Multivariate diffusion bridge simulation

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We propose simple methods of simulating multivariate diffusion bridges, approximately and exactly. Diffusion bridge simulation plays a fundamental role in simulation-based likelihood inference for stochastic differential equations. By a novel application of classical coupling methods, the new approach generalizes the one-dimensional bridge-simulation method proposed by Bladt and Sørensen (2014) to the multi-variate setting. A method of simulating approximate, but often very accurate, diffusion bridges is proposed. These approximate bridges are used as proposal for easily implementable MCMC algorithms that produce exact diffusion bridges. The new method is more generally applicable than previous methods because it does not require the existence of a Lamperti transformation, which rarely exists for multivariate diffusions. Another advantage is that the new method works well for diffusion bridges in long intervals because the computational complexity of the method is linear in the length of the interval. The usefulness of the new method is illustrated by an application to Bayesian estimation for the multivariate hyperbolic diffusion model.

This is joint work with Mogens Bladt and Sam Finch.