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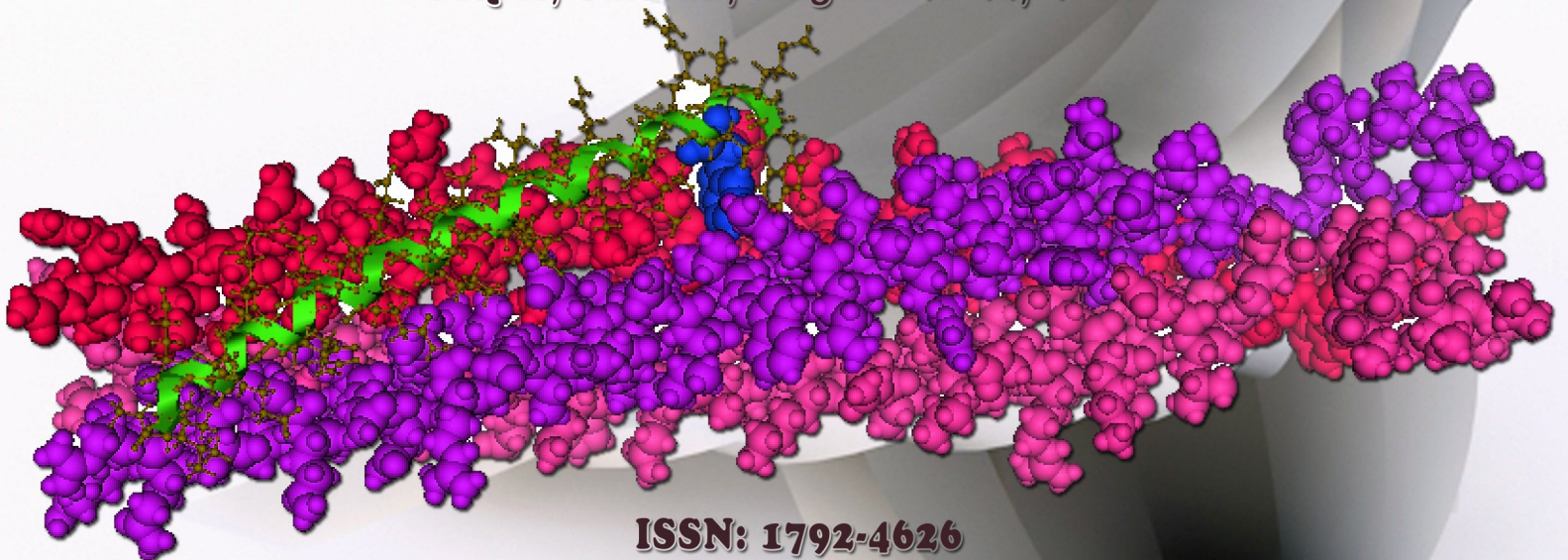
New Aspects of Systems Theory & Scientific Computation

WSEAS

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10th WSEAS International Conference on
Systems Theory and Scientific Computation (ISTASC '10)

Taipei, Taiwan, August 20-22, 2010

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Preface

This year the 10th WSEAS International Conference on SYSTEMS THEORY AND SCIENTIFIC COMPUTATION (ISTASC '10) was held in Taipei, Taiwan, August 20-22, 2010. The conference remains faithful to its original idea of providing a platform to discuss dynamical systems, control systems, control engineering, soft computing, discrete event dynamic systems, manufacturing systems, decentralised systems, remote sensing, game theory, identification, number theory, error estimation in iterative methods, eigenvalue problems, numerical methods for singular equations, error analysis, stability problems, convergence problems, combinatorial programming, integer programming, convex, nonsmooth and variational analysis, multiobjective programming, randomized algorithms, equational logic programming, network optimization, approximation algorithms, theoretical computer science, coding and information theory, error-correcting codes, data compression, switching networks, communication protocols etc. with participants from all over the world, both from academia and from industry.

