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ROUNDING OF CONVEX SETS AND EFFICIENT GRADIENT METHODS FOR LINEAR PROGRAMMING PROBLEMS

Yu. NESTEROV[1]

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Abstract

In this paper we propose new efficient gradient schemes for two non-trivial classes of linear programming problems. These schemes are designed to compute approximate solutions with relative accuracy δ. We prove that the upper complexity bound for both schemes is $O(\frac{\sqrt{n \ln m}}{\delta} \ln n)$ iterations of a gradient-type method, where n and m, $(n < m)$, are the sizes of the corresponding linear programming problems. The proposed schemes are based on preliminary computation of an ellipsoidal rounding for some polytopes in R^n. In both cases this computation can be performed very efficiently, in $O(n^2 m \ln m)$ operations at most.

Keywords: nonlinear optimization, convex optimization, complexity bounds, relative accuracy, fully polynomial approximation schemes, gradient methods, optimal methods.

[1]CORE and INMA, Université catholique de Louvain, Belgium.
E-mail: nesterov@core.ucl.ac.be

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