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INTEGRATED SERVICE SELECTION, PRICING AND FULFILLMENT PLANNING FOR EXPRESS PARCEL CARRIERS – ENRICHING SERVICE NETWORK DESIGN WITH CUSTOMER CHOICE AND ENDOGENOUS DELIVERY TIME RESTRICTIONS

Abstract: Express parcel carriers offer a wide range of guaranteed delivery times in order to separate customers who value quick delivery from those that are less time but more price sensitive. Such segmentation, however, adds a whole new layer of complexity to the task of optimizing the logistics operations. While many sophisticated models have been developed to assist network planners in minimizing costs, few approaches account for the interplay between service pricing, customer decisions and the associated restrictions in the distribution process. This paper attempts to fill this research gap by introducing a heuristic solution approach that simultaneously determines the ideal set of services, the associated pricing and the fulfillment plan in order to maximize profit. By integrating revenue management techniques into vehicle routing and fleet planning, we derive a new type of formulation called service selection, pricing and fulfillment problem (SSFP). It combines a multi-product pricing problem with a cycle-based service network design formulation. In order to derive good-quality solutions for realistically-sized instances we use an asynchronous parallel genetic algorithm and follow the intuition that small changes to prices and customer assignments cause minor changes in the distribution process. We thus base every new solution on the most similar already evaluated fulfillment plan. This adapted initial solution is then iteratively improved by a newly-developed route-pattern exchange heuristic. The performance of the developed algorithm is demonstrated on a number of randomly created test instances and is compared to the solutions of a commercial MIP-solver.

Bio: Florian Martin is a Research and Teaching Associate at the Institute for Economic Geography and GIScience of WU Vienna. His research interests are logistics, transport economics, operations research and Geographic Information Systems (GIS).

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Pavillon André-Aisenstadt
Université de Montréal

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Organisateur / Organizer
Teodor Gabriel Crainic