FLORIDA STATEWIDE TOURISM TRAVEL DEMAND MODEL: DEVELOPMENT OF A BEHAVIOR-BASED FRAMEWORK

presented by
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Outline

• Introduction
• Peer Review - State of the Practice
• State of the Art in Tourism Travel Demand Modeling
• The Framework
• Data Sources
• Conclusion
Introduction

• Florida is the Top Tourism Destination in the World – 106 Million Visitors in 2016
• 1.2 Million People Employed by Tourism Industry
• Contributes $89 Billion to State Economy
• More Advanced Tools Needed to Forecast Visitor Trips and their Impact to Florida’s Transportation System

* Obtained from VisitFlorida
Previous Tourism Trip Component in the FLSWM

• 2000 and 2005 FLSWM contained a tourist trip generation model
• Utilized and applied growth factors to 2000 Florida Visitor Study’s daily in-state trips
  – Florida Residents visiting within Florida
  – Florida Residents visiting other States
  – Residents of other states visiting Florida
  – Canadians

Tourist Trip Generation Model

These steps deal with the tourist trips developed from the Florida Visitor Study
• Daily instate trips made by Florida residents
• Trips made by Florida residents to other states
• Trips made to Florida by residents of other states
• Trips between Florida and Canada by Floridians and Canadians
Peer Review – State of the Practice

• Peer Review of US Models with Tourism Component
  – NCHRP Synthesis 329: Integrating Tourism and Recreation Travel with Transportation Planning and Project Delivery [1]
  – TRB Peer Exchange: Statewide Travel Demand Modeling [3]
  – ASHTO White Paper: Statewide Travel Demand Forecasting [4]
  – NCHRP Report 735: Long-Distance and Rural Travel Transferable Parameters for Statewide Travel Forecasting Models [5]
  – NCHRP Synthesis 358: Statewide Travel Forecasting Models [8]
- Peer Review of US Models with Tourism Component

<table>
<thead>
<tr>
<th>State</th>
<th>Model Structure</th>
</tr>
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<tbody>
<tr>
<td>California</td>
<td>Tour-based</td>
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<tr>
<td>Kentucky</td>
<td>Three-step</td>
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<tr>
<td>Louisiana</td>
<td>Three-step Macro &amp; micro level</td>
</tr>
<tr>
<td>Mississippi</td>
<td>Three-step</td>
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<td>Virginia</td>
<td>Four-step</td>
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<tr>
<td>San Diego (SANDAG)</td>
<td>Tour-based Micro-simulation</td>
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</tbody>
</table>
Peer Review – State of the Practice

California Statewide Model

Outbound leg

Return leg

Home → Access mode → Access Station → Main mode → Egress Station → Egress mode → Primary Destination

Travel Choice → Tour Purpose → Party Size

Duration → Travel Day Status → Time Of Day

Destination → Main Mode → Access/Egress Mode
SANDAG Model

1. Visitor Tour Enumeration
   - Number of Visitor Parties by Segment
   - Number of Visitor Tours by Segment, Party Size, Income, and Travel Mode

2. Tour Level Models
   - 2.1 Time-of-Day Choice (Outbound & Return half-hour)
   - 2.2 Tour Destination Choice
   - 2.3 Tour Mode Choice

3. Stop Level Models
   - 3.1 Stop Frequency Choice
   - 3.2 Stop Purpose
   - 3.3 Stop Location Choice

4. Trip Level Models
   - 4.1 Trip Departure Choice
   - 4.2 Trip Mode Choice
   - 4.3 Trip Assignment

Input Land-Use and Network Level-of-Service Data
- MCRA Data
  - Households
  - Hotels/Occ. Rates
  - Employment by Type
  - Parking Cost
  - Parking Supply
  - Walk Distance to TAP
- TAP Skim Data
  - Level-of-Service by Mode and Time-of-Day
- TAZ Skim Data
  - Level-of-Service by Mode and Time-of-Day

Input Visitor Model Data
- Distribution of Visitor Parties by Segment and Party Size
- Distribution of Visitor Parties by Segment and Car Availability
- Distribution of Visitor Parties by Segment and Income
• Tourism Demand Models
  – Predict number of visitors or annual tourism expenditure for a specific region.
  – Great tie to the economic measures

