Intelligent Decision Support for Logistics and Supply Chain Management

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Information and communication technology (ICT) continues to serve as a prerequisite for successful supply chain management (SCM) and its importance is yet expected to increase in the future. Efficient SCM incorporates and links to information systems, planning tools for decision support as well as supporting devices. While modern ICT systems are vital components in supply chains, their successful management rests on coordinated decision making within logistics networks.

Simulation and optimization can be employed for inventory, production, procurement, distribution planning, and beyond. Intelligent agents can communicate with different partners in the supply chain, assist in collecting information, share product information, negotiate prices, and distribute alerts throughout the logistics networks. The design and implementation of intelligent decision technologies to support human agents in logistics and SCM is a very active field in research, consulting and software development.

This year, our minitrack consists of seven papers dealing with intelligent decision support in the field of logistics and SCM. The papers provide a heterogeneous yet complementary ensemble as they consider different approaches in coping with specific problems and the complexity found in real-world decision making.

In the first paper “Integrating Side Payments into Collaborative Planning for the Distributed Multi-Level Unconstrained Lot Sizing Problem” a collaborative planning approach is used to coordinate the decisions of multiple, autonomous and self-interested agents. A neighborhood search is proposed to solve the problem. Side payments are introduced to compensate agents for accepting inferior solutions that direct the search to solutions with superior global costs.

The second paper considers the “Optimization of a two-stage distribution network with route planning and time restrictions”. A tabu search approach is proposed to solve location and routing decisions simultaneously. Computational experiments are performed for different scenarios. The results are compared with a sequential approach.

Basic hub location models consider a simple model for the transportation costs that uses discount factors on hub arcs. This issue is addressed in the third paper “Hub Location and Network Design with Fixed and Variable Costs”. In this contribution a more general formulation is provided that uses fixed and variable transportation costs on all arcs and fixed costs for hubs. The model also allows direct arcs between origin/destination pairs. Computational results are given and the behavior of the model is illustrated.

“Managing Disruptions in Last Mile Distribution” is the focus of the fourth paper. An overall decision making process is developed for managing disruptions in delivery systems. One part of the disruption management process is the development of a back-up plan. A reassignment problem is formulated to determine a back-up district whose tasks are reassigned to surrounding districts. An illustrative example is given to show how the model works.

“An Approach for Assessing the Applicability of Collaborative Planning Concepts” is developed in the fifth paper to support the coordination of independent agents. The approach is based on knowledge transfer of existing collaborative planning approaches (or parts of them) to specific cases. For this, a matching method and transfer rules are proposed to identify suitable collaborative planning concepts for the individual cases at hand.

The sixth paper considers “Pricing Strategies in a Dual-Channel Supply Chain with Local Advertising”. The optimal decisions for local advertising and pricing in a centralized and decentralized dual-channel supply chain are analyzed by using a two-stage optimization technique and a Stackelberg game. Insights on the effects of local advertising on manufacturers and retailers are provided.

The final paper deals with “Sales Forecasting with Partial Recurrent Neural Networks: Empirical Insights and Benchmarking Results”. A partial recurrent neural network is developed and compared to different statistical forecasting methods. The influences of relevant factors, such as length of time series, are examined.