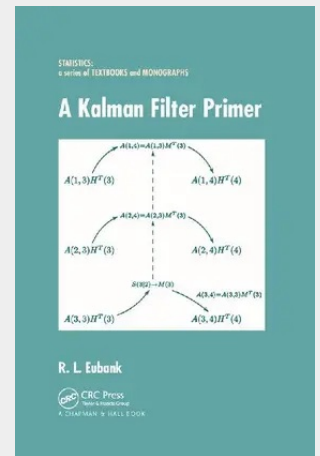


A Kalman Filter Primer

System state estimation in the presence of noise is critical for control systems, signal processing, and many other applications in a variety of fields. Developed decades ago, the Kalman filter remains an important, powerful tool for estimating the variables in a system in the presence of noise. However, when inundated with theory and vast notations, learning just how the Kalman filter works can be a daunting task. With its mathematically rigorous, "no frills" approach to the basic discrete-time Kalman filter, A Kalman Filter Primer builds a thorough understanding of the inner workings and basic concepts of Kalman filter recursions from first principles. Instead of the typical Bayesian perspective, the author develops the topic via least-squares and classical matrix methods using the Cholesky decomposition to distill the essence of the Kalman filter and reveal the motivations behind the choice of the initializing state vector. He supplies pseudo-code algorithms for the various recursions, enabling code development to implement the filter in practice. The book thoroughly studies the development of modern smoothing algorithms and methods for determining initial states, along with a comprehensive development of the "diffuse" Kalman filter. Using a tiered presentation that builds on simple discussions to more complex and thorough treatments, A Kalman Filter Primer is the perfect introduction to quickly and effectively using the Kalman filter in practice.

This text provides a self-contained, "no frills," mathematically rigorous derivation from first principles of all basic Kalman filter recursions. This approach relies on a pared-down version of more general state-space models found most often in the literature. Such simplification saves notational complexity without sacrificing conceptual understanding. The rigor found in the book ensures a fundamental understanding of how the Kalman filter actually works, which builds confidence for those employing the filter in their research and writing code to implement it in practice. The author provides implementations of the Kalman filter in Java available for download from his Web site.



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