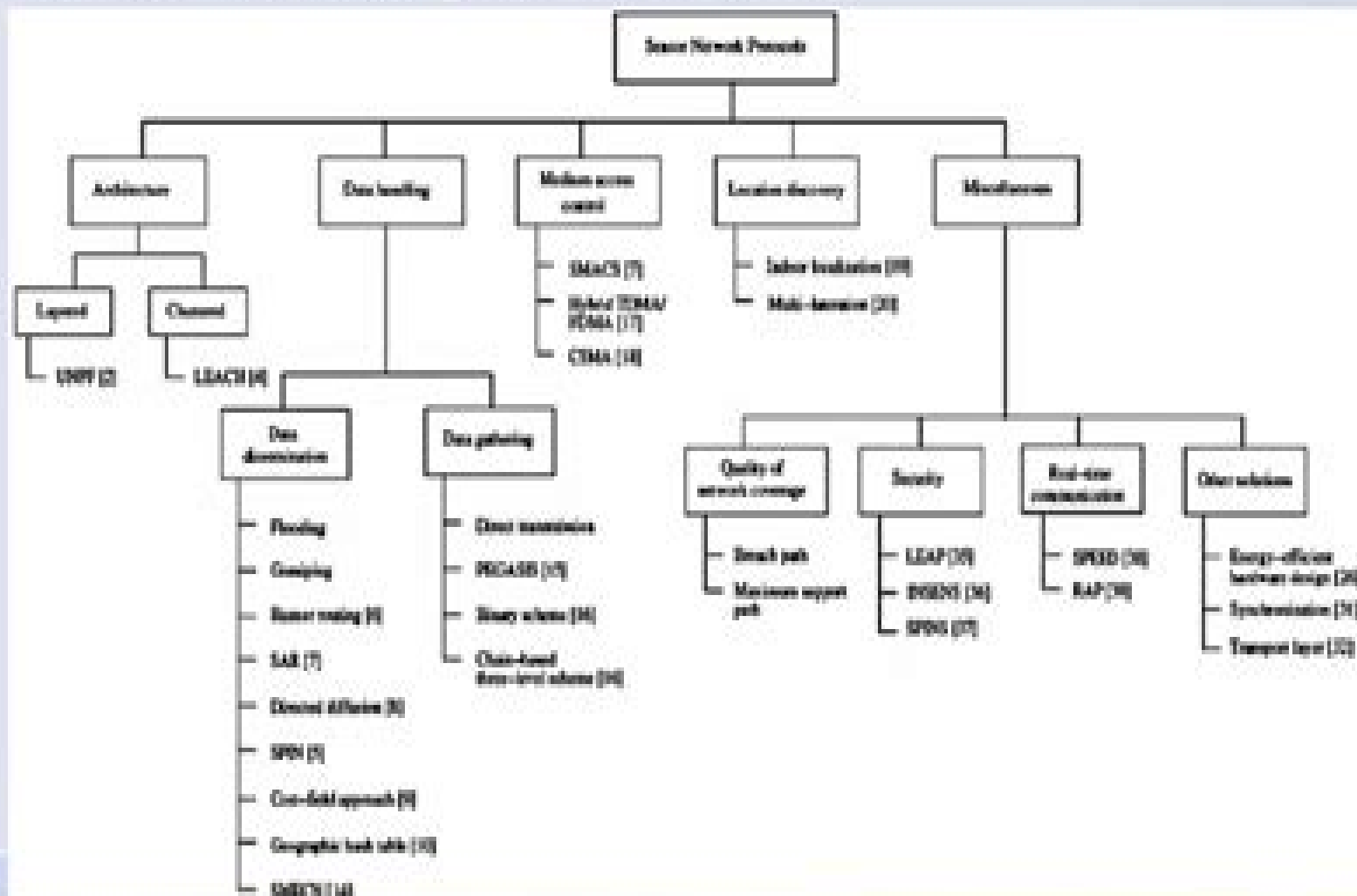


# Classifications of sensor network protocols



# Sensor Network Protocols

**Holger Karl, Andreas Willig**



## **Sensor Network Protocols:**

Sensor Network Protocols Imad Mahgoub, Mohammad Ilyas, 2006-01-27 Sensor networks continue to grow in importance for modern communication networks Communication protocols are at the core of these networks determining their ability to function their capabilities and the environments in which they are able to operate In chapters carefully selected from the popular Handbook of Sensor Networks Sensor Network Protocols supplies a sharply focused reference on protocols security data processing and energy management in communication sensor networks that is ideal for specialists in the field Providing a succinct guide to the protocols currently used in advanced sensor networks this book focuses on four main areas routing protocols data gathering and processing security and reliability and energy management The book opens with a survey of the challenges and opportunities facing the field Then expert contributors authoritatively discuss routing technologies next generation enabling technologies comparative study of energy efficient protocols for wireless sensor networks techniques to reduce computation and communication energy consumption energy aware routing localized algorithms for sensor networks and much more Sensor Network Protocols details the techniques and technologies that are at the heart of modern sensor networks It is an ideal reference for anyone interested in designing planning or building emerging sensor and communications networks

*Sensor Network Protocols* Imad Mahgoub, Mohammad Ilyas, 2018-10-08 Sensor networks continue to grow in importance for modern communication networks Communication protocols are at the core of these networks determining their ability to function their capabilities and the environments in which they are able to operate In chapters carefully selected from the popular Handbook of Sensor Networks Sensor Network Protocols supplies a sharply focused reference on protocols security data processing and energy management in communication sensor networks that is ideal for specialists in the field Providing a succinct guide to the protocols currently used in advanced sensor networks this book focuses on four main areas routing protocols data gathering and processing security and reliability and energy management