Sensor And Data Fusion A Tool For Information Assessment And Decision Making Second Edition Spie Press Monograph Pm

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Data Fusion Mathematics Jitendra R. Raol 2015-08-27 Fills the Existing Gap of Mathematics for Data Fusion Data fusion (DF) combines large amounts of information from a variety of sources and fuses this data algorithmically, logically and, if required intelligently, using artificial intelligence (AI). Also, known as sensor data fusion (SDF), the DF fusion system is an important component for use in various applications that include the monitoring of vehicles, aerospace systems, large-scale structures, and large industrial automation plants. Data Fusion Mathematics: Theory and Practice offers a comprehensive overview of data fusion, and provides a proper and adequate understanding of the basic mathematics directly related to DF. The material covered can be used for evaluation of the performances of any designed and developed DF systems. It tries to answer whether unified data fusion mathematics can evolve from various disparate mathematical concepts, and highlights mathematics that can add credibility to the data fusion process. Focuses on Mathematical Tools That Use Data Fusion This text explores the use of statistical/probabilistic signal/image processing, filtering, component analysis, image algebra, decision making, and neuro-FL-GA paradigms in studying, developing and validating data fusion processes (DFP). It covers major mathematical expressions, and formulae and equations as well as, where feasible, their derivations. It also discusses SDF concepts, DF models and architectures, aspects and methods of type 1 and 2 fuzzy logics, and related practical applications. In addition, the author covers soft computing paradigms that are finding increasing applications in multisensory DF approaches and applications. This book: Explores the use of interval type 2 fuzzy logic and ANFIS in DF Covers the mathematical treatment of many types of filtering algorithms, target-tracking methods, and kinematic DF methods Presents single and multi-sensor tracking and fusion mathematics Considers specific DF architectures in the context of decentralized systems Discusses information filtering, Bayesian approaches, several DF rules, image algebra and image fusion, decision fusion, and wireless sensor network (WSN) multimodality fusion Data Fusion Mathematics: Theory and Practice incorporates concepts, processes, methods, and approaches in data fusion that can help you with integrating DF mathematics and achieving higher levels of fusion activity, and clarity of performance. This text is geared toward researchers, scientists, teachers and practicing engineers interested and working in the multisensor data fusion area.

Handbook of Research on Advanced Wireless Sensor Network Applications, Protocols, and Architectures Ray, Niranjan K. 2016-08-01 The implementation of wireless sensor networks has wide-ranging applications for monitoring various physical and environmental settings. However, certain limitations with these technologies must be addressed in order to effectively utilize them. The Handbook of Research on Advanced Wireless Sensor Network Applications, Protocols, and Architectures is a pivotal reference source for the latest research on recent innovations and developments in the field of wireless sensors. Examining the advantages and challenges presented by the application of these networks in various areas, this book is ideally designed for academics, researchers, students, and IT developers.

The Internet of Things: Breakthroughs in Research and Practice Management Association, Information Resources 2017-02-14 The ubiquity of modern technologies has allowed for increased connectivity between people and devices across the globe. This connected infrastructure of networks creates numerous opportunities for applications and uses. The Internet of Things: Breakthroughs in Research and Practice is an authoritative reference source for the latest academic material on the interconnectivity of networks and devices in the digital era and examines best practices for integrating this advanced connectivity across multiple fields. Featuring extensive coverage on innovative perspectives, such as secure computing, regulatory standards, and trust management, this book is ideally designed for engineers, researchers, professionals, graduate students, and practitioners seeking scholarly insights on the Internet of Things.

Handbook of Multisensor Data Fusion Martin Liggins II 2008-09-26 In the years since the bestselling first edition, fusion research and applications have adapted to service-oriented architectures and pushed the boundaries of situational modeling in human behavior, expanding into fields such as chemical and biological sensing, crisis management, and intelligent buildings. Handbook of Multisensor Data Fusion: Theory and Practice, Second Edition represents the most current concepts and theory as information fusion expands into the realm of network-centric architectures. It reflects new developments in distributed and detection fusion, situation and impact awareness in complex applications, and human cognitive concepts. With contributions from the world's leading fusion experts, this second edition expands to 31 chapters covering the fundamental theory and cutting-edge developments that are driving this field. New to the Second Edition— · Applications in electromagnetic systems and chemical and biological sensors · Army command and combat identification techniques · Techniques for automated reasoning · Advances in Kalman filtering · Fusion in a network centric environment · Service-oriented architecture concepts · Intelligent agents for improved decision making · Commercial off-the-shelf (COTS) software tools From basic information to state-of-the-art theories, this second edition continues to be a unique, comprehensive, and up-to-date resource for data fusion systems designers.

