



Project Summary

Texas Department of Transportation

0-5485: Incorporating Historical Incident Data into Incident Detection and Performance Measures at Transportation Management Centers

Background

Traffic incidents continue to be a major source of congestion and delay in most major metropolitan areas in Texas. The Texas Department of Transportation (TxDOT) has made a significant investment in developing and deploying advanced transportation management systems (ATMS) throughout Texas. These systems generate and archive considerable amounts of traffic operations data and information about the impacts of and responses to incidents.

While there is a growing amount of historical data, relatively little has been done to explore the potential of these data and incorporate them into applications that can assist day-to-day operations at transportation management centers (TMCs). Differences in configuration, deployment, and data management across Texas TMCs add complexity to this issue.

To respond to a growing interest in identifying areas where these data could be used to improve TMC operations, TxDOT needs to assess how they could use incident data to improve incident management and performance measures at TMCs.

What the Researchers Did

Researchers developed a guidebook, to provide TxDOT with methodologies and procedures for effective use of historical incident data collected at Texas TMCs. The guidebook covers two major types of analyses: evaluation/planning and predictive analyses.

For the evaluation/planning type, this guidebook provides:

- guidelines for reporting incident characteristics,
- methodologies for analyzing hot spots,
- methodologies for estimating incident impacts, and
- guidelines and procedures for calculating performance measures.

For the predictive type, this guidebook describes:

- methodologies for predicting incident duration using incident characteristics, and
- methodologies for predicting incident-induced congestion clearance time using combined historical and real-time traffic data.

Researchers then conducted case studies using the procedures outlined in the guidebook and the data collected from three Texas TMCs: Houston's TranStar, Austin's Combined Transportation and Emergency Communications Center (CTECC), and Fort Worth's TransVision.

Research Performed by:

Texas Transportation Institute (TTI),
The Texas A&M University System

Research Supervisor:

Praprut Songchitrukka, TTI

Researchers:

Kevin Balke, TTI
Chi-Leung Chu, TTI
Geza Pesti, TTI
Xiaosi Zeng, TTI
Yunlong Zhang, TTI

Project Completed: 8-31-08

All three TMCs have their own specifications for collecting traffic and incident data. The case studies conducted at these three TMCs represent the majority of the types of analyses and applications that could also be conducted at other Texas TMCs.

What They Found

The researchers recommend that TxDOT consider the following in applying the evaluation/planning analysis modules of the guidebook:

- Key considerations for reporting incident characteristics are the type of data, time scale used in the analysis, data validity, reporting objectives, and reporting frequency.
- Depending on the analysis objectives, incident frequency may not always be the best indicator of hot spot locations.
- The delay index can be used to measure travelers' perceptions of incident impacts.
- Multiple metrics can be used to describe the performance of the facilities and operations of the TMCs. Potential uses of these metrics include traveler information provision, operations evaluation, resource evaluation, safety evaluation, monitoring, planning, and customer satisfaction measurement.

Researchers recommend that TxDOT consider the following in applying the predictive analysis modules of the guidebook:

- Incident type and lane blockage characteristics were the most critical to the development of the incident duration prediction models.
- Incident-induced congestion clearance time can be predicted using the combined historical and real-time traffic data and the characteristics of an ongoing incident.
- Analysis indicated that the method for predicting incident-induced congestion clearance time is most sensitive to the estimated incident duration and the incident-induced traffic diversion rate.

Researchers recommend that TxDOT consider the following suggestions to enhance the utility of the incident database for incident management and performance monitoring efforts:

- Record the number of lanes blocked along with the total number of lanes available at the incident location.
- Develop consistent definitions of all incident data attributes and standardized data entry procedures for Texas TMCs.
- Traffic and weather data are generally available in real time but from different data sources. Consider integrating snapshots from these two types of data directly into the incident database.

What This Means

Researchers found that TMCs can effectively use historical incident data to support the incident management and performance evaluation process, both reactively and proactively. Some procedures need to be automated to be used efficiently in day-to-day operations. This project developed various prototype tools to facilitate and automate the proposed methodologies, including the incident duration and incident-induced congestion clearance prediction tools. Case study results have successfully demonstrated the potential of the guidebook, and the prototype tools have provided a platform for TxDOT to deploy the research results in the future.

For More Information:

Research Engineer - Wade Odell, TxDOT, 512-465-7403
Project Director - David Fink, TxDOT, 713-881-3063
Research Supervisor - Praprut Songchitruksa, TTI, 979-862-3559

Technical reports when published are available at:
<http://library.ctr.utexas.edu/index.html>

www.txdot.gov
keyword: research



This research was performed in cooperation with the Texas Department of Transportation and the Federal Highway Administration. The contents of this report reflect the views of the authors, who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official view or policies of the FHWA or TxDOT. This report does not constitute a standard, specification, or regulation, nor is it intended for construction, bidding, or permit purposes. Trade names were used solely for information and not for product endorsement.