EMS2014
European Modelling Symposium 2014
21 – 23 October 2014, Pisa, Italy

Conference Program
And Abstracts of Presented Papers
### EMS2014 Conference Program at a Glance:

**Session Code:** *Tue.pm1* means Tuesday afternoon before tea break.

Other Time periods: *am1, am2, pm1, pm2*

**Paper Code:** e.g. *K1* see following pages for a full list:

Track letter: A, B, C . and paper number within track e.g. K1

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<td><strong>Close of Conference and foto opportunity</strong></td>
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<td>6pm</td>
<td><strong>Day-3 Thursday 23 October 2014: Social Program and Free Time to explore the heritage, culture and history of Pisa and Italy</strong></td>
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**Requested on this day:** A6, L2, M1, T4, T7, U1. Last minute cancellation, no visa: E2
## EMS2014

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<td>09:00 AM</td>
<td>Tue.am1.A: Opening Session and Keynote Speaker</td>
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<td>10:15 AM</td>
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<td>01:15 PM</td>
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<td>03:30 PM</td>
<td>Tue.pm2.A: Image, Speech and Signal Processing</td>
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<td>08:30 AM</td>
<td>Wed.am1.A: Keynote Speakers 2 and 3</td>
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<td>01:15 PM</td>
<td>Wed.pm1.A: Circuits, Sensors and Devices</td>
<td>Wed.pm1.B: Mobile/Ad Hoc Wireless Networks, Mobicast, Sensor Placement, Target Tracking</td>
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Feature selection (FS) addresses the problem of selecting those system descriptors that are most predictive of a given outcome. Unlike other dimensionality reduction methods, with FS the original meaning of the features is preserved. This has found application in tasks that involve datasets containing very large numbers of features that might otherwise be impractical to model and process (e.g., large-scale image analysis, text processing and Web content classification).

This talk will focus on the development and application of FS mechanisms based on rough and fuzzy-rough theories. Such techniques provide a means by which data can be effectively reduced without the need for user-supplied information. In particular, fuzzy-rough feature selection (FRFS) works with discrete and real-valued noisy data (or a mixture of both). As such, it is suitable for regression as well as for classification. The only additional information required is the fuzzy partition for each feature, which can be automatically derived from the data. FRFS has been shown to be a powerful technique for data dimensionality reduction. In introducing the general background of FS, this talk will first cover the rough-set-based approach, before focusing on FRFS and its application to real-world problems. The talk will conclude with an outline of opportunities for further development.
10:15 AM - 12:15 PM

Tue.am2.A: Intelligent Systems

Chairs: Marco Vannucci (Scuola Superiore Sant'Anna, Italy), Jasmin Smajic (University of Applied Sciences of Eastern Switzerland (HSR), Switzerland)

10:15 Extended Column Level Temporal System Indexing
Michal Kvet (University of Zilina, Faculty of Management Science and Informatics, Slovakia) and Monika Vajsova (University of Zilina in Zilina, Faculty of Management Science and Informatics, Slovakia)

Timed data processing is a fundamental requirement for the database systems. It is not, however, only the changes in time management, but also the complex record of changes during the whole life cycle of the object - historical values, actual states, also data valid the future. Existing solutions are inadequate in terms of performance - effectiveness of the whole system which is manifested using the size of the required data and processing time. This paper deals with the principles of extended temporal data modeling based on the column level, not the whole object. It compares another column level approach, describes the structure and methods for manipulation. Based on the developed structural solution, experiment section compares the performance based on the index structures. This solution is mostly designed for communication systems, intelligent transport system, where the performance based on speed and the size of the transmitted data is needed.

10:35 A Review on Evolutionary Feature Selection
Nadia Abd-Alsabour (Cairo University, Egypt)

This paper presents a review of some of the most recent evolutionary algorithms used for solving feature selection based upon previously published research on feature selection. Also, we discuss various research issues relating to each of the presented evolutionary algorithm. Evolutionary algorithms present several advantages over traditional search such as they require less domain-specific information. Such advantages have made them very popular within feature selection as explained in this paper. This paper covers the first part only of the evolutionary algorithms for the feature selection problem due to the limitation of the number of pages. The references cited in this paper cover the major theoretical issues, and provide access to the main branches of the literature dealing with such methods.