Mathematics of Data Fusion I.R. Goodman 2013-03-14 Data fusion or information fusion are names which have been primarily assigned to military-oriented problems. In military applications, typical data fusion problems are: multisensor, multitarget detection, object identification, tracking, threat assessment, mission assessment and mission planning, among many others. However, it is clear that the basic underlying concepts underlying such fusion procedures can often be used in nonmilitary applications as well. The purpose of this book is twofold: First, to point out present gaps in the way data fusion problems are conceptually treated. Second, to address this issue by exhibiting mathematical tools which treat combination of evidence in the presence of uncertainty in a more systematic and comprehensive way. These techniques are based essentially on two novel ideas relating to probability theory: the newly developed fields of random set theory and conditional and relational event algebra. This volume is intended to be both an update on research progress on data fusion and an introduction to potentially powerful new techniques: fuzzy logic, random set theory, and conditional and relational event algebra. Audience: This volume can be used as a reference book for researchers and practitioners in data fusion or expert systems theory, or for graduate students as text for a research seminar or graduate level course.

Data Fusion for Situation Monitoring, Incident Detection, Alert and Response Management E. Shahbazian 2006-03-02 Data Fusion is a very broad interdisciplinary technology domain. It provides techniques and methods for; integrating information from multiple sources and using the complementarities of these detections to derive maximum information about the phenomenon being observed; analyzing and deriving the meaning of these observations and predicting possible consequences of the observed state of the environment; selecting the best course of action; and controlling the actions. Here, the focus is on the more mature phase of data fusion, namely the detection and identification / classification of phenomena being observed and exploitation of the related methods for Security-Related Civil Science and Technology (SST) applications. It is necessary to; expand on the data fusion methodology pertinent to Situation Monitoring, Incident Detection, Alert and Response Management; discuss some related Cognitive Engineering and visualization issues; provide an insight into the architectures and methodologies for building a data fusion system; discuss fusion approaches to image exploitation with emphasis on security applications; discuss novel distributed tracking approaches as a necessary step of situation monitoring and incident detection; and provide examples of real situations, in which data fusion can enhance incident detection, prevention and response capability. In order to give a logical presentation of the data fusion material, first the general concepts are highlighted (Fusion Methodology, Human Computer Interactions and Systems and Architectures), closing with several applications (Data Fusion for Imagery, Tracking and Sensor Fusion and Applications and Opportunities for Fusion).

Seeing Photons National Research Council 2010-10-28 The Department of Defense recently highlighted intelligence, surveillance, and reconnaissance (ISR) capabilities as a top priority for U.S. warfighters. Contributions provided by ISR assets in the operational theaters in Iraq and Afghanistan have been widely documented in press reporting. While the United States continues to increase investments in ISR capabilities, other nations not friendly to the United States will continue to seek countermeasures to U.S. capabilities. The Technology Warning Division of the Defense Intelligence Agency's (DIA) Defense Warning Office (DWO) has the critical responsibility, in collaborations with other components of the intelligence community (IC), for providing U.S. policymakers insight into technological developments that may impact future U.S. warfighting capabilities. To this end, the IC requested that the National Research Council (NRC) investigate and report on key visible and infrared detector technologies, with potential military utility, that are likely to be developed in the next 10-15 years. This study is the eighth in a series sponsored by the DWO and executed under the auspices of the NRC TIGER (Technology Insight-Gauge, Evaluate, and Review) Standing Committee.

On-line Tool Wear Estimation in Turning Through Sensor Data Fusion and Neural Networks Sagar Vidya Kamarthi 1994

Tracking and Sensor Data Fusion Wolfgang Koch 2013-09-20 Sensor Data Fusion is the process of combining incomplete and imperfect pieces of mutually complementary sensor information in such a way that a better understanding of an underlying real-world phenomenon is achieved. Typically, this insight is either unobtainable otherwise or a fusion result exceeds what can be produced from a single sensor output in accuracy, reliability, or cost. This book provides an introduction Sensor Data Fusion, as an information technology as well as a branch of engineering science and informatics. Part I presents a coherent methodological framework, thus providing the prerequisites for discussing selected applications in Part II of the book. The presentation mirrors the author's views on the subject and emphasizes his own contributions to the development of particular aspects. With some delay, Sensor Data Fusion is likely to develop along lines similar to the evolution of another modern key technology whose origin is in the military domain, the Internet. It is the author's firm conviction that until now, scientists and engineers have only scratched the surface of the vast range of opportunities for research, engineering, and product development that still waits to be explored: the Internet of the Sensors.

