Stochastic differential equations involving Wiener process and almost surely Hölder continuous process with Hölder exponent $\gamma > 1/2$

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Abstract

We consider stochastic differential equations involving possibly dependent Wiener process and almost surely Hölder continuous process with Hölder exponent $\gamma > 1/2$, with nonhomogeneous coefficients and random initial conditions which depend on a parameter.On the one hand, such models include Wiener process that represents randomness in the sense of the memory lack. On the other hand, most of long-ranged-dependent processes have Hölder continuous trajectories with exponent greater than $1/2$. The processes in hydrodynamics, telecommunications, economics, finances demonstrate availability of random noise that can be modeled by Wiener process and also the so called long memory that can be modeled with the help of, for example, fractional Brownian motion with Hurst index $H > 1/2$. The assumptions on coefficients and initial conditions supplying continuous dependence of the solution on a parameter, with respect to the Besov space norm, are established.

Also we study one-dimensional stochastic differential equations with nonhomogeneous coefficients and non-Lipschitz diffusions. We prove some properties of solutions of such equations and of the corresponding Euler schemes. We obtain convergence rate of Euler schemes for diffusions with weak singularity at zero.

AMS Classification: Primary 60G22; Secondary 60G15.