers exist for it. However, SQP-type methods have some drawbacks, like the possible infeasibility of the subproblems and the slow convergence in degenerated solutions. In this paper, we propose a stabilized SQP-type method for NSOCP in order to overcome these difficulties. We establish the local superlinear convergence of this method under SSOSC and the so-called strict Robinson's constraint qualification, which is weaker than the nondegeneracy condition.