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o. Univ. Prof. Dr. Richard Hartl **Fakultät für Wirtschaftswissenschaften**

VORTRAG

Lagrangean relaxation for logistics network design

Dr. Olivier Péton

École des Mines de Nantes.

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BWZ Brünner Straße 72
1210 Wien

Abstract:

We consider a logistics network design problem with multiple periods, echelons, facilities and commodities. The initial network has some operating facilities and a set of potential locations to settle new ones. Over a strategic horizon, the optimisation model aims at locating operating facilities; planning the capacity, the production levels and the product flows. This problem is modelled as a mixed integer linear programme (MILP) with binary variables associated to facility status and continuous variables associated to material flows. For large scale real cases, the MILP is intractable and we resort to a decomposition method to solve it in practice. An intuitive period-by-period decomposition is not recommended because of coupling constraints concerning opening and closing of facilities. Due to the logistics network's complexity, a echelon-by-echelon decomposition is quite complex. Moreover there exist several coupling constraints such as capacity constraints (several products share a common capacity), satisfaction of the demand etc. The proposed scheme is based on the Lagrangean relaxation of some coupling constraints. A first decomposition level is performed by considering the main echelons: sup-pliers / plants; plants / warehouses and customers; warehouses / customers. Then, for each subproblem, we apply a sec-

ondary decomposition level defined accordingly to the characteristics of the corresponding echelon The resolution of this decomposed problem provides a lower bound. On the other hand, the feasible solutions provide upper bounds that can be improved by applying a D.C. (Difference of Convex Functions) algorithm for MILP. These elements are combined to build an iterative heuristic for solving the original problem.