Standort-Optimierung

7. Übung

Sommersemester 2010

Bergische Universität Wuppertal
Fachbereich C – Angewandte Mathematik / Optimierung und Approximation
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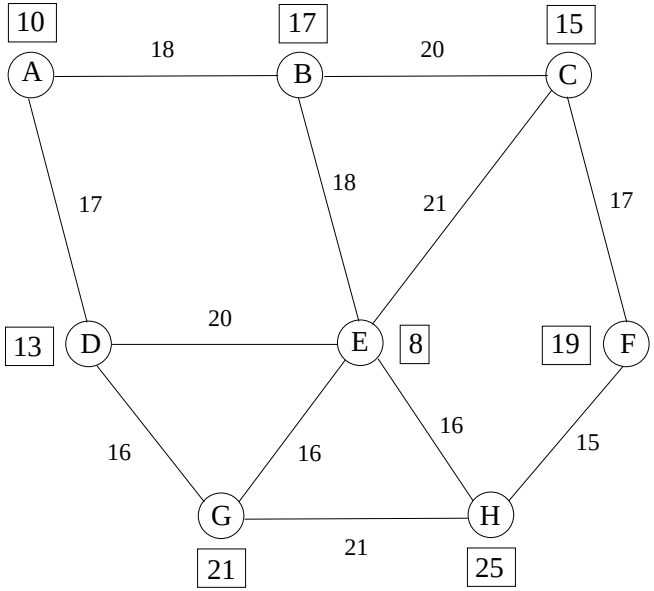
Besprechung der Aufgaben: Dienstag 15. Juni 2010

Aufgabe 25:
Consider the following network. The numbers beside each node enclosed in a box (e.g., [10]) are the demands associated with this node.



(a) Write out the objective function and constraints for the set covering model for this network when the coverage distance is 18. Assume that facilities can only be located on the nodes of the network.

(b) Which candidate sites can be excluded from the formulation? Which rows (corresponding to the need to cover specific demands) can be excluded?

(c) After you have reduced the problem as suggested in part (b), are there any sites at which you must locate facilities? If so, where? Why? If any sites are now forced into the solution, which demand nodes are now covered?

(d) Write out the remaining covering problem. That is, write out the constraint matrix for the remaining candidate sites and uncovered demand nodes.

(e) What is the linear programming relaxation solution to the problem?

(f) What is the solution to the (original) set covering problem? Specifically, where do you locate facilities and what is the objective function value?

Aufgabe 26:
There are often multiple alternate optima for the set covering location problem. This suggests that we can append secondary objectives to the problem to select from among the alternate optima to the primary objective problem (that of minimizing the number of facilities needed to cover all demands) a solution that best attains some secondary objective.

(a) For the network shown in Problem 25, write out as many alternate optima as possible to the set covering problem with a coverage distance of 18.

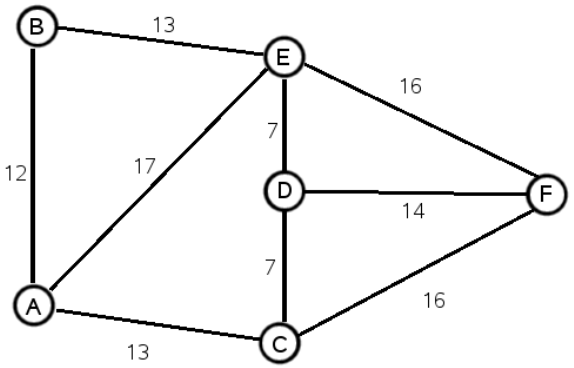
(b) Formulate the following problem:

Primary objective:	Minimize the number of facilities needed to cover all demand *nodes* at least once with a coverage distance D_c^1.
Secondary objective:	Maximize the number of *demands* (as opposed to nodes) that are covered at least twice with a coverage distance D_c^2 (which may be different from D_c^1).

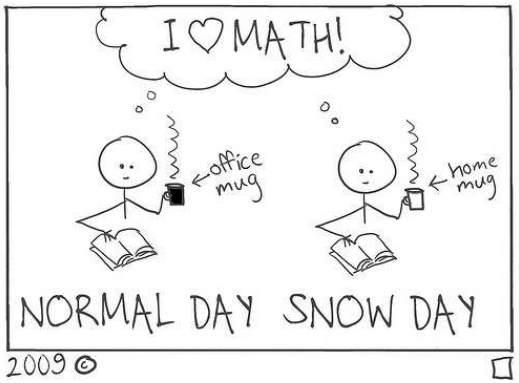
(c) Suggest a means of solving this problem.

(d) Solve the problem for the network shown in Problem 25 using coverage distances of $D_c^1 = 18$ and $D_c^2 = 18$.

Aufgabe 27:
Solve the set covering problem with as much backup coverage as possible - that is, have as many double coverage as possible - for the following network with a coverage distance of 19.



Aufgabe 28:
Construct an example of a set covering problem for which the Koleskar-Walker heuristic does not find an optimal solution when $H = \lfloor \frac{1}{3}|J| \rfloor$.



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

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