SEMINAR ANNOUNCEMENT

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
National University of Singapore
Website: http://www.ece.nus.edu.sg

Area: Control, Intelligent Systems & Robotics

Organised by
Centre for Intelligent Control

TOPIC	**:**	**Stabilization of All-pole Unstable Delay Processes by Simple Controllers**
SPEAKER	**:**	**Mr. Lee See Chek, graduate student** **Dept of Electrical & Computer Engineering, NUS**
DATE	**:**	**23 April 2010 (Friday)**
TIME	**:**	**11.00 am to 12.00 noon**
VENUE	**:**	**E5-02-32, Engineering block E5, NUS**

ABSTRACT

Some industrial processes exhibit unstable dynamics. The stabilizability by simple controllers for such processes remains open. Based on the Nyquist stability criterion, the stabilization of a class of all-pole unstable delay processes of arbitrary order with single unstable pole by means of simple controllers is investigated in details. Complete stabilizability conditions are established and the computational methods for determining stabilizing controller parameters presented. Such results provide theoretical understanding of such a stabilization problem and can also serve as practical guidelines for actual controller design.

BIOGRAPHY

Mr. Lee See Chek received the bachelor's degree and the master's degree in 2003 and 2007, from Universiti Teknologi Malaysia, and National University of Singapore, respectively. Since then, he has been working towards his PhD degree in department of electrical and computer engineering in NUS. His current research interest includes the control and stabilization for unstable processes.

ECE seminar webpage: http://www.ece.nus.edu.sg/events/seminars/seminar2611new.asp

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Area: Control, Intelligent Systems & Robotics

IEEE Distinguished Lecture

TOPIC	:	**Sliding Mode Control in Discrete Time**
SPEAKER	:	**Professor Xinghuo Yu** **RMIT University, Australia**
DATE	:	**22 April 2010 (Thursday)**
TIME	:	**2.00 pm to 3.00 pm**
VENUE	:	**E4-04-06, Engineering Block E4, NUS**

ABSTRACT

Sliding mode control (SMC) is a discontinuous control, aiming to create the so-called sliding mode by changing control structures. An infinite switching frequency is usually required to maintain an ideal sliding mode. SMC has been extensively studied over the last sixty years due to its simplicity and robustness. It is well known that when SMC is implemented digitally, phenomena such as chattering and chaos may occur due to limited sampling rates causing the freezing of the SMC signals during the sampling period. As a result, the elegant invariance property enjoyed by SMC is deteriorated. This has inspired extensive research on SMC in discrete time over the last thirty years, with many methodologies and theories proposed.

Study of SMC in the discrete-time domain generally follows two directions. One direction is the discrete-time design where the dynamical systems are discretized and the discrete-time SMC is then designed. The other direction is through the so called emulation approach where SMC is designed based on the continuous-time systems that are then digitized. In this talk, we will provide a comprehensive overview of the developments in this field, and examine key research issues associated with SMC in discrete time. We will also explore discretization behaviors in SMC systems, showing some inherent discrete SMC trajectory patterns and properties through analysis and simulations. Finally, future research perspectives of SMC in discrete time will be discussed.

BIOGRAPHY

Xinghuo Yu received BSc and MSc degrees from University of Science and Technology of China, Hefei China, in 1982 and 1984, and PhD degree from South-East University, Nanjing China in 1988, respectively. He is now with RMIT University, Melbourne Australia, where he is the Director of RMIT Platform Technologies Research Institute. Prof Yu's research interests include variable structure and nonlinear control, complex and intelligent systems and applications. He has published over 350 refereed papers in technical journals, books and conference proceedings.

Prof Yu served/is serving as an Associate Editor of IEEE Transactions on Circuits and Systems Part I (2001-2004), IEEE Transactions on Industrial Informatics (2005-2008), IEEE Transactions on Industrial Electronics (2007-Present) and several other scholarly journals. He received the 1995 Central Queensland University (Australia) Vice Chancellor's Award for Research, a Chang Jiang Scholar Award from the Ministry of Education of China in 2009, and was made Emeritus Professor of Central Queensland University in 2002 for his long term contributions.

Prof Yu is an IEEE Fellow, Vice-President (Planning and Development) of IEEE Industrial Electronics Society and an IEEE Distinguished Lecturer. He is also a Fellow of Institution of Engineers Australia.

