

Contents

<i>Preface</i>	v
<i>Acronyms</i>	xiii
1. Introduction	1
<i>C. Novara et al.</i>	
References	6
2. Hybrid LPV Modeling and Identification	11
<i>L. Giarré, P. Falugi & R. Badalamenti</i>	
1. Introduction	11
2. Literature review on LPV identification	13
3. HLPV modeling: Problem formulation	20
4. A motivating example: Traffic modeling in wireless ad-hoc networks	23
5. Final remarks and open problems	32
References	34
3. SM Identification of IO LPV Models with Uncertain Time- Varying Parameters	41
<i>V. Cerone, D. Piga & D. Regruto</i>	
1. Introduction	41
2. Problem formulation	44
3. Evaluation of tight parameter bounds	45
4. Semi-static LPV relaxation	47
5. Properties of the computed parameter uncertainty intervals $PUI_j^{(n,\delta)}$	57
6. Simulated example	60
7. Conclusion	62

References	63
4. SM Identification of State-Space LPV Systems	65
<i>C. Novara</i>	
1. Introduction	65
2. Notation and basic notions	67
3. Set membership identification of state-space LPV systems	68
4. Interpolatory and optimal estimates	72
5. Important aspects of the identification process	79
6. Examples	82
7. Conclusion	90
References	91
5. Identification of Input-Output LPV Models	95
<i>V. Laurain et al.</i>	
1. Introduction	95
2. Discrete-time LPV polynomials models	97
3. Estimating LPV-ARX models in DT	100
4. Addressing estimation with general noise models	105
5. Direct estimation of continuous-time LPV systems	116
6. Instrumental variable approach in continuous-time	121
7. Conclusion	128
References	129
6. Reducing the Dimensions of Data Matrices in LPV Subspace Identification	133
<i>V. Verdult & M. Verhaegen</i>	
1. Introduction	133
2. Data equations	136
3. Basic ideas behind the methods	139
4. Two-block identification method	146
5. Implementation by selection of dominant rows	151
6. Implementation by a kernel method	158
7. Conclusion	162
References	163

7. Subspace Identification of MIMO LPV Systems	167
<i>J. W. van Wingerden & M. Verhaegen</i>	
1. Introduction	167
2. Problem formulation and assumptions	169
3. Factorization of the LPV controllability matrix	172
4. LPV predictor-based subspace identification	175
5. Kernel method	180
6. Simulation examples	186
7. Case study: A “smart” airfoil	188
8. Conclusion	196
References	196
8. Subspace Identification of Continuous-Time State-Space LPV Models	201
<i>M. Bergamasco & M. Lovera</i>	
1. Introduction	202
2. Definitions	205
3. Problem statement	207
4. A balanced subspace approach to identification for gain scheduling	207
5. Continuous-time predictor-based subspace identification	208
6. Balancing of the identified models	213
7. Model interpolation	215
8. Comments and discussion	218
9. Simulation examples	219
10. Conclusions	227
11. Acknowledgements	227
References	227
9. Indirect Continuous-Time LPV System Identification	231
<i>P. Lopes dos Santos et al.</i>	
1. Introduction	232
2. LPV systems	234
3. Discretisation of LPV systems	235
4. Successive approximations identification algorithm	238
5. Downsampled LTI discrete-time deterministic-stochastic subspace identification algorithm	240

6. Case study	247
7. Conclusion	254
References	255
10. LPV System Identification Using Series Expansion Models	259
<i>R. Tóth, P. S. C. Heuberger & P. M. J. Van den Hof</i>	
1. Introduction	259
2. Perspectives of series-expansion models	260
3. Orthonormal basis function models	264
4. Identification via OBF models	272
5. Identification of a high-performance positioning device	279
6. Conclusion	292
References	292
11. System Identification of Linear Parameter Varying State-Space Models	295
<i>A. Wills & B. Ninness</i>	
1. Introduction	295
2. Problem formulation	297
3. Maximum-likelihood estimation	298
4. The expectation-maximisation (EM) algorithm for ML estimation	300
5. EM for LPV models	301
6. Simulation study	307
7. Conclusion	312
References	313
12. PWA Identification of Interconnected Systems with LFR Structure	317
<i>S. Paoletti & A. Garulli</i>	
1. Introduction	317
2. PWA-LFR models	319
3. Black-box PWA system identification	322
4. Structured identification of PWA-LFR models	325
5. Applications	334
6. Conclusions	344
References	345

Contents

13. Identification and Model (In)validation of Switched ARX Systems	347
<i>C. Feng et al.</i>	
1. Introduction	348
2. Preliminaries	351
3. System identification	356
4. Model (in)validation	365
5. Numerical examples and applications	370
6. Concluding remarks	377
References	377
<i>Index</i>	381