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Spectral function methods for nonlinear diffusion equations. (English) Zbl 0615.60077
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Two spectral function methods are developed for linear and nonlinear diffusion equations in one dimension where the nonlinearity is in the inhomogeneous term and occurs as a power of the solution. In the single spectral function method polynomial spectral functions in the spatial variable are introduced. The spectral resolution of the diffusion equation in the Hilbert space spanned by these functions yields a system of ordinary differential equations which is then integrated in discrete steps of the time variable.

The double spectral method introduces polynomial spectral functions in both space and time variables and thereby eliminates the need for time integration through application of an iterative algorithm. Both methods are compared against analytical solutions for the linear cases and against the numerical solutions for the nonlinear cases. The second spectral function method was found to be more efficient than the first by a factor of 6 in the case of nonlinear problems.

MSC:

- [60J70](#) Applications of Brownian motions and diffusion theory (population genetics, absorption problems, etc.) Cited in 1 Document
- [82B05](#) Classical equilibrium statistical mechanics (general)
- [81P20](#) Stochastic mechanics (including stochastic electrodynamics)
- [65C99](#) Probabilistic methods, stochastic differential equations

Keywords:

quantum scattering theory; spectral function methods; diffusion equation in the Hilbert space

Full Text: [DOI](#)

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- [1] DOI: 10.1016/0021-9991(85)90058-0 · Zbl 0595.65132 · doi:10.1016/0021-9991(85)90058-0
- [2] DOI: 10.1002/sapm1971504293 · Zbl 0237.76012 · doi:10.1002/sapm1971504293
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