10:55 Neural Network On-Line Modeling for Mechanically Coupled Vehicle
Takeki Ogitsu (Tokyo University of Science & Faculty of Science and Technology, Japan), Tokunosuke Ikegami (Tokyo University of Science, Japan), Shin Kato (The National Institute of Advanced Industrial Science and Technology, Japan) and Hiroshi Mizoguchi (Tokyo University of Science, Japan)

This study is to expand usefulness of personal vehicle. Personal vehicle is able to handle easily, but it has a problem that is lesser load capacity than others. This study provides a solution that some vehicles couple mechanically. However, if vehicles are just coupled, the vehicles' performance of braking, accelerating and steering is degraded. For solving the problems, an on-line modelling system for personal vehicles are developed by own study is proposed. The proposed system employs a neural network algorithm, constructs the whole coupled vehicles model automatically while driving, and makes drivers feel one drives a stand-alone vehicle. In this paper, we explain the detail of the proposed method and report computer simulation experiments which demonstrates the effectiveness of the system.
11:15 **Classifying Workers into Risk Sensibility Profiles: a Neural Network Approach**  
Francesco Pistolesi (University of Pisa, Italy) and Beatrice Lazzerini (University of Pisa, Italy)  
We propose a neural network-based classifier to associate a worker with his/her risk sensibility profile. The basic idea behind the risk sensibility profile is that risks are preventable by performing appropriate actions that decrease their injurious potential. Also, some criticality factors have been shown to be connected with risk perception and risk propensity. Mapping workers into risk sensibility profiles means to measure how safely workers interact with the risks they are exposed to, by considering the preventing actions they perform, and their criticality factors. The main advantages of the proposed classification consist in: (i) supporting the selection of the most suitable worker to safely perform a given task; (ii) tailoring the safety training to each worker's need, to effectively decrease the probability of injury. The proposed neural classifier was trained by using a set of interviews we collected within some volunteer shoe factories. Each worker was asked to indicate the preventive actions he/she would perform if exposed to one or more risks, among a set of proposed actions. Also, workers answered questions to associate a value with each criticality factor. Two typical tasks of the footwear industry, characterized by one and two risks, respectively, were considered for validation and testing.

11:35 **Tracking of People in Paper Mill Warehouse Using Laser Range Sensor**  
Hassan Mashad Nemati (Halmstad University, Sweden) and Björn Astrand (Halmstad University, Sweden)  
In this paper a laser scanner based approach for simultaneous detection and tracking of people in an indoor environment is presented. The operation of an autonomous truck for transporting paper reels in a dynamic environment shared with humans is considered as the example case for this work. In this case, a human leg detection procedure and an Extended Kalman Filter (EKF) based tracking method are employed for real-time performance. Several experiments with different data sets collected from an autonomous forklift truck in a paper mill warehouse have been performed in an offline situation. The results show how the system is able to detect and track multiple moving people. By detecting people and continually tracking them, we can ensure optimal and safe operation.

11:55 **A route planning optimisation system for the steelmaking industry based on Multi-Objective Evolutionary Algorithms**  
Gianluca Nastasi (Scuola Superiore Sant'Anna, Italy), Valentina Colla (Scuola Superiore Sant'Anna, Italy) and Marco Del Seppia (Scuola Superiore Sant'Anna, Italy)  
In this paper a novel planning system for coils route optimisation among different processing steps of a generic steelmaking plant will be presented. This new approach, in addition to production times and costs, considers also customers' quality requirements. The system is based on Multi-Objective Optimisation and, in particular, it can exploit different paradigms of Multi-Objective Evolutionary Algorithms by means of the "Strategy" design pattern. The Strength Pareto Evolutionary Algorithm has been chosen for the first implementation. The system has been then developed in C++ (for the optimisation module) and C# (for the graphical user interface). Moreover, it is highly configurable and it can be easily adapted to several real industrial scenarios by means of an XML configuration file describing the plant.
10:15 Dynamic Virtual Bats Algorithm (DVBA) For Minimization Of Supply Chain Cost With Embedded Risk  
Ali O. Topal (Epoka University, Albania) and Oguz Altun (Epoka University, Albania)  
Dynamic Virtual Bats Algorithm (DVBA) is a new optimization algorithm, which is tested on several benchmark functions for global optimization. However it has not been tested on a real world problem yet. In this paper DVBA has been applied to minimize the supply chain cost with other well-known algorithms; Particle Swarm Optimization (PSO), Bat Algorithm (BA), Genetic Algorithm (GA) and Tabu Search (TS). Optimization of supply chain is considered as a real challenge by researchers because of its complexity. Big number of parameters to be controlled and their distributions, interconnections between parameters and dynamism are the main factors that increase the complexity of a supply chain. The result of the case study showed that the DVBA is much superior to other algorithms in terms of accuracy and efficiency.

