Book Review

**Holger Kantz and Thomas Schreiber, *Nonlinear Time Series Analysis*,
Cambridge: Cambridge University Press, 1997. ISBN 0 521 55144 7 Hb
£50.00 US\$74.95**

This book deals with chaotic signal processing, rather than nonlinear times series in general. Chaos has been among the most popular topics of interest among researchers during the last few years. Numerous relevant features of chaos theory explain such enthusiasm. Most engineers and researchers in many fields as different as physics, biology or economics, to mention but a few, rapidly understood the importance of this approach that provided an alternative to linear stochastic processes in accounting for non periodic behavior. The complexity and variety of signals recorded in chaotic systems, the apparent paradox which resides in the non-predictability (in the long term) of such often simple deterministic systems, made chaos both a challenging and an attractive research direction for nonlinear science. Furthermore, the fractal property of the so-called strange attractors and the aesthetic of the ‘images’ of chaos exerted a fascination that reached farther than the scientific community.

Chaos was measured everywhere ... and most of the time on systems where the dynamics was everything but chaotic. This is the point that makes the book by H. Kantz and T. Schreiber both original, fundamentally honest and very useful and valuable for anyone who would like to deal with chaotic signal analysis. Far from overwhelming the reader with mathematical and statistical concepts, this book presents in a concise way all necessary material from the experimentalist’s point of view. All mathematical hypotheses are considered and their interpretation in terms of applicability to real experimental data is systematically discussed. The authors have emphasized the risks and pitfalls that one may encounter when blindly applying algorithms that were designed for estimating parameters of chaotic behavior, but not for detecting the presence or absence of chaos. The choice of the parameters that are required by most algorithms is shown to be critical; furthermore, bad choices are proved to lead to erroneous conclusions.

Very few textbooks actually address the problem of noise in chaotic motion and analyses its effects on both the physical behavior of the system and the quantitative results of ‘chaotic signal analysis’ algorithms. Avoiding a tedious mathematical derivation of the influence of a stochastic component in the signal, the authors illustrate their approach on noise reduction and evaluation, through their application to a set of real world data. This naturally leads to addressing the problem of modeling

and forecasting of chaotic time series. Here again, most recent approaches and results are presented and exemplified on experimental data.

Even if this book is clearly devoted to the problem of experimental nonlinear data processing, all essential advanced papers, or mathematical references are given in a 'Further reading' section, that concludes every chapter in this book. Many exercises are also proposed that allow the reader to experiment with most of the material presented in the text.

The skills and experience acquired by the authors through a lengthy experience with chaotic data processing are made available to the reader throughout this book. It makes of it a valuable tool for all students, engineers or researchers who are confronted with the analysis of possible chaotic signals.

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