Its success is reflected in the papers received, with participants coming from several countries, allowing a real multinational multicultural exchange of experiences and ideas.

The accepted papers of this conference are published in this Book that will be indexed by ISI. Please, check it: www.worldses.org/indexes as well as in the CD-ROM Proceedings. They will be also available in the E-Library of the WSEAS. The best papers will be also promoted in many Journals for further evaluation.

A Conference such as this can only succeed as a team effort, so the Editors want to thank the International Scientific Committee and the Reviewers for their excellent work in reviewing the papers as well as their invaluable input and advice.

The Editors

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Plenary Lecture 1

A New Artificial Intelligence in Game Design - Introduction to Reinforcement Learning

Assistant Professor Shao-Shin Hung
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Abstract: The past few years have seen steady improvements in computer technology for graphics, sound, networking and processing power. Computer-controlled, non-player characters facilitate games and activities in these worlds and may interact with hundreds of thousands of human-controlled characters. The game theory domain is been widely regarded as appropriate for understanding the concepts of machine learning. Scientists usually focus on strategic games and make efforts to create "intelligent" programs that efficiently compete with human players. Such games are suitable for further studying because of their complexity and the opportunities they offer to explore winning strategies However, artificial intelligence technology to control non-player characters has, so far, lagged behind advances in other virtual world technologies. There is now a need for more believable and intelligent non-player characters to support and enhance virtual world applications.

This speech presents a new artificial intelligence technique – motivated reinforcement learning – for the development of non-player characters in multiuser games. On the other side, reinforcement learning is considered as one of the most suitable and prominent methods for solving game problems due to its capability to discover good strategies by extended self-training and limited initial knowledge. For example, humans and animals have the ability to focus and adapt their behavior. These behavioral traits are also an advantage for artificial agents in complex or dynamic environments, where only a small amount of available information may be relevant at a particular time, and relevant information changes over time. Motivated reinforcement learning combines computational models of motivation with advanced machine learning algorithms – to empower non-player characters to self identify new tasks on which to focus their attention and learn about.

Finally, both theoretical and practical issues are addressed for developing adaptive, dynamic non-player characters. Focus applications include multiuser, role-playing and simulation games.

Brief Biography of the Speaker:
Shao-Shin Hung received the MS. and Ph.D. degrees Computer Science and Information Engineering from National Cheng Chung University Taiwan, in 1992 and 2007, respectively.

Currently, he is an Assistant Professor at the Department of Computer Science and Information Engineering, WuFu Institute of Technology. He serves as a program committee of the 2nd Int. Multi-Conference on Engineering and Technological Innovation (IMETI09), the 4th International Conference on Ubiquitous Information Technologies & Applications (ICUT 2009). He also serves as an Associate Editor/Editorial Board member of the following international journals, such as the Open Software Engineering Journal, the Open Industrial and Manufacturing Engineering Journal, and the Open Artificial Intelligence Journal. He is a paper reviewer of Vis'07, Vis'08, VAST'08, Vis'09 and Journal of Information Science.

His research interests include computational intelligence, data mining, intrusion detection and applications of 3D game system tools. He is a member of the ACM and the IEEE Computer Society.

Plenary Lecture 2

Analytical Synthesis Method - A New Mathematical Design Method for the Analog Circuit Design

Professor Chun-Ming Chang
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Abstract: Analytical Synthesis Method (ASM) has been presented in several papers published in the IEEE Transactions on Circuits and Systems since 2003. It is one of the powerful design methods in the field of analog circuit design. It is the method using a succession of innovative algebra manipulation operations to decompose a complicated transfer function representing the relationship between the output and the input signals of a design project into many simple equations feasible by using the corresponding simple sub-circuitries. The simple sub-circuitries can be constructed by the desired configuration of the element such as the single-ended-input operational transconductance amplifiers (OTAs) and the grounded capacitors, both of which are used for absorbing and reducing the shunt parasitic capacitance and lead to have more precise output responses. In addition to this, the ASM can control the number of the terms in the complicated decomposition process such that the number of both active and passive components used in the circuit is the least compared to the previously reported ones. Then, the ASM is the only one method which can simultaneously achieve the three important criteria for the design of OTA-C circuits without trade-off.

