Time	Track 1	Track 2
Wednesday, 30.10.2013.		
08:00-09:00	Registration	
08:30-09:00	Opening Ceremony	
09:00-10:00	**Plenary Talk 1** Magdi Sadek Mahmoud KFUPM, KSA	
10:00-11:00	**Plenary Talk 2** Veljko Milutinovic University of Belgrade, Serbia	
11:00-11:30	Coffe Break	
11:30-13:30	**Regular Session 1** Networked Based Systems and Control	**Tutorial 1** Control Allocation & Fault-Tolerant Control Systems
13:30-14:30	Lunch	
14:30-16:30	**Regular Session 2** Control Applications	**Regular Session 3** Data Mining and Web Information Systems
16:30-17:00	Coffe Break	
17:00-19:00	**Regular Session 4** Electric Machines, Drives and Inverters	**Workshop 1** Rohde & Schwarz Industrial Presentations Regional Initiative: TV WEB
19:00-20:00	**Round Table** Internet of Things	
20:30-22:00	Welcome Cocktail	
Thursday, 31.10.2013.		
09:00-10:00	**Plenary Talk 3** Eduardo Camacho	

	University of Seville, Spain	
10:00-10:30	Coffe Break	
10:30-12:30	**Regular Session 5** Adaptive, robust and optimal control	**Workshop 2** Safety Aspects for Automation and Process Industries
12:30-13:30	Lunch	
13:30-15:30	**Regular Session 6** Model based, Predictive and Distributed Control	**Tutorial 2** Enhancing Customer Experience over Broadband Access Networks
15:30-16:00	Coffe Break	
16:00-18:00	**Regular Session 7** Intelligent Systems and Applications	**Regular Session 8** Mathematical Methods in Engineering
19:00-22:00	Gala Dinner	
Friday, 01.11.2013.		
09:00-10:00	**Plenary Talk 4** Bruno Siciliano University of Naples Federico II, Italy	
10:00-10:30	Coffe Break	
10:30-12:30	**Regular session 9** Robotics and Mechatronics	**Tutorial 3** Data Mining from Social and Knowledge Networks
13:00-14:00	Lunch	
14:00-15:20	**Regular Session 10** Modeling, Identification and Simulation	**Regular Session 11** Image Processing, Analysis and Retrieval
15:30-16:00	Closing Ceremony	

Plenary Talk 1:
Magdi Sadek Mahmoud: "An Introduction to Wireless Automation"

Chairs:

Date: 30.10.2013

Time: 09:00-10:00

Room:

An Introduction to Wireless Automation

Magdi S Mahmoud, Systems Engineering Department, King Fahd University of Petroleum and Minerals, Saudi Arabia

The use of wireless sensor networks (WSN) in industrial automation has recently gained increasing attention. Admittedly, WSN are technically challenging systems, requiring expertise from several different disciplines. Therefore, the information about important design criteria is often scattered. Additionally, characteristics for the industrial automation applications are often stricter than the other domains, since the failure of the communication system may lead to loss of production or even lives. The importance of gaining experience of applying wireless sensor networks to process automation environments has been addressed in the literature. The experience is important, as it can be used to show, as well as to get rid of, the problems in the current technology, and to enable larger variety of applications.

This presentation attempts to give an overview about the emerging and already employed wireless technologies in process automation.

The presentation initially provides an overview of feedback control history to trace the technological advances ending by networked control systems. Followed the are wireless technologies and motivation for wireless control systems and wireless automation.

Plenary Talk 2:
Veljko Milutinovic: "SuperComputers: ControlFlow versus DataFlow"

Chairs:

Date: 30.10.2013

Time: 10:00-11:00

Room:

SuperComputers: ControlFlow versus DataFlow

Veljko Milutinovic, University of Belgrade, Serbia

This presentation analyses the essence of DataFlow SuperComputing, defines its advantages and sheds light on the related programming model. DataFlow computers, compared to ControlFlow computers, offer speedups of 20 to 200 (even 2000 for some applications), power reductions of about 20, and size reductions of also about 20. However, the programming paradigm is different. The later part of the talk explains the paradigm, using Maxeler as an example (Maxeler is 20% owned by JPMorgan), and sheds light on the ongoing research in the field. Examples include GeoPhysics, FinancialRiskAnalysis, DataMining.

Session 1:
Networked Based Systems and Control

Chairs:

Mirko Franceschinis, Istituto Superiore Mario Boella, Italy

Iman Samizadeh, London Metropolitan University, UK

Date: 30.10.2013

Time: 11:30-13:30

Room:

Adaptive Scalable Rate Control over IEEE 802.15.4 using Particle Swarm Optimization

Iman Samizadeh Iman Samizadeh, Hassan Kazemian, Ken Fisher, Karim Ouazzane, (London Metropolitan University), UK

The IEEE 802.15.4 standard, known as ZigBee, is limited to a through-rate of 250kbps providing support for small packet file transitions and it is designed to provide highly efficient connectivity with low power-usage. ZigBee is commonly used in wireless architecture and in controlling and monitoring applications. ZigBee's cost effective potential makes it highly likely that it will soon be used to transfer large amounts of data or stream video. However, ZigBee's current bandwidth is very low for video transmissions over IEEE 802.15.4 networks, therefore this will be difficult to achieve. Additionally, the ZigBee limitation could become a real problem if the user wishes to transmit a large amount of data in a very short time. Hence, in this paper a solution has been accomplished by applying Particle Swarm Optimization to Scalable Rate Control in order to increase the available bandwidth, which leads to both an improvement in the quality of picture and a reduction in the data loss when transmitting MPEG-4 video over the ZigBee wireless sensor networks.

Predictive Monitoring of Train Wagons Conditions Using Wireless Network Technologies

Mirko Franceschinis, Francesco Mauro, Claudio Pastrone, Maurizio Spirito (Istituto Superiore Mario Boella), Mario Rossi (SKF), Italy

Predictive monitoring of train wagons can allow to anticipate possible malfunctioning due to wear and avoid potential accidents. In this paper some network architectures adopting low-power wireless communication technologies are introduced. A performance comparison is provided based on ns-2 simulation results, suggesting that the combined use of WSN and WiFi in a hierarchical architecture is adequate for long trains with several coaches and a large number of sensing nodes.

Resilient Decentralized Stabilization of Interconnected Networked Systems

Magdi Mahmoud, (KFUPM), Saudi Arabia

The problem of designing dynamic output-feedback schemes for a class of linear interconnected continuous-time systems employing networks in the feedback loop is reformulated in this paper as a resilient decentralized delay-dependent feedback stabilization where the subsystems are subjected to convex-bounded parametric uncertainties and additive feedback gain perturbations. Through the construction of appropriate Lyapunov-Krasovskii functional, we characterize resilient decentralized dynamic output-feedback stabilization schemes are designed such that the family of closed-loop feedback subsystems enjoys the delay-dependent asymptotic stability. The decentralized feedback gains are determined by convex optimization over LMIs. The developed results are tested on a representative example.

Automatic FIBEX Generation from CANdb for FlexRay Network

Younghun Song, Suk Lee (Pusan National University), KyungChang Lee (Pukyong National University), Korea

As vehicles become more intelligent for safety and convenience of drivers, IVN(In-Vehicle Network) requires high speed of transmission and hardware redundancy for safety. FlexRay was developed to replace Controller Area Network (CAN) protocol in chassis networking systems to provide mote transmission capacity and shorter real-time transmission delay. However, FlexRay has many related parameters such as base cycle and slot lengths to be determined in the design stage. To assist vehicle network designers in configurationg a FlexRay network, this paper presents automatic field bus exchange format (FIBEX) generation method for migration from CAN message format such as CANdb to FlexRay FIBEX format.

Consensus over Multi-Hop Networked Systems subject to Heterogeneous Time Delays

Sabato Manfredi, (University of Naples Federico II), Italy

Today great attention it has been posed on the consensus protocols that allow every agent automatically converge to a common consensus state using only local information received from its one hop neighboring agents. We consider the problem of reaching a consensus in multi-hop networked systems where each agent can access to the state of its m-hops neighboring agents. Additionally the presence of heterogeneous time delays affecting the communication through the multi-hop path is considered. Multi-hop and link time delay are unavoidable features of realistic networked system architectures based on wireless sensor networks. In this scenario, we derive condition to reach a consensus which is an explicit function of the system parameters including the delay bound, network topology, number of hop. Also a tradeoff between the convergence speed and the time delay is discussed.

