

The P-median problem: A computational experience

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Abstract: P-median is one of the main problems of the Location-Allocation kind. This problem determines the location of facilities and assigns demand points to each of them. The p-median problem can be established as a discrete problem in graph terms as: Let $G = (V, E)$ be an undirected graph where V is the set of n vertices and E is the set of edges with an associated weight that can be the distance between the vertices $d_{ij}=d(v_i,v_j)$ for every $i, j=1, \dots, n$ in accordance to the determined metric. With the distances a symmetric matrix is formed, finding $V_p \subseteq V$ such that $|V_p| = p$, where p can be either variable or fixed, and the sum of the shortest distances from the vertices in $\{V-V_p\}$ to their closet vertex in V_p is reduced to the minimum. Expressed in this way the P-median problem is a combinatory optimization problem that belongs to the NP-hard class, where the approximation methods have been of great aid in recent years.

Test instances for p-median are found in the website:

- OR-Library (<http://people.brunel.ac.uk/~mastjib/jeb/info.html>)

In this point, we have tested for the OR-Library matrices three algorithms that have given good results for geographical data (Simulated Annealing, Variable Neighborhood Search and a Bioinspired Variable Neighborhood Search). However, the partitioning method PAM (Partitioning Around Medoids), that is modeled like the P-median, attained better results than the mentioned metaheuristics, in a favorable computing time.

In this work we expose the behavior of four different algorithms for the test matrices from OR-Library. An analysis has been made with the goal to explain the quality of the results obtained, to conclude that PAM behaves with efficiency for such test matrices.

Keywords : Metaheuristics. P-median, PAM

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