

Handbook of Signal Processing in Acoustics— Volumes 1 and 2

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The “Handbook of Signal Processing in Acoustics” provides an excellent reference for practicing acousticians and engineers. The two volumes comprise a total of 17 parts. A total of 104 chapters offer comprehensive coverage of every relevant aspect of signal acquisition and processing in acoustics. Topics are presented from a technical perspective, rather than a generic engineering approach, to signal processing so that non-specialists or specialists from different areas will find the self-contained chapters accessible, while discovering the similarities and differences between the approaches and techniques used in different areas of acoustics. The editors acknowledge the fact that the nomenclature and style may vary throughout the book, but each chapter is self-contained and reflects the current methodology and practice within a particular area of acoustics.

Volume one comprises seven parts. Part I introduces the main concepts of acoustical signals and systems. Here, a thorough review of the different data acquisition and analysis techniques is presented, along with a section on filters and signal processing. The contents are very well presented and plenty of references accompany each of the chapters.

Part II deals with auditory systems and hearing, and it's complemented by the psychoacoustics section, contained in Part III. After introducing the auditory system and auditory processing models, the authors cover the topics of hearing aids, masking, pitch perception and the interesting subject of psychoacoustic roughness.

In Part IV, an extensive analysis of musical acoustics is presented. Of special relevance is the chapter on digital waveguide architecture, which discusses the development of virtual musical instruments. This chapter is complemented by a section on modeling of musical instruments.

Part V covers analysis and synthesis of speech, presenting topics pertaining to speech analysis, quality and recognition.

Part VI comprises audio engineering signals, including the topics of loudspeaker design and digital audio recording.

Part VII is devoted to telecommunications and speech transmission systems. This section presents an overview of transmission networks, noise/echo reduction and the influence of networks and terminals on communication quality. This part concludes with a brief

comment on terminal-network interaction and configuration.

Volume two contains 10 parts. Part VIII deals with noise measurements, including determination of sound power levels using sound intensity and sound energy level methods. In addition, it addresses outdoor sound measurements, instrumentation for measuring sound at low frequencies and a section on community noise and regulations.

Part IX covers the control algorithms and signal processing capabilities required for active noise control. It explains the concepts of forward control in single and multichannel systems, and includes a general review of feedback control systems.

Part X treats structural acoustics and vibration measurements. After a brief review of the sound intensity and acoustical holography methods, an excellent summary of actuator design and development is presented. It concludes with an introduction to materials testing for acoustical applications.

Part XI presents a synopsis of bioresponse to vibration, which includes the useful topics of tactile response and whole-body vibration.

Part XI discusses acoustics measurements and transducers and it's complemented by Part XIII, which deals with engineering acoustics. An excellent review of microphone design and applications is presented, including a section dedicated to calibration techniques. In addition, laser Doppler velocimeters, accelerometers and capacitive sensors are introduced.

Part XIV covers the topic of infrasound, a topic that is becoming more important in a number of modern applications, including renewable power facilities. The highlights of this section include a review of infrasound propagation, detection and signal processing algorithms.

Part XV is an extensive review of seismology. This section introduces the subjects of seismic wave propagation and data acquisition and processing. Then, the practical applications are presented, including earthquake localization, estimation of geophysical parameters and seismic tomography.

In Part XVI, the authors present a review on Underwater and oceanographic acoustics, which emphasizes sonar technology applications.

Finally, Part XVII comprises animal bioacoustics, including bats and amphibians. The importance of these topics has been increasing recently, especially in applications like environmental assessments of renewable energy projects.

In summary, the *Handbook of Signal Processing in Acoustics* encompasses essential background material, technical details, standards, and practical tips. It is aimed to a public with some knowledge of signal pro-

cessing, and it is meant to be used as a reference. Some additional topics could be added to the book, including aeroacoustics, acoustical techniques for machine diagnostics and technologies applied to renewable power applications (SODAR).

The Handbook has many illustrations, tables, and key equations. Signal processing techniques which find major application in different areas of acoustics are well presented from different perspectives, and an extensive

index at the end of Volume two is successful at cross-referencing the material in the book. In my opinion, this compendium is an excellent reference for engineers and professionals working in acoustics.

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