

A New Approach for Obtaining Exact PDF Equations for Low-dimensional Nonlinear Functionals of the Solution to High-dimensional Stochastic Problems

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I will present a new approach to obtain exact PDF equations for low-dimensional nonlinear functionals of the solution to high-dimensional stochastic differential equations, including SODEs and SPDEs. The key idea relies on a projection operator framework of Zwanzig-type constructed in an augmented phase space of distributions whose dynamics is governed by the joint response-excitation (Dostupov-Pugachev) PDF equation. The new method does not suffer from the curse of dimensionality and, in principle, it can be used to solve directly for the PDF of the low-dimensional functional we are interested in, thus avoiding the integration of the full stochastic system.