

TMIP Activity and Tour Based Modeling Seminar

presented by
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Background

Acknowledgments

- **Seminar developer**
 - **Thomas Rossi, Cambridge Systematics**
- **Overseen by Texas Transportation Institute**
 - **Gary Thomas**
 - **Penelope Weinberger**
- **Federal Highway Administration**
 - **Michael Culp**

Acknowledgments

● Oversight committee

- Kostas Goulias, Penn State University
- Rebekah Anderson, Mid-Ohio Regional Planning Commission
- Bill Davidson, PB Consult
- Keith Lawton, Portland Metro
- Mark Bradley, Mark Bradley Research and Consulting

● Other contributors

- Harry Timmermans, Ryuichi Kitamura, Chandra Bhat

Background

- Seminar development began in fall 2003; pilot in March 2004
- Has been offered in Boston (pilot), Berkeley, St. Paul, Washington, and Los Angeles
- Scheduled to be offered at least four times in 2004
- Three TMIP seminars (activity modeling, validation, land use modeling) offered on consecutive days in same city

Seminar Contents

Seminar Objectives

Students should:

- **Understand the limitations of traditional trip based models**
- **Learn about existing activity and tour based modeling procedures**
- **Understand the concepts behind such models**
- **Be able to identify the ways in which these models are estimated and the data requirements**
- **Be able to discuss how activity and tour based models can be applied**

The “Unofficial” Objectives

- Really really make sure people understand the limitations of traditional trip based models
- Not use a lot of equations
- Don't oversell the concept

Seminar Outline

- **Limitations of trip based models**
- **Concept of tours and tour based models**
 - **Examples**
- **Activity based approaches**
 - **Examples**
- **Slide on each of several activity based models**
- **Comparison of trip based, tour based, and activity based approaches**

Definition of Activity Based Modeling

- Treatment of travel as a demand derived from the desire to participate in other activities
- Focus on sequences/patterns of behavior
- Households as decision-making units
- Examination of timing and duration of activities and travel
- Incorporation of spatial, temporal, and interpersonal constraints
- Recognition of interdependence of events
- Use of household/person classification schemes based on differences in activity needs, commitments, and constraints

Source: Kitamura (1996).

Activity Based Modeling

Relation to Tour Based Modeling

- All activity models are tour based, but not all tour based models are activity based
- Daily activity patterns have related travel patterns, which are expressed as tours
- Tours, as sequences of trips, can be modeled without modeling the underlying activity patterns (although most modern tour based models are activity based)

Two Types of Activity Based Models

Model Type	Econometric	Hybrid Simulation
<i>Search Stage</i> – What are the alternatives available to individuals?	Exhaustive (Feasible) or Simple Heuristic	Complex Search Heuristic
<i>Choice Stage</i> – How do individuals choose among alternatives?	Utility Maximization	Utility or Satisfaction
<i>Application</i> – How are the choices assigned to individuals?	Probabilistic	Rule Based
<i>Implementation</i> – How are the choices modeled?	Calculated Probabilities or Realization	Realization

Source: Based on Bowman and Ben-Akiva (1996).

Some of the Tour and Activity Based Models Described in Seminar

- Portland
- San Francisco
- New York
- New Hampshire
- Columbus
- Stockholm
- MIDAS
- ALBATROSS
- AMOS
- FAMOS
- TRANSIMS

Important Points about Activity Based Models

- Definition of the daily activity schedule
- Survey data needs for many existing activity based models are similar to those for trip based models
 - Every U.S. tour/activity based model has been estimated using a survey data set used or designed for a four-step model
- Treatment of:
 - In-home activities
 - Joint activities
 - Time of day

Microsimulation of Households/Persons

Why Do It?

- Conventional models are aggregate
- We model groups of “similar” households and attribute *the same behavior to all of them*
- It is possible to model the behavior of individual households and persons

Resource Requirements for Tour and Activity Based Models

	Same as trip based	Greater than trip based
Tour based	<p>Networks Zonal data Estimation data</p>	<p>Survey data processing Programming Model run times Consultant assistance</p>
Activity based	<p>Networks Zonal data Estimation data</p>	<p>Survey data processing Programming (>>) Model run times (>>) Computer memory (>>) Consultant assistance</p>

Summary – Tour Based Vs. Trip Based Models

- **Tour based models account for trip chaining**
- **Travel choices for trips within a tour are not treated as independent of one another in tour based models**
- **In tour based, easier to limit effects of sequential process**
- **More analytical capabilities in tour based models**
- **Model estimation data needs are similar (more processing required for tour based models)**
- **Custom programs needed, run times generally longer for tour based models (for now)**

Summary – Activity Based Vs. Tour Based Models

- In activity based models, demand is assumed to be for activities, rather than trip making (more realistic behavior)
- Activity based models can account for intra-household effects on travel behavior
- More analytical capabilities in activity based models
- Model estimation data needs are similar although more data needed for application of disaggregate (microsimulation) activity based models
- Run times and computing resource requirements greater for activity based models

Lessons Learned

Types of Participants

- **Wide range of modeling experience ranging from none (!) to more than me**
- **Participants:**
 - **MPOs (15, mostly large)**
 - **State DOTs (5)**
 - **Federal**
 - **Consultants**

What Participants Say

- **Vast majority of participants say that they would be more likely to recommend a tour/activity based approach for their agencies or clients**
- **Want to see more specifics on the models (maybe even hands-on examples)**
- **Many say they are already convinced of the shortcomings of conventional models**
- **There are a few “skeptics” who don’t see any problems with the four-step approach**

What Modelers Want

- **The answers to questions:**
 - How long will it take?
 - How much does it cost?
- **A comparison of a tour/activity based model and a four-step model for the same area**
 - Validation statistics
 - Sensitivity tests (including for things that trip based models might not be sensitive to!)
 - Time and resource requirements for model development
 - Hardware requirements and run times

So the Lessons Are...

- **People like that there are working examples, but we need more**
- **People are worried that these models seem to take lots of time and money**
- **There is a need for a comparative study between trip based and tour/activity based approaches**