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Advanced Traffic Management using Behavioral Models and Network Simulation

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ABSTRACT

In the event of natural (e.g. a snow storm) or man-made (e.g. new-year celebration) events, transportation networks are a vulnerable and critical infrastructure. Properly managing both the increase in travel demand and the capacity loss can determine the success of a traffic management system. Models of drivers' behavior and traffic simulation are used to evaluate and refine traffic management plans for foreseen events, as well as to tailor them in real time as events unfold. The technique combines three critical pieces: 1) behavioral models, which simulate individual travelers' decision-making, 2) dynamic traffic assignment, which simulates the movements of vehicles on the road network, and 3) data from traffic surveillance systems (e.g. counts and speeds from loop detectors and point-to-point travel times from probe vehicles), which are used to calibrate the behavior and network models. The outputs of such a model system are short-term predictions of the network conditions. Travelers' information provision and potential mitigation plans can then be evaluated based on predicted network conditions. Two advanced traffic simulation systems developed at the MIT Intelligent Transportation Systems Laboratory – MITSIMLab and DynaMIT – will be presented along with sample applications to real-world traffic management problems.