Incorporating Uncertainty in Truckload Relay Network Design

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Abstract

In a relay network for full truckload (TL) transportation, facilities known as relay points (RPs) serve as exchange points where truck drivers can exchange trailers. This would help carriers to assign more regular tours to drivers when compared to the excessively long tours that exist in the traditional Point-to-Point (PtP) method. More regular driver tours would help to alleviate the driver turnover problem that significantly affects the industry. However, modifying the current system and completely replacing it with relay networks would not be practical. Instead a hybrid configuration known as truckload relay network design with mixed fleet dispatching (TLRND-MD) would allow certain loads to be delivered via the relay network while others are still served via the traditional PtP method. The strategic design of these hybrid networks entails locating RPs, determining the appropriate dispatching method for truckloads, and the selection of the appropriate route for those truckloads that are dispatched over the relay network. Most of the existing literature on the strategic design of truckload relay networks assumes deterministic parameters in the formulation of mathematical programs used to find optimal solutions. However, the TL transportation environment can be affected by uncertainty in terms of demands, travel times, transportation costs, disruptions, etc. Understanding the impacts of uncertainty on the design of relay networks for TL transportation is essential for making effective decisions. In this dissertation, we aim to explicitly incorporate demand uncertainty in the formulation of the TLRND-MD and the capacitated TLRND-MD problems.

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