Big Data for Models

April 29, 2014

Derek Miura

Innovation for better mobility
Agenda

• Integrated Corridor Management System use of Big Data
• System Overview
• Incident Analysis
• Decision Support System
What is Integrated Corridor Management?

- Congestion management tool
- Leveraging unused capacity
- Optimization of existing infrastructure
- Multi-modal integration and management
- Improved situational awareness
- Enhanced response and control
- Better-informed travelers
ICMS Analysis Modeling Simulation: A Process for Continuous Improvement

Performance Measurement

Comprehensive Situational Awareness

Archived Data

Trusted Models

Modeling and Simulation

Substantive Alternatives Analysis
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Interstate 15 - Integrated Corridor Manage System (ICMS) Pilot Project

San Diego I-15 ICMS:
- Caltrans – District 11
- SANDAG
- MTS – SD Transit
- North County Transit
- City of Escondido
- City of Poway
- City of San Diego
- US DOT
- FHWA
- FTA
ICMS – PeMS: Managing Big Data

System Services

**IMTMS**
- Ramp Meter Information System
- Lane Closure System
- Arterial Congestion System
- Intersection status
- Local traffic advisories

**FMS**
- Freeway Mgmt System
- Meter Timing Plans
- Construction/Maint Status

**REMS**
- Regional Event Mgmt System
- Incident Detection
- Incident Details

**PeMS**
- Performance Monitoring Sys.
  - Performance measures
  - Visualizations
  - Storage of predictions and events

**IMTMS System Services**
- DSS Control Interface
- One-way IMTMS Interface
- Two-way IMTMS Interface
- DSS control interface

**ICMS**
- System Services

**RAMS**
- Regional Arterial Mgmt
  - Arterial Congestion
  - Intersection status
  - System alarms
  - Local traffic advisories

**LCS**
- Local Traffic Systems

**RMIS**
- Ramp Meter Information System

**511**
- Arterial Travel Time System
  - 511 Usage Statistics
  - Alert messages

**Weather NWS**
- Weather/NERFARAD
- Predictions

**NPS**
- Network Prediction

**RTSS**
- Real-Time Simulation

**RTMS**
- Regional Transit Mgmt System
  - Service change requests
  - Free spaces
  - Area ID

**SPS**
- Smart Parking System

**ATTS**
- Arterial Travel Time System

**Key**
- New or Upgraded System
- Dashed line: One-way IMTMS interface
- Solid line: Two-way IMTMS interface
- Dashed-dot line: DSS control interface

**ICMS Context**
- Interoperable on the Same Highway
- Connectivity with IT System
- Data, Predictions, Control
- Current Pricing/VTS signs
- EL Congestion
- Service change request

**Performance Monitoring**
- Performance measures
- Visualizations
- Storage of predictions and events
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I-15 ICMS – Inventory of Elements

- Data Elements:
  - Freeway and arterial links
  - Data detectors
  - Traffic signal control
  - DMS signs
  - Toll Signs
  - Ramp metering signals
  - Parking facilities
  - Transit facilities
  - Transit Operations
I-15 ICMS Dashboard: Overview

- Top plots show error in prediction for freeway and arterial links.
- Bottom tables show route travel times over the course of the day.
Route Prediction Comparison

- Observed Travel time and four travel time prediction ranges
- Different errors for different predictions out into the future
Route Speed Prediction Accuracy

- Can see the spread of the different 5 min. predictions when things start to change
- Measured speed can be compared with 15/30/45/60 minute predictions
- Error of prediction versus time
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- Another way to look at incident statistics is by day of the week
- We see the spikes in the incident counts on Fridays

Days when several incidents occur results in response plan increases.
ICMS - Decision Support System (DSS)

- ICMS - Decision Support System:
  - Traffic Prediction every five minutes
  - Real-Time Traffic Modeling
  - Incident Response Plan Estimation

- Ribbon displays events by date and time of day
- Selecting an event time provides incident location map, details of the incident and proposed response plan
DSS Single Incident Visualization

- Event selection provides further details on incidents and lists response plans with their rankings for effectiveness.
- Proposed response ranks - higher values equate to impact. Positive and Negative sings are estimated benefits or degradation to the system.
DSS Visualization

• Users can click on the event and get to the response plan details
• Here we’re showing the list of signals that were given a directive in the response plan
Event Response Plan – Detail List

- Table of events and their response plans
- Designed to show the progression of response plans over time
- Each is evaluated and scored
- If there is a response plan that has a score above a threshold then it’s “recommended”
- If another threshold is met then it’s “approved”
- Waiting to see an approved response plan
**Detailed Response Plans Archive**

- Details of each response plans is stored
- Each element that was given a directive with an effective rank
- Details of each ATIS/511: Displays alternative route detour details

### ATIS/511 Messages

<table>
<thead>
<tr>
<th>Response Plan</th>
<th>Date</th>
<th>RP Status</th>
<th>RP Score</th>
<th>Type</th>
<th>Message</th>
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<tr>
<td>29751</td>
<td>04/10/2015 15:44</td>
<td>pending</td>
<td>0</td>
<td>atis-advisory</td>
<td>Congestion on north 1-15 near BERNARDO CENTER DRIVE. Consider alternate routes including Exit at Rancho Penasquitos to Black Mountain North and re-enter at Bernardo Center on ramp.</td>
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<td>Congestion on north 1-15 near BERNARDO CENTER DRIVE. Consider alternate routes including Exit at Scripps Poway to Pomerado North and re-enter at Rancho Bernardo on ramp.</td>
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Thank You!

Contact Information:

Derek Miura
510.292.4384
dsm@iteris.com

www.iteris.com