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**Title:** Integer programming formulations for facility location problems with distance constraints

**Abstract:** Facility location problems have attracted much attention in the last decades since they appear in various real-world problems. However, facility location problems with distance constraints have received relatively little attention in OR and related areas. In this work, we study two variants of facility location problems, the  $p$ -median and the  $p$ -dispersion problems, where minimum distance constraints exist. The problems with distance constraints can be utilized in cases where the facilities to be located are semi-obnoxious, e.g., filling gas stations. We have selected two representative facility location problems to experiment with; the  $p$ -median problem deals with locating  $p$  facilities so that the sum of distances between the demand points and their nearest facility is minimized, while the  $p$ -dispersion problem concerns the location of  $p$  facilities so that the minimum separation distance between any pair of open facilities is maximized. We also consider both the problem of locating homogeneous and the one of locating heterogeneous facilities on the plane and we propose various integer linear programming models to solve these problems. Gurobi Optimizer is used to compare these integer linear programming models on a large dataset of problems and useful conclusions are drawn.