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Room Acoustics *CRC Press* **Well established as a classic reference and specialised textbook, since its first publication in 1973, Heinrich Kuttruff's Room Acoustics combines detailed coverage with a state of art presentation of the theory and practice of sound behaviour in closed spaces. This sixth edition presents several additional new sections, for instance on the reflection of a spherical wave from a wall, on finite element methods for sound field calculation and on virtual reality, as well as giving an overhaul of the standard material. Particular emphasis is given to the properties and calculation of reverberation, the most obvious acoustical feature of a room. And further key topics include the various mechanisms of sound absorption and their practical application as well as scattering by wall irregularities including pseudo-stochastic structures. Extensive space is given to of psychoacoustic insights and the quality criteria derived from them, along with new procedures for the sensory assessment of concert hall acoustics. As in earlier editions, one full and updated chapter is devoted to the design and performance of electroacoustic systems which nowadays is not just a method for sound amplification but offers many possibilities for correcting acoustic deficiencies and modifying a hall's natural acoustics. Head-Related Transfer Function and Virtual Auditory Display Second Edition** *J. Ross Publishing* **This book systematically details the basic principles and applications of head-related transfer function (HRTF) and virtual auditory display (VAD), and reviews the latest developments in the field, especially those from the author's own state-of-the-art research group. Head-Related Transfer Function and Virtual Auditory Display covers binaural hearing and the basic principles, experimental measurements, computation, physical characteristics analyses, filter design, and customization of HRTFs. It also details the principles and applications of VADs, including headphone and loudspeaker-based binaural reproduction, virtual reproduction of stereophonic and multi-channel surround sound, binaural room simulation, rendering systems for dynamic and real-time virtual auditory environments, psychoacoustic evaluation and validation of VADs, and a variety of applications of VADs. This guide provides all the necessary knowledge and latest results for researchers, graduate students, and engineers who work in the field of HRTF and VAD. Underwater Acoustics and Signal Processing Proceedings of the NATO Advanced Study Institute held at Kollekolle, Copenhagen, Denmark, August 18-29, 1980** *Springer Science & Business Media* **The comprehensive research activity around the World in the fields of Underwater Acoustics and Signal Processing being strongly supported by new experimental technique and equipment and by the parallel fast developments in computer technology and solid state devices, which has led to a rapidly reducing cost of digital processing thus enabling more complex processing to be carried out economically, emphasize how necessary it is at intervals of a few years through a NATO Advanced Study Institute (NATO ASI) and guided by leading experts to study the conquests in the fields of Underwater Acoustics and Signal Processing. This need of study is moreover stressed by the interdisciplina rity of Underwater Acoustics and Signal Processing, where a strong impact from other branches of science, - Geophysics, Radioastronomy, Bioengineering, Telecommunication, Seismology, Space Research etc. - is taking place, which makes it an extre mely difficult task for scientists to follow-up the development in all its phases and to preserve the general view of its rapid ly increasing number of possibilities. The present Proceedings of the NATO ASI held in Copenhagen during August 1980 join the series of proceedings of NATO summer schools on Underwater Acoustics and Signal Processing held during the past 20 years. The equality and the fusion of the individual research fields of Underwater Acoustics and Signal Processing and the separate introduction of advanced research results from other scientific areas related to underwater acoustics such as transducers characterize the subject matter of this NATO ASI. Theory and Applications of Spherical Microphone Array Processing** *Springer* **This book presents the signal processing algorithms that have been developed to process the signals acquired by a spherical microphone array. Spherical microphone arrays can be used to capture the sound field in three dimensions and have received significant interest from researchers and audio engineers. Algorithms for spherical array processing are different to corresponding algorithms already known in the literature of linear and planar arrays because the spherical geometry can be exploited to great beneficial effect. The authors aim to advance the field of spherical array processing by helping those new to the field to study it efficiently