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Highway Safety: Improved Monitoring and Oversight of Traffic Safety Data Program Are Needed

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Springer Nature

Each state in the United States can be viewed as a universe of road segments. For each road segment in each state, it is desired to know various traffic characteristics based on count data, classification count data, and weigh-in-motion data. These data are absolutely essential for highway design, maintenance, safety, and planning. Given no cost constraints, each road segment would be continuously monitored every day of the year. However, in practice, a few road segments are monitored continuously every day of the year to produce annual characteristics of traffic flow. The remaining road segments are monitored for one or two days each year, and this resulting data are'adjusted' (using factors based on data collected from the continuously monitored road segments) to produce estimates of annual characteristics. With this general approach, each state strives to provide estimates of annual

characteristics for each road segment within its jurisdiction. In 1985, the Federal Highway Administration (FHWA) published the Traffic Monitoring Guide to assist states in achieving this end. As with almost any data collection effort, the monitoring data suffers from errors from many sources. In this paper, we report some empirical findings in a research project sponsored by the FHWA. This research project studied the variability in the traffic data from the continuously monitored road segments from state(s) and, the extent to which this variability is transferred to and affects the precision of the data produced from the road segments which are monitored only one or two days each year. The ultimate hope is that states will eventually be able to not only publish an estimate of a characteristic such as Average Annual Daily Traffic (AADT) for each road segment, but also that each estimate will be accompanied by a statement expressing how good the estimate is in terms of its estimated variability or precision, which will likely be expressed as a coefficient of variation.

Traffic Monitoring Guide CRC Press

Numerous factoring and baseline values are required to ensure annual average daily traffic (AADT) data are collected and reported correctly. The variability of numerous methods currently used are explored so that those in the traffic community will

clearly know the limitations and the extent of each method used and how to properly utilize methods for their agency to obtain the necessary results. Federal Highway Administration (FHWA) Travel Monitoring Analysis System (TMAS) data from 14 years consisting of 24 hours of the day and 7 days of the week volume data from over 6000 continuous permanent volume traffic data sites in the United States comprised the reference dataset for this research. Randomly selected (with some constraints) sites each include one year of 100% complete daily reporting and the set of sites represent 12 functional classes, years 2000 through 2013, 43 states and DC, and various volume ranges. Four AADT estimation methods were examined for accuracy when data from various time periods were removed. This report is a final task report that summarizes identified inaccuracies with current methods that are used for AADT estimation, and includes the analysis methodology and summary statistics findings.

1990 Survey of Traffic Monitoring Practices Among State Transportation Agencies of the United States American Association of State Highway & Transportation Officials

This synthesis report will be of interest to DOT administrators, supervisors, and staff, as well as to the consultants that work with them. Metropolitan Planning Organization (MPO)

regional and local agency staffs might also find it informative. The synthesis was initiated in response to a recommendation made during the Highway Performance Monitoring System (HPMS) Reassessment, which was undertaken by the FHWA in 1997/1998 to expand data sharing and partnering more widely among states, MPOs, and local governments. It documents current arrangements among state DOTs, MPOs, and other local and regional agencies to partner in the collection and share in the use of HPMS data. Key elements examined include institutional arrangements, the use of data and data sharing, cost and resource requirements, technical capabilities/barriers, implementation processes, and data quality and capability, as well as successes, failures, and difficulties. Case studies of successful state and MPO partnerships are included.

Code of Federal Regulations American Association of State Highway & Transportation Officials

This report examines the quality of state crash information; the activities states undertook using 411 grant funds to improve their traffic safety data systems, and the progress they made using the grant funds; and NHTSA's oversight of the grant program.

