

# Preface

The Wireless Communication Network is developing at an accelerated pace, which provides ubiquitous communication access to people, enabling real-time multimedia communications and supporting exciting applications such as sensor networks, smart homes, telemedicine, video conferencing and distance learning, cognitive radio networks, automation, and so on. It brings fundamental changes to data networking and telecommunication, and is making integrated networks to increase capacity and coverage. This book highlights the current research issues and trends in wireless communications and networking. Moreover, this book includes some chapters on the fundamentals of wireless communications, which puts the reader in a good place to be able to understand more advanced research and make a contribution in this field for themselves.

Chapter 1 presents the evolution of wireless and mobile technologies and analyzes the market trends of mobile communication in addition to the amount of traffic projected for future mobile communications. This chapter also addresses different network architectures, including 4G networks.

Chapter 2 informs the reader on the latest developments in power-efficient and cost-effective cellular architectures, as well as guides promising research directions in cellular wireless networks.

Chapter 3 is focused on identifying the high level use cases and scenarios where IP-based VPN services can be implemented on top of the cellular network. Furthermore, the authors predict the future involvement of IP-based VPNs in beyond-LTE cellular networks.

Chapter 4 presents current efforts to provide coordination frameworks between various self-organizing network (SON) use cases and lists the major research challenges and open issues to be focused on. An additional important contribution of the chapter is the description of SON activities within 3GPP.

Chapter 5 focuses on mobility prediction in wireless networks in order to enhance the handover performance. The mobility prediction technique via Markov Chain and user's mobility history is proposed as a technique to predict user movement in deployment of LTE femtocells.

Chapter 6 helps prospective newcomers in amateur wireless communications to become familiar with the 'open' software and, as well, to encourage them in implementing many 'free' software solutions at home or work.

Chapter 7 presents an access control system termed the Access of Things, which employs a gradual degradation of privilege philosophy. The Access of Things concept is applicable to the dynamic security environment present in the Internet of Things.

Chapter 8 provides the emerging trends in wireless ad hoc networks. It highlights various issues pertaining to the implementation of ad hoc networks and the research efforts that have been done to resolve these issues, as well as gives future research direction.

Chapter 9 presents a detailed description of the three stability-based connected dominating sets (CDS) algorithms with illustrative examples for wireless mobile ad hoc networks (MANETs) whose topology changes dynamically with time.

Chapter 10 presents an improvement in the interactions between Medium Access Control (MAC) and Transmission Control Protocol (TCP) for better performance in MANET, which is called the Improvement of Backoff algorithm of MAC protocol (IB-MAC) and proposes a new backoff algorithm.

Chapter 11 gives an overview of current available research works on secure routing protocol and proposes a novel Secure Routing.

Chapter 12 presents the latest developments in the field of sensor-based networks, focusing on cooperative healthcare and environmental monitoring.

Chapter 13 provides an overview of three well-known clustering protocols: LEACH, EECS and HEED.

Chapter 14 emphasizes various power saving protocols, techniques and the improvement in the Performance of Clustered WSN by using Multi-tier Clustering.

Chapter 15 deals with the challenges and evaluation of performance in transmitting data over an IEEE 802.15.4 network for different transport protocols: User Datagram Protocol (UDP), Transport Control Protocol (TCP) and Stream Control Transmission Protocol (SCTP).

Chapter 16 presents a hybrid MAC layer design that can support video application with low power consumption and achieve better quality of service (QoS) as required by video application.

Chapter 17 proposes a graph intersection-based benchmarking algorithm to determine the sequence of longest-living stable data-gathering trees for wireless mobile sensor networks whose topology changes dynamically with time due to the random movement of the sensor nodes.

Chapter 18 presents adaptive multiuser detection (MUD) techniques that constitute feasible detection techniques for deployment in practical UWB systems. With the aid of a training sequence of reasonable length, an adaptive MUD is capable of achieving a similar BER performance as the ideal MMSE-MUD.

Chapter 19 concentrates on the problem of deafness, which is introduced due to the use of directional antennas in wireless ad-hoc, sensor, and mesh networks, and drawbacks of available solutions and future research directions.

Chapter 20 presents metamaterial-based wearable antennas that are useful for WLAN, BAN, and Wi-Fi applications, is fabricated and tested. The bending effect on the antenna performance due to the movement of the human body is also presented in this chapter.

This book serves as a comprehensive reference for graduate and undergraduate senior students who seek to learn about the latest developments in wireless communication and networks.

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