A practical example for the non-linear Bayesian filtering of model parameters. (English) Zbl 07287511


Summary: In this tutorial we consider the non-linear Bayesian filtering of static parameters in a time-dependent model. We outline the theoretical background and discuss appropriate solvers. We focus on particle-based filters and present Sequential Importance Sampling (SIS) and Sequential Monte Carlo (SMC). Throughout the paper we illustrate the concepts and techniques with a practical example using real-world data. The task is to estimate the gravitational acceleration of the Earth $g$ by using observations collected from a simple pendulum. Importantly, the particle filters enable the adaptive updating of the estimate for $g$ as new observations become available. For tutorial purposes we provide the data set and a Python implementation of the particle filters.

For the entire collection see [Zbl 07233453].

MSC:

62M20 Inference from stochastic processes and prediction
62L12 Sequential estimation
65C05 Monte Carlo methods
62P35 Applications of statistics to physics
86A20 Potentials, prospecting

Keywords:
nonlinear Bayesian filtering; model parameters; time-dependent model; particle-based filters; sequential importance sampling; sequential Monte Carlo

Software:
EnKF

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References:


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