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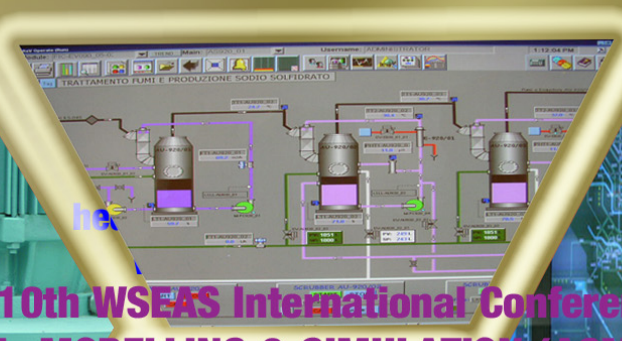
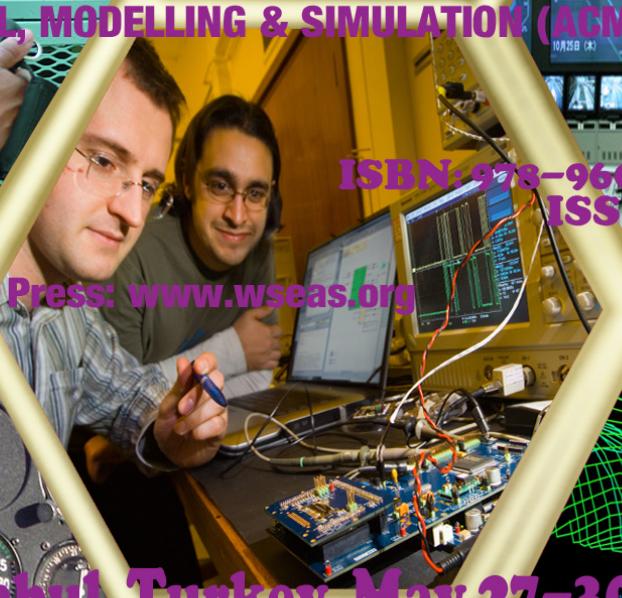
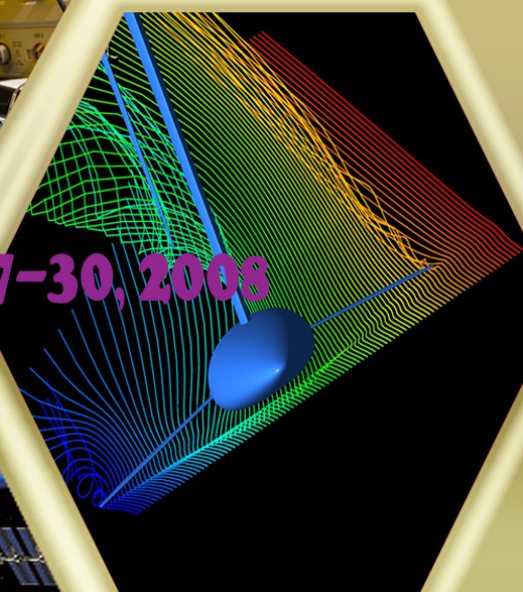
NEW ASPECTS OF AUTOMATIC CONTROL, MODELLING AND SIMULATION



Proceedings of the 10th WSEAS International Conference on AUTOMATIC CONTROL, MODELLING & SIMULATION (ACMOS'08).

ISBN: 978-960-6766-63-3
ISSN: 1790-5117

Published by WSEAS Press: www.wseas.org

Istanbul, Turkey, May 27-30, 2008

Editors
Prof. Metin Demiralp, Istanbul Technical University, Istanbul, TURKEY
Prof. Wasfy B. Mikhael, University of Central Florida, USA
Prof. Amaury A. Caballero, Florida International University, USA
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Prof. M. Nasseh Tabrizi, Univesity of East Carolina University, USA
Prof. Remi Leandre, Universite de Bourgogne, FRANCE
Prof. Maria I. Garcia-Planas, Universitat Politecnica de Catalunya, SPAIN
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All papers of the present volume were peer reviewed by two independent reviewers. Acceptance was granted when both reviewers' recommendations were positive.
See also: http://www.worldses.org/review/index.html