10:35 Comparison of optimization algorithms for the indirect encoding of a neural controller for a soft robotic arm  
Vito Cacucciolo (Scuola Superiore Sant'Anna, Italy), Matteo Cianchetti (Scuola Superiore Sant'Anna, Italy) and Cecilia Laschi (Scuola Superiore Sant'Anna, Italy)  
With their dexterity, robustness and safe interaction with humans, soft robots bode to revolution the field of robotics. However, featuring structures undergoing non-linear deformations and under-actuated mechanisms, traditional control techniques are usually unsuccessful. Artificial neural networks have instead shown to be a suitable solution to control soft robots in several cases. Among the different classes of algorithms to train neurocontrollers, one that recently experienced a wide spread consists of optimization with genetic algorithms through indirect encoding. Main advantages are: the ability to produce networks with functional regularities that exploit the geometry of the domain; the decoupling of problem complexity from its resolution. The predominant use of GA has several reasons, ranging from bio-inspiration to some undeniable technical advantages. However, two main issues suggest the need to explore different and possibly more efficient algorithms to train neurocontrollers for soft robots: the high computational cost of mathematical models to simulate soft robots and evidences of unsuccessful global convergence of GA if not carefully tuned. In this study, we compare the performance of genetic algorithms with those of other optimization algorithms in training a neural network to control a soft robotic arm inspired by the octopus, simulated through a non-linear dynamic mathematical model.

10:55 Microvascular blood flow with laser speckle contrast imaging: analysis of static scatterers effect through modelling and simulation  
Adil Khalil (LARIS - University of Angers, France), Anne Humeau-Heurtier (LARIS - University of Angers, France), Pierre Abraham (University hospital of Angers, France) and Guillaume Mahé (University hospital of Rennes, France)  
Laser speckle contrast images (LSCI) give full-field data of surface blood flow. From LSCI, the computation of moving scatterers velocity (mainly red blood cells velocity) is possible when the modelling of the speckle contrast is performed assuming a velocity distribution for the moving scatterers. A Lorentzian distribution is often proposed. The associated mathematical expression for the speckle contrast has been studied previously. From this contrast expression, the goal herein is to simulate moving scatterers velocity values from the processing of LSCI data and to analyse the possible impact of static scatterers (like skin). For this purpose, LSCI are acquired experimentally on the forearm of twenty healthy subjects at rest, during a vascular occlusion and during reactive hyperaemia. In this study, an increase of the moving scatterers velocity is reported with the presence of static scatterers at rest, during vascular occlusion and during reactive hyperaemia. Increasing thickness of the static scattering layer has therefore an influence on moving scatterers velocities computed from LSCI.
11:15 Sensitivity analysis of the circuit model of a medical equipment for the evaluation of leakage currents

Emanuele Zennaro (Sapienza University of Rome, Italy), Carlo Mazzetti (Università di Roma, Italy), Giovanni Amicucci (INAIL, Italy) and Fabio Fiamingo (INAIL, Italy)

In an operating theatre the most hazardous events related to the circulation of low leakage currents (currents of the order of decades of microamperes that are not functional) through the human body during a surgical procedure (microshock), should be identified. The electrical circuit model of a surgical layout could be an important tool for the microshock risk analysis. The international standards on safety of Electrical Medical Equipment (EME) require the measurement of leakage currents in order to evaluate their compliance with limit values. Modeling of leakage current measurements set-up of each EME involved in a surgical procedure is a fundamental step to obtain the circuit model of a surgical layout. The case of a commercial defibrillator is taken as example to show how the circuit model is built. The model parameters assigned and the currents simulated are characteristic input and output data of the single test performed. In the present work, an evaluation of the model output of a commercial defibrillator due to the uncertainty in the estimation of model input is presented in order to verify the robustness of the circuit model. This evaluation has been performed by the adaptive Monte Carlo method.