Data Fusion: Concepts and Ideas H B Mitchell 2012-02-09 This textbook provides a comprehensive introduction to the concepts and idea of multisensor data fusion. It is an extensively revised second edition of the author's successful book: "Multi-Sensor Data Fusion: An Introduction" which was originally published by Springer-Verlag in 2007. The main changes in the new book are: New Material: Apart from one new chapter there are approximately 30 new sections, 50 new examples and 100 new references. At the same time, material which is out-of-date has been eliminated and the remaining text has been rewritten for added clarity. Altogether, the new book is nearly 70 pages longer than the original book. Matlab code: Where appropriate we have given details of Matlab code which may be downloaded from the worldwide web. In a few places, where such code is not readily available, we have included Matlab code in the body of the text. Layout. The layout and typography has been revised. Examples and Matlab code now appear on a gray background for easy identification and advancd material is marked with an asterisk. The book is intended to be self-contained. No previous knowledge of multi-sensor data fusion is assumed, although some familarity with the basic tools of linear algebra, calculus and simple probability is recommended. Although conceptually simple, the study of mult-sensor data fusion presents challenges that are unique within the education of the electrical engineer or computer scientist. To become competent in the field the student must become familiar with tools taken from a wide range of diverse subjects including: neural networks, signal processing, statistical estimation, tracking algorithms, computer vision and control theory. All too often, the student views multi-sensor data fusion as a miscellaneous assortment of different processes which bear no relationship to each other. In contrast, in this book the processes are unified by using a common statistical framework. As a consequence, the underlying pattern of relationships that exists between the different methodologies is made evident. The book is illustrated with many real-life examples taken from a diverse range of applications and contains an extensive list of modern references.

Data Fusion Mathematics Jitendra R. Raol 2017-07 Fills the Existing Gap of Mathematics for Data Fusion Data fusion (DF) combines large amounts of information from a variety of sources and fuses this data algorithmically, logically and, if required intelligently, using artificial intelligence (AI). Also, known as sensor data fusion (SDF), the DF fusion system is an important component for use in various applications that include the monitoring of vehicles, aerospace systems, large-scale structures, and large industrial automation plants. Data Fusion Mathematics: Theory and Practice offers a comprehensive overview of data fusion, and provides a proper and adequate understanding of the basic mathematics directly related to DF. The material covered can be used for evaluation of the performances of any designed and developed DF systems. It tries to answer whether unified data fusion mathematics can evolve from various disparate mathematical concepts, and highlights mathematics that can add credibility to the data fusion process. Focuses on Mathematical Tools That Use Data Fusion This text explores the use of statistical/probabilistic signal/image processing, filtering, component analysis, image algebra, decision making, and neuro-FL-GA paradigms in studying, developing and validating data fusion processes (DFP). It covers major mathematical expressions, and formulae and equations as well as, where feasible, their derivations. It also discusses SDF concepts, DF models and architectures, aspects and methods of type 1 and 2 fuzzy logics, and related practical applications. In addition, the author covers soft computing paradigms that are finding increasing applications in multisensory DF approaches and applications. This book: Explores the use of interval type 2 fuzzy logic and ANFIS in DF Covers the mathematical treatment of many types of filtering algorithms, target-tracking methods, and kinematic DF methods Presents single and multi-sensor tracking and fusion mathematics Considers specific DF architectures in the context of decentralized systems Discusses information filtering, Bayesian approaches, several DF rules, image algebra and image fusion, decision fusion, and wireless sensor network (WSN) multimodality fusion Data Fusion Mathematics: Theory and Practice incorporates concepts, processes, methods, and approaches in data fusion that can help you with integrating DF mathematics and achieving higher levels of fusion activity, and clarity of performance. This text is geared toward researchers, scientists, teachers and practicing engineers interested and working in the multisensor data fusion area.