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World Scientific and Engineering Academy and Society

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Preface

This book contains the proceedings of the 10th WSEAS Int.Conf. on AUTOMATIC CONTROL, MODELLING & SIMULATION (ACMOS'08) which was held in Istanbul, Turkey, May 27-30, 2008. This conference aim to disseminate the latest research and applications in Multivariate Analysis, Automatic Control, Dynamical Systems, Robotics, Simulation, Optimization, Modelling, Systems Theory and their Applications in Science and Engineering.

The friendliness and openness of the WSEAS conferences, adds to their ability to grow by constantly attracting young researchers. The WSEAS Conferences attract a large number of well-established and leading researchers in various areas of Science and Engineering as you can see from **http://www.wseas.org/reports**. Your feedback encourages the society to go ahead as you can see in. **http://www.worldses.org/feedback.htm**

The contents of this Book are also published in the CD-ROM Proceedings of the Conference. Both will be sent to the WSEAS collaborating indices after the conference: **www.worldses.org/indexes**

In addition, papers of this book are permanently available to all the scientific community via the WSEAS E-Library.

Expanded and enhanced versions of papers published in these conference proceedings are also going to be considered for possible publication in one of the WSEAS journals that participate in the major International Scientific Indices (Elsevier, Scopus, EI, ACM, Compendex, INSPEC, CSA .... see: www.worldses.org/indexes) these papers must be of high-quality (break-through work) and a new round of a very strict review will follow. (No additional fee will be required for the publication of the extended version in a journal). WSEAS has also collaboration with several other international publishers and all these excellent papers of this volume could be further improved, could be extended and could be enhanced for possible additional evaluation in one of the editions of these international publishers.

Finally, we cordially thank all the people of WSEAS for their efforts to maintain the high scientific level of conferences, proceedings and journals.

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Plenary Lecture I

Classification with Diffuse or Incomplete Information

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USA

Abstract: In many different fields like finance, business, pattern recognition, communication and many other applications, analysts are often faced with the task of classifying items based on historical or measured data. A major difficulty faced by such analysts is that the data to be classified can often be quite complex, with numerous interrelated variables, or incomplete. The time and effort required to develop a model to solve accurately such classification problems can be significant. There could be three major categories that affect directly the performance of the classifier: Ambiguous class labels in the sample data set, Values corrupted by noise or not enough precise sensor measurements, Missing values in the incoming information. Many methods exist for solving the problem: Imputation techniques, Factorial analysis, Decision tree methods, Rule-based methods, fuzzy logic, Neural networks and Bayesian and Dependency Networks. The most important characteristic of a classifier is its generalization ability, permitting to produce decisions based on data not previously seen during the training process. The use of neural networks and fuzzy logic give the analyst a powerful tool for solving the proposed task. The work is focused on analyzing the advantages of these methods, from the point of view of their simplicity and time consuming. Several examples are introduced in order to clarify the presentation.

Brief Biography of the Speaker: Professor Amaury A. Caballero graduated as Electrical Engineer from the University of Havana, Cuba (1966), obtained the Ph.D. in Technical Cybernetics from the Energy Institute of Moscow, Russia (1979) and the Professional Engineer License from the State of Florida, USA (1996). He Worked in teaching and research in the area of Control Systems and Robotics with the Higher Polytechnic Institute of Havana, Cuba, the Technical University of Brno, Czech Republic, the State University of Hidalgo, Mexico, and Florida International University, USA. He has Published two books and over 100 papers in scientific journals and refereed conferences.

