



The Digital Signal Processing Handbook

SECOND EDITION

Wireless, Networking,
Radar, Sensor Array
Processing, and
Nonlinear Signal
Processing

EDITOR-IN-CHIEF
Vijay K. Madisetti



CRC Press
Taylor & Francis Group

Contents

Preface	ix
Editor	xi
Contributors	xiii

PART I Sensor Array Processing

Mostafa Kaveh

1 Complex Random Variables and Stochastic Processes	1-1
<i>Daniel R. Fuhrmann</i>	
2 Beamforming Techniques for Spatial Filtering	2-1
<i>Barry Van Veen and Kevin M. Buckley</i>	
3 Subspace-Based Direction-Finding Methods	3-1
<i>Egemen Gonen and Jerry M. Mendel</i>	
4 ESPRIT and Closed-Form 2-D Angle Estimation with Planar Arrays	4-1
<i>Martin Haardt, Michael D. Zoltowski, Cherian P. Mathews, and Javier Ramos</i>	
5 A Unified Instrumental Variable Approach to Direction Finding in Colored Noise Fields	5-1
<i>P. Stoica, Mats Viberg, M. Wong, and Q. Wu</i>	
6 Electromagnetic Vector-Sensor Array Processing	6-1
<i>Arye Nehorai and Eytan Paldi</i>	
7 Subspace Tracking	7-1
<i>R. D. DeGroat, E. M. Dowling, and D. A. Linebarger</i>	
8 Detection: Determining the Number of Sources	8-1
<i>Douglas B. Williams</i>	
9 Array Processing for Mobile Communications	9-1
<i>A. Paulraj and C. B. Papadias</i>	
10 Beamforming with Correlated Arrivals in Mobile Communications	10-1
<i>Victor A. N. Barroso and José M. F. Moura</i>	

11	Peak-to-Average Power Ratio Reduction	11-1
	<i>Robert J. Baxley and G. Tong Zhou</i>	
12	Space-Time Adaptive Processing for Airborne Surveillance Radar	12-1
	<i>Hong Wang</i>	

PART II Nonlinear and Fractal Signal Processing

Alan V. Oppenheim and Gregory W. Wornell

13	Chaotic Signals and Signal Processing	13-1
	<i>Alan V. Oppenheim and Kevin M. Cuomo</i>	
14	Nonlinear Maps	14-1
	<i>Steven H. Isabelle and Gregory W. Wornell</i>	
15	Fractal Signals	15-1
	<i>Gregory W. Wornell</i>	
16	Morphological Signal and Image Processing	16-1
	<i>Petros Maragos</i>	
17	Signal Processing and Communication with Solitons	17-1
	<i>Andrew C. Singer</i>	
18	Higher-Order Spectral Analysis	18-1
	<i>Athina P. Petropulu</i>	

PART III DSP Software and Hardware

Vijay K. Madisetti

19	Introduction to the TMS320 Family of Digital Signal Processors	19-1
	<i>Panos Papamichalis</i>	
20	Rapid Design and Prototyping of DSP Systems	20-1
	<i>T. Egolf, M. Pettigrew, J. Debardeleben, R. Hezar, S. Famorzadeh, A. Kavipurapu, M. Khan, Lan-Rong Dung, K. Balemarthy, N. Desai, Yong-kyu Jung, and Vijay K. Madisetti</i>	
21	Baseband Processing Architectures for SDR	21-1
	<i>Yuan Lin, Mark Woh, Sangwon Seo, Chaitali Chakrabarti, Scott Mahlke, and Trevor Mudge</i>	
22	Software-Defined Radio for Advanced Gigabit Cellular Systems	22-1
	<i>Brian Kelley</i>	

PART IV Advanced Topics in DSP for Mobile Systems

Vijay K. Madisetti

23	OFDM: Performance Analysis and Simulation Results for Mobile Environments	23-1
	<i>Mishal Al-Gharabally and Pankaj Das</i>	

24	Space-Time Coding and Application in WiMAX	24-1
	<i>Naofal Al-Dhahir, Robert Calderbank, Jimmy Chui, Sushanta Das, and Suhas Diggavi</i>	
25	Exploiting Diversity in MIMO-OFDM Systems for Broadband Wireless Communications	25-1
	<i>Weifeng Su, Zoltan Safar, and K. J. Ray Liu</i>	
26	OFDM Technology: Fundamental Principles, Transceiver Design, and Mobile Applications	26-1
	<i>Xianbin Wang, Yiyang Wu, and Jean-Yves Chouinard</i>	
27	Space-Time Coding	27-1
	<i>Mohammed O. Sinnokrot and Vijay K. Madisetti</i>	
28	A Multiplexing Approach to the Construction of High-Rate Space-Time Block Codes	28-1
	<i>Mohammed O. Sinnokrot and Vijay K. Madisetti</i>	
29	Soft-Output Detection of Multiple-Input Multiple-Output Channels	29-1
	<i>David L. Milliner and John R. Barry</i>	
30	Lattice Reduction-Aided Equalization for Wireless Applications	30-1
	<i>Wei Zhang and Xiaoli Ma</i>	
31	Overview of Transmit Diversity Techniques for Multiple Antenna Systems	31-1
	<i>D. A. Zarboudi, D. A. Kateros, D. I. Kaklamani, and G. N. Prezerakos</i>	

PART V Radar Systems

Vijay K. Madisetti

32	Radar Detection	32-1
	<i>Bassem R. Mahafza and Atef Z. Elsherbeni</i>	
33	Radar Waveforms	33-1
	<i>Bassem R. Mahafza and Atef Z. Elsherbeni</i>	
34	High Resolution Tactical Synthetic Aperture Radar	34-1
	<i>Bassem R. Mahafza, Atef Z. Elsherbeni, and Brian J. Smith</i>	

PART VI Advanced Topics in Video and Image Processing

Vijay K. Madisetti

35	3D Image Processing	35-1
	<i>André Redert and Emile A. Hendriks</i>	

Index	I-1
--------------------	------------