

## Analyse numérique

**Mercredi 18 avril 2012 – Salle MAA331 – 16.15 h.**

Dr. Erik **VON SCHWERIN** (King Abdullah University of science and technology (KAUST))  
donnera un séminaire<sup>1</sup> intitulé :

***“Adaptive multilevel Monte Carlo simulation of Ito SDEs”.***

**Abstract**

We consider the numerical approximation of expected values of functionals of solutions to Ito Stochastic Differential Equations (SDE). This problem has many applications in physics and finance, such as pricing financial contracts in the Black-Scholes model. The multilevel Monte Carlo method (MLMC) was introduced in the context of forward Euler time stepping for Ito SDEs by M. Giles in [1] based on a hierarchy of uniform time discretizations and control variates to significantly reduce the computational effort required by a standard, single level, Forward Euler Monte Carlo method. This talk reviews our recent results on a generalisation of MLMC to adaptive time stepping algorithms [2,3].

The adaptive MLMC method uses a hierarchy of non uniform time discretisations, generated by adaptive algorithms previously introduced in [4, 5] and based on a posteriori error expansions following [6]. Adaptive time stepping is advantageous in cases where constant step size has decreased convergence rate due to lower regularity. Under sufficient regularity conditions, both our analysis and numerical results, which include one case with singular drift and one with stopped diffusion, exhibit savings in the computational cost to achieve an accuracy of  $O(TOL)$ , from  $O(TOL^{-3})$  using the single level adaptive method to  $O(TOL^{-1} \log(TOL))^2$  using the multilevel adaptive method; for these test problems single level uniform Euler time stepping has a complexity  $O(TOL^{-4})$ .

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1. Les séminaires qui ont lieu à la Section de Mathématiques sont annoncés sur Internet à l'adresse <http://www.epfl.ch/cgi-bin/memento/memento>.