ON LINEAR PROGRAMS WITH LINEAR COMPLEMENTARITY CONSTRAINTS

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ABSTRACT

This thesis concentrates on the studies of linear programs with linear complementarity constraints (LPCCs), and one of the LPCCs' important applications: quadratic programs (QPs). It consists of several fairly independent chapters that address different questions arising in theories and applications of the LPCCs.

In Chapter 1, we give an introduction of the problems that will be studied in this thesis, including the mathematical formulations of the LPCC and the QP, and a review of the existing computational methods for these two problems.

Chapter 2 discusses the different applications of the LPCCs arising from science and engineering. This discussion is not exhaustive, which we believe still sheds some light on the importance of studying the LPCCs.

Chapter 3 presents a parameter-free integer-programming based algorithm for the global resolution of an LPCC. The cornerstone of this approach is to reformulate the LPCC as a minimax integer program, which can then be resolved by applying the Benders decomposition to the inner problem. The algorithm is tested on randomly generated problems with the results attached at the end of this chapter.

Chapter 4 focuses on the topic of indefinite quadratic programming, which have been extensively studied in mathematical programming. The contribution of this thesis is to fill a gap in the existing work on this topic by showing that the global resolution of a feasible QP, which is not known a priori to be bounded or unbounded below, can be accomplished in finite time by solving two LPCCs: the first one confirms whether or not the QP has unbounded objective value on its feasible region; the second LPCC computes the optimal solution if such a solution exists.

As a concluding remark, Chapter 5 provides a summary over the work that has been done in this thesis with some comments on the directions that the future work may possibly lead to.