Centre of Excellence in Supply Chain Management

Workshop on Logistics and Supply Chain Management
Louvain School of Management
Université Catholique de Louvain
October 12th, 2007
Facultés Universitaires de Saint Louis, Brussel

PROGRAM

1300- 
1300-1345 hrs - Welcome, Pierre Semal
1345-1430 hrs - Christophe Lecluyse, T. Van Woensel, H. Peremans
   "Vehicle Routing with Stochastic time-dependent travel times"
   Technische Universiteit, Eindhoven, Netherlands
   Discussant: Xavier Brusset

1345-1430 hrs - Said Dabia, T. Van Woensel, A.G. De Kok
   "A Dynamic Programming Approach to the VRP with Both
   Limited Transportation and Time Capacity"
   Technische Universiteit, Eindhoven, Netherlands
   Discussant: Yugang Yu

1430-1515 hrs - Ola Jabali, Pierre T. Van woensel, C. Lecluyse, H. Peremans,
   A.G. De Kok
   "Stochastic Vehicle Routing with Random Time
   Dependent Travel Times Subject to Perturbations"
   Technische Universiteit, Eindhoven, Netherlands
   Discussant: Philippe Chevalier

1515-1530 hrs - Break

1530-1615 hrs - Morteza Pourakbar, Andrei Sleptchenko, Rommert Dekker
   "A Mathematical Approach to Floating Stock Policy in FMCG
   Supply Chains"
   Economic Institute, Erasmus University Rotterdam,
   Netherlands
   Discussant: Etienne Loute

1615-1700 hrs - Yugang Yu, René de Koster
   "Simulation study of sequencing heuristics for storing and
   retrieving unit-loads in 3D compact AS/RS"
   Rotterdam School of Management, Rotterdam, Netherlands
   Discussant: Per Agrell

1700-1705 hrs - René de Koster - Closing words, date for next seminar
Summary of Abstracts

Vehicle Routing with Stochastic time-dependent travel times
Christophe Lecluyse, T. Van Woensel, H. Peremans

Abstract
Assigning and scheduling vehicle routes in a stochastic time-dependent environment is a crucial management problem. The assumption that in a real-life environment everything goes according to an a priori determined static schedule is unrealistic. Our methodology builds on earlier work in which the traffic congestion is captured based on queueing theory in an analytical way and applied to the VRP problem. In this paper, we introduce the variability in the traffic flows into the model. This allows for an evaluation of the routes based on the uncertainty involved. Different experiments show that the risk taking/avoiding behavior of the planner can be taken into account during optimization. As more weight is contributed to the variability component, the resulting optimal route will be slightly lower, but more reliable. The solution quality in terms of the 95th - percentile of the travel time distribution (assumed lognormal) will also improve.

A Dynamic Programming Approach to the VRP with Both Limited Transportation and Time Capacity
S. Dabia, T. Van Woensel, A.G. De Kok

Abstract
In this paper we consider a vehicle routing problem with both transportation and time capacity. We assume a time dependent environment, meaning that travel costs change over time. A warehouse uses a fixed fleet to fulfill customers demand. Each truck has a finite capacity and is only available for a limited time during a day. Furthermore, demand is deterministic and is assumed to be known before a truck is dispatched. Our aim is to schedule the fleet in such a way that a truck utilization is maximized and travel time is minimized. We believe that such a schedule will minimize the number of vehicles to be used. A forward time dependent multiple criteria dynamic programming (TDMCDP) formulation is used to computed the set of non-dominated routes. Finally, a numerical example is illustrated.