Cooperative Load Balancing Algorithm in multiple bottleneck Networks

Sabato Manfredi, (University of Naples Federico II), Italy

In this paper we validate the recent introduced cooperative load balancing algorithm ([6]) in a multiple bottleneck scenario. The controller at each router (server or switch) regulates the rates of the heterogeneous sources leveraging on the cooperation of neighboring bottlenecks. The proposed approach guarantees good performance in terms of link utilization, packet loss and fairness. Additionally it is guaranteed queue balancing without requiring rerouting or hop by hop operation differently from the existing approaches. A validation is carried out by a discrete packet experiment simulator in a realistic multibottleneck scenario to demonstrate the effectiveness of the key idea of the paper.

Tutorial 1:
Control Allocation & Fault-Tolerant Control Systems

Coordinator:

Edin Omerdic, University of Limerick, Ireland

Date:	30.10.2013
Time:	11:30-13:30
Room:	

Control Allocation & Fault-Tolerant Control Systems

Edin Omerdic, University of Limerick, Ireland

Typically, open-frame underwater vehicles have p>=4 actuators (thrusters) for the motion in the horizontal plane and the control allocation problem in this case is very complex and hard to visualise, because the normalised constrained control subset is p-dimensional unit cube. The aim of this tutorial is:
- to introduce and define general control design problem based on control allocation.
- to formulate problem for class of underwater vehicles with p=4 actuators (thrusters).
- to give a clear picture and a geometric interpretation of the problem using low-dimension example.
- to present existing methods for its solution and to introduce a hybrid approach, based on the integration of a pseudoinverse and the fixed-point iteration method, which is able to allocate the entire attainable command set and finds the solution optimal in l2 sense, i.e. which minimises the control energy cost function.
- to discuss fault tolerance and implementation issues.
- to demonstrate unique visualisation of control space.
- to present results from sea trials - real-world application of proposed algorithm.
- to demonstrate live demo of proposed algorithm through Internet remote control of UL real-time ROV simulator (running in Ireland) from Sarajevo.

Session 2:
Control Applications

Chairs:	Date:	30.10.2013
Ryoichi Suzuki, Kanazawa Institute of Technology, Japan	Time:	14:30-16:30
Andrej Zdešar, University of Ljubljana, Slovenia	Room:	

Hierarchical Control of Combined Power Control Resources Mitigating Local Power Grid Fluctuations

Cedric Bodet, Anett Schuelke, (NEC Europe Ltd.), Germany

Power grid fluctuations are an increasing concern in power grids with high penetration of intermittent generation sources. This paper describes a hierarchical control scheme defined by the dynamics of actually de-coupled power units over possibly different business domains into an integrated control scheme providing fluctuation mitigation. Specifically, a method built on the combination of charging control of a variable EV fleet and a small-scale energy storage system in prioritized control hierarchy is investigated with its impacts on both domains. The control hierarchy uses the EV charging dynamics as prime resource for the mitigation of local generation fluctuations and accommodates the residual lack with local electric storage. The underlying two-layer control algorithms is evaluated through simulations of a residential grid segment combining different grid resources in its dynamic manner. The results show significantly enhanced performance for effectively reducing the energy surplus-needs through the prime control layer (here: EV charging), but also the need for careful design of a secondary power capacities (here: storage).

High Performance Disturbance Observer based Control of the Nonlinear 2DOF Helicopter System

Almir Salihbegovic, Emir Sokic, Nedim Osmic, Mujo Hebibovic (University of Sarajevo), Bosnia and Herzegovina

This paper addresses the challenges of the disturbance observer (DOB) algorithms faced with highly nonlinear electromechanical systems which are dealing with high resolution and high speed operations. It describes the synthesis of robust and stable controllers and their applications in controlling azimuth and elevation angles of the helicopter model CE 150 supplied by Humosoft. Description of the helicopter, including its mechanical characteristics and mathematical model, is given in the paper. Tracking error, transient performances, power consumption and motor strains are used for the validation of control quality. Implementation of the control system on the experimental setup is also explained. MATLAB and Simulink are used as tools for developing the simulation model of the helicopter system. Obtained simulations are showing that developed controllers provide significantly improved results even in the presence of unknown and unpredictable inputs (disturbance and noise), unpredictable and unknown dynamics, external forces (torques) and change of the system parameters.

Estimation and control of brush pressure by using IMC based controller

Ryoichi Suzuki, Suguru Kuzuhara, Nobuaki Fujiki, Hiroyuki Kawai, Nobuaki Kobayashi (Kanazawa Institute of Technology), Japan

In this paper, we propose the control method of a writing robot for reproducing brush pressure and trajectory without force sensors. The main goal of this research is to estimate and save the brush pressure by using the internal model control. In order to evaluate the proposed controllers, the experimental device is developed. The paper shows that the proposed controller is able to reproduce the brush pressure on flat and inclined surface through experiments.

Dynamical Compensation of Bounded External Impacts for Yaw Stabilisation System

Mikhail Smirnov, Maria Smirnova (St.Petersburg State University), Russia

In this paper, one of the most important problems concerned with the automatic control for marine ships, namely the problem of suppression of external disturbances act on a ship, about which we have no information except its boundedness, is considered. The new method of suppression of bounded disturbances is proposed. The control is sought as a static state feedback. The requirement of the desirable degree of stability is also fulfilled.

Modal Synthesis of Astatic Controllers for Yaw Stabization System

Mikhail Smirnov, Maria Smirnova (St.Petersburg State University), Russia

In this paper, the problem of choosing the parameters of the controller that provide the desired dynamics of the closed-loop system is considered. The structure of the astatic controller for the marine ship, oriented to implementation of all requirements to the quality of dynamic processes is performed. The method of the computer search for the coefficients of the stated control law is offered, computer modeling of the dynamic processes is performed.

Design of the image-based satellite attitude control algorithm

Andrej Zdešar, Gregor Klančar, Gašper Mušič, Drago Matko, Igor Skrjanc, (University of Ljubljana), Slovenia

This paper presents the design of the image-based control algorithm for interactive Earth observation. The image-based control algorithm is obtained from the modelling of the satellite pose in space. It is shown that the image-based control algorithm can be designed for two types of satellite attitude control problems: direction tracking and oriented-direction tracking. The reference target is not limited to the camera centre, but can be given anywhere in the image. The image-based control algorithm requires in-image tracking of one or two points on the Earth's surface (depending on the type of the controller). To achieve robust image-based tracking, the general framework for tracking points on the Earth's surface, which is assumed to be locally flat, is presented. The method is based on geometric local image features that are invariant to several image transformations and change in some environmental conditions. The presented methods are experimentally validated in simulation environment.

Session 3:
Data Mining and Web Information Systems

Chairs:	Date:	30.10.2013
Alan Sprague, University of Alabama at Birmingham, USA	Time:	14:30-16:30

Using Closed Frequent Sets to Cluster Malwares

Alan Sprague, Adam Rhodes, Gary Warner, (University of Alabama at Birmingham), USA

The static analysis of malwares at UAB starts with the receipt of about 5000 malwares each day. One of our goals is to cluster these malwares into families. Each malware is an executable. For processing, we represent each malware by the set of printable strings that it contains. A method we have pursued to cluster malwares into families starts with the data mining technique of generating frequent itemsets. It is difficult to generate frequent itemsets at low support thresholds, which is what our application demands. This paper discusses our successful efforts to overcome this barrier of low support threshold.

Importance of Stable Velocity in Agile Maintenance

Samir Omanovic, Emir Buza, (University of Sarajevo), Bosnia and Herzegovina

Agile maintenance is the best choice if you want to keep step with your customer needs. It is a result of trying to respond to customer change requests with the high efficiency. High involvement of the customer in the maintenance process is good but also can have negative effects. Change in the behavior of the customer can influence the execution of the change management process or cause the change of the release plan, etc. All that can destabilize normal maintenance velocity and lead to a chaotic relationship with the customer, if not controlled or prevented. This paper describes problems in agile maintenance caused mostly by the change of the customer behavior at the beginning of the economic crisis. It also presents results of the analysis of these problems and recommendations how to identify them and how to prevent them.

