

# Control and Cybernetics

vol. **35** (2006) No. 2

## Book review:

### APPROXIMATION THEORY FROM TAYLOR POLYNOMINALS TO WAVELETS

by

**Ole Christensen and Khadija L. Christensen**

The book is a concisely written introduction to approximation theory. The presentation of results demonstrates the dynamic nature of mathematics and is enriched by illustrative examples, which help to develop intuition.

The book consists of five chapters, each followed by exercises. The first is devoted to function approximation with polynomials. It begins with a general introduction to the idea of approximation, then deals with the Weierstrass and Taylor theorems. In the second chapter the authors focus on the approximation properties related to infinite series of functions. The basic idea of signal transmission is also presented. The next chapter indicates how Fourier series and Fourier transform can be used as tools to represent functions and how properties of a function are reflected in the expansion coefficients. The purpose of the last two chapters is to introduce wavelets as natural continuation of the previous material. They give the reader an understanding of the fundamental concepts, sketch the history of wavelets and present their application in signal processing. The explanation for how wavelet expansions reflect the local behaviour of a function and how wavelets can be used to detect jumps in a signal is also provided. The book ends with an outline for the frames and Gabor systems, which are frequently used as alternatives to wavelet systems.

The authors focus on ideas rather than on technical details, so that proofs are generally omitted, and just a few are included in the appendices. Minimal prerequisites (elementary calculus) make the book comprehensible to undergraduate students of mathematics, mathematical physics and engineering. Readers are, at the same time, led towards the advanced literature in approximation theory.

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Ole Christensen and Khadija L. Christensen, <i>Approximation Theory. From Taylor Polynomials to Wavelets</i> . ANHA - Applied and Numerical Harmonic Analysis. Birkhäuser Verlag AG, Basel-Boston-Berlin 2004, 168 pages, ISBN 3-7643-3600-5, EUR 38.00 (softcover).
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