Behavioral Freight Transportation Modeling System with Logistics Choices: A Framework

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Abstract

Freight movements have significant impacts on transportation system and regional economic growth. However, the complexity of the process and multi-dimensionality of the decision-making practice in freight transportation and its related logistics choices are considered as major challenges that develop in reliable freight forecasting models. While large scale freight transportation microsimulation models are effective tools to predict freight transportation demand and to better address the impacts of these movements, many existing freight models are short in terms of logistics elements such as, predicting the trip chain, considering intermediate handling facilities, determining shipment size, or multi-modal shipments. This paper outlines a new conceptual framework for freight transportation modeling by incorporating the logistics choices into an operational large-scale freight transportation modeling system called FAME (Freight Activity Micro-simulation Estimator). FAME is a micro-simulation model for freight transportation in the U.S. that has been developed by the transportation research team at the University of Illinois at Chicago (UIC) in 2010. The model simulates commodity movements in the U.S. at a disaggregate level, but it also makes certain simplifying assumptions concerning logistics choices such as considering consolidation centers, distribution centers, warehouses, etc. This paper deals with issues related to incorporating the new logistics elements in the FAME framework and proposing a new conceptual framework. The proposed logistics modeling framework simulates the national freight movements in the U.S at the disaggregate level of firm-to-firm and replicates the logistics choices such as, selecting supplier, use of intermediate handling facilities, choice of shipment size, mode choice, etc. The paper discusses the framework and operational and practical issues of the model.