Numerical Approximation of Parabolic SPDE's

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Abstract

Convergence theory for numerical schemes to approximate solutions of stochastic parabolic equations of the form form

$$du + A(u)\,dt = f\,dt + g\,dW, \qquad u(0) = u^0,$$

will be reviewed. Here u is a random variable taking values in a function space U, $A : U \to U'$ is partial differential operator, $W = \{W_t\}_{t\geq 0}$ a Wiener process, and f, g, and u^0 are data. This talk will illustrate how techniques from stochastic analysis and numerical partial differential equations can be combined to obtain a realization of the Lax–Richtmeyer meta–theorem

A numerical scheme converges if (and only if) it is stable and consistent.

Structural properties of the partial differential operator(s) and probabilistic methods will be developed to establish stability and a version of Donsker's theorem for discrete processes in the dual space U'.

This is joint work with M. Ondrejat (Prague, CZ) and A. Prohl (Tuebingen, DE).