Empirical Analysis of Crowdsourced Google Travel Time Data for Sustainable Transportation Applications

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September 15th, 2016
Background and Objectives

• Google uses cellular devices to give live travel data and uses stored data to give the best estimates for future predictions.

• Objective: Maximize the efficiency of delivery trucks based on distance and traffic data provided by Google.
Methodology

- Development of a Python-based program to gather travel information from Google Directions API
- Analysis of travel time data
- Analyzed factors:
  - Size of study area
  - Number of Origin Destination (OD) pairs to simulate
  - Day of the week
  - Location (LA Metro, Cities in Latin-America)
  - Time of day (0-4, 4-6, 6-8, 8-10, 10-12, 12-14, 14-16, 16-18, 18-20, 20-24)
- Estimation of congestion index
Program

GoogleAPI.py
Sends and receives information from Google

Variables.py
Input:
Coordinates
Length of Side
Etc.

TimeGetter.py
Converts Epoch time to date

Data
Saves results
## Typical Results

<table>
<thead>
<tr>
<th>Number</th>
<th>Side Length</th>
<th>Time Interval</th>
<th>O_Lat</th>
<th>O_Long</th>
<th>D_Lat</th>
<th>D_Long</th>
<th>Distance (m)</th>
<th>Duration (sec)</th>
<th>Date</th>
<th>Duration (hr)</th>
<th>Distance (mi)</th>
<th>Speed (mi/hr)</th>
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Numerical Results
Size of Study Area (Downtown, 250 ODs)

- Average Speeds per time period for different square areas of different side lengths (in miles)

- Afternoon peak has a greater impact than morning peak
- The larger the area, higher average speeds
Number of ODs per Area (Downtown, 1 sq mi)
Day of the Week (250 Ods, 1 sq mi)

- Not much difference for this Downtown location. Other locations showed different speed profiles
Location (LA Metro, 250 ODs, 1 sq mi)

• Downtown area exhibits the lowest average speeds. Pasadena showed the highest congestion impact.
Latin America (250 ODs, 1 sq mi)

• Latin-American cities show slower average speeds than Los Angeles. (Speed limits are also lower)

• Santiago and Sao Paulo core areas are very congested
General Findings

- Programming is fun and StackOverFlow is your best friend.
- Google predictions are consistent with other GPS data.
Thank you!
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