11:35 A Multi-Class ECG Beat Classifier Based on the Truncated KLT Representation

Giorgio Biagetti (Università Politecnica delle Marche, Italy), Paolo Crippa (Università Politecnica delle Marche, Italy), Alessandro Curzi (Università Politecnica delle Marche, Italy), Simone Orcioni (Università Politecnica delle Marche, Italy) and Claudio Turchetti (Università Politecnica delle Marche, Italy)

Automatic classification of electrocardiogram (ECG) signals is of paramount importance in the detection of a wide range of heartbeat abnormalities as aid to improve the diagnostic achieved by cardiologists. In this paper an effective multi-class beat classifier, based on statistical identification of a minimum-complexity model, is proposed. The classifier is trained by extracting from the ECG signal a multivariate random vector by means of a truncated Karhunen-Loève transform (KLT) representation. The resulting statistical model is thus estimated using a robust and efficient Expectation Maximization (EM) algorithm to find the optimal parameters of a Gaussian mixture model. Based on the above statistical characterization a multi-class ECG classifier was derived. The experiments, conducted on the ECG signals from the MIT-BIH arrhythmia database, demonstrated the excellent performance of this technique to classify the ECG signals into different disease categories, with a reduced model complexity.

11:55 A cost-object model for Activity Based Costing simulation of Business Processes

Giuseppe Di Modica (University of Catania, Italy), Orazio Tomarchio (University of Catania, Italy), Daniele Manni (University of Catania, Italy) and Vincenzo Cartelli (University of Catania & BEng Business Engineering Company, Italy)

The achievement of business goals is heavily affected by the capability of enterprises to design, enforce and govern business processes. The dynamism of the market requires business goals to be constantly tuned, thus obliging the enterprise to continuously re-design processes. The cost for process re-engineering may be not negligible, if we consider that it may require several refinement steps and that tuning processes on-the-job may impair regular business activities. To this end, there is a growing interest towards tools that allow to simulate the processes’ performance before they get actually enforced. In this paper we propose a novel business process simulator which makes use of a cost-object resource model to allow for Activity Based Costing (ABC) analysis of the simulation results. The simulator works with business processes modelled in the Business Process Model and Notation (BPMN) and exploits the rigour of the Colored Petri Nets’(CPNets) formalism. A case study test was conducted on a prototype implementation and related results are presented.
1:15 PM - 3:15 PM

Tue.pm1.A: Methodologies, Discrete and Image/Signal/Speech Processing

Chairs: Kenneth S Nwizege (University of SWANSEA, United Kingdom), Nadia Abd-Alsabour (Cairo University, Egypt)

1:15 Ranking Entities in Networks via Lefschetz Duality
Andreas Aabrandt (Technical University of Denmark, Denmark), Vagn Lundsgaard Hansen (Technical University of Denmark, Denmark), Bjarne Poulsen (Technical University of Denmark, Denmark) and Chresten Træholt (Technical University of Denmark, Denmark)

In the theory of communication it is essential that entities are able to exchange information. This fact is closely related to the study of connected spaces in topology. A communication network may be modelled as a topological space such that entities can communicate if and only if they belong to the same path connected component in that space. In order to study combinatorial properties of such a space, notions from algebraic topology is applied. This makes it possible to determine the shape of a network by concrete invariants, e.g. the number of connected components. Elements of a network may then be ranked according to how essential their positions are in the network by considering the effect of their respective absences. Defining a ranking of a network which takes the individual position of each entity into account, has the purpose of assigning different roles to the entities, e.g. agents, in the network.

