Standort-Optimierung

8. Übung

Sommersemester 2010

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

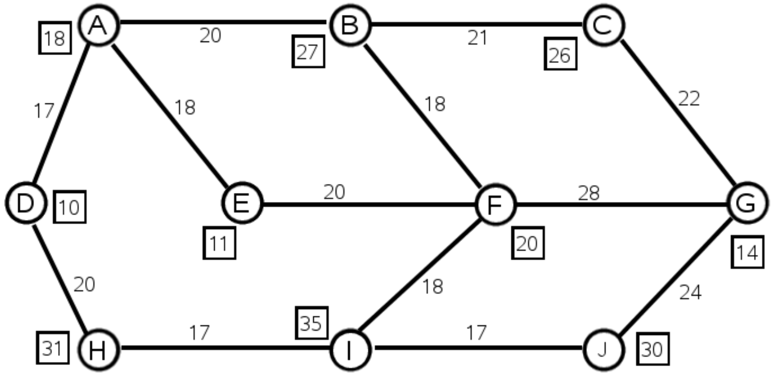
Besprechung der Aufgaben: Dienstag 22. Juni 2010

Aufgabe 29:
Consider the following network. Link distances are shown beside the links and the demands are shown in boxes beside each node.

(a) Use the greedy adding algorithm to solve the maximum coverage problem for this network with a coverage distance of 34 and a single facility.

(b) For a coverage distance of 34 use the greedy adding algorithm for the maximum covering problem to complete the following table.

Number of Facilities	Facility Locations	Total Covered Demand	Covered Demand Nodes
1			
2			
3			
4			
5			



Aufgabe 30:

(a) Write out the formulation of the maximum covering problem for the network shown in exercise 25 using a coverage distance of 18 if we are to locate $P \in \{1, \cdots, |I|\}$ facilities.

(b) For $P = 1$, what is the optimal location? Which demand nodes are covered? What is the total covered demand?

(c) For $P = 2$, what is the solution that you obtain using the greedy adding algorithm (without substitution)? Again, which demand nodes are covered? What is the total covered demand?

(d) What is the optimal solution to the maximum covering problem for $P = 2$?

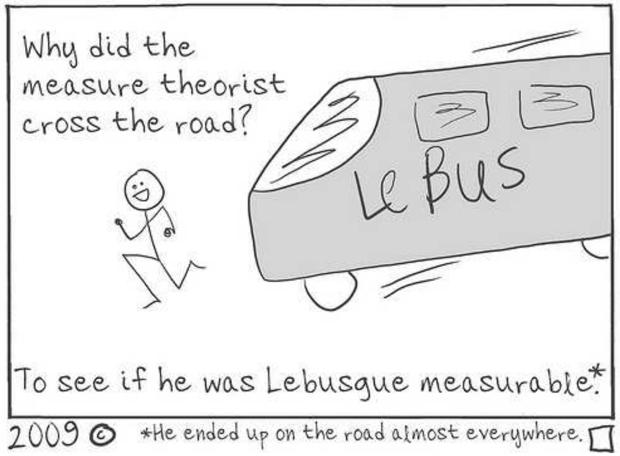
Aufgabe 31:
Let f_i be the cost of building a facility at candidate location j. Also, let B be the maximum amount that can be spent on building facilities. Finally, let ϕ_j be a unit cost of not covering demands at demand node i.

(a) Formulate the problem of minimizing the combined cost of locating facilities and not covering demands.
Hint: You should not have a constraint which limits the number of facilities to P. The optimal number of facilities will be determined endogenously by this model.

(b) Relax an appropriate constraint and formulate a Lagrangian relaxation problem related to the one you formulated in part (a).
Hint: You should have only one candidate constraint to relax.

(c) For fixed values of the Lagrange multipliers in the problem you formulated in part (b), explain how you would solve the Lagrangian relaxation problem. In other words, how would you find the optimal values of the location variables X_j and the coverage variables Z_i?

Aufgabe 32:
Implement the Branch and Bound algorithm (Algorithm 6.7) and the Koleskar-Walker heuristic (Algorithm 6.8) for the set covering problem in Matlab or a programming language of your choice.
Compare the computation time and the resulting objective function value of these two solution methods.
Hint: You can use randomly generated test examples to compare the algorithms.



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

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