A Parallel Algorithm to Induce Decision Trees for Large Datasets

Joel Suárez-Cansino, Anilú Franco Árcega, Linda Gladiola Flores Flores, (Autonomous University of the State of Hidalgo), Mexico

This paper introduces a new parallel algorithm called ParDTLT and discusses some of its advantages with respect to a set of well known sequential and parallel algorithms. The parallel process occurs in every node in the decision tree, which is constructed during the supervised training phase. The basis of the distribution of a parallel task is on the attributes of the training objects and the growing of the tree is based on two criteria, who are defined by the maximum number of training objects that every node can support and an entropic gain ratio criterion. Different experiments have been made to compare the behavior of the parallel algorithm ParDTLT with the behavior of the sequential algorithms C4.5, VFDT, YaDT and DTLT and with the parallel algorithm called Synchronous. The experimental results show that ParDTLT keeps the quality of classification and it reduces the execution time.

Selecting Samples for Labeling in Unbalanced Streaming Data Environments

Hanqing Hu, Mehmed Kantardzic, Tegjyot Singh Sethi, (University of Louisville), USA

In this paper we proposed an alternative approach to random selection for labeling extremely unbalanced stream data sets where one class is only 1-10% of the entire data set. Labeling, especially when human resources are needed, is often time consuming and expensive. In an extremely unbalanced data set, usually a lot of data points need to be labeled to get enough minority class samples. The goal of this research was to reduce the total number of samples needed in the labeling process of training new classification models for updating streaming data ensemble classifier. Our proposed approach is to find minority class clusters using the grid density algorithm, and sample minority class instances inside those regions. The result from the synthetic data set showed that efficiency of our proposed approaches varies with different grid sizes. Results on real world data sets confirmed that observation, and showed that when the data set has high dimensionality, dimensionality reduction was useful for reducing the number of grids in the data space increasing sampling efficiency. Our best results showed 19.4% improvement for an eight-dimension data set without dimensionality reduction, and 27.4% improvement for a thirty-six-dimension data set with dimensionality reduction.

ReadGoGo!: Towards Real-Time Notification on Readersï¿½ State of Attention

Mohamad Eid, Andres Fernandez, (New York University Abu Dhabi), United Arab Emirates

In this paper we present ReadGoGo!, a system that reminds readers when they are not focusing on the texts at hand. Towards developing such real-time system, we used a commercial ECG device, Mindwave by NeuroSky, to measure the attention level of readers, and combine the measurement with visual-based information. Existing related works involve only clinical experiments using EEG sensors to understand brain activities from specific set-ups. Little has been done to distinguish mental states between focusing and losing focus on word texts. In addition, there exist few market solutions, and most of them are not automated. The proposed system can automatically remind the reader when she/he is losing focus and eventually help the reader to quickly regain his/her focus on the text at hand. The implementation and usability analysis has demonstrated the ability of the proposed system to help readers regain attention during reading sessions.

New Web Information Retrieval paradigm based on a Multi-Space Interpretation Index and Projection operations

Mehdi Adda, Amel Hannech, Hamid Mcheick, (University of Quebec At Chicoutimi), Canada

Classical search engines rely mainly on keyword matches. More advanced search engines and information retrieval systems use personalization techniques to enhance the relevancy of the results. Those approaches assume that the current search of a user is directly related to his/her profiles and/or past navigation/search experience. However, this assumption does not hold in all cases. In this paper, we are proposing an information retrieval approach that is not making any assumption about the user. It offers a straightforward way to choose and navigate the available interpretations. Our approach relies on a navigation model that is based on a new paradigm called multi-space interpretation index and projection operations. We have derived a mathematical model of a Web information retrieval system based on the new paradigm. This concept naturally distinguishes between the different interpretation layers (each layer is a separate space). Therefore, it offers to users the flexibility to navigate the interpretation spaces in such a way that suites better their information needs.

Session 4:
Electric Machines, Drives and Inverters

Chairs:

Carlos Meza, ICTP, Italy

Date: 30.10.2013

Time: 17:00-19:00

Branko Blanuša, University of Banja Luka, Bosnia and Herzegovina Room:

A Novel Approach to Analytically Modeling Switched Reluctance Machine

Senad Smaka, Semsudin Masic, (University of Sarajevo), Bosnia and Herzegovina

This paper presents a novel analytical model for computation of the switched reluctance machine's (SRM) nonlinear magnetization characteristic and torque lookup table. The flux-tube and the gage-curve methods are used to develop the novel analytical model. Presented model is used for computation of the magnetization characteristic and torque lookup table of three and four phase SRMs. The simulation results obtained using proposed analytical model are compared to finite-element method (FEM) results. Experimental verification of the analytical model is presented for an 8/6 SRM.

The Effects of Magnetic Circuit Geometry on Torque Generation of 8/14 Switched Reluctance Machine

Senad Smaka, Mirsad Cosovic, Semsudin Masic, (University of Sarajevo), Bosnia and Herzegovina

The effects of magnetic circuit geometry on torque generation of switched reluctance motor with higher number of rotor poles are investigated in this paper. Specifically, the torque generation of novel switched reluctance machine with 8 stator and 14 rotor poles (SRM 8/14) is explored. A few suggested values of design ratios are derived for this novel SRM. The machine characteristics are computed using two-dimensional finite element method (2-D FEM).

Optimal Flux Control of Elevator Drive

Branko Blanusa, Bojan Knezevic, (University of Banja Luka), Bosnia and Herzegovina

Modern gearless elevator drives have ability to control speed and other parameters of motion like a jerk. Also techniques for indirect vector-control of induction motor provides possibility for efficiency optimization. This paper describes control algorithm based on optimal control. It combines two crucial elements for elevator drive, smooth motion which increase comfort of elevator passengers and minimum energy consumption for one elevator drive. Validity of suggested algorithm is tested through computer simulations.

Control and estimation scheme for PV central inverters

Carlos Meza, (ICTP), Italy, Romeo Ortega, (SUPELEC), France

Photovoltaic (PV) systems that inject energy directly to the grid have attracted much attention over the last years due to their lower cost per watt with respect to other photovoltaic applications and the incentives that governments offer for such systems. In a grid-connected PV system a power inverter is required to optimize the energy transfer from the photovoltaic modules to the power grid. Considering the nonlinear time-varying nature of grid-connected PV systems allows to obtain well-defined mathematical description of the problem that can be useful for the design of control schemes. Nevertheless, control structures that explicitly take into account the non-linear electrical model of the PV modules usually depend on parameters that are unknown and/or difficult to measure. Consequently, such controllers should normally be used with estimator schemes. In the present paper a control and estimator scheme for a fullbridge central PV inverter which is valid for a wide range of PV technologies is presented. As shown with a simulation study, the required control objectives have been achieved and the unknown temperature dependent have been correctly estimated.

On-line parameter tuning of discontinous fuzzy friction compensator in linear drive

Marcin Jastrzębski, (Lodz University of Technology), Poland

This paper presents an adaptive algorithm to control the position of the linear motor. The algorithm uses the discontinuous fuzzy model of friction with extended functions of consequence in rules. Learning data for tuning the model were collected with using parametric observer for identifying friction. For tuning off-line model, bacterial evolutionary algorithm was used. Adaptive part of the control algorithm was used for the calculation of the friction correction factor. The corrected value of the modeled friction force was used for on-line tuning of fuzzy friction model. The effectiveness of the proposed solution was verified in the real mechatronic system.

An Algorithm for Boost Converter Efficiency Optimization

Zeljko Ivanovic, Branko Blanusa, Mladen Knezic, (University of Banja Luka), Bosnia and Herzegovina

In this paper, an algorithm based on the technique of variable switching frequency is applied, so that working point of boost converter is at the boundary between continuous and discontinuous working mode aiming at achieving maximum efficiency of the converter. Controller is based on variable switching frequency and measuring the voltage on the main converter switch. The proposed algorithm is verified by the simulations and experimental measurements on a converter prototype.

Workshop 1:
Rohde Schwarz Industrial Presentations
Regional Initiative: TV WEB

Coordinator:

Mesud Hadzialic, University of Sarajevo, Bosnia and Herzegovina

Date: 30.10.2013

Time: 17:00-19:00

Room:

Presentation VALUE series of instruments of producers H and R. (A brief overview of the instruments and presentation of companies.)