1:35 Solving assembly line balancing problems with emphasis on cost calculations: A Petri nets based approach
Reggie Davidrajuh (University of Stavanger, Norway)

In this paper, a new heuristic approach based on Petri net is provided for assembly line balancing problem (ALBP). Unlike the other works that assume homogenous workstations (that the workstations are identical), this paper assumes that workstations need not be homogenous (e.g. their running costs can be different), and attempts to optimize on the total cost of production too, in addition to maximizing workstation line time. The new approach makes use of Activity-Oriented Petri net (AOPN) with which resources (and hence - workstations) can be abstracted away from the Petri net model, thereby drastically reducing the complexity and size of Petri net models. AOPN also allows embedding costs to workstations so that the total costs of production can be calculated. This paper also presents an application example showing how the approach can be put into practice.

1:55 Dynamic reliability assessment based on Ouroboros paradigm
Hela Kadri (LIP2 Laboratory, University of Tunis El Manar, Tunisia), Sajeh Zairi (LIP2 Laboratory, University of Tunis El Manar, Tunisia) and Eric Niel (AMPERE Laboratory, France)

Dynamic reliability notions have gained popularity as an efficient indicator to assess performance degradation during system's life. Time dependent failure rates, as well as impact of operating constraints, cannot more be ignored to characterize service efficiency. By that way, this work aims, firstly to discuss factors influencing failure rates, and secondly, to develop a formal approach which integrates the effect of a system life factors into associated component. The first part of the paper attempts to transpose the conventional coupling model well fitted to "Ouroboros" paradigm to assess the reliability degradation due to aging and operating conditions. The second part of the paper is devoted to the risk of losing the service due to the too low reliability level of the involved components or maintenance tasks. A seaport for oil export validates the proposal. Hereby, connection components such as valves are involved in order to define an alignment. The reciprocal local-global dependency for reliability assessment is directly measurable on the alignment achievement. High level Petri nets have been used in one hand to compose this coupling paradigm, in the other hand to assess the dynamic reliability level for valves (local) and compute the risk of alignment lose (global).
2:15 Efficient data structures for a new Petri net based simulator
Reggie Davidrajuh (University of Stavanger, Norway)
This paper shows how the basic elements of a Petri Net are represented in a Petri Net simulator as data structures, and how they contribute to the efficiency of the simulator. After a brief introduction to Petri Nets, this work presents a new Petri Nets based approach known as Activity-Oriented Petri Nets (AOPN), and then the simulator GPenSIM as a realization of AOPN. The data structures of GPenSIM are presented through an application example that deals with the problem of finding total costs of production when machines and resources add costs to the production. Unlike the most other simulators that compute only time, the data structures presented in this work reveal that the simulator is capable of calculating costs too.

2:35 A realistic two-lanes traffic simulation model based on cellular automata
Hector Guzman (Universidad Nacional Autonoma de Mexico & Instituto de Ingenieria, Mexico), María Lárraga Ramírez (Universidad Nacional Autonoma de Mexico, Mexico), Luis Álvarez-Icaza Longoria (Universidad Nacional Autonoma de Mexico, Mexico) and Fernando Huerta Trejo (Universidad Nacional Autonoma de Mexico, Mexico)
Lane-changing models are an important component of microscopic traffic simulation. In this paper we present an asymmetric two-lanes cellular automata (CA) model for traffic flow. The aim of this paper is to reproduce the usage of the two-lanes highway space and to make the lane change process more in line with reality. For this purpose, the model determines both the utility of a given lane and the risk associated with lane changes in terms of accelerations and safe braking distances. The simulation results on a system with periodic conditions and two types of vehicles show that the model reproduces most empirical findings observed in two-lanes highways and preserves the computational simplicity of CA traffic models, so it can be used in real time.

2:55 A Simulation of Non-stationary Signal Analysis Using Wavelet Transform Based on LabVIEW and Matlab
Alaa Jaber (Newcastle University, United Kingdom) and Robert Bicker (Newcastle University, United Kingdom)
The condition monitoring of machines has long been accepted as a most effective solution in avoiding sudden shutdown and for detecting and preventing failures in complex systems. However, signal capturing, signal analysis, features extraction and classification represent the main tasks for building any monitoring system. The signal processing step plays a significant role in condition monitoring and fault diagnosis process. There are many signals can be used for condition monitoring of machines, such as vibration, electrical and sound signals. The most important thing is how to process these signals in appropriate way in order to extract the salient features that are related to specific fault types. A large number of signal processing techniques can be employed to do that and the nature of the captured signal represents a significant factor that effects on selecting the appropriate technique. Thus, the main focus of this research is to discuss the various signal processing techniques which can be applied for condition monitoring, and explore their pros and cons. Then, the wavelet transform has been discussed in detail, and a monitoring system is simulated using LabVIEW and Matlab capabilities.
1:15 PM - 3:15 PM

