

Index

- a posteriori adaptation error, 135
- a posteriori predicted output, 58
- a posteriori prediction error, 58
- a priori predicted output, 58
- a priori prediction error, 58
- ad-hoc certainty equivalence, 14
- adaptation error, 56
- adaptation gain, 67
- adaptation mechanism, 4
- adaptive control, 1, 4, 5
- adaptive control algorithms, 541
- adaptive feedforward compensation, 503
- adaptive minimum variance tracking and regulation, 380, 382
- adaptive operation, 483
- adaptive pole placement, 417, 469
- adaptive prediction, 195
- adaptive predictor, 14
- adaptive regulation, 481
- adaptive regulation, experimental results, 496
- adaptive tracking and regulation with independent objectives, 367
- adaptive tracking and regulation with weighted input, 378
- additive uncertainties, 275
- adjustable predictor, 14
- anti-aliasing filter, 529
- anti-windup, 531
- ARMA, 44
- ARMAX, 44, 163
- asymptotic convergence analysis, 386
- asymptotic hyperstability, 567
- asymptotic stability, 551
- auxiliary poles, 213
- averaging method, 126

- bias, 123

- bounded growth lemma, 371, 392
- bumpless transfer, 533

- closed loop output error algorithm, 303, 307
- computational delay, 533
- conditional expectation, 548
- constant forgetting factor, 68
- constant gain, 71
- constant trace, 70
- control design, 6
- convergence w.p.1, 548

- data normalization, 339, 352, 357, 359
- delay margin, 271, 273, 279
- desired performance, 535
- digital control, 207, 528
- digital to analog converter, 530
- direct adaptive control, 11, 365
- direct adaptive control with bounded disturbances, 395
- direct adaptive control with unmodelled dynamics, 398
- direct adaptive prediction, 196, 200
- direct adaptive regulation, 489
- discrete time stochastic process, 547
- dominant poles, 213
- dual control, 2
- dwelling time, 464, 468
- dynamic normalization, 355

- equation error method, 157
- equation error model, 44
- equivalent feedback representation, 77
- estimated parameter vector, 58
- extended closed loop output error algorithm, 309
- extended least squares, 159, 163

- external excitation, 433
- feedback uncertainties, 277
- filtered closed loop output error algorithm, 308
- filtered open loop identification algorithm, 304, 310
- filtered predicted value, 40
- filtered recursive least squares, 312
- filtering of input/output data, 338, 339, 357
- flexible transmission, 25, 189, 297, 327, 331, 449, 468
- gaussian (normal) distribution, 546
- generalized least squares, 159, 168
- generalized predictive control, 242
- global asymptotic stability, 552
- gradient algorithm, 57
- hot-dip galvanising, 23
- hyperstability, 78, 555, 558
- identification in open loop, 153
- image of the disturbance, 503
- implicit model reference adaptive control, 17
- improved gradient algorithm, 61, 80
- independent random variable, 546
- indirect adaptive control, 14, 413, 449
- indirect adaptive prediction, 204
- indirect adaptive regulation, 494
- initial adaptation gain, 71
- initialization, 542
- injected system, 467
- innovation process, 549
- input error method, 157
- input sensitivity function, 211, 267, 292
- input strictly passive, 556
- input-output model, 35
- instrumental variable method, 157
- integral + proportional PAA, 92
- integral type adaptation algorithms, 56
- internal model control, 224
- internal model principle, 483, 487
- iterative identification and controller redesign, 18, 301, 331
- Kalman filter, 72, 256, 461
- Kalman predictor, 48
- Kronecker lemma, 576
- linear quadratic control, 254
- martingale approach, 135
- martingale convergence analysis, 389
- martingale convergence theorem, 571
- martingale difference sequence, 124, 136, 571
- matrix inversion lemma, 65, 102
- measurable disturbances, 233, 377
- measurement vector, 57
- minimum variance tracking and regulation, 237
- model reference adaptive control, 12
- model reference adaptive systems, 12
- model uncertainty, 265, 462
- model validation, 170, 178, 318
- modulus margin, 271, 273, 278
- monitoring, 5
- multi-controller, 464
- multi-estimator, 463
- multimodel adaptive control, 19, 462, 475
- multiplicative uncertainties, 277
- noise sensitivity function, 268, 294
- nominal model, 266
- nominal performance, 266, 280
- norm L_2 , 79
- Nyquist frequency, 529
- Nyquist plot, 269
- observation vector, 56
- on-line estimation, 55
- open loop adaptive control, 10
- output error, 133
- output error adaptive predictor, 83
- output error method, 157
- output error model, 51
- output error predictor, 51
- output error with extended prediction model, 108, 140, 159
- output sensitivity function, 211, 267, 283
- output strictly passive, 556
- PAA for systems with time-varying parameters, 96
- PAA with dead zone, 338, 345
- PAA with leakage, 94
- PAA with projection, 338, 348
- PAA with time-varying adaptation gain, 97
- PAA without integrator effect, 338
- parallel model reference adaptive system, 83
- parameter adaptation algorithm, 14, 21, 55, 476, 536
- parameter estimation, 55
- parameter vector, 56
- parametric convergence, 111, 116
- Parseval theorem, 87, 116, 340
- passive, 79, 556
- passive linear time-varying system, 563
- passivity, 78, 555, 556

- performance index, 3
- persistent excitation, 116
- persistently exciting signal, 111, 115
- phosphate drying, 25
- pole closeness validation, 320
- pole placement, 213
- positive definite matrix, 60
- positive feedback coupling, 506
- positive real, 558
- positive real condition, 107
- positive real lemma, 560
- positive real PAA, 90
- positive real transfer function, 558
- positive real transfer matrix, 558
- prediction error, 14
- predictive control, 208
- probability space, 545
- pseudo-linear regression, 157
- pseudo-random binary sequence, 116, 180

- random variable, 545
- re-parameterization, 17
- receding horizon, 208
- recursive identification, 159
- recursive identification in closed loop, 301
- recursive least squares, 62, 135, 159, 163
- recursive maximum likelihood, 159, 166
- recursive parameter estimation, 153
- recursive prediction error method, 157
- regressor form, 43, 49
- residual prediction error, 178
- robust adaptive pole placement, 435, 438
- robust control, 7, 265
- robust direct adaptive control, 394
- robust indirect adaptive control, 434
- robust parameter estimation, 337, 362
- robust stability, 269, 277, 278
- robustness margins, 269
- RST controller, 210, 469, 530

- scalar adaptation gain, 72
- self-tuning operation, 483

- separation theorem, 16
- small gain theorem, 278, 569, 570
- spectral factorization theorem, 548
- stability, 77, 466, 551
- stability criterion, 270
- stability margin, 271
- stability of adaptive regulation, 492
- stochastic disturbance, 121
- stochastic process, 44
- stochastic reference model, 13
- strictly positive real transfer function, 88
- strictly positive real transfer matrix, 560
- supervisor, 464
- switching, 19, 462
- Sylvester matrix, 215
- synthesis of PAA, 82
- system identification, 55, 153

- template for the sensitivity function, 280
- time domain validation, 321
- tracking and regulation with independent objectives, 226
- tracking and regulation with weighted input, 234
- tracking reference model, 210
- transfer function, 37
- transfer operator, 37

- U-D factorization, 539
- uncorrelated random variable, 546
- uncorrelation test, 179, 319

- vanishing adaptation, 122
- vanishing gain, 68
- variable forgetting factor, 69
- very strictly passive, 556

- white noise, 44, 547
- whiteness test, 320

- Youla-Kucera parameterization, 222, 484, 496