Introducing Fairness in Facility Location Problems

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Abstract

We consider a plant location problem where a supplier will be locating facilities to serve a set of customers. We assume that the location costs are in charge of the supplier, whereas each customer pays the transportation costs between its position and the serving facilities. For the supplier, an effective service is then reflected by two goals: the facility location cost and the customer satisfaction. While the first goal is easy to formulate uniquely, the second goal can be characterized in different ways. In this talk, we assume that customer satisfaction is a matter of both fair allocation of transportation cost (system equity) and minimum total transportation cost (system efficiency). We then argue that both aspects are captured by the minimization of the sum of the k highest transportation costs among customers (k-sum), where k is an integer parameter whose value reflects the relative importance assigned to equity and efficiency. After discussing the properties of the selected measure, we show how to embed it into a compact bi-objective MILP model, where the first objective is location cost. We analyze heuristic procedures to build an approximation of the Pareto optimal solution set. We discuss computational results on benchmark instances, focusing on the trade-off between objectives in the obtained solutions.

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