ICM 1998, Berlin, Aug. 18–27

Abstracts of Short Communications and Posters

Section:

9. Ordinary Differential Equations and Dynamical Systems

1991 MS Classification: 34, 60, 65

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Contractivity and Stability Exponents of Nonlinear Stochastic Dynamical Systems

Nonlinear stochastic dynamical systems as ordinary stochastic differential equations and stochastic difference methods are in the center of this presentation. We study the exponential growth behaviour of their solutions as time tends to infinity. For this purpose, the concepts of **nonlinear contractivity and stability exponents** for moments are introduced as generalizations of well-known Lyapunov exponents of linear systems. Under appropriate monotonicity assumptions we gain uniform estimates of these exponents from above and below. Eventually, these concepts are generalized to describe the exponential growth behaviour of certain Lyapunov-type functionals of their solutions.

Reference: H. Schurz, *Stability, stationarity, and boundedness of some implicit numerical methods for stochastic differential equations and applications*, Logos-Verlag, Berlin, 1997.