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A New Iteration-Complexity Bound for the MTY Predictor-Corrector Algorithm

Abstract:

In this paper we present a new iteration-complexity bound for the Mizuno-Todd-Ye predictor-corrector (MTY P-C) primal-dual interior-point algorithm for linear programming. The analysis of the paper is based on the important notion of crossover events introduced by Vavasis and Ye. For a standard form linear program $\min\{c^T x : Ax = b, x \geq 0\}$ with decision variable $x \in \Re^n$, we show that the MTY P-C algorithm started from a well-centered interior-feasible solution with duality gap $n\mu_0$ finds an interior-feasible solution with duality gap less than $n\eta$ in $\mathcal{O}(n^2 \log(\log(\mu_0/\eta)) + n^{3.5} \log(\bar{\chi}_A^* + n))$ iterations, where $\bar{\chi}_A^*$ is a scaling invariant condition number associated with the matrix A. More specifically, $\bar{\chi}_A^*$ is the infimum of all the conditions numbers $\bar{\chi}_{AD}$, where D varies over the set of positive diagonal matrices. Under the setting of the Turing machine model, our analysis yields an $\mathcal{O}(n^{3.5} L_A + n^2 \log L))$ iteration-complexity bound for the MTY P-C algorithm to find a primal-dual optimal solution, where L_A and L are the input sizes of the matrix A and the data (A, b, c), respectively. This contrasts well with the classical iteration-complexity bound for the MTY P-C algorithm which depends linearly on L instead of $\log L$.