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Fundamentals of Wireless Sensor Networks

Theory and Practice



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Wireless Sensor Networks From Theory To Applications

Gianluigi Ferrari



Wireless Sensor Networks From Theory To Applications:

Wireless Sensor Networks Ibrahiem M. M. El Emary, S. Ramakrishnan, 2013-08-28 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 WSNs In order to provide the wide ranging guidance required the book brings together the contributions of domain experts working in the various subfields of WSNs worldwide This edited volume examines recent advances in WSN technologies and considers the theoretical problems in WSN including issues with monitoring routing and power control It also details methodologies that can provide solutions to these problems The book s 25 chapters are divided into seven parts Data Collection Physical Layer and Interfacing Routing and Transport Protocols Energy Saving Approaches Mobile and Multimedia WSN Data Storage and Monitoring Applications The book examines applications of WSN across a range of fields including health military transportation and mining Addressing the main challenges in applying WSNs across all phases of our life it explains how WSNs can assist in community development Complete with a list of references at the end of each chapter this book is ideal for senior undergraduate and postgraduate students researchers scholars academics industrial researchers and practicing engineers working on WSNs The text assumes that readers possess a foundation in computer networks wireless communication and basic electronics

Introductory Concepts of Wireless Sensor Network. Theory and Applications Dac-Nhuong Le, Raghvendra Kumar, Jyotir Moy Chatterjee, 2018-01-02 Document from the year 2018 in the subject Instructor Plans Computing Data Processing IT Telecommunication course Wireless Sensor Network language English abstract This book *Introductory Concepts of Wireless Sensor Network* provides the details study of Wireless Sensor Network Introduction Application Middleware and basic concept of cloud computing with WSN This book also uses the Data Transmission concepts for secure data transmission over the wireless sensor network in distributed environment This book is useful for undergraduates postgraduates and research scholar students for their course work and research projects in the field of engineering science and technology The text is organized into ten chapters Chapter 1 and Chapter 2 provides Basic concept of wireless sensor network and their application in real life Chapter 3 and Chapter 4 Routing in Cluster Based Wireless Sensor Networks and Cluster Based Distribution Routing Protocol for wireless sensor network Chapter 5 and Chapter 6 includes MAC Protocol for WSN MANET and Routing Protocols in Wireless Sensor Network Chapter 7 and Chapter 8 give the brief introduction of Transport Control Protocols for WSN and different Middleware s for WSN Chapter 9 and Chapter 10 give brief Concept of Cloud Computing with WSN and Data Transmission over the WSN Finally this book includes un solved problems exercise and list of projects that are useful for both graduate and post graduate students *Ad Hoc And Sensor Networks: Theory And Applications* Dharma Prakash Agrawal, Carlos De Moraes Cordeiro, 2006-03-01 This book introduces a new explanatory cross

layer model specifically designed to understand all aspects of ad hoc and sensor networking from design through performance issues to application requirements Future directions challenges and potential simulation projects are also discussed The topics included represent a significant portion of what is going on in academia and industry The vast materials provided will enable readers to not only understand and position themselves in this hot area but also to develop new capabilities enhance skills share expertise consolidate knowledge and design future solutions Thus the book is useful for researchers and engineers and anyone who seeks a deeper understanding of this growing field and wishes to pursue it as a future research topic

Wireless Ad Hoc and Sensor Networks Xiangyang Li,2008 An overview of the various approaches and insights required to understand and optimize wireless ad hoc and sensor network performance **Ad Hoc And Sensor Networks: Theory And Applications (2nd Edition)** Carlos De Moraes Cordeiro,Dharma Prakash

Agrawal,2011-02-28 This book provides a comprehensive yet easy coverage of ad hoc and sensor networks and fills the gap of existing literature in this growing field It emphasizes that there is a major interdependence among various layers of the network protocol stack Contrary to wired or even one hop cellular networks the lack of a fixed infrastructure the inherent mobility the wireless channel and the underlying routing mechanism by ad hoc and sensor networks introduce a number of technological challenges that are difficult to address within the boundaries of a single protocol layer All existing textbooks on the subject often focus on a specific aspect of the technology and fail to provide critical insights on cross layer interdependencies To fully understand these intriguing networks one need to grasp specific solutions individually and also the many interdependencies and cross layer interactions Ad Hoc and Sensor Networks Carlos De Moraes

