Abstract

This thesis presents some perturbation results for the existence of solution of different types of Generalized Linear Complementarity Problem (GLCP). New generalizations of the Linear Complementarity Problem (LCP) are introduced, and the solution pattern for such problems is also studied. Different perturbation methods and optimization techniques are also provided for solving some of the Generalized Linear Complementarity Problems.

The Parametric Vertical Linear Complementarity Problem (PVLCP) is proposed when both the input data corresponding to the Vertical Linear Complementarity Problem (VLCP) are parametric. Assuming the vertical block matrix as a vertical block P-matrix, an algorithm is developed to solve the VLCP. Necessary and sufficient conditions are derived to ensure unique basis for the parametric input of the matrix. Based on these, an algorithm is developed to obtain solution of the PVLCP. Next, the VLCP associated with the vertical block P_0-matrix is considered. Results and solution procedures are provided under which the VLCP can be solved by a perturbation technique. Different matrix properties are defined for the Generalized Horizontal Linear Complementarity Problem (GHLCP) where the associated matrices are considered as vertical block matrices. Some results are derived using these properties. Perturbation conditions are also provided for the existence of solution of the GHLCP.

Two Multi-objective Programming (MOP) techniques including the weighting method and the minimax approach are used to solve the VLCP and the Horizontal Linear Complementarity Problem (HLCP). These techniques neither depend on the matrix classes nor on the matrix properties. A perturbed problem is also derived to revise the VLCP when it is unsolvable due to slight variation in the input data. For the HLCP, the MOP approach is used to characterize its solvability and unsolvability properties. The approximate solution of an unsolvable HLCP is obtained using the concept of fuzzy set theory. The fuzzy relations are used to relax the original problem to a certain level and then the solution is obtained with some degree of satisfaction.

Keywords: Linear Complementarity Problem, Generalized Linear Complementarity Problem, Vertical Linear Complementarity Problem, Horizontal Linear Complementarity Problem, Multi-objective Programming Problem, Fuzzy Sets.