An Open Source Approach to Calculating Accessibility

Mike McGurrin
David Greczner
Brian Cheng
Transportation (the movement of people and goods) is a means to an end, not an end in and of itself:
- Supplying goods or services
- Providing access to jobs
- Reaching a vacation destination

**Accessibility metrics** measure the ease of reaching the desired destinations
- Measures transportation outcomes, rather than intermediate performance or problems (e.g., speed, delay, congestion)
- Recommended by multiple organizations, e.g., the National Transportation Policy Project
- Rigorous, quantifiable, transparent, and understandable
- Previously difficult to analyze
Utilize growing set of open government data and open source software to develop simple low-cost analysis tools and visualizations.

New Approach to Accessibility Analysis
• Data appender and/or visualization tools can be used as stand-alone tools to visualize results
  • Input is simple XML-based files.
Comparison of OTP Travel Times with WMATA Trip Planner

OTP Trip Calculations vs WMATA Trip Calculations

\[ y = 0.9277x + 5.7447 \]

\[ R^2 = 0.8325 \]
Visualizations

3D Visualization:
color depicts cumulative opportunity, height depicts population
Visualizations
Challenges and Next Steps

• Long run times on single processor:

<table>
<thead>
<tr>
<th>Number of regions</th>
<th>Trip calculations</th>
<th>Total runtime</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>250,000</td>
<td>2 days</td>
</tr>
<tr>
<td>1000</td>
<td>1,000,000</td>
<td>8 days</td>
</tr>
<tr>
<td>4000</td>
<td>16,000,000</td>
<td>128 days</td>
</tr>
</tbody>
</table>

– Potential solutions:
  • Separate out walk time calculations
    – Avoid huge duplicative effort
    – Greatly simplifies remaining graph and travel time analysis
  • Parallel processing: problem ideally suited for splitting over multiple processors
Challenges and Next Steps (Concluded)

- Many agencies do not publish transit schedules in GTFS
  - E.g., WMATA, Arlington County, DC Connector do, Fairfax and Loudon Counties do not
  - Some may be available upon special request
  - Labor intensive, but can create GTFS from other formats (see, for example, Brookings study: *Missed Opportunity: Transit and Jobs in Metropolitan America*)

- No open data on auto travel times
  - Imagine the potential opportunity of connected vehicles: *anonymous, crowd-sourced open travel time data*
  - Would open up traveler information applications in the same way GTFS opened up transit information applications
Reduced time and cost for analyses:
- New approach reduces the investment costs and level of effort required to conduct such analyses
- Still dependent upon having the necessary data
  - E.g., in Washington area, WMATA and Arlington provide public GTFS transit files, Fairfax and Loudon counties do not – manual entry required
- Further work needed to reduce run-times for large networks

Provide easily used and understood visualizations to communicate results

Source code available as open source:
- Open Source Accessibility Toolkit (OSAT):
  https://github.com/Noblis/OSAT
- Source code, example data, sample outputs, and documentation