Adaptive timestepping for S(P)DEs.

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Traditional explicit numerical methods to simulate stochastic differential equations (SDEs) or stochastic partial differential equations (SPDEs) rely on globally Lipschitz coefficients to ensure convergence. Many applications of interest include non Lipschitz drift functions. Implicit methods (when they exist) can often be too computationally expensive for practical uses and standard explicit methods suffer from growth of moments of the solution (which can be thought of as a form of numerical instability).

Therefore the construction of explicit methods to simulate SDEs or SPDEs with non-Lipschitz drift has been an area of great interest. These methods are broadly in a number of classes where either the numerical approximations are projected or the growth is controlled in the scheme.

In this talk we give an overview, emphasizing the context of SPDEs, of this issue and discuss how using an adaptive time step can be used to control this growth. We will discuss some of the key difficulties in proving strong convergence with a random time mesh and how these might be overcome. We show that in numerical experiments the adaptive time stepping is an efficient alternative to the other methods.