• Tourism Travel Behavior and Activity Models
  – Explore different attributes of visitor travel
  – Predict activity-travel behaviors
Tourism Demand Modeling Approaches

• Time Series Models
• Gravity Based Approaches
• Artificial Intelligence Methods

![Graph showing time series data](image)

- Environment
- Experience
- Performance measure
- Response

- Theoretical distance decay curve
- Plateauing distance decay curve
Travel Behavior and Activity Models

- Mode Choice
- Destination Choice
- Time Allocation
- Expenditure Behavior
The Framework

- Tour-based Structure
- Differentiates Origin Source Markets
  - Intra-state Visitor Trips
  - Domestic Visitor Trips From Other States
  - International Tourism
The Framework

- 3 Modeling Layers
  - Tourist Synthesis
  - Tour Generation
  - Daily Trip Simulation

Tourist Synthesizer
- Long distance Intra-state Tourism Demand
- Domestic Tourism Demand
- International Tourism Demand
- Travel Purpose
- Travel Party Formation

Visitor Tour Generation
- Primary Destination Choice
- Travel Duration
- Main Mode & Access/Egress Mode Choice

Daily Trip Simulation
- Daily Trip/tour generation
- Tour/Trip Purpose
- Primary Destination Choice
- Destination choice for intermediate stop
- Stop frequency/purpose
- Time of Day Choice
- Stop Duration
- Mode Choice
- Network Assignments
Tourist Synthesis

Long Distance Intra-state Tourism Demand
- Econometric Model (e.g. MNL)
- Socio-economic data on households/individual

Domestic Tourism Demand
- Time Series (e.g. ARIMA)
- Historical Tourist Arrivals; Economic Characteristics of Origin and Destination;

International Tourism Demand
- Time Series (e.g. ARIMA)
- Historical Tourist Arrivals; Economic Characteristics of Origin and Destination;

Number of daily tourist trips to Florida by origin by time of year.
Tourist Synthesis (cont.)

Travel Purpose
- Vacation/Recreation (excluding cruise trips)
- Cruise Trips
- Visiting family/friends
- Business (including conferences)
- Special Events (Sporting events, festivals)

Econometric discrete choice models

Socio-economic attributes of origin;
Tourism attributes of destination

Travel Party Formation
- Gender
- Age
- Party Size
- Income

Decision tree model

Tourist arrivals; Travel Purpose; Origin Attributes

Simulated tourist arrivals and their main characteristics
Visitor Tour Generation

**Primary Destination Choice**

Two step process:
- Identify destination Geographic Area (DGA)
- Determine destination location within the area

Econometric Model (Joint or Sequential)

**Travel Duration**

Econometric approach

Attributes of visitor parties; Economic Characteristics of Origin and Destination;

**Main Mode & Access/Egress Mode Choice**

Econometric approach

Attributes of visitor parties; Economic Characteristics of Origin and Destination;
Daily Trip Simulation

