ADVANCED TOLL MODELING

Presented To:
Model Task Force Meeting
Orlando, Florida

Presented By:
Jim Fennessy
Fennessy Associates

May 25, 2010
MTF Priorities Survey

1. Time-of-Day Modeling
2. Land Use Interfaces
3. Advanced Toll Modeling
   - Florida Turnpike Features since the Toll Facilities Model (since 1998)
Advanced Toll Modeling

- History and Development
- Application at Florida’s Turnpike
  - Technology Advances
  - Alternate Tolling Strategies
- Cube-FSUTMS Application
Development History of Toll Modeling

- CTOLL
- UTPS -- UROAD
- Toll Facilities Model
- Other Miscellaneous Toll Modeling Developments
- Ramp-to-Ramp Toll Modeling
CTOLL

- Conversion of cost to time based upon average income in study area

- Equilibrium highway load parameter: ranges from 0.02 (income = $100k) to 0.10 (income = $20k)

- \( CTOLL = \frac{1.0}{(Rate \times A)} \)

Where:

- Rate = Average Wage Rate for Study Area
UTPS – UROAD
Toll Representation

- Up to 20 toll categories
- Coded in the TRANPLAN cost field
- TOLLS – toll in dollars for each category (converted to time via CTOLL)
- SERVT – service time in minutes
- Toll links should be coded with zero distance on links to turn off capacity restraint calculation
UTPS – UROAD
Link Representation

A
B
C
D

B-C Toll Link
Toll Facilities Model

- Current FSUTMS Toll Model

- TOLL DATA file
  - CTOLL (overrides any parameter)
  - A-NODE and B-NODE
  - Toll in dollars
  - Service time in minutes : seconds
  - Toll facility identification
  - Number of lanes
  - Toll type ramp (no accel/decel) or barrier
TOLL FACILITIES MODEL
Link Representation

A-B  Decel Link
B-C  Toll Link
C-D  Accel Link
Advanced Toll Modeling Developments

- Open Road Tolling (TOLDATA file additional fields)
- Hot-Lane (Value Pricing) Tolls
- Distance-Based Tolls
- Discrete Tolls – Toll based upon the number of toll facilities crossed
- Congestion-Pricing Tolls
- Ramp-to-Ramp
Project Team

- Jim Fennessy, Fennessy Associates
- Wilbur Smith Associates
- Central Office Staff
CUBE Application

- Identification of Pertinent Advanced Features
- Features Currently in CUBE
- Verification of CUBE and TRANPLAN Features
CUBE Application
Features Currently in CUBE

- Review Current CUBE Documentation
- Undocumented Features About to be Released
- Discussions with Citilabs
CUBE Application
CUBE and TRANPLAN Verification

- Recognize the Inherent Differences in the Equilibrium Assignments
- Rigorous Testing of the Selected Toll Features utilizing TRANPLAN as a Benchmark
- Ensure Adequate Reporting Capabilities
Ramp-to-Ramp Toll Modeling

Latest Toll Collection Methods
- Ramp-to-Ramp (Card System)
- Barrier
- Electronic Tolling (SunPass)
- Discount Pricing (Discrete Tolling)
- Open Road Tolling
- Variable Pricing (HOT-Lanes)

Flexible for all cases

Software Modifications
Ramp-to-Ramp Toll Modeling

Software Problem:

Toll Pathing:

A B C D + 50
D E F G + 75
A B C E F G + 125
Ramp-to-Ramp Toll Modeling

Software Solutions:

- Network Restructure
- Pseudo Links
  - Turn Prohibitors / Penalties
  - Selected Links
- Pseudo to Real Links
- Assignment by Iteration
- Output File – Real Links
Ramp-to-Ramp Toll Modeling

Software Output:

- Ramp-to-Ramp Detail Report
  - Volumes
  - Estimated Revenue
  - Ramp ID’s
- Company Summary
- DBF Output for Other Software Interfaces
Ramp-to-Ramp Toll Modeling

SUB-TASKS:

• Software developed to convert TRANPLAN ramp-to-ramp inputs to DBF files for CUBE Voyager processing
• DBF files input to CUBE Voyager for ramp-to-ramp processing
• Several model runs with selected toll facilities
CUBE Voyager Tests:

