Defining Measureable Accessibility Metrics for Transit Agencies

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Defining Measureable Accessibility Metrics

Transit Accessibility Analysis Today
- Defining accessibility for use in transit systems
- Current geospatial methodologies and capabilities

Building Analysis Capabilities
- Detailed transportation networks
- Informative demographic and destination datasets
- Multi-modal routing capability

Tomorrow’s Accessibility Analysis
- Types of accessibility metrics possible
- Building comprehensive benchmark metrics
Accessibility is a measure that examines both land use and transportation systems, it is the ease of reaching valued destinations.

- Accessibility is used in many ways in transportation (Litman 2014)
  - Roadway Engineering
  - ADA and Pedestrian Planning
  - Geography and Urban Economics
- How should accessibility be defined for public transportation?
  - Accessing transit stations
  - Wait and transfer times
  - Accessing destinations
- Measure it … for various transportation modes … to different types of destinations … at different times of day
Transit Accessibility Today

- Transit Line Buffer Analysis
  - Classic ¼ mile buffer around transit stations/lines

- Transit Station Accessibility Analysis
  - Network distance vs. “as the crow flies”

- Accessibility Metric… 83,000 jobs and 58,000 people within ¼ mile of transit line stops
Transitioning Accessibility Analysis

- **What are we modeling?**
  - Physical features of the transit line
    - How many people are living around the station?
    - Are there jobs located along the transit line?

- **How can we improve upon this?**
  - Model individual trips using transit
    - Where do people live and how long does it take them to access the transit system?
    - How long does it take for the bus to arrive at the station?
    - How long does it take to travel along the transit line?
    - Where do people want to travel to and far away is it from the transit system?
What Should Our Accessibility Metrics be?

- Comprehensive Accessibility Analysis
  - Walking times to get to transit stop along pedestrian network
  - Transit times from originating stop to destination stop

- New Accessibility Metric... 38,000 average job accessible within 30 minutes using public transportation within service area.
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Roadway and Pedestrian Network

- Not every street is the same...

- We need the ability to model these differences in GIS
Roadway and Pedestrian Network

- Accurate and detailed networks from Here
- A network link is more than a line in space
Transit Network

- Capture all transit attributes from local GTFS File

**GTFS File**
- Shapes.txt
- Stops.txt
- Trips.txt
- Routes.txt
- Calendar.txt
- Stop_Times.txt

**Transit Attributes**
- Mode
- Headway
- Run Times
- Transit Stops
- Route Paths
Origin and Destination Information

- Set our Origins and Destinations as Census Blocks
- Every Census Block connected to roadway network through connectors
Additional Destination Information

- Points of interest database
  - Schools, parks, restaurants, every destination possible...
  - Geocoded to their exact locations
One Comprehensive Analysis

- Walk 7 Minutes … 15 Minute Bus Ride … Walk 4 Minutes = 13 people have 188 jobs accessible in 26 minutes along this OD pair
32,000 Origins to 32,000 Destinations
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Types of Accessibility Metrics

- **Travel Times**
  - Minimum travel time to a grocery store in the city by walking
  - Minimum travel time to job centers using public transportation

- **Destination Summation**
  - Amount of jobs accessible within 30 minutes using public transportation
  - Number of parks accessible within 15 minutes by walking

- **Comprehensive Accessibility Scoring**
  - Local walkability score
  - Healthy living index
## Minimum Travel Time to a Hospital Using Public Transportation

<table>
<thead>
<tr>
<th>Demographic Group</th>
<th>Travel Time (minutes)</th>
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<tbody>
<tr>
<td>Total</td>
<td>32.7</td>
</tr>
<tr>
<td>White</td>
<td>38.3</td>
</tr>
<tr>
<td>Black</td>
<td>20.1</td>
</tr>
<tr>
<td>American Indian</td>
<td>23.2</td>
</tr>
<tr>
<td>Asian</td>
<td>31.1</td>
</tr>
<tr>
<td>Pacific Islander</td>
<td>29.9</td>
</tr>
<tr>
<td>Age 65+</td>
<td>35.9</td>
</tr>
</tbody>
</table>
Comprehensive Accessibility Scoring Metrics

- Accessibility scores have become very popular
  - People want to live in neighborhoods with high scores
  - Research has shown health factors to be correlated with the walkability of where you live

- Allows us to analyze accessibility to a multitude of types of destinations
  - Accurately reflect the ability to accomplish one’s daily errands by walking
  - Show a person’s ability to access healthy amenities throughout the city

- Easy to Compare
  - Quantitatively scored from 0 to 100
Comprehensive Accessibility Scoring Metrics

Table

<table>
<thead>
<tr>
<th>OID</th>
<th>POINTCLASS</th>
<th>FAC_TYPE</th>
<th>DESCRIPTION</th>
<th>POL_TARGET</th>
<th>CAT_WEIGHT</th>
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<tbody>
<tr>
<td>0</td>
<td>400</td>
<td>357836000</td>
<td>ATM, Bank</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>1</td>
<td>100</td>
<td>5400</td>
<td>Grocery Store</td>
<td>2</td>
<td>24</td>
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<tr>
<td>2</td>
<td>110</td>
<td>9565</td>
<td>Pharmacy</td>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td>3</td>
<td>120</td>
<td>9535</td>
<td>Convenience Store</td>
<td>2</td>
<td>16</td>
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<tr>
<td>4</td>
<td>140</td>
<td>9537</td>
<td>Clothing Store</td>
<td>1</td>
<td>7</td>
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<tr>
<td>5</td>
<td>130</td>
<td>9545</td>
<td>Department Store</td>
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<td>7</td>
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<tr>
<td>6</td>
<td>150</td>
<td>9906</td>
<td>Home Improvement &amp; Hardware Store</td>
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<td>5</td>
</tr>
<tr>
<td>7</td>
<td>180</td>
<td>6512</td>
<td>Shopping/Specialty Store</td>
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<td>5</td>
</tr>
<tr>
<td>8</td>
<td>150</td>
<td>9530</td>
<td>Post Office</td>
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<td>5</td>
</tr>
<tr>
<td>9</td>
<td>160</td>
<td>9988</td>
<td>Office Supply &amp; Services Store</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

Citilabs Comprehensive Scoring App

Decay Function

Travel Time (Minutes)

Decay Factor
Regional Transit Access Score
Thank You!

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