Management and Integration of Data and Modeling at Santa Clara County Congestion Management Agency

VTA Modeling and GIS Group
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Outlines

• Introduction
• VTA CMA and Modeling Group
• Organization of Data Development and Modeling at VTA
• Travel Demand Modeling
Introduction

• As the Congestion Management Agency, VTA is responsible for
  ✓ Managing and monitoring congestion on roadway facilities.
  ✓ Developing a comprehensive transportation improvement program among local jurisdictions that will reduce traffic congestion, improve land use decision making and improve air quality.
Introduction

• As the Transit Agency, VTA provides
  ✓ Bus and light rail transit services in Santa Clara County.
• VTA also has taxing authority:
  ✓ Administers the local sales tax measures that fund transit
    and roadway improvements.
Introduction

- One of the responsibilities of the CMA:
  ✓ Development and maintenance of a Countywide Travel Demand Model to estimate future transportation needs and impacts caused by growth in population and jobs.
  ✓ VTA model is used to support capital projects through all phases of both highway and transit development.

Examples:
- BART Extension to Silicon Valley
- El Camino Real BRT
- Express Lane Corridors
- Light Rail Efficiency Project
Modeling and GIS Group

• Travel Demand Forecasting Program:
  ✓ Developing and maintaining the VTA Countywide Travel Demand Models

• Geographical Information Systems Program:
  ✓ Web service, mapping, data analysis

• Data Collection Program:
  ✓ Mobile data, fleet data

• Survey Program

• Research and Development

• Public Partnerships (CCAG, Alameda CTC, Caltrain, SamTrans)
Key Steps of VTA Data Ecosystem

- Database Infrastructure - Open Source PostGreSQL & PostGIS
- Developing Activity Based Model
- Developing Cube Land Model
- Developing Open Data Portal
Key Steps of VTA Data Ecosystem

- Progress on Data Development:
  - Open Data Portal for Hack-a-thon/Public Sharing
  - American Community Survey
  - Association of Bay Area Governments (ABAG) land use projections and travel demand modeling input
  - GPS real time feed data from VTA bus fleet
  - Most data from the current GIS file folder, including parcel, CMP Networks and Intersections, Bike Facilities, Transit Facilities, etc.
Key Steps of VTA Data Ecosystem

• Research and Development
  ✓ Google API Transit Virtual Ride
  ✓ Open Trip Planner/Web + Mobile App
  ✓ Smartphone Data Collection Trip Diary Surveys
  ✓ Real Time Transit Application
VTA CMA Modeling and Analysis Group

**Cartography**
- Thematic Maps showing the recent Census or projected ABAG Social Demographic attributes
- Thematic Maps showing modeling results such as Emission, LOS and transit usage/benefits, etc.

**Data Development & Integration**
- Census
- OSM
- Proprietary GIS Data Obtained through MTC
- Data from various other sources: County, ABAG, Caltrans...

**Analysis**
- Allocation of the Census or ABAG data into VTA Traffic Analysis Zones
- Extraction of social demographic statistics for the area with various planning interests such as transit station area, transit/bike corridor

**PostgreSQL+ PostGIS Database**
- VTA Modeling related GIS data
- Real time GPS info
- Data for others

**Land Use Model**
- CUBE LAND
  - Under Construction...
  - Population Synthesizer
  - Mobility Choices
  - Model Outputs
  - Model Inputs
  - Long-term Choices
  - Daily Activity Pattern
  - Trip Assignment

**Activity-Based Travel Demand Model**
- Under Construction...

**EMFAC (CARB) Emission Model**
- Under Construction...

**Trip-Based Travel Demand Model**
- Trip Generation
  - Highway Network
  - Walk Trips
  - Mode Choice
  - Assignment
  - Bike Trips
  - Bike Output
  - Transit Outputs
Trip Based Model

- Consistent with the Metropolitan Transportation Commission (MTC) regional model, BAYCAST-90
- Emission Model and Land Use Model Integrated into VTA Trip-Based Model.
Trip Based Model

Emission Model

- Non-Truck Vehicle-Miles Distribution by Speed Bins
- Truck Vehicle-Miles Distribution by Speed Bins
- EMFAC 2011 (CARB)
- Non-Truck Emission Factors
- Truck Emission Factors
- Emissions Outputs

Travel Demand Model

- Land Use Data
- Trip Generation
- Highway Network
- Trip Distribution
- Mode Choice
- Walk Trips
- Assignment (Auto & Transit) Trips
- Bike Trips
- Highway Output: Drive Alone, Shared-ride 2, Shared-ride 3+, Small Truck, Medium Truck, Large Truck, Park and Ride
- Transit Output: Walk Access, BART, Commuter Rail, LRT, Express Bus, BRT, Local Bus
- Transit Output: Drive Access, Park and Ride, Kiss and Ride

VTA Trip-Based Model and Emission Model
Activity Based Model

- Based on Metropolitan Transportation Commission (MTC) regional activity based model (Travel Model One) for nine-county San Francisco Bay Area using Coordinated Travel – Regional Activity Based Modeling Platform (CT-RAMP) and programs.

- Components of the model were transferred from models previously developed for the San Francisco County Transportation Authority (SFCTA) and Atlanta Regional Commission (ARC).
Activity Based Model

- Population Synthesizer: Simulate individual travel with inputs of synthetic household and population files.
- Inputs of Population Synthesizer: Summary File 1, Summary File 3, Census Transportation Planning Package (CTPP), American Community Society (ACS), and Public Use Microdata Sample (PUMS) data.
Activity Based Model

- Computing Environment and System Design: one main machine with three satellite machines - high memory and high-speed CPU are required to simulate every household and person
- Current Progress: Integrate VTA’s TAZ structure, highway and transit coding into MTC regional model.
- Recalibrate and Validate Models
- Next Challenge: Improve model running efficiency.
Activity Based Model

Flow Chart of Activity-Based Model
Questions?

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Thank You!