Due to the flexibility of the ASM, the simple sub-circuitries used in the circuit design can be changed and chosen according to different necessities for the target of the circuit design. For example, if the reduction of the number of the active and passive components used in the circuit is more important than the type of the element configurations like single-ended-input/differential-input OTAs and grounded/floating capacitors due to the consideration about power consumption, chip area, noise, and total parasitics……, etc., the minimum component OTA-C circuit can also be investigated and developed successfully using the ASMs. The fully flexible characteristic and the real demonstration in the literature of the ASM may make it be one of the most prospective methods in the field of analog circuit design in the near future.

Brief Biography of the Speaker:
Chun-Ming Chang received the B.S.E.E. and M.S.E.E. degrees from National Cheng Kung University, Tainan, Taiwan, R. O. C. in 1975 and 1977, respectively, and the Ph.D. degree from the University of Southampton, Southampton, U.K., in 2004.
In 1979, he joined the Department of Electrical Engineering, Taipei Institute of Technology, Taipei, Taiwan, R. O. C., as a Lecturer. After one year, he transferred to the Department of Electronic Engineering, Fu Jen Catholic University, Taipei Hsien, Taiwan, R.O.C. In 1982, he joined the Department of Electrical Engineering, Chung Yuan Christian University, Chung-Li, Taiwan, R.O.C., where he became an Associate Professor and a Full Professor in 1985 and 1991, respectively. He is currently a Professor of Electrical Engineering and leader of the Electronic Circuits Group in the Department of Electrical Engineering, Chung Yuan Christian University. He is also a departmental teacher promotion committee member and a college teacher promotion committee member. He was the chairman of the Department of Electrical Engineering of Chung Yuan Christian University from 1995 to 1999. His research interests are divided into two parts: network synthesis and analog circuit design before and after 1991, respectively. The improvement for the approach technique to factorize a paramount matrix used in network synthesis and proposed by Professor I. Cederbaum let him be promoted to a Full Professor in 1991. He has published over 70 SCI papers, in which the most famous is the invention of a new analytical synthesis method for the design of analog circuits which can, for the first time, simultaneously achieve three important criteria for the design of OTA-C filters without trade-offs. Using a succession of innovative algebra manipulation operations, a complicated nth-order transfer function can be decomposed into a set of simple equations feasible using the single-ended-input OTAs and grounded capacitors. Several IEEE Transaction papers on Circuits and Systems with analytical synthesis method have been published in

the literature since 2003. Recently, he was invited as the Plenary Speaker of the (i) 7th WSEAS International Conference on Instrumentation, Measurement, Circuits and Systems (IMCAS '08), Hangzhou China, April 6-8, 2008; (ii) 8th WSEAS International Conference on Electronics, Hardware, Wireless and Optical Communications (EHAC'09), University of Cambridge, UK, February 21-23, 2009; and (iii) 11th WSEAS International Conference on Mathematical and Computational Methods in Science and Engineering (MACMESE'09), Baltimore USA, November 7-9, 2009. He is in the process of writing his professional textbook: "Analog Circuit Design---Analytical Synthesis Method".

Prof. Chang is a senior member of the IEEE Circuits and Systems Society.

