Full-Newton Step Interior-Point Algorithms for Second-Order Cone Optimization

Abstract

The algorithms in this paper use full-Newton steps. So no line searches are required. In the first part of the paper we present a new primal-dual interior-point algorithm for second-order conic optimization. It is proven that the number of iterations of the algorithm is $O(\sqrt{N\log \frac{1}{\varepsilon}})$, which coincides with the best known iteration bound for second-order conic optimization. Here $N$ stands for the number of second-order cones in the problem formulation and $\varepsilon$ is the desired accuracy. In the second part, we generalize a recently proposed infeasible interior-point method to second-order conic optimization. As usual for infeasible interior-point methods the starting point depends on a positive number $\zeta$. The algorithm either finds an $\varepsilon$-solution in at most $O(N\log \frac{1}{\varepsilon})$ steps or detects that the primal-dual problem pair has no optimal solution with vanishing duality gap satisfying a condition in terms of $\zeta$. 