Florida Department of Transportation Research

Framework for Multi-Resolution Analyses of Advanced Traffic Management Strategies

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Current Situation

Transportation planning relies extensively on software that can simulate and predict travel behavior in response to alternative transportation networks. However, different software packages view traffic at different scales. Some programs are based on the average, large-scale behavior of many vehicles (macroscopic resolution), while others simulate the small-scale, individual behavior of vehicles in a traffic flow (microscopic resolution). Each approach has its advantages. Advances in computer modeling and improved data acquisition make it possible to bring these modeling approaches together, producing more powerful and useful multiple resolution modeling (MRM) tools. The need for these improved planning tools is increased by new and more complex transportation solutions.

Traffic planners work constantly to find solutions to alleviate congestion on Florida roads.

Research Objectives

Florida International University researchers studied the ability of MRM tools to assess congestion impacts and advanced strategies in order to recommend a multi-resolution modeling framework that can support analysis and modeling of congestion impacts and advanced strategies.

Project Activities

The researchers created MRM tools from a toolkit of 10 modeling packages, including VISUM, Dynasmart, DynusT, Cube Avenue, and TransModeler, among others. Some of these tools focus on macroscopic analysis, and others on microscopic; still others take an intermediate approach called mesoscopic.

The researchers designed the MRM modeling as a framework with three components: data sources, both real world and the product of other simulations; the modeling tools themselves; and a support environment that manages the interactions between the data, the modeling tools, and the user.

The modeling framework was tested by analyzing five problems, including managed lanes, origin-destination estimation, construction zones, evaluation of arterial traffic management strategies for urban streets, and connected vehicle market penetration. Each problem was approached as a mini project, with an analysis of the problem, presentation of previous efforts, development of appropriate data sources, matching modeling component's capabilities to key problem aspects, analysis of results, and summary and recommendations.

The researchers' MRM framework was successfully applied to each of the five selected traffic management problems. The project demonstrated the usefulness of the framework and created pathways to new insights into traffic planning problems.

Project Benefits

Improved traffic planning software, and in this case, methodologies for combining software into more powerful tools, will allow planners to develop more efficient and novel solutions for Florida's increasingly crowded roadways.

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