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EQUIVALENCE BETWEEN GENERALIZED COMPLEMENTARITY PROBLEM AND GENERALIZED VARIATIONAL INEQUALITY PROBLEM INVOLVING XOR-OPERATION WITH EXISTENCE OF SOLUTION

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Abstract. In this paper, we study a generalized complementarity problem and a variational inequality problem involving XOR-operation. Equivalence between both the problems is shown by using the technique of Karamardian [16, 17]. An iterative algorithm is defined for solving generalized variational inequality problem involving XOR-operation. An existence and convergence result is proved. We provide an example in support of some of the concepts used in our main result.

1. Introduction

The techniques of variational inequalities are powerful tools for solving many problems related to mechanics, optimization, transportation, economics, elasticity, etc., see for example [2, 6]. Due to their applications, variational inequalities were generalized and extended in various directions. Equally important is the area of operations research known as complementarity theory, which has received much recognition in recent past. If the convex set involved in a variational inequality problem and a complementarity problem is a convex cone, then both the problems are equivalent, see Karamardian [16, 17]. Indeed, variational inequality problems are more general than complementarity problems and include them as special cases. For more details on variational inequalities, complementarity problems and their applications, we refer to [4, 5, 7, 8, 10, 12, 13, 18–20, 27–30].

A Boolean logic operation called "exclusive or", or XOR-operation is widely used in cryptography as well as in generating parity bits for error checking and fault tolerance. XOR compares two input bits and generate one output bit. The logic is simple, if the bits are same, the result is zero. Suppose a system receiving a continuous stream of data in some fixed packet size. The parity check can help to know whether the data is received, correctly received or has been corrupted. We mention one more application of XOR-operation, that is, when a file is being transferred from server A to server B, it is cut into blocks, sent over piece by piece, then reattached at its destination. To ensure each block is not corrupted, a checksum function is run on it, generating a unique checksum. All the symbols are then intercepted in base 2 (1's and 0's), and each chunk is XOR-ed together. One can find application of XOR-terminology in digital electronics, combination

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