Traffic Monitoring Guide Transportation Research Board

The deployment of Intelligent Transportation Systems (ITS) that incorporate some type of

data collection or traffic surveillance capabilities has been rapidly increasing over the past decade. More recently it has been recognized that these data collection systems can be used as additional sources of mobility data, augmenting traditional data sources such as relatively sparsely distributed permanent count stations and supplementary 48-hour volume counts. Most of the research conducted to date has focused on data archiving systems that have freeway system data collection equipment as their primary data source. However, little is known about the feasibility of using advanced signal control systems (ASCSs) as sources of mobility data. A possible cause for the relative inattention to the use of advanced signal system equipment is that using an intersection as a source for road segment volume counts is contrary to conventional traffic data collection principles, which stipulate that road segment volume counts be taken outside the influence area of intersections. The purpose of this research was to determine if data collected from an advanced arterial signal control system could be used to generate information that would be useful for transportation engineering analyses other than signal optimization and control. This research also looked at some of the technical challenges and limitations to using data collected by an arterial signal control system and presents an analysis of the validity of

the data. The premise investigated is that data from signal control system surveillance equipment can be used to calculate daily volume counts for a roadway segment. This premise was tested by screening and aggregating data from signal system data collection equipment and comparing it with data from traffic monitoring equipment located in close proximity to the intersections being analyzed. The results of this research support the conclusion that reasonable volume estimates can be generated from system detectors located upstream of the intersection stop bars if the system detectors are deployed on all major approach through lanes. This research also demonstrated that the utility of ITS data requires more than simply the deployment of ASCS or other ITS data collection equipment. In order for an ITS archived data management system to be successfully implemented, the data product needs of the end users must be considered in the design and deployment of the traffic monitoring and control system, as well as the data management system.

Highway Traffic Monitoring and Data Quality Highway Traffic Monitoring and Data Quality

This book introduces the concepts of mobility data and data-driven urban traffic monitoring. A typical framework of mobility data-based urban traffic monitoring is also

presented, and it describes the processes of mobility data collection, data processing, traffic modelling, and some practical issues of applying the models for urban traffic monitoring. This book presents three novel mobility data-driven urban traffic monitoring approaches. First, to attack the challenge of mobility data sparsity, the authors propose a compressive sensing-based urban traffic monitoring approach. This solution mines the traffic correlation at the road network scale and exploits the compressive sensing theory to recover traffic conditions of the whole road network from sparse traffic samplings. Second, the authors have compared the traffic estimation performances between linear and nonlinear traffic correlation models and proposed a dynamical non-linear traffic correlation modelling-based urban traffic monitoring approach. To address the challenge of involved huge computation overheads, the approach adapts the traffic modelling and estimations tasks to Apache Spark, a popular parallel computing framework. Third, in addition to mobility data collected by the public transit systems, the authors present a crowdsensing-based urban traffic monitoring approach. The proposal exploits the lightweight mobility data collected from participatory bus riders to recover traffic statuses through careful data processing and analysis. Last but not the

least, the book points out some future research directions, which can further improve the accuracy and efficiency of mobility data-driven urban traffic monitoring at large scale. This book targets researchers, computer scientists, and engineers, who are interested in the research areas of intelligent transportation systems (ITS), urban computing, big data analytic, and Internet of Things (IoT). Advanced level students studying these topics benefit from this book as well.

Stratification of Locally Owned Roads for Traffic Data Collection Artech House

Average annual daily traffic (AADT) is perhaps the most fundamental measure of traffic flow. The data used to produce AADT estimates are largely collected by in-highway traffic counters operated by traffic monitoring crews who must cover thousands of segments in their statewide systems on a continual basis. In addition to being costly, dangerous, and disruptive, the combination of limited resources and the large number of highway segments spread across the expansive geographic regions of the state requires that the state DOTs collect short-term sample volumes on a multi-year cycle. We have developed a method that combines the older, ground-based traffic data with traffic information contained in recent air photos in a statistically justified manner to produce more accurate

estimates of AADT. To take advantage of this promising method in practice, it is necessary to develop an efficient way to use it on a widespread, repeated basis in an operational setting. The proposed work builds on previous efforts that led to conception, development, and preliminary testing of the estimation method. We designed the components of a software system that can be used to efficiently produce the improve AADT estimate, conducted empirical tests of the performance of the estimate, and worked toward gaining institutional acceptance for this novel estimation approach.

