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Recent Advances in Electrical & Computer Engineering

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Plenary Lecture 1

Integration between Super Grids and Smart Grids: A Challenge for the Future

Professor Francesco Muzi
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Abstract: A super grid is a wide-area HHV network involving the exchange of considerable energy entities transmitted across very long distances. Throughout the world, three major super grids are presently developing: the European Super Grid, the U.S. Super Grid and the Asian Super Grid. Sometimes in the future, the European super grid is due to include the interconnection of several European countries and neighboring regions such as North Africa, Ukraine, Kazakhstan, allowing a wide sharing of the total renewable power resources. These super grids exhibit prominent, intelligence features in the transmission nodes which integrate the local smart grids present on the other side. In the last few years medium or low voltage intelligent distribution networks, the so-called smart grids, have been developed to respond to the increasing demand of electrical energy. These smart grids allow to use profitably the otherwise hard to exploit energy from renewable sources dispersed on the territory, and at the same time to improve efficiency in energy distribution, consumption and storing. Smart grids must carry out these complex functions with high reliability, energy sustainability and high security levels. An important issue to be solved in such a large, complex system consisting of a super grid and a myriad of linked smart grids is to maintain stability throughout the system. In this context, particular attention must be paid to voltage stability and to the linked reactive power that must be absorbed or supplied at each sensible node also by important, private renewable production systems. In other words, the main private energy operators must collaborate to the network voltage control. As a consequence, the liberalization of the reactive energy market will become of outmost importance in the future. Given these upcoming scenarios, the new private operators will be obliged to supply reactive energy by allocating all proper available resources efficiently, in order to obtain the most economical solution as any profitable competition requires. For this reason, rules must be given in advance, since producers need to have all the necessary information to correctly evaluate their investments. A general overview of this topic is presented and possible future scenarios are described and discussed.

Brief Biography of the Speaker: Francesco Muzi is a professor of Power Systems at the University of L'Aquila, Italy, where he has also the scientific responsibility for the Power System Group. His main research interests concern Power systems transients and dynamics, Reliability and power quality in distribution systems, Power systems diagnostics and protection. In these fields, he authored or co-authored over 100 scientific papers published in reviewed journals or presented at international conferences. He received mentions in books edited by John Wiley & Sons, New York and participated to the outline of the "IEEE Guide for improving the lightning performance of electric lines", IEEE Standards Department, New York. He has also a patent for an industrial invention, namely "Power system controlled by a microprocessor". He is a regional chairman of the Italian National Lighting Society and was a chairman or keynote lecturer in a number of international conferences organized by different prestigious societies. He is a technical reviewer for the following international journals: IEEE Transactions on Power Delivery, Electric Power Systems Research by Elsevier Science, IET Generation, Transmission & Distribution.

Plenary Lecture 2

Parallel Storing of Independent Data Sets in Multiple Hash Tables

Professor Eleazar Jiménez Serrano
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Abstract: Implicit partition of data and instructions sets is carried out in multi-core architectures providing parallel computing capabilities. We focus on exploring the state-spaces generated from Petri nets with an explicit partition of data sets stored in multiple hash tables. We describe the architecture and algorithm allowing the parallel exploration of the state space and storage of the data sets as independent multiple hash tables. We discuss the necessity or not of main memory and cache update during the exploration for accelerating the parallel exploration.

Brief Biography of the Speaker: Professor Jiménez Serrano received a B.S. degree in Systems and Industrial Engineering from the University of Sonora and a M.S. degree in Systems Engineering from the A. University of B. California. His work experience includes a position as an associate engineer in Allied Signal Aerospace and SONY, and as a lecturer at the A. University of B. California. He was granted with the JICA and Monbusho scholarship to continue his graduate studies in Japan. He has a PhD degree in computer sciences from Kyushu University. He is also a visiting researcher in TOYOTA. He is currently a lecturer and researcher (assistant professor) at Kyushu University. He has delivered several publication, presentations and delivered keynote speeches at international conferences.

Plenary Lecture 3

Innovators Marketplace (R): A Gaming Approach to Chance Discovery

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Abstract: Since 2000, we have been conducting studies, workshops, and publications on chance discovery. Chance discovery is defined as the discovery of chance, rather than discovery by chance. A "chance" here means an event/situation that can be viewed as either an opportunity or a risk - which may be ignored due to low frequency. For example, a small earthquake may be the sign of a big quake in the future. and a claim by a picky customer may point out a serious problem in a product. In both examples, individuals have to plan a scenario that is the series of future actions and events by estimating the impact of an observed event with respect to the dynamics of the real world. The discovery of chances is of crucial importance because they may have a significant impact on humans' decision in inventing and surviving the future rather than simply predicting the future - desirable effects of opportunities should be actively promoted, while preventive measures should be taken in the case of discovered risks.
By applying our original technologies of data mining/visualization to natural/social events and human behaviors in the field of commerce, the ability of individuals to externalize potential scenarios has been enhanced, contributing to beneficial strides forward in businesses - manufacturing, marketing, medicine, politics, education, policies in power plant management, etc. Overall, our methods are based on one basic principle: make a spiral process where computers and humans interact, where computers analyze/visualize data available in countable conditions and humans pay attention to interesting scenarios. In this talk, I introduce a game called Innovators Marketplace (R) we developed as a method to train and activate the spiral of chance discovery. Here, players called "inventors" create and promote ideas by combining pre-existing basic individual ideas reflecting to a map in which the computer visualized relations among existing pieces of knowledge, while others called "consumers" evaluate those ideas. This interaction is primarily an embodiment of our ten years of studies on chance discovery, a tool for aiding innovative thoughts and communications. The exchanges of voices between inventors and consumers construct and destruct new ideas about products, services, and all manner of business scenarios, sometimes involving serious conflicts - which may discourage participants in other situations. However, the positive air thanks to using games makes Innovators Marketplace a self-productive positive-feedback engine, generating power for enhancing, training, and reusing individual's thoughts and communications for innovation.

