Florida Department of Transportation Research

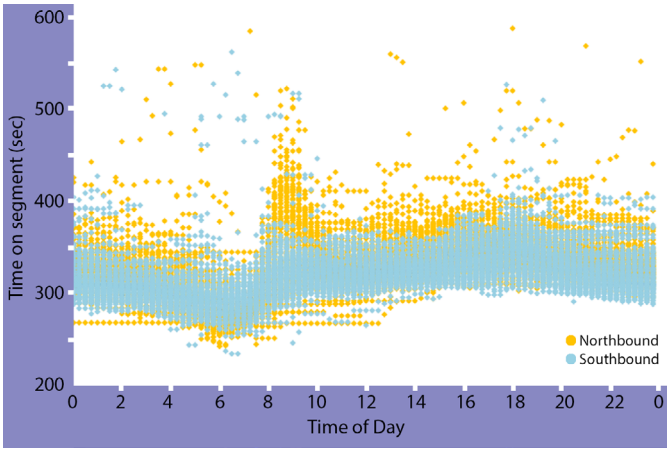
Modeling, Implementation and Validation of Arterial Travel Time Reliability
BDK77 977-20

Travel time reliability (TTR) has been proposed as a better measure of a facility's performance than a statistical measure like peak hour demand. TTR is based on more information about average traffic flows and longer time periods, thus including events such as crashes, work zones, or adverse weather conditions. Also, TTR has been widely recognized as the performance measure with possibly the most impact on highway traveler perceptions.

In a previous project for the Florida Department of Transportation (FDOT), Project BDK77 977-10, the current researchers examined and developed methods to extend TTR tools beyond expressways for use on arterial roads. The enhanced tools more accurately consider the impact of weather conditions. They also proposed a conceptual framework for multimodal travel time analysis. Traffic modeling was conducted with the CORSIM traffic microsimulator.

In this project, the researchers implemented and evaluated the TTR models using data from arterials in Jacksonville, Florida. Field travel time data was collected using BlueTOAD (Bluetooth Travel-time Origination and Destination), which integrates vehicle detection and tracking with data logging and data processing. Comparison of model-estimated travel times with field data showed that previous modeling had greatly overestimated arterial travel times. This discrepancy resulted from overestimating the impact of flashing yellow lights during early morning hours and the use of pre-timed signal control, when in fact, all the intersections in the study area used actuated control.

CORSIM was used to model 504 scenarios considering factors like number of lanes, number of signals per mile, demand, incident duration, and quality of progression. Regression models were developed separately for undersaturated and oversaturated conditions using IBM SPSS Statistics. Model fits were good, and the format of the equations was consistent with preliminary analysis of the simulation results.



Travel time along an arterial road segment in Jacksonville, Florida. Note the difference between northbound and southbound travel times during peak morning hours.

Travel times were estimated for the four selected arterials using the refined models. Model-estimated travel times were closer to field data than those from earlier models, matching best during low demand periods in early morning and late night; during periods of heavier demand and peak hours, the models still overestimated travel times, suggesting examination of other modeling assumptions and factors.

The researchers developed a statewide arterial reliability database based on 2011 data in order to implement the revised models and to obtain reliability performance measures for all the arterials in the State Highway System (SHS). While these data must be used with an awareness of their strengths and weaknesses, this database provides the first comprehensive reliability picture of a significant portion of the SHS. Continued refinements of the models and better TTR data will give managers and planners new ways of making Florida's highways more efficient for all their users.

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For more information, visit http://www.dot.state.fl.us/research-center