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Area: Control, Intelligent Systems & Robotics

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TOPIC	:	**The Derivation of the Analytical Structure of Symmetrical IT2 Fuzzy PD and PI Controllers**
SPEAKER	:	**Mr. Nie Maowen, graduate student** **Dept of Electrical & Computer Engineering, NUS**
DATE	:	**9 April 2010 (Friday)**
TIME	:	**11.00 am to 12.00 noon**
VENUE	:	**E5-02-32, Engineering block E5, NUS**

ABSTRACT

This seminar introduces the analytical structure of a class of interval type-2 (IT2) fuzzy PD and PI controllers that have symmetrical rule base and symmetrical consequent sets. Two assumptions are made: (1) Zadeh AND operator is employed as t-norm operator; (2) the centroid type-reduction method is used. The main contribution is the analytical relationship between the inputs and output of this IT2 fuzzy controller. Comparing with its T1 counterpart, the additional two FOU parameters generate 31 extra local regions that each provides a unique relationship between the inputs and output signals. The generation of a relatively large number of local regions at the cost of two extra design parameters means that an IT2 fuzzy controller has the potential to provide better performance improvement. Another outcome is the analysis of the centroid type-reduction algorithm yielded closed form expressions for each partition. This result may provide a platform for further theoretical study.

BIOGRAPHY

Mr. Nie Maowen received the B. Eng degree in electrical engineering from University of Electronic Science and Technology of China, Chengdu in 2007. Since then, he has been with the NUS Advanced Control Technology Laboratory, and working toward the PhD degree. His research interests include the theory of Interval type-2 fuzzy logic system, general type-2 fuzzy logic system and their application.

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Area: Control, Intelligent Systems & Robotics

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TOPIC	:	**Library-based Performance-based Optical Proximity Correction**
SPEAKER	:	**Ms Teh Siew Hong, graduate student** **Dept of Electrical & Computer Engineering, NUS**
DATE	:	**26 March 2010 (Friday)**
TIME	:	**11.00 am to 12.00 noon**
VENUE	:	**E5-02-32, Engineering block E5, NUS**

ABSTRACT

During the Design-to-Manufacturing tape out flow, Optical Proximity Correction (OPC) is commonly adopted to correct the systematic proximity-effects-caused patterning distortions in order to minimize the across-gate and across-chip linewidth variation. Conventional geometrical EPE-based OPC approach often results in complicated mask and requires expensive computational effort. To address the mask complexity issue, a device performance-based OPC (DPB-OPC) algorithm which operates based on parametric current, rather than desired layout pattern as in conventional OPC, has been proposed to achieve considerable mask data saving. However, the performance gain is currently limited by the comparatively longer run-time. To improve run-time efficiency of the previous work, we present a library-based DPB-OPC methodology in the paper. In particular, cell-wise OPC concept is deployed to explore its merit of run-time saving. To counteract the performance degradation shift that caused by different surrounding environment, a localized DPB-OPC refinement can be selectively performed. When compared to full chip OPC, substantial run-time reduction is achieved in the benchmark design.

BIOGRAPHY

Ms Teh Siew Hong received her B.Eng. degree in Telecommunication Engineering from University of Malaya, Malaysia, in 2004. Since 2007, she has been working towards a Ph.D. degree at the Department of Electrical and Computer Engineering, NUS. Her research fields include design and process integration for microelectronic manufacturing, and electronics design automation.

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TOPIC	**:**	**A Histogram Analysis of Believable Driving Behaviour in Games**
SPEAKER	**:**	**Mr Tan Chin Hiong, graduate student, NUS** **Dept of Electrical & Computer Engineering, NUS**
DATE	**:**	**12 March 2010 (Friday)**
TIME	**:**	**11.00 am to 12.00 noon**
VENUE	**:**	**E5-02-32, Engineering block E5, NUS**

ABSTRACT

Believable non-player characters (NPC) in games can help to improve the gaming experience of the human player by providing a more immersive and hence more realistic game environment. In order to develop a believable game artificial intelligence (AI), it is important to understand the differences between an unrealistic game AI and a normal human player. This work investigates the use of action histograms to quantify some of the observable differences between two car driving controllers evolved using evolution strategies and driving data collected from human. It also proposed how action histograms can be used as a fitness function for evolving believable game NPCs.

BIOGRAPHY

Mr Tan Chin Hiong received the B.Eng. degree from the Department of Electrical and Computer Engineering at National University of Singapore in 2006. He is currently working towards his Ph.D. degree at the Centre for Intelligent Control, National University of Singapore. His research interests include evolutionary computation and neural networks, specifically in adaptive learning schemes for games.

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You are cordially invited to a seminar on

TOPIC	:	**Self-optimizing and Explicit Methods for Online Optimizing Control**
SPEAKER	:	**Professor Sigurd Skogestad** **Norwegian University of Science and Technology (NTNU)**
DATE	:	**3 March 2010 (Wednesday)**
TIME	:	**11.15 am to 12.15 noon**
VENUE	:	**E1-06-03, Engineering block E1, NUS**

ABSTRACT

The computational effort involved in the solution of real-time optimization problems can be very demanding. Hence, simple but effective implementations of optimal policies are attractive. The main idea is to use off-line calculations and analysis to determine the structure and properties of the optimal solution. This will be used to determine alternate representations of the optimal solution that are more suitable for implementation.

