GeoVisualization of Automobile Congestion

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AGILE: GeoVisualization of Dynamics, Movement, and Change
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The next 10 minutes...

- What is Traffic Visualization
  - Data collection and workflow
  - Pre-trip and en route uses
- Unfolding events
- New depictions of mobility in space
- Discussion Questions
Motivation

• Previous research indicates
  – Driver behavior and overall system performance benefit from real-time information provision to drivers
  – Design variables can influence interpretation and travel behavior

• How do we improve design and driver behavior?
Traffic Visualization

• Real-time traffic maps
• Component of Advanced Traveler Information Systems
• Dynamic displays of network conditions
• Potentially among the most used visualizations in the world
Traffic Data

- Data often comes from Inductive Loop Detectors (ILD)
- Aggregate data include:
  - Average velocity
  - Flow (# of vehicles / 5-minutes)
  - Occupancy
Uses and users

• Traffic visualization uses:
  – Wayfinding, route selection, congestion assessment, congestion avoidance, departure selection timing, fleet management, evacuation assistance

• We focus on:
  – Individual drivers in pre-trip scenarios
  – Individual drivers in en route scenarios
Individual Drivers

• Pre-trip: assess conditions along a single, or multiple prospective routes
Individual Drivers

• Pre-trip: assess conditions along a single, or multiple prospective routes

• En route: evaluate conditions along current route, weigh potential diversion strategies
2 issues with traffic visualization

• Traffic events: definition and detection
• Relevance and traffic visualization
  – Limitations of stage-one snapshots
  – Isochrones and forecasting
Traffic Events

• What constitutes a traffic event? What is traffic?
• Pre-trip and en route users interested in “unfolding events”
• Events are conventionally detected at their end times (Galton 2002)
• Traffic-event-detection strategies only query at one time interval, disregarding measurements from previous atomic intervals, making it difficult to visualize trends, anomalies, or changes.
Stage-one, relevance, movement, and mobility

- Distance-decay and relevance
  - Dynamic attributes (Weather, traffic)
- Snapshots deliver irrelevant information
User assesses mobility potentials at $T_1$, makes wayfinding decisions at $T_1$

Mobility event occurs along path at $T_2$, previous visualization irrelevant

AGILE workshop:
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Sinton 1978: The inherent structure of information as a constraint to analysis

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(x, y, t, a)
\]

location theme (attribute)

Conventional approaches to location-based mapping neglect the influence of mobility on future geographic observation.

\[
(x, y, m, t, a)
\]

location theme (attribute)

Mobility influences an individual’s locational, temporal, and thematic experiences
Traffic data as mobility potential

• Distance is “the cost of separation”
• Time-cost is important in 2008
• Traffic data, as a proxy for mobility potential, can help calculate time-cost
• The interaction of two distance surfaces:
  – Conventional distance (congruence)
  – Travel time distance
Discussion Questions

1. What about mobility in GeoVisual Spatial Analytics? - “Real-time” can be antiquated, and inadequate

   Spatially-aware displays that employ snapshot approaches are vulnerable to relevance decay.
   
   Example: In-vehicle-navigation with “real-time” traffic.

2. How can we blend active databases, forecasting, spatial awareness and graphics technologies to create thematic isochronic displays?