

Standort-Optimierung

Handout 7

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Fachbereich C – Angewandte Mathematik / Optimierung und Approximation

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Algorithm 7.23: Myopic Algorithm for the P -Median Problem

- Step 1: Initialize $k = 0$ (k will count the number of facilities we have located so far) and $X_k = \emptyset$, the empty set (X_k will give the location of the k facilities that we have located at each stage of the algorithm).
- Step 2: Increment k , the counter on the number of facilities located.
- Step 3: Compute $Z_j^k = \sum_i h_i d(i, j \cup X_{k-1})$ for each node j which is not in the set X_{k-1} . Note that Z_j^k gives the value of the P -median objective function if we locate the k -th facility at node j , given that the first $k - 1$ facilities are at the locations given in the set X_{k-1} (and node j is not part of that set).
- Step 4: Find the node $j^*(k)$ that minimizes Z_j^k , that is, $j^*(k) = \arg \min_j \{Z_j^k\}$. Note that $j^*(k)$ gives the best location for the k -th facility, given the location of the first $k - 1$ facilities. Add node $j^*(k)$ to the set X_{k-1} to obtain the set X_k ; that is, set $X_k = X_{k-1} \cup j^*(k)$.
- Step 5: If $k = P$ (i.e., we have located P facilities), STOP; the set X_P is the solution to the myopic algorithm. If $k < P$, go to Step 2.

Algorithm 7.24: Neighborhood search Algorithm for the P -Median Problem

- Input: Let $X_P^0 \subseteq I$ be an initial choice of P indices of nodes (i.e. facility sites), where I is the index set of all nodes in the considered network. Set $k = 0$.
- Step 1: Determine the neighborhoods $N^k(j) := \{i \in I : d_{ij} < d_{il} \forall l \in X_P^k, l \neq j\}$ for all sites $j \in X_P^k$.
- Step 2: Set $k = k + 1$, determine the optimal 1-median $x_{k,j}^*$ for all neighborhoods $N^{k-1}(j)$ and update the index set X_P^k according to the locations of $x_{k,j}^*$.
- Step 3: If $X_P^k = X_P^{k-1}$, STOP.
- Step 4: Determine the neighborhoods $N^k(j)$ for the new set of facility sites X_P^k .
- Step 5: If $\forall N^k(j), j \in X_P^k \exists N^{k-1}(i), i \in X_P^{k-1} : N^k(j) = N^k(i - 1)$, STOP. Otherwise go to Step 2.

Algorithm 7.25: Exchange Heuristic for the P -Median Problem

- Input: Let $X_P^0 \subseteq I$ be an initial choice of P indices of nodes (i.e. facility sites), where I is the index set of all nodes in the considered network. Set $k = 1$.
- Step 1: Select the k -th element x_k^k in X_P^k . Set $X_P^{k-} := X_P^k \setminus x_k^k$.
- Step 2: Determine $j^* = \arg \min_{j \in I \setminus X_P^{k-}} \sum_{i \in I} h_i d(i, j \cup X_P^{k-})$.
- Step 3: Set $k = k + 1$ and $X_P^{k+1} = X_P^{k-} \cup \{j^*\}$.
- Step 4: If $k = P$, STOP, otherwise go to Step 1.