Atlanta Travel Forecasting Methods:

Traditional Trip-Based & Activity-Based Model

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Travel Demand Forecasting @ ARC
Where Do We Start?

Travel Behavior

Existing/Planned Transportation System

Land Use & Socio-Economic Characteristics

The Travel Demand Model Set
(The “Black Box”)
ARC’s Trip Generation

• 6 Trip Purposes:
  – Home-Based Work
  – Home-Based Shopping
  – Home-Based Grade School
  – Home-Based University
  – Home-Based Other
  – Non-Home Based

ARC’s Trip Production

• IS NOT Cross-Classification, it’s Logit
• Why? Allows more independent variables:
  – Household size (1, 2, 3, 4+)
  – Household income (<$20K, $20–50K, $50–100K, $100K+)
  – # of workers per household (0, 1, 2, 3+)
  – # of children per household (0, 1, 2, 3+)
  – # of autos per household (0, 1, 2, 3+)
ARC’s Trip Attraction

- Developed from Household Travel Survey & Workplace Establishment Survey
- Features an Attraction Share Model based on 4 market segments:
  - Households without cars
  - Households with cars < workers
  - Low income hshlds with # cars >= # workers
  - High income hshlds with # cars >= # workers

ARC’s Trip Distribution

- Still using Gravity Model, but looking into Destination Choice
- Makes use of Topographic Penalty to compensate for area bias created by a river crossing
- The “topo” penalty is a lump sum of time in minutes (2 to 3) added to the composite time of interzonal times for all zone pairs on opposite sides of the river
ARC Commercial Vehicle & Truck Model
based on
FHWA 13-Bin
Vehicle Classification

1: 2/3 Wheels
2: Automobiles
3: 2 Axle/4 Tire Trucks
4: Buses
5: 2 Axle/6 Tire Trucks
6: 3 Axle Single Unit Trucks
7: 4+ Axle Single Unit Trucks
8: 4 or Less Axles Single Trailer Trucks
9: 5 Axles Single Trailer Trucks
10: 6 or More Axles Single Trailer Trucks
11: 5 or Less Axles Multiple Trailer Trucks
12: 6 Axles Multiple Trailer Trucks
13: 7 or More Axles Multiple Trailer Trucks

91 External Stations (2024 + 91 = 2115 total taz)
The 4-Step Process
ARC Travel Demand Forecasting

Land Use, Population & Employment
Traffic Analysis Zones (TAZs)
Trip Generation
Travel Pattern Surveys
Transit Assignments

Land Use Models
Trip Distribution
Mode and Path Choice
Model Trip Tables
Auto Occupancy P/A to O/D

Transportation Facilities & Performance
Highway and Transit Networks
Skim Trees
Highway Assignments

No
Speeds in = Speeds Out?
Yes
Vehicle Emission Estimates

ARC Model Applications: Using Radar Graphs to Visualize Performance Measures

Scenario 1
Demands
Accessibility
Mode Share
Congestion

Scenario 1a
Demand
Accessibility
Mode Share
Congestion

Scenario 2
Demand
Accessibility
Mode Share
Congestion

Scenario 2b
Demand
Accessibility
Mode Share
Congestion
ARC’s Activity-Based Model

• Provides results similar to 4-step trip based model
• Ok, so then why bother with an ABM?
• Because ARC’s ABM provides additional details, more info about travel patterns & market segments
• ABM allows to answer questions the 4-step model is not capable to provide
• For internal use only, not for official purposes, hence dual/parallel track of models

ARC Activity-Based Modeling System

• Based on the CT-RAMP\(^1\) family of ABMs developed in New York, NY, Columbus OH (MORPC) and others
  - Explicit intra-household interactions
  - Continuous temporal dimension (Hourly time periods)
  - Integration of location, time-of-day, and mode choice models
  - Java-based package for AB model implementation

• Implemented with the existing Cube-based networks, GUI and ancillary models (external model, truck model, assignments, etc)

• Households: 1.7 million in 2005, 2.7 million in 2030

• Model development parallel effort with MTC

\(^1\)Coordinated Travel-Regional Activity-Based Modeling Platform
Synthesized Population: Person Age Share

Trip-Based Model Mode Share Compared to ABM Mode Share
Line Boardings: Trip Based Model Versus ABM

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$R^2 = 0.987$

AM SOV Free:
Trip Length Frequency Distributions
What Sort of Performance Measures & Visuals are Possible with an Activity-Based Model?

ABM results in a complete activity diary for all ARC residents

• A wealth of activity/travel results

• Just about any custom report/query/visual is now possible

• Performance Measures also available by Age, Gender & Household Types

Mean Delay, Peak Period Travel
Travelers By Age

Persons Not At Home By TAZ and Hour
Persons By TAZ and Hour

Questions / Comments
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