Variable timestepping algorithms for stochastic differential equations

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We describe a variable timestepping algorithm for the pathwise (strong)) numerical integration of stochastic ordinary differential equations with a single Brownian forcing. The algorithm is based upon embedded Runge-Kutta pairs of strong order 0.5 and 1 that utilize only the Stratonovich stochastic integral J_1. A new heuristic is developed for trying to optimise the chosen timesteps subject to satisfying the local error criterion. In particular the choice of stepsize is not constrained to be either half or double the previous attempted stepsize. This approach is based upon an asymptotic consideration of the leading terms in the local error estimate and highlights the potential unsuitability of analytically solvable test problems for demonstrating the effectiveness of such algorithms on more general problems. Numerical results are also presented.