Project Summary

Texas Department of Transportation

0-5257: Strategies for Managing Transportation Operations Data

Background

Operating and managing the transportation network generates enormous quantities of data. Examples include real-time and archived intelligent transportation system (ITS) data; work zone and lane closure data; maintenance data; signal system data; traffic count data; crash data; aerial photography; and drawings depicting features such as highway alignments, pavement markings, ITS equipment, and traffic signal equipment.

Frequently, data formats are incompatible and the data reside on incompatible storage media with different levels of accuracy and resolution. As a result, districts are finding that managing their operations data is an increasingly difficult task, which is only getting worse as the amount of data produced continues to grow. This situation makes it challenging for district personnel to be familiar with the wealth of data at their disposal and the applications/procedures that make use of the data.

What the Researchers Did

The researchers surveyed current and potential operations data users to characterize their data needs and review pertinent data management practices and implementation plans at the Texas Department of Transportation (TxDOT). The researchers surveyed a broad range of internal and external data users from four TxDOT districts: El Paso, Houston, Laredo, and San Antonio. The research included two surveys: a short, preliminary survey and a long, detailed survey.

The purpose of the short survey was to find out data subjects of interest to individual users and to identify target participants for the more detailed survey. The purpose of the long survey was to assess data needs by collecting detailed information about topics such as data needs, justification for using the data, specific data elements needed, geographic scope of interest, temporal and spatial resolution, geographic reference, data source and data collection method, and access method and frequency. The researchers developed a database representation of the survey data to assist in the compilation and analytical process. The result is a data model and tool to capture, characterize, and analyze transportation operations data needs and flows that, at the same time, could facilitate the development of strategies to help optimize transportation operations data processes.

The research also included an assessment of transportation operations data management procedures and systems in California, Florida, Virginia, and Washington.

What They Found

The short survey included a list of 46 different data subjects. The top five data subjects of interest to all users were detector volume data, travel time and detector speed data, crash data, freeway incident data, and aerial photography data.

Research Performed by:

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

Research Supervisor:
Cesar Quiroga, TTI

Researchers:
Robert Benz, TTI
Robert Brydia, TTI
Khaled Hamad, TTI
Rajat Rajbhandari, TTI
Srinivasa Sunkari, TTI
Shawn Turner, TTI

Project Completed:
8-31-06

This result is not surprising because a substantial number of users surveyed were associated directly or indirectly with transportation management center (TMC) activities. Users expressed considerable interest in aerial photography, even though aerial photography is a data resource not "normally" associated with transportation operations. Other data subjects of interest were freeway incident data, dynamic message sign data, and traffic signal operation and control data. With respect to traditional traffic engineering data subjects, the top five subjects of interest to all users were aerial photography, crash data, traffic signal operation and control data, intersection vehicle count (turning volume) data, and intersection geometrics and control data. Additional data subjects included roadway inventory data and traffic simulation data.

The long survey revealed interesting variations with respect to user relevance of data subjects, use type (real-time data versus historical data), and level of aggregation (spatial and temporal). Users outside TMCs indicated an interest in using TMC data if a tool to query and download the data in a useful format is available and easy to use. The long survey also helped to identify a number of potential areas for improvement. Examples include collecting additional data elements traditionally not provided, developing new practices to provide metadata for users, developing strategies to avoid duplication in the collection and management of transportation operations data, and developing formal data models for ITS infrastructure and signals.

What This Means

The research identified several recommendations to help optimize the management of transportation operations data:

- Use electronic document management systems to manage transportation operations data.
- Implement good metadata practices.
- Implement data quality mechanisms.
- Develop geographic information system (GIS)-based ITS device inventories with ties to real-time and archived ITS databases.
- Increase the use of online and offline GIS-based mapping components to support TMC operations.
- Develop user-friendly, web-based interfaces for users to access, query, and retrieve archived ITS data.
- Leverage and/or augment the capability of existing web-based platforms at TxDOT to manage and disseminate transportation operations data.
- Archive transportation operations data at the finest disaggregation level possible.
- Develop guidelines and templates for the preparation of agreements between TxDOT and other agencies describing data access and responsibilities.
- Develop comprehensive traffic signal data models.
- Develop a lane closure data model to address district needs and TxDOT highway condition reporting needs.
- Develop procedures, data models, and implementation roadmaps for integrating traffic signal and freeway operations data.

For More Information:
Research Engineer - Wade Odell, TxDOT, 512-465-7403
Project Director - Bill Jurczyn, TxDOT, 210-731-5132
Research Supervisor - Cesar Quiroga, TTI, 210-731-9938

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

Texas Department of Transportation
Research and Technology Implementation Office
P.O. Box 5080
Austin, Texas 78763-5080
512-465-7403