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Enabling Congestion Avoidance and Reduction in the Michigan-Ohio Transportation Network to Improve Supply Chain Efficiency: Freight ATIS

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Research Progress Report

Our project has three major milestones for the first year:
• Collecting data for MI-OH road network structure and historical incident data from MDOT, ODOT, and other agencies using ArcGIS software
• Developing road network models representative of major freight transportation routes
• Developing static re-routing optimization models and implementation for a limited set of scenarios

We have made good progress with respect to all three milestones. What follows is a brief summary of our research efforts to date:

Collaboration with MITS-Center

We have, to date, had multiple meetings with Mia Silver of MITS Center and her team to develop a better understanding for their traffic monitoring system (for Southeast Michigan highways) and have also received data representing several weeks of traffic for the Southeast Michigan highways. We are currently in the process of analyzing this data to improve the quality of the models being developed for dynamic routing decision support when operating with access to ATIS (Advanced Traveler Information Systems) information.

Collaboration with METSIM and MDOT Metro Region

METSIM and Gateway projects, headed by Matt Webb of METSIM and Catherine Jensen at MDOT Metro Region, respectively, are two projects that aim to develop tools for strategic and operational planning of highway projects through microsimulation models. Both of these projects are utilizing the Paramics Suite software package for traffic simulation. The METSIM model is nearly complete undergoing extensive calibration studies for simulation accuracy. The Gateway project extends the METSIM model to include major local roads in the Metro Region. Both Mr. Webb and Ms. Jensen

are very supportive of our research efforts and plan to share nearly fully-specified microsimulation models for the southeast Michigan corridor to test our dynamic routing decision models as well future analysis on the effect of traffic incidents (i.e. accidents, breakdowns) on the delivery reliability within JIT supply chain operations. The METSIM model will be available late March or early April and the Gateway project model will be available mid-summer. After consulting with Mr. Webb and Ms. Jensen and researching other traffic simulation software alternatives, we have decided to use Paramics for two reasons. First, it is versatile and allows us to incorporate our dynamic re-routing algorithms. Second, we will be able to use the traffic simulation models produced by the two projects. We have been in contact with the company that provides Paramics Suite software. The software is relatively expensive, even for an academic license (priced between $5,000 and $10,000 depending on options). We are trying to identify other groups at Wayne State University that might be interested in jointly purchasing a license.

Routing Decision Model Development

Most of our efforts to date have focused on reviewing state-of-the-art algorithms for dynamic routing under ATIS. We have identified two PhD dissertations (from University of Michigan and MIT) that are being carefully examined through our weekly research group meetings. We are also reviewing other literature on routing algorithms. We have identified several major limitations with models reported in the literature. For example, none of the models seem to account for (corruptive) interaction between traffic flows on arcs/road ways under traffic congestion. We are trying to develop highly stylized static and dynamic routing models to improve the effectiveness of the models available in the literature. We are currently at the very earliest stages of this research.