and from a single source, as well as by offering a way for more experienced researchers and engineers to consolidate their understanding, adding either or both of breadth and depth. The level of the presentation corresponds to graduate studies at MSc and PhD level. This book begins with a presentation of some of the essential mathematical and physical theory relevant to spherical microphone arrays, and of an acoustic impulse response simulation method, which can be used to comprehensively evaluate spherical array processing algorithms in reverberant environments. The chapter on acoustic parameter estimation describes the way in which useful descriptions of acoustic scenes can be parameterized, and the signal processing algorithms that can be used to estimate the parameter values using spherical microphone arrays. Subsequent chapters exploit these parameters including in particular measures of direction-of-arrival and of diffuseness of a sound field. The array processing algorithms are then classified into two main classes, each described in a separate chapter. These are signal-dependent and signal-independent beamforming algorithms. Although signal-dependent beamforming algorithms are in theory able to provide better performance compared to the signal-independent algorithms, they are currently rarely used in practice. The main reason for this is that the statistical information required by these algorithms is difficult to estimate. In a subsequent chapter it is shown how the estimated acoustic parameters can be used in the design of signal-dependent beamforming algorithms. This final step closes, at least in part, the gap between theory and practice. Engineering Vibroacoustic Analysis Methods and Applications** *John Wiley & Sons* **The book describes analytical methods (based primarily on classical modal synthesis), the Finite Element Method (FEM), Boundary Element Method (BEM), Statistical Energy Analysis (SEA), Energy Finite Element Analysis (EFEA), Hybrid Methods (FEM-SEA and Transfer Path Analysis), and Wave-Based Methods. The book also includes procedures for designing noise and vibration control treatments, optimizing structures for reduced vibration and noise, and estimating the uncertainties in analysis results. Written by several well-known authors, each chapter includes theoretical formulations, along with practical applications to actual structural-acoustic systems. Readers will learn how to use vibroacoustic analysis methods in product design and development; how to perform transient, frequency (deterministic and random), and statistical vibroacoustic analyses; and how to choose appropriate structural and acoustic computational methods for their applications. The book can be used as a general reference for practicing engineers, or as a text for a technical short course or graduate course. Handbook of Signal Processing in Acoustics** *Springer Science & Business Media* **IEEE ASSP Workshop on Applications of Signal Processing to Audio and Acoustics Real-Time Adaptive Concepts in Acoustics Blind Signal Separation and Multichannel Echo Cancellation** *Springer Science & Business Media* **Blind Signal Separation (BSS) deals with recovering (filtered versions of) source signals from an observed mixture thereof. The term `blind' relates to the fact that there are no reference signals for the source signals and also that the mixing system is unknown. This book presents a new method for blind signal separation, which is developed to work on microphone signals. Acoustic Echo Cancellation (AEC) is a well-known technique to suppress the echo that a microphone picks up from a loudspeaker in the same room. Such acoustic feedback occurs for example in hands-free telephony and can lead to a perceived loud tone. For an application such as a voice-controlled television, a stereo AEC is required to suppress the contribution of the stereo loudspeaker setup. A generalized AEC is presented that is suited for multi-channel operation. New algorithms for Blind Signal Separation and multi-channel Acoustic Echo Cancellation are presented. A background is given in array signal processing methods, adaptive filter theory, and fast filtering in the frequency domain. The included CD-ROM can be played using any compact disc player to play the simulation results that are described in the text. When inserted into a computer, it furthermore gives Matlab implementations of the new algorithms along with audio data with which to experiment. This makes the book suited to researchers, engineers, and university students, who want to get acquainted with these emerging fields. Concert Hall Acoustics** *Springer* **1997 IEEE International Conference on Acoustics, Speech, and Signal Processing April 21-24, 1997, Munich, Germany Aural Architecture in Byzantium Music, Acoustics, and Ritual** *Taylor & Francis* **Emerging from the challenge to reconstruct sonic and spatial experiences of the deep past, this multidisciplinary collection of ten essays explores the intersection of