

Index

- active disturbance rejection control, 159
- adaptive control, 73
- adaptive internal model, 145
- antialiasing filter, 299
- antiwindup, 121
- approximation-based control, 101

- backstepping, 162
- Backward Difference method, 281
- Bilinear Transformation method, 281

- cascade high-gain observer, 212
 - with feedback injection, 224
- circle criterion, 170, 227
- comparison method, 140
- conditional integrator, 118
- conditional servocompensator, 126, 130
- converse Lyapunov theorem, 37, 40, 52–54, 124, 248, 266, 291, 295, 304, 306

- differential observability, 18
- digital control, 279
- digital implementation, 279
- discrete-time Lyapunov equation, 291
- disturbance estimator, 159
- dynamic inversion, 183

- exosystem, 108
- extended high-gain observer, 159
- extended Kalman filter, 204

- feedback linearization, 61, 165, 280

- Forward Difference method, 280, 281
- fuzzy approximation, 102

- global normal form, 103
- Gronwall–Bellman inequality, 287

- high-frequency gain, 113
- high-gain feedback, 31
- high-gain observer, 17, 19
- Hurwitz matrix, 20
- Hurwitz polynomial, 12, 19
- hysteresis, 280

- input-to-state stability, 67, 110, 172
- integral action, 172
- integral control, 109
- internal dynamics, 159
- internal model perturbation, 139
- internal model principle, 108
- inverted pendulum on a cart, 42

- Kalman–Yakubovich–Popov lemma, 170, 227

- low-pass filter, 261
- low-power high-gain observer, 211
- LQR optimal control, 182
- Lyapunov equation, 20, 22, 26, 29, 54, 62, 88, 123, 248, 255, 266
- Lyapunov redesign, 31, 105

- magnetic-levitation system, 32
- measurement noise, 237, 298
- minimum phase, 50
- minimum-phase property, 110

- minimum-phase system, 31, 50, 75
- model predictive control, 280
- multi-input–multi-output systems, 176
- multi-output high-gain observer, 26
- multi-output systems, 26
- multirate digital control, 280, 301
- multivariable circle criterion, 180
- multivariable normal form, 28

- neural networks, 102
- nonlinear-gain high-gain observer, 272
- nonminimum phase system, 162, 194, 200, 208
- normal form, 17, 50, 52, 109, 159, 164, 176

- observer discretization, 280

- parameter projection, 77
- peaking phenomenon, 4, 21
- persistence of excitation, 153
- persistently exciting signal, 80
- PI controller, 113, 122
- PID controller, 113, 122
- planar vertical take off and landing aircraft (PVTOL), 46

- quasi monotone, 140

- reduced-order high-gain observer, 23
- regulation, 107
- relative degree, 17, 109
- relative-degree-higher-than-one system, 52

-
- relative-degree-one system, 31, 50
 - Riccati equation, 22
 - robot manipulator, 27, 181
 - robust stabilization, 50
 - $\text{sat}(\cdot)$, 19
 - saturation function, 19
 - separation principle, 32
 - servocompensator, 108
 - single-link manipulator, 76
 - singularly perturbed system, 37, 115, 135, 184, 254, 256
 - sliding mode control, 31, 50, 65
 - splines, 102
 - stabilization, 31, 219, 284
 - steady-state solution, 75
 - sufficiently smooth functions, 73
 - synchronous generator, 207
 - target response, 165
 - target system, 165
 - tracking, 31, 60, 253
 - translational oscillator with rotating actuator (TORA), 199
 - uniformly observable system, 18
 - universal controller, 113
 - vector relative degree, 28
 - wavelets, 102
 - zero dynamics, 50, 85, 172, 196, 200
 - zero-error manifold, 108, 128, 129
 - zero-order hold (ZOH), 286