The book opens with a survey of the challenges and opportunities facing the field Then expert contributors authoritatively discuss routing technologies next generation enabling technologies comparative study of energy efficient protocols for wireless sensor networks techniques to reduce computation and communication energy consumption energy aware routing localized algorithms for sensor networks and much more Sensor Network Protocols details the techniques and technologies that are at the heart of modern sensor networks It is an ideal reference for anyone interested in designing planning or building emerging sensor and communications networks

Low-Power Wireless Sensor Networks Jukka Suhonen, Mikko Kohvakka, Ville Kaseva, Timo D. Hämäläinen, Marko Hännikäinen, 2012-01-14 Wireless sensor network WSN is an ad hoc network technology comprising even thousands of autonomic and self organizing nodes that combine environmental sensing data processing and wireless networking The applications for sensor networks range from home and industrial environments to military uses Unlike the traditional computer networks a WSN is application oriented and

deployed for a specific task WSNs are data centric which means that messages are not sent to individual nodes but to geographical locations or regions based on the data content A WSN node is typically battery powered and characterized by extremely small size and low cost As a result the processing power memory and energy resources of an individual sensor node are limited However the feasibility of a WSN lies on the collaboration between the nodes A reference WSN node comprises a Micro Controller Unit MCU having few Million Instructions Per Second MIPS processing speed tens of kilobytes program memory few kilobytes data memory In addition the node contains a short range radio and a set of sensors Supply power is typically obtained with small batteries Assuming a target lifetime of one year using AA size batteries the available power budget is around 1 mW This book covers the low power WSNs services ranging from hardware platforms and communication protocols to network deployment and sensor data collection and actuation The implications of resource constraints and expected performance in terms of throughput reliability and latency are explained As a case study this book presents experiments with low energy TUTWSN technology to illustrate the possibilities and limitations of WSN applications