The plans of building a broadband Internet access to European households are behind the schedule due to a lack of investment in broadband infrastructure. Some of the less advantaged areas in Europe are even without any Internet access. Therefore alternative concepts of delivering Internet experience and content are being developed. An example is an international project TV WEB (TV WEB, 2013) funded by the European union, whose idea is to use the free digital terrestrial television (DTT) broadcasting frequency spectrum capacities for transmitting selected Internet content

(such as news, e-services etc.), thus ensuring a sort of Internet experience via TV devices. The target groups are certain less advantaged segments of the population, or those in rural areas without broadband access. The goal of the workshop is to present research results, system solution and TV web application developed in order to ensure a kind of 'push content' experience, which should allow for interactive experience without an existing return channel. This means that users can receive information but can't input or send data. The project pilot setups will be deployed and tested in six European countries.

Next generation of digital oscilloscopes - working principles and applications (In this presentation basic principles of digital oscilloscopes are explained. Working principle and applications od DIGITAL TRIGGER SYSTEM is emphasized. Importance of 1000 000 acquisition/ second is particularly explained as well as importance for reliability of failure detection. Usage of ASIC for hardware accelerated FFT and other mathematical functions are detailed described)

Round table:
Internet of Things

Moderator:

Kemal A. Delic, Hewlet-Packard, France

Date: 30.10.2013

Time: 19:00-20:00

Room:

Round table: Internet of Things

Participants:

Kemal A. Delic (HP, ACM Ubiquity - Associate Editor), Ed Parsons (Google), Paolo Faraboschi (HP), Dejan Milojcic (IEEE-Computer society, President Elect 2013), Maja Vukovic (IBM), Milan Milenkovic (Intel), Mladen Vouk (UNC)

Agenda:

1. How would you define Internet of Things from your perspective?

2. What do you see as the tipping point, enableing this 3rd Internet revolution? Sensors, CPUs, OS, networks, applications...

3. Some obstacles would be inevitable - Which? And how do you see them suprassed?

4. Envisioning tomorrows's IoT world... How it will look like? Angelic - Demonic face of it?

Thursday, 31.10.2013.

Plenary Talk 3:
Eduardo Camacho: "Control of Solar Energy Systems"

Chairs:	Date:	31.10.2013
	Time:	09:00-10:00
	Room:	Banjaluka

Control of Solar Energy Systems

Eduardo Camacho, (University of Seville), Spain

There is a renewed interest in the use of renewable energies nowadays driven by the need of reducing the high environmental impact produced by the use of fossil energy systems. There are two main drawbacks of energy systems: a) the resulting energy costs are not yet competitive and b) solar energy is not always available when needed. Considerable research efforts are being devoted to techniques which may help to overcome these drawbacks; control is one of those techniques. A thermal solar power plant basically consists of a system where the solar energy is collected, then concentrated and finally transferred to a fluid.

The thermal energy of the hot fluid is then used for different purposes such as generating electricity, the desalination of sea water etc. While in other power generating processes, the main source of energy (the fuel) can be manipulated as it is used as the main control variable, in solar energy systems, the main source of power which is solar radiation cannot be anipulated and furthermore it changes in a seasonal and on a daily base acting as a disturbance when considering it from a control point of view. Solar plants have all the characteristics needed for using advanced control strategies able to cope with changing dynamics, (nonlinearities and uncertainties). The talk describes the main solar thermal plants, the control problems involved and how control systems can help in increasing their efficiency. Some illustrative examples are given.

Session 5:
Adaptive, robust and optimal control

Chairs:	Date:	31.10.2013
Hamid Reza Karimi, University of Agder, Norway	Time:	10:30-12:30
Zeeshan Shareef, University of Paderborn, Germany	Room:	

Mixed Sensitivity Based Dynamical Anti-Windup Compensator Design using LMI: An Application to Constrained Hot Air Blower System

Zeeshan Shareef, (University of Paderborn), Germany, Abrar Ahmed, Naeem Iqbal, (Pakistan Institute of Engineering and Applied Sciences), Pakistan

There are always some type of constraints present in the all physical systems and these constraints or saturations produce the windup effect. This paper describes the design and implementation of a new dynamical Anti-Windup Compensator (AWC) scheme to remove the windup effect. In the new antiwindup scheme the state space matrices of the mixed sensitivity controller's parameters are used in the coprime factorization of the AWC to provide the robustness and optimize it using the Linear Matrix Inequalities (LMI). The mixed sensitivity controller designed in this technique is based on the direct method, that is easy to design and do not involve complex calculations and algorithms. This new mixed sensitivity based AW scheme can work for other types of linear controllers other than mixed sensitivity controllers. This new scheme is applied to the benchmark plant with linear controllers and the results and compared with the already existing techniques. To prove the validation of this new proposed AW scheme, it is applied to a hot air blower system and practically results are discussed and compared with simulation results. This paper aims to support the industrial application of the new AWC scheme ensuring stability and performance.

Exponential Stability Analysis of Markovian Jump Nonlinear Systems with Mixed Time Delays and Partially Known Transition Probabilities

Hamid Reza Karimi, (University of Agder), Norway, Bo Wang (University Electronic Science and Technology of China), China, Peng Shi, (The University of Adelaide), Australia

In this paper, the problem of exponential stability is studied for a class of Markovian jump neutral nonlinear systems with mixed neutral and discrete time delays. By Lyapunov-Krasovskii function approach, a novel mean-square exponential stability criterion is derived for the situation that the system's transition rates are partially or completely accessible. Finally, some numerical examples are provided to illustrate the effectiveness of the proposed methods.

A Passivity Approach to Control of Markovian Jump Systems with Mixed Time-Varying Delays

Hamid Reza Karimi, Bahador Makki, B. Makki, (University of Agder), Norway

This paper investigated the problem of control design for a class of stochastic systems with Markovian jump parameters and time-varying delays. For the model under consideration, a passivity-based approach is introduced for designing mode-dependent output feedback controllers with mixed discrete and distributed delays. A Lypunov-Krasovskii function (LKF) is defined to establish new required sufficient conditions for ensuring exponentially mean-square stability and the passivity criteria, simultaneously. Moreover, controller gains are calculated based on a convex optimization method by solving a Linear Matrix Inequality (LMI). Finally, simulation results are provided to illustrate the effectiveness of our approach.

State Dependent Riccati Equation Based Model Reference Adaptive Control Design for Nonlinear Systems

Naser Babaei, Metin Salamci , (Gazi University), Turkey

A new model reference adaptive control (MRAC) algorithm is presented for a class of nonlinear systems. The proposed MRAC method uses a nonlinear reference model whose controller is designed by using the so-called State Dependent Riccati Equation (SDRE) techniques. The controller designed for the nonlinear reference model is then adapted for the (presumably unknown or uncertain) nonlinear plant dynamics, again by using the SDRE methodology. The proposed methodology is exemplified by using the simulation model of an inverted pendulum, showing the effectiveness of SDRE-based MRAC for nonlinear systems.

Emulation Design based Linear Quadratic Regulation

Rahat Ali, Mohammad Malik, Muhammad Salman (National University of Sciences and Technology), Pakistan

With the encouraging rapid advancement in digital controller design, there is a need to explore further the optimal and robust digital controller implementation schemes. The ease in implementation of the discrete time controller urge the designers to adopt the emulation design technique, in which discrete-time systems are treated in a continuous-time framework. In emulation design, a discrete-time controller is obtained after the discretization of continuous-time controller at a high sampling rate. Keeping in view the valuable advantages of emulation design, a linear discrete time closed loop structure is proposed with emulation design based linear quadratic regulator (LQR). The suggested scheme provides optimal tracking of a reference signal even in the presence of external disturbances. Prior knowledge about the external disturbance is utilized by the control scheme to effectively minimize its effect on the system. Through computer simulations, a comparison is also drawn between the proposed emulation based control scheme and the corresponding continuous-time control scheme. Results shows that sampling time and weighing parameters of the cost function play important roles in defining the system performance.

