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## Book Review

**Active Control of Sound**, by P. A. Nelson and S. J. Elliot. Published by Academic Press, Inc., San Diego, CA, 1994, 436 pp.

The authors state that a principle objective of their book was to bring together the results of contemporary research in the disciplines of acoustics and signal processing and present these results in a unified fashion. This objective was accomplished by first presenting the fundamentals of acoustics, linear system analysis, and control system theory and then concepts and methods of active noise control. This book could be used as a classroom text to present the basics of these subjects and would also be of value to practicing engineers with expertise in one or more of the basic fields of acoustics, signal processing, or control systems.

Chapter 1 is a comprehensive compressed introduction to acoustics. Chapters 2 and 3 present an introduction to linear system theory with discussions of "deterministic" and "random" signals, Fourier analysis, correlation analysis, analogue-to-digital conversion, Laplace transforms, transfer functions, convolution, coherence, and optimal filtering. Chapter 4 presents the principles of sampled data systems with discussions of sampled signals, Z transforms, digital filters, optimal filters, and adaptive filters.

Acoustic background theory for active control of sound is presented Chapter 5. The main emphasis is on cancellation and absorption of plane waves in pipes or ducts by monopole sources. Chapter 6 continues to deal with the active control of plane wave sound fields and presents the concepts of single channel feedforward control. Block diagrams are used to describe single channel control systems and controller designs. Control system engineers will be comfortable with

the discussions of frequency domain and time domain controller design. Brief discussions of optimal and adaptive controllers are also presented.

In Chapter 7 the fundamentals of feedback control including Nyquist stability criteria and Bode plots are presented with applications to ear defenders and ductborne noise.

Chapters 8 and 9 address the control of sound in a free field. Cancellation and absorption methods are discussed. Problems and methods of controlling sound in rooms is presented in Chapters 10 and 11. An aircraft cabin is used as a practical example of global control.

The presentation of active control of sound is concluded in Chapter 12 with discussions of multichannel feedforward control of periodic and random sound, discussions of cost functions, and control algorithms to reduce cost functions.

This book would be an asset to the personal library of engineers working in the fields of acoustics and/or control systems. While this book presents an excellent comprehensive coverage of active control of sound, it does not replace standard references in acoustics and control systems but supplements them. There is an extensive list of references that is mostly on active noise control but also includes standard references in acoustics and control systems.

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