References


References


References


References


Parts of the book have appeared in the archived literature and the authors gratefully acknowledge permissions to re-use material from the following papers in the archived literature.


Chapter 7 contains excerpts from Thornhill, N.F., 2005, Finding the source of non-linearity in a process with plant-wide oscillation, *IEEE Transactions on Control System Technology*, 13, 434–443, © 2005, Institute of Electrical and Electronics Engineers (IEEE), with permission from IEEE.


Index

Apparent Stiction, 187

Bicoherence
  definition, 34
  estimation, 35
    spurious peaks, 37
    estimation issue, 37
  properties, 35
Bispectrum, 27
  data length, 38
  definition, 29
  estimation, 30
  estimator properties, 32
  properties, 35
  window function, 38

Compression, 45
  Backward slope, 47
  Box Car, 47
  detection, 59
  factor, 49
  implementation, 61
  methods, 46
  overview, 47
  swinging door, 49
Control performance, 123
  causes of poor performance, 125
  diagnosis, 126
  industrial case studies, 129
  stiction, 129
Control Valve
  components, 137
  definition, 137
  physics, 153
  simulation, 157
Control Valve Models
  friction model, 154

Physic based model, 153
  data-driven models, 161
    one parameter model, 161
    two parameter model, 163
  limit cycles, 179
Cumulants, 18, 20

Data driven concepts, 2
Data Driven Valve Models
  One parameter model, 161
  Two parameter model, 163
Data Quality, 50
  compression, 49
  data quality measures, 50
  quantization, 63

Frequency, 6
Friction Model, 154
  parameters, 155

Gaussianity Test, 81

Higher Order Statistics, 10
  Cumulants, 18, 20
  bispectrum, 27
  bicoherence, 34
  trispectrum, 27

Moments, 18

Non-Gaussianity Index
  NGI, 84

Nonlinear, 3
  disturbance, 121
  process, 111
  CSTR, 115
  spherical tank, 111
  time series, 69
valve, 8
valve characteristic, 117

Nonlinearity
  bicoherence, 77, 78
  bispectrum, 78
  control loop, 111
  definition, 69
  degree, 90
  measures, 70
  harmonic, 73
  model based, 71
  surrogate, 72
  time series based, 71
  noise effect, 90
Nonlinearity Index, NLI, 84

Oscillations, 230
detection, 231
  auto-correlation function, 232
  frequency, 230
  power spectral envelope, 240

Performance Index, 51
Plantwide Oscillation
classification, 237
definition, 237
detection, 229, 238
  spectral decomposition, 241
diagnosis, 253
  Eastman Chemical Plant case, 257
  harmonics, 255
  limit cycles, 255
  Mitshubishi Chemical Company case, 266
  PSCMAP, 239
  root-cause, 253
  SEA Refinery Case, 263
Power Spectral Envelope, 240
Power Spectrum, 26
  estimation, 26
  PSCMAP, 239

Quantization, 63
  factor, 64

Randomness, 3

Spectral, 6, 25
Statistics, 3

Stiction, 12, 143
  apparent, 187
  compensation, 213
  confirmation
    gain change method, 218
    industrial example, 225
  definition, 143, 146
detection, 182
  cascade loop, 209
  flow loop, 208
  industrial case studies, 205
  level loop, 205, 210
  nonlinearity, 183
  practical issues, 201
  pressure loop, 210
  temperature loop, 212
discussions, 145
gain change
  describing function, 222
model
  data driven, 161
  physics based, 153
  practical examples, 148
quantification, 187
  automation, 193
  clustering, 187
  ellipse fitting, 190
  industrial case studies, 205
  practical issues, 201
Stiction Model
  comparison, 171
data driven, 161
describing function, 173
  one parameter, 161
  two parameter, 163
Surrogate
  algorithm, 95
  application, 106
  calculation, 96
  estimation
    end-matching, 102
    preprocessing, 102
  estimation parameters, 99
  oscillation, 104
  root cause identification, 106
  time series, 93

Time Series
  linear, 3
  nonlinear, 3, 69
Total Nonlinearity Index, TNLI, 85

Valve
  characteristic, 117
  equal percentage, 118
  faults, 138
  faulty diaphragm, 139
  hysteresis, 140
  linear, 118
  oversized, 139
  saturation, 131, 141
  square root, 119
  undersized, 139
Other titles published in this Series (continued):

Soft Sensors for Monitoring and Control of Industrial Processes
Luigi Fortuna, Salvatore Graziani, Alessandro Rizzo and Maria Gabriella Xibilia
Publication due December 2006

Advanced Control of Industrial Processes
Piotr Tatjewski
Publication due December 2006

Process Control Performance Assessment
Andrzej Ordys, Damien Uduehi and Michael A. Johnson (Eds.)
Publication due December 2006

Modelling and Analysis of Hybrid Supervisory Systems
Emilia Villani, Paulo E. Miyagi and Robert Valette
Publication due January 2007

Model-based Process Supervision
Belkacem Ould Bouamama and Arun K. Samantaray
Publication due February 2007

Magnetic Control of Tokamak Plasmas
Marco Ariola and Alfredo Pironti
Publication due May 2007

Continuous-time Model Identification from Sampled Data
Hugues Garnier and Liuping Wang (Eds.)
Publication due May 2007

Process Control
Jie Bao, and Peter L. Lee
Publication due June 2007

Distributed Embedded Control Systems
Matjaž Colnaric, Domen Verber and Wolfgang A. Halang
Publication due October 2007

Optimal Control of Wind Energy Systems
Iulian Munteanu, Antoneta Iuliana Bratcu, Nicolas-Antonio Cutululis and Emil Ceanga
Publication due November 2007

Model Predictive Control Design and Implementation Using MATLAB®
Liuping Wang
Publication due November 2007