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ISSN: 1790-5117

Plenary Lecture II

Real-Time NIR Monitoring of a Pharmaceutical Blending Process through Multivariate Analysis-derived Models

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CANADA
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Abstract: The Quality by Design (QbD) guideline of the USA Food & Drug Administration (FDA) and of the International Conference on Harmonisation (ICH) became lately the major driver of pharmaceutical processes optimization. The majority of these processes are complex and consequently multivariate. Although new insights have improved the knowledge on the phenomena taking place, it is not usually possible to develop deterministic models. Processes involving powders handling like the multi-component pharmaceutical formulations blending are common and the real-time monitoring of their physico-chemical attributes is challenging. This QbD initiative is nowadays possible through the use of Process Analytical Technologies (PAT). In this work we propose a multivariate analysis of a V-blender mixing unit operation using an in-line Near-Infra Red (NIR) measurement technique. For the NIR measurements, a system, consisting of an Axsun IntegraSpec XLP 410 spectrometer connected to an IP-65 encased optical measuring head (sampling probe) through a 1-meter length umbilical wire cord, was used. It uses the Diffuse Reflectance Sampling technology and provides a 40 mm spot size with a spectral range of 1350 nm to 1800 nm. The methodology includes the following steps: (1) modification of a nominal 1 ft^3 (30 l) V-blender unit to accommodate Axsun's NIR spectroscopy system; (2) 3 experimental runs, each with different mixing time, while monitoring powder homogeneity with NIR spectroscopy; (3) acquisition of 10 powder samples after each run from predetermined locations in the V-blender, evaluated both with Axsun NIR spectrometer and current QA/QC Lab methods, to determine mixing end point and (4) data analysis using SIMPA-P+ and GRAMS chemometrics softwares. Two qualitative algorithms (Analysis of Spectral Variance and Distance Analysis using Hostelling T2) for real-time homogeneity determination are developed and their efficiency is evaluated. A quantitative model was derived and tested with success; it relies on the development of a Partial Least Squares (PLS) model in a principal component hyperspace which better describes the blending information.
In all cases, the size of the acquired information is not comparable to the classical "thief analysis" and the result (prediction of the mixing end point) proved equally or more efficient than with actually employed quality control protocols. In addition, this information can be obtained in real-time using chemometric models. The time savings are huge when compared to classical laboratory analysis (i.e. High Pressure Liquid Chromatography). It is expected that any one of the presented NIR analyses can be beneficial on many aspects of pharmaceutical blending, such as: (1) Real-time quality monitoring of current manufacturing batches; (b) Improve process efficiency and performance by selecting adequate process parameters and blending time; (3) Quality by Design (QbD) initiatives during the development of blending processes for new formulas.

Brief biography of the speaker: Dr. Nicolas Abatzoglou is full professor at the department of Chemical Engineering of the Universite de Sherbrooke. He has earned his Ph.D from the NTU Polytechnic School Metsovion, Athens, Greece in 1989. He is co-founder with Professor Chornet of the company Enerkem Technologies Inc., a spin-off of the Universite de Sherbrooke; Enerkem commercializes technologies in the field of energy from renewable resources. N. Abatzoglou has fulfilled the role of vice-president, technology, from 1999 to 2002 to insure the start-up and the necessary technology transfer during the first three years of the company.
He has a career of many years at both the academic and industrial levels. He is a known researcher in the field defined at the junction of Energy & Environment. He represented Canada at the International Energy Agency (Gasification