*Wireless Sensor Networks* Ian F. Akyildiz, Mehmet Can Vuran, 2010-06-10 This book presents an in depth study on the recent advances in Wireless Sensor Networks WSNs The authors describe the existing WSN applications and discuss the research efforts being undertaken in this field Theoretical analysis and factors influencing protocol design are also highlighted The authors explore state of the art protocols for WSN protocol stack in transport routing data link and physical layers Moreover the synchronization and localization problems in WSNs are investigated along with existing solutions Furthermore cross layer solutions are described Finally developing areas of WSNs including sensor actor networks multimedia sensor networks and WSN applications in underwater and underground environments are explored The book is written in an accessible textbook style and includes problems and solutions to assist learning Key Features The ultimate guide to recent advances and research into WSNs Discusses the most important problems and issues that arise when programming and designing WSN systems Shows why the unique features of WSNs self organization cooperation correlation will enable new applications that will provide the end user with intelligence and a better understanding of the environment Provides an overview of the existing evaluation approaches for WSNs including physical testbeds and software simulation environments Includes examples and learning exercises with a solutions manual supplemented by an accompanying website containing PPT slides *Wireless Sensor Networks* is an essential textbook for advanced students on courses in wireless communications networking and computer science It will also be of interest to researchers system and chip designers network planners technical managers and other professionals in these fields **Industrial Wireless Sensor Networks** Seong-eun Yoo, Taehong Kim, 2020-12-07 Wireless sensor networks are penetrating our daily lives and they are starting to be deployed even in an industrial environment The research on such industrial wireless sensor networks IWSNs considers more stringent requirements of robustness reliability and timeliness in each network layer This Special Issue presents the recent

research result on industrial wireless sensor networks Each paper in this Special Issue has unique contributions in the advancements of industrial wireless sensor network research and we expect each paper to promote the relevant research and the deployment of IWSNs

Wireless Sensor Networks: Technology, Protocols, And Applications Daniel Minoli Kazem Sohraby, Taieb Znati, 2010-07-21 This book is intended to be a high quality textbook that provides a carefully designed exposition of the important aspects of Wireless Sensor Networks The book provides a thorough coverage of wireless sensor networks including applications communication and networking protocols middleware security and management The book is targeted at networking professionals managers and practitioners and government agencies who want to understand the benefits of this new technology and plan for its use and deployment Chapter 1 Introduction and Overview of Wireless Sensor Networks Chapter 2 Commercial and Scientific Applications of Wireless Sensor Networks Chapter 3 Basic Wireless Sensor Technology Chapter 4 Wireless Sensors Networks Protocols Physical Layer Chapter 5 Medium Access Control Protocols for Wireless Sensor Networks Chapter 6 Sensors Network Protocols Routing Protocols Chapter 7 Transport Control Protocols for Wireless Sensors Networks Chapter 8 Middleware for Sensor Networks Chapter 9 Network Management for Wireless Sensor Networks Chapter 10 Operating Systems for Sensor Networks Chapter 11 Performance and Traffic Management Issues

**Protocols and Architectures for Wireless Sensor Networks** Holger Karl, Andreas Willig, 2007-10-08 Learn all you need to know about wireless sensor networks Protocols and Architectures for Wireless Sensor Networks provides a thorough description of the nuts and bolts of wireless sensor networks The authors give an overview of the state of the art putting all the individual solutions into perspective with one and other Numerous practical examples case studies and illustrations demonstrate the theory techniques and results presented The clear chapter structure listing learning objectives outline and summarizing key points help guide the reader expertly through the material Protocols and Architectures for Wireless Sensor Networks Covers architecture and communications protocols in detail with practical implementation examples and case studies Provides an understanding of mutual relationships and dependencies between different protocols and architectural decisions Offers an in depth investigation of relevant protocol mechanisms Shows which protocols are suitable for which tasks within a wireless sensor network and in which circumstances they perform efficiently Features an extensive website with the bibliography PowerPoint slides additional exercises and worked solutions This text provides academic researchers graduate students in computer science computer engineering and electrical engineering as well as practitioners in industry and research engineers with an understanding of the specific design challenges and solutions for wireless sensor networks Check out [www.wiley.com/go/wsn](http://www.wiley.com/go/wsn) for accompanying course material I am deeply impressed by the book of Karl Willig It is by far the most complete source for wireless sensor networks The book covers almost all topics related to sensor networks gives an amazing number of references and thus is the perfect source for students teachers and researchers Throughout the book the reader will find high quality text figures formulas comparisons etc all you need for a sound basis to start sensor network

