

Review of the book
”*Wireless Sensor Networks: Principles and Practice*”
by Fei Hu and Xiaojun Cao
CRC Press, Taylor & Francis Group, 2010
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1 Summary of the review

Wireless Sensor Networks (WSNs) are self-organizing networks. They have many real-life applications and are becoming widely prevalent. This review is about a book that focuses on the principles and practices associated with wireless sensor networks. The book looks at various aspects of WSNs and the design and implementation required for dealing with practical challenges. The book is made up of eighteen chapters.

2 Summary of the book

The book discusses principles and practices related to wireless sensor networks. It is made up of eight parts comprising eighteen chapters. The eight parts focus on topics such as basics; engineering design; network protocol stack; computer science principles; advanced topics; special wireless sensor networks; miscellaneous topics; and case studies.

The first part is on basics. It has just one chapter.

Chapter 1 (Introduction) offers a brief debut into wireless sensor networks. Routing, communication issues, sensor localization, clock synchronization, power management, special wireless networks (such as wireless multimedia sensor networks and underwater acoustic sensor networks), and applications of wireless sensor networks are discussed.

The second part of the book deals with engineering design aspects. This part contains just one chapter.

Chapter 2 (Hardware-Sensor Mote Architecture and Design) looks at components of a sensor mote (sensors, microprocessor, memory, radios, power sources, and peripheral support). The architecture of a typical sensor mote is discussed. Customized designs and the design of a mica mote are also discussed.

The third part of the book is on the network protocol stack. This part has three chapters.

Chapter 3 (Medium Access Control in Wireless Sensor Networks) introduces the concept of medium access control in wireless networks. It studies the challenges in designing medium access control for wireless sensor networks. The challenges include resource constraints, signal loss in wireless channels, collision occurring at the receiver’s end, and hidden terminal and exposed terminal problems. A brief overview of the IEEE 802.11 standard is given along with a classification of medium access control protocols.

Chapter 4 (Routing in Wireless Sensor Networks) introduces the difficulties in routing in wireless sensor networks. A classification of routing protocols for such networks is given. Data-centric routing protocols and hierarchical routing protocols in wireless sensor networks are discussed in detail.

Chapter 5 (Transport Layer in Wireless Sensor Networks) explains why we cannot use TCP in the wireless sensor network transport layer design. Transport layer protocols known as ESRT and STCP are studied. Congestion detection and avoidance in sensor networks is also discussed. Challenges to the downstream reliability of WSNs are discussed along with an approach known as GARUDA.

The fourth part of the book studies computer science principles. This part consists of three chapters.

Chapter 6 (Operating System in Sensors) looks at operating systems of WSNs. These include TinyOS, LA-TinyOS (which is locality aware), SOS (an improved version of TinyOS), and RETOS (a resilient, expandable and threaded OS).

Chapter 7 (Middleware Design in Wireless Sensor Networks) looks at the middleware architecture of a WSN. Several examples are also looked at.

Chapter 8 (Sensor Data Management) looks at techniques for managing sensor data. Methods for cleaning, querying, storing sensor data are also studied.

The fifth part of the book focuses on advanced topics. This part consists of three chapters.

Chapter 9 (Sensor Localization) discusses the elements of localization, the use of mobile robots for sensor localization, the use of multidimensional scaling for sensor localization, and the security of WSN localization.

Chapter 10 (Time Synchronization in Wireless Sensor Networks) introduces synchronization in general networks, clock synchronization in WSNs, methods for evaluating the performance of synchronization, and examples of WSN synchronization protocols.

Chapter 11 (Security and Privacy in Wireless Sensor Networks) looks at a general attack taxonomy. Attacks on physical sensor motes, the WSN communication stack, and wormhole attacks are studied. Practical security schemes for motes are also talked about.

The sixth part of the book focuses on special wireless sensor networks. This part consists of three chapters.

Chapter 12 (Wireless Sensor and Actor Networks) discusses the sensor-actor co-ordination problem and the hierarchical sensor-actor co-ordination mechanism.

Chapter 13 (Underwater Sensor Networks) discusses the application of underwater WSNs and the differences between them and terrestrial WSNs. The underwater sensor network protocol stack, medium access control design, and hardware prototype design are examined.

Chapter 14 (Video Sensor Networks) looks at the applications of video sensor networks.

The seventh part of the book discusses miscellaneous topics. This part consists of two chapters.

Chapter 15 (WSN Energy Model) looks at the basic WSN energy model, simulation-based energy modeling, and battery-aware routing.

Chapter 16 (Sensor Network Simulators) discusses various simulation tools useful for simulating WSNs.

The eighth part consists of case studies. This part has two chapters.

Chapter 17 (Case Study 1: Tele-Healthcare) looks at the application of WSNs in tele-healthcare.

Chapter 18 (Case Study 2: Light Control) looks at the interesting application of WSNs for light control.

3 What is the book like (style)?

The book is well written by its two award-winning authors. The book is very readable and suited for teaching master's and doctoral level students. The problems and exercises at the end of each chapter will help the readers to evaluate their learning. The organization of the book will help understanding wireless sensor networks. The style of presentation followed by the authors makes the book easy to read. The numerous references at the end of the book will supplement further learning. The references are current. The index of the book is useful.

The authors could have included some guidance for further research. The chapters of the book are sufficiently self-contained so they may be read independent of one another. Wireless sensor networks will become ubiquitous in the future so this book is a useful contribution to the literature. There are many books in the market that cover many topics discussed in the book, however, this book is quite unique partly due to the excellent presentation style used by the authors.

4 Would you recommend this book?

This book offers a very good introduction to issues related to wireless sensor networks. It will be useful for researchers as well as students. It will also be useful for industry professionals wishing to keep themselves informed on the topics covered by this book. I potently recommend this book as a useful introduction to wireless sensor networks. However, those interested in security aspects must look elsewhere.

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