liturgy, acoustics, and art in the churches of Constantinople, Jerusalem, Rome and Armenia, and reflects on the role digital technology can play in re-creating aspects of the sensually rich performance of the divine word. Engaging the material fabric of the buildings in relationship to the liturgical ritual, the book studies the structure of the rite, revealing the important role chant plays in it, and confronts both the acoustics of the physical spaces and the hermeneutic system of reception of the religious services. By then drawing on audio software modelling tools in order to reproduce some of the visual and aural aspects of these multi-sensory public rituals, it inaugurates a synthetic approach to the study of the premodern sacred space, which bridges humanities with exact sciences. The result is a rich contribution to the growing discipline of sound studies and an innovative convergence of the medieval and the digital. Uncertainties in Acoustical Transfer Functions Modeling, Measurement and Derivation of Parameters for Airborne and Structure-borne Sound 2000 IEEE International Conference on Acoustics, Speech, and Signal Processing Silver Anniversary, Proceedings, 5-9 June 2000, Hilton Hotel and Convention Center, Istanbul, Turkey Acoustics in the Built Environment: a Challenge for Improving the Quality of Life** *Frontiers Media SA* **Intelligent Systems Technology and Applications, Six Volume Set** *CRC Press* **Intelligent systems, or artificial intelligence technologies, are playing an increasing role in areas ranging from medicine to the major manufacturing industries to financial markets. The consequences of flawed artificial intelligence systems are equally wide ranging and can be seen, for example, in the programmed trading-driven stock market crash of October 19, 1987. Intelligent Systems: Technology and Applications, Six Volume Set connects theory with proven practical applications to provide broad, multidisciplinary coverage in a single resource. In these volumes, international experts present case-study examples of successful practical techniques and solutions for diverse applications ranging from robotic systems to speech and signal processing, database management, and manufacturing. Theory and Application of Acoustic Sources Using Complex Analysis Complex Acoustic Sources, Green's Functions and Half-Space Problems, Acoustic Radiation and Scattering Using Equivalent Source and Boundary Element Methods** *Springer Nature* **This book highlights the mathematical and physical properties of acoustical sources with singularities located in the complex plane and presents the application of such special elements to solve acoustical radiation and scattering problems. Sources whose origin lies in the complex plane are also solutions of the wave equation but possess different radiating properties as their counterparts with real positions. Such mathematical constructions are known in the fields of optics and electrodynamics, but they are not common in acoustical research. The objective of the book is to introduce this concept to acousticians and motivate them to engage themselves in further research and application of complex sources. Such sources are particularly useful to formulate Green's functions and related equivalent source and boundary element methods in half-spaces. Speech Dereverberation** *Springer Science & Business Media* **Speech Dereverberation gathers together an overview, a mathematical formulation of the problem and the state-of-the-art solutions for dereverberation. Speech Dereverberation presents current approaches to the problem of reverberation. It provides a review of topics in room acoustics and also describes performance measures for dereverberation. The algorithms are then explained with mathematical analysis and examples that enable the reader to see the strengths and weaknesses of the various techniques, as well as giving an understanding of the questions still to be addressed. Techniques rooted in speech enhancement are included, in addition to a treatment of multichannel blind acoustic system identification and inversion. The TRINICON framework is shown in the context of dereverberation to be a generalization of the signal processing for a range of analysis and enhancement techniques. Speech Dereverberation is suitable for students at masters and doctoral level, as well as established**