Plenary Lecture 3

Multi-attribute Intelligent Grey Target Decision Model

Professor Sifeng Liu
Director of Institute for Grey Systems Studies
President of Grey Systems Society of China
Vice-president of Chinese Society for Optimization, Overall Planning and Economic Mathematics
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Abstract: A new multi-attribute intelligent grey target decision model is put forward in this paper. Four kind uniform effect measures of the effect measure for benefit type objective, the effect measure for cost type objective, the lower effect measure for moderate type, and the upper effect measure for moderate type have been formed in view of different decision objective of benefit type, cost type, and moderate type which with a pleased field. Accordingly, the decision objectives which with different meaning, different dimension, and/or different nature can be transferred to uniform effect measure. So, the matrix of synthetic effect measures can be obtained easily. The critical value of grey target is designed as the dividing point of positive and negative, that is the zero point. It with very clear physical meaning. And the two cases of hit the bull's eye or not of the objective effect value are fully considered. The distinguishing rate between synthetic effect measures are improved greatly.

Brief Biography of the Speaker:
Professor Sifeng Liu received his bachelor's degree in mathematics from Henan University, China, in 1981, his MS in economics and his PhD in systems engineering from Huazhong University of Science and Technology, China, in 1986 and 1998, respectively. He has been to Slippery Rock University in Slippery Rock, Pennsylvania and Sydney University in Sydney, Australia as a visiting professor. At present, Professor Liu is the Director of the Institute for Grey Systems Studies and the dean of the College of Economics and Management of Nanjing University of Aeronautics and Astronautics(NUAA); he is also a distinguished professor and guide for doctoral students in management science and systems engineering disciplines.
Dr. Liu's main research activities are in grey systems theory and regional technical innovation management. He has directed more than 50 projects at national, provincial or ministerial levels, has participated in international cooperation projects, and has published over 200 research papers and 18 monographs and edited volumes published by famous publishers, such as Springer, Taylor and Francis, and Science Press. He is currently a co- editor of the book series "Systems Evaluation, Prediction and Decision-Making," published by CRC Press, an imprint of Taylor and Francis.
Dr. Liu is a member of the evaluation committee of Natural Science Foundation of China(NSFC), a member of the standing committee for teaching guide in management science and engineering of the Ministry of Education, China. He also serves as an expert on soft science at the Ministry of Science and Technology, China. Professor Liu currently serves as the chair of the Technical Committee of the IEEE SMC on Grey Systems, the president of Grey Systems Society of China(GSSC), a vice president of Chinese Society for Optimization, Overall Planning and Economic Mathematics(CSOOPEM), a vice chair of Beijing Chapter Of IEEE SMC, a vice chair of Nanjing Chapter Of IEEE SMC, a vice president of Econometrics and Management Science Society of Jiangsu Province(EMSSJS) and a vice president of Systems Engineering Society of Jiangsu Province(SESJS), a member of the Nanjing Decision Consultancy Committee. He serves as a member of the editorial board of over 10 professional journals, including "The Journal of Grey System (UK)," "Scientific Inquiry (USA)", "Journal of Grey System (Taiwan)", "Chinese Journal of Management Science", "Systems Theory and Applications", "Science & Technology Progress and Policy","Systems Science and Comprehensive Studies in Agriculture", and "the Journal of Nanjing University of Aeronautics and Astronautics".
Dr. Liu has won several accolades such as the "National Excellent Teacher" in 1995, "Excellent Expert of Henan Province" in 1998, "Excellent Science and Technology Staff in Jiangsu Province" in 2002 ,"Expert Enjoying

Government's Special Allowance" in 2000, "National Expert with Prominent Contribution" in 1998, and "Outstanding Managerial Personnel of China " in 2005.

