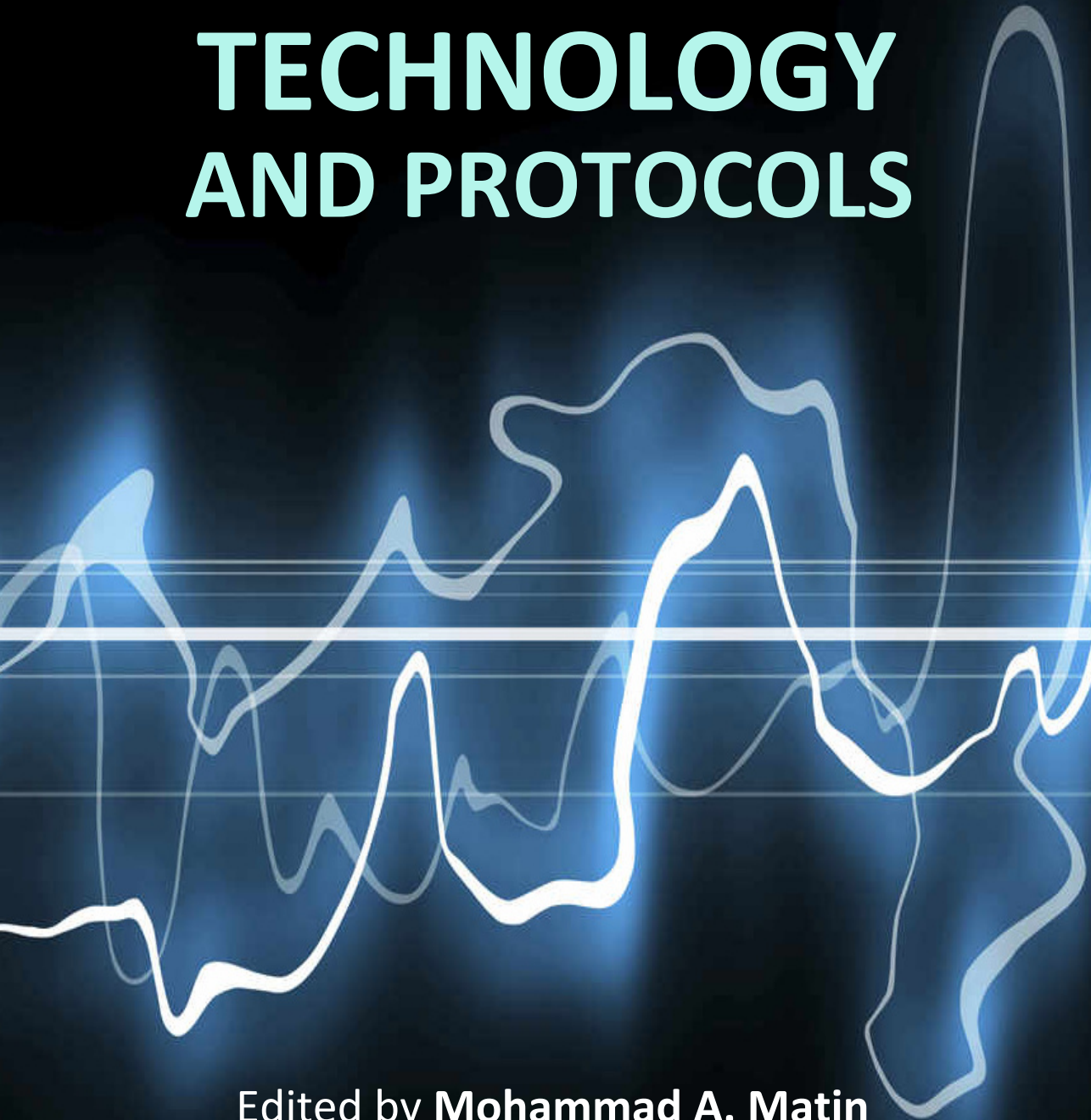


# WIRELESS SENSOR NETWORKS

# TECHNOLOGY AND PROTOCOLS



Edited by **Mohammad A. Matin**

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# **WIRELESS SENSOR NETWORKS – TECHNOLOGY AND PROTOCOLS**

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## **Wireless Sensor Networks – Technology and Protocols**

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# Contents

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## **Preface IX**

### **Section 1 Basic Concepts & Energy Efficient Design Principles 1**

Chapter 1 **Overview of Wireless Sensor Network 3**  
M.A. Matin and M.M. Islam

Chapter 2 **Maximum Lifetime Scheduling in Wireless Sensor Networks 25**  
Akshaye Dhawan

Chapter 3 **Calculation of an Optimum Mobile Sink Path in a Wireless Sensor Network 49**  
S. Chinnappen-Rimer and G. P. Hancke

Chapter 4 **Tradeoffs Among Delay, Energy and Accuracy of Data Aggregation for Multi-View Multi-Robot Sensor Networks 71**  
Wuyungerile Li, Ziyuan Pan and Takashi Watanabe

Chapter 5 **Spatial Communication Activity in Wireless Sensor Networks Based on Migrated Base Stations 99**  
Jan Nikodem, Marek Woda and Maciej Nikodem