Tue.pm1.B: Industry, Business, Management, and Engineering Systems

Chairs: Emanuele Zennaro (Sapienza University of Rome, Italy), Jasmin Smajic (University of Applied Sciences of Eastern Switzerland (HSR), Switzerland)

1:15 Supporting numerical investigation during the recovery of a steady longitudinal flight with constant forward velocity
Alexandra Emilia Fortis (West University of Timisoara, Romania, Romania), Stefan Balint (West University of Timisoara, Romania) and Teodor-Florin Fortiş (HPC Center, West University of Timisoara, Romania, Romania)

In the case of unmanned aerial vehicles, for the variation of the elevator deflection there exists a safe interval, the interval for which steady longitudinal flight with constant forward velocity is present. As the elevator deflection is one of the control parameters, when the automated flight control system (AFCS) is decoupled and the value of the elevator deflection is situated outside the safe interval then steady longitudinal flight with constant forward velocity doesn't exist any more and the flight becomes oscillatory. This phenomenon, and the recovery of the steady longitudinal flight, raise a number of interesting research problems. This paper offers an overview of an instrument able to support numerical investigation for studying the variations of the components of the aerodynamic forces and moments during the recovery of a steady longitudinal flight with constant forward velocity, in the case of an unmanned aircraft.

1:35 PID-Terminal sliding mode control of Aircraft UAV
Lamia Melkou (Centre de Développement des Technologies Avancées, Algeria), Amar Rezoug (Centre De Developpement Des Technologies Avancees, Algeria) and Hamerlain Mustapha (CDTA, Algeria)

This paper deals with the design of two controllers applied to a fixed-wing unmanned aerial vehicle (UAV). The aim is to stabilize an UAV type Cessna 182 in longitudinal and in lateral-directional flight. The UAV is identified by decoupling the system to longitudinal and lateral-directional modes and using off line modeling. The resulting models represent approximately the UAV because of nonlinearities and parametric uncertainties characterizing it. This lack of accuracy makes the UAV difficult to control. Hence the necessity to implement a robust control laws. In this work, the controllers are based on Terminal Sliding Mode (TSM) and cascade control PID-TSMC. A comparative study between the two control laws is performed in order to determine the controller that offers best performance. Simulation results are used to analyze the two controllers.

Mohammed Ammar (Cairo University & Faculty of Engineering, Egypt)

Cross-Directional (CD) processes are a class of spatially distributed systems. Paper properties are controlled by a set of different actuator arrays acting in the cross direction (CD) as the paper sheet moves along the machine direction (MD). The industrial custom is to identify CD models from bump tests that are run in open-loop. This article presents a technique for CD response shape, alignment and dynamics model identification in open-loop. The spatial response is identified by a noncausal spatial FIR model that accounts for the actuator response in the cross-direction (CD). The spatial model identification is followed by estimating the CD process dynamics. The CD model identification technique is extended to feedback loops running under model predictive control (MPC) when an accurate estimate of the process time constant is available. CD process models are identified in closed-loop from short identification experiments in a low signal-to-noise ratio (SNR). The proposed technique is validated by conducting identification experiments on an industrial paper machine model running under MPC.
2:15 Proposal of system testing integration into safety critical system design process supported by SysML
Lukas Spendla (Slovak University of Technology, Faculty of Materials Science and Technology, Slovakia) and Lukas Hrcka (Slovak University of Technology, Faculty of Materials Science and Technology, Slovakia)
This paper focuses on system testing in design and development process of safety critical systems. System testing of safety critical systems must not only verify the system requirements, but also all requirements related to safety and real time operation. The proposal aims to identify requirements for system testing of safety critical systems and connects them with system model defined in SysML language. Proposed model focuses on the connection between safety critical system specification and system model in SysML language. The advantage of this connection is more precise definition of requirements in various phases of design and development process. The steps and requirements in this process are based on analysis of standards and guidelines carried out in our previous work. The proposed model is captured using appropriate SysML diagrams.

