Exact method for the competitive facility location problem with quantile criterion*

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The location model in the scope of the present paper was firstly introduced in [2] as a deterministic reformulation of a stochastic competitive location problem and can be thought as a multi-scenario generalization of the problem from [1]. It considers two competing parties opening their facilities in a finite discrete space with the goal to maximize their profits. Emulating the framework of Stackelberg game, the decision-making process is organized as follows. One of the parties, called Leader, opens its facilities first. The set of customers is unknown for Leader at the moment of making a decision. Instead of this, Leader is provided with a finite set of possible scenarios. Each scenario has a probability of realization and fully characterizes the set of customers.

After the Leader's turn, one of the possible scenarios is realized and the set of customers becomes specified. This information is available for the second party, Follower, who opens its facilities with the goal to maximize profit. Leader's goal in this situation is to make a profit that can be guaranteed with given probability or *reliability level* as big as possible.

In [3] we formulate an estimating problem in a form of MIP providing an upper bound for Leader's objective function. Two reformulations of the estimating problem are suggested as well. In the present work we develop branch-and-bound algorithm utilizing the aforementioned upper bounds and perform numerical experiments with artificial data to investigate their efficiencies.

References

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