Brief Biography of the Speaker: Yukio Ohsawa is a professor of Systems Innovation in the School of Engineering, The University of Tokyo. He received BE, ME, and Ph.D in Communication and Information Engineering from The University of Tokyo, worked also for the School of Engineering Science in Osaka University (research associate, 1995-1999), Graduate School of Business Sciences in University of Tsukuba (associate professor, 1999-2005), Japan Science and Technology Corporation (JST researcher, 2000-2003) etc. He initiated the research area of Chance Discovery, and relevant series of international conference sessions and workshops. He edited books on chance discovery "Chance Discovery" (2003), "Chance Discoveries in Real World Decision Making" (2005) etc, and recently wrote "Innovators Marketplace: I Using Games to Activate and Train Innovators (Understanding Innovation" (2012). Also he edited special issues in international and domestic journals. He was in the program committee of IJCAI, editorial board of a number of interdisciplinary journals, and is the TC chair of IEEE-SMC technical committee of Information Systems for Design & Marketing since 2005. His research interests started from non-linear physics, and, via working in artificial intelligence, he initiated chance discovery and extended it to methods for innovation - applying his original methods of chance discovery and borrowing ideas from the dynamics in the real market.

Plenary Lecture 4

Monolithic Integration of High-Voltage Generators

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Abstract: Many applications like bistable display drivers or MEMS actuator drivers require on-chip high-voltage generators with specific needs in terms of power efficiency, voltage and current range, response time, output voltage stability, programmability and silicon cost. This talk will give general guidelines on how the most suitable high-voltage generator topology can be chosen for a given application based on a number of selection criteria. Both inductor-based boost converters and capacitor-based charge-pumps will be considered and compared, and the specific implementation down to component or transistor level will be analyzed. Dedicated feedback architectures to obtain full digital programmability will be presented and techniques for achieving maximum power efficiency will be explained. This includes e.g. charge-recycling, sequential sub-pump boosting and variable frequency boosting. Based on real chip designs it will be shown how these features can be integrated in advanced smart-power IC technologies for various applications. Experimental data will be compared to the theoretical predictions, leading to the conclusion that the presented methodologies and techniques are indeed capable of complying with the stringent specifications imposed by the application.

Brief Biography of the Speaker: Prof. Jan Doutreloigne obtained his Master and PhD degrees in electronic engineering from the University of Gent (Belgium) in 1987 and 1992 respectively. His PhD research dealt with the development of a complementary TFT technology for the integration of driver circuits on active matrix LCDs. From 1992 to 1998, he was a full-time lecturer at the University of Cuenca (Ecuador) in the area of electronics, telecommunications and computer sciences. In 1998, he joined the Centre for Microsystems Technology (CMST), which is a research facility at the University of Gent as well as an associated laboratory of the Inter-university MicroElectronics Centre (IMEC). Prof. Jan Doutreloigne is appointed as full-time professor at the University of Gent, responsible for conducting research in the area of advanced electronic microsystems and teaching courses in the field of microelectronics. At the same time he is also an R&D manager at IMEC, responsible for leading and coordinating national and European research projects related to microelectronic design. He is currently leading a research team at the CMST laboratory, specialized in the full-custom design of mixed analog-digital integrated circuits and the development of advanced high-voltage transistors in smart-power technologies. He is author or co-author of more than 100 papers in international technical journals and conference proceedings, and is inventor of several patents.

Plenary Lecture 5

An Agent Based Framework to Avoid Insider Threat

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Abstract: The profiling based agent system to avoid insider threat is solution to many problems inside an organization. Keeping in view the emerging area of software agents, a model has been designed that checks out whether user-activities are in accordance with organization's policy or not? The major developments are: Monitoring behavior either suspicious or normal, Certifying user's authenticity to use resources, Checking limitations of the users, Monitoring that user comes into view from the assigned location or not, Analyzing the level of the destruction caused by user, etc.

The ACENET, agent framework, scores every user of the organization and maintains a detailed profile of whether a legitimate user is doing any malicious activity. ACENET is adaptable to deploy in any organization where agents are designed as service on the top layers of the model. The threats have been categorized in various classes and for each category, agents have been designed. Communication among agents takes place by message passing at upper level whereas internally socket based communication is underway. Considering privacy as a major concern, a matrix or grid of the trust levels 'trust grid' is designed where diverse access privileges are assigned to different level of the users to resolve conflict between users and organizations. The professional issues regarding privacy and activities monitoring, were studied and it is proposed that the organization may announce in advance what can be monitored and what cannot be monitored though a user monitoring policy.

The framework, ACENET, is tested on real data, obtained from the organizations, and the performance has also been evaluated on the basis of specified parameters. Framework's results were analyzed to match with the targeted objectives. Finally future directions for the extension of the framework have been presented.

Brief Biography of the Speaker: Dr Ghulam Ali Mallah is Full Professor and approved PhD Advisor in the area of Computer Science & Information Technology at Department of Computer Science, Shah Abdul Latif University, Khairpur, Pakistan. He has presented papers in more than 10 countries. He is dedicated Teaching & Research professional, having strong understanding of systems development issues related to intelligent applications, Multi-agent Systems, Insider Threat Models, Social Networks, etc. He has organized two international conferences in his university. He is member of many professional bodies. He has written more than 50 research articles in internationally indexed journals & conference proceedings.