researchers. Auralization Fundamentals of Acoustics, Modelling, Simulation, Algorithms and Acoustic Virtual Reality *Springer Nature* Auralization is the technique of creation and reproduction of sound on the basis of computer data. With this tool it is possible to predict the character of sound signals which are generated at the source and modified by reinforcement, propagation and transmission in systems such as rooms, buildings, vehicles or other technical devices. This book is organized as a comprehensive collection of the basics of sound and vibration, acoustic modelling, simulation, signal processing and audio reproduction. With some mathematical prerequisites, the readers will be able to follow the main strategy of auralization easily and work out their own implementations of auralization in various fields of application in architectural acoustics, acoustic engineering, sound design and virtual reality. For readers interested in basic research, the technique of auralization may be useful to create sound stimuli for specific investigations in linguistic, medical, neurological and psychological research, and in the field of human-machine interaction. Proceedings of the 1998 IEEE International Conference on Acoustics, Speech, and Signal Processing May 12-15, 1998, Washington State Conventon and Trade Center, Seattle, Washington (USA) Real-Time Adaptive Concepts in Acoustics Blind Signal Separation and Multichannel Echo Cancellation *Springer* Blind Signal Separation (BSS) deals with recovering (filtered versions of) source signals from an observed mixture thereof. The term `blind' relates to the fact that there are no reference signals for the source signals and also that the mixing system is unknown. This book presents a new method for blind signal separation, which is developed to work on microphone signals. Acoustic Echo Cancellation (AEC) is a well-known technique to suppress the echo that a microphone picks up from a loudspeaker in the same room. Such acoustic feedback occurs for example in hands-free telephony and can lead to a perceived loud tone. For an application such as a voice-controlled television, a stereo AEC is required to suppress the contribution of the stereo loudspeaker setup. A generalized AEC is presented that is suited for multi-channel operation. New algorithms for Blind Signal Separation and multi-channel Acoustic Echo Cancellation are presented. A background is given in array signal processing methods, adaptive filter theory, and fast filtering in the frequency domain. The included CD-ROM can be played using any compact disc player to play the simulation results that are described in the text. When inserted into a computer, it furthermore gives Matlab implementations of the new algorithms along with audio data with which to experiment. This makes the book suited to researchers, engineers, and university students, who want to get acquainted with these emerging fields. 12 ICA The Nature and Technology of Acoustic Space *Elsevier* Discusses the acoustics and vibrations theories within the framework of modern communication and information science. Topics include: the techniques of signal analysis; sound propagation; intensity distributions; subjective and physiological responses to sound fields; and sound field control. Scientific and Engineering Studies: Studies in acoustic signal processing Building Acoustics *CRC Press* Building or architectural acoustics is taken in this book to cover all aspects of sound and vibration in buildings. The book covers room acoustics but the main emphasis is on sound insulation and sound absorption and the basic aspects of noise and vibration problems connected to service equipment and external sources. Measuring techniques connected Oceans '95 "Challenges of Our Changing Global Environment" : Conference Proceedings, October 9-12, 1995, San Diego, California *IEEE* Advances in Geophysics Earth Heterogeneity and Scattering Effects on Seismic Waves *Academic Press* Seismic waves generated by earthquakes have been interpreted to provide us information about the Earth's structure across a variety of scales. For short periods of less than 1 second, the envelope of seismograms changes significantly with increased travel distance and coda waves are excited by scattering due to randomly distributed heterogeneities in the Earth. Deterministic structures such as horizontally uniform velocity layer models in traditional seismology cannot explain these phenomena. This book focuses on the Earth heterogeneity and scattering effects on seismic waves. Topics covered are recent developments in wave theory and observation including: coda wave analysis for mapping medium heterogeneity and monitoring temporal variation of physical properties, radiation of short-period seismic waves from an earthquake fault, weak localization of seismic waves, attenuation of seismic waves in randomly porous media, synthesis of seismic wave envelopes in short periods, and laboratory investigations of ultrasonic wave propagation in rock samples. Understanding new methods for the analysis of short-period seismic waves to characterize the random heterogeneity of the Earth on many scales Observations of seismic wave scattering Discussion of techniques for mapping medium heterogeneity and for monitoring temporal change in medium characteristics Up-to-date techniques for the synthesis of wave envelopes in random media Room Acoustics, Fifth Edition *CRC Press* Since publication of the first edition in 1973, this professional and scientific reference has become the standard work in the field, providing detailed analysis of the state of the art in room acoustics. It outlines the theory