Dynamics of Continuous, Discrete and Impulsive Systems
Series **B:** *Applications & Algorithms* **17 (2010)** 553-563
 http://www.watam.org

ERROR BOUND ESTIMATION OF THE GENERALIZED LINEAR COMPLEMENTARITY PROBLEM OVER A POLYHEDRAL CONE

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Abstract. In this paper, we make an error bound estimation to the generalized linear complementarity problem over a polyhedral cone (GLCP). To this end, we first reformulate the GLCP as an affine variational inequality problem over a polyhedral cone via a quadratic programming problem, and then we establish the error bound estimations for the GLCP without increasing the dimensions of variables under suitable assumptions.

Keywords. GLCP, affine VI problem, Reformulation, Global error bound, Relative error bound, .

AMS (MOS) subject classification: 65H10, 90C33, 90C30.

1 Introduction

Let $F(x) = Mx + p, G(x) = Nx + q$, where $M, N \in R^{n\times n}$, $p, q \in R^n$. The generalized linear complementarity problem, abbreviated as GLCP, is to find a vector $x^* \in R^n$ such that

$$F(x^*) \in \mathcal{K}, \quad G(x^*) \in \mathcal{K}^\circ, \quad F(x^*)^\top G(x^*) = 0, \tag{1.1}$$

where $\mathcal{K}$ is a polyhedral cone in R^n, i.e., there exist $A \in R^{s\times n}$ and $B \in R^{t\times n}$ such that $\mathcal{K} = \{v \in R^n \mid Av \geq 0,\ Bv = 0\}$. It is easy to verify that its dual cone $\mathcal{K}^\circ$ assumes the following form ([1, 13])

$$\mathcal{K}^\circ = \{u \in R^n \mid u = A^\top \lambda_1 + B^\top \lambda_2, \lambda_1 \in R^s_+, \lambda_2 \in R^t\}.$$

Throughout this paper, we denote the "feasible" region of the GLCP by X, i.e.,

$$X = \left\{ x \in R^n \;\middle|\; \begin{array}{l} A(Mx + p) \geq 0,\ B(Mx + p) = 0, \\ Nx + q = A^\top \lambda_1 + B^\top \lambda_2, \lambda_1 \in R^s_+, \lambda_2 \in R^t \end{array} \right\},$$

and the solution set of the GLCP is denoted by X^* which is assumed to be nonempty throughout this paper.