2:35 Productivity Increase through Joint Space Path Planning for Robot Machining
Agus Atmosudiro (ISW Uni Stuttgart, Germany), Akos Csiszar (Stuttgart University, Graduate School of Ecelleence Advanced Manufacturing Engineering, Germany), Matthias Keinert (University of Stuttgart, Germany), Ali Karim (Institute for Control Engineering of Machine Tools and Manufacturing Units, Germany), Armin Lechler (University of Stuttgart, Germany) and Alexander Verl (Stuttgart University, Institute for Control Engineering of Machine Tools, Germany)
Machine tools realize tool movements with high accuracy mainly due to highly developed computerized numerical controls (CNCs). As articulated industrial robots are used more and more for machining, robot controller (RC) have to be equipped with additional path planning capabilities, similar to machine tools. A RC is very similar to a CNC from a software and hardware point of view, but with one major difference, the RC has an additional transformation stage, the transformation from Cartesian space to joint space. Machining with robots is a field intensely researched in the last years. CNC systems for robots are commercially available, furthermore, more and more CAM systems have extensions for machining with robots. Most of these offer a simulation of the machining process using a robot model, in order to solve the inverse kinematic problem and, additionally, to take into consideration axis motion limits (maximum angular amplitudes) and singularities. Moreover, path planning for machining robots is done in exactly the same way as for machine tools, with the mentioned additional transformation stage. This paper describes the advantages and challenges which result from the integration of the kinematic transformation in the path planning stage.

2:55 Modeling, simulation and control of pneumatically actuated Stewart platform with input quantization
Boris Andrievsky (IPME RAS & SPb State University, Russia), Dmitry Kazunin (Transas Group, Russia), Nikolay Kuznetsov (University of Jyväskylä, Finland), Olga A. Kuznetsova (Saint-Petersburg State University, Russia), Gennady Leonov (Saint Petersburg State University, Russia) and Svetlana Seledzhi (Saint Petersburg State University, Finland)
The present paper is devoted to modeling the Stewart-platform based simulator for training of freight vehicle KamAZ drivers that is currently under construction by the Transas Co. The Stewart (or Gough-Stewart) platform is the six-degree of-freedom parallel manipulator. This platform being representative of the class of parallel manipulators. The car cab is mounted on the Gough-Stewart platform for reproducing the desired motions of the cab. The pneumatic servos are used as the actuators for the Transas simulator. An essential peculiarity of the described Transas simulator is usage of the on-off air valves rather than sliding piston-type selector valves for motion control, which imposes serious restrictions on the control law design The mathematical model, including motion dynamics and pneumatical actuators is presented. The simulation results for quantized sliding-mode control are presented.
3:30 PM - 5:50 PM

Tue.pm2.A: Image, Speech and Signal Processing

Chairs: Hassan Mashad Nemati (Halmstad University, Sweden), Alaa Jaber (Newcastle University, United Kingdom)

3:30 Vehicle classification in video based on shape analysis
Can Nguyen (People's Police University of Technology and Logistics, Vietnam)

This paper aims at presenting some methods of representing image's features that help to detect and classify vehicle from video. Proposed methods include: Method of representing shape, contour of vehicle or a set of block of vehicle that can be classified. Parameters of the image's length in combination with parameters of visual length of the object that can used to classify object type or separate object. Use general deformable model of vehicle for allowing to be completely or partially occluding in the image. Apply some proposed methods of representing vehicle for vehicle recognition and classification system in traffic video. This paper also proposes a general working frame for the video-based traffic density detection and vehicle classification system in observation region. System was experimentally installed and obtained good results about the level of accuracy.

3:50 Face Recognition Based on Features Measurement Technique
Mahammad M Fakhir (Newcastle University, United Kingdom), Wai Lok Woo (Newcastle University, United Kingdom) and Satnam Dlay (University of Newcastle, United Kingdom)

We present a new technique to infer dimensions that can be used in biometric face recognition. The methodology is centered on inferring unique dimensions from human ears which provides unique physical biometric features. The process of determining the distance is by harvesting the real actual dimensions from 2D faces images. This is achieved by using specific point to point distances on the two ears in human face. The points chosen give dimension information which enables discrimination for face recognition. The empirical results confirm that an accuracy of 94% recognition rate is achievable. The different positions of measurement points on the ears have a powerful impact to reduce the error of face recognition. Hence, our new measurement dimensions technique is precise and nodal facial points can be reflected as a robust face recognition method.