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Task) from 1997-2001 and was the secretary of the Board of Directors and the Executive Committee of the AQME from 1996-2000. A specialist of the chemical reactors and the use of granular materials in reactive and non-reactive environments Prof. N. Abatzoglou has focused his research activities during the six last years to: a) Establish industry-university R&D collaborative programs with pharmaceutical companies (Wyeth and Merck-Frosst) to study the mechanisms of particulate matter segregation and develop new prediction tools in order to improve the Design and operation protocols of industrial processes within a process Analytical technologies (PAT) context. b) Design, optimize, model and scale-up of a H2S reactive adsorption process for biogas purification in collaboration with an industrial partner (commercialized by Bio-Terre). c) Study water and dry reforming of methane, ethanol and biofuels for catalyst-supported SOFC application (recent US Patent application). d) Develop a technology for Carbon sequestration through CO2 (dry) reforming (recent US patent Application). e) Establish a knowledge base for the study and improvement of technologies leading to higher alcohols and green diesel synthesis from biosyngas (recently approved CRD/NSERC Project). f) Study and simulate the behavior of a new granular hot gas mobile bed filter, patented lately (USA & Canada). His production as a researcher includes more than 50 publications in scientific reviews, international conferences, patents and a book chapter. He currently supervises or co-supervises 10 graduate students, a post-doc fellow and 3 undergraduate students in specialty projects or training sessions. He has won twice the first price in environmental R&D at the Quebec Eastern Townships. He is a recognized chemical engineering teacher (2002, 2003, 2004, 2005, 2006 Bazinet awards for the best Chem. Eng. Professor) at the department of Chem. Engineering of the Universite de Sherbrooke. He teaches mainly: Design of Chemical Processes, Reactor Engineering and Pharmaceutical Process Engineering. Prof. Abatzoglou is trilingual (French, English, Greek) with an average but functional knowledge of Spanish. He has a wide cultural education and a natural ability in team motivation and hard work.

ISBN: 978-960-6766-63-3

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Plenary Lecture III

Risk and Reliability Analysis of Flexible Manufacturing Systems

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ROMANIA

Abstract: Thinking to risk and reliability analysis of flexible manufacturing systems (FMS) from a probabilistic perspective, leads to the conclusion that probability is a measure of expressing uncertainty about the process seen through the point of view of the assessor (i.e. the controller of the process), and based on some background information and knowledge that we have at the time we quantify our uncertainty. A distinction between objective, real risk, and perceived risk cannot be made. Risk is primarily a judgment, not a fact. As risk expresses uncertainty about the process outcomes, risk perception has a role to play to guide the decision of the controller. A number of different types of models are used in risk analysis. These include both quantity-oriented models and event oriented models. It is difficult to give a detailed specification of what a satisfactory model is. How accurate must a model be in order to be considered satisfactory? One may say that a necessary requirement for a risk model is that any improvement in the model to make it more accurate, as judged by the controller, should not lead to a change in the conclusions considered. Also, when analyzing FMS's performance, human and organizational factors need to be taken into account. For instance, the conventional reliability analysis is based on the premise that increasing the reliability of a system will decrease the losses from failures; but an inappropriate increase of the reliability of the system may determine the risk of a simultaneous increase of the losses from the failure. In order to avoid these situations, an efficient discrete-event simulation model has been proposed for reducing the risk of the reliability analysis based on the losses from failure for FMS. The proposed model have been successfully applied and tested for the reliability value analysis of FMS in railway transportation.

Brief Biography of the Speaker: Professor Calin I. Ciufudean is a Honour Member of the Romanian Society of Electrical & Control Engineering - Member of the Romanian Technical Experts Corp and Technical Expert of the Romanian Ministry of Justice. He is also the President of the Romanian Society of Electrical & Control Engineering, Suceava Branch. Professor Calin I. Ciufudean is Assoc. Professor, Dept. of Automatics and Computers, Faculty of Electrical Engineering and Computer Science, "Stefan cel Mare" University of Suceava, Romania. His expertise fields are Discrete Event Systems, Complex Measurement Systems, Reliability and Diagnosis of Control Systems, Environmental Management. He published 6 books and over 120 scientific papers in conference proceedings and

