Traffic Sensors Its

In recent times wireless sensors and sensor networks have become a great interest to research, scientific and technological community. Though the sensor networks have been in place for more than a few decades now, the wireless domain has opened up a whole new application spaces of sensors. Wireless sensors and sensor networks are different from traditional wireless networks as well computer networks and therefore pose more challenges to solve such as limited energy, restricted life time, etc. This book intends to illustrate and to collect recent advances in wireless sensors and sensor networks, not as an encyclopedia but as clever support for scientists, students and researchers in order to stimulate exchange and discussions for further developments.

Although there are many books available on WSNs, most are low-level, introductory books. The few available for advanced readers fail to convey the breadth of knowledge required for those aiming to develop next-generation solutions for WSNs.Filling this void, Wireless Sensor Networks: From Theory to Applications supplies comprehensive coverage of WS

The rapid development of advanced, arguably, intelligent sensors and their massive deployment provide a foundation for new paradigms to combat the challenges that arise in significant tasks such as positioning, tracking, navigation, and smart sensing in various environments. Relevant advances in artificial intelligence (AI) and machine learning (ML) are also finding rapid adoption by industry and fan the fire. Consequently, research on intelligent sensing systems and technologies has attracted considerable attention during the past decade, leading to a variety of effective applications related to intelligent transportation, autonomous vehicles, wearable computing, wireless sensor networks (WSN), and the internet of things (IoT). In particular, the sensors community has a great interest in novel, intelligent information fusion, and data mining methods coupling AI and ML for substantial performance enhancement, especially for the challenging scenarios that make traditional approaches inappropriate. This reprint book has collected 14 excellent papers that represent state-of-the-art achievements in the relevant topics and provides cutting-edge coverage of recent advances in sensor signal and data mining techniques, algorithms, and approaches, particularly applied for positioning, tracking, navigation, and smart sensing.

Traffic congestion is a problematic experience for commuters in metropolitan areas, costing time and money. For situations involving emergency services, traffic congestion may also be life threatening. A traffic information system (TIS) can play a significant role in improving traffic congestion problems by providing information to road users about the location and degree of traffic congestion. Knowing the location and degree of traffic congestion in real time can assist drivers in planning their routes to avoid heavy traffic. A TIS collects data from multiple sources, including sensors. However, data from sensors may become unavailable due to some reasons such as sensor damage or lost communication. In addition, some roads lack sensors. To ensure the availability and continuity of reported traffic information despite the uncertainty of sensor data, an approach that estimates traffic congestion when sensory data is not available is required. In this thesis, we conduct research into this issue through the lens of a design science research methodology. We propose an artefact, the Context-Aware Traffic Congestion Estimation Framework to Overcome Missing Sensory Data (the CATE framework), to address the above issues. Most existing methods estimate traffic congestion using sensors. In contrast, the CATE framework utilizes available external context information to infer the traffic situation. The framework contains several inference models that represent different situations based on the available context. When sensory traffic data is missing, an appropriate model is selected during run time to infer the traffic congestion degree. The models were developed using machine learning algorithms during our research based on traffic data collected in Bangkok. To deal with the possibility of changes to traffic situations that may make predictions less accurate, the CATE framework incorporates a built-in relearning function that can be used to improve the accuracy of models over time. During the test phase of this research, the CATE framework proved feasible and efficient. It inferred the traffic congestion degree with accuracy higher than that of existing methods and within comparable turnaround times.To further improve the initial artefact of the CATE framework, further test was carried out in the form of survey. The survey aims to validate and improve the initial selection of the context information chosen for the CATE framework. The survey collected Bangkok road users' perceptions of the factors that affect traffic in Bangkok. The evaluation of this phase demonstrated that the final artefact improved from the initial artefact and again performed better than existing methods in terms of accuracy while also reducing the required processing times and costs associated with calculating the traffic congestion degree.The proliferation of social media and mobile devices suggests that these are possible outlets for disseminating traffic reports in the future and so we included questions in our survey to investigate this possibility. We used the results of these questions to create recommendations for the development of TIS and traffic report services. These recommendations - that information regarding journey routes and traffic conditions be accessible via mobile devices and websites to meet the needs of road users, and that social networks be considered alternative sources of potential traffic data - can be used as guidelines to improve existing TIS and traffic information dissemination services in Bangkok. Through the conceptualization and evaluation of our CATE framework, this thesis makes theoretical and practical contributions to the Intelligent Transportation System (ITS) domain. Through the survey based on the perceptions of Bangkok road users and subsequent statistical analysis, the thesis also makes contributions to the development of TIS reporting systems. Although our study was based on Bangkok data, it may be applicable to other cities that share similar road infrastructure and traffic information issues. This research has produced a framework that has the potential to make a positive difference to road users. The results justify continuing research in this area in order to increase the body of scientific knowledge of the ITS domain and to provide practical support to those involved in managing and maintaining TIS.

