

# Discrete Ordered Median Problems: Models, Solution Techniques and Extensions

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**Abstract.** Flexible discrete location problems are a generalization of most of the classical discrete locations problems like  $p$ -median or  $p$ -center problems. They can be modeled by using so-called ordered median functions. These functions multiply a weight to the cost of fulfilling the demand of a customer which depends on the position of that cost relative to the costs of fulfilling the demand of the other customers. The Discrete Ordered Median Problem (DOMP) was introduced by Nickel (2000), who formulated it as both a nonlinear and a linear integer program.

In this paper a covering type of model for the discrete ordered median problem is presented. For the solution of this model two sets of valid inequalities, which reduce the number of binary variables tremendously, and several variable fixing strategies are identified. Based on these concepts a specialized branch & cut procedure is proposed and computational results are reported. Finally some extensions to models with attraction and repulsion as well as capacities are discussed.

**Keywords:** Discrete Location, Discrete Ordered Median Problem, Valid Inequalities, Variable Fixing