Chapter 6 **Assessing the Vulnerabilities of Mission-Critical Wireless Sensor Networks 117**  
Mohamed M. A. Azim and Aly M. Al-Semary

### **Section 2 MAC Protocols 137**

Chapter 7 **Preamble-Based Medium Access in Wireless Sensor Networks 139**  
Alexander Klein

**Section 3 Routing Protocols 163**

Chapter 8 **Multihop Routing for Energy Efficiency in Wireless Sensor Networks 165**  
Elias Yaacoub and Adnan Abu-Dayya

Chapter 9 **Cross-Layer Design for Smart Routing in Wireless Sensor Networks 189**  
Omar M. Sheikh and Samy A. Mahmoud

**Section 4 Security Mechanisms 215**

Chapter 10 **Asymmetric Encryption in Wireless Sensor Networks 217**  
Gustavo S. Quirino, Admilson R. L. Ribeiro  
and Edward David Moreno

Chapter 11 **Reputation System Based Trust-Enabled Routing for Wireless Sensor Networks 233**  
A. R. Naseer

**Section 5 Localization & Positioning 287**

Chapter 12 **Distributed Range-Free Localization of Wireless Sensor Networks via Nonlinear Dynamics 289**  
Shuai Li and Yangming Li



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# Preface

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Wireless Sensor Networks hold the promise of delivering a smart communication paradigm which enables setting up an intelligent network capable of handling applications that evolve from user requirements. With the recent technological advances of wireless sensor network, it is becoming an integral part of our lives. However, due to the nature of wireless sensor networks, researchers face new challenges related to the design of algorithms and protocols. This book identifies the research that needs to be conducted on a number of levels to design and assess the deployment of wireless sensor networks. It highlights the current state of the technology, which puts the readers in good pace to be able to understand more advanced research and make a contribution in this field for themselves.

Chapter 1 has approached to draw the overall concept of a Wireless Sensor network so that the general readers can be able to easily grasp some ideas in this area.

Chapter 2 examines the problem of maximizing the duration of time for which the network meets its coverage objective. Since networks are very dense, only a subset of sensors need to be in “sense” or “on” mode at any given time to meet the coverage objective, while others can go into a power conserving “sleep” mode. This active set of sensors is known as a cover. The lifetime of the network can be extended by shuffling the cover set over time.

Chapter 3 presents the optimum path calculation for a mobile sink and ensures equitable usage of all nodes to transfer an event message so that no specific set of nodes is overloaded with the task of routing event messages to the sink.

Chapter 4 discusses data aggregation in wireless multi-view multi-robot sensor networks and introduces a User Dependent Multi-view Video Transmission (UDMVT) scheme to decrease the bit rate of multi view video transmission, thus reduces bandwidth requirement.

Chapter 5 deals with the base station migration feature which allows for reduction a number of base stations along with the dynamic network load distribution adapted to a current situation.



Chapter 6 investigates the impact of region-based faults on the connectivity of wireless networks. It also introduces a new model for a worst-case cut (partition) due to failure regions. The presented model takes into consideration the physical correlation among the locations of the network nodes and the possible priority of some nodes over the others. Based on this model, the location of a disaster can be identified.

Chapter 7 presents Preamble sampling protocol which is the ideal candidate for energy-constraint WSNs.

Preamble sampling can be integrated in many ways to schedule the medium access and achieve the desired access characteristics.

Chapter 8 outlines cooperative data transmission in wireless sensor networks with the objective of energy minimization. The problem is formulated into an optimization problem, and efficient suboptimal methods are presented for the two scenarios: the multihop case where the maximum number of hops is allowed and the clustering case where sensors are grouped into cooperating clusters, each headed by a cluster head in charge of the communication with the base station. Practical implementation aspects are also discussed.

Chapter 9 covers the design of the smart routing protocol for wireless sensor networks (WSNs). This protocol is based on performance measure and energy optimization using cross-layer considerations of the protocol stack. Smart routing selects candidate nodes that are best able to satisfy both performance and energy conservation requirements given network conditions. It analyzes application requirements, available network routes, transmission channel quality and remaining energy distribution in the network prior to making a resource allocation decision.

Chapter 10 presents different cryptographic algorithms for WSN. The algorithm Multivariate Quadratic Quasigroup (MQQ) was discovered recently and showed significant performance when compared to RSA and Elliptic Curve Cryptography (ECC). This algorithm is post-quantum, and may even be a good solution when the quantum computation is standardized.

Chapter 11 describes reputation system based Trust-enabled Routing approach – Geographic, Energy and Trust Aware Routing (GETAR). A research-guiding approach is also presented to the reader that analyzes and criticizes different techniques and solution directions for the Reputation system based Trust-enabled secure routing problem in wireless sensor network.

Chapter 12 explains the importance of designing localization hardware and localization algorithms in the development of a WSN system and formulates the range-free localization problem as two different optimization problems, each of which corresponds to a dynamic model. The models are described by nonlinear ordinary differential equations (ODEs). The state value of the ODEs converges to the expected

position estimation of sensors. Both of the two models find feasible solutions to the formulated optimization problem.

It is believed that the students who seek to learn the latest developments in wireless sensor network technologies will need this book.

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