The Code of Federal Regulations of the United States of America Transportation Research Board

Traffic monitoring is one of the primary activities of state highway agencies. A reliable estimation of the traffic is vital for the management and future planning of the roadways, and as well as the apportionment of the federal funding. Traffic Monitoring Program in states is responsible for collecting, storing, processing, and disseminating the traffic data. Determination of volume and vehicle classification trends, utilization of appropriate MADT and AADT estimation methods, establishment of Traffic Pattern Groups (TPG) and use of the adjustment factors to expand the short duration counts are some of the primary activities within states' traffic monitoring

program. □ DelDOT Traffic Monitoring Program has been evaluated and updated to establish the TPGs and derive the adjustment factors to represents the current traffic conditions in Delaware. Analysis of data revealed few problems that should be addressed (i.e. adjustment factors are sometimes not properly used, and TPGs are not regularly evaluated/updated). Additionally, a national level survey conducted to understand the issues and challenges that state highway agencies facing in collecting and processing of state traffic monitoring data, specifically continuous and shortduration data. Both survey responses and DelDOT analysis results have shown that a Knowledge-based Expert System (KBES) application can contribute to states' traffic monitoring program by informing and guiding the user to improve the traffic monitoring related decisions. □ The primary objective of this study was to develop a KBES application, called TMDEST, for providing assistance and decision support tool to the transportation agencies in states' traffic monitoring programs, specifically in TPG analysis. TMDEST asks focused and relevant questions to the user and provide situation-specific advice in six modules. In some modules, the user is asked to provide numerical input such as the number of stations and coefficient of variation value if available. □ Class/Weight Trend Module is designed

to guide the user to identify the most important vehicle classes and the trucks that exert the most weight by using FHWA's VTRIS W-Tables. MADT/AADT Methods Module and TPG Methods Module are designed to inform the user regarding the major MADT/AADT estimation methods and TPG analysis methods to recommend the most appropriate methods based on the presence and amount of missing data and the inclusion of temporal variations. TPG Groups Module provides an approximate estimation of TPGs based on roadway functional classification and seasonal variation. Sample Size Estimation Module is designed to test the number of continuous count stations in each TPG for statistical significance. Lastly, Adjustment Factors Module incorporates all possible adjustment factors and evaluates the necessity of the use by asking multiple-choice questions to the end user regarding the extent of the collected short duration data. □ Overall evaluation of the TMDEST revealed that each module well satisfies the design specifications, and in general, the developed tool (1) informs and guides the user regarding the methods and procedures, (2) provides an approximate method for establishing TPGs. Additionally, verification, validation, and evaluation of the TMDEST showed that the expert system based tool was built right and does the job that it intends to do. Utilization of an expert system development tool (Exsys

Corvid® Core) significantly expedited to the verification and validation process. The simple proof method was used to evaluate each module for completeness, consistency, and correctness. Although the majority of the content in the knowledge base was obtained from FHWA's traffic monitoring guide, simple true/false test was applied to the modules where the content was partially generated to validate the knowledge base. TMDEST and each module are considered as valid and applicable tool in states traffic monitoring program. Lastly, a discussion of further work is provided to improve the extent of the TMDEST in states' traffic monitoring program.

Assessing Roadway Traffic Count Duration and Frequency Impacts on Annual Average Daily Traffic Estimation

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For highway maintenance and planning purposes, it is desirable to characterize each road segment by its traffic flow [such as the annual average daily traffic (AADT) and the AADT for each vehicle class], by the weight distribution of vehicles that travel on its roads [such as the annual average daily equivalent single axle loadings (ESAL) and the annual average daily weight per vehicle for each vehicle class]. As with almost any data collection effort, the monitoring data suffer from errors from many sources. This report summarizes results of a two year empirical research effort, which was

sponsored by the Federal highway Administration, (i) to study and characterize the variability in the traffic data (volume, classification, and weight) from the continuously monitored road segments, and (ii) to study the extent to which this variability is transferred to, and affects the precision of the data produced form the road segments which are monitored only one or two days each year. The ultimate hope is not only that states will eventually be able to publish an estimate of a characteristic such as AADT for each road segment, but also that each estimate will be accompanied by a statement of how good the estimate is in terms of the estimated variability or precision which will likely be experienced as a coefficient of variation (i.e., the quotient of a standard deviation and a mean). This report provides highlights of research reported in five working papers.