and practice of sound behaviour in enclosed spaces. Particular emphasis is given to the properties and calculation of reverberation, the most obvious acoustical feature of a closed room. Further key topics include the mechanisms of sound absorption and psychoacoustical factors, from which design parameters and figures of merit are derived. Two chapters are devoted to practical questions such as measurement techniques and the procedures of room acoustical design. The interaction between a room's acoustic properties and its electroacoustic systems is also considered, and refined systems for optimizing listening conditions in a room are presented. This edition includes a new list of symbols, and updated sections include the measurement of the impulse response including a discussion of distortions, sound propagation as a diffusive process and scattering by wall irregularities. Development of an Efficient Binaural Simulation for the Analysis of Structural Acoustic Data Body, Sound and Space in Music and Beyond: Multimodal Explorations *Routledge* Body and space refer to vital and interrelated dimensions in the experience of sounds and music. Sounds have an overwhelming impact on feelings of bodily presence and inform us about the space we experience. Even in situations where visual information is artificial or blurred, such as in virtual environments or certain genres of film and computer games, sounds may shape our perceptions and lead to surprising new experiences. This book discusses recent developments in a range of interdisciplinary fields, taking into account the rapidly changing ways of experiencing sounds and music, the consequences for how we engage with sonic events in daily life and the technological advancements that offer insights into state-of-the-art methods and future perspectives. Topics range from the pleasures of being locked into the beat of the music, perception-action coupling and bodily resonance, and affordances of musical instruments, to neural processing and cross-modal experiences of space and pitch. Applications of these findings are discussed for movement sonification, room acoustics, networked performance, and for the spatial coordination of movements in dance, computer gaming and interactive artistic installations. Roadmapping Extended Reality Fundamentals and Applications *John Wiley & Sons* ROADMAPPING EXTENDED REALITY This book offers a comprehensive overview of the technological aspects of Extended Realities (XR) and discusses the main challenges and future directions in the field. This book is important and timely – XR technologies have overcome the 3 main aspects that were holding it back from mainstream adoption: cost, cables, and size. However, there are many aspects of XR technologies that are now going to be explored and developed that still need urgent research in terms of security, privacy, health and safety, long-term effects, addiction risks, and age-related developmental concerns, and the aim of the book is to inform all readers of these open issues and challenges. There are currently a great number of interdisciplinary researchers and developers working in the XR R&D field. Recently, XR technologies moved from the Gartner Hype Cycle onto the Plateau of Productivity on the Gartner Hype Cycle signaling that the fundamental XR technologies are now deemed mature technologies and ready for deployment in a wide variety of application areas. Corroborated by the fact that XR technologies are part of the future Metaverse, a concept that went rapidly mainstream during the time of writing of this book. Roadmapping Extended Reality is divided into two parts: (1) fundamentals and (2) applications. The first part covers the main technological aspects of XR. The chapters in this section review and discuss relevant fundamental concepts of XR, the actual state-of-the-art, and future challenges. The second part of the book focuses on covering a wide range of applications of XR including a future roadmap. All in all, the book offers a snapshot of the state-of-the-art in XR and addresses the needs of a multidisciplinary audience working in both academia and the industry, as well as stakeholders at government agencies and non-profit organizations. Audience This book is aimed at academic and industrial developers, exploring and developing applications in the XR, VR, AR, AI, smart IoT, 4th Industrial Revolution space, including those that are solving technology requirements, human factors, evaluation methodology advances, and ROI investigations. Expanded Abstracts with Biographies Technical Program Acoustics An Introduction to Its Physical Principles and Applications *Springer* This corrected version of the landmark 1981 textbook introduces the physical principles and theoretical basis of acoustics with deep mathematical rigor, concentrating on concepts and points of view that have proven useful in applications such as noise control, underwater sound, architectural acoustics, audio engineering, nondestructive testing, remote sensing, and