Florida Department of Transportation Research

Demand Based Signal Retiming
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Traffic congestion is a major problem in urban areas of the U.S. Roadway infrastructure cannot keep pace with the constant increase in driving population, and highway networks are experiencing more frequent oversaturated traffic conditions, with longer saturation events (temporal effects) and wider impacts on adjacent and nearby roads (spatial effects).

A prerequisite to managing this situation is measuring the temporal and spatial aspects of oversaturated traffic conditions, but this requires covering an entire network with traffic sensors which can monitor traffic demand in real time and trigger strategies to reduce oversaturation. While all the desired sensors may not exist, an extensive network of sensors does, in Florida's Intelligent Transportation System (ITS). The ITS collects vast amounts of data, and the Florida Department of Transportation is pursuing many ways to exploit this data to improve conditions on Florida roadways.

In this project, Florida Atlantic University researchers developed a method that can be used both to measure and report demand in real time and to predict traffic demand from available data. The method can identify network traffic conditions and establish thresholds for response strategies. One outcome of the research was a guideline to help traffic operators effectively manage and control different traffic scenarios.

Developing an implementable method required a wide range of tasks: acquire data from available sources; derive demand measures; identify strategies and their effects; establish thresholds for strategy implementation; and build, calibrate, and validate microsimulation models.

The researchers developed two microsimulation models of roads in Broward County, Florida. Broward Boulevard, a major thoroughfare in Ft. Lauderdale, was separately modeled. In the process, an algorithm was developed to estimate

As traffic increases, the duration and impact of congestion on major roads, especially at peak hours, has a greater effect on the entire road network.

traffic demand in a chosen microsimulation level. Also, several statistical models were generated to estimate traffic demand from its surrogates such as throughput, occupancy, spot speed, and travel time. Working with geometrical characteristics showed that assuming a linear relationship between traffic demand and traffic and geometrical parameters is reasonable.

Strategies to relieve congestion in recurring and nonrecurring scenarios were studied using microsimulation. Recurring scenarios included baseline demand, saturation, and oversaturation scenarios. Nonrecurring scenarios included freeway and arterial incidents, left turn spillover, rail preemption, and event traffic.

Based on this project, the researchers created the Traffic Operator's Guideline as a tool for traffic managers. The guideline includes details about each scenario, such as location, scope, identification strategy, traffic strategy, and strategy benefits.

More precise understanding of traffic demand and more effective use of available data will help traffic managers maintain the efficiency of Florida roadways for all users.

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