Preface

Over the past half a century, our real world has been digitalized more and more deeply. Computer, communication, and control technologies have enormously changed our life styles. We can let computers play chess with world-class players by artificial intelligence. We can forecast coming weather of any city in several minutes by super computing. We also can contact any people whenever we want, and wherever we are, by wireless communication. When we immerse in this wonderful digital world happily, some flaws of this life mode have been ignored to some extent. Which are the ways of how to make the digital world touch the real world freely, effectively, and roundly. At present, most data that the digital world requires is collected and preprocessed manually by some special ways before it can accept them. How to make the digital world understand the real world is seamlessly an attractive research area. The appearance of the Wireless Sensor Network (WSN) has provided a good way for eliminating the gap between the digital world and the real one.

The WSN, as one of the top ten emerging technologies for the 21st century (MIT’s Technology Review stated in 2003), has been developing at an accelerated pace in the past ten years. Much research work has been done to push it forward, referring to various aspects, including architecture, operating systems of nodes, routing protocols, data gathering, fusion, location mechanism, time synchronization, and so forth. Moreover, large numbers of promising applications have emerged and been deployed over various geographical areas such as infrastructure protection, scientific exploration, military surveillance, traffic monitoring and controlling, mining and shipping security, environment protection, animal tracking, military affairs, and so forth. With the conveniences brought by WSNs, our lives have been affected and changed largely in many ways.

However, there are still many challenges existing for WSNs. Typical ones include the unreliable wireless communication systems, large scale deployments, limited power availability, failures of nodes, and so forth. Attempting to conquer these difficulties, various routing schemes, power management policies, and data dissemination methods have been designed and implemented for WSNs. To view the latest developments, and to provide a seedbed for new breakthroughs for these challenges, this book brings the latest achievements and excellent studies of WSNs together.

General, this book is organized as four sections as follows:

Firstly, Section 1 introduces WSNs. Briefly including some general issues such as deployment strategies, taxonomy and design space for collaborative sensor networks, design features and challenges for QoS, infrastructure for testing nodes, power conservation techniques, and so forth.

Secondly, main attentions are paid to protocols and middlewares of WSNs in section 2. Topics include practical experiences and design considerations on medium access control protocols, transmission control protocols, joint link scheduling and topology control, connected $k$-coverage protocols for densely deployed WSNs, middleware support for WSNs, and so forth.
Then, security and privacy are discussed in section 3. Compared with traditional networks, security and privacy are more sensitive topics and harder jobs in WSNs, due to limited resources in them. Prominently, some important subjects are discussed in this book, referring to applied cryptography in secure mobile Ad Hoc networks and WSNs, privacy and trust management schemes, distributed group security, and jamming attacks and countermeasures, and so forth.

Finally, section 4 shows some representative practices and applications. Which are data visualizations, sink mobility, network-wide broadcast service, an indoor positioning system using wireless ZigBee technology, an open sensor Web architecture by integrating sensor networks with Web and cyber infrastructure, and so forth.

This book is one in the latest collection of wonderful works from many devoted WSN researchers all over the world, which exhibits the up-to-date developments of WSNs in various aspects. The primary target audience of this book are those who are interested in WSNs and related issues, including scholars, researchers, developers, postgraduate students, et al. In particular, the book will be a valuable companion and comprehensive reference source for students who are taking a course in WSNs. To provide the greatest reading flexibility, this book is organized in self-contained chapters.

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