

This paper considers the Bayesian filtering problem in high-dimensional nonlinear state-space systems. In such systems, classical particle filters (PFs) are impractical due to the prohibitive number of required particles to obtain reasonable performances. One approach that has been introduced to overcome this problem is the concept of multiple PFs (MPFs), where the state-space is split into low-dimensional subspaces and then a separate PF is applied to each subspace. Remarkable performances of MPF-like filters motivated our investigation here into a new strategy that combines the variational Bayesian approach to split the state-space with random sampling techniques, to derive a new computationally efficient MPF. The propagation of each particle in the prediction step of the resulting filter requires generating only a single particle in contrast with standard MPFs, for which a set of (children) particles is required. We present simulation results to evaluate the behavior of the proposed filter and compare its performances against standard PF and a MPF.