Cordeiro,Dharma Prakash Agrawal,2011 **Wireless Sensor Networks** Shuang-Hua Yang,2013-10-23 Wireless Sensor Networks presents the latest practical solutions to the design issues presented in wireless sensor network based systems Novel features of the text distributed throughout include workable solutions demonstration systems and case studies of the design and application of wireless sensor networks WSNs based on the first hand research and development experience of the author and the chapters on real applications building fire safety protection smart home automation and logistics resource management Case studies and applications illustrate the practical perspectives of sensor node design embedded software design routing algorithms sink node positioning co existence with other wireless systems data fusion security indoor location tracking integrating with radio frequency identification and Internet of things Wireless Sensor Networks brings together multiple strands of research in the design of WSNs mainly from software engineering electronic engineering and wireless communication perspectives into an over arching examination of the subject benefiting students field engineers system developers and IT professionals The contents have been well used as the teaching material of a course taught at postgraduate level in several universities making it suitable as an advanced text book and a reference book for final year undergraduate and postgraduate students *Wireless Ad Hoc and Sensor Networks* Xiang-Yang Li,2008-06-30 If you have

to understand and optimize the performance of wireless ad hoc and sensor networks this explanation provides you with the information and insights you need It delivers an understanding of the underlying problems and the techniques to develop efficient solutions and maximize network performance Taking an algorithmic and theoretical approach Li dissects key layers of a wireless network from the physical and MAC layers covering the IEEE 802.11 and 802.16 protocols and protocols for wireless sensor networks and Bluetooth through to the network routing layer In doing so he reviews the practical protocols formulates problems mathematically solves them algorithmically and then analyses the performance Graduate students researchers and practitioners needing an overview of the various algorithmic graph theoretical computational geometric and probabilistic approaches to solving problems in designing these networks will find this an invaluable resource Additional resources for this title are available online at www.cambridge.org/9780521865234 *Wireless Sensor and Actuator Networks* Roberto Verdone, Davide Dardari, Gianluca Mazzini, Andrea Conti, 2010-07-27 When choosing the technology options to develop a wireless sensor network WSN it is vital that their performance levels can be assessed for the type of application intended This book describes the different technology options MAC protocols routing protocols localisation and data fusion techniques and provides the means to numerically measure their performance whether by simulation mathematical models or experimental test beds Case studies based on the authors direct experience of implementing wireless sensor networks describe the design methodology and the type of measurements used together with samples of the performance measurements attained *Wireless Sensor and Actuator Networks* will enable you to answer vital questions such as How long will my network remain alive given the amount of sensing required of it For how long should I set the sleeping state of my nodes How many sensors should I distribute to meet the expected requirements of the application What type of throughput should I expect as a function of the number of nodes deployed and the radio interface chosen whether it be Bluetooth or Zigbee How is the Packet Error Rate of my Zigbee nodes affected by the selection of adjacent frequency sub bands in the ISM 2.4GHz band How is the localisation precision dependant on the number of nodes deployed in a corridor Communications and signal processing engineers researchers and graduate students working in wireless sensor networks will find this book an invaluable practical guide to this important technology This book gives a proper balance between theory and application it is a book for those R it is valuable for both students and practicing engineers and is an essential addition for engineering libraries Professor Moe Win Associate Professor at the Laboratory for Information and Decision Systems LIDS Massachusetts Institute of Technology Only book to examine wireless sensor network technologies and assess their performance capabilities against possible applications Enables the engineer to choose the technology that will give the best performance for the intended application Case studies based on the authors direct experience of implementing wireless sensor networks describe the design methodology and the type of measurements used together with samples of the performance measurements attained **Fundamentals of Wireless Sensor Networks** Waltenegus Dargie, Christian

