Optimal explicit stabilized integrator of weak order one for stiff and ergodic stochastic differential equations

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Explicit stabilized Runge-Kutta methods are efficient for solving stiff (deterministic or stochastic) differential equations in large dimensions. In this talk, we present a new explicit stabilized scheme of weak order one for stiff and ergodic stochastic differential equations (SDEs). In the absence of noise, the new method coincides with the classical deterministic stabilized scheme (or Chebyshev method) for diffusion dominated advection-diffusion problems and it inherits its optimal stability domain size, in contrast to known existing methods for mean-square stable stiff SDEs. In addition, the new method can be used to sample the invariant measure of a class of ergodic SDEs, and combined with postprocessing techniques of geometric numerical integration originally from the deterministic literature, it achieves a convergence rate of order two at a negligible overcost.