Body Sensor Networks Guang-Zhong Yang 2014-04-16 The last decade has witnessed a rapid surge of interest in new sensing and monitoring devices for wellbeing and healthcare. One key development in this area is wireless, wearable and implantable in vivo monitoring and intervention. A myriad of platforms are now available from both academic institutions and commercial organisations. They permit the management of patients with both acute and chronic symptoms, including diabetes, cardiovascular diseases, treatment of epilepsy and other debilitating neurological disorders. Despite extensive developments in sensing technologies, there are significant research issues related to system integration, sensor miniaturisation, low-power sensor interface, wireless telemetry and signal processing. In the 2nd edition of this popular and authoritative reference on Body Sensor Networks (BSN), major topics related to the latest technological developments and potential clinical applications are discussed, with contents covering. Biosensor Design, Interfacing and Nanotechnology Wireless Communication and Network Topologies Communication Protocols and Standards Energy Harvesting and Power Delivery Ultra-low Power Bio-inspired Processing Multi-sensor Fusion and Context Aware Sensing Autonomic Sensing Wearable, Ingestible Sensor Integration and Exemplar Applications System Integration and Wireless Sensor Microsystems The book also provides a comprehensive review of the current wireless sensor development platforms and a step-by-step guide to developing your own BSN applications through the use of the BSN development kit.

Data Fusion Support to Activity-Based Intelligence Richard T. Antony 2015-09-30 This new resource provides a coherent, intuitive, and theoretical foundation for the fusion and exploitation of traditional sensor data as well as text-based information. In addition to presenting a detailed discussion of base-level data fusion requirements, a variety of higher level exploitation algorithms are presented that perform fully automated relationship discovery, rank interest level of entities, and support context-sensitive behavior understanding (both static and dynamic context). This book identifies eight canonical fusion forms as well as twenty foundational fusion services to enable formal mapping between models and services. Normalization and representation processes for (hard) sensor data and (soft) semantic data are described as well as methods for combining hard and soft data. Included is a prototype fusion system developed to implement virtually all the presented applications in order to demonstrate the robustness and utility of the design principles presented in this resource. The prototype system presented supports a variety of user workflows and all the applications are fully integrated. There is extensive fusion system output for unclassified scenarios to permit the reader to fully understand all presented design principles. This book also presents context-sensitive fuzzy semantic spatial and temporal reasoning.

Handbook of Multisensor Data Fusion Martin Liggins II 2017-01-06 In the years since the bestselling first edition, fusion research and applications have adapted to service-oriented architectures and pushed the boundaries of situational modeling in human behavior, expanding into fields such as chemical and biological sensing, crisis management, and intelligent buildings. Handbook of Multisensor Data Fusion: Theory and Practice, Second Edition represents the most current concepts and theory as information fusion expands into the realm of network-centric architectures. It reflects new developments in distributed and detection fusion, situation and impact awareness in complex applications, and human cognitive concepts. With contributions from the world's leading fusion experts, this second edition expands to 31 chapters covering the fundamental theory and cutting-edge developments that are driving this field. New to the Second Edition— · Applications in electromagnetic systems and chemical and biological sensors · Army command and combat identification techniques · Techniques for automated reasoning · Advances in Kalman filtering · Fusion in a network centric environment · Service-oriented architecture concepts · Intelligent agents for improved decision making · Commercial off-the-shelf (COTS) software tools From basic information to state-of-the-art theories, this second edition continues to be a unique, comprehensive, and up-to-date resource for data fusion systems designers.

Advances in Multi-Sensor Information Fusion: Theory and Applications 2017 Xue-Bo Jin 2018-06-26 This book is a printed edition of the Special Issue "Advances in Multi-Sensor Information Fusion: Theory and Applications 2017" that was published in Sensors

Distributed Detection and Data Fusion Pramod K. Varshney 2012-12-06 This book provides an introductory treatment of the fundamentals of decision-making in a distributed framework. Classical detection theory assumes that complete observations are available at a central processor for decision-making. More recently, many applications have been identified in which observations are processed in a distributed manner and decisions are made at the distributed processors, or processed data (compressed observations) are conveyed to a fusion center that makes the global decision. Conventional detection theory has been extended so that it can deal with such distributed detection problems. A unified treatment of recent advances in this new branch of statistical decision theory is presented. Distributed detection under different formulations and for a variety of detection network topologies is discussed. This material is not available in any other book and has appeared relatively recently in technical journals. The level of presentation is such that the book can be used as a graduate-level textbook. Numerous examples are presented throughout the book. It is assumed that the reader has been exposed to detection theory. The book will also serve as a useful reference for practicing engineers and researchers. I have actively pursued research on distributed detection and data fusion over the last decade, which ultimately interested me in writing this book. Many individuals have played a key role in the completion of this book.

