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Generalized Transportation Relay Network Design

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Abstract

The truckload industry faces a serious problem of high driver shortage and turnover rate, typically around 100\%. Among the major causes of this problem are extended on-the-road times, where drivers handle several truckload pickup and deliveries successively, non-regular schedules and get-home rates, and low utilization of drivers dedicated time. These are by-and-large consequences of the driver-to-load dispatching method, which is based on point-to-point dispatching or direct shipment from origin to destination, commonly employed in the industry.

We consider an alternative dispatching method that necessitates careful design of an underlying network. In this scheme, a truckload on its way to destination visits multiple relay nodes and the driver and/or tractor are switched with a new one so that drivers stay close to their base. Some specific design characteristics include both direct and relay-network shipments, multi-route assignments, fixed relay costs, and route circuity, and coverage required for relay points. We present a mathematical model capturing these characteristics and a solution procedure based on strengthened Benders decomposition enhanced with surrogate constraints and efficient heuristics. The solution approach is able to solve the large-scale problems, considering realistic inputs, in a reasonable time, and helps us to examine the performance of the RP-network. Computational results demonstrate the performance of the algorithm.

Keywords

Truckload Transportation, Network Design, Relay Networks, Benders Decomposition

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Biographies

Amin Ziaeifar received his BS and MS degrees in Industrial Engineering from Isfahan University of Technology and University of Tehran, respectively. He is currently a doctoral candidate in the Operations Research Program in the Department of Engineering Management, Information, and Systems at Southern Methodist University, Dallas, TX, USA. He is member of INFORMS.

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