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Understanding Where We Live and How We Travel

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Understanding Where We Live and How We Travel:

The Development of an Online Visual Survey Tool for Evaluating Preferences in Residential Neighborhood Choice and Commute.

Kristina M. Currans

Friday Transportation Seminar

October 17th, 2014
About the Speaker

• Doctoral Student
• Civil Engineering (CE)
• Portland State University

• Dwight D. Eisenhower Fellow
• Advisor: Dr. Kelly Clifton (2010-Present)
• M.S. @ Portland State University (CE, 2013)
• B.S. @ Oregon State University (CE, 2010)
About the Project

Understanding Residential Location Choices for Climate Change and Transportation Decision Making (2011-Present)

Dr. Kelly J. Clifton (PI)

Funded in part:

• Oregon Department of Transportation (ODOT)
• National Institute for Transportation and Communities (NITC)
Introduction

This project includes several surveys which investigate preferences for certain residential environments and trade-offs made when selecting where to live and how to travel.

Objective:

Improve the representation of neighborhoods in surveys by developing a visual tool to depict objectively-defined neighborhoods for a non-technical audience.
Outline

• How to Describe Neighborhoods
• Developing a Visual Neighborhood Survey Tool
  1. Objectively define neighborhood types
  2. Compile image sets
  3. Validate visual tool
  4. Revise and apply tool in practical surveys
• Conclusions
• Lesson’s Learned
• Future Work
How to Describe Neighborhoods

Engineers and planners describe neighborhoods using **discrete attributes**:

- Activity or intersection density
- Curb cuts
- Mixed use
- Floor-to-area ratio
- Lot size

(Image Source: Stamen Maps)
Living Space
Housing Type
Travel Options
Accessibility
Parking
Tenure
Retail and Service Land Uses
Neighborhood “Bundle”
How to Describe Neighborhoods

People who are not transportation professionals experience neighborhoods as a **bundle**.

One way to depict these complex relationships is through the use of **images**.

- Living Space
- Housing Type
- Travel Options
- Retail and Service Land Uses
- Accessibility
- Parking
- Tenure
Using Images to Depict the Bundle

Depict qualities that are hard to measure\textsuperscript{1,2}:

- Enclosure
- Human Scale
- Architecture

Or difficult to conceptualize\textsuperscript{2}:

- Density
- Entropy

And can relate complex arrangements of characteristics\textsuperscript{1,2}.

\textsuperscript{1}(Ewing & Handy, 2009); \textsuperscript{2}(Jansen, 2009)
Using Images to Depict the Bundle\textsuperscript{1}

- Captures vague concepts
- Help participants appreciate words
- “Enhance the realism of the task”
- Reduce information overload
- Provide interesting comparisons with less fatigue
- May be expected in a society accustomed to imagery
- Ground participants in a similar reality

\textsuperscript{1}(Jansen, 2009)
Developing the Visual Neighborhood Tool

1. Objectively Define N’hood
2. Create Image Sets of N’hood
3. Validate Tool
4. Apply Tool in Surveys
(1) Objectively define neighborhood

- Quantitatively classify environments into discrete categories
  - Commonly available data (Smart Growth Database\(^1\)) to describe the environment
    - **Density**: Activity Density
    - **Diversity**: 5-Category Employment Entropy
    - **Design**: Intersection Density
  - Representing environments found throughout the United States (top 25 highest population MPOs)

\(^1\)(EPA, 2012)
(2) Create Image Sets

• Collect images of environment located within each neighborhood (Google Earth Streetview, screenshots)
• Integrating images of the residential, transportation, land use, and recreational options
• Portray the neighborhood in the best possible light
(2) Create Image Sets

• Control for the use of images that have:
  • specific cultural significance
  • uniquely identify a particular region
  • explicitly describe a place
  • potentially elicit individual biases
early morning downtown
early morning downtown
car-centric viewpoint
adequately depict neighborhood
continuity of neighborhood
including people
(3) Validate Image Sets

When using imagery to depict “neighborhood” choices within a survey (and all the characteristics bundled within neighborhood) in what ways are respondents grounded in the same reality?