BIOGRAPHY

Sigurd Skogestad is a professor in chemical engineering at the Norwegian University of Science and Technology (NTNU) in Trondheim. Born in Norway in 1955, he received the Siv.Ing. degree (M.S.) in chemical engineering at NTNU in in 1978. After finishing his military service at the Norwegian Defence Research Institute, he worked from 1980 to 1983 with Norsk Hydro in the areas of process design and simulation at their Research Center in Porsgrunn, Norway. Moving to the US and working 3.5 years under the guidance of Manfred Morari, he received the Ph.D. degree from the California Institute of Technology in 1987. He has been a full professor at NTNU since 1987 and since 1999 Head of Department of Chemical Engineering (Kjemisk prosessteknologi). He was at sabattical leave at the University of California at Berkeley in 1994-95, and at the University of California at Santa Barbara in 2001-02.

The author of about 150 international journal publications and 200 conference publications, he is the principal author together with Ian Postlethwaite of the book "Multivariable feedback control" published by Wiley in 1996 (first edition) and 2005 (second edition). Dr. Skogestad was awarded "Innstilling to the King" for his Siv.Ing. degree in 1979, a Fullbright fellowship in 1983, received the Ted Peterson Award from AIChE in 1989, the George S. Axelby Outstanding Paper Award from IEEE in 1990, the O. Hugo Schuck Best Paper Award from the American Automatic Control Council in 1992, and the Best Paper of the Year 2004 Award from Computers and Chemical Engineering. He was an Editor of Automatica during the period 1996-2002.

Professor Skogestad has graduated 27 PhD candidates (1990-2009). He presently has a group of about 10 Ph.D. students and is the Head of PROST which is the strong point center in process systems engineering in Trondheim and involves about 50 people in various departments.

The goal of his research is to develop simple yet rigorous methods to solve problems of engineering significance. Research interests include the use of feedback as a tool to (1) reduce uncertainty (including robust control), (2) change the system dynamics (including stabilization), and (3) generally make the system more well-behaved (including self-optimizing control). Other interests include limitations on performance in linear systems, control structure design and plantwide control, interactions between process design and control, and distillation column design, control and dynamics.

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You are cordially invited to a seminar on

TOPIC	**:**	**Automatic Control and the Human Evolution in the 21st Century**
SPEAKER	**:**	**Professor Adrian-George V. Moise** **Department of Automatic Control & Computers** **Petroleum - Gas University of Ploiesti** **Romania**
DATE	**:**	**24 February 2010 (Wednesday)**
TIME	**:**	**11.00 am to 12.00 noon**
VENUE	**:**	**E1-06-02, Engineering block E1, NUS**

ABSTRACT

This lecture will address the problem of control in the context of 21st century conditions. That means, the real global world architecture (politics, finance etc.) has important influence on how the human knowledge are used.

In the first part, the main (basic) control structures are presented as well as the modern ones, those based on neural networks and fuzzy logic. The stress is put on the modern control structures and implementation solutions are presented together with practical, real, examples. The new solutions usefulness is discussed in the context of Electronics and Computer Science development in the 21st century. Also, there are taken into consideration some control systems that work (or should work) in any society and in the world.

In the second part, the intentional evolution of humanity is addressed. The main idea is that we have to drastically change our vision about the human development and to establish global goals that can be touched only in a society based on real co-operation. The technology (control, robotics etc.) has to be used for human evolution.

In the end, there will be some conclusions but the real conclusions will be established during an open dialog with the audience. Where are we? Where do we want to be in the future?

BIOGRAPHY

Adrian Moise is an associate professor at the Department of Automatic Control and Computers, Petroleum-Gas University of Ploiesti, Romania. He is a Vice-dean of the Faculty of Mechanical and Electrical Engineering. He obtained MSc. in Electronics, University Politehnica Bucharest, Romania (1981), and MSc. in Mathematics, University of Bucharest (1991). He has a PhD degree in Automatic Systems (June 1998, Computer Vision Systems for Underwater Oil Installation Inspection).

His teaching and research areas are: Control Systems, Robot Control, Digital Systems, Programmable Automata, Digital Systems Design, Intelligent Control, Pattern Recognition and Neural Networks, Electric Circuits, Signal Processing.