Plenary Lecture 4

Science for Life or Live for Science, Take the RFID System and e-Learning for Example

Assistant Professor Ming-Shen Jian
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Abstract: Today, many researcher and scholars propose various algorithms, theories, and systems via proposals, papers, and presentations. Every year, there are more than thousands papers proposed in different conferences or journals. In addition, there are many graduates from universities and research institute. However, how many algorithms or systems are realistic or realized is an interesting question. In the world, many companies claim that their products or technologies come from human nature. In fact, there are huge differences between the technologies proposed and implemented. It also makes the graduates work on the job with less relation to the researches they did. Due to the location, culture, and behavior habits, the researches implemented in the laboratory may not be suitable for people or satisfy the requirements at the specific location. To enhance the feasibility of the research or algorithms, considering the distance between laboratory and reality is important. Sometimes, researchers or students implement the technologies just because that they suppose to. In fact, the end users or general users of the technologies services should be the most important targets that the researchers have to take into account. In other words, how to encourage people to adopt the technologies or make people interest in these technologies is important. An acceptable or interesting technology may have the chance to be realizable or implemented by business model.
The RFID system today is general. However, even there are many researchers who proposed their ideas or papers, the technologies implemented around us are only a few. Some researches present that the RFID system can achieve some functions and capabilities. Most RFID systems until now still work as the identification key of the guard systems or monitoring applications. Some new RFID applications work as one method or type of payment such as metropolitan rapid transportation card. The ideas in the laboratory may be good and efficient but are not realized or accepted in the life. In other words, some or more conditions and limitations such as the cost, the behavior, the procedure, even the demand of these ideas should be carefully considered.
Another famous application: e-learning has been considered and implemented for a long time. Most researchers in this area know or completely understand one of the standards: SCORM. It is a procedure or standard process for an engineer to implement a e-learning material or system. Many papers, applications, or systems are proposed and realized. However, the e-learning system which is really interesting for students or is are based on the content, even there are many researchers who propose the possible and new structure or applications year by year. Researchers and engineers pay too much attention to the technologies themselves than to take the users or students into account. In other words, the proposed systems or applications may force the people to conform to the systems. It means that the users just can follow the technical procedure made by the engineer even they are not technical staffs.
Engineers or researchers provide the new and better technologies or systems to general users. The more important issue is: "Are these technologies, algorithms, and applications needed by users?" In addition, some questions about science should be also considered: 1) Is it provided to improve the life and to be completely better than the original function or application, sometimes even can instead of the original one, 2) Does it provide another choice or function for users dealing with the original application, or 3) Does it encourage users changing their original habits or suiting the new technology? To make the science or technology useful and beneficial for users, "User" should be the most important factor.

Brief Biography of the Speaker:
Ming-Shen Jian is an assistant professor at the Dept. of Computer Science and Information Engineering of the National Formosa University in Yunlin County, Taiwan from 2009. He received the Ph.D. degree in Computer Science and Engineering of the National Sun Yet-Sen University in Kaohsiung City, Taiwan, in 2007. He got his B.S. degree in Electronic and Control Engineering of the National Chiao Tung University in Hsinchu City, Taiwan, in 2000.
He was the consultant of the International Semiconductor Technology Ltd. and International Megatrend Smart Technology Ltd. (2007~2008) and an assistant professor at the Dept. of Computer Science and Communication

Engineering in Shu Te University in Kaohsiung County, Taiwan (2008). His current research interests are in the area related to Integration of RFID system, e-learning and game for learning, and cloud computing.

Plenary Lecture 5

Analysis of Robust Stability of Variable Structure Control in Frequency Domain

Professor Chingyei Chung
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Abstract: Conventionally, the variable structure control is investigated in the time domain. However, this paper xplore the properties of robust stability for variable structure control in frequency domain. Here, it can be shown that the variable structure control can be transformed into a Lur'e problem. If the uncertainties of system and input matrices satisfy the "matching conditions", then the zero dynamics of sliding surface will not changed; For robust stability, it can be shown that from frequency domain point of view, the variable structure control possesses phase margin and infinity gain margin. With this point of view, the sliding mode control reveals superior robust properties. Finally, according to circle criterion, a formula is presented that with suitable boundary layer, the sliding mode control can achieve absolute stability of overall system.

