Quasi-Monte Carlo integration in uncertainty quantification of elliptic PDEs with log-Gaussian coefficients

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Abstract

Quasi-Monte Carlo (QMC) rules are suitable to overcome the curse of dimension in the numerical integration of high-dimensional integrands. Also the convergence rate of essentially first order is superior to Monte Carlo sampling. We study a class of integrands that arise as solutions of elliptic PDEs with log-Gaussian coefficients. In particular, we focus on the overall computational cost of the algorithm. We prove that certain multilevel QMC rules have a consistent accuracy and computational cost that is essentially of optimal order in terms of the degrees of freedom of the spatial Finite Element discretization for a range of infinite-dimensional priors.

References

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