He is the head of the Microprogrammed Systems team and the head of the Robot Control team at Petroleum - Gas University of Ploiesti. He is author for more than 45 papers in journals and conferences, 8 books and 7 invited papers. He published 5 textbooks for practical laboratory works. All of these are closely related to Computer Engineering, Control Systems and Computer Vision. He was Visiting Professor at Boise State University, USA (2001-2003), Democritus University of Thrace, Greece (2000) and University of Milan, Italy (1997). He is IEEE member, Member of the European Commission for Peace and Development (ECPD), Member of the Romanian Society for Automatic Control and Technical Informatics (SRAIT), Member of the Romanian Robotics Association (ARR).

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Area: Control, Intelligent Systems & Robotics

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You are cordially invited to a seminar on

TOPIC	**:**	**Vision-based Applications for Unmanned Aerial Vehicles**
SPEAKER	**:**	**Mr. Lin Feng, PhD candidate** **Department of Electrical And Computer Engineering** **NUS**
DATE	**:**	**5 February 2010 (Friday)**
TIME	**:**	**11.00 am to 12.00 noon**
VENUE	**:**	**E5-02-32, Faculty of Engineering** **National University of Singapore**

ABSTRACT

Vision-based systems have become an exciting field in the academic research and industrial applications. By integrating information from the vision-based sensors and other sensors adopted, functions of the unmanned systems can be extremely extended so that the unmanned systems can autonomously perform a variety of work. In this talk, we present the design and construction of the vision system for the unmanned aerial vehicle: helicopter in NUS UAV team. The hardware and software configuration of the system will be illustrated in the talk. In addition, based on the proposed vision system, we will discuss two applications for the unmanned helicopter, including vision-based ground target tracking, and vision-based navigation. Finally, the promising trends and future work in the development of vision-based systems for unmanned systems will be presented.

BIOGRAPHY

Mr. Lin Feng received his B.Eng. degree in computer science and control, and M.Eng. degree in system engineering from Beihang University, Beijing, China, in 2000 and 2003, respectively. Currently, he is working towards his Ph.D. degree in Department of Electrical and Computer Engineering at National University of Singapore. His main research interests are in construction of unmanned aerial vehicles, robot vision, vision-based navigation and image processing.

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You are cordially invited to a seminar on

TOPIC	**:**	**Introduction of Financial Mathematics and FHJM Models**
SPEAKER	**:**	**Dr. Li, Eric JinLiang,** **Global Head of CVA modeling and analytics,** **Standard Chartered Bank (SCB)**
DATE	**:**	**22 January 2010 (Friday)**
TIME	**:**	**11.00 am to 12.00 noon**
VENUE	**:**	**E5-02-32, Faculty of Engineering** **National University of Singapore**

ABSTRACT

In this presentation, the basic background for financial tradable, derivatives, bond math and option pricing will be introduced first. Then we will go into details about one of the challenging problems in financial mathematics: Futures HJM (FHJM) models to price interest rate derivatives, where the interest rate dynamics can be described through a small number of stochastic state variables and flexible classes of volatility structures. Step by step we will show how to extend from FHJM to FxFHJM model to price cross currency derivatives. As a new frontier for derivatives modeling in the Emerging Market (EM), all contracts related to EM currency are credit linked or credit contingent because an EM country or sovereign could default as well as its currency may devalue (jump) dramatically. In order to tackle this difficulty, advanced hybrid jump models are utilized to model the IR, FX and Credit and Currency jump simultaneously to price and risk management an EM portfolio of derivatives.

Towards the end of the lecture, Dr Li will also discuss the job opportunities at the financial companies: What Are Investment Banks Looking For?

BIOGRAPHY

Dr. Jinliang Eric Li is the global head of CVA modeling and analytics at Standard Chartered Bank (SCB). He received B.S. degree in Computational Mathematics from Fudan University, Shanghai, China in 1986, M.S. degree in Computational Mathematics from Nanjing Aeronautical Institute (now Nanjing University of Aeronautics and Astronautics) Nanjing, China in 1988, M.S. degree in Computer Science in 1997 and Ph.D. degree in Applied Mathematics in 2002 from University of North Carolina at Charlotte, NC, US.

Before joining SCB, he had spent about five years as a senior vice president in Derivatives Research Group at Lehman Brothers Inc in New York from 2004 to 2009. In Lehman, he was the head of CVA modeling and head of EM modeling. Before then, he was a vice president in Quantitative Research Group at Bank of America in Chicago from 2002 to 2004; vice president and head of Quantitative Research and Analytics at Blackbird Holding Inc. in Charlotte, North Carolina from 1996 to 2001. Before moved to United States, he had taught mathematics at Northern Jiaotong University (now Beijing Jiaotong University) for about six years from 1988 to 1994. Dr. Li has published a number of papers in the area of financial derivatives modeling as well as computational mathematics.

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