ISBN: 978-960-6766-63-3

ISSN: 1790-5117

Plenary Lecture IV

Fuzzy Techniques in Optimization-Based Analog Design

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Abstract:
The actual trends in VLSI technology are towards the integration of mixed analog-digital circuits as a complete system-on-a-chip. Most of the knowledge-intensive and challenging design effort spent in such systems design is due to the analog building blocks. System level analog design is a process largely dominated by heuristics. While in digital design functionality depends on discrete sequences of discrete signals, continuous sequences (waveforms) of continuous values encode the information we need to manipulate and use in the analog case. For this reason, any second-order physical effect may have a significant impact on function and performance of an analog circuit. Given a set of specification/requirements that describe the analog system to be realized, the selection of the optimal implementation comes mainly out of experience. The current number of analog designers cannot keep up with the demand for analog components. Together with the increasing complexity of the analog blocks, this situation has created an analog- design bottleneck. Consequently, the development of CAD tools that automate and speed up the design process of analogue portions of circuits and systems remains as an active research area in both industry and academia. Fuzzy techniques have been successfully applied in fields such as automatic control, data classification, decision analysis, expert systems, computer vision, multi-criteria evaluation, modeling, optimization, etc. Works showing the possibility of application of fuzzy logic in computer aided design of electronic circuits started to appear in late 1980s and early 1990s. An argument for fuzzy logic application in CAD is derived from the nature of the algorithm used for solving design problems. The majority of algorithms for design synthesis use heuristics that are based on human knowledge acquired through experience and understanding of problems. The natural language, a fuzzy logic language is the most convenient way to express such knowledge. Linguistic descriptions are usually given in fuzzy terms not only because this is the most common form of representation of human knowledge, but also because our knowledge about many aspects of the design is fuzzy. Linguistic information while not precise represents an important source of knowledge. Another important source of knowledge is numerical data. Fuzzy logic systems are appropriate in such situations because they are able to deal simultaneously with both types of information: linguistically and numerical. This paper presents some applications of fuzzy techniques in the design of analog modules. Our research direction turns into account the advantages of fuzzy techniques in the optimization-based analog circuit design field. All the phases of the optimization process (optimization problem formulation, optimization engine, and performance evaluation) involve fuzzy approaches. The multiobjective optimisation problem (MOP) formulation is accomplished in a flexible manner using fuzzy sets to fuzzify the design requirements. The unfulfilment degrees of the requirements (UDR) are used as a measure of objective achievements, getting this way the possibility to consider different degrees for requirement achievements and acceptability degrees for a particular solution. The heart of the optimization algorithm is the optimisation engine. It should provide a rapid convergence toward an optimal solution (ideally global optimum) carrying out the best modification in the design parameters in the iterative process of optimization. The paper proposes two optimization engines based on fuzzy inference systems. The first one, GGFO (Global Gradients Fuzzy Optimization) uses global qualitative dependencies (qualitative gradients) of the performance functions on the design parameters. For every design parameter a zero order Takagi-Sugeno fuzzy system compute a coefficient to modify it, depending on the unfulfilment degrees for all the requirements that depends on that design parameter. The second optimization engine, LGFO (Local Gradients Fuzzy Optimization) is based on local quantitative gradients. For each design requirement, a fuzzy inference system computes a partial coefficient to modify

ISBN: 978-960-6766-63-3

ISSN: 1790-5117

each design parameter, based on the UDR and on the weight of the parameter in the respective performance function. Using these partial coefficients, a final coefficient for modifying each design parameter is inferred. This fuzzy optimization engine acts as a human expert: 1) it is better to modify more the parameter with greater importance, 2) the parameter with lower importance is modified less or not at all, 3) the final modification of a parameter is a weighted sum of the partial modification (the weights being imposed by every objective function). This optimization engine, involving a gradient- like algorithm will provide a local noninferior solution. To obtain a more valuable solution, consisting in a Pareto local noninferior set (specific to MOP) we develop the LFGO optimization engine to use multiple search paths using the concept of population of solutions. In the optimization based analog design the iterative process needs a large number of circuit performance evaluations and this is the most time-consuming task. A very efficient way to reduce the time spent with these simulations is to build efficient models of circuit functions. In this paper, fuzzy systems are used to model each circuit performance, satisfying both main requirements for a model - accuracy and speed. Fuzzy systems are very useful to model the circuit performances because they implies just a few simple mathematical operation and can model any complex, multivariable and nonlinear function at any level of accuracy. These models are automatically built up using a set of input-output data and the ANFIS training procedure in Matlab. Each circuit performance function is modelled by a first order Takagi-Sugeno system, with the circuit parameters as inputs and the performance function as output. Finally, a CAD tool called FADO (Fuzzy Analog Design Optimization) was implemented in the Matlab environment. Using a user-friendly graphical interface, the user can design several basic analog modules. The above mentioned methods and procedures are validated by a large collection of experimental results. Basic analog modules, as common-emitter stage, simple transconductance operational amplifier and Miller operational transconductance amplifier was designed for several sets of design requirements with very good results.