• What differences in characteristics of neighborhood do respondents see?

• Do respondents generally see the same differences?
(3) Validate Image Sets

Present two slideshows representing two neighborhood concepts

Rank neighborhood for 13 different characteristics
Characteristics of Neighborhood

- larger private yards
- a greater variety in types of dwelling
- larger residential living spaces
- closer proximity to local shopping and/or retail establishments
- better access to parks and/or outdoor recreational facilities
- better access to regional shopping centers and/or big box stores
- greater population density
- a greater variety of transportation options
- better accommodations for car ownership
- a greater ease for finding parking spaces
- better public transportation service
- better walking environments
- better streets to ride a bicycle for transportation
(3) Validate Image Sets

- Respondents saw differences in density
- Hard to portray transportation network in static images
- Suggests images be supplemented with text to distinguish variation in attributes
- Very urban (A, B, C) and very exurban (E, F) concepts are harder to differentiate
- “Priming-the-pump” is very important
(4) Revise and Apply Tool

Stated-Choice Experiments (SCE) are intended to allow respondents to evaluate hypothetical scenarios consisting of various alternatives and attributes describing each alternative.

Benefits:

• Supplement revealed preference data & methods
• Evaluate alternatives that do not yet exist
• Access the trade-offs that respondents make
• Investigate variation in utility for different market segments
• Applied within larger travel demand models
<table>
<thead>
<tr>
<th>Your Trip:</th>
<th>CAR TOLL ROAD</th>
<th>CAR NO TOLL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel time to work</td>
<td>45 min.</td>
<td>70 min.</td>
</tr>
<tr>
<td>Time variability</td>
<td>± 1 min.</td>
<td>± 1 min.</td>
</tr>
<tr>
<td>Toll (one way)</td>
<td>$6.00</td>
<td>free</td>
</tr>
<tr>
<td>Pay toll if you leave between these times (otherwise free)</td>
<td>6:30-9:00 am</td>
<td>—</td>
</tr>
<tr>
<td>Fuel cost (per day)</td>
<td>$6.00</td>
<td>$12.00</td>
</tr>
<tr>
<td>Parking cost (per day)</td>
<td>$20.00</td>
<td>$10.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Your Trip:</th>
<th>BUSWAY</th>
<th>TRAIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total time in the vehicle (one way)</td>
<td>30 min.</td>
<td>30 min.</td>
</tr>
<tr>
<td>Time from home to your closest stop</td>
<td>Walk 25 min.</td>
<td>Walk 5 min.</td>
</tr>
<tr>
<td></td>
<td>Car/Bus 8 min.</td>
<td>Car/Bus 4 min.</td>
</tr>
<tr>
<td>Time to your workplace from the closest stop</td>
<td>Walk 25 min.</td>
<td>Walk 5 min.</td>
</tr>
<tr>
<td></td>
<td>Bus 8 min.</td>
<td>Bus 4 min.</td>
</tr>
<tr>
<td>Frequency of service</td>
<td>Every 25 min.</td>
<td>Every 5 min.</td>
</tr>
<tr>
<td>Return fare (per day)</td>
<td>$3.00</td>
<td>$3.00</td>
</tr>
</tbody>
</table>

(Hensher et al, 2007)
**Games 1**

Make your choice given the route features presented in this table, thank you.

