Solving Global Optimization Problems With Constraints Via Branch and Bound Method

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Abstract

The purpose of this paper is to present a new approach for solving a global optimization problem. It is the Branch and bound method applied to solve a DC programming problem with a separable concave part, in which we use two techniques of subdivision the first is called the largest distance bisection, denoted by (LDB) and the other is the w-subdivision. To calculate the lower bounds, we propose to solve the subproblems obtained by replacing the concave term in the objective function by a linear term. An algorithm is developed followed by a theorem of convergence and applications

Consider the following DC optimization problem :

$$\begin{cases} \min f(x) \\ Ax \leq b, \\ l \leq x \leq u. \end{cases} \qquad (DCP)$$

where

$f(x) = g(x) + \varphi(x)$

g is a convex function and $\varphi(x) = \sum_{i=1}^{n} \varphi_i(x_i)$,

The functions $\varphi_i(x_i)$, $i = 1, ..., n$, are concave functions.

The feasible domain is the intersection of the polytope

$$S = \{x \in \mathbb{R}^n \ / \ Ax \leq b\},$$

Where

$A \subset \mathbb{R}^{m \times n}, b \in \mathbb{R}^m$ and the rectangle defined by

$$D = \{x \in \mathbb{R}^n \ / \ l \leq x \leq u\}.$$

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