Big Data & Congestion Management

February 19, 2014

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Innovation for better mobility
1. Congestion Management Process

2. What is big data?

3. Going beyond:
   • Bottleneck Analysis
   • Reliability
   • Incidents
   • Special Events
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Solutions for Congestion Monitoring

Software
- Websites with real time data

Services
- Customizable congestion reports using Big Data

Hardware
- Video detection
- Bluetooth
- Bicycle detection
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Congestion Monitoring integrated into the core transportation improvement process

- Informed decision making
- Continuous feedback loop

Adapted from FHWA Congestion Management Process
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What is big data?

- Location
- Speed
- Heading

Couple of minutes
What is big data?

Segment 1
19 mph

Segment 2
44 mph

Segment 3
63 mph

@ 7:14 AM
How does big data help?

• **Greater accuracy**
  – Current approaches not statistically sound
  – (More vehicles) X (More times) X (More days)

• **Reduced costs**
  – Travel time runs are expensive
  – Probe data is cheaper
Example Big Data Monitoring Project

Bay Area Freeway Locations With Most Delay
Example Big Data Monitoring Project

Average Auto Speeds

Average Muni Bus Speeds

Weekday AM Peak Period on CMP network
Example Big Data Monitoring Project
Going beyond

- ✔ Severity: How bad?
- ✔ Duration: How long?
- ✔ Reliability: Variation?
- ✔ Origin Destination: Traffic Patterns?

Flowchart:
1. Regional Objectives
2. Define CMP Network
3. Develop Performance Measures
4. Measure Performance
5. Identify Needs
6. Identify Strategies
7. Plan, Program, Implement
Solutions using Traditional Methods

Lower $  

Higher $
Going beyond: Examples

1. Bottlenecks
2. Reliability
3. Incidents
4. Special events
1. Bottlenecks

1. Monitor speed to find bottlenecks

2. Use OD data to determine who's contributing
1. Bottleneck Solutions

Lower $  

Higher $  

Bus  

Traffic light  

One vehicle per green  

Road design elements
## 2. Reliability Measures

<table>
<thead>
<tr>
<th>Measure</th>
<th>Description</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning Time</td>
<td>95(^{th}) Percentile TT</td>
<td>On-time arrival</td>
</tr>
<tr>
<td>Buffer Time</td>
<td>Extra time to allow for trip variation</td>
<td>Quantify the spread</td>
</tr>
</tbody>
</table>
2. Reliability

Northbound

Southbound

Travel Time (min)
2. Reliability

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Frequency

Northbound

Buffer

Buffer

Southbound

Buffer

Buffer

Travel Time (min)

Peak Period

AM

PM
2. Reliability Solutions

Lower $  
Bus turnouts

Adaptive

Higher $  
Driveable shoulders
3. Incidents
3. Incidents

710 Interchange
3. Incident Solutions

Lower $  

Higher $
4. Special events

![GIANTS Logo]

<table>
<thead>
<tr>
<th>Location</th>
<th>All days</th>
<th>Game Day</th>
<th>Non Game Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>3rd St: Terry Francois to Market</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4th St/Stockton: Harrison to Channel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brannan: 6th to 3rd</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brannan: 3rd to 6th</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bryant: Division to 4th Street</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bryant: 4th Street to Embarcadero</td>
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</tbody>
</table>

Average Speed (mph)
3. Solutions for Special Events
Conclusions

Big data for:

- Performance measurement
- Informed decision making
“Iteris provided the analysis and support to help us transition to commercial speed data for our traffic monitoring, cost-effectively generating more robust results than we could achieve using the floating car method.”

- San Francisco County Transportation Authority

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