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Evaluation of Uncertainty Evolution in Initial Conditions by the Least Square Kernel Density Function Method[1] CARLOS PANTANO, BABAK SHOTORBAN, University of Illinois at Urbana-Champaign — We present an approximation method to solve the probability density function (pdf) in the Liouville equation encountered in the evolution of uncertainty of initial values in dynamical systems. A state-space based method is implemented through a least-squares projection using global functional approximations. The analytical elementary (kernel density) functions have parameters whose temporal evolution is obtained by the present method. The realizability conditions of the probability density, normalization and non-negativity, are enforced at all times. The method is successfully tested for the evolution of uncertainty in a Riccati equation and in a particle moving in a one-dimensional fluid under the influence of Stokes drag force. Predicted results compare well against the results obtained by Monte-Carlo Simulations.

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