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Book review

Understanding Active Noise Cancellation, Colin H. Hansen

Understanding Active Noise Cancellation is a much needed book in the field of acoustics and active control and Colin Hansen does a thorough job of covering all the major aspects. In order for active noise control to become more practical than is has over the last 15 years it is essential that there is a more in depth understanding throughout the noise control community. This book highlights one of the major reasons why this has not happened, that is that active noise control requires understanding of several complex fields, the subtleties of each play an important role in the final performance of an active system. A successful active noise control engineer has an understanding of acoustics, vibration, signal processing and adaptive filters, DSP hardware and programming, transducer design and power electronics.

Like many textbooks this one is based on a series of lectures and at times this becomes apparent as the breadth of material covered assumes that a large amount further reading will be undertaken. The introduction is particularly guilty of this as the author tries to introduce and explain the majority of active control systems, leaving the reader somewhat disorientated by the rapid switches between details and broad statements. Thankfully the remainder of the book clarifies the topics introduced here and is well structured.

Foundations of active control are discussed in chapter two, which couples well with the third chapter that discusses adaptive algorithms. A very clear description of the filtered-x-LMS algorithm is given, however the discussion of neural networks as adaptive filters in active control may be slightly esoteric for a book which is meant to be an introduction to the fundamentals of active noise control.

Secondary sound sources are the subject of the fourth chapter and the practical considerations such as temperature range, durability, stability of response are well treated. The discussion of an active noise control system for industrial chimneys spewing hot gas gives food for thought for those of us who spend the majority of our time working in controlled laboratory environments. In keeping with the scope of the book little technical detail of various transducer mechanisms is given as most practical control system use standard loudspeakers or inertial shakers. As is the case throughout the book a good number of references for further reading are provided.

Wave synthesis, modal and standard vibration and pressure sensors, energy density and intensity sensors, potential energy, sum of squared pressures are all discussed with regard to reference and error sensing. As with most of the book the mathematics is light but lucid descriptions of the physics are given. The final chapter is a review of noise control applications, cases in point are the active headsets found on commercial airlines and transmission loss through simple panels. The final section of the book is given over to discussing noise control problems that will always be impractical, such as global reduction transient and broadband, noise outdoors, global reduction of high frequencies in large spaces etc. This section is invaluable to those who have had to spend their entire time at a party explaining why nothing can be done about noisy neighbors.

This book fulfils its purpose well as a review of the current position of active noise control in both practical and research fields. Although not in depth enough to gain a complete understanding of the problems facing the active control system designer it is a good introductory text that points the reader in the correct directions.

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