Brief Biography of the Speaker: Gabriel Oltean is currently a Professor with the Electronics, Telecommunications and Information Technology Faculty at the Technical University of Cluj-Napoca, Romania. He received the Ph.D. degree (magna cum laudae) in Electronics and Telecommunications Engineering from the Technical University of Cluj-Napoca, Romania. His research interests include fuzzy techniques application in the analysis and design of electronic circuits, design and FPGA implementation of digital systems, applications of computational intelligence techniques in electronics. He has published more than 45 journal and conference papers. He is the sole author of three books in the field of electronic devices and circuits. He is also a co-author of two books – the first one dealing with fuzzy techniques applications in the design and modeling of electronic circuit and the second one dealing with analog circuits for support vector machine classifiers implementation. He has served as a reviewer for Acta Technica Napocensis. Electronics and Telecommunications Journal, KES2008 International Conference (2008, Zagreb, Croatia), as well as for research project proposals to the Romanian Research Council (CNCSIS). He is member of IEEE (since 2000), IEEE Computational Intelligence Society (since 2005), and IEEE Circuits and Systems Society.

ISBN: 978-960-6766-63-3

ISSN: 1790-5117

Plenary Lecture V

Scenario and Risk Management Simulation for Supporting Strategical Operational Management in Process and Manufacturing Industry

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Italy

Abstract: Modeling and simulation is a powerful tool able to address complex decision making process: it allows the responsible to infer the effect of a decision well in advance and to avoid excessive risky decisions. In literature there several Simulation Methodologies are described, in particular Discrete Event Simulation (DES) is the traditional paradigm used for model manufacturing processes, in such view the problem is describe in term of Entities (nouns) , Resources and Activities (verbs). Several application examples of such vision can be identified in the Steel industry, we have models of steel melting process, of steel rolling mills and of steel treatments. Generally speaking these examples rely on a very hi-fidelity hi-detailed model of the production process that requires a very deep knowledge of the process in order to be properly applied. There are, however, another class of modeling methodologies that are more suitable for strategic planning evaluation rather than for operative/tactical simulations; in such approaches the experimenter create an approximate model of the systems in order to investigate, at a very high level, what could happened to the system in specific cases (scenario simulation). The focus of the simulation is then the robustness of a solution rather that its performances, in literature these example have been extensively presented and discussed: they are known under various names: Monte-Carlo Simulations, Risk Analysis Tools, Strategic Simulations, Worksheet Simulations and many others.
The basic concept underlying this methodology is founded on the creation and evaluation of several scenario according to specific multi-disciplinary criteria: a long term investment plan in the steel industry could be tested against the occurrence of several events (market growth, economy recession, new players appearances, etc.). The simulator creates and evaluate thousands of different “stories” each one carrying one or more occurrences and test the response of the stimulated system to these “events”. In the following bulleted list is possible to identify possible application of such methodology:

- Product mix decisions where demand and resource requirements for each product are uncertain
- Optimal inventory ordering decisions where product demand is uncertain
- Capacity planning and optimal configuration of plant capacities when faced with uncertain demand for a new product
- Capital budgeting and project selection when resources required for available projects are uncertain
- Optimal cash management policy where cash inflows are uncertain
- Capacity planning for utilities where power usage and power prices are uncertain
- Timing market entry decisions where market growth is uncertain, including the possibility of reduced market share due to late entry and danger of limited market growth
- Making test-marketing decisions that maximize product profitability in the face of uncertain demand

