

Customer selection rules in competitive facility location problems

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Abstract

When locating a new facility, one of the most important considerations is whether there are competitors in the market offering the same goods or services. If there are competitors in the area, then the locating firm will have to compete for the market, and the profit that the firm makes will be affected by the decisions of its competitors. Therefore, maximizing profit is a much more difficult problem to solve in the presence of competitors than in a monopolistic scenario.

Knowing how customers purchase goods among existing facilities helps to estimate the market share captured by each facility (see [1–3]). An often used rule is that customers only travel to the nearest/cheapest facility to make their purchases, as occurs in Hotelling-like models [4]. In other models, individuals travel farther than necessary to purchase goods, or occasionally do not shop at the lowest price. Another rule frequently used in retailing is that each customer patronizes all available facilities offering the goods probabilistically, with a probability proportional to her/his attraction to each facility, as in Huff-like models [5, 6].

In this work, we deal with static competitive facility location problems, in which demand is assumed to be inelastic and concentrated in a finite set of demand points. The attraction function follows the Multiplicative Competitive Interaction pattern, and thus depends on both the location and the quality of the facilities, being inversely proportional to a modified distance measure and proportional to the quality or other positive factors taken into account. Prices are not considered as decision variables, but they can be considered as part of the attraction factors determining the qualities of the facilities. Most of the existing models of this type focus on maximizing market share, although profit maximization has also been used in many works lately.

A number of different customer selection rules have been presented in the literature and are now reviewed:

- **Huff probabilistic rule:** demand points split their buying power among the facilities proportionally to the attraction they feel for them.
- **Multi-deterministic or Partially binary rule:** assuming that there are several chains present in the market, customers split their demand among all the chains, but are served only from the most attractive facilities of each chain. The demand is split probabilistically among the most attractive facilities of each firm.
- **Partially probabilistic rule:** only the facilities with a minimum utility level serve a customer, and among those facilities the demand is split probabilistically.
- **Pareto-Huff rule:** for each customer, the facilities on the Pareto-front by minimizing distance and maximizing quality can gain its demand. Demand is split probabilistically among these facilities.
- **Brand preference:** a customer splits its demand among all the facilities of its favourite brand probabilistically.

Our goal is to unify these rules, and build a possible solution procedure on the unified model.

References

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