

# Variance reduction for particle filters of systems with time-scale separation

Panagiotis Stinis  
School of Mathematics  
University of Minnesota  
email: `stinis@math.umn.edu`

We present a particle filter construction for a system that exhibits time-scale separation. The separation of time-scales allows two simplifications that we exploit: i) The use of the averaging principle for the dimensional reduction of the system needed to solve for each particle and ii) the factorization of the transition probability which allows the Rao-Blackwellization of the filtering step. Both simplifications can be implemented using the coarse projective integration framework. The resulting particle filter is faster and has smaller variance than the particle filter based on the original system. The method is tested on a multiscale stochastic differential equation and on a multiscale pure jump diffusion motivated by chemical reactions. This is joint work with D. Givon and J. Weare.