Poellabauer,2010-11-05 In this book the authors describe the fundamental concepts and practical aspects of wireless sensor networks The book provides a comprehensive view to this rapidly evolving field including its many novel applications ranging from protecting civil infrastructure to pervasive health monitoring Using detailed examples and illustrations this book provides an inside track on the current state of the technology The book is divided into three parts In Part I several node architectures applications and operating systems are discussed In Part II the basic architectural frameworks including the key building blocks required for constructing large scale energy efficient sensor networks are presented In Part III the challenges and approaches pertaining to local and global management strategies are presented this includes topics on power management sensor node localization time synchronization and security At the end of each chapter the authors provide practical exercises to help students strengthen their grip on the subject There are more than 200 exercises altogether Key Features Offers a comprehensive introduction to the theoretical and practical concepts pertaining to wireless sensor networks Explains the constraints and challenges of wireless sensor network design and discusses the most promising solutions Provides an in depth treatment of the most critical technologies for sensor network communications power management security and programming Reviews the latest research results in sensor network design and demonstrates how the individual components fit together to build complex sensing systems for a variety of application scenarios Includes an accompanying website containing solutions to exercises http://www.wiley.com/go/dargie_fundamentals This book serves as an introductory text to the field of wireless sensor networks at both graduate and advanced undergraduate level but it will also appeal to researchers and practitioners wishing to learn about sensor network technologies and their application areas including environmental monitoring protection of civil infrastructure health care precision agriculture traffic control and homeland security

Wireless Sensor Networks Ananthram Swami,Qing Zhao,Yao-Win Hong,Lang Tong,2007-11-12 A wireless sensor network WSN uses a number of autonomous devices to cooperatively monitor physical or environmental conditions via a wireless network Since its military beginnings as a means of battlefield surveillance practical use of this technology has extended to a range of civilian applications including environmental monitoring natural disaster prediction and relief health monitoring and fire detection Technological advancements coupled with lowering costs suggest that wireless sensor networks will have a significant impact on 21st century life The design of wireless sensor networks requires consideration for several disciplines such as distributed signal processing communications and cross layer design Wireless Sensor Networks Signal Processing and Communications focuses on the theoretical aspects of wireless sensor networks and offers readers signal processing and communication perspectives on the design of large scale networks It explains state of the art design theories and techniques to readers and places emphasis on the fundamental properties of large scale sensor networks Wireless Sensor Networks Signal Processing and Communications Approaches WSNs from a new angle distributed signal processing communication algorithms and novel cross layer design paradigms Applies ideas and illustrations from

classical theory to an emerging field of WSN applications Presents important analytical tools for use in the design of application specific WSNs Wireless Sensor Networks will be of use to signal processing and communications researchers and practitioners in applying classical theory to network design It identifies research directions for senior undergraduate and graduate students and offers a rich bibliography for further reading and investigation

Ultra-Low Energy Wireless Sensor Networks in Practice Mauri Kuorilehto, Mikko Kohvakka, Jukka Suhonen, Panu Hämäläinen, Marko Hännikäinen, Timo D. Hamalainen, 2008-02-28 Finally a book on Wireless Sensor Networks that covers real world applications and contains practical advice Kuorilehto et al have written the first practical guide to wireless sensor networks The authors draw on their experience in the development and field testing of autonomous wireless sensor networks WSNs to offer a comprehensive reference on fundamentals practical matters limitations and solutions of this fast moving research area Ultra Low Energy Wireless Sensor Networks in Practice Explains the essential problems and issues in real wireless sensor networks and analyzes the most promising solutions Provides a comprehensive guide to applications functionality protocols and algorithms for WSNs Offers practical experiences from new applications and their field testing including several deployed networks Includes simulations and physical measurements for energy consumption bit rate latency memory and lifetime Covers embedded resource limited operating systems middleware and application software Ultra Low Energy Wireless Sensor Networks in Practice will prove essential reading for Research Scientists advanced students in Networking Electrical Engineering and Computer Science as well as Product Managers and Design Engineers

Handbook on Sensor Networks Yang Xiao, Hui Chen, Frank Haizhon Li, 2010 Sensor networks have many interesting applications with great utility however their actual deployment and realization rely on continuous innovations and solutions to many challenging problems Thus sensor networks have recently attracted the attention of many researchers and practitioners The compilation of the Handbook on Sensor Networks will meet the demand of the sensor network community for a comprehensive reference and summary of the current state of the area The Handbook on Sensor Networks is a collection of approximately 40 chapters on sensor network theory and applications The book spans a wide spectrum and includes topics in medium access control routing security and privacy coverage and connectivity modeling and simulations multimedia energy efficiency localization and tracking design and implementation as well as sensor network applications

Electromagnetics and Network Theory and their Microwave Technology Applications Stefan Lindenmeier, Robert Weigel, 2011-07-13 This volume provides a discussion of the challenges and perspectives of electromagnetics and network theory and their microwave applications in all aspects It collects the most interesting contribution of the symposium dedicated to Professor Peter Russer held in October 2009 in Munich

