

DynaMIT

Real-Time Traffic Estimation and Prediction System

INTRODUCTION

DynaMIT is a state-of-the-art, real-time computer system designed to effectively support the operation of an Advanced Traveler Information System (ATIS) and Advanced Traffic Management Systems (ATMS) at a Traffic Management Center (TMC). Sponsored by the Federal Highway Administration (FHWA), with Oak Ridge National Laboratories (ORNL) as the program manager, DynaMIT is the result of several years of intense research and development by the Massachusetts Institute of Technology Intelligent Transportation Systems laboratory.

FUNCTIONALITY

The key to DynaMIT's functionality is its detailed network representation, coupled with models of traveler behavior. Through an effective integration of historical information databases with real-time inputs from field installations (surveillance data and control logic for traffic signals, ramp meters and toll booths), DynaMIT efficiently achieves:

- Estimates of network conditions;
- Predictions of network conditions in response to various traffic control measures and information dissemination strategies;
- Generation of traveler information to guide drivers towards optimal decisions.

DynaMIT incorporates unbiasedness and consistency into its core operations. Unbiasedness guarantees that the information provided to travelers is based on the best available knowledge of current and anticipated network conditions. Consistency ensures that DynaMIT's predictions of expected network conditions match what drivers would experience on the network.

FEATURES

DynaMIT has the ability to trade off level of detail (or resolution) with computational practicability, without compromising the integrity of its output. Its important features include:

- Simulation-based dynamic estimation of network state;
- Employs prediction to generate information and guidance that account for the evolution of traffic conditions over time;
- Detailed micro-simulation (or enumeration) of drivers, facilitating fine distinctions in vehicle types and driver behavior;
- Distinguishes between informed and uninformed drivers;
- Individually simulates each trip to generate detailed vehicle trajectories;
- Optimally uses historical, surveillance, and O-D data to generate reliable O-D estimates in real-time;
- Iterates between predicted network state, driver response to information, and the resulting network state, toward the generation of a consistent information strategy;
- Uses a rolling horizon to achieve efficient and accurate real-time estimations and predictions;
- Generates both descriptive and prescriptive information and easily adapts to specific ATIS requirements;
- Handles a variety of real-time scenarios such as incidents, special events, weather conditions, highway construction activities, fluctuations in demand, etc.;
- Records the valuable information obtained from previous O-D estimations to update existing O-D databases;
- Integrated with the MITSIMLab microscopic traffic simulator for offline evaluation and calibration;
- Supports a distributed CORBA architecture to allow for flexibility and future adaptability and expansion.

APPLICATIONS

DynaMIT operates an ATIS to improve travel decisions. Its applications include:

- Generation of unbiased and consistent information to drivers;
- Optimizing the operation of TMCs through the provision of real-time predictions;
- Efficient operation of Variable Message Signs (VMS);
- Real-time incident management and control;
- Off-line evaluation of real-time incident management strategies;
- Evaluation of alternative traffic signals and ramp meters operation strategies;
- Co-ordination of evacuation and rescue operations in real-time emergencies (natural disasters, etc.) that could block highway links;
- Generating historical databases.

PRINCIPAL INVESTIGATOR

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