research Prof Jochen Schiller Institute of Computer Science Freie Universität Berlin Wireless Sensor Networks Nirupama Bulusu, 2005 This first of its kind resource offers you an in depth understanding of wireless sensor networks from a systems perspective The book describes and categorizes the technological trends leading applications state of the art platform developments future trends and challenges of sensor networks You find critical coverage of network protocols and mechanisms for node localization time synchronization media access control topology creation and management routing transport storage collaborative signal processing security and fault tolerance and node deployment in large scale sensor networks *Wireless sensor networks protocols in IoT. A performance evaluation and comparison* Polycarp Yakoi, 2021-02-02 Master's Thesis from the year 2018 in the subject Engineering Computer Engineering grade 3.71 Cyprus International University language English abstract In this thesis three Wireless Sensor Networks Ad hoc On Demand Distance Vector Dynamic Source routing protocol and Optimized Link State routing protocol have been simulated and compared in typical IoT scenarios Their performance was evaluated using three performance metrics and then they were compared the performance metrics are Routing Overhead Average End to End Delay and Throughput Different number of nodes with different percentages of mobile nodes were analyzed Specifically number of nodes analyzed were 20 40 60 and 70 with the number of mobile nodes 10 15 and 20 using OPNET while with NS 3 20 60 and 100 nodes were analyzed For each of the number of nodes all the number of mobile nodes were evaluated The routing protocols were analyzed using the OPNET Simulation Software and NS 3 and the environment size for the simulation was 1000m by 1000m IoT has continue to grow bigger since from its inception Many mobile devices are now available the internet and its application have only grown bigger and better As IoT is continually growing so also is the complexity as a result issues pertaining routing have also increased Many researches have been made in attempt to proffer solutions that will either minimize or eliminate these routing issues Different routing protocols have been designed with different specifications for different applications of the IoT Also attempts have been made to implement routing protocols of other types of networks in the IoT **Smart Wireless Sensor Networks** Yen Kheng Tan, Hoang Duc Chinh, 2010-12-14 The recent development of communication and sensor technology results in the growth of a new attractive and challenging area wireless sensor networks WSNs A wireless sensor network which consists of a large number of sensor nodes is deployed in environmental fields to serve various applications Facilitated with the ability of wireless communication and intelligent computation these nodes become smart sensors which do not only perceive ambient physical parameters but also be able to process information cooperate with each other and self organize into the network These new features assist the sensor nodes as well as the network to operate more efficiently in terms of both data acquisition and energy consumption Special purposes of the applications require design and operation of WSNs different from conventional networks such as the internet The network design must take into account of the objectives of specific applications The nature of deployed environment must be considered The limited of sensor nodes resources such

as memory computational ability communication bandwidth and energy source are the challenges in network design A smart wireless sensor network must be able to deal with these constraints as well as to guarantee the connectivity coverage reliability and security of network s operation for a maximized lifetime This book discusses various aspects of designing such smart wireless sensor networks Main topics includes design methodologies network protocols and algorithms quality of service management coverage optimization time synchronization and security techniques for sensor networks *Industrial Wireless Sensor Networks* Seong-eun Yoo,Taehong Kim,2020 Wireless sensor networks are penetrating our daily lives and they are starting to be deployed even in an industrial environment The research on such industrial wireless sensor networks IWSNs considers more stringent requirements of robustness reliability and timeliness in each network layer This Special Issue presents the recent research result on industrial wireless sensor networks Each paper in this Special Issue has unique contributions in the advancements of industrial wireless sensor network research and we expect each paper to promote the relevant research and the deployment of IWSNs Industrial Wireless Sensor Networks V. Çağrı Güngör, Gerhard P. Hancke,2013-04-04 The collaborative nature of industrial wireless sensor networks IWSNs brings several advantages over traditional wired industrial monitoring and control systems including self organization rapid deployment flexibility and inherent intelligent processing In this regard IWSNs play a vital role in creating more reliable efficient and productive industrial systems thus improving companies competitiveness in the marketplace *Industrial Wireless Sensor Networks Applications Protocols and Standards* examines the current state of the art in industrial wireless sensor networks and outlines future directions for research What Are the Main Challenges in Developing IWSN Systems Featuring contributions by researchers around the world this book explores the software and hardware platforms protocols and standards that are needed to address the unique challenges posed by IWSN systems It offers an in depth review of emerging and already deployed IWSN applications and technologies and outlines technical issues and design objectives In particular the book covers radio technologies energy harvesting techniques and network and resource management It also discusses issues critical to industrial applications such as latency fault tolerance synchronization real time constraints network security and cross layer design A chapter on standards highlights the need for specific wireless communication standards for industrial applications A Starting Point for Further Research Delving into wireless sensor networks from an industrial perspective this comprehensive work provides readers with a better understanding of the potential advantages and research challenges of IWSN applications A contemporary reference for anyone working at the cutting edge of industrial automation communication systems and networks it will inspire further exploration in this promising research area Smart Wireless Sensor Networks Yen Kheng Tan,Hoang Duc Chinh,2010-12-14 The recent development of communication and sensor technology results in the growth of a new attractive and challenging area wireless sensor networks WSNs A wireless sensor network which consists of a large number of sensor nodes is deployed in environmental fields to serve various applications Facilitated with the ability of

