Building a Multimodal Network for Accessibility Analysis in ArcGIS

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Early Experiments in Transportation

The Far Side
What is Accessibility Analysis?

• A method to measure the performance of transportation networks.

  • Measure access to jobs, points of interest, or for population groups,…

  • The network can be simple (one mode - auto) or complex (several modes – auto, biking, walking, transit...)

• The measure is calculated using an Origin-Destination (OD) Cost Matrix analysis on a network.
Origin-Destination (OD) Cost Matrix:
GIS data for a Multimodal Network

- Determine Transportation

<table>
<thead>
<tr>
<th>Mode</th>
<th>Data Source</th>
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<tbody>
<tr>
<td>Auto</td>
<td>Street Centerlines</td>
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<tr>
<td>Bike</td>
<td>Bike Paths</td>
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<tr>
<td>Walk</td>
<td>Sidewalks, Paths</td>
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<td>Transit</td>
<td>GTFS Files</td>
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Network Attributes

• Speed
  • Auto - posted and/or actual.
  • Bike (9.6 mph), Pedestrian (3.1 mph) - average speed.

• Accessibility Restrictions
  • Auto, Bike, Pedestrian
  • Y/N

• One-way
  • Auto, Bike (not always the same as auto).
  • B/T/F

• Connectivity - grade access, bridges, tunnels.
  • Elevation Fields
  • Edit Geography
Network Attributes:
Minimum needed for bike, pedestrian, auto

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<th>ToElevation</th>
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<th>OneWayB</th>
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GIS Data Sources

• Ready to use networks:
  • Citilabs-Sugar Access – HERE Data
  • ArcGIS Online Network Analysis Services

• Data sources to build your own network:
  • Local, State, Federal Government
  • Open source (Open Street Map)
    • MapCompare
  • GTFS
    • Local Transit Agency
    • TransitLand (https://transit.land/)
    • TransitFeeds (https://transitfeeds.com/)
GIS Data Sources

- MATPB Multimodal Network Data Sources:
  - Street Centerlines – Dane County LIO
  - Bike Paths – MATPB
  - Pedestrian Paths – MATPB, Open Street Map
  - Transit – Madison Metro Transit GTFS (General Transit Feed Specification)
Build the Network in Network Analyst: Many options, parameters, settings
Adding Transit to The Network: GTFS (General Transit Feed Specification) Files

GTFS Files:
Set of text files:
Adding Transit to The Network: GTFS Tools

• First make a copy of the Non-Transit Network
  • Use this as a base for Transit Networks

Esri Tools:

• *Add GTFS to a Network DataSet*
  • Incorporates GTFS into a Network.
  • Use in ArcGIS Network Analyst for OD Analysis, Routing.

• *BetterBusBuffers*
  • Frequency of Transit Service (count trips by stop, route)
  • Requires a Non-Transit Network

• On Esri Open Source site:
Accessibility Analysis Example: Transit Access to Jobs


Percentage of Jobs (2010) in Madison Urban Area Accessible within 30 Minutes of Walking and/or Transit During the Morning Peak Period

- 0% - 1%
- 2% - 3%
- 4% - 5%
- 6% - 7%
- 8% - 11%
- 12% - 16%
- 17% - 22%
- 23% - 29%
- 30% - 40%

* Start time: Wednesday, 7:30 AM.
* Areas in white are not served by Bus Transit.
Accessibility Analysis Example:
Transit Access for Proposed DMV Locations

Existing Peak Service Area (8:30 AM)
Proposed Peak Service Area (8:30 AM)

Transit Travel Time to DMV
- 1 to 20 minutes
- 21 to 40 minutes
- 41 to 60 minutes

Concentration of Minority Population*
- Greater than 40% of Total Population

DMV Location
Street Centerline
Rail Corridor
Lake
Accessibility Analysis Example:
Access to Jobs on Low vs. High Stress Bike Network
Routing Example:
Low-Stress Bike Route Finder
Thank you.

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