medical ultrasonics. Since its publication, this text has been used as part of numerous acoustics-related courses across the world, and continues to be used widely today. During its writing, the book was fine-tuned according to insights gleaned from a broad range of classroom settings. Its careful design supports students in their pursuit of a firm foundation while allowing flexibility in course structure. The book can easily be used in single-term or full-year graduate courses and includes problems and answers. This rigorous and essential text is a must-have for any practicing or aspiring acoustician. Smaart V8 User Guide From Rational Acoustics, the owners & developers Smaart, comes the official Smaart v8 User Guide. The Smaart v8 User Guide is a comprehensive guide to working with the latest version of professional audio's most widely used system analysis & optimization software. All of Smaart v8's measurement capabilities are covered in detail, along with helpful illustrations and application examples. It also includes sections on fundamental audio concepts, navigating the user interface, capturing & managing data as well as an extensive set of appendices covering measurement rig setup, licensing & installation, applicable standards and suggested further reading.Written in Rational Acoustics' approachable easy-to-read style, with just the right amount of geeky humor, the Smaart v8 User Guide is more than just a software manual, it is a fantastic all-in-one reference that Smaart users will find themselves returning to again and again. Applied Mechanics Reviews MultiMedia Modeling 23rd International Conference, MMM 2017, Reykjavik, Iceland, January 4-6, 2017, Proceedings, Part II *Springer* The two-volume set LNCS 10132 and 10133 constitutes the thoroughly refereed proceedings of the 23rd International Conference on Multimedia Modeling, MMM 2017, held in Reykjavik, Iceland, in January 2017. Of the 149 full papers submitted, 36 were selected for oral presentation and 33 for poster presentation; of the 34 special session papers submitted, 24 were selected for oral presentation and 2 for poster presentation; in addition, 5 demonstrations were accepted from 8 submissions, and all 7 submissions to VBS 2017. All papers presented were carefully reviewed and selected from 198 submissions. MMM is a leading international conference for researchers and industry practitioners for sharing new ideas, original research results and practical development experiences from all MMM related areas, broadly falling into three categories: multimedia content analysis; multimedia signal processing and communications; and multimedia applications and services. Sound Reproduction The Acoustics and Psychoacoustics of Loudspeakers and Rooms *CRC Press* First published in 2007. Routledge is an imprint of Taylor & Francis, an informa company. NASA Technical Report The Journal of the Acoustical Society of America Acoustics An Introduction *CRC Press* This definitive textbook provides students with a comprehensive introduction to acoustics. Beginning with the basic physical ideas, Acoustics balances the fundamentals with engineering aspects, applications and electroacoustics, also covering music, speech and the properties of human hearing. The concepts of acoustics are exposed and applied in: room acoustics sound insulation in buildings noise control underwater sound and ultrasound Scientifically thorough, but with mathematics kept to a minimum, Acoustics is the perfect introduction to acoustics for students at any level of mechanical, electrical or civil engineering courses and an accessible resource for architects, musicians or sound engineers requiring a technical understanding of acoustics and their applications. Computational Intelligence in Emerging Technologies for Engineering Applications *Springer Nature* This book explores applications of computational intelligence in key and emerging fields of engineering, especially with regard to condition monitoring and fault diagnosis, inverse problems, decision support systems and optimization. These applications can be beneficial in a broad range of contexts, including: water distribution networks, manufacturing systems, production and storage of electrical energy, heat transfer, acoustic levitation, uncertainty and robustness of infinite-dimensional objects, fatigue failure prediction, autonomous navigation, nanotechnology, and the analysis of technological development indexes. All applications, mathematical and computational tools, and original results are presented using rigorous mathematical procedures. Further, the book gathers contributions by respected experts from 22 different research centers and eight countries: Brazil, Cuba, France, Hungary, India, Japan, Romania and Spain. The book is intended for use in graduate courses on applied computation, applied mathematics, and engineering, where tools like computational intelligence and numerical methods are applied to the solution of real-world problems in emerging areas of engineering.