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Section:

12. Probability and Statistics

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Milstein, Grigori N., Weierstrass Institute for Applied Analysis and Stochastics, Berlin, Germany

The probability approach to numerical solution of nonlinear parabolic equations

A number of new layer methods for solving semilinear parabolic equations and reaction-diffusion systems is derived by using probabilistic representations of their solutions. The methods exploit the ideas of weak sense numerical integration of stochastic differential equations. In spite of the probabilistic nature these methods are nevertheless deterministic. A special attention is given to equations with small parameter at higher derivatives (this part of the work is done jointly with Michael Tretyakov). The obtained algorithms are tested by simulating blow-up solutions for equations with power law nonlinearities, shock waves for the Burgers equation, and wave propagation for the generalized KPP-equation with a small parameter.