"Sensor and Data Fusion for Intelligent Transportation Systems introduces readers to the roles of the data fusion processes defined by the Joint Directors of Laboratories (JDL) data fusion model, data fusion algorithms, and noteworthy applications of data fusion to ITS. Additionally, the monograph offers detailed descriptions of three of the widely applied data fusion techniques and their relevance to ITS (namely, Bayesian inference, Dempster-Shafer evidential reasoning, and Kalman filtering), and indicates directions for future research in the area of data fusion. The focus is on data fusion algorithms rather than on sensor and data fusion architectures, although the book does summarize factors that influence the selection of a fusion architecture and several architecture frameworks"--

Sensors and Their Applications VIII provides a valuable forum for individuals from all over the world working in all areas of sensors to meet and discuss the developments and applications of transducers and sensor systems. The strength of the sensor community in the UK reinforces the importance of this volume as a valuable reference for all workers in the field.

This book constitutes the refereed proceedings of the First International Conference on Mobile Ad-hoc and Sensor Networks, MSN 2005, held in Wuhan, China in December 2005. The volume also contains 12 papers of the MSN workshop on Modeling and the Security in the Next Generation Mobile Information Systems (MSNG 2005). The 112 revised full papers were carefully reviewed and selected from a total of 512 submissions. The papers address all current topical areas in mobile ad hoc and sensor networks such as network architecture and protocols, software platforms and development tools, self-organization and synchronization, routing and data dissemination, failure resilience and fault isolation, energy management, data, information, and signal processing, security and privacy, network planning, provisioning, and deployment, network modeling and performance evaluation, developments and applications, as well as integration with other systems.

Building around innovative services related to different modes of transport and traffic management, intelligent transport systems (ITS) are being widely adopted worldwide to improve the efficiency and safety of the transportation system. They enable users to be better informed and make safer, more coordinated, and smarter decisions on the use of transport networks. Current ITSs are complex systems, made up of several components/sub-systems characterized by time-dependent interactions among themselves. Some examples of these transportation-related complex systems include: road traffic sensors, autonomous/automated cars, smart cities, smart sensors, virtual sensors, traffic control systems, smart roads, logistics systems, smart mobility systems, and many others that are emerging from niche areas. The efficient operation of these complex systems requires: i) efficient solutions to the issues of sensors/actuators used to capture and control the physical parameters of these systems, as well as the quality of data collected from these systems; ii) tackling complexities using simulations and analytical modelling techniques; and iii) applying optimization techniques to improve the performance of these systems.

This book is a printed edition of the Special Issue "Sensors and Actuators in Smart Cities" that was published in JSAN

