Highway Traffic Monitoring and Data Quality Artech House Intelligent Transportation Systems Library

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The Manitoba Department of Highways and Transportation requires a variety of traffic volume and other statistics on the usage of provincial highways. This paper describes a review of the Department's former traffic data collection system and the design, development, and implementation of a new traffic information system. The research includes: (1) characterization of traffic data systems generally and the former Manitoba traffic monitoring system in particular; (2) formulation of performance criteria for the system based on general principles of data collection, definition of particular data needs in Manitoba, and technical criteria related to efficiency and effectiveness; (3) an evaluation of the former data collection program against these performance criteria; and (a) the design and implementation of numerous improvements to the system to address the identified shortcomings. Key components of the new system are a new method of specifying traffic pattern groups and a "factorless expansion" process for expanding short-term traffic counts to estimates of average annual daily traffic.

"TRB's National Cooperative Highway Research Program (NCHRP) 756: Highway Safety Research Agenda: Infrastructure and Operations develops a proposed agenda of prioritized safety research needs in the area of highway infrastructure and operations. The report provides options to the U.S. transportation community on how to direct research to the areas where it can provide the most benefit. The agenda is based on a prioritization methodology developed by the research team which can be applied on a recurring basis to update the agenda over time. Both the agenda and the methodology documented in this report will assist government officials, private sector employees, and academics with managing highway safety research. In addition to the report, 16 unpublished appendices (Appendices A-O and R) have been made available electronically."--Publisher description.

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.


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.

Issues for 1963- include section: Urban transportation research digest.

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.

This proceedings book presents selected papers from the 4th Conference on Signal and Information Processing, Networking and Computers (ICSINC) held in Qingdao, China on May 23–25, 2018. It focuses on the current research in a wide range of areas related to information theory, communication systems, computer science, signal processing, aerospace technologies, and other related technologies. With contributions from experts from both academia and industry, it is a valuable resource anyone interested in this field.

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

This is a collection of several applications for condition monitoring and damage identification in bridge structures. Bridge structural condition monitoring is essential since it can provide early warning of potential defects in bridges, which may induce catastrophic accidents and result in huge economic loss. Such bridge condition monitoring relies on sensing techniques, especially advanced sensing techniques that can provide detailed information on bridge structures. Additionally, postprocessing systems can interpret the captured data and warn of any potential faults. This book will give students a thorough understanding of bridge condition monitoring.

Road Traffic Modeling and Management: Using Statistical Monitoring and Deep Learning provides a framework for understanding and enhancing road traffic monitoring and management. The book examines commonly used traffic analysis methodologies as well the emerging methods that use deep learning methods. Other sections discuss how to understand statistical models and machine learning algorithms and how to apply them to traffic modeling, estimation, forecasting and traffic congestion monitoring. Providing both a theoretical framework along with practical technical solutions, this book is ideal for researchers and practitioners who want to improve the performance of intelligent transportation systems. Provides integrated, up-to-date and complete coverage of the key components for intelligent transportation systems: traffic modeling, forecasting, estimation and monitoring. Uses methods based on video and time series data for traffic modeling and forecasting includes case studies, key processes guidance and comparisons of different methodologies.

Asphalt is a complex but popular civil engineering material. Design engineers must understand these complexities in order to optimize its use. Whether or not it is used to pave a busy highway, waterproof a rooftop or smooth out an airport runway, Asphalt Materials Science and Technology acquaints engineers with the issues and technologies surrounding the proper selection and uses of asphalts. With this book in hand, researchers and engineering will find a valuable guide to the production, use and environmental aspect of asphalt. Covers the Nomenclature and Terminology for Asphalt including: Performance Graded (PG) Binders, Asphalt Cement (AC), Asphalt-Rubber (A-R) Binder, Asphalt Emulsion and Cutback Asphalt Includes Material Selection Considerations, Testing, and applications Biodegradation of Asphalt and environmental aspects of asphalt use.

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. 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 monitoring standards. They specifically address concerns of state transportation agencies. The Code of Federal Regulations is a codification of the general and permanent rules published in the Federal Register by the Executive departments and agencies of the United States Federal Government. This synthesis will be of interest to officials of municipal, regional, and statewide transportation agencies who are responsible for the management of surface transportation systems in metropolitan areas. It presents information on the processes used by transportation agencies to monitor, evaluate, and implement a variety of solutions to the management of surface transportation systems. This is a complex and dynamic area of application, and the examples presented herein represent a selection of such applications in 1997. The concept of transportation system management is constantly changing and will continue to change, especially with further implementation of intelligent transportation systems. This report of the Transportation Research Board provides an overview of the specialized process that transportation agencies have found to be effective in managing the various aspects of their transportation systems. Specific case examples of effective management strategies are described for several metropolitan areas including Houston, Seattle, metropolitan New York, Los Angeles, San Francisco, and Minneapolis/St. Paul.
The book will provide a critical review of key developments in the structural health monitoring technologies applied to civil engineering structures. It covers all aspects required for such monitoring in the field, including sensors and networks, data acquisition and processing, damage detection techniques and damage prognostics techniques. A number of case studies, showing how the techniques can be applied to large civil engineering structures are included.