• Replicates a typical activity-travel day of each tourist party during their stay
<table>
<thead>
<tr>
<th>Name of Data Source</th>
<th>Origin-Destination Trip Matrices</th>
<th>Activity Density</th>
<th>Economic Data</th>
<th>Socio-Economic Data</th>
<th>Travel Survey</th>
<th>Arrivals / Departures</th>
<th>Publicly Available</th>
<th>High Temporal Resolution</th>
<th>High Geographical Resolution</th>
<th>Brief Description of Data Source</th>
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<td>It provides visitor location data based on mobile device activity. Some important variables included in this dataset are trip purpose, household income and traveler type.</td>
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<td>American Express Business Insights</td>
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<td>It is a database based on transaction data from millions of cards. It can be used to understand economic impacts of tourists at different locations and identify share of tourism on Florida’s economy.</td>
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<td>American Travel Survey</td>
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<td>The survey was conducted to gather information about the long-distance travel of households / individuals living in the United States. Some important variables included in the survey dataset were income, travel party size, trip types, person-miles, person-nights, vehicle type, educational attainment, and mode.</td>
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<td>Amtrak State Economic Impact Brochures</td>
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<td>Amtrak produces annual data which provides station ridership information. Some important variables are trip purpose, economic characteristics like ticket revenue, value added.</td>
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<td>Application program interface (API)</td>
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<td>There are multiple APIs which can be utilized to know the tourist locations. The locations include intermodal transfer locations, recreation centers, shopping locations, restaurants and other tourist attractions. Some APIs which are identified are Google, MapQuest, Tript, Traxit and HERE.</td>
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<td>Bureau of Transportation Statistics - Airline Origin and Destination Survey (DB1B)</td>
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<td>This survey includes approximately 10% random sample of airline passenger tickets. The data provides information for each domestic itinerary of the Origin and Destination survey which includes the operating carrier, origin-destination airports, number of passengers, fare class, trip break indicator, distance, prorated market fare, market miles flown, carrier change and roundtrip indicator.</td>
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<td>Business Research and Economic Advisors</td>
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<td>Passenger surveys were conducted onboard ships of the Florida-Caribbean Cruise Association member cruise lines. The surveys were designed to collect hours spent ashore, expenditures for different categories, likelihood of returning for a land-based vacation and demographic characteristics of cruise passengers.</td>
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<tr>
<td>Name of Data Source</td>
<td>Origin-Destination Matrices</td>
<td>Activity Density Matrices</td>
<td>Economic Data Matrices</td>
<td>Tourism Related Data Matrices</td>
<td>Socio-Economic Data Matrices</td>
<td>Travel Survey Matrices</td>
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<td>Florida Ports Council Cruise Activity Data</td>
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<td>International Trade Administration-National Travel and Tourism Office- U.S Resident Outbound</td>
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<td>Official Airline Guide (OAG) Traffic Analyzer</td>
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<td>Smith Travel Research (STR, Inc.)</td>
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<td>Southeast Florida Transportation Council (SEFTC) 2016 Regional Travel Survey</td>
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<td>Streetlight Data</td>
<td>Streetlight provides visitor location data based on mobile device activity.</td>
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<td>Survey of International Air Travelers Program</td>
<td>The Office of Travel and Tourism Industries (OTTI) releases data on non-resident visitors to the U.S. The data is derived from in-flight surveys. Some of the important variables are information used for planning this trip, frequency of visit, trip purpose, transportation mode in U.S, demographics of visitor, occupation of visitor, trip expenditure and number of destinations visited during trip.</td>
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<td>Travel and Tourism Satellite Account (TTSAs)</td>
<td>The dataset has following data tables: production of commodities by industry, supply and consumption of commodities, demand for commodities type of visitor, demand for commodities by type of visitor, output and value added by industry, output by commodity, employment and compensation of employees by industry, employment by industry and real tourism output.</td>
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<td>U.S Travel Association Datasets</td>
<td>The different datasets are economic trends of tourism travel which include: state budget allocations for tourism, shares of lodging and industry across different regions, employment generated by tourism.</td>
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<td>Visa Vue</td>
<td>It provides a unique data which gives a breakdown of international visitors and their spending by origin country to a U.S destination. Enhanced data provides spending by market segment. Some important variables are origin country, U.S destination, total amount spent, number of transactions, transaction locations, market segment, spending level of users.</td>
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<td>Visit Florida</td>
<td>This data is a product of a survey. Visitor profiles are created for the following variables: mode, international and domestic travelers, activities participated in, people employed in tourism, season, activity participation, length of stay, age, income etc., travel party size, accommodation type, and average expenditure by day, trip purpose like business and leisure. Visit Florida provides following statistics too: Quarterly Visitors, Annual Visitors, and Historical Visitors, AADT through Common Corridors and Florida Tourism and Recreation Taxable Sales.</td>
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Conclusion

• Long distance tourism travel demand and behaviors are ignored or treated inadequately
• The framework provides an advanced approach to modeling tourist travel behaviors in Florida
• Considers different origin source markets related to the state’s tourism industry
• Capture behavioral factors and seasonality of tourist travels to Florida and simulate daily activity-travel behavior of tourists
• Flexible structure, Macro, Meso and Micro-level Modeling Layers
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