Linear Quadratic Tracking for Noisy Signal with State Space Recursive Least Squares Noise Rejection

Rahat Ali, Mohammad Malik, Muhammad Salman (National University of Sciences and Technology), Pakistan

In many real life problems, related to closed loop control systems the reference signal is corrupted by additive noise. The noisy reference signal leads to inferior tracking by the plant. However tracking performance can further improved if noise is removed from the reference signal prior applying to the control system. In this paper, we present a linear quadratic regulator (LQR) based control scheme that incorporates state space recursive least squares (SSRLS) method for cleaning the noisy reference signal. The proposed closed loop structure provides an optimal tracking of a reference signal while minimizing the effect of external disturbance acting on the plant. The prior knowledge about the external disturbance is utilized by the control scheme. Functioning of the proposed algorithm is demonstrated with the help of computer simulations with a practical application of third order system of grid tie converters. The result shows significant improvement in tracking performance as compared to the tracking of a noisy reference signal applied directly to the control system.

Workshop 2:
Safety Aspects for Automation and Process Industries

Coordinator(s):	Date:	31.10.2013
Josef Börcsök, University of Kassel, Germany	Time:	10:30-12:30
Michael Schwarz, University of Kassel, Germany	Room:	

Tool to Derive and Calculate Safety Parameter

Ossmane Krini, Josef Börcsök, (University of Kassel), Germany

The objective is the new development of a Software-Tool, known as FRCas, to calculate the failure rates from various components. This Software-Tool should offer the User the opportunity to determine the failure rate for various components on the basis of various Standards of Siemens SN 29500, Military Handbok MIL-HNDB, SINTEF, and CENELEC. The user should be able to obtain results with this Tool without previous knowledge of the details of standard. A further objective is the integration of Program Package "OrCAD" into the developed Software-Tool, therefore to determine the failure rates of individual components that are in the OrCAD developed electronic circuits.

A possible Approach for Determining Safety Parameters for Safety Integrated Circuits

Josef Börcsök, Peter Holub, (University of Kassel), Germany

The approach for calculating the failure rate of a safety integrated circuit is used if the number of available test patterns is not sufficient. The safety integrated circuit can be structured in function blocks, that can be functionally compared to semiconductors with discrete structure. Failure models already known and applied for discrete semiconductors can be used to determine the failure rate of the individual function blocks. These models with their known failure rates serve as a reference for the safety integrated circuit function blocks. An advantage of this approach is that the internal safety integrated circuit structure can be taken into consideration when calculating the failure probability. The paper is based on the principles of the generic standard IEC 61508 Edition 2, 2010-04. Because new technologies lack field experience and a basis for evaluating certain risks, a conservative approach to determining failure rates has been emphasized as set forth in SN 29500.

Safety requirements and safety functions for decentralized controlled autonomous systems

Andreas Trenkle, Zäzilia Seibold, Thomas Stoll (Karlsruche Institute of Technology, KIT), Germany

Flexibility and safety are important criteria for automated material handling systems. Autonomous and decentralized controlled systems are flexible but they also pose new challenges in safety. We describe KARIS, a decentralized controlled, autonomous intralogistic system and indicate the differences to conventional autonomous guided vehicles. Based on the results of a risk assessment, we point out the particular challenges to safety technology and describe the developed safety functions. They are evaluated and compared to required performance levels determined by the risk assessment.

Optimization of Diagnostics with Respect to the Diagnostic Coverage and the Cost Function

Hans-Dieter Wacker, Peter Holub, Josef Börcsök (University of Kassel), Germany

In this paper the authors study a Safety Instrumented System (SIS) subjected to periodically performed diagnostic measures or tests. They focus their interest onto partial tests similar to partial stroke tests, which are well known from testing valves. They then introduce diagnostic parameters in order to

quantify manual, automatic and semi-automatic testing mathematically, and they distinguish between two different diagnostic modes: The semi-automatic component-based mode and the semi-automatic-time-based mode. In Chapter V, they investigate the semi-automatic mode by means of two functions depending on their diagnostic parameters: The diagnostic coverage factor and the cost function. They then pose two optimization problems in form of two linear programs. The first one minimizes the cost function under constraints on the diagnostic coverage, and the second one maximizes the diagnostic coverage under constraints on the cost function. The paper closes with the examples of a 1oo1-system and a 2oo2-system.

A Survey on OPC and OPC-UA: About the standard, developments and investigations

Michael Schwarz, Josef Börcsök, (University of Kassel), Germany

In 1996, a new standard was announced that should serve as a software interface to exchange process data and to solve the problem to exchange process data using different industrial protocols and communication systems. A successful story started since then with few additional standards like the Alarm and Event standard using the OPC approach and some revisions and new editions. Ten years later a new approach was created that unified all existing standards and was also concerned with e.g. interoperability, security and web-based systems. This paper details the different OPC standards, tries to answer the question why this standard is important for industries and academia and where current research and development utilising those standards.

Session 6:
Model based, Predictive and Distributed Control

Chairs:

Naim Bajcinca, Max Planck Institute, Germany

Alessandro Zanarini, ABB Corporate Research, Switzerland

Date: 31.10.2013

Time: 13:30-15:30

Room:

Model Based Predictive Peak Observer Method in Parameter Tuning of PI Controllers

Erdinc SAHIN, (KTU), Müjde Güzelkaya, Ibrahim Eksin, (Istanbul Technical University), Turkey

The peak observer method is firstly proposed and used for PID type fuzzy logic controllers. In this study, the peak observer method is adapted and then implemented to the classical PI control structure. The basic principle of the method is to change the controller parameters of the system using the peak values of the system response in order to improve system performance. Firstly, the peak observer method is reconsidered on a simple internal model control based classical PI controller. Later, the peak observer method is further developed and a new structure called model based peak observer is proposed and the parameters of PI controller are further tuned for a much better performance. The performances of the proposed methods are tested and compared on different systems based on simulations

Exploiting Parallelization in Explicit Model Predictive Control

Alessandro Zanarini, Mahmoud Jafargholi, Helfried Peyrl, (ABB Corporate Research), Switzerland

Traditionally Model Predictive Control (MPC) has been mainly restricted to processes with rather slow dynamics and with sampling times ranging from a few minutes to hours, such as the ones encountered in the areas of (petro)chemicals, minerals and metals. However, recent algorithmic advances (such as the explicit approach for MPC) allowed the application of MPC to problems arising in the automotive or power electronics industry where the time scales are in the milli- or even the microsecond area. In this study we aim to push the limit of explicit MPC even further by exploiting the computational power offered by parallel CPU architectures. We present the parallelisation of three different algorithms and we report experimental results showing how for certain problems, the parallelisation offers performances that top state-of-the-art approaches.

Distributed Feedforward Control of Vehicle Dynamics based on Event-Triggered Optimization

Shaban Gumma, (Technical University of Berlin), Naim Bajcinca, (Max Planck Institute), Germany

A fully distributed event-triggered optimization scheme for optimal tire friction force allocation representing the core part of a feedforward control approach is proposed in this work. A standard projected subgradient algorithm involving consensus has been used for solving the resulting optimization problem. The triggering condition has been utilized to reduce the communication between the concurrent computing nodes primarily for facilitating real-time eficiency.

Output Disturbance Rejection Using Parallel Model Predictive Control

Carlos Andrade-Cabrera, Jan Maciejowski, (Cambridge University), UK

The solution time of the online optimization problems inherent to Model Predictive Control (MPC) can become a critical limitation when working in embedded systems. One proposed approach to reduce the solution time is to split the optimization problem into a number of reduced order problems, solve such reduced order problems in parallel and selecting the solution which minimises a global cost function. This approach is known as Parallel MPC. The potential capabilities of disturbance rejection are introduced using a simulation example. The algorithm is implemented in a linearised model of a Boeing 747-200 under nominal flight conditions and with an induced wind disturbance. Under significant output disturbances Parallel MPC provides a significant improvement in performance when compared to Multiplexed MPC (MMPC) and Linear Quadratic Synchronous MPC (SMPC).

Fault-Tolerant Distributed Feedback Global Chassis Control

Naim Bajcinca, (Max Planck Institute), Germany

We propose an approach to fault-tolerant feedback global chassis control employing a reconfiguration of distributed optimization scheme in the feedforward path according to a precompiled bank of faulty scenarios and corresponding switching topologies of the network of computation and actuation nodes of a single-wheel electrical car powertrain. This intuitive idea is underpinned by the functional redundancy provided by the distribution of the overall global chassis computational control task amongst a set of collaborating processors and the associated actuation in implementing a prespecified maneuver. Our work represents a step towards novel cyber-physical design approaches in realizing complex behavior of vehicle dynamics.

