Survival Analysis-Based Choice Set Formation Approach for Destination Choice Using GPS Travel Data

Contributions
- Proposed a new method to form choice sets for home-based non-work destination choice.
- Proposed a procedure to decide an appropriate choice set size.
- Examined the impacts of land use and route-specific network structure on destination choice based on GPS travel data.

Key findings
- Turn index and travel time are the two most influential factors.
- A destination reached by a route with greater changes of speed or more turns per unit time is less attractive.
- A destination closer to work is more attractive, and a destination closer to downtown is less attractive.
- Greater accessibility and diversity of services make a destination more attractive.

In-vehicle GPS data
- Collected to study commuters’ travel behavior before and after the opening of the new I-35 W Bridge by installing GPS devices in participants’ vehicles in the Twin Cities Area.
- Number of participants: 141
- Project sponsors: NSF, MN/DOT, and Oregon Transportation Research and Education Consortium

Mixed-effects logistic model
- Land use
  - Accessibility (ln): Total number of services within 15 minutes’ walking from a parking destination.
  - Diversity of services (entropy at destination k): $H_k = - \sum p_{ks} \ln (p_{ks})$
  - Travel time:
  - Turn index:
  - Speed discontinuity:
  - Time to work:
  - Time to downtown:
  - Time from home to time to work:

Hypotheses
- Variable | Trip’s attractiveness
- Accessibility | +
- Diversity of services | +
- Travel time | -
- Turn index | -
- Speed discontinuity | -
- Time to work | -
- Time to downtown | +
- Time from home to time to work | -

Mixed-effects logistic model
Dependent variable: destination choice
Key independent variables:
- Land use
- Accessibility (ln): Total number of services within 15 minutes’ walking from a parking destination.
- Diversity of services (entropy at destination k):
- Travel time:
- Turn index:
- Speed discontinuity:
- Time to work:
- Time to downtown:
- Time from home to time to work:

Elasticity of the odds of selection
<table>
<thead>
<tr>
<th>Variable</th>
<th>Elasticity (%)</th>
<th>Rank by absolute value</th>
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<tbody>
<tr>
<td>TURN</td>
<td>-76</td>
<td>1</td>
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<tr>
<td>TRAVEL</td>
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<td>2</td>
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<tr>
<td>TIME</td>
<td>-32</td>
<td>3</td>
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<td>-29</td>
<td>4</td>
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<td>DIVERSITY</td>
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<td>5</td>
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<td>DISCONT</td>
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<td>6</td>
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<tr>
<td>ACCESSIBILITY</td>
<td>12</td>
<td>7</td>
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<tr>
<td>DOWNTOWN</td>
<td>-11</td>
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