Deriving Bus Travel Speed/Dwell Time Using Automatic Passenger Counter (APC) Data

presented to
MTF Transit Committee

presented by
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Study Purpose

- Improve input values (bus travel time/dwell time) for the Transit Boarding and Estimation Simulation Tool (TBEST).

- Derive bus travel time/dwell time for different time periods.

- Provide data that could be used in the calibration and validation of the FSUTMS model.
Background

Why is transit travel time important\(^{(1)}\)?

- Used to calculate the transit impedances in mode choice
- In Small/New Starts evaluation, almost all of the user benefits come from transit travel time savings
- Need the actual transit travel time to do all the model calibration and validation

AVL/APC Data have the information for actual travel time. The APC data have passenger on and off counts, arrival time, dwelling time, and department time for each stop.

Most transit agencies have the AVL/APC data, few are using it for capturing bus speeds on roadway segment level!

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Our Previous study

- Kittelson & Associates, Inc. worked with Washington Metropolitan Area Transit Authority (WMATA) to evaluate bus performance by corridor.

- The analysis used GPS data collected through WMATA’s Automatic Vehicle Location (AVL) system.

- Results are summarized in the speed maps for all-day, weekday PM peak (3pm – 6pm), and weekday AM peak (6am – 9am) conditions.
Case Study

LYNX

AVL Data

• Lynx is working to build its Computer-Aided Dispatch (CAD)/AVL system

APC data

• April – August, 2011
• Over 3,000,000 stop level observations
APC Data

- Passenger Count
- Location
- Arrival Time
- Departure Time
Data Reduction

Stop Level Records

- Stop A | Attributes
- Stop B | Attributes
- Stop C | Attributes

Link Level Records

- Stop A – Stop B | Attributes
- Stop B – Stop C | Attributes
Geometric Relationship
Geometric Relationship
Travel Time Analysis

- Any subset of data
  - Time
  - Day of Week
  - Route
  - Sub-Area
Travel Time Analysis - All Day
Travel Time Analysis – AM Peak
Travel Time Analysis – PM Peak
# Most Congested Roadway Segments – All Day

<table>
<thead>
<tr>
<th>Segment</th>
<th>From</th>
<th>To</th>
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<tbody>
<tr>
<td>W Livingston Street</td>
<td>Gertrude Ave</td>
<td>N Garland Ave</td>
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<td>N Garland Ave</td>
<td>N Hughey Ave</td>
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<td>Vineland Avenue</td>
<td>Arrezzo Way</td>
<td>Regency Village Dr</td>
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<td>N Magnolia Avenue</td>
<td>Wall St</td>
<td>E Washington St</td>
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<td>W Livingston St</td>
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<td>N Hughey Avenue</td>
<td>Pittman St</td>
<td>Railroad</td>
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<td>N Hiawassee Road</td>
<td>Silver Star Rd</td>
<td>Portage Ave</td>
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<td>W Colonial Drive</td>
<td>S Park Ave</td>
<td>Main St</td>
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Most Congested Segments

- Slowest segments are commonly minor approaches to major arterials
- Transit priority could be an effective improvement
Other Potential Applications

- Help model predict transit speed more accurately based on observed data at the segment level, route level, or system level during different time periods.

- Better understand the relationship between bus and auto travel times (and speeds). This can be used to calibrate the curves in the travel demand model.

- Identify specific congestion locations in need of bus speed enhancing improvements during different time periods.
Questions?

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