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Finite Element Approximations of Stochastic Optimal Control Problems Constrained by Stochastic Elliptic PDEs.

In this paper, we study stochastic optimal control problems constrained by stochastic elliptic PDEs. The control objective is to minimize the expectation of a cost functional, and the control is of the deterministic, distributed type. Mathematically, we prove the existence of an optimal solution; we establish the validity of the Lagrange multiplier rule to obtain the stochastic optimality system of equations; we represent the input data in terms of their Karhunen-Loeve expansions and deduce the deterministic optimality system of equations. Computationally, we find finite element approximations to the optimality system and its error through the discretizations of the random parameter space and the spatial space. (Received September 22, 2010)