Comparison and Analysis of Big Data for a Regional Freeway Study in Washington State

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Traditional data sources have limited time and area coverage.

Big data is passively collected data from GPS, Bluetooth, mobile devices.

Useful transportation measures: origin destination patterns, travel times, travel distances, routing, vehicle speeds.
RTC Regional OD Study

- SW Washington Regional Transportation Council (RTC) is the MPO for Washington portion of Portland-Vancouver area
- Covers Clark County, Washington
- Need to understand regional OD flows on freeway and other transportation system
- Project prepares for Urban Freeway Corridor Operations Study
- Project reviewed potential data sources
Data Source Criteria Considered

- **Technical Criteria**
  - Data Resolution
  - Time of Day
  - Day Type
  - Sample Size
  - Travel time
  - Routing details
  - Trip distance
  - Other trip details

- **Logistical Criteria**
  - Data format
  - User interface
  - Schedule
  - Cost
  - Contracting process

- **Flexibility for other application**
  - Data customization
  - User accessibility
Traditional manual Bluetooth data collection did not scale well and was infeasible due to cost, schedule, and limited data periods.

Several probe data products are applicable for other uses but offered limited application to RTC due to:
- Lack of user interface
- Inability to run subsequent data queries
- Limited zone size/count
- Precision of location data
- Lack of routing information
INRIX Waypoint data in Moonshadow’s DB4IoT platform was the recommended data source:
- Detailed waypoint data (can achieve routing)
- DB4IoT platform
- County-wide coverage
One year of data from INRIX Trips

Included all trips beginning in, ending in, or passing through Clark County

Web-based DB4IoT platform allows interactive exploration of the data

Dataset is biased towards heavy vehicles
- Understand general travel patterns for any defined zone system (e.g. zip code, TAZ)
- Generate regional OD summaries
- Web interface provides ability to dynamically update visualization based on mouse position
Pass-through zones created for each bridge crossing the Columbia River

Filter for all trips passing through the bridge

Travel patterns summarized by large districts in the greater Portland-Vancouver area
Summarized for each on-off ramp on four freeways

Filtered by day, time period, and vehicle class

Data used to develop mainline OD tables for segment and operations analysis

<table>
<thead>
<tr>
<th>Origin</th>
<th>Destination</th>
<th>153 4th/Mill Pl exit from I-5 NB</th>
<th>156 78th St exit from I-5 NB</th>
<th>157 99th St exit from I-5 NB</th>
<th>160 179th St exit from I-5 NB</th>
<th>161 SR 502 exit from I-5 NB</th>
<th>162 I-5 SB gateway</th>
<th>173 SB I-205 exit from I-5 SB</th>
</tr>
</thead>
<tbody>
<tr>
<td>101 I-5 Bridge NB gateway</td>
<td>30</td>
<td>17</td>
<td>8</td>
<td>0</td>
<td>4</td>
<td>10</td>
<td>3</td>
<td></td>
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<tr>
<td>102 SR 14 entrance to I-5 NB</td>
<td>518</td>
<td>408</td>
<td>130</td>
<td>0</td>
<td>2</td>
<td>12</td>
<td>1</td>
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<tr>
<td>105 39th St/SR 500 entrance to I-5 NB</td>
<td>2</td>
<td>24</td>
<td>18</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>109 NB I-205 entrance to I-5 NB</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>220</td>
<td>142</td>
<td>7868</td>
<td>44</td>
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<tr>
<td>110 179th entrance to I-5 NB</td>
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<td>0</td>
<td>17</td>
<td>5</td>
<td>26</td>
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</tr>
<tr>
<td>121 I-5 SB gateway</td>
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<td>2</td>
<td>1</td>
<td>85</td>
<td>160</td>
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</tr>
<tr>
<td>132 City Center entrance to I-5 SB</td>
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<td>4</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
Aggregated segment speeds do not account for differential

Speeds by lane can vary due to specific movements, which is muted at the segment level

Locations identified where some lanes may have lower speed
Weekday AM peak period traffic on I-5 Southbound traffic

Some trips exit freeway and use local system to bypass freeway congestion before re-entering freeway

Diversion checks were performed in a workshop setting to verify diversion related to congested locations
Summary

- Traditional road surveys provide a small sample over a small time period
- GPS probe data can provide large data samples for long periods
- There are many data providers that are suited for different types of projects
- Waypoint data provides detail and flexibility to examine routing and diversion
- OD information was used to identify and prioritize freeway transportation projects