

Book review:

**INTELLIGENT METHODS
IN SIGNAL PROCESSING AND COMMUNICATIONS**

by

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Editors**

This book is a collection of papers presented at the Workshop on Intelligent Methods for Signal Processing and Communications, held on June 24-26, 1996, in Spain. The aim of the Workshop was to summarise the state-of-the-art and to suggest new research directions in the development of intelligent methods which has emerged in the last decade. The book contains interesting and informative research results of several research groups in Europe, Canada and USA. It consists of 14 chapters written by various authors.

Chapter 1 ("Adaptive Antenna Arrays in Mobile Communications") overviews adaptive array processing methods in mobile communication systems. Several algorithms (LMS, P-Vector, CMA) for updating the weights in the adaptive array are discussed.

Chapter 2 ("Demodulation in the Presence of Multiuser Interference: Progress and Misconceptions") deals with multi-user communications. The concept of the CDMA (Code-Division Multiple-Access) channels is reviewed and some critical discussion on recent multi-user detection is given. The chapter contains 157 references.

Chapter 3 ("Intelligent Signal Detection") describes a novel system for the detection of a target signal in the presence of additive interference. The system operates under the assumption that the statistics of the target signal and the interference are unknown and that both may be nonstationary.

Chapter 4 ("Biometric Identification for Access Control") demonstrates a successful application of probabilistic decision-based neural networks (PDBNN) to face and palm print recognition. The authors of this chapter give 67 references.

Chapter 5 ("Multidimensional Nonlinear Myopic Maps, Volterra Series, and Uniform Neural-Network Approximations") relates to the Volterra and Wiener theories of nonlinear systems. A theorem is presented which gives necessary and sufficient conditions under which multidimensional myopic input-output maps with vector-valued inputs drawn from a certain large set can be uniformly approximated arbitrarily well using a structure consisting of a linear preprocessing

Chapter 6 (“Monotonicity: Theory and Implementation”) presents a systematic method for incorporating prior knowledge (monotonicity) into the learning-from-examples paradigm. The approach is demonstrated on a credit card application task and a problem in medical diagnosis.

Chapter 7 (“Analysis and Synthesis Tools for Robust SPRness”) studies the robust SPR (Strict Positive Real) property which arises in identification and adaptive control problems. The motivation for the study comes from the adaptive infinite impulse response (IIR) filters.

Chapter 8 (“Boundary Methods for Distribution Analysis”) introduces the use of *boundary methods* for distribution analysis. Typical examples include features set evaluation and sample pruning for progressive classifier construction.

Chapter 9 (“Constructive Function Approximation: Theory and Practice”) reviews some theoretical results on the constructive function approximation. The authors set up a framework where constructive algorithms, based on convex combinations of elements taken from a subset of a Hilbert space, can be analysed. Moreover, they obtained the optimal values of the coefficients in the convex expansions to guarantee a desired convergence rate.

Chapter 10 (“Decision Trees Based on Neural Networks”) overviews the current research on tree classification based on neural networks. Some new learning rules that can speed up learning and reduce than final misclassification probability are proposed.

Chapter 11 (“Applications of Chaos in Communications”) presents and overviews communication systems with chaos. The concept of chaotic synchronisation and chaotic modulation is given.

Chapter 12 (“Design of Near PR Non-Uniform Filter Banks”) discusses the problems related to the design of non-uniform filter banks. The MPEG audio standard is outlined in order to show why and how non-uniform banks could be exploited.

Chapter 13 (“Source Coding of Stereo Pairs”) considers the problem of stereo image coding. A new coding technique based on subspace projection is proposed.

In chapter 14 (“Design Methodology for VLSI Implementation of Image and Video Coding Algorithms – A Case Study”) a methodology for the design of VLSI circuits for image and video coding applications is presented. The VLSI architectures are developed and the software environments are described.

The book presents excellent overviews of several intelligent methods used in signal processing and communication. Moreover, it shows the original results of current research in these areas. Most of the text is informative and easy to follow.

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