Moving Horizon Filter for Monotonic Trends

S. Samar, D. Gorinevsky, and S. Boyd

Proceedings IEEE Conference on Decision and Control, 3:3115-3120, Paradise Island, Bahamas, December 2004.

- mh_filter_monotrend.pdf

This paper presents a novel approach for constrained state estimation from noisy measurements. The optimal trending algorithms described in this paper assume that the trended system variables have the property of monotonicity. This assumption describes systems with accumulating mechanical damage. The performance variables of such a system can only get worse with time, and their behavior is best described by monotonic regression. Unlike a standard Kalman filter problem, where the process disturbances are assumed to be gaussian, the proposed approach considers systems that are driven by a one-sided exponentially distributed noise. The main contribution of this paper is in studying recursive implementation of the monotonic regression algorithms.We consider a moving horizon approach where the problem size is fixed even as more measurements become available with time. This enables us to perform efficient online optimization, making embedded implementation of the estimation computationally feasible.