<table>
<thead>
<tr>
<th>Details of Your Recent Trip</th>
<th>Road A</th>
<th>Road B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time in free-flow traffic (mins)</td>
<td>20</td>
<td>24</td>
</tr>
<tr>
<td>Time slowed down by other traffic (mins)</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Travel time variability (mins)</td>
<td>+/- 5</td>
<td>+/- 6</td>
</tr>
<tr>
<td>Running costs</td>
<td>$ 2.00</td>
<td>$ 2.20</td>
</tr>
<tr>
<td>Toll costs</td>
<td>$ 3.00</td>
<td>$ 4.80</td>
</tr>
</tbody>
</table>

If you make the same trip again, which road would you choose?
- Current Road
- Road A
- Road B

If you could only choose between the 2 new roads, which road would you choose?
- Road A
- Road B

(Leontsini & Green, 2003)
Neighborhood and Commute Trade-offs

“Of the two options presented, please select the most appealing to you:”

**Central District**
- Multifamily units in high-rises (500 sq. feet)
- Predominately renters
- Retail, services, & entertainment located within a maximum of 1/8 mile
- Off-street parking (paid, secure)
- High public transit access to regional centers

**Urban Residential District**
- Multifamily units in mid-rises (750 sq. feet)
- Mix of renters and owners
- Retail, services, & entertainment located within a maximum of 1/4 mile
- Off-street parking (paid, secure)
- Reasonable public transit access to regional centers

**Commute Characteristics**
- Public Transit
  - 15 Minutes

- Bike or Walk
  - 30 Minutes
Neighborhood and Commute Trade-offs

- Summer 2014
- Administered in Qualtrics
- Supplement with desired attribute descriptions

<table>
<thead>
<tr>
<th>Neighborhood</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central District</td>
<td>Multifamily units in high-rises (500 sq. ft)</td>
</tr>
<tr>
<td></td>
<td>Predominately renters</td>
</tr>
<tr>
<td></td>
<td>Retail, services, &amp; entertainment located within a maximum of 1/8 mile</td>
</tr>
<tr>
<td></td>
<td>Off-street parking (paid, secure)</td>
</tr>
<tr>
<td></td>
<td>High public transit access to regional centers</td>
</tr>
<tr>
<td></td>
<td>Commute Characteristics</td>
</tr>
<tr>
<td></td>
<td>Public Transit</td>
</tr>
<tr>
<td></td>
<td>15 Minutes</td>
</tr>
<tr>
<td>Urban Residential District</td>
<td>Multifamily units in mid-rises (750 sq. ft)</td>
</tr>
<tr>
<td></td>
<td>Mix of renters and owners</td>
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<td></td>
<td>Retail, services, &amp; entertainment located within a maximum of 1/4 mile</td>
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<tr>
<td></td>
<td>Commute Characteristics</td>
</tr>
<tr>
<td></td>
<td>Bike or Walk</td>
</tr>
<tr>
<td></td>
<td>30 Minutes</td>
</tr>
</tbody>
</table>
Neighborhood and Commute Trade-offs

- “Cards” with neighborhood images and commute options
- Images are hosted on the web, and linked within survey
- Allow users to examine photos
Future Work
& Lesson’s Learned
Conclusions

• Developed a set of national and objectively defined neighborhood types
• Constructed visuals representing neighborhoods available in Oregon
• Constructed a hypothetical visual tool for neighborhoods not yet available in Oregon
• Using visual tools to describe complex, multidimensional topics help get respondents on the same page
Lesson’s Learned

• Pilot surveys indicated importance of “priming the pump” on any elements you want to distinguish
  • Mentioning important neighborhood elements early on in survey
  • Supplementing photo sets with text or description
• Respondents had difficulty seeing differences in transportation networks
• Very urban and very exurban concepts are harder to differentiate
Future Work

• What is the impact of a single photo on the overall understanding of a photo set?

• How do people with different backgrounds (sociodemographic and economic characteristics and preferences) see the visuals differently?

• Analyze results of stated and revealed preference surveys
  • Residential neighborhood and commute trade-offs

• Incorporate visual tool into other surveys to represent neighborhood types
Acknowledgements

%&^*’~ Happy Birthday, Adam @ PBOT! ~’*^&%
References


Environmental Protection Agency (EPA). Smart Growth Location Database.. Available at http://www.epa.gov/smartgrowth/smartlocationdatabase.htm.


