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Public Facility Location Using Dispersion and Population Biases

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Abstract

Administrators responsible for making locational decisions for public facilities have many other overriding factors to consider that dominate traditional OR/MS objectives that relate to response time. Due to the importance of these factors, which include real-estate values, accessibility of the plot and the availability of land, they often make a short list of relatively few feasible sites and choose amongst these via suitable performance measures. This paper deals with the question of how bad locational decisions can be if they are made assuming that the administrators have (i) a *dispersion* bias that ensures a minimum distance between every pair of facilities, and (ii) a *population* bias which stipulates that the distance from a demand point to its closest facility is inversely proportional to its population. We take a well-studied location problem and perform a worst-case analysis when the two biases are used. Sensitivity analysis with respect to the bias parameters is performed and computational results are reported. Our results show that when decision makers restrict location to demand points, the worst-case values are close to the p-median values for certain values of the population and dispersion bias parameters. In other words, the bias parameters are fairly effective in eliminating most of the poor solutions, thus leaving a good set of solutions for the decision makers to choose from. The significance of our work is twofold. For practitioners, it is comforting to know that using common-sense measures such as biases results in fairly good solutions. For academic researchers, it motivates the need for developing solutions for finding the k best solutions for the p-median problem.