

Preface

The evolution of individual sensors and discrete sensor systems into pervasive sensing environments poses fascinating challenges to scientists and developers. The field is defined not merely by component integration into a sensing network but also by the way in which sensor technologies must adapt and evolve to operate in diverse collective sensing applications.

In these scenarios, specific issues arise for configuration and association modes, power consumption and energy harvesting, computing resources and communication protocols, autonomy, reliability, and ubiquitous deployment of the technological resources, which are concurrent with the special priorities of each type of application.

This volume of the chemical sensors and biosensor series by Springer-Verlag attempts to provide a comprehensive survey of the established areas of wireless sensor networks and the supporting technologies which make them possible, including examples of representative applications and the associated emerging concepts. The impact of collective sensing on analytical and biomedical monitoring problems, as well as the ensuing particular sensing solutions, is examined.

Chapters 1–3 provide an introduction to core concepts such as wireless sensor networks, body area networks, and ambient assisted living. The presentation of these topics is self-contained, including specific technological aspects, application examples, and future prospects.

The sensing concepts involved in these core subjects entail diverse technologies, which must be customized to satisfy unique demands. Such are the cases of energy harvesting devices and the protocols needed for deployable autonomous networks, which are distinct aspects of the fabrication and integration of wearable devices, the supporting technologies for embedded and disposable sensors, such as smart textiles and printed organic electronic devices, as well as the highly demanding scenarios associated with implanted sensors. The strategies, difficulties, state-of-the-art technologies, implementation examples, and outlook for these topics are presented in Chaps. 4–8.

Chapters 9 and 10 deal with emerging analytical tools suitable for the special conditions demanded by chemical sensing components, in decentralized situations

and autonomous sensor networks. Chapter 9 focuses on autonomous lab-on-chip technologies and the integration requirements of all preparatory and detection stages in deployable devices, whereas Chap. 10 develops the ubiquitous instrumentation concept for chemical sensing, which consists of tailoring chemical sensing devices to exploit regular consumer electronic devices, such as DVD drives and cell phones, as a readily available preexisting measuring infrastructure.

Chapter 11 develops an aspect common to all sensor types, which is packaging technology, whereas Chaps. 12–14 illustrate the main uses of sensor networks, such as health care, distributed environmental monitoring, and military applications.

Finally, Chap. 15 surveys emerging strategies such as self-organization, artificial immune systems, cellular signal pathways, swarm intelligence of components in a flock, and self-healing systems, including implemented examples.

The book is aimed at graduate level students and researchers in both academic and industrial settings, who may require a comprehensive reference for collective sensing and associated subjects. The diversity of topics has been accommodated by an introduction to the field in the first three chapters, followed by six chapters representing detailed aspects of the involved sensing technologies, three chapters of core applications, and a chapter of emerging concepts. The chapters are self-contained but support multiple reading paths of two or three units of increasing and complementary detail.

This book is the result of efforts by international experts from multiple disciplines, and I would like to thank their dedicated and authoritatively crafted contributions.

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