ANALYZING IMPACT OF I-85 BRIDGE COLLAPSE ON REGIONAL TRAVEL IN ATLANTA

Masoud Hamedi, Sepideh Eshragh, Mark Franz, Przemyslaw Michal Sekula
{masoud, eshragh, mfranz2, psekula} @ umd.edu

Research Objective:
To demonstrate application of Big-Data analytics for quantifying, analyzing and visualizing impact of the I-85 bridge collapse in Atlanta on the surface road network performance.

I-85 Bridge Collapse

In the evening of March 30, 2017, there was a massive fire under heavily travelled Interstate 85 (I-85) Bridge in Atlanta, Georgia. Flames reached 20 ft high and a thick black smoke was visible from the distance, resulting in partial collapse of the bridge deck during rush hour.

The Aftermath

In a report published by Atlanta Journal-Constitution (AJC), on top of the direct damage costs, the bridge collapse would affect nearby businesses, change commuter patterns and impact job growth in a city where the construction sector is soaring.

In order to repair the 100 feet long section of the bridge, approximately two miles of I-85 between the I-75 split and the interchange with SR-400 was shut down in both directions.

Data Preparation

I-95 Corridor Coalition’s Probe Data Analytics (PDA) Suite was used to retrieve data for:
- Before collapse: Feb 13, 2017 to March 29, 2017
- During reconstruction: March 31, 2017 to May 23, 2017
- After resuming service: May 24, 2017 to June 27, 2017
- Corresponding time period in previous year: Feb 13, 2016 to June 27, 2016

In total approximately 44 GB worth of data containing more than 228 million records were retrieved.

A GIS channal with detail information on the geometry, length and location of TMC segments was also downloaded for spatial analysis and visualization of the results.

Bottleneck Analysis

A bottleneck, as defined by the PDA Suite, occurs when, “the speeds observed for a roadway segment drop below 60% of the free flow speed for a period greater than 5 minutes. Adjacent roadway segments meeting this condition are joined together to form a bottleneck queue. The duration of the bottleneck is calculated for each roadway segment, and the times the speeds are greater than 60% for more than 5 minutes. This definition uses minute-to-minute speeds available across the highway system to determine congestion patterns for the entire day.”

Impact factor = Average duration (in minutes) x Average max queue length (in miles) x Number of occurrences.

Regional Travel Time Reliability Analysis

Travel time reliability analysis is an effective method for measuring uncertainty associated with speed variability caused by congestion. Texas Transportation Institute defines Travel Time Index (TTI) and Planning Time Index (PTI) for congestion and reliability as following:

TTI = \frac{average travel time}{free flow travel time}

PTI = \frac{90th percentile travel time}{free flow travel time}

Conclusions

✓ Changes in congestion levels, bottleneck locations, and mobility performance measures are successfully captured and reflected by probe data.
✓ Statistical distribution parameters of travel time index and planning time index can be used as a proxy for network resiliency, and makes it possible to quantitatively compare resiliency of different travel directions in a network, or compare resiliency among different networks affected by major link closures.

Data used in this study and bottleneck analysis tools were made available by I-95 Corridor Coalition as part of their Vehicle Probe Project. The results and conclusions in this document are those of the authors and not the I-95 Corridor Coalition.