- Basic tests virtually replicate TRANPLAN
- Turn prohibitors OK
- Selected links OK

Problems

- Certain ramp-to-ramp configurations not handled
- Detailed and Summary reports not available
### Ramp-to-Ramp Toll Modeling

#### Ramp-to-Ramp Detail Report

<table>
<thead>
<tr>
<th>Ramp-to-Ramp Identification</th>
<th>Toll ($)</th>
<th>Dist. (Miles)</th>
<th>Volume</th>
<th>Rev. ($)</th>
<th>From Ramp</th>
<th>To Ramp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Veterans Exwy SB On at Suncoast</td>
<td>1.75</td>
<td>11.3</td>
<td>11353</td>
<td>19660</td>
<td>15000-15000</td>
<td>15000-15000</td>
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<td>-to Veterans Exwy SB Off at SR 60</td>
<td>1.75</td>
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<td>11353</td>
<td>19660</td>
<td>15000-15000</td>
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<tr>
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<tr>
<td>to Veterans Exwy SB Off at Hillsborough</td>
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Company Totals: 169618
## Ramp-to-Ramp Toll Modeling

### Company Summary Report

<table>
<thead>
<tr>
<th>Company Number</th>
<th>Company Name</th>
<th>Volume</th>
<th>Revenue ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Sunshine Skwy BR</td>
<td>73997</td>
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<tr>
<td>17</td>
<td>St. Johns Ferry</td>
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<tr>
<td>12</td>
<td>Suncoast Pky</td>
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<td>42</td>
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<td>11</td>
<td>Veterans Exwy</td>
<td>168637</td>
<td>178632.0</td>
</tr>
</tbody>
</table>

**Total -- All Companies**

| Total          | 6148844 | 5472082.0 |
OTHER PROJECT TOLLING

• OPEN ROAD TOLLING

• HOT LANE (VALUE PRICING)

• DISTANCED-BASED TOLLS
CUBE Voyager Tests:

- Voyager scripts developed with Toll Facilities Model with the only impedance on the toll facilities being a function of the toll and not related to delays

Problems

- Non identified – testing still underway
CUBE Voyager Tests:

- Voyager scripts developed with Toll Facilities Model with the impedances being a function of the toll, service time, queuing and accel/decel delays by trip mode

Problems

- Non identified – testing still underway
DISTANCE-BASED TOLLS

CUBE Voyager Tests:

• Voyager scripts developed with Toll Facilities Model with the impedances being a function of the toll (based upon the distance travelled on the toll facility), service time, queuing and accel/decel delays by trip mode

Problems

• Non identified – testing still underway
Tasks to Complete

RAMP-TO-RAMP

- Certain ramp-to-ramp configurations not handled
- Detailed and Summary reports needed
- Improved Voyager documentation

Task Assignments

- Fennessy Associates
- Citilabs
Tasks to Complete

OPEN ROAD TOLLING

- Verify network inputs to the path builders and assignment algorithms
- Compare assignment outputs for “reasonableness”

Task Assignments

- Fennessy Associates
- Wilbur Smith Associates
- Central Office Staff
Tasks to Complete

HOT LANE (VALUE PRICING)

• Verify network inputs to the path builders and assignment algorithms
• Compare assignment outputs for “reasonableness”

Task Assignments
• Fennessy Associates
• Wilbur Smith Associates
• Central Office Staff
Tasks to Complete

DISTANCE-BASED TOLLS

- Create Voyager script with Toll Facilities Model for distance based tolls
- Verify network inputs to the path builders and assignment algorithms
- Compare assignment outputs for “reasonableness”

Task Assignments

- Fennesssy Associates
- Wilbur Smith Associates
- Central Office Staff
Tasks to Complete

FINAL REPORT

- Detailed and summary analyses of the testing between the two software packages
- Determination of needs to be referred to Citilabs – software modifications and documentation
- Listings of TRANPLAN and CUBE Voyager scripts

Task Assignments

- Fennessy Associates
- Wilbur Smith Associates
- Central Office Staff
ADVANCED TOLL MODELLING

Questions / Comments?
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