

Location Analysis WS 2004/2005 Homework 4

To be discussed in the tutorial on January 13, 2005.

13. Consider a problem of type $2/P/\bullet/l_1/\Sigma$ with existing facility locations $a_1 = (5; 13)$, $a_2 = (7; 11)$, $a_3 = (5; 11)$ and weights $w_{1,11} = 4$, $w_{1,12} = 1$, $w_{1,13} = 1$, $w_{1,21} = 1$, $w_{1,22} = 3$, $w_{1,23} = 1$, $w_{2,12} = 1$.
 - a) Determine an approximate solution with Approximation Algorithm 4.3. (Handout 3).
 - b) Try to improve this solution applying Approximation Algorithm 4.4. (Handout 3).
 - c) Find the linear programming formulations of section 4.2. for $k = 1, 2$.
 - d) Determine the exact optimum of the problem.
14. Develop an LP formulation for a problem of type $m/P/\bullet/l_1/\max$ directly, i.e., without using the transformation T from $m/P/\bullet/l_\infty/\max$.
15. Consider the following problem of type $1/P/\bullet/l_\infty/\max$: Existing facility locations $a_1 = (1; 1)$, $a_2 = (2; 4)$, $a_3 = (5; 2)$, weights $w_1 = 2$, $w_2 = 1$, $w_3 = 4$.
 - a) For $k = 1, 2$, graph the functions $A_{jk}^+(z)$, $A_{jk}^-(z)$, $A_k^+(z)$ and $A_k^-(z)$.
 - b) Solve the problem using the algorithm for $1/P/\bullet/l_\infty/\max$ on Handout 4.
 - c) For the same existing facility locations, solve the problem with $w_1 = w_2 = w_3 = 1$ using the algorithm for $1/P/w_j = 1/l_\infty/\max$ on Handout 4.
 - d) Graph the situation for both cases (i.e., existing facility locations and optimal solutions in \mathbb{R}^2).
 - e) What would be the set of optimal solutions of the corresponding Weber problems (i.e., of $1/P/\bullet/l_\infty/\Sigma$ and $1/P/w_j = 1/l_\infty/\Sigma$, respectively)?