

Preface

Wireless sensor networks (WSNs) are more and more frequently seen as a solution to large-scale tracking and monitoring applications, because of their low-data-rate, low-energy-consumption, and short-range link network which provides an opportunity to monitor and control the physical world to a previously unprecedented scale and resolution. The deployment of a large number of small, wireless sensors that can sample, process, and deliver information to external systems such as the satellite network or the Internet, opens many novel application domains. Potential WSN applications include industrial control and monitoring, home automation and consumer electronics, security and military sensing, asset tracking and supply chain management, intelligent agriculture and health monitoring. MIT classified WSNs as one of the ten emerging technologies that will change the world. Internet of Things (IoT), which is technically supported by WSN and other relevant technologies, has been classified as a national economic development strategy by the Chinese Government in 2009. Research in WSNs has mainly concentrated on energy consumption, routing, fault tolerance, data acquisition, and operating systems, particularly focusing on collecting and aggregating data from specific networks with an associated sink node, called a WSN gateway. Some work has been carried out on the connection of different disparate sensor networks for a single or multiple applications. Some of the most documented research challenges are attributed to issues relating to scalability, reliability, security, coverage, and massive deployment.

This book is concerned with the design and application challenges of ZigBee based WSNs, which we experienced firsthand in our research and development work over the past few years. A principle aim has been to include in the book a comprehensive coverage of topics suitable for use in university courses. This book is the result of nine Ph.D. theses and a number of public funded projects completed under my supervision. A significant aspect of this book is the presentation to the readers of enough technical details to enable them to actually repeat the work rather than merely understanding the principle involved. I hope that it will be a valuable reference book for industrial design as well as for university teaching and academic research. I believe that this broad targeted audience is an attractive feature of this book, as most of the very limited selection of WSN books currently available were written primarily for academic researchers or as a textbook, presenting the fundamental basic concepts while providing, little guidance on how to

carry out the actual design process. This book is unique in bringing together wireless communication principles with actual WSN design processes. It will enable readers to become increasingly capable in exploiting fully the new technologies described here in their research or industrial work.

This book consists of 15 chapters grouped into three parts. Part I (Chaps. 1 and 2) provides the principle of WSNs. Part II (Chaps. 3–9) focuses on providing solutions to various design issues. Chapters 10–12 in Part III explore the application technologies of WSNs in indoor location tracking, logistics management, and Internet of Things (IoT), followed by Chaps. 13 and 14, two real applications to home automation and building fire safety. Chapter 15 forms the conclusion.

Target Audience

The book can serve both as a textbook and a reference book. The primary target audience for this book is the university student community. The materials included in this book have been used several times as a handout for teaching Master of Science (M.Sc.) modules on WSNs. Resulting student feedback has been addressed in the book. The secondary audience for this book is the research and development community. This includes both academia from universities and research institutes together with industrial developers. It can also be used as a reference book for any readers, who are interested in getting insight into the WSN area but have been unable to find any sources of real-life WSN designs.

Acknowledgments

Many people have directly or indirectly contribute to the work presented in this book. Chapters 3–12 were produced based on the theses of my former Ph.D. students. They are Dr. Fang Yao, Dr. Xin Lu, Dr. Hesham Abusaimeh, Dr. Yanning Yang, Dr. Khusvinder Gill, Dr. Tareq Alhmiedat, Dr. Huanjia Yang, and Dr. Ran Xu, and my nearly completed Ph.D. student Mr. Md Zaid Ahmad. Prof. Bokia Xia, Dr. Yuanqing Qin, and Mr. Guizheng Fu, my former academic visiting scholars, Mr. Donato Salvatore, my former research assistant, Ms. Weiwei He and Mr. Hakan Koyuncu, my on-going Ph.D. students, have also contributed to the work. I am extremely thankful to their hard work and cooperation. I would like to express my deep appreciation to my industrial collaborators from the consortiums SafetyNET (DCSI, Sure Technology, Jennic, Arqiva, and ASFP), IndeedNET (Advantica, Sure Technology, EMHA), and iNET (IDC), and my academic collaborators, Prof. Wan-Liang Wang at Zhejiang University of Technology, Prof. Chunjie Zhu at Huazhong University of Science and Technology, Prof. Xuemin Tian, Prof. Bokia Xia at Petroleum University, Prof. Ping Li at Liaoning Shihua University, Prof. Jie Chen at Beijing Institute of Technology, and

Prof. Hongyong Yuan at Tsinghua University, and Prof. Min-Hong Wu at Derby University. There are too many to name here. I would also like to thank the TSB project monitoring officers Mr. Guy Hirson (SafetyNET) and Mr. Mike Patterson (IndeedNET) for their constructive guidance in our research. My appreciation also goes to my colleagues in the Computer Science Department at Loughborough University for their enthusiasm and dedicated assistance they have provided me.

My gratitude goes to my colleague Dr. Roger Knott, and Ms. Charlotte Cross (Springer-Verlag) for their proof reading and to my formal Ph.D. student, Dr. Ran Xu, for his graphic expertise.

Finally, I gratefully acknowledge the financial supports from the Technology Strategy Board through Technology Program (TP/J3521A, TP/3/PIT/6/I/16993), Carbon Connection Trust, and European Regional Development Fund through Transport iNET program, EPSRC through Transforming Energy Demand through Digital Innovation (TEDDI) call in Energy Program (EP/I000267/1), Natural Science Foundation of China through Major International Joint Research Program (61120106010), and Santander Program for Mobility of Young Faculty and Researchers operated by Tsinghua University.

July 2013

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Wireless Sensor Networks

Principles, Design and Applications

Yang, S.-H.

2014, XVII, 293 p. 175 illus., 80 illus. in color.,

Hardcover

ISBN: 978-1-4471-5504-1