Data Fusion and Sensor Management James Manyika 1994 Presenting a single probability-based information-theoretic model for addressing issues in data fusion and sensor management for multi-sensor systems in general and decentralized systems in particular, this text develops mutually consistent data fusion architectures and algorithms. The algorithms are various architectural forms of the information filter and a corresponding Bayesian classification algorithm. Of significance is the normative sensor management method, making use of information-based utility functions.

Lawrence A. Klein 2017-08-07 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, freeway-management 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. Sensor data fusion and wireless networking for the transmission of data to and from 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.

David Lee Hall 2004 Since the publication of the first edition of this book, advances in algorithms, logic and software tools have transformed the field of data fusion. The latest edition covers these areas as well as smart agents, human computer interaction, cognitive aides to analysis and data system fusion control. data fusion system, this book guides you through the process of determining the trade-offs among competing data fusion algorithms, selecting commercial off-the-shelf (COTS) tools, and understanding when data fusion improves systems processing. Completely new chapters in this second edition explain data fusion system control, DARPA's recently developed TRIP model, and the latest applications of data fusion in data warehousing and medical equipment, as well as defence systems.

Lawrence A. Klein 2004 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.

Ni-Bin Chang 2018-02-21 Combining versatile data sets from multiple satellite sensors with advanced thematic information retrieval is a powerful way for studying complex earth systems. The book Multisensor Data Fusion and Machine Learning for Environmental Remote Sensing offers complete understanding of the basic scientific principles needed to perform image processing, gap filling, data merging, data fusion, machine learning, and feature extraction. Written by two experts in remote sensing, the book presents the required basic concepts, tools, algorithms, platforms, and technology hubs toward advanced integration. By merging and fusing data sets collected from different satellite sensors with common features, we are enabled to utilize the strength of each satellite sensor to the maximum extent. The inclusion of machine learning or data mining techniques to aid in feature extraction after gap filling, data merging and/or data fusion further empowers earth observation, leading to confirm the whole is greater than the sum of its parts. Contemporary applications discussed in this book make all essential knowledge seamlessly integrated by an interdisciplinary manner. These case-based engineering practices uniquely illustrate how to improve such an emerging field of importance to cope with the most challenging real-world environmental monitoring issues.

Distributed Data Fusion for Network-Centric Operations David Hall 2017-12-19 With the recent proliferation of service-oriented architectures (SOA), cloud computing technologies, and distributed-interconnected systems, distributed fusion is taking on a larger role in a variety of applications—from environmental monitoring and crisis management to intelligent buildings and defense. Drawing on the work of leading experts around the world, Distributed Data Fusion for Network-Centric Operations examines the state of the art of data fusion in a distributed sensing, communications, and computing environment. Get Insight into Designing and Implementing Data Fusion in a Distributed Network Addressing the entirety of information fusion, the contributors cover everything from signal and image processing, through estimation, to situation awareness. In particular, the work offers a timely look at the issues and solutions involving fusion within a distributed network enterprise. These include critical design problems, such as how to maintain a pedigree of agents or nodes that receive information, provide their contribution to the dataset, and pass to other network components. The book also tackles dynamic data sharing within a network-centric enterprise, distributed fusion effects on state estimation, graph-theoretic methods to optimize fusion performance, human engineering factors, and computer ontologies for higher levels of situation assessment. A comprehensive introduction to this emerging field and its challenges, the book explores how data fusion can be used within grid, distributed, and cloud computing architectures. Bringing together both theoretical and applied research perspectives, this is a valuable reference for fusion researchers and practitioners. It offers guidance and insight for those working on the complex issues of designing and implementing distributed, decentralized information fusion.

