Standort-Optimierung

6. Übung

Sommersemester 2010

Bergische Universität Wuppertal
Fachbereich C – Angewandte Mathematik / Optimierung und Approximation
Prof. Dr. K. Klamroth, Dipl. Math. M. Kaiser

Besprechung der Aufgaben: Dienstag 8. Juni 2010

Aufgabe 21:
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 5.

c) For the same existing facility locations, solve the problem with $w_1 = w_2 = w_3 = 1$ using the algorithm for $1/P/w_j = 1/l_\infty/\max$ introduced in exercise 20.

d) Graph the situation for both cases (i.e., existing facility locations and optimal solutions in $\mathbb{R}^2$).

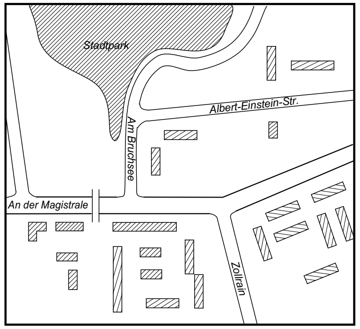
e) What would be the set of optimal solutions of the corresponding Weber problems (i.e., of $1/P/\bullet/l_\infty/\sum$ and $1/P/w_j = 1/l_\infty/\sum$, respectively)?

Aufgabe 22:
Consider a location problem of the type $1/P/\bullet/l_2/\max$. Find a simple bisection search algorithm that solves the problem and specify it by using pseudocode representation.

Aufgabe 23:
Find a mathematical programming formulation for the weighted multi-facility center problem with Euclidean distances $m/P/\bullet/l_2/\max$ and formulate the Karush-Kuhn-Tucker (KKT-) optimality conditions for this problem.

Aufgabe 24:

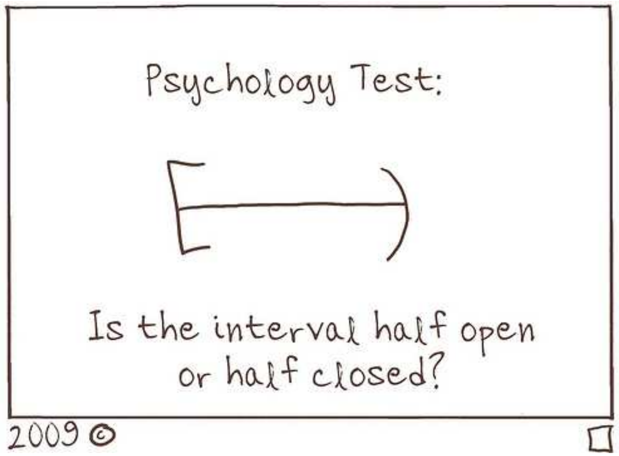
The city council of Halle, Germany, plans to build a playground in a densly populated residential area of the city. Taking into account 18 appartment buildings in the respective area, the playground should be centrally located such that the maximum Euclidean distance from any of the blocks to the playground is minimized.

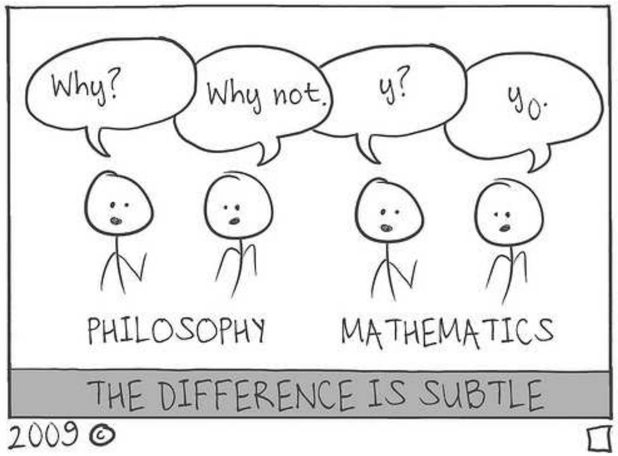


The coordinates of the entrances of the appartment blocks are specified in the following table:

Building number	Coordinates
1	$(1.5, 5)^\top$
2	$(2.5, 4)^\top$
3	$(3, 5)^\top$
4	$(3, 3)^\top$
5	$(5, 3)^\top$
6	$(5.5, 5.5)^\top$
7	$(6, 4)^\top$
8	$(6, 3.5)^\top$
9	$(6, 3)^\top$
10	$(6.5, 4.5)^\top$
11	$(7, 3.5)^\top$
12	$(10, 4.5)^\top$
13	$(10.5, 6)^\top$
14	$(11.5, 5.5)^\top$
15	$(5.5, 8.5)^\top$
16	$(6.5, 9)^\top$
17	$(9.5, 12.5)^\top$
18	$(11, 12)^\top$

Find the optimal center location for the playground using the Elzinga-Hearn Algorithm.





Bemerkung: Aktuelle Informationen zur Vorlesung und zu den Übungen finden Sie im Internet unter:

http://www.math.uni-wuppertal.de/opt/location_ss2010/