Mathematical Modeling of Vehicle Frontal Crash by a Double Spring-Mass-Damper Model

Bernard Munyazikwiye, Hamid Reza Karimi, Kjell Robbersmyr, (University of Agder), Norway

This paper presents development of a mathematical model to represent the real vehicle frontal crash scenario. The vehicle is modeled by a double spring-mass-damper system. The front mass m1 represents the chassi of the vehicle and rear mass m2 represents the passenger compartment. The physical parameters of the model (Stiffness and dampers) are estimated using Nonlinear least square method (Levenberg-Marquart algorithm) by curve fitting the response of a double spring-mass-damper system to the experimental displacement data from the real vehicle crash. The model is validated by comparing the results from the model with the experimental results from real crash tests available.

Tutorial 2:
Enhancing Customer Experience over Broadband Access Networks

Coodinator:

Haris Gacanin, Alcatel-Lucent, Belgium

Date: 31.10.2013

Time: 13:30-15:30

Room:

Enhancing Customer Experience over Broadband Access Networks

Haris Gacanin, Alcatel-Lucent, Belgium

To succeed in this rapidly changing market, operators need the ability to deliver high-value services that differentiate and enhance the customer experience over there, in most cases different, access technologies. Those technologies are not designed to interoperate with each other and most of them can cope with only one type of access medium. At this point we are looking at fiber or digital subscriber line (DSL), powerline communication (PLC), Wi-Fi, Mobile, Femto home access technologies. Some efforts are done to enable the unified next generation access technology through the International Telecommunication Union (ITU) and IEEE standardization groups. This tutorial provides an overview of problematics, research directions and potential solutions in all-IP broadband home access networks. The focus is on the evolution of test requirements and methods as the access network evolves towards all-IP. Indeed, as a network converges to an all-IP network offering broadband services, operators are confronted with the question of how to evolve their testing infrastructure. This talk begins by providing an overview of legacy test methodologies and access networks, as well as their objectives. We then discuss the user and service requirements that drive the evolution of the broadband access networks towards all-IP. Finally, the talk presents home access broadband testing technique for all-IP networks and some examples with focus on OPEX/CAPEX reduction.

Session 7:
Intelligent Systems and Applications

Chairs:

Haris Dindo, University of Palermo, Italy

Joel Suárez-Cansino, Autonomous University of the State of Hidalgo, Mexico

Date: 31.10.2013

Time: 16:00-18:00

Room:

A novel Evolution Strategy for Constrained Optimization in Engineering Design

Ali Osman Kusakci, Mehmet Can (International University of Sarajevo), Bosnia and Herzegovina

Nature Inspired Algorithms (NIAs) are extensively employed to solve constrained optimization problems (COPs) in engineering design domain. Since the global optimum for almost all benchmark problems are already identified, improving the objective function value is not possible. However, an improvement in terms of number of objective function evaluations (FES) and reliability is still likely. This paper proposes an Evolution Strategy (ES) with a Covariance Matrix Adaptation (CMA)-like mutation operator and a ranking based constraint-handling method. The results indicate that the algorithm is able to find the global optimum in less FES and with high reliability when compared with the benchmarked methods.

Intrusion Detection using Neural Network Committee Machine

Alma Husagic-Selman (International University of Sarajevo), Rasit Koker (Sakarya University), Turkey, Suvad Selman (International University of Sarajevo), Bosnia and Herzegovina

Intrusion detection plays an important role in todays computer and communication technology. As such it is very important to design time efficient Intrusion Detection System (IDS) low in both, False Positive Rate (FPR) and False Negative Rate (FNR), but high in attack detection precision. To achieve that, this paper proposes Neural Network Committee Machine (NNCM) IDS which consists of Input Reduction System based on Principal Component Analysis (PCA) Neural Network and Intrusion Detection System, which is represented by three levels committee machine, each based on Back-Propagation Neural Network. To reduce the FNR, the system uses offline System Update, used to retrain the networks when new attacks are introduced. The system shows the overall attack detection success of 99.8%.

An Intelligent System for Inspection and Selection of Parts in a Manufacturing Cell

Juan Carlos González Islas, Daniel de Jesús Cano Tejeda, (Technological University of Tulancingo), Joel Suárez-Cansino, VirgilioLopez-Morales, (Autonomous University of the State of Hidalgo), Mexico

This paper addresses the design and implementation of an artificial vision system implemented in a manufacturing cell. The vision system recognizes and selects in an intelligent manner the manufactured parts through a feedforward artificial neural network and the decisions are completely based on the part's color and its geometry. A simple digital camera is used as an image acquisition device. This image is then processed by an artificial neural network, which is able to identify the part's color. Then a Programmable Logic Controller (PLC) drives an electropneumatic system, in order to store the identified part into a corresponding repository. An interface based on power electronic devices and a Data Acquisition Card (DAQ) system

implements the communication between the PLC and the computer. The proposed system is completely implemented and tested in a real Flexible Manufacturing System (FMS) of FESTO© showing good results.

Fuzzy Pitch Angle Control of Wind Hybrid Turbine To Power Quality Improvement

Saeid Ghaderi, Nastaran Vasheg, Reza Ghandehari, (SHAHI RAJAEE TEACHER TRAINING), Iran

Wind energy is not constant and because of nonlinear effect of wind speed in output power of windmill, the generated power of wind turbine generators (WTGs) fluctuates. In order to reduce fluctuation, different methods are available. This paper presents a control strategy based on fuzzy modeling in different wind speeds to control frequency and together with a hybrid system that controls voltage, can improve power quality of a wind-hybrid power generation system. The simulation results show the effectiveness of the proposed method.

Recognizing Actions with the Associative Self-Organizing Map

Miriam Buonamente, Haris Dindo, (University of Palermo), Italy, Magnus Johnsson, (Lund University), Sweden

When artificial agents interact and cooperate with other agents, either human or artificial, they need to recognize others' actions and infer their hidden intentions from the sole observation of their surface level movements. Indeed, action and intention understanding in humans is believed to facilitate a number of social interactions and is supported by a complex neural substrate (i.e. the mirror neuron system). Implementation of such mechanisms in artificial agents would pave the route to the development of a vast range of advanced cognitive abilities, such as social interaction, adaptation, and learning by imitation, just to name a few. We present a first step towards a fully-fledged intention recognition system by enabling an artificial agent to internally represent action patterns, and to subsequently use such representations to recognize - and possibly to predict and anticipate - behaviors performed by others. We investigate a biologically-inspired approach by adopting the formalism of Associative Self-Organizing Maps (A-SOMs), an extension of the well-known Self-Organizing Maps. The A-SOM learns to associate its activities with different inputs over time, where inputs are high-dimensional and noisy observations of others' actions. The A-SOM maps actions to sequences of activations in a dimensionally reduced topological space, where each centre of activation provides a prototypical and iconic representation of the action fragment. We present preliminary experiments of action recognition task on a publicly available database of thirteen commonly encountered actions with promising results.

Current and Future Trends in AI

Kemal Delic, (Hewlett Packard, France), Jeff Riley, (Hewlett Packard, Australia)

During the past 70+ years of research and development in the domain of Artificial Intelligence (AI) we observe three principal, historical waves: embryonic, embedded and embodied AI. As the first two waves have demonstrated huge potential to seed new technologies and provide tangible business results, we describe likely developments of embodied AI in the next 25-35 years. We postulate that the famous Turing Test was a noble goal for AI scientists, making key, historical inroads - while we believe that Biological Systems Intelligence and the Insect/Swarm Intelligence analogy/mimicry, though largely disregarded, represents the key to further developments. We describe briefly the key lines of past and ongoing research, and outline likely future developments in this remarkable field.

Session 8:
Mathematical Methods in Engineering

Chairs:

Jian Wan, National University of Ireland, Ireland

Željko Jurić, University of Sarajevo, Bosnia and Herzegovina

Date: 31.10.2013

Time: 16:00-18:00

Room:

Novel Matrix-based Improvement of Nodal Analysis for Circuits with Singularities

Željko Juric, (University of Sarajevo), Harun Šiljak, (Burch International University), Bosnia and Herzegovina

This paper presents an alternative to existing techniques based on Nodal Analysis designed specifically to suit implementation in matrix-oriented programming languages, keeping the simplicity of original Nodal Analysis and bringing improvements to make virtually all circuit topologies solvable through it, dealing with potential singularities, hence the name Singular Nodal Analysis (SNA). Two variants of this novel algorithm are described. Their validity is proven and their applicability is shown through two practical examples.

