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Book review

New Acoustics—Selected Topics by C. Ranz-Guerra and J.A. Gallego-Juárez (Eds.), Spanish Research Council (CSIC), Madrid, 2002, pp. 193, ISBN 84-00-08111-0

The content of this book corresponds to a series of lectures given in 2000–2001 at the Instituto de Acustica (Madrid, Spain) to commemorate its 25th Anniversary as a Research Institute. It presents an overview (in more or less detail, depending on the authors) of some recent aspects in Acoustics. The title “New Acoustics” is actually somewhat misleading. For most topics, “recent” would be a better adjective.

Apart from a foreword and a short chapter on the historical evolution of Acoustics in Spain, the book contains eight scientific chapters:

- *Image-guided acoustic hemostasis* (L. Crum et al., 12 pages, 8 references). This chapter presents some preliminary studies of the combined use of ultrasound imaging devices and High Intensity Focused Ultrasound (HIFU) devices to detect internal bleeding and to induce coagulative necrosis and then hemostasis. Some examples are shown (blood vessel, liver of pig). They are illustrated by high-quality pictures and their practical operating conditions are described (dimensions of the cut, frequency band, time necessary to achieve hemostasis, etc.).
- *Numerical modeling of sonic and ultrasonic devices* (B. Dubus, 37 pages, 40 references). This chapter presents the applications of Finite Element and Boundary Element Methods (FEM and BEM) to electromechanical transducers and fluid–structure coupling. Numerical aspects are described in details, for the equations in the frequency domain and in the time domain. Examples related to transducers for macrosonic and airborne applications, ultrasonic motors and piezocomposite materials are presented. Some non-linear applications are discussed in the conclusion.
- *Building acoustics in the new century: improving insulation quality by simulating sound transmission for building designs* (E. Gerretsen, 11 pages, 16 references). This chapter presents a brief overview of the activities of a European co-operation in Building Acoustics. The main objectives of this co-operation are the development of simulation models and new measuring methods. Gathering of reliable input data for the models is also an important aspect. The applications are the airborne and impact sound transmission (sound transmission between rooms, vibration reduction index for junctions, etc.) but also sound reduction by facade against outdoor noise.
- *A new approach to ultrasound generation: the capacitive micromachined transducers* (M. Pappalardo et al., 18 pages, 34 references). The capacitive micromachined transducers have interesting properties which make them more suited to some applications than the classical piezoelectric transducers. This chapter describes several aspects of these devices, such as the operation principle, the fabrication process, detailed equations of analytical models and some experimental results.

- *High powered ultrasound in physical and chemical processing* (T.J. Mason, 33 pages, 68 references). This chapter is dedicated to the physical and chemical effects of ultrasound. The first part is concerned with acoustic cavitation in liquid media (basis of sonochemistry) where examples such as homogeneous liquid–phase reactions and heterogeneous powder–liquid reactions are examined in details. The second part is concerned with applications of power ultrasound in processing, such as surface cleaning, removal of biological and chemical pollutants.
- *Model-based correlators: interesting cases in underwater acoustics* (S.M. Jesus, 14 pages, 10 references). This chapter is concerned with model-based correlators which are widely used to solve inverse problems, for example in underwater acoustics to identify the position of a source from sound pressure data. The theoretical background is first presented, with definitions of some filters. Then simulation results are presented to show how a model-based correlator can lead to erroneous results if it is used in a model mismatch situation. Numerical examples show the results obtained in case of a small error on water depth and on source position.
- *Some contemporary aspects of the theory of nonlinear acoustics and their applications* (L. Bjorno, 14 pages, 33 references). The first part of the chapter presents the characteristics of the governing equations in non-linear acoustics. Some particular applications are then described in details, namely the characterization of non-linearities in fluids, parametric acoustic arrays and focused ultrasonic fields. In conclusion, it is pointed out that although there exists now a “well-developed toolbox” for the theoretical and numerical aspects of non-linear acoustics, more practical applications have still to be found.
- *Active noise control: past, present and future* (S.J. Elliott, 17 pages, 61 references). This chapter first presents in some details the principles of active noise control in the case of a one-dimensional duct, in a free space and in an enclosure. An example of noise reduction in an aircraft is then shown, with some quantitative results. Applications of local control of sound are also presented, such as reducing the noise around a passenger’s head in a car or airplane. Finally, future possibilities in the aerodynamic field are discussed such as the reduction of blade passing noise in helicopters or high frequency whines.

Most of the chapters include a long list of references and are nicely illustrated by examples, pictures and quantitative results.

Unfortunately, there are a lot of misprints. For those which occur in the text, this does not matter too much but some occur in equations (wrong numbering of figures or equations, wrong symbols, missing definitions, etc.).

However, this is a book which can be recommended to students and engineers, especially those working in the ultrasound field but not only. The book can also be read by non-specialists. In particular, as a non-specialist, I have found the four chapters related to ultrasound and their applications quite clear and interesting.

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