

WIRELESS SENSOR AND ACTUATOR NETWORKS

Technologies, Analysis
and Design

Roberto Verdone
Davide Dardari
Gianluca Mazzini
Andrea Conti



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Preface

Aim of this book

Wireless sensor and actuator networks (WSANs) are among the most addressed research fields in the area of information and communication technologies (ICT) these days, in the US, Europe and Asia. WSANs are composed of possibly a large number of tiny, autonomous sensor devices and actuators equipped with wireless communication capabilities. One of the most relevant aspects of this research field stands in its multidisciplinary nature and the broad range of skills that are needed to approach their design. Theory of control systems is involved, networking, middleware, application layer issues are relevant, joint consideration of hardware and software aspects is needed, and their use can range from biomedical to industrial or automotive applications, from military to civil environments, etc.

This book mainly covers wireless networking and design issues of WSANs with applications.

This research field attracted enormous and ever increasing attention in the past years. However, by looking, for example, at the IEEE literature, the first paper having ‘wireless sensor network’ in the title in the online IEEE database of scientific papers Xplore, dates back to the year 2000. A query on the ACM database brings us to the same outcome. So, this is a new research field that only very recently attracted the interest of many scientists worldwide. On the other hand, the number of papers in the open literature increased exponentially after the year 2000 (e.g. with a similar query IEEE Xplore shows 3 papers for 2000, 20 in 2001, 34 in 2002, 98 in 2003, 289 in 2004, 622 in 2005, 952 in 2006): this clearly testifies to the relevance of the research field on the one hand; on the other, owing to the chaotic distribution of effort provided by thousands of separate research groups worldwide, a consensus on major design rules of WSANs is still lacking, and it is not unusual to find recent papers using model assumptions which have been proven to be not realistic by others. This book also aims at defining some general design rules for WSANs and a common set of model assumptions that are real-world-proof. Some myths will be destroyed.

Why a new book on WSANs

As anticipated by the title, this book covers aspects of WSANs, ranging from channel modelling, transmission techniques, communication protocols, localization and signal processing issues. Some of these aspects have already been covered by previously published books, by this and other publishers. The rationale for providing a new book on WSANs is the following. The majority of available books provide extensive descriptions