Adaptive algorithms driven by a posteriori estimates of error reduction

for PDEs with random data

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An efficient adaptive algorithm for computing stochastic Galerkin finite element approximations of elliptic PDE problems with random data will be outlined in this talk. The underlying differential operator will be assumed to have affine dependence on a large, possibly infinite, number of random parameters. Stochastic Galerkin approximations are sought in a tensor-product space comprising a standard *h*- finite element space associated with the physical domain, together with a set of multivariate polynomials characterising a *p*- finite-dimensional manifold of the (stochastic) parameter space.

Our adaptive strategy is based on computing distinct error estimators associated with the two sources of discretisation error. These estimators, at the same time, will be shown to provide effective estimates of the error reduction for enhanced approximations. Our algorithm adaptively `builds' a polynomial space over a low-dimensional manifold of the infinitely-dimensional parameter space by reducing the energy of the combined discretisation error in an optimal manner. Convergence of the adaptive algorithm will be demonstrated numerically.