Standort-Optimierung

4. Übung

Sommersemester 2010

Bergische Universität Wuppertal
Fachbereich C – Angewandte Mathematik / Optimierung und Approximation
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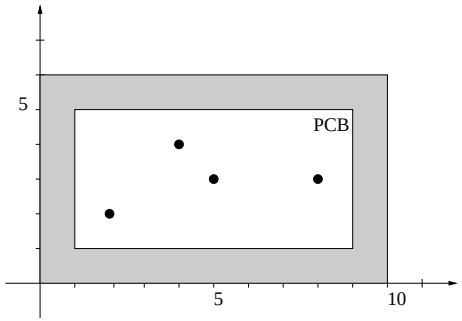
Besprechung der Aufgaben: Dienstag 18. Mai 2010

Aufgabe 14:
Consider a PCB of the size $[1;9] \times [1;5]$. A circular part has to be placed at each of the locations $(2;2)$, $(4;4)$, $(5;3)$ and $(8;3)$. This is done using a robot arm which needs a time proportional to $\max\{|x_1 - y_1|, |x_2 - y_2|\}$ to move from a point $x = (x_1; x_2)$ to another point $y = (y_1; y_2)$. Find an optimal location for a container containing the circular parts that has a security distance of 1 to the PCB using the boundary search algorithm. It is sufficient to search for the solution along the upper boundary of the forbidden region, that is, along the segment $\{(x_1; x_2) : x_1 \in [0; 10], x_2 = 6\}$.



Aufgabe 15:
Solve the problem from Exercise 14. using the construction line algorithm for $1/P/R/l_1/\sum$ (Algorithm 3.20).

Aufgabe 16:
Prove Lemma 3.19: Let $R \subset \mathbb{R}^2$ be closed and convex, and let $\mathcal{X}^* \subseteq \text{int}(R)$ for $1/P/\bullet/l_1/\sum$. Then there is an optimal solution x_R^* of $1/P/R/l_1/\sum$ such that $x_R^* \in \partial R$ and $x_R^* \in \mathcal{G}_{l_1}$, where

$$\begin{aligned}\mathcal{G}_{l_1} &= \big\{(x_1, x_2) \in \mathbb{R}^2 : x_1 = a_{j_1}, j \in \{1, \ldots, n\}\big\} \\ &\quad \cup \big\{(x_1, x_2) \in \mathbb{R}^2 : x_2 = a_{j_2}, j \in \{1, \ldots, n\}\big\}\end{aligned}$$

is the construction line grid wrt. the existing facility locations at $a_1, \ldots, a_n$.

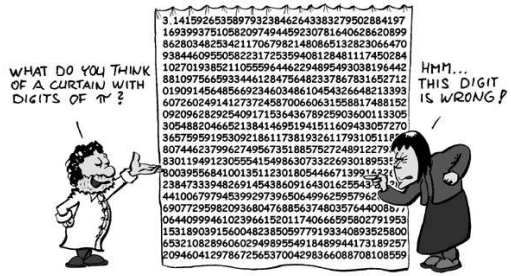
Aufgabe 17:
Consider a problem of type $2/P/\bullet/l_1/\sum$ with existing facility locations at $a_1 = (5;13)$, $a_2 = (7;11)$, $a_3 = (5;11)$ and weights $w_{1,11} = 4$, $w_{1,12} = 1$, $w_{1,13} = 1$, $w_{1,21} = 1$, $w_{1,22} = 3$, $w_{1,23} = 1$, $w_{2,12} = 1$.

a) Determine an approximate solution with Algorithm 4.3.

b) Try to improve this solution applying Algorithm 4.4.

c) Find the linear programming formulations of Section 4.2. for $k = 1, 2$.

d) Determine the exact optimum of the problem.



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

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