Multilevel Quadrature Methods for Stochastic PDEs with Lognormal Diffusion Coefficients

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This talk is dedicated to multilevel quadrature methods for the rapid solution of stochastic partial differential equations with a log-normal distributed diffusion coefficient. The key idea of these approaches is a sparse grid approximation of the occurring product space between the stochastic and the spatial variable. We develop the mathematical theory and present error estimates for the computation of the solution's statistical moments with focus on the mean and variance. Especially, the present framework covers the multilevel Monte Carlo method and the multilevel quasi Monte Carlo method as special cases. We show that the quasi Monte Carlo method based on a Halton sequence is applicable in arbitrary high stochastic dimension provided that the diffusion coefficient complies certain regularity assumptions. The theoretical findings are supplementedby numerical experiments.

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