On the global solution of linear programs with linear complementarity constraints

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This paper presents a parameter-free integer-programming based algorithm for the global resolution of a linear program with linear complementarity constraints (LPEC). The cornerstone of the algorithm is a minimax integer program formulation that characterizes and provides certificates for the three outcomes—infeasibility, unboundedness, or solvability—of an LPEC. An extreme point/ray generation scheme in the spirit of Benders decomposition is developed, from which valid inequalities in the form of satisfiability constraints are obtained. The feasibility problem of these inequalities and the carefully guided linear programming relaxations of the LPEC are the workhorse of the algorithm, which also employs a specialized procedure for the sparsification of the satifiability cuts. We establish the finite termination of the algorithm and report computational results using the algorithm for solving randomly generated LPECs of reasonable sizes. The results establish that the algorithm can handle infeasible, unbounded, and solvable LPECs effectively.

This is joint work with Jing Hu, John Mitchell, Kristin Bennett, and Gautam Kunapuli.