



Efficient particle filtering through residual nudging

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We introduce an auxiliary technique, called residual nudging, to the particle filter to enhance its performance in cases that it performs poorly. The main idea of residual nudging is to monitor, and if necessary, adjust the residual norm of a state estimate in the observation space so that it does not exceed a pre-specified threshold. We suggest a rule to choose the pre-specified threshold, and construct a state estimate accordingly to achieve this objective. Numerical experiments suggest that introducing residual nudging to a particle filter may (substantially) improve its performance, in terms of filter accuracy and/or stability against divergence, especially when the particle filter is implemented with a relatively small number of particles.

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