Solving Laplace Differential Equation Using Markov Chains in Monte Carlo Method

Mario Kokorus, Kemo Sokolija (University of Sarajevo), Bosnia and Herzegovina

This paper outlines solving of Laplace differential equation using Markov chains in Monte Carlo method. Two-dimensional model with Dirichlet and Neumann conditions was considered. The problem of electrostatic field was particularly observed for a case of homogeneous Neumann condition at one of the domain boundaries.

A Dynamic Sampling Methodology for Plasma Etch Processes using Gaussian Process Regression

Jian Wan, BahmanHonari, (National University of Ireland), Sean Mcloone, (NUIM), Ireland

Plasma etch is a key process in modern semiconductor manufacturing facilities as it offers process simplification and yet greater dimensional tolerances compared to wet chemical etch technology. The main challenge of operating plasma etchers is to maintain a consistent etch rate spatially and temporally for a given wafer and for successive wafers processed in the same etch tool. Etch rate measurements require expensive metrology steps and therefore in general only limited sampling is performed. Furthermore, the results of measurements are not accessible in real-time, limiting the options for run-to-run control. This paper investigates a Virtual Metrology (VM) enabled Dynamic Sampling (DS) methodology as an alternative paradigm for balancing the need to reduce costly metrology with the need to measure more frequently and in a timely fashion to enable waferto-wafer control. Using a Gaussian Process Regression (GPR) VM model for etch rate estimation of a plasma etch process, the proposed dynamic sampling methodology is demonstrated and evaluated for a number of different predictive dynamic sampling rules.

On Pole Placement and Invariant Subspaces

Naim Bajcinca, (Max Planck Institute), Germany

The classical eigenvalue assignment problem is revisited in this note. We derive an analytic expression for pole placement which represents a slight generalization of the celebrated Bass-Gura and Ackermann formulae, and also is closely related to the modal procedure of Simon and Mitter.

Calculation of Traversing Time Distributions in Semi-Markov Chains with Application on Petri Nets

Faruk Hadziomerovic, (SSST), Bosnia and Herzegovina

This paper shows how to obtain probability distribution of traversing time between initial and final states in Markov Chains underlying Petri Nets. The exact closed form solution is obtained for the negative exponential transition firing times with or without one deterministic firing time, and the approximate solution for the mix of negative exponential with more than one deterministic transitions. Then the known distribution enables to find the percentile estimates. We apply our method to obtain the percentile of a packet delay in the network. This approach can be applied to any performance tool which reduces to Markov chains, such as Finite State Machines as well as Queuing Networks.

Friday, 01.11.2013.

Plenary Talk 4:
Bruno Siciliano: "Grasping and Control of Multi-fingered Hands"

Chairs:

Date: 01.11.2013.

Time: 09:00-10:00

Room: Banjaluka

Grasping and Control of Multi-fingered Hands

Bruno Siciliano, (University of Naples Federico II), Italy

The talk reports some recent results achieved within the framework of the European project DEXMART. An important issue in controlling a multi-fingered robotic hand grasping an object is the synthesis of the optimal contact points and the evaluation of the minimal contact forces able to guarantee the stability of the grasp and its feasibility. Both these problems can be solved online if suitable sensing information is available. In detail, using images taken by a camera mounted in an eye-in-hand configuration, a surface reconstruction algorithm and a grasp planner evolving in a synchronized parallel way have been designed for fast visual grasp of objects of unknown geometry. On the other hand, using finger tactile information and contact force measurements, an efficient algorithm was developed to compute the optimal contact forces, assuming that, during the execution of a manipulation task, both the position of the contact points on the object and the wrench to be balanced by the contact forces may change with time. Another goal pursued in DEXMART was the development of a human-like grasping approach inspired to neuroscience studies. In order to simplify the synthesis of a grasp, a configuration subspace based on few predominant postural synergies of the robotic hand has been computed. This approach was evaluated at kinematic level, showing that power and precise grasps can be performed using up to the third predominant synergy. The talk concludes by outlining active trends and perspectives in the field.

Session 9:
Robotics and Mechatronics

Chairs:

Sarfraz Ul Haque Minhas, TU Cottbus, Germany

Kurt Gerlach-Hahn, RWTH, Aachen University, Germany

Date: 01.11.2013.

Time: 10:30-12:30

Room:

Adaptive behavior-based control for robot navigation: a multi-robot case study

Haris Balta (Royal Military Academy Brussel), Belgium, Salvatore Iengo, Alberto Finzi, Silvia Rossi, Bruno Siciliano, (UNINA), Italy, Geert De Cubber, (Royal Military Academy), Belgium*

The main focus of the work presented in this paper is to investigate the application of certain biologically inspired control strategies in the field of autonomous mobile robots, with particular emphasis on multi-robot navigation systems. The control architecture used in this work is based on the behavior based approach. The main argument in favor of this approach was its impressive and rapid practical success. This powerful methodology demonstrated simplicity, parallelism, perception action- mapping and real implementation. When a group of autonomous mobile robots needs to achieve a goal operating in complex dynamic environments, such a task involves high computational complexity and a large volume of data needed for continuous monitoring of internal states and the external environment. Most autonomous mobile robots have limited capabilities in computation power or energy sources with limited capability, such as batteries. Therefore, it becomes necessary to build additional mechanisms on top of the control architecture able to efficiently allocate resources for enhancing the performance of an autonomous mobile robot. For this purpose, it is necessary to build an adaptive behavior-based control system focused on sensory adaptation. This adaptive property will assure efficient use of robot's limited sensorial and cognitive resources. The proposed adaptive behavior-based control system is then validated through simulation experiments in a multi-robot environment with a task of pray/predator scenario.

An experimental electronic interface design for a Two-link elastic robotic arm

Mahsa Doosthoseini, Behzad Kadkhodaei, (Asre Jadid Ariana. Co.), Iran, Moharam Habib Nejad Korayem, Ali Mohammad Shafei, (Iran University of Science and Technology) ,Iran

Trying to record vibration of an elastic arm for identifying behavior of robot, is one of important case studies in mechatronic science. So in this paper designing an electrical interface with a six channel strain gage data logger, is presented. The high speed vibration of a flexible robotic arm compared to the low speed of software and hardware interface between the computer and experimental setup is one of the most important obstacles for measuring and control of such a systems. In this paper, a combination of using high speed digital to analog convertor (DAC) components on an electrical interface board and using National Instrument's LABVIEW software package is proposed as a solution for this problem. Dynamic modeling of the system is developed based on Gibbs-Appell (G-A) formulation and Assumed Mode Method (AMM). An experimental setup of a Two-link elastic robotic arm is prepared and the electrical interface board works between this experimental setup, user and computer. The input data by the electrical interface board are the number of mode shapes up to 4 for one-link elastic arm and 2 for two-link elastic arm and the profile of the input torque via time. Then these data transferred to the Elastic arm robotic system. Finally user can see the vibration of the elastic link in graphical interface environment and model validation carried out by comparing both experimental and theoretical results.

Robotic manipulation in dimensional measurement

Samir Lemeš, Malik Čabaravdić, Nermina Zaimović-Uzunović, (University of Zenica), Bosnia and Herzegovina

Three dimensional measurement of complex geometry with Coordinate measuring machines (CMMs) requires multiple clamping and fixturing of measured object. In order to speed-up this process and to reduce the number of fixturing operations, a robotic arm can be used to manipulate the

measured object. This paper describes measurement uncertainty analysis of an improved complex measurement system consisting of robotic arm and the coordinate measuring machine.

Gradient based adaptive trajectory tracking control for mobile robots

Dinko Osmankovic, Jasmin Velagic, (University of Sarajevo), Bosnia and Herzegovina

This paper presents a classical approach to model reference adaptive control for trajectory tracking problem. Gradient based or MIT rule adaptation technique was applied to the well known trajectory tracking controller and the mathematical model of that adaptation is presented. The proposed solution is compared to the controller without adaptation and to the feedback linearisation based controller. In both simulation and experimental environments the effectiveness of the proposed adaptive controller is shown and its use justified.

