Workshop on Stochastic Differential Equations and Applications

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Programme

Venue: LT907, Livingstone Tower, 26 Richmond Street, Glasgow G1 1XH.
The University map can be found at
http://www.strath.ac.uk/maps/johnandersoncampus/

Date: Monday 12 Feb 2018

Chair	**Professor Xuerong Mao**, University of Strathclyde
09:13 – 09:15	*Welcome address*
09:15 – 10:15	**Professor Fuke Wu**, Huazhong University of Sci and Tech, China *An Averaging Principle for Two-Time-Scale Functional Diffusions*
10:15 – 11:00	**Miss Yongmei Cai**, University of Strathclyde, UK *Stochastic prey-predator system with foraging arena scheme*
11:00 – 13:30	*Discussions over Tea/Coffee and Lunch*
Chair	**Professor Xuerong Mao**, University of Strathclyde
13:30 – 14:30	**Prof Chenggui Yuan**, Swansea University, UK TBA
14:30 – 15:15	**Mr Ran Dong**, University of Strathclyde, UK *On pth Moment Stabilization of Hybrid Systems by Discrete-time Feedback Control*

15:15 – 15:45 *Discussions over Tea/Coffee*

Chair **Professor Xuerong Mao**, University of Strathclyde

15:45 – 16:30 **Dr Yin Li**, Northeast Normal University, China

The Development Status of Carbon Futures Market-An Analysis of Jump Features in EU ETS

16:30 – 17:15 **Miss Jianqiu Lu**, University of Strathclyde, UK

Stabilisation of hybrid systems by feedback control based on discrete-time state and mode observations

17:15 – 18:00 *Discussions over Cheese/Wine*

Abstracts

Fuke Wu

An Averaging Principle for Two-Time-Scale Functional Diffusions

Dupire recently developed a functional It\^o formula, which has changed the landscape of the study of stochastic functional equations and encouraged a reconsideration of many problems and applications. Delays are ubiquitous, pervasive, and entrenched in everyday life. Based on the new development, this work examines functional diffusions with two-time scales in which the slow-varying process includes path-dependent functional and the fast-varying process is a rapidly-changing diffusion. The gene expression of biochemical reactions occurring in living cells in the introduction of this paper is such a motivating example. This paper establishes mixed functional It\^{o} formulas and the corresponding martingale representation. Then it develops the averaging and weak convergence methods. By treating the fast-varying process as a random ``noise", under appropriate conditions, it is shown that the slow-varying process converges weakly to a stochastic functional differential equation whose coefficients are averages of that of the original slow-varying process with respect to the invariant measure of the fast-varying process.

Yongmei Cai

Stochastic prey-predator system with foraging arena scheme

In this paper we extend the foraging arena model describing the dynamics of prey-predator abundance from a deterministic framework to a stochastic one. This is achieved by introducing the environmental noises into the growth rate of prey as well as the death rate of predator populations. We then prove that this stochastic differential equation (SDE) has a unique global positive solution. The long-time behaviours of the system are then developed. Furthermore the existence of a stationary distribution is pointed out under certain parametric restrictions. All the results are illustrated by the computer simulations.

Changgui Yuan

TBA

Ran Dong

On pth Moment Stabilization of Hybrid Systems by Discrete-time Feedback Control

Since Mao initiated the study of stabilization of continuous-time hybrid stochastic differential equations (SDEs) by feedback controls based on discrete-time state observations in 2013, many authors have further studied and developed it. However, so far no work on the pth moment stabilization has been reported. This paper is to investigate how to stabilize a given unstable hybrid SDE by feedback controls based on discrete-time state observations, in the sense of H_∞, asymptotic

Yin Li

The Development Status of Carbon Futures Market-An Analysis of Jump Features in EU ETS

Different from common commodity markets, carbon futures market is an emerging market which influenced significantly by the policies, showing special fluctuations in its price. In this paper, with the aim at exploring the market development status of the European Union Emissions Trading Scheme (EU ETS), we adopt jump existence test and jump type test to acquire jump features (jump intensity and jump amplitude). Through the comparison of jumps in oil and gold futures price, we find jumps in carbon futures market are not significant in high sampling frequency (15 minutes and 30 minutes) but significant in low sampling frequency (45 minutes and 60 minutes). And even though carbon futures market exists large and finite jumps as well as small and infinite jumps, the frequency of these jumps is lower than those in control markets. Analyzing these phenomena, we suspect that carbon futures market is a weak efficient market with low liquidity and small size. In addition, investors should select different pricing simulation equations based on their trading frequencies to hedge jump risks.

and exponential stability in pth moment for all $p>1$. The main techniques used are constructions of the Lyapunov functionals and generalizations of inequalities.

Jianqiu Lu

Stabilisation of hybrid systems by feedback control based on discrete-time state and mode observations

Mao(2013) proposed a kind of feedback control based on discrete-time state observations to stabilize continuous-time hybrid stochastic systems in mean-square sense. We find that the feedback control there still depends on the continuous-time observations of the mode. However, it usually costs to identify the current mode of the system in practice. So we can further improve the control to reduce the control cost by identifying the mode at discrete times when we make observations for the state. In this paper, we aim to design such a type of feedback control based on the discrete-time observations of both state and mode to stabilize the given hybrid stochastic differential equations (SDEs) in the sense of mean-square exponential stability. Moreover, a numerical example is given to illustrate our results.