Intelligent Transportation Systems (ITS) are cost-effective measures to manage congestion due to increasing demand by improving the efficiency of existing transportation infrastructure. Traffic detection and surveillance play a pivotal role in deploying these technologies in the field. This dissertation continues the work that has been done in recent years in relation to the use of wireless magnetic sensor networks in transportation systems. As part of the effort to improve vehicle detection system technologies so that better management strategies can be implemented in the field, the work presented here focuses on advancing the use of wireless magnetic sensors in Intelligent Transportation Systems. This dissertation addresses improvements in algorithmic tools that advance the use of wireless magnetic sensors for both freeways and arterials. The applications addressed here include on-ramp queue estimation, arterial link vehicle-count, travel time estimation on heavily congested arterial streets, travel time and link vehicle-count in freeways, truck re-identification along long freeway segments, as well as cost-effective vehicle classification. The overall goal of this dissertation is to advance the use of these basic detection technologies to roles that extend beyond basic vehicle detection. A vehicle re-identification system, which relies on matching vehicle signatures from wireless magnetic sensors is modified to improve its performance for stop-and-go traffic conditions and is extended so that it can be used for truck re-identification along long freeway segments. The modifications to the algorithm address problems observed when vehicles stop or accelerate/decelerate as they go through the sensors. The modified system was tested to ensure that it overcame the deficiencies imposed by the original system. The extension of the vehicle re-identification system, presented as the iterative vehicle re-identification system, addresses traffic dynamics observed when vehicles travel along long road segments, in particular, vehicle overtaking. The system was tested extensively to ensure that it can be deployed for truck re-identification along long freeway segments, e.g., in between weigh-in-motion (WIM) stations. A link vehicle-count and a travel time estimator based on flow-measurements and vehicle re-identification data were studied at a freeway on-ramp, arterial segments as well as at freeway segments. The results show that the estimators are reliable and accurate, and are suitable for real-time traffic responsive management strategies that require precise link vehicle-count and/or vehicle travel time information, such as ramp metering, speed control and traffic intersection control. Vehicle classification, which utilizes a single wireless magnetic sensor installed in the middle of a freeway lane is also presented. The approach uses a two stage binary support vector machine (SVM) classifier based on features extracted from vehicle signatures. This is a cost effective classification system that uses a small subset of data efficiently extracted from the magnetic signal measured by the sensor. The results showed that vehicles can be reliably and accurately classified into passenger vehicles and trucks, and once trucks are extracted, this group can be further divided, with lower accuracy and consistency, into two groups: small trucks and large trucks. Finally, this dissertation presents a systematic tool for tuning vehicle re-identification parameters and evaluating performance. This tool uses different plots, metrics and algorithms to evaluate the output of the vehicle re-identification algorithm as well as estimates based on it, i.e., link vehicle-count and vehicle travel time.

Modern intelligent transportation systems (ITS) make driving more efficient, easier, and safer. Knowledge of real-time traffic conditions is a critical input for operating ITS. Real-time freeway traffic state estimation approaches have been used to quantify traffic conditions given limited amount of data collected by traffic sensors. Currently, almost all real-time estimation methods have been developed for estimating laterally aggregated traffic conditions in a roadway segment using link-based models which assume homogeneous conditions across multiple lanes. However, with new advances and applications of ITS, knowledge of lane-based traffic conditions is becoming important, where the traffic condition differences among lanes are recognized. In addition, most of the current real-time freeway traffic estimators consider only data from loop detectors. This dissertation develops a bi-level data fusion approach using heterogeneous multi-sensor measurements to estimate real-time lane-based freeway traffic conditions, which integrates a link-level model-based estimator and a lane-level data-driven estimator. Macroscopic traffic flow models describe the evolution of aggregated traffic characteristics over time and space, which are required by model-based traffic estimation approaches. Since current first-order Lagrangian macroscopic traffic flow model has some unrealistic implicit assumptions (e.g., infinite acceleration), a second-order Lagrangian macroscopic traffic flow model has been developed by incorporating drivers anticipation and reaction delay. A multi-sensor extended Kalman filter (MEKF) algorithm has been developed to combine heterogeneous measurements from multiple sources. A MEKF-based traffic estimator, explicitly using the developed second-order traffic flow model and measurements from loop detectors as well as GPS trajectories for given fractions of vehicles, has been proposed which gives real-time link-level traffic estimates in the bi-level estimation system. The lane-level estimation in the bi-level data fusion system uses the link-level estimates as priors and adopts a data-driven approach to obtain lane-based estimates, where now heterogeneous multi-sensor measurements are combined using parallel spatial-temporal filters. Experimental analysis shows that the second-order model can more realistically reproduce real world traffic flow patterns (e.g., stop-and-go waves). The MEKF-based link-level estimator exhibits more accurate results than the estimator that uses only a single data source. Evaluation of the lane-level estimator demonstrates that the proposed new bi-level multi-sensor data fusion system can provide very good estimates of real-time lane-based traffic conditions.

This book features selected papers presented at the Fourth International Conference on Nanoelectronics, Circuits and Communication Systems (NCCS 2018). Covering topics such as MEMS and nanoelectronics, wireless communications, optical communications, instrumentation, signal processing, the Internet of Things, image processing, bioengineering, green energy, hybrid vehicles, environmental science, weather forecasting, cloud computing, renewable energy, RFID, CMOS sensors, actuators, transducers, telemetry systems, embedded systems, and sensor network applications in mines, it offers a valuable resource for young scholars, researchers, and academics alike.

