

Nature and Technology of Acoustic Space

The Nature and Technology of Acoustic Space

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The purpose of this book is to serve both as a textbook that can be used for advanced undergraduate and graduate courses on acoustics and noise control and as a resource for current research in the rapidly-expanding subject of the properties of sound fields in rooms and other enclosed spaces.

The technical content begins in chapter 2 with a review of signal analysis. This includes both continuous and discrete Fourier transforms, windowing, analysis of signals in the time domain, and other properties of acoustical signals.

Chapter 3 is mainly a review of sound propagation in rooms, the effect of rooms on the sound power output of sources, sound radiation from plates, and reverberation room theory. However, a portion of the chapter deals with the statistics of random sound fields, transfer function statistics, and statistical phase analysis, important topics related to the active control of sound fields.

Chapter 4 is devoted to visualization of sound fields, mainly through determination of sound intensity. Topics covered include visualization of sound fields in general, and visualization of sound fields in the vicinity of sources.

Having described the physical properties of sound fields, the authors, in Chapter 5, turn to subjective and physiological responses to sound. Much of the material is related to subjective responses to sound in concert halls and the physical factors that govern these responses. A model of the auditory-brain system is proposed.

In Chapter 6, the authors return to a physical analysis of sound fields - the control of sound fields in enclosed spaces. The analysis includes both passive control and active control. An example of the former is proper placement of a source in an automobile audio system, and an example of the latter is active minimization of the sound power output of a source in a reverberant space.

The theme of sound field control is continued in Chapter 7 where the applications are related to the control of concert hall acoustics. Among the topics covered are digital signal processing for the control of sound fields in concert halls, and the importance of interaural cross correlations in concert hall design.