Brief Biography of the Speaker:
Chingyei Chung is a professor in the Department of Electronic Engineering, Ming Shin University of Science and Technology, Taiwan Prior to this position, he held various academic positions at Feng Chia University Taiwan and San Francisco State University, USA respectively. He received B.S. from Natl. Chiao Tung University, Taiwan ROC and M.S. degree in electrical engineering from San Jose State University, U.S.A. Also He finished his Ph.D degree in Mechanical Engineering from University of California, Berkeley, USA.
He has four Patents granted by the United State Patent and Trademark Office. In 2003, he is an Distinguished Research Advisor in ABI (American Biographic Institute). His research interests include nonlinear control, nonlinear circuit theory and etc.

Plenary Lecture 6

Multimedia System Learning – D-Learning Way on Science and Technological Course

Professor Tsai-Hua Lin
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Abstract: Based on the functions of theoretical foundations and related literature analysis, study group develop a multimedia system named: D-Learning way on science and technological course. The original purpose of research work targeting on constructing a learning platform for three-dimensional computer animation. The feasibility was based on the evaluated functions of D-Learning animation techniques and the prototype constructed. Platform derived from three-dimensional computer animation technique associated with ASP.NET and SQL Database.

This Model aims at probing into meaning and purpose of the Nature and Science Technology course, studying the way, and implementing the tactics concretely, combining information science and technology and applying every discipline teaching actually.

Brief Biography of the Speaker:
Dr. Tsai-Hua Lin – 2009 graduated from The Department of Industrial Technology Education, National Kaohsiung Normal University PhD program. She had been Director of Computation Center, later, been a President of National Taitung (East Taiwan) University. In 2010, she concentrates her research on multimedia hardware, learnung, and system development for more than twenty years and gain more than twenty years financial support from Taiwan's National Science Council. In recent years, she works mostly on 3D Interactive Model Web learning.

Plenary Lecture 7

Design and Application of Cerebellar Model Articulation Controllers

Professor Chih-Min Lin
Electrical Engineering Deptartment
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Abstract: Based on biological prototype of human brain and improved understanding of the functionality of the neurons and the pattern of their interconnections in the brain, a theoretical model used to explain the information-processing characteristics of the cerebellum was developed independently by Marr (1969) and Albus (1971). The cerebellar model articulation controller (CMAC) was first proposed by Albus in 1974. The CMAC is a learning structure that imitates the organization and functionality of the cerebellum of the human brain. That model revealed the structure and functionality of the various cells and fibers in the cerebellum. The core of CMAC is an associative memory which has the ability to approach complex nonlinear functions. The CMAC takes advantage of the input-redundancy by using distributed storage and can learn nonlinear functions extremely quickly due to the on-line adjustment of its system parameters. The CMAC is classified as a non-fully connected perceptron-like associative memory network with overlapping receptive-fields. It has good generalization capability and fast learning property and is suitable for a lot of applications. This speech introduces several CMAC-based adaptive learning systems; these systems combine the advantages of CMAC identification, adaptive learning and control techniques. In these systems, the on-line parameter training methodologies, using the Lyapunov stability theorem, are proposed to increase the learning capability. Moreover, the applications of these systems in servomotor control, missile guidance systems, biped robot and computer-aided diagnostic of breast nodules are demonstrated.

Brief Biography of the Speaker:
Prof. Chih-Min Lin is currently a Chair Professor of Electrical Engineering, Yuan Ze University, Taiwan. He also serves as the Editor-in-Chief of WSEAS Trans. Systems and Control and Associate Editor of IEEE Trans. Systems, Man, and Cybernetics, Part B; Asian Journal of Control; and International Journal of Fuzzy Systems. He is now the Chair of IEEE Systems, Man, and Cybernetics Society, Taipei Chapter, and Board of Government of IEEE Taipei Section. His research interests include fuzzy systems, neural network, cerebellar model articulation controller, and intelligent control systems. He is an IEEE Fellow and IET Fellow. He has published 96 journal papers and 134 conference papers.

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