Project Summary

Texas Department of Transportation

0-5686: Utilizing the Data Collected at Traffic Management Centers for Planning Purposes Through Non-Traditional Sources and Improved Equipment

Background

Intelligent transportation systems (ITS) infrastructure automatically records vast amounts of traffic data, which is highly useful for a variety of applications if properly archived. Induction loops are still the most common, although newer technologies continue to improve and have been successfully deployed. Since these devices are automated, this data is typically collected continuously and at a relatively fine temporal resolution.

It is easy to find applications for a data set of this sort, especially in regions where spatial coverage is high. A common use is in operational studies, such as before-and-after evaluation of traffic management strategies. More recently, it has been suggested that transportation planners can use ITS data sets to assist in generating annual average daily traffic (AADT) counts. Many other applications exist for calibrating planning models, validating mode choice and route choice models, and evaluating work zone channelization plans, to name just three.

Four prime advantages of using ITS data for this purpose are increased coverage, more accurate statistical inferences, diminished safety risks to agency personnel collecting manual data, and the elimination of inefficient "double counting" of traffic volumes by personnel in different agency departments. For these reasons, the Texas Department of Transportation (TxDOT) is interested in the feasibility of archiving and sharing ITS data.

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What the Researchers Did

Several other agencies have created centralized data archives. The researchers began by examining these case studies in detail, and identified factors contributing to data sharing successes as well as challenges that had to be overcome. In particular, it was clear that developing a state-of-the-art data archive required innovation in three major areas: organization, methodology, and technology.

Organizational innovation is needed to decide how data should be stored, and how responsibilities should be assigned, in order to maximize the archive's usefulness for a broad set of applications.

Methodological innovation, in terms of statistics or other quantitative procedures, is needed to ensure the data is useful and generates useful models. The most significant issue is related to data quality—if incorrect data cannot be marked as such, the quality of the archive will suffer.

A second key issue involves estimation of missing or suspicious data, and developing statistical procedures that allow accurate imputation based on contemporaneous observations.

Technical innovation is well underway in the field of traffic data collection and many new detector types are either under development or currently being implemented. If the archive is to be useful well into the future, it cannot be "locked in" to a single technology. Instead, the researchers identified trends in ITS data collection, and sought to design a system that functions well with both current detectors (typically inductive loops) and with a broad spectrum of devices, which are currently under development.

After addressing the above questions, the research team developed a prototype system, which obtained data from two detectors in the Houston area: an automated traffic recorder (ATR) operated by TxDOT's Transportation Planning and Programming Division, and a side-fire radar detector operated by the Houston Traffic Management Center. This data was converted to a common format and stored in the archive. A web interface was developed to allow access, and the methodological techniques developed in this research were tested on the data.

What They Found

In past experience, the barriers to successfully implementing data sharing are primarily institutional rather than technological. Additionally, the researchers successfully created a working archive on a small scale, indicating feasibility of this type of system. Therefore, it is crucial to clearly explain the benefits of such a system, and to design it with all of the involved parties in mind.

In developing the prototype system, the best way to handle input data from different types of detectors (and to ensure flexibility regarding future technological developments) was to develop a common data format and to standardize all incoming data. From the standpoint of maximizing the archive's value for multiple applications, a PostgreSQL database was found to be extremely useful, since it interfaces well with other programming languages, allowing easy generation of application-specific reports.

Reliability and quality were also identified as major issues in ensuring the credibility of archived data. The researchers found that by applying three different kinds of checks, suspicious data could be identified with greater accuracy. Statistical techniques for estimating missing data were found to function well, especially when further aggregation occurs, as when adding an entire day's worth of volume counts to calculate AADT.

What This Means

Given the technical feasibility of implementing a data archive, as illustrated by the prototype system, and given the potential benefits of a rich data source to transportation planners, operations personnel, and others, the advantages of implementing a shared archive should be evident. Additionally, the researchers' tests showed that statistical techniques can be used to "fill in" missing data with a high level of accuracy, especially when generating daily volume counts. Although institutional barriers may still exist, the future outlook for this type of data sharing is bright, and there are significant benefits that can be reaped.

For More Information:
0-5686-1 Archiving, Sharing, and Quantifying Reliability of Traffic Data

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