Stochastic Vehicle Routing with Random Time Dependent Travel Times Subject to Perturbations
O. Jabali, T. Van Woensel, C. Lecluyse, H.Peremans, A.G. de Kok

Abstract
Assigning and scheduling vehicle routes in a stochastic time dependent environment is a crucial management problem. The assumption that in a real-life environment everything goes according to an a priori determined static schedule is unrealistic, resulting in a planning gap (i.e. difference in performance between planned route and actual route). Our methodology introduces the traffic congestion component based on queueing theory, thereby introducing an analytical expression for the expected travel. In real life travel times are subject to uncertainty, we solve a time dependent vehicle routing problem to find robust solutions, that can potentially absorb such uncertainties. We model uncertainty as perturbations that are randomly inserted on the routes, we optimize the perturbed solutions via Tabu Search. We conduct experiments on a set of 32 cities, and found that the perturbed solutions generally cope better with the uncertainty than the non-perturbed solutions, with a small increase in expected travel times.

A Mathematical Approach to Floating Stock Policy in FMCG Supply Chains
Morteza Pourakbar, Andrei Sleptchenko, Rommert Dekker

Abstract
In this paper a mathematical approach for analysing the concept of Floating Stock while backlogging is allowed is presented. The floating stock distribution concept exploits inter-modal transport to deploy inventories in a supply chain in advance of retailer demand. It is appropriate in case of batch production and containerized transport of standard product mixes. In this way response times are reduced and storage costs can be reduced as well by having products in the transport-pipeline. Supplying part of the demand directly by road compensates the longer transit time of the inter-modal transport. A possible disadvantage is the possible extra costs of
transshipments and longer routes. This concept has been previously introduced and analysed using a simulation approach and showed to be efficient under simplifying assumptions for demand distribution. In this paper we present two mathematical models to analyse this policy. The first one tries to optimize the advanced shipping time of containers to inter-modal transport, and the second one optimizes the total number of containers in pipeline and terminal. In fact, in both policies before the demand being realized containers are shipped to terminal to benefit from less storage cost at factory by utilizing the shipping time and also free of storage cost period at inter-modal terminals.

A comparison is made regarding the proposed model results with the simulation results of applying previously developed policies which shows that this concept has advantages in inventories over other policies.

Simulation study of sequencing heuristics for storing and retrieving unit-loads in 3D compact AS/RS
Yugang Yu, M.B.M. de Koster
Abstract
Sequencing problem in conventional warehouses has been studied for decades by minimizing throughput time of orders to shorten the response time of supply chain. But in new compact multi-deep (3D) automated storage and retrieval systems (AS/RS), the sequencing problem for scheduling a block of storage and retrieval requests is still in its infancy. And it becomes urgent to have an easily implementable solution from industry. Especially in order to save land and shorten throughput time (or total cycle time), the new systems are becoming more common to replace conventional 2D AS/RSs that store product single deep. This study, as the first paper, aims to find easily implementable and well performed heuristics for the sequencing problem in such new system where the S/R machine operates in dual command cycle modes. We review and collect all related heuristics for solving sequencing problems in the conventional 2D AS/RS, and evaluate their performance in a studied 3D compact AS/RS by simulation if the introduced heuristics are applicable. Simultaneously, we propose and evaluate a new heuristics: percentage priority to retrievals with shortest leg (PPR-SL) by simulation. The results show that: 1) sequencing problem in 3D compact AS/RS is much more important than that in 2D AS/RS in the sense that it can bring much more cycle time reduction from benchmark heuristics: first-come first-served (FCFS); 2) The nearest neighbour (NN) heuristics that performs very well in conventional 2D AS/RS, performs very badly in 3D AS/RS and even worse than widely used FCFS; 3) Our proposed heuristics consistently outperforms all the introduced heuristics. Generally, it can outperform FCFS more than 20-90%. Furthermore, based on FCFS and PPR-SL, we obtain some recommendations for dimensioning the 3D storage rack and implementing PPR-SL easily.

Directions to arrive : Entrance either through the “Official entrance” 43 Bld Jardin Botanique and follow the green path or through the parking entrance 117 rue du Marais-Broekstraat 117, and follow the green path. Both paths lead to a lift. Take it to floor 6. Exit the lift on your right. The room is P61, Brussels