## Contents

Edi	tor Biographies	V
Edi	torial Board	vii
Pre	face	ix
Acl	knowledgments	xi
Co	ntributors	xvii
PA	ART I ACOUSTIC SIGNALS AND SYSTEMS	1
1	Signals and Systems	3
2	Acoustic Data Acquisition	17
3	Spectral Analysis and Correlation	33
4	The FFT and Tone Identification	53
5	Measuring Transfer-Functions and Impulse Responses	65
6	Digital Sequences	87
7	Filters	107
8	Adaptive Processing	125
9	Beamforming and Wavenumber Processing	131

## Contents

Edit	or Biographies	V
Edit	orial Board	vii
Pre	ace	ix
Ack	nowledgments	хi
Cor	tributors	xvii
PA	RT VIII NOISE	931
51	Sound Levels of Noise Sources	933
52	Outdoor Measurements	949
53	Measurements of Physical Characteristics Using Sound at Audible or Lower Frequencies	983
54	Community Response to Noise	1005
PA	RT IX ACTIVE NOISE CONTROL	1021
	Introduction	1023
55	Forward Control in Single-Channel Systems	1029
56	Forward Control in Multichannel Systems	1057
57	Feedback Control Systems	1081

PA	RT X STRUCTURAL ACOUSTICS	
	AND VIBRATION	1107
58	Intensity Techniques	1109
<b>5</b> 9	Nearfield Acoustical Holography	1129
60	Actuator Design and Deployment	1141
61	Materials Testing	1167
PA	RT XI BIORESPONSE TO VIBRATION	1183
62	<b>Tactile Responses to Vibration</b>	1185
63	Uses and Applications of Somatosensation	1215
64	Sensory Substitution	1231
PA	RT XII TRANSDUCERS FOR ACOUSTIC MEASUREMENT	1245
65	Condenser Microphones	1247
66	<b>Dynamic Pressure Microphones</b>	1267
67	<b>Dynamic Pressure Difference Microphones</b>	1275
68	The Microflown Particle Velocity Sensor	1283
69	Microphone Calibration	1293
<b>70</b>	Piezoceramic Accelerometer	1313
71	Laser Doppler Velocimeter	1329
72	Capacitive Sensors	1339

		Contents xv
PA	RT XIII ENGINEERING ACOUSTICS	1347
73	<b>Energy Saving Transducers and Thermoacoustics</b>	1349
74	Sinusoidal Representation of Acoustic Signals	1365
75	Room Transfer Function	1381
<b>76</b>	Spatial Information of Sound Fields	1403
PA	RT XIV INFRASONICS	1423
77	Infrasound Event Detection Using the Progressive Multi-Channel Correlation Algorithm	1425
78	Ray Tracing in an Inhomogeneous Atmosphere with Winds	1437
79	Infrasonic Data Processing at the Provisional Technical Secretariat of the Comprehensive Nuclear-Test-Ban Organization	1461
80	The Design and Performance of Infrasound Noise-Reducing Pipe Arrays	1473
81	Processing Infrasonic Array Data	1487
82	Infrasound Propagation	1497
PA	RT XV SEISMOLOGY	1521
83	Structure and Elastic Properties of the Earth	1523
84	Seismic Wave Propagation	1535
85	Seismic Data Acquisition	1545
86	Signal Models in Seismic Processing	1559
87	Deconvolution and Optimal Filtering in Seismology	1571

xvi Contents	
--------------	--

88	Seismic N	ligration Imaging	1585
89	Geophysical Parameter Estimation		1593
90	Earthquak	ce Localization	1627
91	Seismic T	omography	1635
92	Array Sigr	nal Processing	1655
PA	RT XVI	UNDERWATER AND OCEANOGRAPHIC ACOUSTICS	1667
93	Propagati	on and Signal Modeling	1669
94	Statistica	I Signal Processing	1695
95	Inverse P	roblems in Underwater Acoustics	1723
96	6 Active Sonar 1737		1737
97	7 Passive Sonar 1757		1757
98	98 Transducers for Sonar Systems		1783
99	99 Flow Noise		1821
PA	RT XVII	ANIMAL BIOACOUSTICS	1833
100	Bat Bio	acoustics	1835
101	. Fish Bio	pacoustics	1851
102	2 Amphib	ian Bioacoustics	1861
103	Avian B	ioacoustics	1887
<b>10</b> 4	Cetacea	an Bioacoustics with Emphasis	
	on Reco	ording and Monitoring	1897
Index		1909	
Cun	umulative Contents 1931		

PA	RT II AUDITORY SYSTEM AND HEARING	145
10	Anatomy, Physiology and Function of the Auditory System	147
11	Physiological Measures of Auditory Function	159
12	Auditory Processing Models	175
13	Speech Intelligibility	197
14	Signal Processing in Hearing Aids	205
PA	RT III PSYCHOACOUSTICS	213
15	Methods for Psychoacoustics in Relation to Long-Term Sounds	215
16	Masking and Critical Bands	229
<b>17</b>	Aspects of Modeling Pitch Perception	241
18	Calculation of Loudness for Normal and Hearing-Impaired Listeners	251
19	Psychoacoustical Roughness	263
PA	RT IV MUSICAL ACOUSTICS	275
20	<b>Automatic Music Transcription</b>	277
21	Music Structure Analysis from Acoustic Signals	305
22	<b>Computer Music Synthesis and Composition</b>	333
23	Singing Voice Analysis, Synthesis, and Modeling	359
24	Instrument Modeling and Synthesis	375
25	Digital Waveguide Architectures for Virtual Musical Instruments	399
26	Modeling of Musical Instruments	419

		Contents xv
PA	RT V SPEECH	447
27	Display and Analysis of Speech	449
28	Estimation of Speech Intelligibility and Quality	483
29	Gaussian Models in Automatic Speech Recognition	521
30	Speech Synthesis	557
31	Speech Coders	587
PA	RT VI AUDIO ENGINEERING	621
32	Transducer Models	623
33	Loudspeaker Design and Performance Evaluation	649
34	PA Systems for Indoor and Outdoor	669
35	Beamforming for Speech and Audio Signals	691
36	Digital Audio Recording Formats and Editing Principles	703
37	Audiovisual Interaction	731
38	Multichannel Sound Reproduction	747
39	Virtual Acoustics	761
40	Audio Restoration	773
41	Audio Effects Generation	785
42	Perceptually Based Audio Coding	797
PA	RT VII TELECOMMUNICATIONS	819
43	Speech Communication and Telephone Networks	821
44	Methods of Determining the Communicational Quality of Speech Transmission Systems	831

xvi	Contents	

45	Efficient Speech Coding and Transmission Over Noisy Channels	853
46	Echo Cancellation	883
47	Noise Reduction and Interference Cancellation	897
48	Terminals and Their Influence on Communication Quality	909
49	Networks and Their Influence on Communication Quality	915
50	Interaction of Terminals, Networks and Network Configurations	921
List	of Important Abberviations	927