Demand Estimation Model for Park-and-Ride Service

How to use case study analysis and LEHD data to estimate ridership and bus trip needs at new or existing park-and-ride sites in the Houston Area.
Investigation of past and present methods/thoughts

LITERATURE/SOURCE REVIEW

RELATIVE DEMAND ESTIMATION
General Notions About Shape of Market-Shed for Park-and-Rides

- Limited by distance to facility vs. destination
- Facilities close together may reduce each other’s market generation effectiveness
- Riders’ willingness to backtrack limited
- Parabola is most common shape
- 50% of riders typically live within 2.5 mile radius circle around facility

2000 Analysis of riders using one of three facilities

HOUSTON PARK-AND-RIDE STUDIES
West Bellfort P&R (2000)
Observations

• 2.5 mi radius circle covers large amount of riders
• Parabola shape fits general distribution
• Findings concur with research
  – 2.5 mile radius circle to measure/estimate demand may safely represent 50% of riders
A close look at nine park-and-ride facilities

CASE STUDY ANALYSIS OF HOUSTON AREA PARK-AND-RIDES
Location of Case Study Facilities

Nine Facilities:
- 4, Spring
- 7, Kingwood
- 8, Townsen
- 18, Bay Area
- 49, Grand Parkway
- 51, Kingsland
- 55, Cypress
- 56, Northwest Station

Current FBC Facilities:
- 42, AMC Movie Theater
- 43, University of Houston
Summary of Case Study

- Average distance to CBD: 24.3 miles
- Average peak weekday CBD bound riders: 726
- Average # of inbound bus trips: 25
- Average boardings per bus trip at P&R: 27.9
Use the Census’ online tool to obtain paired geography analysis of worker flows by income bracket.

OBTAIN LEHD DATA FOR ANALYSIS
LEHD OnTheMap Data, US Census Bureau

- Available annually from 2002-2010
- Longitudinal Employer-Household Dynamics (LEHD)
- Links home to work Census Blocks
- Work data, not exactly travel data
- [OnTheMap](#) is online tool for analysis
Paired Analysis to Get Worker Flows

• Selecting 2.5 mile radius around P&R
• Selecting 1.0 mile radius to encompass CBD
• Tabulating worker flow by income brackets
  – $1,250 per month or less
  – $1,251 to $3,333 per month
  – More than $3,333 per month
Example: Kingsland P&R to CBD

Step 1. Select areas for analysis

2.5 mile radius circle around facility used to identify home Census Blocks

1 mile radius circle around CBD used to identify work Census Block
Example: Kingsland P&R to CBD

Step 2. Select analysis settings
Example: Kingsland P&R to CBD

Step 3. Run analysis, record findings
Use of existing, local, and LEHD data to estimate demand for P&R service

MODEL FOR P&R DEMAND ESTIMATION USING LEHD DATA
Demand Estimation Model

Simplified Steps

• Obtain initial LEHD and P&R data
• Clean, arrange P&R data for use
• Create case study rates by combining P&R and LEHD data
• Obtain LEHD data for new P&R sites
• Estimate demand for P&R services by applying rates from case study to LEHD data for new P&R sites
Location of Study Sites

Current FBC Facilities:
- 42, AMC Movie Theater
- 43, University of Houston

Exploratory Sites:
- Constellation Field
- FBC Fairgrounds

Other Sites Modeled:
- Baytown (existing)
- Brazoria (2013)
42, AMC Movie Theater Lot
43, University of Houston

Circle intentionally offset from UH to the southwest along 59 to avoid most overlap with AMC Movie Theater P&R.
TrekExpress Study

Approx. Markets for Current P&Rs

Not downtown riders, but still may indicate market-shed for existing FBC park-and-ride facilities
Constellation Field
FBC Fairgrounds, Rosenberg
Based on Eight Case Study Sites: Model Inputs

- Average distance to CBD: **24.3 miles**
- Average peak weekday CBD bound riders: **767**
- Average # of inbound bus trips: **28**
- Average boardings per bus trip at P&R: **27.9**
- Average LEHD worker flow to CBD: **1,579**
- Case study adjusted ratios (percent of workers using P&R service):
  - Medium or average estimate **24.3%**
  - Low estimate **14.7%**
  - High estimate **38.5%**
Things to Note

• Estimated ridership is to Central Houston in peak hours, does **not** include other riders
• Estimated ridership is for transit services equivalent to the high-quality service at the 8 case study P&Rs
• The five options for P&R service in FBC each affect estimated demand differently
• Operating AMC/Town Center, UH, and Constellation Field at the same time may reduce total estimated demand due to site competition
## Summary of Model Findings

### Ridership Estimation: Avg/Low/High

#### LOW SCENARIO: RIDERSHIP GENERATION SIMILAR TO THREE LOWEST CASE STUDY PARK-AND-RIDE FACILITIES

<table>
<thead>
<tr>
<th>Analysis P&amp;R Sites</th>
<th>Current Lot Spaces</th>
<th>Workers Living Within 2.5 miles of P&amp;R with Jobs in Houston CBD</th>
<th>Model Worker Flow P&amp;R Capture Ratio (LOW)</th>
<th>Earn $1,250 month or less</th>
<th>Earn $1,251 to $3,333 per month</th>
<th>More than $3,333 per month</th>
<th>Distance to next Metro competing park-and-ride facility in corridor:</th>
<th>Estimated Demand for Peak Hour P&amp;R Service to Central Houston</th>
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<tbody>
<tr>
<td>AMC Movie Theater Lot</td>
<td>150</td>
<td>1,439</td>
<td>14.65%</td>
<td>3.6%</td>
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<td>Fort Bend County Fairgrounds</td>
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#### AVERAGE SCENARIO: RIDERSHIP GENERATION SIMILAR TO ALL CASE STUDY PARK-AND-RIDE FACILITIES

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#### HIGH SCENARIO: RIDERSHIP GENERATION SIMILAR TO THREE HIGHEST CASE STUDY PARK-AND-RIDE FACILITIES

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<th>Workers Living Within 2.5 miles of P&amp;R with Jobs in Houston CBD</th>
<th>Model Worker Flow P&amp;R Capture Ratio (HIGH)</th>
<th>Earn $1,250 month or less</th>
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