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Nota di contenuto	Optimal State Estimation; CONTENTS; Acknowledgments; Acronyms; List of algorithms; Introduction; PART I INTRODUCTORY MATERIAL; 1 Linear systems theory; 1.1 Matrix algebra and matrix calculus; 1.1.1 Matrix algebra; 1.1.2 The matrix inversion lemma; 1.1.3 Matrix calculus; 1.1.4 The history of matrices; 1.2 Linear systems; 1.3 Nonlinear systems; 1.4 Discretization; 1.5 Simulation; 1.5.1 Rectangular integration; 1.5.2 Trapezoidal integration; 1.5.3 Runge-Kutta integration; 1.6 Stability; 1.6.1 Continuous-time systems; 1.6.2 Discrete-time systems; 1.7 Controllability and observability 1.7.1 Controllability1.7.2 Observability; 1.7.3 Stabilizability and detectability; 1.8 Summary; Problems; 2 Probability theory; 2.1 Probability; 2.2 Random variables; 2.3 Transformations of random variables; 2.4 Multiple random variables; 2.4.1 Statistical independence; 2.4.2 Multivariate statistics; 2.5 Stochastic Processes; 2.6 White noise and colored noise; 2.7 Simulating correlated noise; 2.8 Summary; Problems; 3 Least squares estimation; 3.1 Estimation of a constant; 3.2 Weighted least squares estimation; 3.3 Recursive least squares

estimation; 3.3.1 Alternate estimator forms
3.3.2 Curve fitting3.4 Wiener filtering; 3.4.1 Parametric filter optimization; 3.4.2 General filter optimization; 3.4.3 Noncausal filter optimization; 3.4.4 Causal filter optimization; 3.4.5 Comparison; 3.5 Summary; Problems; 4 Propagation of states and covariances; 4.1 Discrete-time systems; 4.2 Sampled-data systems; 4.3 Continuous-time systems; 4.4 Summary; Problems; PART II THE KALMAN FILTER; 5 The discrete-time Kalman filter; 5.1 Derivation of the discrete-time Kalman filter; 5.2 Kalman filter properties; 5.3 One-step Kalman filter equations; 5.4 Alternate propagation of covariance
5.4.1 Multiple state systems5.4.2 Scalar systems; 5.5 Divergence issues; 5.6 Summary; Problems; 6 Alternate Kalman filter formulations; 6.1 Sequential Kalman filtering; 6.2 Information filtering; 6.3 Square root filtering; 6.3.1 Condition number; 6.3.2 The square root time-update equation; 6.3.3 Potter's square root measurement-update equation; 6.3.4 Square root measurement update via triangularization; 6.3.5 Algorithms for orthogonal transformations; 6.4 U-D filtering; 6.4.1 U-D filtering: The measurement-update equation; 6.4.2 U-D filtering: The time-update equation; 6.5 Summary; Problems
7 Kalman filter generalizations7.1 Correlated process and measurement noise; 7.2 Colored process and measurement noise; 7.2.1 Colored process noise; 7.2.2 Colored measurement noise: State augmentation; 7.2.3 Colored measurement noise: Measurement differencing; 7.3 Steady-state filtering; 7.3.1 - filtering; 7.3.2 -- filtering; 7.3.3 A Hamiltonian approach to steady-state filtering; 7.4 Kalman filtering with fading memory; 7.5 Constrained Kalman filtering; 7.5.1 Model reduction; 7.5.2 Perfect measurements; 7.5.3 Projection approaches; 7.5.4 A pdf truncation approach; 7.6 Summary; Problems
8 The continuous-time Kalman filter

Sommario/riassunto

A bottom-up approach that enables readers to master and apply the latest techniques in state estimationThis book offers the best mathematical approaches to estimating the state of a general system. The author presents state estimation theory clearly and rigorously, providing the right amount of advanced material, recent research results, and references to enable the reader to apply state estimation techniques confidently across a variety of fields in science and engineering.While there are other textbooks that treat state estimation, this one offers special features and a uniqu