

Integer Programming Approach to Static Monopolies in Graphs

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We give an integer linear programming formulation for the static monopoly problem. We study the facial structure of the corresponding polytope and introduce some families of valid inequalities. A method to strengthen the formulation is discussed. In the case that the graph has a vertex cut or a cut-set, the problem can be solved more efficiently by adding some strong valid inequalities. We also give an algorithm that solves the minimum monopoly problem in trees and cactus graphs in linear time. Several experiments have been done on randomly generated graphs to test our methods. A software package is introduced that solves the minimum monopoly problem using open source ILP solvers.

Keywords: Static Monopoly; Majority Thresholds; Integer Programming; Polytopes; Valid Inequalities; Cactus Graphs.