Use of Truck Data for Freight Forecasting

NATMEC
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Presentation Overview

Purpose

To improve truck model and trip generation rates

Overview

1. Truck Counts
2. Motivation
3. GPS Data
4. Grocery Store Trip Generation
5. On-going efforts
Vehicle Counts

Currently Obtained Data:

- 4,368 observation points on the Metropolitan Transportation System (MTS)
- 754 contain information about trucks
## Count Types

<table>
<thead>
<tr>
<th>Data Type</th>
<th>Sub-type</th>
<th>Jurisdiction/Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classification</td>
<td>Complete</td>
<td>Auburn, Bothell, Everett, Pierce &amp; Snohomish Counties, PSRC</td>
</tr>
<tr>
<td></td>
<td>Truck only</td>
<td>Port of Tacoma</td>
</tr>
<tr>
<td>AWDT</td>
<td>With truck percentage</td>
<td>WSDOT, Fife</td>
</tr>
<tr>
<td></td>
<td>With peak periods</td>
<td>Lynnwood, Seattle</td>
</tr>
<tr>
<td></td>
<td>By direction</td>
<td>Renton, Shoreline, Tacoma</td>
</tr>
<tr>
<td></td>
<td>Combined directions</td>
<td>Bellevue, Redmond</td>
</tr>
<tr>
<td>ADT</td>
<td>With truck class</td>
<td>Seattle (Heffron study)</td>
</tr>
<tr>
<td></td>
<td>By direction</td>
<td>King &amp; Kitsap Counties</td>
</tr>
<tr>
<td></td>
<td>Combined directions</td>
<td>Covington, Kirkland, Lakewood, Puyallup</td>
</tr>
<tr>
<td>Peak Period/s</td>
<td></td>
<td>Federal Way, Woodinville</td>
</tr>
</tbody>
</table>
### Truck Count Locations

<table>
<thead>
<tr>
<th></th>
<th>Freeway</th>
<th>Major Arterial</th>
<th>Minor Arterial</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>King</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Counts</td>
<td>99</td>
<td>130</td>
<td>177</td>
<td>406</td>
</tr>
<tr>
<td>Percent of Total</td>
<td>10%</td>
<td>15%</td>
<td>22%</td>
<td>15%</td>
</tr>
<tr>
<td><strong>Kitsap</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Counts</td>
<td>7</td>
<td>15</td>
<td>21</td>
<td>43</td>
</tr>
<tr>
<td>Percent of Total</td>
<td>12%</td>
<td>18%</td>
<td>19%</td>
<td>17%</td>
</tr>
<tr>
<td><strong>Pierce</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Counts</td>
<td>39</td>
<td>51</td>
<td>56</td>
<td>146</td>
</tr>
<tr>
<td>Percent of Total</td>
<td>11%</td>
<td>25%</td>
<td>32%</td>
<td>20%</td>
</tr>
<tr>
<td><strong>Snohomish</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Counts</td>
<td>24</td>
<td>38</td>
<td>97</td>
<td>159</td>
</tr>
<tr>
<td>Percent of Total</td>
<td>13%</td>
<td>32%</td>
<td>24%</td>
<td>23%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Counts</td>
<td>169</td>
<td>234</td>
<td>351</td>
<td>754</td>
</tr>
<tr>
<td>Percent of Total</td>
<td>10%</td>
<td>19%</td>
<td>24%</td>
<td>17%</td>
</tr>
</tbody>
</table>
Cooperative Data Sharing

Truck Counts
Motivation
Data
Grocery Store Trip Generation
On-going Efforts
## Model Validation

<table>
<thead>
<tr>
<th>Facility Type</th>
<th>Count</th>
<th>Volume</th>
<th>Locations</th>
<th>Difference</th>
<th>Percent Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freeways</td>
<td>552,755</td>
<td>960,468</td>
<td>186</td>
<td>407,714</td>
<td>74%</td>
</tr>
<tr>
<td>Arterials</td>
<td>679,012</td>
<td>267,427</td>
<td>581</td>
<td>(411,585)</td>
<td>-61%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1,231,767</td>
<td>1,227,895</td>
<td>767</td>
<td>(3,871)</td>
<td>0%</td>
</tr>
</tbody>
</table>
GPS Truck Data

Source

Washington State Department of Transportation (WSDOT) and University of Washington (UW)

Performance measures program

Description

2,500 trucks per day

Starts, stops, 15 minute reads when moving

> 3,000,000 records per month
Geo-Coding

Trucks travel everywhere!

Automation of GPS read coding to road network

Coding based on proximity to roadway and heading

60% match
Defining Origins and Destinations

Intentional stops need to be separated from traffic-related stops

Used 3-minute dwell time to differentiate

Which stops are of interest? i.e. parking location vs actual destination
Sample Data

Examined data from Fall 2008

One month of data results:

- 3,000,000 reads
- 358,000 trips
- 16 mile average trip distance
- 21 minute average travel time
- 34 miles per hour average speed
Grocery Stores & Distribution Centers

Project with Ed McCormack (UW) and Maren Outwater (RSG)

Considered “Large” grocers
  • ~50-100K SF
  • Independents and chains

Did not include
  • Big-Box
  • Convenience stores
Grocery Truck Statistics

Over 91 days:

- 2,400 trucks (26 trucks per day)
- 22,000 tours (242 tours per day)
- 215,000 trips (2362 trips per day)
- 9 tours per truck
- 0.1 tours per truck per day
- 10 trips per tour
- 2 trips to major grocer
### Grocery Truck Trips by Area Type

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Average Truck Trips per Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metropolitan Cities</td>
<td>12.4</td>
</tr>
<tr>
<td>Core Cities</td>
<td>12.1</td>
</tr>
<tr>
<td>Larger Cities</td>
<td>8.4</td>
</tr>
<tr>
<td>Smaller Cities</td>
<td>6.6</td>
</tr>
<tr>
<td>Unincorporated Urban Areas</td>
<td>7.3</td>
</tr>
<tr>
<td>Rural</td>
<td>3.9</td>
</tr>
</tbody>
</table>
GPS dataset is subset of all trucks

McCormack et al (2010) grocery trip generation study

- Favorable comparison to interview information (10 to 12 daily trucks)
- But half of observed manual counts (18 trucks per day)
Transferability to Other Sectors

Manual traffic counts for each sector is cost prohibitive

Need weighting/expansion factor so GPS truck data can represent all truck trips

Potential approaches:

• Traffic counts (cordon, zone, or link)
• Total truck population
GPS Expansion Factors

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Data Products

Truck trips and tours disaggregated by employment sectors, land use types, and times of day

Average trip and tour lengths

Speed data and route choice

Uses

Calibration

- Aggregate distribution models
- Aggregate trip generation models

Air Quality studies/modeling

Potential for commodity flow model
Prospects and Limitations

Improving quality of GPS data

National availability

But,

It’s not cheap

May not have desired granularity

Research in nascent stage

And,

NEED MORE TRUCK COUNTS
Thank You

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