**Introduction**

- **Motivation**: According to the annual transportation report [1], approximately 50% of freeway congestion is caused by non-recurring issues, such as traffic incidents, weather, special events.
- To avoid such congestions, we aim to predict the impact of events. The predicted result can be either used by a driver directly to avoid potential gridlocks or consumed by a smart route-planning algorithm.

**Event Impact Prediction**

- **Problem Definition (Propagation phase)**
  + Given an even just happened, what is the impacted distance (with speed decrease no less than Δν%) in the next t minutes?
  (Input: Event reports, sensor readings Output: behavior vector)

- **Proposed Solutions & Sample Training Result**
  + Opt 1: matching Event Attributes with previous event (EA)
    1) retrieve current event attribute(s)
    2) find historical events with same attributes
    3) use their corresponding behavior vector for prediction
  + Opt 2: matching the first 5-min Propagation Behavior (PB)
    1) cluster the behavior vector from all historical events
    2) get the first 5-min propagation behavior from current event
    3) use the closest cluster centroid for prediction
  + Opt 3: matching both attributes and 5-min behavior (EA+PB)
    1) Cluster based on both behavior vector and event attributes
    2) & 3) same with option 2.

  Note: the training result is based on events and sensor data collected in 06/2012

**Prediction Result on traffic collision events**

- Case 1: 07/02/2012 (Mon) 15:20 / on I-405 North at West LA
- Case 2: 07/07/2012 (Sat) 18:19 / on I-5 South at Central LA

**Case Study**

- **Sample Traffic Collision Event**
  + Location: I-5 S. at Colorado Blvd.
  + Time: 10/30/2012(Tue) 3:00 PM

**Impact Measurement:**

  + Speed Change Ratio:
    \[
    \Delta \nu = \frac{\text{avg}(\nu_i) - \nu_i}{\text{avg}(\nu_i)} \times 100\%
    \]

**Observations:**

- further from event location later the speed decrease
- further from event location shorter the impact period

**Event Propagation Modeling**

- **Project the propagation from 3D to 2D (fix the speed decrease)**

- **Piecewise fitting (propagation phase, clearance phase)**
  \[
  g = \begin{cases} 
  h_1(x) & x \leq t_0 \\
  h_2(x) & x > t_0 
  \end{cases}
  \]
  \[h_1(x): \text{propagation phase} \]
  \[h_2(x): \text{clearance phase} \]

- **Behavior Model Construction**
  In Propagation phase:
  Behavior Vector (\(d\)) is defined as
  \(<d_0, d_1, ..., d_{30}>\)
  for the first 30-minute propagation

  The fitting function is used to interpolate

**Related Research**

- Predicting accumulative delays and impact region for traffic incidents with fixed thresholds
- Predicting a single clearance time for traffic accidents

**Future Work and Reference**

- Include more event attributes for the propagation behavior prediction
- Model and prediction events’ clearance behavior

[1] FASANA MOTION.
http://www.metro.net/board/Items/2012/03_March/20120322RBM item57.pdf