Contents

Introduction — v

1	General properties of bispectrum-based digital signal processing —— 1
1.1	General properties of cumulant and moment functions —— 1
1.2	Triple correlation function and bispectrum —— 4
1.3	Bispectral density estimation techniques — 9
1.4	Bispectrum-based algorithms in application for filtering and signal
	shape reconstruction —— 12
1.5	Reduction of waveform distortions in bispectrum-based signal
	reconstruction systems —— 31
1.6	Performance of the bispectral density estimator —— 42
1.7	Conclusions —— 46
2	Unknown noisy signal shape estimation by bispectrum-filtering techniques —— 48
2.1	Smoothing the noisy bimagnitude and biphase or the real and
	imaginary parts of bispectrum estimates by using nonadaptive 2-D
	linear and nonlinear filtering —— 50
2.2	Statistical properties of bispectrum estimate contaminated by
	noise —— 63
2.3	Novel techniques developed for improving noisy bispectrum
	estimates — 67
2.4	Adaptive 1-D filtering applied for bispectrum-based signal
	reconstruction — 92
2.5	Conclusions —— 99
3	Bispectrum-based digital image reconstruction using tapering pre-distortion —— 101
3.1	Additive predistortions in reconstruction of the images contaminated by noise and jitter —— 101
3.2	Bispectrum-based image reconstruction by using multiplicative
	predistortions —— 113
3.3	Search of the optimal parameters used for additive and multiplicative
	pre-distortion functions —— 117
3.4	Conclusions — 125

ass --- enoluciallogs vibra-

Detection of deterministic signals by

4	Signal detection by using third-order test statistics in communications an radar applications —— 126
4.1	Detection of deterministic signals by using third-order test statistics and likelihood ratio criterion —— 126
4.2	Bispectrum-based encoding technique developed for noisy, multipath and fading radio links —— 136
4.3	Naval surface target detection and recognition by estimation of radar range profiles —— 148
4.4	Using bicoherence-based features for aerial target classification —— 161
4.5	Time-frequency analysis of backscattering in ground surveillance Doppler radar —— 168
5	Conclusions —— 188

imaginary parts of bispectrum estimates by using nonadaptive 2-D

Additive predistortions in reconstruction of the images conteminated by

Search of the optimal garameters used for additive and multiplicative

Statistical properties of bispectrum estimate contaminated by

Move! techniques developed for improving noisy bispectrum

linear and nonlinear filtering --- 50

pre-distortion functions - 317

Conclusions - 125

pre-distortion --- 101

Bibliography —— 191

Subject index — 198