

Minimizing a convex separable exponential function subject to linear equality constraint and bounded variables

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Abstract

In this paper, we consider the problem of minimizing a convex separable exponential function over a region defined by a linear equality constraint and bounds on the variables. Such problems are interesting from both theoretical and practical point of view because they arise in some mathematical programming problems as well as in various practical problems. Polynomial algorithms are proposed for solving problems of this form and their convergence is proved. Some examples and results of numerical experiments are also presented.

Keywords and phrases : Exponential function, convex programming, separable programming, polynomial algorithms, computational complexity.

1. Introduction

Consider the following convex separable program with an exponential objective function, linear equality constraint and bounded variables

$$(CSE) \quad \min \left\{ c(\mathbf{x}) \equiv \sum_{j \in J} c_j(x_j) \equiv \sum_{j \in J} s_j(e^{-m_j x_j} - 1) \right\} \quad (1)$$

$$\text{subject to } \sum_{j \in J} d_j x_j = \alpha \quad (2)$$

$$a_j \leq x_j \leq b_j, \quad j \in J, \quad (3)$$

where $s_j > 0$, $m_j > 0$, $d_j > 0$, $j \in J$, $\mathbf{x} = (x_j)_{j \in J}$, and $J \stackrel{\text{def}}{=} \{1, \dots, n\}$.

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