Probe Data Analytics (PDA) Suite Applications for Measuring Road Performance in Washington DC

NOCOE

FHWA EDC-5 Adventures in Crowdsourcing Webinar
February 27, 2020
Agenda

- Background/Motivation
- Data Sources
- Practical Applications
- Future Opportunities
- Questions
Citywide Signal Optimization
  › How do we **efficiently** evaluate benefits for all roadway users?

Quick Response to Citizen Concerns

Major Special Events
  › How to predict, mitigate and monitor?

How good is the data?
Motivation

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

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

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
Downtown Results – Vehicle Probe Project (VPP) Travel Time

Travel Time for NB 12th Street Between Pennsylvania Avenue and Massachusetts Avenue

Travel Time Savings noted during ‘after’ AM, Midday and PM period
Downtown Results – VPP Travel Time as CDFs

- CDFs provide a visual representation of travel time reliability
- Possible since PDA Suite provides many travel time data points
- With traditional floating car data (~6 runs per corridor) this is not possible
Downtown Results – VPP Travel Times Mapped
Significantly reduced queuing and increased speeds noted during ‘after’ AM, Midday and PM period
Citizen Requests – Rapid Before/After Evaluations

- Early March 2017 Report from citizen of congestion along Michigan Avenue during AM
- Not optimized since 2005; network optimization scheduled for Fall 2017
- Quickly reviewed and updated timings for 4 intersections
- Achieved approximately 2 minute travel time improvement on 1.3 mile corridor
- Extremely low cost improvement & minimal before/after data collection cost to demonstrate benefits
Citizens note increase in congestion/travel time on a Wednesday

- Field Observations performed on following Tuesday show typical conditions.
- So, what happened?

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.

RITIS can tell us that *something* happened but not necessarily why or what.
Citizen Requests – Rapid Validation

Citizens note increase in congestion/travel after Phase Conversion

- Used RITIS data to validate the concern
- Resolved, and then rechecked the data
### Analysis Results – User Costs

**PDA Suite User Delay Cost Tool**
- Considered mainline traffic only

<table>
<thead>
<tr>
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<th>Delay Costs</th>
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<tbody>
<tr>
<td>US 1 (Rhode Island Ave)</td>
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<tr>
<td>Average Day Before</td>
<td>$41,797</td>
</tr>
<tr>
<td>Average Day After</td>
<td>$32,116</td>
</tr>
<tr>
<td>Daily Savings</td>
<td>$9,681 (23%)</td>
</tr>
<tr>
<td>Annual Savings</td>
<td>$2,420,250</td>
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</tbody>
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**Synchro-based Intersection Delay**
- Considered all traffic approaches

<table>
<thead>
<tr>
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<th>Delay (hours)</th>
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<tbody>
<tr>
<td>US 1 (Rhode Island Ave)</td>
<td></td>
</tr>
<tr>
<td>“Before”</td>
<td>772,900</td>
</tr>
<tr>
<td>“After”</td>
<td>556,880</td>
</tr>
<tr>
<td>Daily Benefit</td>
<td>216,020 (28%)</td>
</tr>
<tr>
<td>Annual Benefit</td>
<td>$5,839,021</td>
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Sabra & Associates notified of need for traffic analysis and operations services 22 business days before arrival:

- Microsimulation of entire network for upper management
- Report identifying impacts within 7 days
- Possible detour/alternate routes
- Signal re-timing/mitigation
- Traffic Control Officer (TCO) deployment
- Variable Message Sign (VMS) locations
Papal Visit – Impact Analysis

- RITIS/INRIX/Google to observe typical maximum queue lengths
- Estimate typical bottleneck capacity
- Estimate typical jam density
- Identify closure-induced bottleneck location and estimate capacity
- Calculate maximum static queue length
Papal Visit – Impact Analysis Validation

Anticipated Impacts due to 14th Street Closure

Historical Unplanned Closure of 14th Street incident
Papal Visit – Mitigation Measures

Seriously, You Should Not Drive When the Pope Is Here

It could take more than an additional hour to drive into DC next week, officials say.

By Benjamin Freed on September 14, 2015

D.C.: Telecommute During Papal Visit, But Use Metro if You Can’t

ANDREW CUNNINGHAM — SEP 14, 2015 7 PM

District Line Daily: Pope-mageddon 2015

ANDREW CUNNINGHAM — SEP 15, 2015 11 AM

Six Reasons Why The Pope’s Visit Will Be A Disaster For DC Residents

JOSH FALTZICK

7:45 PM 09/17/2015

The papal visit is already causing headaches for residents in the District of Columbia, and he won’t even be in town until next week.
Papal Visit – Mitigation Measures
Metro says traffic light for Pope's first morning in DC

What Pope Francis did for D.C. traffic

Why Popemageddon Traffic Jams Didn't Happen (But Still Could)

Study: Papal visit had miraculous impact on traffic

Pope's arrival fails to bring traffic apocalypse

WASHINGTON — When Pope Francis visited D.C. in September, he did more than offer blessings to true believers. He may have also delivered a miracle to the region with the worst traffic in the country.

By Ari Ashe | ariasheWTOP
October 24, 2015 6:40 pm

A recent study found that the papal visit resulted in a relatively non-existent rush hour. The National Capital Region Transportation Planning Board used traffic speed data from INRIX to determine how fast people were travelling on Sept. 23 and Sept. 24, when the pope was in town.
Papal Visit - Outcomes

RITIS Comparison Tweeted by MATOC
Data Quality – How good is it?

Like any other tool – you need to know how and when to use it!

- Baltimore City PDA Data Quality:
Data Quality – How good is it?

Like any other tool – you need to know how and when to use it!

- Long-term analysis:

I-95 Corridor Coalition Validation of Arterial Probe Data Report (2015):

Probe data consistently errored toward faster speeds during congested periods. The extent of slowdown measured in terms of reduction in speed was consistently underestimated as evidence by SEB measurements as well as by the distribution analysis. Even for events classified as fully captured, any error in the extent of slowdown was biased toward faster speeds. **This systematic bias towards higher speeds will have programmatic significance if probe data is used in long term performance monitoring.** As probe data quality improves, the data will more accurately report the full extent of slowdowns. As a result **congestion may appear to grow worse when in actuality, it is only the quality of the probe data that is improving.** This scenario has been corroborated by early adopters of probe data for arterial performance measures.
Where do we go from here?

› Heavier reliance on PDA Suite travel time data for analysis
› Bluetooth/WiFi/TPMS travel time data when PDA data is poor (e.g. Baltimore City)
› Field-collected travel time data for validation
› Heavier use of Transit AVL data for TSP and Signal Optimization evaluation
› Leverage available Bike data from bike-share services?
› Pedestrians? Crowdsourced GPS?
Thank You