An intelligent transportation system (ITS) offers considerable opportunities for increasing the safety, efficiency, and predictability of traffic flow and reducing vehicle emissions. Sensors (or detectors) enable the effective gathering of arterial and controlled-access highway information in support of automatic incident detection, active transportation and demand management, traffic-adaptive signal control, and ramp and freeway metering and dispatching of emergency response providers. As traffic flow sensors are integrated with big data sources such as connected and cooperative vehicles, and cell phones and other Bluetooth-enabled devices, more accurate and timely traffic flow information can be obtained. The book examines the roles of traffic management centers that serve cities, counties, and other regions, and the collocation issues that ensue when multiple agencies share the same space. It describes sensor applications and data requirements for several ITS strategies; sensor technologies; sensor installation, initialization, and field-testing procedures; and alternate sources of traffic flow data. The book addresses concerns related to the introduction of automated and connected vehicles, and the benefits that systems engineering and national ITS architectures in the US, Europe, Japan, and elsewhere bring to ITS. Sensor and data fusion benefits to traffic management are described, while the Bayesian and Dempster–Shafer approaches to data fusion are discussed in more detail. ITS Sensors and Architectures for Traffic Management and Connected Vehicles suits the needs of personnel in transportation institutes and highway agencies, and students in undergraduate or graduate transportation engineering courses.

Traditional traffic data-collection methods, such as inductive loops and road tube counters, require intrusion into the roadway to install. This creates traffic interruptions and safety concerns as personnel are exposed to traffic during installation. This project developed an accurate, simple, cost-effective, portable and safe method of collecting traffic. The "Portable Non-Intrusive Traffic Detection System" (PNITDS) provides an alternative to conventional methods by allowing agencies to collect data in high-traffic locations without compromising traffic flow or personnel safety. The Minnesota Department of Transportation (Mn/DOT) is the lead state in conducting the PNITDS evaluation test. The project is supported by 16 other participating state DOTs through a pooled-fund effort. The purpose of this project is to provide data-collection practitioners with a cost-effective PNITDS system design. The project fabricated and field-tested a prototype system. This system was then demonstrated to participating pooled fund states for onsite training. The selected design consists of a battery-powered, pole-mounted system that serves as a platform for mounting side-fired non-intrusive traffic sensors. Three sensors were evaluated: the RTMS by EIS, the SAS-1 by SmarTek, and the SmartSensor by Wavetronix. Field-test results were obtained for volume, speed and length-based vehicle classification under a variety of mounting configurations. The project also examined the ease of system setup, system reliability and flexibility. An additional test was conducted to assess a newly developed sensor, The Infra-Red Traffic Logger (TRITL), for its ability to collect axle-based vehicle classification data. Test method and results are included in the project's final report.

Learn the fundamental concepts, major challenges, and effective solutions in wireless sensor networking This book provides a comprehensive and systematic introduction to the fundamental concepts, major challenges, and effective solutions in wireless sensor networking (WSN). Distinguished from other books, it focuses on the networking aspects of WSNs and covers the most important networking issues, including network architecture design, medium access control, routing and data dissemination, node clustering, node localization, query processing, data aggregation, transport and quality of service, time synchronization, network security, and sensor network standards. With contributions from internationally renowned researchers, Wireless Sensor Networks expertly strikes a balance between fundamental concepts and state-of-the-art technologies, providing readers with unprecedented insights into WSNs from a networking perspective. It is essential reading for a broad audience, including academic researchers, research engineers, and practitioners in industry. It is also suitable as a textbook or supplementary reading for electrical engineering, computer engineering, and computer science courses at the graduate level.