wireless communication and intelligent computation these nodes become smart sensors which do not only perceive ambient physical parameters but also be able to process information cooperate with each other and self organize into the network These new features assist the sensor nodes as well as the network to operate more efficiently in terms of both data acquisition and energy consumption Special purposes of the applications require design and operation of WSNs different from conventional networks such as the internet The network design must take into account of the objectives of specific applications The nature of deployed environment must be considered The limited of sensor nodes resources such as memory computational ability communication bandwidth and energy source are the challenges in network design A smart wireless sensor network must be able to deal with these constraints as well as to guarantee the connectivity coverage reliability and security of network s operation for a maximized lifetime This book discusses various aspects of designing such smart wireless sensor networks Main topics includes design methodologies network protocols and algorithms quality of service management coverage optimization time synchronization and security techniques for sensor networks

### **Wireless Sensor Networks.**

**Routing Protocol Overview** Madhumathy Perumal,R. Umamaheswari,2020-11-27 Document from the year 2020 in the subject Engineering Computer Engineering language English abstract Sensor nodes have restricted storage computational and energy resources these restrictions place a limit on the types of deployable routing mechanisms Routing protocol disseminates information that enables the sensor nodes to select routes to communicate with other nodes on the network and the choice of the route is determined by the routing algorithms Thus the routing protocol helps the nodes to gain knowledge about the topology of the network to which it is attached directly There are mainly two types of routing processes one is static routing and the other is dynamic routing In a static routing the routing tables are set up in a static manner in the nodes The network routes for the packet are initially set between the nodes However if any node on the specified route fails the data may not reach the destination In a dynamic routing routing tables in the routers often change whenever the possible routes change Dynamic routing is more suitable as the nodes in WSNs may frequently change their position and die at any moment The routing protocols are classified into single hop and multi hop routing In a single hop routing sensor node directly communicates with the sink to share the gathered information Energy consumption is high in the network using single hop protocol In multi hop routing data is routed through the intermediate nodes to the base station Each node transfers sensed data to the immediate node which in turn transfers the data to the next immediate node and finally the data reaches the base station Energy consumption in this kind of routing protocol is less and thus the lifetime of the nodes is high The major challenge to the efficient operation of wireless sensor network lies in its ability to deliver the sensed information from the nodes to the sink within the specific time duration without the loss of data packets

*Smart Wireless Sensor Networks* Yen Kheng Tan,Hoang Duc Chinh,2010-12-14 The recent development of communication and sensor technology results in the growth of a new attractive and challenging area wireless sensor networks WSNs A wireless sensor network



which consists of a large number of sensor nodes is deployed in environmental fields to serve various applications. Facilitated with the ability of wireless communication and intelligent computation, these nodes become smart sensors which do not only perceive ambient physical parameters but also are able to process information, cooperate with each other, and self-organize into the network. These new features assist the sensor nodes as well as the network to operate more efficiently in terms of both data acquisition and energy consumption. Special purposes of the applications require design and operation of WSNs different from conventional networks such as the internet. The network design must take into account the objectives of specific applications. The nature of the deployed environment must be considered. The limited resources of sensor nodes, such as memory, computational ability, communication bandwidth, and energy source, are the challenges in network design. A smart wireless sensor network must be able to deal with these constraints as well as to guarantee the connectivity, coverage, reliability, and security of network operation for a maximized lifetime. This book discusses various aspects of designing such smart wireless sensor networks. Main topics include design methodologies, network protocols, and algorithms, quality of service, management, coverage optimization, time synchronization, and security techniques for sensor networks.

