Dynamics of Continuous, Discrete and Impulsive Systems
Series **B:** *Applications & Algorithms* **17 (2010)** 581-598
 http://www.watam.org

AN UNCONSTRAINED CONVEX PROGRAMMING APPROACH TO CONVEX SEMI-INFINITE PROGRAMMING

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Abstract. A smooth convex penalty function method for solving a semi-infinite convex programming problem is proposed in this paper. The semi-infinite convex programming problem can be successively solved by by a sequence of smooth unconstrained convex programming problems, whose optimal solutions are convergent to the optimal set of the original problem. Some other convergence results are also established in this paper, and several numerical examples are included to illustrate our approach.

Keywords. semi-infinite convex programming, penalty function, unconstrained convex programming approach.

AMS (MOS) subject classification: 90C34, 90C25.

1 Introduction

Semi-infinite convex optimization deals with optimization problems with a convex objective function and convex constraints in which either the number of constraints or the dimension of the variables space but not both are allowed to be infinite (see in [9]). Many applications can be found in truss topology design, chemical engineering, and other engineering problems (see in [9, 10, 11]). In this paper, we consider the following semi-infinite convex programming problem:

$$\begin{array}{lll} (P) & \min & f(x) \\ & \text{s.t.} & g_i(x,y) \le 0, \quad \forall y \in Y_i,\ i = 1, \cdots, m \\ & & x \in X, \end{array}$$

where X is a convex compact set in R^n, Y_i is a compact set in R^{l_i}, $g_i : X \times Y_i \to R$ is continuous and f and $g_i(,y) : X \to R, y \in Y_i$ are convex and C^1.