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Section:

12. Probability and Statistics

1991 MS Classification: 62M
Pfeiffer, Ruth, University of Maryland, USA

Statistical Problems for Stochastic Processes with Hysteresis

We consider a system with hysteresis: the motion of a particle is governed by one of two stochastic differential equations depending on which of two thresholds x_0 and x_1, $x_1 > x_0$ was crossed last. The first problem considered is an estimation problem: Using observations of the process over a fixed time interval we construct the maximum likelihood estimator for the unknown threshold x_1. A close connection to the order statistics allows to calculate the asymptotic characteristics of the estimator. We also present a test to determine whether the observed sample path comes from a system with hysteresis perturbed by noise, or if it arises from a system governed by an ordinary differential equation with the same noise.
Reference: M. I. Freidlin, R. Pfeiffer, A Threshold Estimation Problem for Stochastic Processes with Hysteresis, *Statistics and Probability Letters* vol 36, n4, (1998), pp337.