Interactive Data Visualization Tools for Travel Demand Model Datasets

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Transportation system analysis and forecasting are critical components in the regional transportation planning process.

Analysis of current travel patterns
Forecasts of future travel demand

MAG Modeling Area
Area: 16,080 Square Miles
Population: 4.9 Million
Employment: 2.1 Million

MAG Metropolitan Planning Area
County Boundary
Online interactive visualization is the trend

- We searched through DOTs and large MPOs websites in late 2015: All DOTs and 90%+ of large MPOs have at least one data visualization online for their transportation-related data.

- This has been the direction we are heading in for our transportation-related data.

- MAG Transportation Data Management System
  [www.magtrans.org](http://www.magtrans.org)

- MAG Bottleneck Study
  [BottleneckStudy.azmag.gov](http://BottleneckStudy.azmag.gov)
Translating \textit{geospatial data involved to easy-to-digest insights} could be challenging.
Case Study: MAG Next Generation Freight Demand Model

Funded by FHWA SHRP2 C20 IAP Grant, a joint proposal by ADOT, MAG, and PAG to build a proof-of-concept, advanced freight demand model.

Modeling and Data Consultant Team: Cambridge Systematics, RS&H, ATRI, CDM SMITH, StreetLight

Challenges

- Various data types:
  - OD matrix (trucks, goods)
  - Link-level truck volume
  - Trajectory (Truck GPS data)

- Various geographic level
  - International
  - National
  - Regional

- Various modeling components/layers

- Limited resources (i.e. time, money, staff) allocated for visualization

Wish List

- Customizable/Flexible

- Quick turnaround
  "We want something cool to present next week."

- Low costs
  "Can we do it in-house?"

- Easy to deploy
  "Can you do it yourself?"
Live Demo

- Live demo is replaced by the following screenshots in this downloadable version of slides.
Polygon Feature Extrusion: Number of simulated employment per TAZ
Desire Line: Commodity Flow by Type of Goods
Interactive Desire Line: Trucks Flow OD Matrix
Volume Map Comparison: Trucks Volume
Truck GPS Traces Animation

External Trucks
629 trucks

From Northern Arizona

From Nevada & California →

← From New Mexico
Truck GPS Heat Map
Simple Workflow

1 Staff 1 Week, From Scratch to Prototypes to Presentable Visualizations

Modeling Input/Output

Post-Processing

Data File

csv, json, etc.

JavaScript

Behavioral

CSS

Presentational

HTML

Structural

Spatial Files

(ESRI shapefile, TransCAD network, etc.)

Format Conversion

Spatial Info

GeoJSON
Open Source Libraries make visualization development much easier and faster

▪ Leaflet: http://leafletjs.com/
  ▪ The leading open-source library for interactive maps.
  ▪ A wide range of plugins for visualizing geospatial data beyond simple mapping.
    ▪ MovingMarker: trajectory animation
    ▪ Heat: heat map
    ▪ SpatialSankey: interactive desire line
    ▪ MarkerCluster: automatically cluster points at different zoom level.

▪ Mapbox GL JS: https://www.mapbox.com/mapbox-gl-js/api/
  ▪ Rendering interactive maps in 3D while allowing users to control the perspective.
  ▪ Data-Driven Styling: Style spatial features (point, polyline or polygon) with different color, width/radius, and extrusion height, based on associated data.
Web Development Technology is advancing fast

We don’t need to be a web developer ourselves, but

Low Costs, Big Impacts Visualization Projects
Thank you!
Questions?

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