Design and evaluation of a serial elastic actuator for human assistance

Kurt Gerlach-Hahn, Christian Dahmen, Berno Misgeld, Steffen Leonhardt, (RWTH Aachen University), Germany

In this article, the systematic development of a serial elastic actuator for human assistance is presented. First, requirements for the actuator are deduced from the specific application, as part of an assistance robots for partially paralyzed patients. A test bench was developed to evaluate the serial elastic actuator under various conditions and to produce reference sensor data. The device was tested in four different scenarios, ranging from stiff fixation of the output to interaction with the knee joint of an active or passive human test subject. A variable system inherent friction was identified and the potential of this (usually undesired) characteristic is discussed for the special case of human assistance.

Dynamic cycle times for adaptive manufacturing control in automotive flow shops

Raffaello Lepratti, (Siemens AG), Ulrich Berger, (BTU Cottbus), Thomas Creutznacher, (Siemens AG), Sarfraz Ul Haque Minhas, (BTU Cottbus), Germany

The automotive industry has to deal with an increasing complexity of production processes and various kinds of disturbances along the supply chain. This requires a higher level of flexibility through an intelligent production planning from the engineering phase. Today's manufacturing flexibility is mostly provided during the operational phase (so-called run-time) by methodologies for order re-scheduling and re-sequencing. The focus of this paper is a novel concept, which adds the intelligent production planning to these methodologies and uses the synergies of the holistic system. This approach enables flexible automated manufacturing processes by the dynamic use of machine capabilities during run-time. The paper shows in details how the adaption of operating speeds both in manufacturing and material handling processes leads to dynamic cycle times with maximized Key Performance Indicators (KPIs). This concept is based on so-called production variants defined and validated during the engineering phase. First results show stability and good response of the test system.

Tutorial 3:
Data Mining from Social and Knowledge Networks

Coordinatior:	Date:	01.11.2013.
Veljko Milutinovic, University of Belgrade, Serbia	Time:	10:30-12:30
	Room:	

Data Mining from Social and Knowledge Networks

Veljko Milutinovic, University of Belgrade, Serbia

First, a general introduction into datamining is given, by reviewing the most utilized datamining algorithms. Second, it is explained how these algorithms get modified if they are applied to different computational environments, like: sensor networks, biological networks, social networks, customer networks, etc... Third, one of the above mentioned cases, selected by the audience, is fully elaborated. Forth, it is discussed how datamining can benefit from dataflow supercomputing. Sixth, details of the dataflow programming model are given, in the contex of datamining.

Session 10:
Modeling, Identification and Simulation

Chairs:	Date:	01.11.2013
Hajrudin Efendic, Johannes Kepler University Linz, Austria	Time:	14:00-15:20
Houda Nouasse, ENIT, France	Room:	

Closed-loop Frequency-based Identification Method for Hammerstein Type Plants with a Transport Delay using a Relay Feedback

Željko Jurić, Selma Hanjalić, Hamza Šehović, (University of Sarajevo), Bosnia and Herzegovina

This paper proposes a new closed-loop frequency based method for parametric identification of Hammerstein type plants with a transport delay. The method is a generalization of Ziegler Nichols' (ZN) experiment, with relay added in the control loop. It provides a simultaneous estimation of the

parametric model of the plant dynamic, value of the time delay and a point by point relationship between input and output of the nonlinear part of the plant, which need not to be symmetrical. No extra equipment is needed, except the relay and a low pass filter.

Exact Inversion of TSK Fuzzy Systems With Linear Consequents

Cenk Ulu, Müjde Güzelkaya, Ibrahim Eksin, (İstanbul Technical University), Turkey

In literature, there is no exact inversion method for TSK fuzzy systems with linear consequents. In this study, an analytical method is proposed for the exact inversion of TSK fuzzy systems with linear consequents of which input variables are described using strong triangular partitions. When strong triangular partitions are used, the universes of discourse of input variables are divided into specific regions. In the proposed method, linear equations of triangular membership functions of inversion variable and the rule consequents are directly used in the analytical formulation of TSK fuzzy system output. In this way, the output of the TSK fuzzy system can be expressed in a unique quadratic form in terms of the inversion variable for any region where only the parameters of the appropriate equations of triangular membership functions are embedded. Thus, the inverse solution is easily obtained for any region by using explicit solution of the quadratic equation. An illustrative example has been given to validate the proposed method.

Transportation network model with time delay for flood lamination strategy

Houda Nouasse, Pascale Chiron, Bernard Archimède, (ENIT), France

Flooding due to rivers overflowing have affected this year many countries in the world. The engendered problems, due to their intensity, are relative to goods and persons safety, and often cause a sharp increase of the insurance costs, which is no more tolerable in the actual economic context. To prevent these problems, it is necessary to limit water heights downstream the streams. In the literature, numerous described works were done on flows modelling and management. The work presented in this paper, is interested in the quantitative management by means of floods diversion areas placed along the river and for which location and sizing are known. A management method computing the height of gates opening at each time step is proposed. The strategy is based on a transportation network model of the flood diversion area system including the time transfer delays. It allows the computation of the water volumes to be stored in time. Simulation results for different flood episode are discussed.

Fault Isolation using Model-on-Demand Algorithm

Hajrudin Efendic, Luigi del Re, (Johannes Kepler University Linz), Austria

This paper discusses the Model-on-Demand algorithm for fault isolation in large and complex technical systems. The main objective of the proposed algorithm is to improve fault isolation performance metrics by applying a structural analysis approach which targets the isolability problem in structurally time-invariant systems. This objective is achieved by the utilization of a reverse modeling approach in order to modify the structural matrix of the system in such a way to improve its isolability property. The proposed algorithm was tested in a real technical system and an overview of the experimental results is given here.

Session 11:
Image Processing, Analysis and Retrival

Chairs:	Date:	01.11.2013
Haris Supic, University of Sarajevo, Bosnia and Herzegovina	Time:	14:00-15:20
Dinko Osmankovic, University of Sarajevo, Bosnia and Herzegovina	Room:	

Evaluation of OpenCL Native Math Functions for Image Processing Algorithms

Damir Demirović, Amira Šerifović-Trbalić, (University of Tuzla), Bosnia and Herzegovina, Philippe Cattin (University of Basel), Switzerland

Image enhancement plays an important role in different research fields such as medical image analysis. Since the same computations are usually performed on many image elements, those computations can be easily parallelized. Modern Graphics Processing Units (GPUs) are capable for doing many tasks in parallel. However, improving running times on GPUs usually leads to a loss of floating point precision. In this paper we evaluate the impact of GPU hardware implemented native functions on three GPUs, and one Central Processing Unit (CPU). As an example, the bilateral filter with built-in and native math functions was implemented and used for smoothing noisy brain Magnetic Resonance Images (MRI). For all experiments widely used error metrics were calculated. Experiments shows that native versions improve running times significantly (up to 155 times). As expected precision is lower for the measures which include a lot additions without normalization.

Detecting heat sources from 3D thermal model of indoor environment

Dinko Osmankovic, Jasmin Velagic, (University of Sarajevo), Bosnia and Herzegovina

Recent developments in environment sensing and virtual modelling enabled the construction of virtual models of indoor environments with added thermal information. In this paper we present the methods for heat sources extraction from the 3D thermal model of an indoor environment. They are based on known image segmentation techniques but adjusted to work with 3D models with added thermal information. All data are acquired using an autonomous mobile robot platform equipped with 3D laser scanner and thermal imaging camera.

Study of the best view selection based on human observer

Ivana Varhanikova, Michal Hucko, Zuzana Cernekova, Julia Kucerova, (Comenius University), Slovakia

In this paper we present results from questionnaire focused on searching for the best view on virtual 3D objects. For our research we collected database of virtual models from different categories and we tried to find out if the best view selected by respondents varies from category to category. We performed clustering using von Mises-Fisher mixture model to find out the means of each group of selected views. Following we would like to determine if we can predict the best view similar to the one chosen by questionnaire only by just categorizing examined object.

A Compact Color Descriptor for Image Retrieval

Vedran Ljubovic, Haris Supic, (University of Sarajevo), Bosnia and Herzegovina

The resource usage in Content-Based Image Retrieval is a frequently neglected issue. This paper describes a novel compact feature vector based on image color histograms in the HSL color space. The images are represented using only 10 bytes per image. It is shown that, in the context of Query-by-Example (QbE) usage scenarios, the method described achieves retrieval performance close to the state of the art image retrieval methods that use considerably more memory. It is also shown that the described method outperforms other methods with similar memory usage.