Applications of Numerical Methods and its Analysis for Systems of Stochastic Differential Equations

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ABSTRACT: This paper deals with diverse applications of numerical methods for systems of ordinary stochastic differential equations in 16 sections. We briefly sketch the main tools to construct and analyze those methods. The applications range from

a) prediction of water levels in hydrology,
b) statistical estimation of drift parameters of diffusion processes using discrete observations,
c) stochastic quadrature and stochastic integration,
d) discretization of Markov chain filters,
e) approximation of pricing functionals in investments,
f) bifurcation analysis of noisy Hopf systems,
g) random vibrations of strings, beams and structures with cubic nonlinearity and delay in control mechanism
h) population modeling in biology and ecology (random Lotka-Volterra systems, stochastic SIR models, birth and death processes, etc)

to name a few of them. A table of contents and detailed literature list are provided. This represents a kind of introductory review paper with some innovative thoughts, theorems with sketched proofs, and ideas with potential for further work.