

Quasi-Monte Carlo methods for optimal feedback control problems under uncertainty

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A control in feedback form is developed for linear, quadratic, time-invariant optimal control problems subject to parabolic partial differential equations with uncertain coefficients. The input random field is parameterized in terms of a countably infinite number of parameters by a KarhunenLoève expansion. Then, it is shown that the Riccati-based feedback operator depends analytically on the parameters and quasi-Monte Carlo methods can be used to efficiently compute an a-priori chosen feedback law based on the expected value. Moreover, under moderate assumptions on the input random field, the application of quasi-Monte Carlo methods, leads to error rates which are superior to ordinary Monte Carlo methods, independently of the stochastic dimension of the problem. The feedback control is compared to the robust optimal control, which is obtained from the first order optimality conditions of the optimal control problem.