

Preface

The applications of Sensing Technology include medical diagnostics, industrial manufacturing, defense, national security, and prevention of natural disaster. The correct detection of events by high performance sensors, and appropriate analysis of sensor signals can lead to early warning of phenomena, such as “Superstorm Sandy” which hit the eastern coast of the United States in 2012, and help to prevent deaths from these types of catastrophic incident. There is a need for interaction between researchers across technologically advanced and developing countries working on design, fabrication, and development of different sensors.

This book contains a collection of selected works stemming from the 2012 International Conference on Sensing Technology (ICST), which was held in Kolkata, India. This was the sixth time the conference had been held, and over the years it has become an incredibly successful event—in 2012 it attracted over 245 papers and provided a forum for interaction between researchers across technologically advanced and developing countries working on design, fabrication, and development of different sensors.

The conference was jointly organized by the Centre for the Development of Advanced Computing (CDAC), India, and the School of Engineering and Advanced Technology, Massey University, New Zealand. We whole-heartedly thank the members of CDAC for extending their support to the conference, as well as the authors and the Technical Program Committee: without the support of these people the conference would not be possible.

Since ICST provides a platform for a wide range of sensing technologies, this book presents a broad overview of the work currently undertaken by researchers in this field internationally; the second volume of this book, available separately, focuses specifically on sensors in the bio-mimicking area.

[Chapter 1](#) begins with work discussing a smart system for monitoring of a person’s movement and vital signs, a comprehensive system that has been developed in response to the world-wide issue of population ageing. It is thought that such systems will prove essential in the future in order to assist healthcare providers in targeting their efforts toward patients in need of care, thus replacing current periodic visit models for healthcare delivery. [Chapter 2](#) continues with the elder-care theme, proposing an alternative method for the monitoring of vital signs, specifically respiratory systems for signs of some prevailing disorder. [Chapter 3](#) rounds off the healthcare theme with the use of sensors for analysis of

gait during walking in order to monitor and develop, through biofeedback, patient walking patterns, which are both safe and offer sufficient clearance.

[Chapter 4](#) discusses the notion of sensor modeling, which can address major challenges about heterogeneity in sensor data communication, data representation and their semantics. This chapter presents a novel seven layer modeling approach which enables the description of sensor models from the physical properties to the end functionality (i.e. definition of sensor services which can interface seamlessly and work corporately with other enterprise applications). [Chapter 5](#) considers the use of modeling, via small signal analysis, to apply the level determination method of pneumatic volume gauging to ventilated storage vessels.

[Chapter 6](#) sees the first in a sequence of chapters which discuss application of electromagnetic-based sensor systems. Such systems are typically useful for measurements of material dielectric properties, and can often offer advantages over competing sensor technologies in terms of reduced complexity and cost. In particular, this Chapter describes a system for the monitoring of water quality.

[Chapter 7](#) discusses the application of a resonant cavity sensor to the problem of monitoring water holding capacity in meat. [Chapter 8](#) discuss the use of microwave tomography for analysis of timber, and finally for this topic, [Chap. 9](#) considers the use of microwave frequency technology for the purpose of structural health monitoring, namely the monitoring of metallic structural elements.

[Chapters 10–13](#) focus on sensors suited for the purposes of gas sensing, particularly through the use of nano-structures ([Chaps. 10 and 11](#)) and thick film resistors ([Chaps. 12 and 13](#)). These chapters discuss the design, construction, and rigorous testing undertaken for a variety of sensor types developed by researchers at a number of Institutions-based in India.

[Chapter 14](#) discusses work of Japanese researchers, who have developed a laser induced breakdown spectroscopy (LIBS) system, and are looking at novel ways to improve its sensitivity for measurement purposes. [Chapter 15](#) considers the development of an image analysis system which is demonstrated as having use in security applications, as well as for monitoring for abnormalities in buildings services systems, thus showing huge potential for future works in a number of applied areas.

[Chapter 16](#), while not dealing directly with development of sensing, discusses important issues in the area of energy harvesting. Energy is typically a significant challenge for researchers considering remote or environmental monitoring applications since batteries have a finite lifetime. Thus, this work supports the work of others (e.g., systems such as those discussed in [Chaps. 1–3](#)), ensuring that sensor network systems have a prolonged operational life-span.

The final chapter of the book discusses an area of future potential and need for sensor development, that of radiation contamination in water. Tragic events such as Chernobyl and Fukushima have led to water sources being threatened by high levels of radiological contamination. These impact both on drinking water as well as food sources through the food chain and thus cause a significant interest. The chapter focuses on the most common sources of radiological contamination of water; it reviews the current regulatory approach to the measurement of such

contamination and critically discusses the advantages and limitations of traditional laboratory-based methods of water samples analysis as compared to novel emerging technologies that could be potentially implemented into online monitoring system for continuous verification of water quality and safety.

This book is written for academic and industry professionals working in the field of sensing, instrumentation and related fields, and is positioned to give a snapshot of the current state of the art in sensing technology, particularly from the applied perspective. The book is intended to give broad overview of the latest developments, in addition to discussing the process through which researchers go through in order to develop sensors, or related systems, which will become more widespread in the future.

We would like to express our appreciation to our distinguished authors of the chapters whose expertise and professionalism has certainly contributed significantly to this book.

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Sensing Technology: Current Status and Future Trends

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