The accurate measurement of vehicle classification is a highly valued factor in traffic operation and management, validations of travel demand models, freight studies, and even emission impact analysis of traffic operation. Inductive loops are increasingly used specifically for traffic monitoring at highway traffic data collection sites. Many studies have proven that the vehicle speed can be estimated accurately by using dual-loop data under free traffic condition, and then vehicle lengths can be estimated accurately.

The capability of measuring vehicle lengths makes dual-loop detectors a potential real-time data source for vehicle classification. However, the existing dual-loop length-based vehicle classification model was developed with an assumption that the difference of a vehicle's speed on the first and the second single loop is not significant. Under congested traffic flows, vehicles' speeds change frequently and even fiercely, and the assumption cannot be met any more. The outputs of the existing models have a high error rate under non-free traffic conditions (such as synchronized and stop-and-go congestion states). The errors may be contributed by the complex characteristics of traffic flows under congestion; but quantification of such contributing factors remains unclear. In this study, the dual-loop data and vehicle classification models were evaluated with concurrent video ground-truth data. The mechanism of the length-based vehicle classification and relevant traffic flow characteristics were tried to be revealed. In order to obtain the ground-truth vehicle event data, the software VEVID (Vehicle Video-Capture Data Collector) was used to extract high-resolution vehicle trajectory data from the videotapes. This vehicle trajectory data was used to identify the errors and reasons of the vehicle classifications resulted from the existing dual-loop model. Meanwhile, a probe vehicle equipped with a Global Positioning System (GPS) data logger was used to set up reference points for VEVID and to collect traffic profile data under varied traffic flow states for developing the new model under stop-and-go traffic flow. The research has proven inability of the existing vehicle classification model in producing satisfactory estimates of vehicle lengths under congestion, i.e., synchronized or stop-and-go traffic states. The Vehicle Classification under Synchronized Traffic Model (VC-Sync model) was developed to estimate vehicle lengths against the synchronized traffic flow and the Vehicle Classification under Stop-and-Go Model (VC-Stog model) was developed to estimate vehicle lengths against the stop-and-go traffic flow. Compare to the existing models, under the congested traffic flows, the newly developed models have improved the accuracy of vehicle length estimation significantly. The contribution of this research is reflected in the following aspects: 1) An innovative VEVID-based approach is developed for evaluating the concurred dual-loop data and resulted vehicle classification and relevant traffic flow characteristics against video-based ground-truth vehicle event trajectory data, which is difficult to conduct with traditional approaches; 2) Innovative vehicle classification models for both synchronized traffic and stop-and-go traffic states are developed through such an evaluation process; 3) The algorithms for processing the dual-loop vehicle event raw data have been improved by considering the influence of traffic flow characteristics; 4) A GPS-based approach is developed for setting up the reference points in field in conjunction with application of VEVID, which is proven a safety and efficient approach compared to traditional manual approaches. And the GPS-based travel profile data is greatly helpful in developing the new models.

With the encroachment of the Internet into nearly all aspects of work and life, it seems as though information is everywhere. However, there is information and then there is correct, appropriate, and timely information. While we might love being able to turn to Wikipedia® for encyclopedia-like information or search Google® for the thousands of links on a topic, engineers need the best information, information that is evaluated, up-to-date, and complete. Accurate, vetted information is necessary when building new skyscrapers or developing new prosthetics for returning military veterans While the award-winning first edition of Using the Engineering Literature used a roadmap analogy, we now need a three-dimensional analysis reflecting the complex and dynamic nature of research in the information age. Using the Engineering Literature, Second Edition provides a guide to the wide range of resources available in all fields of engineering. This second edition has been thoroughly revised and features new sections on nanotechnology as well as green engineering. The information age has greatly impacted the way engineers find information. Engineers have an effect, directly and indirectly, on almost all aspects of our lives, and it is vital that they find the right information at the right time to create better products and processes. Comprehensive and up to date, with expert chapter authors, this book fills a gap in the literature, providing critical information in a user-friendly format.

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.

This text looks at a number of issues from the initial collection of data, through its planning and control, use of in marketing and demand management in the aspects of the application of Information Technology to the transport industry. It is aimed at students of transport systems who are seeking information on techniques used within the industry and the specialist practitioner seeking a description of related fields with a view to the development of linked transport systems or seeking inspiration from the methods adapted by specialists in other areas.

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.

In response to the need to improve road traffic operation, researchers implement advanced technologies and integration of systems and data, and develop state-of-the-art applications to assist traffic engineers. This SpringerBrief introduces three novel Web applications which can be an exceptional resource and a good visualization tool for traffic operators, managers, and analysts to monitor the congestion, and analyze incidents and signal performance measures. The applications offer more detailed analysis providing users with insights from different levels and perspectives. The benefit of providing these automated and interactive visualization tools is more efficient estimation of the local transport networks’ performance, thus facilitating the decision making process in case of emergency events.