Multi-Sensor Data Fusion with MATLAB® Jitendra R. Raol 2009-12-16 Using MATLAB® examples wherever possible, Multi-Sensor Data Fusion with MATLAB explores the three levels of multi-sensor data fusion (MSDF): kinematic-level fusion, including the theory of DF; fuzzy logic and decision fusion; and pixel- and feature-level image fusion. The authors elucidate DF strategies, algorithms, and performance evaluation mainly for aerospace applications, although the methods can also be applied to systems in other areas, such as biomedicine, military defense, and environmental engineering. After presenting several useful strategies and algorithms for DF and tracking performance, the book evaluates DF algorithms, software, and systems. It next covers fuzzy logic, fuzzy sets and their properties, fuzzy logic operators, fuzzy propositions/rule-based systems, an inference engine, and defuzzification methods. It develops a new MATLAB graphical user interface for evaluating fuzzy implication functions, before using fuzzy logic to estimate the unknown states of a dynamic system by processing sensor data. The book then employs principal component analysis, spatial frequency, and wavelet-based image fusion algorithms for the fusion of image data from sensors. It also presents procedures for combing tracks obtained from imaging sensor and ground-based radar. The final chapters discuss how DF is applied to mobile intelligent autonomous systems and intelligent monitoring systems. Fusing sensors' data can lead to numerous benefits in a system's performance. Through real-world examples and the evaluation of algorithmic results, this detailed book provides an understanding of MSDF concepts and methods from a practical point of view. Select MATLAB programs are available for download on www.crcpress.com

Multi-Sensor Data Fusion Hassen Fourati 2017-12-19 Multisensor Data Fusion: From Algorithms and Architectural Design to Applications covers the contemporary theory and practice of multisensor data fusion, from fundamental concepts to cutting-edge techniques drawn from a broad array of disciplines. Featuring contributions from the world's leading data fusion researchers and academicians, this authoritative book: Presents state-of-the-art advances in the design of multisensor data fusion algorithms, addressing issues related to the nature, location, and computational ability of the sensors Describes new materials and achievements in optimal fusion and multisensor filters Discusses the advantages and challenges associated with multisensor data fusion, from extended spatial and temporal coverage to imperfection and diversity in sensor technologies Explores the topology, communication structure, computational resources, fusion level, goals, and optimization of multisensor data fusion system architectures Showcases applications of multisensor data fusion in fields such as medicine, transportation's traffic, defense, and navigation Multisensor Data Fusion: From Algorithms and Architectural Design to Applications is a robust collection of modern multisensor data fusion methodologies. The book instills a deeper understanding of the basics of multisensor data fusion as well as a practical knowledge of the problems that can be faced during its execution.

Sensor and Data Fusion Concepts and Applications Lawrence A. Klein 1999 First published in 1993, this Tutorial Text has been revised and updated to provide explanations and examples of data fusion algorithms in areas not covered in the first edition. These include Bayesian inference, artificial neural networks and fuzzy logic. All of the chapters in the first edition have been revised and updated and new material is included on the FASCODE and MODTRAN atmospheric models, and EOSAEL, which analyzes physical processes that affect the performance of millimeter-wave and IR sensors.

Lucien Wald 2002-01-01 This book establishes the fundamentals (particularly definitions and architectures) in data fusion. The second part of the book is devoted to methods for the fusion of images. It offers an in-depth presentation of standard and advanced methods for the fusion of multi-modality images.

Xue-Bo Jin 2020-03-23 This book includes papers from the section "Multisensor Information Fusion", from Sensors between 2018 to 2019. It focuses on the latest research results of current multi-sensor fusion technologies and represents the latest research trends, including traditional information fusion technologies, estimation and filtering, and the latest research, artificial intelligence involving deep learning.

Structural Health Monitoring Moises Rivas-Lopez 2017-06-21 Structural health monitoring (SHM) is a new engineering field with a growing tendency, based on technology development focused on data acquisition and analysis, to prevent possible damage in man-made structures and land's natural faults. The data are obtained from sensors and monitoring systems that allow detecting damages on structures, space vehicles, and land natural faults, to model their behavior under adverse scenarios, in order to search the detection of anomalies. Currently, there are many SHM systems with sensors based on different technologies like optical fiber, video cameras, optical scanners, wireless networks, and piezoelectric transducers, among others. In this context, the present book includes selected chapters with theoretical models and applications, to preserve infrastructure and prevent loss of human lives.

Fusion of Security System Data to Improve Airport Security National Research Council 2007-11-14 The security of the U.S. commercial aviation system has been a growing concern since the 1970's when the hijacking of aircraft became a serious problem. Over that period, federal aviation officials have been searching for more effective ways for non-invasive screening of passengers, luggage, and cargo to detect concealed explosives and weapons. To assist in this effort, the Transportation Security Administration (TSA) asked the NRC for a study of emerging screening technologies. This book - the fourth of four - focuses on data fusion as a means to significantly improve the ability of the existing suite of airport detection systems and access control systems to detect and prevent attacks. The book presents a discussion of the data fusion, an analysis of current data fusion efforts, and an assessment of data fusion opportunities for various airport security activities.