Anandalingam (1987) proposed the process model of the Indian iron and steel industry with particular focus on energy use and conservation possibilities. Uncertainty problems in the industry where analyzed by using probabilistic Monte-Carlo simulations, where model parameters where modeled to be stochastic and distributed normally. There is another type of simulation that build on top of the Theory of Systems developed by MIT Professor Jay W. Forrester at the Sloan School of Management, this approach is known as System Dynamics and could be used to create Decisions Cockpits able to dynamically evaluate the effect of a strategical decision. Based on the case of a two-echelon steel

ISBN: 978-960-6766-63-3

ISSN: 1790-5117

industry supply chain, Hafeez et al. (1996) demonstrate the application of Systems Dynamics to supply chains and describe an integrated system dynamics framework, with the aim of giving an example to good total systems design. The modeling exercise deals with the design of a supply chain with respect to moving more rapidly towards a minimum reasonable inventory, whereby the chain exhibits capacity constraints, breakdowns and material supply lead-time bottlenecks. Over the past twenty-five years there has been a significant reduction in UK iron and steel making capacity. This has happened primarily as a result of a deliberate strategy which places emphasis on maintaining or improving financial performance. Dangerfield and Roberts (2000) described the use of a System Dynamics simulation model able to identify an unanticipated but possible scenario of the consequences of this strategy. The model considered both short and long term effects and represented and aid to learning in the face of the complexity which characterizes manufacturing operations. In Author's research group several experiences have been achieved by applying scenario and risk management simulation to real industrial cases, in every application great attention was posed to the integration phase in order to create a Decision Support System (DSS) constantly updated with the real data collected by the Enterprise Data Information System.

- Development of the applicative method and use both Monte-Carlo and Artificial Intelligence techniques (Fuzzy Logic, Neural Networks, Genetic Algorithms) for the solution of off-line and on-line problems of stock management (1998-AMT-SGS Project, Azienda Mobilita e Trasporti) and Production Scheduling (2000-FRINE Project, Marconi Telecommunications).
- Development of Monte-Carlo models of analysis for complex Power Plant maintenance with the PUMA 2001-Project for Ultimate Maintenance in ANSALDO and 2002-TARAS (Finmeccanica Group) Projects.
- Development of an urban network optimization model for the waste collection and treatment, by considering also the extension and application to the differentiated collection with the development of algorithms aiming to the construction of the optimal path and the collection vehicle fleet dimensioning (2006-PING Project).
- Development of a System Dynamics Model for supporting complex decision making in Pharmaceutical Industry (2007-IB Informatica)
- Development of a Monte-Carlo model for supporting the Risk Identification and Mitigation in dangerous goods logistics and transportation (2006-Provincia di Savona Project)
- Development of a simulation meta-model for supporting the investments stream allocation in manufacturing industry (2005-Whirlpool Europe Project)

The possibilities offered to Process and Manufacturing Industry by Monte-Carlo and System Dynamics simulation are many, in particular is possible to create a model for supporting the evaluation of an investments plan by identifying the more promising investment streams within a constrain of a limited budget, in this way the model will identify the most robust strategy able to maximize profits. The implementation of a Decision Cockpit is another possibility offered by the system Dynamics methodology, the simulator will be connected to the company ERP (i.e. SAP R/3) that will keep "warm" the mod el with the real life system allowing complex what if scenarios evaluation through the use of a very user friendly graphical user interface. The user will have "handles", "sliders" and "joysticks" to control the model and to interact with it obtaining the real-time reaction in a simple widget panel.
There are other possibilities that can be explored based upon a specific needs since scenario and risk modeling and simulation remains one of the most promising methodology in the field of the Strategical Operation Management.

