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Title: Integer programming formulations for the p-median problem with distance constraints

Abstract: The p-median problem is a well-known and studied problem in the field of facility location. However, the p-median problem with distance constraints has received little attention within the vast literature on location problems in OR and related areas. In this work, we study a variant of the p-median problem where minimum distance constraints exist both between the facilities and between the facilities and the demand points. This problem can be used to model situations where the facilities to be located are semi-obnoxious, i.e., have both desirable and undesirable properties. We consider both the problem of locating homogeneous and the one of locating heterogeneous facilities on the plane so that the sum of distances between the demand points and their nearest facility is minimized. Various integer linear programming models are presented for the p-median problem with distance constraints, coupling classical formulations of the p-median problem with four formulations of the distance constraints. We utilize Gurobi Optimizer v9.0.3 in order to compare these integer linear programming models on a large dataset of problems.