Nonlinear Dynamics and Systems Theory, **24** (4) (2024) 410–418

An Efficient DCA Algorithm for Solving Non-Monotone Affine Variational Inequality Problem

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Received: November 20, 2023; Revised: July 5, 2024

Abstract: In this paper, we propose a method for solving a non monotone affine variational inequality problem (AVI). We consider an equivalent optimization model, which is formulated as a DC program, and we apply DCA for solving it. The process consists of solving a successive convex quadratic program. The effeciency of the proposed approach is illustrated by the numerical experiments on several test problems in terms of the quality of the obtained solutions and their convergence.

Keywords: *affine variational inequality problem; quadratic program; DC programming; DCA (Difference of Convex functions Algorithms).*

Mathematics Subject Classification (2010): 90C20, 90C30, 90C90, 49J40.

1 Introduction

The variational inequality problem (VIP) remains a prominent and highly sought-after research focus within the realm of numerical optimization. Our objective is to develop a more comprehensive and less restrictive theoretical framework while devising appropriate algorithms to address it. Both the affine variational inequality problem (AVI) and the standard linear complementarity problem bear a close connection to the Karush-Kuhn-Tucker conditions commonly encountered in quadratic programming. Let us define some essential notations: We denote by $\mathbb{R}^n$ and $\mathbb{R}^m$ the finite-dimensional Euclidean spaces, and $\mathbb{R}^{n\times n}$ and $\mathbb{R}^{m\times n}$ represent, respectively, the spaces of $(n\times n)$-matrices and $(m\times n)$-matrices. The following constitutes an affine variational inequality problem (AVI):

$$\begin{cases} \text{Find } x\in C \\ \text{such that } \langle Mx+q, y-x\rangle \geq 0, \text{ for all } y\in C. \end{cases} \tag{1}$$

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