This stimulating and inspiring book explores the present and anticipates the future of Automotive Microsystems. The past decade has seen enormous progress in the use of automotive microsysems; their effect has been dramatic in reducing casualties, controlling emissions and increasing passenger comfort and vehicle performance. The book is a snapshot of new technological priorities in microsystems-based smart devices that offers a mid-term perspective on coming smart systems applications in automobiles.
This book constitutes the refereed proceedings of the 10th European Conference on Principles and Practice of Knowledge Discovery in Databases, PKDD 2006. The book presents 36 revised full papers and 26 revised short papers together with abstracts of 5 invited talks, carefully reviewed and selected from 564 papers submitted. The papers offer a wealth of new results in knowledge discovery in databases and address all current issues in the area.
This project focused on the enhancement of a previous battery-less wireless traffic flow sensor so as to enable it to provide weigh-in-motion (WIM) measurements and provide enhanced telemetry distance. The sensor consists of a 6-feet-long device which is embedded in a slot in the road flush with the pavement. As a vehicle travels over the sensor, vibrations are induced in the sensor. Using piezoelectric elements, energy is harvested from the vibrations and used to power the electronics in the sensor for signal measurements and wireless transmission. The sensor's performance was evaluated by embedding it in a slot in concrete pavement and driving various vehicles of known weight over it at a number of different speeds on different days.
This book illustrates the benefits of sensor fusion by considering the characteristics of infrared, microwave, and millimeter-wave sensors, including the influence of the atmosphere on their performance. Applications that benefit from this technology include: vehicular traffic management, remote sensing, target classification and tracking- weather forecasting- military and homeland defense. Covering data fusion algorithms in detail, Klein includes a summary of the information required to implement each of the algorithms discussed, and outlines system application scenarios that may limit sensor size but that require high resolution data.
Traditional intrusion detection and logfile analysis are no longer enough to protect today’s complex networks. In this practical guide, security researcher Michael Collins shows you several techniques and tools for collecting and analyzing network traffic datasets. You’ll understand how your network is used, and what actions are necessary to protect and improve it. Divided into three sections, this book examines the process of collecting and organizing data, various tools for analysis, and several different analytic scenarios and techniques. It’s ideal for network administrators and operational security analysts familiar with scripting. Explore network, host, and service sensors for capturing security data Store data traffic with relational databases, graph databases, Redis, and Hadoop Use SiLK, the R language, and other tools for analysis and visualization Detect unusual phenomena through Exploratory Data Analysis (EDA) Identify significant structures in networks with graph analysis Determine the traffic that’s crossing service ports in a network Examine traffic volume and behavior to spot DDoS and database raids Get a step-by-step process for network mapping and inventory
There are many instances in which it is possible to plan ahead for an emergency evacuation (e.g., an explosion at a chemical

processing facility). For those cases, if an accident (or an attack) were to happen, then the best evacuation plan for the prevailing network and weather conditions would be deployed. In other cases (e.g., the derailment of a train transporting hazardous materials), there may not be any previously developed plan to be implemented and decisions must be made ad-hoc on how to proceed with an emergency evacuation. In both situations, the availability of real-time traffic information plays a critical role in the management of the evacuation operations. To improve public safety during a vehicular emergency evacuation it is necessary to detect losses of road capacity (due to incidents, for example) as early as possible. Once these bottlenecks are identified, re-routing strategies must be determined in real-time and deployed in the field to help dissipate the congestion and increase the efficiency of the evacuation. Due to cost constraints, only large urban areas have traffic sensor deployments that permit access to some sort of real-time traffic information; any evacuation taking place in any other areas of the country would have to proceed without real-time traffic information. The latter was the focus of this SERRI/DHS (Southeast Region Research Initiative/Department of Homeland Security) sponsored project. That is, the main objective on the project was to improve the operations during a vehicular emergency evacuation anywhere by using newly developed real-time traffic-information-gathering technologies to assess traffic conditions and therefore to potentially detect incidents on the main evacuation routes. Phase A of the project consisted in the development and testing of a prototype system composed of sensors that are engineered in such a way that they can be rapidly deployed in the field where and when they are needed. Each one of these sensors is also equipped with their own power supply and a GPS (Global Positioning System) device to auto-determine its spatial location on the transportation network under surveillance. The system is capable of assessing traffic parameters by identifying and re-identifying vehicles in the traffic stream as those vehicles pass over the sensors. The system of sensors transmits, through wireless communication, real-time traffic information (travel time and other parameters) to a command and control center via an NTCIP (National Transportation Communication for ITS Protocol) -compatible interface. As an alternative, an existing NTCIP-compatible system accepts the real-time traffic information mentioned and broadcasts the traffic information to emergency managers, the media and the public via the existing channels. A series of tests, both in a controlled environment and on the field, were conducted to study the feasibility of rapidly deploying the system of traffic sensors and to assess its ability to provide real-time traffic information during an emergency evacuation. The results of these tests indicated that the prototype sensors are reliable and accurate for the type of application that is the focus of this project.