Wireless Sensor and Actuator Networks Amiya Nayak, Ivan Stojmenovic, 2010-01-26 This timely book offers a mixture of theory experiments and simulations that provides qualitative and quantitative insights in the field of sensor and actuator networking The chapters are selected in a way that makes the book comprehensive and self contained It

covers a wide range of recognized problems in sensor networks striking a balance between theoretical and practical coverage The book is appropriate for graduate students and practitioners working as engineers programmers and technologists

Rechargeable Sensor Networks Jiming Chen, Shibo He, Youxian Sun, 2014 The harvesting of energy from ambient energy sources to power electronic devices has been recognized as a promising solution to the issue of powering the ever growing number of mobile devices around us Key technologies in the rapidly growing field of energy harvesting focus on developing solutions to capture ambient energy surrounding the mobile devices and convert it into usable electrical energy for the purpose of recharging said devices Achieving a sustainable network lifetime via battery aware designs brings forth a new frontier for energy optimization techniques These techniques had in their early stages resulted in the development of low power hardware designs Today they have evolved into power aware designs and even battery aware designs This book covers recent results in the field of rechargeable sensor networks including technologies and protocol designs to enable harvesting energy from alternative energy sources such as vibrations temperature variations wind solar and biochemical energy and passive human power

Sensor Networks Gianluigi Ferrari, 2010-03-10 The idea of this book comes from the observation that sensor networks represent a topic of interest from both theoretical and practical perspectives The title and lines that sensor networks offer the unique opportunity of clearly linking theory with practice In fact owing to their typical low cost academic researchers have the opportunity of implementing sensor network testbeds to check the validity of their theories algorithms protocols etc in reality Likewise a practitioner has the opportunity of understanding what are the principles behind the sensor networks under use and thus how to properly tune some accessible network parameters to improve the performance On the basis of the observations above the book has been structured in three parts Part I is denoted as Theory since the topics of its chapters are apparently detached from real scenarios Part II is denoted as Theory and Practice since the topics of its three chapters although theoretical have a clear connection with specific practical scenarios Part III is denoted as Practice since the topics of its three chapters are clearly related to practical applications

Handbook On Sensor Networks Yang Xiao, Hui Chen, Frank Haizhong Li, 2010-08-30 Sensor networks have many interesting applications with great utility however their actual deployment and realization rely on continuous innovations and solutions to many challenging problems Thus sensor networks have recently attracted the attention of many researchers and practitioners The compilation of the Handbook on Sensor Networks will meet the demand of the sensor network community for a comprehensive reference and summary of the current state of the area The Handbook on Sensor Networks is a collection of approximately 40 chapters on sensor network theory and applications The book spans a wide spectrum and includes topics in medium access control routing security and privacy coverage and connectivity modeling and simulations multimedia energy efficiency localization and tracking design and implementation as well as sensor network applications

Building Wireless Sensor Networks Smain Femmam, 2017-09-26 Building Wireless Sensor Networks Application to

Routing and Data Diffusion discusses challenges involved in securing routing in wireless sensor networks with new hybrid topologies An analysis of the security of real time data diffusion a protocol for routing in wireless sensor networks is provided along with various possible attacks and possible countermeasures Different applications are introduced and new topologies are developed Topics include audio video bridging AVB switched Ethernet which uses the representation of a network of wireless sensors by a grayscale image to construct routing protocols thereby minimizing energy consumption and data sharing in vehicular ad hoc networks Existing wireless networks aim to provide communication services between vehicles by enabling the vehicular networks to support wide range applications New topologies are proposed first based on the graphiton models then the wireless sensor networks WSN based on the IEEE 802 15 4 standard ZigBee sensors and finally the Pancake graphs as an alternative to the Hypercube for interconnecting processors in parallel computer networks Presents an analysis and protocol for routing in wireless sensor networks Presents ways to prevent attacks against this protocol Introduces different applications Develops new topologies

Fundamentals of Sensor Network Programming S. Sitharama Iyengar,Nandan Parameshwaran,Vir V. Phoha,Narayanaswamy Balakrishnan,Chuka D. Okoye,2011-03-29 This book provides the basics needed to develop sensor network software and supplements it with many case studies covering network applications It also examines how to develop onboard applications on individual sensors how to interconnect these sensors and how to form networks of sensors although the major aim of this book is to provide foundational principles of developing sensor networking software and critically examine sensor network applications

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