*Wireless Sensor Networks* Jr., Edgar H. Callaway, 2003-08-26. Because they provide practical machine-to-machine communication at a very low cost, the popularity of wireless sensor networks is expected to skyrocket in the next few years, duplicating the recent explosion of wireless LANs. *Wireless Sensor Networks Architectures and Protocols* describes how to build these networks from the layers of the network.

*Comparative Analysis of Network Protocols for Wireless Sensor Networks* Mohammed Abdulaziz Almeer, 2014. This dissertation proposes a methodology for performance evaluation and comparison of Wireless Sensor Network (WSN) protocols. The methodology is simulation-based and it examines the protocols' lifetime, scalability, fault tolerance, and the effect of multiple sinks. Both the evaluation and the comparison consider the network lifetime, both the number of rounds before the death of the first node and the number of rounds before the death of the last node, the energy dissipation rate, and the nodes' death rate. The methodology is conducted on LEACH, TEEN, APTEEN, and REE-LEACH protocols. The proposed methodology provides a better understanding of the protocols' behavior. This study emphasizes on some information that helps WSN designers to take decisions. Besides which protocol lives longer, the designers should consider other details about these protocols. Such as the death rate and energy dissipation rate should be considered for redeployment decision. Furthermore, the designers should consider the effect of enlarging the network not only on the rounds for first or last death but also they should consider the effect on the ratio between the first and last deaths rounds. Moreover, there are other findings that help the WSN users and designers to take protocol decisions. Furthermore, the analysis conducted in this research proves and supports some of the main attributes of the protocols that are claimed in the literature. Such as the equality of percentage between the failing nodes and the lost energy by failure, and the effect of multi-sink on the death rates prove that the protocols have a good level of load balancing. Furthermore, the changes in the death

rate and energy dissipation rate mean a good level of fault tolerance In general the proposed methodology provides better understanding of the protocols Furthermore it provides abundant amount of information to determine protocol suitability for different WSN applications Moreover this extended analysis reveals drawbacks that should be considered in future works

**Wireless Ad hoc and Sensor Networks** Jagannathan Sarangapani, 2017-12-19 With modern communication networks continuing to grow in traffic size complexity and variety control systems are critical to ensure quality and effectively manage network traffic Providing a thorough and authoritative introduction Wireless Ad hoc and Sensor Networks Protocols Performance and Control examines the theory architectures and technologies needed to implement quality of service QoS in a wide variety of communication networks Based on years of research and practical experience this book examines the technical concepts underlying the design implementation research and invention of both wired and wireless networks The author builds a strong understanding of general concepts and common principles while also exploring issues that are specific to wired cellular wireless ad hoc and sensor networks Beginning with an overview of networks and QoS control he systematically explores timely areas such as Lyapunov analysis congestion control of high speed networks admission control based on hybrid system theory distributed power control of various network types link state routing using QoS parameters and predictive congestion control The book also provides a framework for implementing QoS control using mote hardware Providing a deeply detailed yet conveniently practical guide to QoS implementation Wireless Ad hoc and Sensor Networks Protocols Performance and Control is the perfect introduction for anyone new to the field as well as an ideal reference guide for seasoned network practitioners Wireless Sensor Networks C.S. Raghavendra, Krishna M. Sivalingam, Taieb

Znati, 2005-07-01 Wireless Sensor Networks presents a comprehensive and tightly organized compilation of chapters that surveys many of the exciting research developments taking place in this field Chapters are written by several of the leading researchers exclusively for this book Authors address many of the key challenges faced in the design analysis and deployment of wireless sensor networks 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

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