The use of non-intrusive technologies for traffic detection has become a widespread alternative to conventional roadway-based detection methods. Many sensors are new to the market or represent a substantial change from earlier versions of the product. This pooled fund study conducted field tests of the latest generation of non-intrusive traffic sensors. Sensors were evaluated in a variety of traffic and environmental conditions at two freeway test sites, with additional tests performed at both signalized and unsignalized intersections. Emphasis was placed on urban traffic conditions, such as heavy congestion, and varying weather conditions. Standardized testing criteria were followed so that the results from this project can be directly compared to results obtained by other transportation agencies. While previous tests have evaluated sensors' volume and speed accuracy, the current generation of sensors has introduced robust classification capabilities, including both length-based and axle-based classification methods. New technologies, such as axle detection sensors, and improved radar, contribute to this improved performance. Overall, the sensors performed better than their counterparts in previous phases of testing for volume and speed accuracy. However, the additional classification capabilities had mixed results. The length-based sensors were generally able to report accurate vehicle lengths. The axle-based sensors provided accurate inter-axle measurements, but significant errors were found due to erroneously grouping vehicles, affecting their ability to accurately classify trucks.

This book gives an overview of best effort data and real-time multipath routing protocols in WMSN. It provides results of recent research in design issues affecting the development of strategic multipath routing protocols that support multimedia data traffic in WMSN from an IoT perspective, plus detailed analysis on the appropriate traffic models.

CD-ROM contains: Adobe Acrobat files for Appendices A-L.

With the advances in the technology of microelectromechanical system (MEMS), developments in wireless communications and wireless sensor networks (WSNs) have also emerged. WSNs have become the one of the most interesting areas of research in the past few years. A WSN is composed of a number of wireless sensor nodes which form a sensor field and a sink. These large numbers of nodes, having the abilities to sense their surroundings, perform limited computation and communicate wirelessly form the WSNs. WSNs can be found in a variety of both military and civilian applications worldwide, examples include detecting enemy intrusion on the battlefield, object tracking, habitat monitoring, patient monitoring and fire detection. Sensor networks are emerging as an attractive technology with great promise for the future. However, challenges remain to be addressed in issues relating to coverage and deployment, scalability, quality-ofservice, size, computational power, energy efficiency and security. Wireless Sensor Networks - Technology and Applications present important issues of WSNs, from the application, design and technology points of view. The book serves as a comprehensive valuable tool for senior graduate students and scholars who seek to learn latest development in wireless sensor networks.

This book emphasizes the increasingly important role that Computational Intelligence (CI) methods are playing in solving a myriad of entangled Wireless Sensor Networks (WSN) related problems. The book serves as a guide for surveying several state-of-the-art WSN scenarios in which CI approaches have been employed. The reader finds in this book how CI has contributed to solve a wide range of challenging problems, ranging from balancing the cost and accuracy of heterogeneous sensor deployments to recovering from real-time sensor failures to detecting attacks launched by malicious sensor nodes and enacting CI-based security schemes. Network managers, industry experts, academicians and practitioners alike (mostly in computer engineering, computer science or applied mathematics) benefit from th e spectrum of successful applications reported in this book. Senior undergraduate or graduate students may discover in this book some problems well suited for their own research endeavors.

The automotive industry appears close to substantial change engendered by “self-driving” technologies. This technology offers the possibility of significant benefits to social welfare—saving lives; reducing crashes, congestion, fuel consumption, and pollution; increasing mobility for the disabled; and ultimately improving land use. This report is intended as a guide for state and federal policymakers on the many issues that this technology raises.

This book is a printed edition of the Special Issue "Road Vehicles Surroundings Supervision: On-Board Sensors and Communications" that was published in Applied Sciences

This book will help engineers, technicians, and designers to better understand a wide range of sensors, from those based on piezoelectric phenomena through those for thermal and flow measurement to the directional sensors that can inform the driver of his orientation on the road. Author John Turner, concludes his book with future trends in use of telematic sensing systems for traffic control and traffic automation.

"The first-of-its-kind book presents state-of-the-art traffic monitoring and analysis methods, helping professionals make the most of their data collection and assessment efforts. This unique resource offers a hands-on understanding of the latest sensors, processors, and communication links for everything from vehicle counts to urban congestion measurement. Moreover, practitioners learn statistical techniques for quantifying data accuracy and reducing uncertainly in both current system state assessments and future system slate forecasts."--BOOK JACKET.

This book provides cutting-edge insights into autonomous vehicles and road terrain classification, and introduces a more rational and practical method for identifying road terrain. It presents the MRF algorithm, which combines the various sensors' classification results to improve the forward LRF for predicting upcoming road terrain types. The comparison between the predicting LRF and its corresponding MRF show that the MRF multiple-sensor fusion method is extremely robust and effective in terms of classifying road terrain. The book also demonstrates numerous applications of road terrain classification for various environments and types of autonomous vehicle, and includes abundant illustrations and models to make the comparison tables and figures more accessible.