Multisensor Data Fusion and Machine Learning for Environmental Remote Sensing Ni-Bin Chang 2018-02-21 In the last few years the scientific community has realized that obtaining a better understanding of interactions between natural systems and the man-made environment across different scales demands more research efforts in remote sensing. An integrated Earth system observatory that merges surface-based, air-borne, space-borne, and even underground sensors with comprehensive and predictive data-driven algorithms is revolutionizing the study of global water, energy, and carbon cycles as well as land use and land cover changes. The aim of this book is to present a suite of relevant concepts, tools, and methods of integrated multisensor data fusion and machine learning technologies to promote environmental sustainability. The process of machine learning for intelligent feature extraction consists of regular, deep, and fast learning algorithms. The niche for integrating data fusion and machine learning for remote sensing rests upon the creation of a new scientific architecture in remote sensing science that is designed to support numerical as well as symbolic feature extraction managed by several cognitively oriented machine learning tasks at finer scales. By grouping a suite of satellites with similar nature in platform design, data merging may come to help for cloudy pixel reconstruction over the space domain or concatenation of time series images over the time domain, or even both simultaneously. Organized in 5 parts, from Fundamental Principles of Remote Sensing; Feature Extraction for Remote Sensing; Image and Data Fusion for Remote Sensing; Integrated Data Merging, Data Reconstruction, Data Fusion, and Machine Learning; to Remote Sensing for Environmental Decision Analysis, the book will be a useful reference for graduate students, academic scholars, and working professionals who are involved in the study of Earth systems and the environment for a sustainable future. The new knowledge in this book can be applied successfully in many areas of environmental science and engineering.

Multi-Sensor Data Fusion H.B. Mitchell 2007-07-13 This textbook provides a comprehensive introduction to the theories and techniques of multi-sensor data fusion. It is aimed at advanced undergraduate and first-year graduate students in electrical engineering and computer science, as well as researchers and professional engineers. The book is intended to be self-contained. No previous knowledge of multi-sensor data fusion is assumed, although some familiarity with the basic tools of linear algebra, calculus and simple probability theory is recommended.

Amita Dev 2021-06-30 The 2nd International Conference on Artificial Intelligence and Speech Technology (AIST2020) was organized by Indira Gandhi Delhi Technical University for Women, Delhi, India on November 19–20, 2020. AIST2020 is dedicated to cutting-edge research that addresses the scientific needs of academic researchers and industrial professionals to explore new horizons of knowledge related to Artificial Intelligence and Speech Technologies. AIST2020 includes high-quality paper presentation sessions revealing the latest research findings, and engaging participant discussions. The main focus is on novel contributions which would open new opportunities for providing better and low-cost solutions for the betterment of society. These include the use of new AI-based approaches like Deep Learning, CNN, RNN, GAN, and others in various Speech related issues like speech synthesis, speech recognition, etc.

Multisensor Data Fusion David Hall 2001-06-20 The emerging technology of multisensor data fusion has a wide range of applications, both in Department of Defense (DoD) areas and in the civilian arena. The techniques of multisensor data fusion draw from an equally broad range of disciplines, including artificial intelligence, pattern recognition, and statistical estimation. With the rapid evolut

Data Fusion in Wireless Sensor Networks Domenico Ciuonzo 2019-05-03 This book describes the advanced tools required to design state-of-the-art inference algorithms for inference in wireless sensor networks. Written for the signal processing, communications, sensors and information fusion research communities, it covers the emerging area of data fusion in wireless sensor networks.

Arturo Román Messina 2020-05-05 Data Fusion and Data Mining for Power System Monitoring provides a comprehensive treatment of advanced data fusion and data mining techniques for power system monitoring with focus on use of synchronized phasor networks. Relevant statistical data mining techniques are given, and efficient methods to cluster and visualize data collected from multiple sensors are discussed. Both linear and nonlinear data-driven mining and fusion techniques are reviewed, with emphasis on the analysis and visualization of massive distributed data sets. Challenges involved in realistic monitoring, visualization, and analysis of observation data from actual events are also emphasized, supported by examples of relevant applications. Features Focuses on systematic illustration of data mining and fusion in power systems Covers issues of standards used in the power industry for data mining and data analytics Applications to a wide range of power networks are provided including distribution and transmission networks Provides holistic approach to the problem of data mining and data fusion using cutting-edge methodologies and technologies Includes applications to massive spatiotemporal data from simulations and actual events

