Standort-Optimierung

Handout 4

Sommersemester 2010

Bergische Universität Wuppertal
Fachbereich C – Angewandte Mathematik / Optimierung und Approximation
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Algorithm 5.2: LP-Based Algorithm for $m/P/\bullet/l_\infty/\max$

Input: Existing facilities $a_1, \ldots, a_n \in \mathbb{R}^2$; number m of new facilities sought; positive weights $w_{1,ij}$, $i = 1, \ldots, m$, $j = 1, \ldots, n$ and $w_{2,ir}$, $i = 1, \ldots, m-1$, $r = i+1, \ldots, m$.

Step 1: For $k = 1, 2$ do: Solve the LP

$$\begin{array}{lrcl}
\min & z_k & & \\
\text{s.t.} & -x_{ik} + \frac{1}{w_{1,ij}} z_k & \geq & -a_{jk} \\
 & x_{ik} + \frac{1}{w_{1,ij}} z_k & \geq & a_{jk}
\end{array} \left.\right\} \forall i \in \{1, \ldots, m\},\ j \in \{1, \ldots, n\}$$

$$\begin{array}{rcl}
-x_{ik} + x_{rk} + \frac{1}{w_{2,ir}} z_k & \geq & 0 \\
x_{ik} - x_{rk} + \frac{1}{w_{2,ir}} z_k & \geq & 0
\end{array} \left.\right\} \forall i, r \in \{1, \ldots, m\},\ i < r$$

and determine the optimal solution $x^*_{1k}, \ldots, x^*_{mk}, z^*_k$.

Step 2: Set $x^*_i := (x^*_{i1}, x^*_{i2})$, $i = 1, \ldots, m$, $x^* := (x^*_1, \ldots, x^*_m)$, and $z^* := \max\{z^*_1, z^*_2\}$.

Output: Optimal solution x^* of $m/P/\bullet/l_\infty/\max$ with objective value z^*.

Algorithm 5.3.: LP-Based Algorithm for for $m/P/\bullet/l_1/\max$

Input: Existing facilities $a_1, \ldots, a_n \in \mathbb{R}^2$; number m of new facilities sought; positive weights $w_{1,ij}$, $i = 1, \ldots, m$, $j = 1, \ldots, n$ and $w_{2,ir}$, $i = 1, \ldots, m-1$, $r = i+1, \ldots, m$.

Step 1: Find an optimal solution $\tilde{x}$ of the corresponding problem of type $m/P/\bullet/l_\infty/\max$ with existing facility locations at $T^{-1}(a_1), \ldots, T^{-1}(a_n)$.

Output: Optimal solution $x^* := T(\tilde{x})$ of $m/P/\bullet/l_1/\max$.