Brief Biography of the Speaker: In 1991 he takes the Commercial School leaving diploma of Accountant and Estimator and then holds the role of administrator for "RPM snc di Revetria P&R Costruzioni Impianti Frigoriferi Industriali" Company. In 1997 he participates to ICAMES with the WOLVES project winning the Prize for the best algorithm about the Prisoner Dilemma "Bush-8". He gets the degree with honours in 1998 and wins the 4° Competition for Italian Navy Reserve Officer Cadet; in July 1999 he is appointed Acting Sublieutenant in the Naval Army Corps. From July 1998 to July 1999 he is attached to the Control and Testing Service Head Office (Capo Servizio Controllo e Collaudi) of the Military Maritime Arsenal of Taranto where he holds the role of Responsible for the on land bodies Control and Testing. During this period he develops a strong experience not only in management and testing of the Technical Plants (Desalination Plants, Frigorific Cells, Sewage Drainage Plants) and Civil Works (Building up of 3 lighthouses, re-engineering of the Artillery Maintenance Department (Settore Manutenzione Artiglierie), but also in testing of on Board Scaffolds and in re-organisation of the Control and Testing Service of the on Land Bodies, coordinating 15 persons. During 1998 he wins the Scholarship for the XIV Cycle Doctoral Program at the University of Parma - Faculty of Engineering which ends with success in October 2001 by getting the title of PHD. On December 20, 2000 he passes the exam for the Level D Project Manager IPMA Certificate. On November 2001 he wins the Competition for the role of Researcher at the University of Genoa where he takes service at the Department of Production Engineering. The personal experience achieved in the construction of computer-aided analysis models and tools brought him to develop complex software using multipurpose (C/C++, Java, Tcl/Tk, Python, Php, Fortran, Pascal, VBA) and dedicated (Automod, Simul8, ESL, GPSS/H, Arena, Witness) languages. Up today he

ISBN: 978-960-6766-63-3

ISSN: 1790-5117

has been working in the development of the mentioned software above all in the Windows, Linux and Mac environments by acquiring experience on the main applications and office automation packs. He makes use and develops models in virtual reality for the Virtual Design by exploiting also Web-Oriented graphic environments (Atmosphere, Java 3D, Blender, Vega Prime, Multigen-Creator). On March 2004 he wins the Competition for the role of Associated Professor at the University of Parma. He is, as well, Associate Director of the McLeod Institute of Simulation Science (MISS) - San Diego CA, USA.

ISBN: 978-960-6766-63-3

ISSN: 1790-5117

Plenary Lecture VI

Adaptive Sliding Mode Control for an Interior Permanent-Magnet Synchronous Motor

Professor Arash Kiyoumarsi
Faculty of Engineering
University of Isfahan
Iran

Abstract: An adaptive sliding controller will be proposed for the control of an interior permanent-magnet (IPM) synchronous motor-drive. A backstepping-like design is used to deal with the mismatched-uncertainties problem and the function approximation method is employed to transform the uncertainties into finite combinations of orthonormal basis functions. Adaptive laws are derived based on the Lyapunov-like design.

Brief Biography of the Speaker: Arash Kiyoumarsi was born in Shahr-e-Kord, Iran, on September 11th, in the year 1972. He received B.Sc. (with honors) from Petruliom University of Technology (PUT), Iran, in electronic engineering in 1995 and M.Sc. from Isfahan University of Technology (IUT), Iran, in electrical power engineering in 1998. He received Ph.D. degree from the same university in electrical power engineering in 2004. In March 2005 he jointed the faculty of University of Isfahan, Department of Electrical Engineering as an assistant professor. He was a Post-Doc. research fellow of the Alexander von Humboldt foundation at the Institute of Electrical Machines, Technical University of Berlin from February to October 2006 and July to August 2007. His research interests have included application of finite element analysis in electromagnetics, interior permanent-magnet synchronous motor drives, shape design optimization, chaos and applied non-linear control and power system harmonics and unbalances.

ISBN: 978-960-6766-63-3

ISSN: 1790-5117

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