Data Fusion Methodology and Applications Marina Cocchi 2019-05-11 Data Fusion Methodology and Applications explores the data-driven discovery paradigm in science and the need to handle large amounts of diverse data. Drivers of this change include the increased availability and accessibility of hyphenated analytical platforms, imaging techniques, the explosion of omics data, and the development of information technology. As data-driven research deals with an inductive attitude that aims to extract information and build models capable of inferring the underlying phenomena from the data itself, this book explores the challenges and methodologies used to integrate data from multiple sources, analytical platforms, different modalities, and varying timescales. Presents the first comprehensive textbook on data fusion, focusing on all aspects of data-driven discovery Includes comprehensible, theoretical chapters written for large and diverse audiences Provides a wealth of selected application to the topics included

Data Fusion Mathematics: Theory and Practice Jitendra R. Raol 2015-08-27 Fills the Existing Gap of Mathematics for Data Fusion Data fusion (DF) combines large amounts of information from a variety of sources and fuses this data algorithmically, logically and, if required intelligently, using artificial intelligence (AI). Also, known as sensor data fusion (SDF), the DF fusion system is an important component for use in various applications that include the monitoring of vehicles, aerospace systems, large-scale structures, and large industrial automation plants. Data Fusion Mathematics: Theory and Practice offers a comprehensive overview of data fusion, and provides a proper and adequate understanding of the basic mathematics directly related to DF. The material covered can be used for evaluation of the performances of any designed and developed DF systems. It tries to answer whether unified data fusion mathematics can evolve from various disparate mathematical concepts, and highlights mathematics that can add credibility to the data fusion process. Focuses on Mathematical Tools That Use Data Fusion This text explores the use of statistical/probabilistic signal/image processing, filtering, component analysis, image algebra, decision making, and neuro-FL-GA paradigms in studying, developing and validating data fusion processes (DFP). It covers major mathematical expressions, and formulae and equations as well as, where feasible, their derivations. It also discusses SDF concepts, DF models and architectures, aspects and methods of type 1 and 2 fuzzy logics, and related practical applications. In addition, the author covers soft computing paradigms that are finding increasing applications in multisensory DF approaches and applications. This book: Explores the use of interval type 2 fuzzy logic and ANFIS in DF Covers the mathematical treatment of many types of filtering algorithms, target-tracking methods, and kinematic DF methods Presents single and multi-sensor tracking and fusion mathematics Considers specific DF architectures in the context of decentralized systems Discusses information filtering, Bayesian approaches, several DF rules, image algebra and image fusion, decision fusion, and wireless sensor network (WSN) multimodality fusion Data Fusion Mathematics: Theory and Practice incorporates concepts, processes, methods, and approaches in data fusion that can help you with integrating DF mathematics and achieving higher levels of fusion activity, and clarity of performance. This text is geared toward researchers, scientists, teachers and practicing engineers interested and working in the multisensor data fusion area.

Sensor and Data Fusion Hassen Fourati 2017-12-19 Multisensor Data Fusion: From Algorithms and Architectural Design to Applications covers the contemporary theory and practice of multisensor data fusion, from fundamental concepts to cutting-edge techniques drawn from a broad array of disciplines. Featuring contributions from the world's leading data fusion researchers and academicians, this authoritative book: Presents state-of-the-art advances in the design of multisensor data fusion algorithms, addressing issues related to the nature, location, and computational ability of the sensors Describes new materials and achievements in optimal fusion and multisensor filters Discusses the advantages and challenges associated with multisensor data fusion, from extended spatial and temporal coverage to imperfection and diversity in sensor technologies Explores the topology, communication structure, computational resources, fusion level, goals, and optimization of multisensor data fusion system architectures Showcases applications of multisensor data fusion in fields such as medicine, transportation's traffic, defense, and navigation Multisensor Data Fusion: From Algorithms and Architectural Design to Applications is a robust collection of modern multisensor data fusion methodologies. The book instills a deeper understanding of the basics of multisensor data fusion as well as a practical knowledge of the problems that can be faced during its execution.

ITS Sensors and Architectures for Traffic Management and Connected Vehicles

Mathematical Techniques in Multisensor Data Fusion

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