Procedures for the Collection and Analysis of Traffic Volume Data, Vehicle Classification Data, Truck Weight Data

DIANE Publishing

Modern highway engineering reflects an integrated view of a road system's entire lifecycle, including any potential environmental impacts, and seeks to develop a sustainable infrastructure through careful planning and active management. This trend is not limited to developed nations, but is recognized across the globe. Edited by renowned authority

Traffic Monitoring Guide
"The primary purpose of these standards is to ensure that data from traffic monitoring activities involving funds administered and/or provided by New York State are received by the NYSDOT Highway Data Services Bureau in the appropriate format"--Page [2].
Mobility Data-Driven Urban Traffic Monitoring
The objective of this research was to investigate the potential uses of the annual submittal and output data that result from the Highway Performance Monitoring System (HPMS), to determine what the data needs and uses of the Virginia Department of Highways and Transportation are, and to make recommendations as to how the HPMS data could be effectively used by the agency. A literature search and a survey of the 50 state transportation agencies were conducted to determine what innovative applications of the HPMS are being developed in the field. The Virginia Department of Highways and Transportation was also surveyed to determine what its current data needs and uses are, and to then relate the HPMS applications to Departmental data needs. It is recommended that the Department (1) distribute the HPMS report to key persons in the organization as an educational tool, (2) have the districts and divisions review the.annual data table summaries for potential applications, (3)

review the HPMS data prior to requesting the collection of new data or extensive system level calculations to avoid duplication of effort, and (4) commit itself to maximum usage of the HPMS, keeping abreast of developments in HPMS applications, and integrate the analytical package into Department activities.

An Application on the Statistical Analysis System (SAS) to Manage State Traffic Data

The Code of Federal Regulations Title 23 contains the codified Federal laws and regulations that are in effect as of the date of the publication pertaining to Federal highways, including national highway traffic safety.

Development of a Statewide Traffic Counting Program Based on the Highway Performance Monitoring System

The Code of Federal Regulations is the codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the Federal Government.

Utilization of Knowledge-based Expert Systems to Enhance the Decision Making in States' Traffic Monitoring Programs

The objective of these AASHTO Guidelines is to improve the quality of the traffic information that supports decisions at all levels of the transportation profession. The Guidelines provide a reference for professional

traffic monitoring and establish a process for adoption of national traffic nomitoring standards. They specifically address concerns of state transportation agencies. The Arizona Department of Transportation (ADOT) undertook a review and evaluation of the technologies used by the agency to process, store, manage, and disseminate traffic data. Traffic count information constitutes the most elemental data that ADOT uses for planning, analysis and monitoring, and yet often remains the least accessible within the agency. ADOT found that different functional departments often duplicated traffic counts, count information was often little understood, and hence not trusted, and consistent data were not accessible throughout ADOT -- there was not a single source where traffic data were collected and disseminated. Through the research ADOT identified a hierarchy of actions designed to more effectively manage this most basic resource, and to restore confidence among users. An implementation plan was developed and is now being acted upon within the department.

Assessing Accuracy Issues with Current Known Methods in AADT Estimation from Continuous Traffic Monitoring Data

This guide is designed to provide direction on the monitoring of traffic characteristics. It begins with a discussion of the structure of traffic characteristics monitoring and traffic counting. The

next two sections cover vehicle classification and truck weighing. The last section presents the coordinated record formats for station identification, traffic volume, vehicle classification, and truck weight data.
Methods and Procedures
Highway Traffic Monitoring and Data QualityArtech House
Improved Monitoring and Oversight of Traffic Safety Data Program are Needed : Report to Congressional Committees
This unique resource gives you a hands-on understanding of the latest sensors, processors, and communication links for everything from vehicle counts to urban congestion measurement. Moreover, you learn statistical techniques for quantifying data accuracy and reducing uncertainty in both current system state assessments and future system state forecasts.

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