Séminaire conjoint CIRRELT / Département OSD

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OPERATIONAL MANAGEMENT CHALLENGES IN LAST-MILE LOGISTICS: CROWDSHIPPING IN DYNAMIC PICKUP-AND-DELIVERY PROBLEMS

Abstract: The recent acceleration of technology has influenced distribution logistics and many other sectors. In a competitive global marketplace, customers consider the time factor to be a significant issue in their supplier selection. A 2020 BusinessWire survey found that 65% of consumers are willing to pay more for faster delivery. As customer demands rise, last-mile logistics companies must optimize their delivery capacity. They must also consider how to manage the growing volume of packages according to the concept of sustainability and the principles of the sharing economy, which are key issues in logistics. In this context, this study focuses on a particular class of vehicle routing problem identified as the pickup-and-delivery problem (PDP), in which each customer is characterized by a request pickup location and a delivery location in a context of same-day delivery. Based on the attributes of a customer request, a dispatcher dynamically schedules the delivery service on either a dedicated vehicle or a crowdshipper, both of whom experience time-dependent travel times. While dedicated vehicles are available throughout the day, the availability of crowdshippers is unknown a priori and they appear randomly for only portions of the day. With an objective of minimizing the sum of routing costs, piece-rate crowdshipper payments, and lateness charges, the uncertainty in request arrivals and crowdshipper appearances is modeled as a Markov decision process. To determine an action at each decision epoch, a heuristic is designed that partially destroys the existing routes and repairs them under the guidance of a parameterized cost function approximation that accounts for the remaining temporal capacity of delivery vehicles. The real-time heuristic is benchmarked with an adaptive large neighborhood search and demonstrate the effectiveness of our method with several performance metrics. An analysis of the economic impact of using crowdshippers is carried out and computational results on real-world instances are presented. This study can be extended to analyze the operational impact of crowdshipping and parcel lockers for a same-day stochastic PDP.

Biography: Demetrio Laganà is an Associate Professor of Operations Research at the Department of Mechanical, Energy, and Management Engineering, University of Calabria His research interests lie in the field of combinatorial optimization, with a particular focus on distribution and integrated logistics He has authored over 50 publications on exact and heuristic methods for routing problems (arc and node), inventory routing and supply chain management In 2020 the paper "An Exact Solution Framework for Multi Trip Vehicle Routing Problems with Time Windows", published in Operations Research together with Rosario Paradiso, Roberto Roberti and Wout Dullaert received the 2020 INFORMS Transportation and Logistics best paper award. Recently, he has been working on optimization problems for last mile logistics in the dynamic and stochastic domain.

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Ouvert à tous

Café et viennoiseries

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