Solution of some convex separable resource allocation and production planning problems with bounds on the variables

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Abstract

In this paper, we consider the problems of minimizing convex separable functions of two specific forms over a feasible region defined by a linear inequality or linear equality constraint, and two-sided bounds on the variables (box constraints). These problems are interesting from both theoretical and practical point of view because they arise in some mathematical programming problems and in various practical problems, for example, resource allocation and production planning problems. Necessary and sufficient condition is proved for a feasible solution to be an optimal solution to a more general convex separable problem consisting in minimizing a strictly convex separable function subject to a linear inequality constraint and box constraints. Necessary and sufficient conditions for a feasible solution to be an optimal solution to the two problems under consideration are obtained as corollaries of this more general result. Iterative algorithms of polynomial complexity for solving such problems are proposed and their convergence is proved. Some examples and results of numerical experiments are also presented.

Keywords and phrases : *Convex programming, separable programming, resource allocation, production planning, polynomial algorithms, computational complexity.*