Practical Applications of Arterial Performance Measures in Downtown Washington DC

2015 Joint ITS MD Annual Meeting and Traffic Signal Forum

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Practical Applications of Arterial Performance Measures

Agenda

- Background/Motivation
- Data Sources
- Practical Applications
- Future Opportunities
- Questions
Background

• Citywide Signal Optimization
  – How do we evaluate multi-modal benefits?
    • Auto
    • Bikes
    • Pedestrians
    • Transit

• Papal Visit
  – How to predict, mitigate and monitor?

• Daily Operations
  – Citizen Inquiries
  – Construction Activities
  – Signal Timing Changes
Motivation

- What data is available now?
- How are we using it?
- What have we learned along the way?
- Where do we go from here?
Data Sources

- RITIS
  - Live System Status
  - Historical Data/VPP
- WMATA AVL
- Google Traffic
  - Live/Typical
  - Waze
- Floating Car/GPS
- Bicycle Travel Time
- CCTV
Practical Applications

• Anacostia Optimization
  – 200+ Signal Arterial Network
    • Major Commuter Routes
• Downtown Optimization
  – 600+ Signal Grid Network
  – Overnight Implementation
  – Cars, Buses, Peds, Bikes
    • 49 Travel Time Routes
    • 40+ Bus Routes
    • 1,500+ Signalized Crosswalks
    • 7,000+ Cycle Trips per Day
Anacostia Results – Travel Time
Practical Applications of Arterial Performance Measures

Anacostia Results – Google Traffic

After – 8:30 AM
Anacostia Results – Bus Performance

**Metro Bus Stop Arrival (18 Routes)**

- **Early**
  - Before: 9%
  - After: 12%

- **On Time**
  - Before: 74%
  - After: 78%

- **Late**
  - Before: 17%
  - After: 10%
## Anacostia Results – VPP Bottlenecks

<table>
<thead>
<tr>
<th>Bottleneck Direction and Location</th>
<th>Average Max Queue Length</th>
<th>Average Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before (miles)</td>
<td>After (miles)</td>
</tr>
<tr>
<td>WB Suitland Parkway at South Capitol Street</td>
<td>3.34</td>
<td>2.6</td>
</tr>
<tr>
<td>WB Pennsylvania at Minnesota Avenue</td>
<td>1.49</td>
<td>1.06</td>
</tr>
<tr>
<td>WB Good Hope at Minnesota Avenue</td>
<td>0.82</td>
<td>0.72</td>
</tr>
<tr>
<td>WB Pennsylvania at Branch Avenue</td>
<td>0.81</td>
<td>0.76</td>
</tr>
<tr>
<td>NB South Capitol at Potomac Avenue</td>
<td>0.69</td>
<td>0.65</td>
</tr>
</tbody>
</table>
Downtown Results – Floating Car Travel Time
Downtown Results – Floating Car Video
Downtown Results – VPP Travel Time

Travel time for 12TH ST between Pennsylvania Ave and Massachusetts Ave
Averaged by 1 hour in April 21, 2015 through April 23, 2015 and April 28, 2015 through April 30, 2015

Northbound

Travel time (minutes)
## Downtown Results – Floating Car vs. VPP

<table>
<thead>
<tr>
<th>12&lt;sup&gt;th&lt;/sup&gt; Street</th>
<th>Floating Car</th>
<th>VPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before</td>
<td>5:02</td>
<td>4:52</td>
</tr>
<tr>
<td>After</td>
<td>2:42</td>
<td>3:51</td>
</tr>
<tr>
<td>Difference</td>
<td>2:20 (46%)</td>
<td>1:01 (20%)</td>
</tr>
</tbody>
</table>
Downtown Results – VPP Congestion
Downtown Results – Floating Car vs. VPP

<table>
<thead>
<tr>
<th>Rhode Island</th>
<th>Floating Car</th>
<th>VPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before</td>
<td>9:46</td>
<td>13:06</td>
</tr>
<tr>
<td>After</td>
<td>7:35</td>
<td>9:48</td>
</tr>
<tr>
<td>Difference</td>
<td>2:11 (22%)</td>
<td>3:18 (25%)</td>
</tr>
</tbody>
</table>

- **What about stops?**
  - GPS Runs can give us this data directly
  - Not available in VPP (as far as I know!)
Downtown Results – User Costs

- **VPP User Cost Tool**
  - Aggregate performance data and user value-of-time
  - Estimates user cost associated with congestion

<table>
<thead>
<tr>
<th>Rhode Island</th>
<th>User Delay Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Day Before</td>
<td>$41,797</td>
</tr>
<tr>
<td>Average Day After</td>
<td>$32,116</td>
</tr>
<tr>
<td>Weekly Savings</td>
<td>$9,681</td>
</tr>
<tr>
<td>Annual Savings</td>
<td>$2,420,250</td>
</tr>
</tbody>
</table>
Downtown Results – WMATA AVL
Downtown Results – WMATA AVL

Average Downtown WMATA Bus Route Travel Time (AM Peak)

- Comparison of average bi-directional bus route travel time before and after changes.
- Data unavailable for certain routes.
- % Travel Time Improvement chart shows improvement in travel time for selected routes.
• Annual savings of 315,000 person-hours.
Downtown Results – Bicycle Travel Time
## Downtown Results – Bicycle Travel Time

<table>
<thead>
<tr>
<th></th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Travel Time</td>
<td>Stops</td>
</tr>
<tr>
<td><strong>AM Eastbound</strong></td>
<td>7:30</td>
<td>5</td>
</tr>
<tr>
<td><strong>AM Westbound</strong></td>
<td>8:30</td>
<td>7</td>
</tr>
<tr>
<td><strong>MD Eastbound</strong></td>
<td>8:10</td>
<td>8</td>
</tr>
<tr>
<td><strong>MD Westbound</strong></td>
<td>8:20</td>
<td>7</td>
</tr>
<tr>
<td><strong>PM Eastbound</strong></td>
<td>10:30</td>
<td>8</td>
</tr>
<tr>
<td><strong>PM Westbound</strong></td>
<td>7:45</td>
<td>7</td>
</tr>
</tbody>
</table>
Downtown Results – Pedestrian Improvements

- Pedestrian Clearance Times recalculated to meet 2009 MUTCD.
- FDW values “before” and “after” implementations compared.
Papal Visit

- Traffic analysis of potential impacts
- Development of mitigation measures
- Real-time traffic monitoring and management
Papal Visit

• Typical DC Traffic
Papal Visit

- Expected Queuing Impacts – Constitution Ave Closure
Papal Visit

- Expected Queuing Impacts – 14th Street Closure
Papal Visit

• CCTV + Live Traffic Data Monitoring
Papal Visit

• Google Traffic Typical vs. Live Data
Papal Visit

- RITIS Comparison Tweeted by MATOC
Daily Operations

- Citizens note increase in congestion/travel time on a Wednesday
  - Field Observations performed on Tuesday show typical conditions.
Daily Operations

• What happened?
  – Checked RITIS incident data
  – Checked RITIS construction data
  – Checked signal timing data
  – Checked signal trouble calls
  – Checked for special events in the area
  – Etc.

• Data can tell us that *something* happened but not necessarily why or what.
Where do we go from here?

- Heavier reliance on VPP travel time data for analysis
- Sensys/WiFi travel time data
- Field-collected travel time data for validation and immediate results
- Heavier use of Transit AVL data for TSP and Signal Optimization evaluation
- Leverage available Bike data from bike-share services
- Pedestrians? Crowdsourced GPS?
Questions?

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