



## Particle Filters for Partially Observed Diffusions

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In this paper we introduce a novel particle filter scheme for a class of partially-observed multivariate diffusions. %continuous-time dynamic models where the %signal is given by a multivariate diffusion process. We consider a variety of observation schemes, including diffusion observed with error, observation of a subset of the components of the multivariate diffusion and arrival times of a Poisson process whose intensity is a known function of the diffusion (Cox process). Unlike currently available methods, our particle filters do not require approximations of the transition and/or the observation density using time-discretisations. Instead, they build on recent methodology for the exact simulation of the diffusion process and the unbiased estimation of the transition density as described in \cite{besk:papa:robe:fear:2006}. %In particular, we introduce the Generalised Poisson Estimator, which generalises the Poisson Estimator of \cite{besk:papa:robe:fear:2006}. %Thus, our filters avoid the systematic biases caused by %time-discretisations and they have significant computational %advantages over alternative continuous-time filters. These %advantages are supported theoretically by a central limit theorem is given for our particle filter scheme.

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