

Signals and Communication Technology

Hossam Mahmoud Ahmad Fahmy

# Wireless Sensor Networks

Concepts, Applications, Experimentation  
and Analysis

 Springer

# **Signals and Communication Technology**

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Concepts, Applications, Experimentation  
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Hossam Mahmoud Ahmad Fahmy  
Faculty of Engineering, Computer  
Engineering and Systems Department  
Ain Shams University  
Cairo  
Egypt

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*Dedicated to my family; parents, brothers  
and sister with whom I grew up warmly...*

*wife and daughters who gave my life a caring  
taste...*

*Dedication is not only for who are in our  
world...*

# Preface

Writing a book is tempting, many ideas and topics, idea after idea, and topic upon topic, what to elaborate, which to mention, the reader must find a satisfying answer, enough knowledge; overlooking or going-by are painful choices for the author, space is limited, a hard decision is to be made, without compromising what should be transferred to the audience. Writing a scientific book is navigating, across the Nile, the Mediterranean, the Atlantic, and the Indian oceans, in boat and in glass submarine, looking and searching for known and unknown species, appreciating diversified colors and a variety of sizes, collecting for a near benefit and for the future. I navigated, explored, day and night, when cold and hot, whether windy or breezing, without tolerating a least chance to know and learn.

Networking is a field of integration, hardware and software, protocols and standards, simulation and testbeds, wired and wireless, VLSI and communication; an orchestrated harmony that collaborates dependably, all for the good of a connected well-performing network. That is the charm of networking, of life in a civilization that recognizes differences and goes on.

In introductory computer networking books, chapters sequencing follows the bottom-up or top-down architecture of the seven layers protocol. This book is some more steps after, both horizontally and vertically, the view and understanding are getting clearer, chapters ordering is based on topics' significance to the elaboration of wireless sensor networks (WSNs), concepts, and issues.

This book focuses on the notions of WSNs, their applications, and their analysis tools; meticulous care has been accorded to the definitions and terminology. To make WSNs felt and seen, the adopted technologies as well as their manufacturers are presented in detail. With such a depth, this book is intended for a wide audience, it is meant to be helper and motivator, for senior undergraduates, post-graduates, researchers, and practitioners; concepts and WSN-related applications are laid out, research and practical issues are backed by the appropriate literature, and new trends are put in focus. For senior undergraduate students, it familiarizes with conceptual foundations and practical project implementations. For graduate students and researchers, testbeds and simulators provide a must follow emphasis

on the analysis methods and tools for WSNs. For practitioners, besides applications and deployment, the manufacturers and components of WSNs at several platforms and testbeds are fully explored.

Chapter 1 introduces the basics of sensors and WSNs, the types of WSNs, and the standards specifically innovated to bring WSNs to useful life. Chapter 2 presents the distinctive protocol stack in WSNs. Chapter 3 lays out the plentiful applications of WSNs in military, industry, environment, agriculture, health, daily life, and multimedia. Chapter 4 is devoted to exhibiting characterizing transport layer protocols in WSNs. Analysis tools of WSNs are prime methods and tools to study, analyze, and implement WSNs, this is the goal of Chaps. 5 and 6. Chapter 5 presents the testbeds as existing in research institutes and projects to investigate protocols and practical deployment. Chapter 6 takes care of exhaustively surveying and comparing the simulation tools existing in the WSN realm. Chapters 7 and 8 must be checked whenever a product or a manufacturer is mentioned in the text, they are meant to provide the full spectrum of the WSN industry, from a full variety of products and their specs, to a wide diversity of manufacturers. Chapter 9 motivates the takeoff in WSNs study, research, and implementation. Exercises at the end of each chapter are not just questions and answers; they are not limited to recapitulate ideas. Their design objective is not bound to be a methodical review of the provided concepts, but rather as a motivator for a lot more of searching, finding, and comparing beyond what has been presented in the book.

Talking numbers, this book extends over nine chapters, and embodies 232 acronyms, 127 figures, 29 tables, and above 750 references.

With the advance of technology writing a book is becoming easier, information is attainable; but it is certainly harder, details and depth are not to be missed. A book, any book, is a step in a long path sought to be correct, precise as possible, nonetheless errors are non-escapable, they are avoided iteratively, with follow up and care.

The preface is the first get-together between the author and the audience, it is the last written words, it is lying in the ground after the end line, to restore taken breath, to enjoy relaxing after long painful efforts, mentally and physically, to relax in preparation for a new game.

An author has his ups and downs, as everybody, but he is visible like nobody. Could he manage to hide some of his letdowns? He has to, unlike anybody, for the sake of his book, his readership.

If you find somebody talking to himself, tumbling, wearing a differently colored pair of shoes, don't laugh at him, he is probably writing a book...

Hossam Mahmoud Ahmad Fahmy



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