Western Science

Department of Applied Mathematics

APPLIED MATHEMATICS COLLOQUIUM

Date: Wednesday, February 25, 2015
Time: 2:30 – 3:30 p.m.
Location: Middlesex College Room 204

Effective simulation of stochastic models of biochemical systems

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Abstract:

Stochastic modelling is essential for studying key biological processes, such as signaling chemical pathways in a cell, when some molecular species are in low numbers. The random fluctuations due to low amounts of certain biochemically reacting species have been observed experimentally. Mathematically, the dynamics of these biochemical systems may be accurately described using Markov processes. Typically, such systems evolve on multiple time-scales, thus their mathematical models manifest stiffness. Stochastic models which, in addition, are stiff are computationally challenging, therefore the need for developing effective and accurate numerical methods for approximating their solution. We present several adaptive stepsize strategies for the numerical solution of stochastic models of biochemical systems. Numerical experiments on problems of practical interest show the advantages of the adaptive strategies over the fixed-step methods. Both spatially homogeneous and heterogeneous biochemical systems are considered.