TRANSIMS in the Buffalo / Niagara Falls Area

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Scott Smith

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at TRACC
Major Issues

• Freight
• Cross border congestion
• Domestic issues
Gap between Planning and Operational Models

**Planning:**
- Entire region
- Average flows over several hours
- Trip generation, mode choice, route choice

**Operations:**
- Small area
- Second by second
- Demand is typically fixed
Objectives of the TRANSIMS Implementation

- To show that a regional TRANSIMS model could be developed based on existing data
- To demonstrate the capabilities of this model, some of which go beyond those of a typical four-step model
  - Grand Island Bridge toll plaza changes
  - Increased freight
  - Lane configurations
- To transfer the TRANSIMS model and the development of further capabilities to GBNRTC
Existing Model Data

- Existing model
  - Links
  - Number of Lanes
  - Speed
  - Some tolls
  - Freeway interchanges
- List of signals
- Highway database
  - Lanes
  - Parking
  - Traffic count data
Supply: Filling in the Gaps

- Defaults
- Local knowledge
- Aerial photography
- Modifications to
  - Capacities
  - Speeds
  - Lane Connectivity
Modeling Demand

- Four-step model trip tables
  - Four time periods: AM, MD, PM, NT
  - Zones
- TRANSIMS can handle a greater level of detail
  - Minute – by - minute
  - Activity locations
TRANSIMS Link Flows versus Counts by Hour
Activity Locations and Zones

• Activity locations are generated with the TRANSIMS network
  – Pairs along non-freeway, non-ramp links
  – Near each external zone

• Each zone typically includes many activity locations

• Zone – activity location assignment process
  – Default: nearest zone centroid
  – Use LocationData to associate activity locations with the proper zone based on the zone shapefile (supplied by GBNRTC)
Modeling a Border Crossing

Lewiston-Queenston Bridge:
U.S. Inspection

TOD: 153046
Modeling a Border Crossing

- Limited by primary inspection capacity
- TRANSIMS Router
  - Lowered capacity on the crossing
  - Penalties (via the Toll table) to discourage crossing the border to save a few minutes of travel time.
- TRANSIMS Microsimulator
  - Lane use restrictions to separate cars and trucks
  - Traffic signal with 2-minute red and 1-second green green green.

<table>
<thead>
<tr>
<th>Bridge</th>
<th>“Toll”</th>
<th>EB Lanes</th>
<th>EB Cap. (veh/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lewiston-Queenston</td>
<td>900 sec.</td>
<td>6 car, 4 trk</td>
<td>180 car, 120 truck</td>
</tr>
<tr>
<td>Whirlpool (NEXUS only)</td>
<td>1200 sec.</td>
<td>2</td>
<td>60</td>
</tr>
<tr>
<td>Rainbow (no trucks)</td>
<td>900 sec.</td>
<td>15</td>
<td>450</td>
</tr>
<tr>
<td>Peace</td>
<td>900 sec.</td>
<td>18</td>
<td>540</td>
</tr>
</tbody>
</table>
Subarea Microsimulation

**Subarea:**
- I-190 corridor - North side of Buffalo to Lewiston-Queenston bridge

**Process:**
- Iterate between the microsimulator (sub area) and router (full area)
- Link delays from the microsimulator are inputs to the router
Daily Flows
Scenario Test: Toll Plaza on Bridge

Baseline:
6 second **delay** for all traffic at toll plaza

Scenario: **No stop** at the plaza
Changes in Daily Flows

- **L-Q WB:** +151 (2%)
- **NF Blvd:** -227 (1%)
- **Porter:** -360 (2%)
- **River:** -530 (3%)
- **Toll Plaza:** +1100 (3%)
- **Peace:** -219 (1%)

Legend:
- ● <=-5%
- ● -5 to -1%
- ● -1 to +1%
- ● +1 to -5%
- ● >5%
Flow at Plaza (link 6228)
Speed at Plaza (link 6228)
Shifts in flows from 606 to 717 with no-stop toll 5-6 PM, total flow = 62

Hamilton, Toronto (Zone 717)

I-90 from the East (Zone 606)
Technical Lessons Learned

• It is possible to set up a usable TRANSIMS model with existing data
  • Run time and quality of results comparable to existing four-step models

• Typical issues in going from a four-step model to a TRANSIMS model
  – TRANSIMS is more sensitive to time-of-day information in the trip tables
  – Some advanced features in a four-step model might need to be addressed in the microsimulator, not the router
  – The TRANSIMS microsimulator is much more sensitive to network fidelity (signals, stop/yield signs, lane configurations, etc.) than a four-step model
Future Work

• SUNY-Buffalo project
  • Assess the feasibility of using TRANSIMS for on-line transportation management during emergencies
  • Builds upon the model presented here

• TRANSIMS – version 5
  • Major enhancements to TRANSIMS, due later in 2010
  • Improved toll / border delay modeling
  • Vehicle – following model for microsimulator
    • Higher fidelity than the current cellular automata model