4:10 Simultaneous Localization and Mapping based on Semantic World Modelling
Bjoern Sondermann (RWTH Aachen University, Germany) and Juergen Rossmann (Technical University of Aachen, Germany)

In mobile robotics the problem of simultaneous localization and mapping is quite complex. However, by using smart constraints, the problem can be reduced considerably. Instead of constraining the issue to a specific robotic system or its movement behavior, we show how semantic environment perception and modeling allows for another point of view and therefore a simple solution for the problem. We present a method for application independent localization and mapping based on semantic landmarks and the concept of visual odometry. Central starting point is a generic landmark definition, allowing for a reduction of the 3d localization problem to a more simple search for an affine transformation in 2d space. These semantic landmarks are simultaneously used to map the surrounding environment of the robot, resulting in a widely applicable world model.
4:30 Searching The Effects of Image Scaling for Underground Object Detection Using KMeans and KNN
Ibrahim Mesecan (Rruga Tirane-Rinas Km 12 & Epoka University, Albania) and Ihsan Bucak (Meliksah University, Turkey)
With the increase in conflicts between countries, underground object detection has become a serious problem today. One of the commonly used technologies is Ground penetrating Radar (GPR). There are different variants of GPR devices, but usually they have an array of sensors, which emits electromagnetic waves, and then, collect the reflecting data through its sensors. The signals travel with different speeds in different mediums which yield some beams together and forms holes or peaks in the signal. According to the properties of searching object, depth of the object, or the soil properties, GPR produces different signals. These signals are used to detect searching underground objects. In order to have a detailed view, more sensors are used; and the frequency is changed to be able to detect deeper objects. Increasing the signal (image) quality causes many algorithms to fail or slow down seriously. On the other hand, underground object detection, needs fast and accurate detection. In this paper, we have analyzed the effects of image scaling on object detection using KMeans and k-Nearest Neighbor algorithms (KNN). According to the results, even after serious image scaling, the results have not change much while increasing the running time performance and memory efficiency significantly.

4:50 Image super-resolution via sparse representation over coupled dictionary learning based on patch sharpness
Faezeh Yeganli (Eastern Mediterranean University, Turkey), Mahmoud Nazzal (Eastern Mediterranean University, Turkey), Murat Unal (Eastern Mediterranean University, Turkey) and Huseyin Ozkaramanli (Eastern Mediterranean University, Turkey)
In this paper a new algorithm for single-image super-resolution based on sparse representation over a set of coupled low and high resolution dictionary pairs is proposed. The sharpness measure is defined via the magnitude of the gradient operator and is shown to be approximately scale-invariant for low and high resolution patch pairs. It is employed for clustering low and high resolution patches in the training stage and for model selection in the reconstruction stage. A pair of low and high resolution dictionaries is learned for each cluster. The sharpness measure of a low resolution patch is used to select the appropriate cluster dictionary pair for reconstructing the high resolution counterpart. The sparse representation coefficients of low and high resolution patches are assumed to be equal. By multiplying the high resolution dictionary and the sparse coding coefficient of a low resolution patch, the corresponding high resolution patch is reconstructed. Simulation results in terms of PSNR and SSIM and visual comparison, indicate the superior performance of the proposed algorithm compared to the leading super-resolution algorithms in the literature over a set of natural images in sharp edges and corners.

5:10 Single Image Super-resolution via sparse representation over directionally structured dictionaries based on the patch gradient phase angle
Mahmoud Nazzal (Eastern Mediterranean University, Turkey), Faezeh Yeganli (Eastern Mediterranean University, Turkey) and Huseyin Ozkaramanli (Eastern Mediterranean University, Turkey)
This paper presents an algorithm for single-image super-resolution based on sparse representation over a set of cluster dictionaries. For each cluster, a directionally structured dictionary pair is designed. The dominant angle in the patch gradient phase matrix is employed as an approximately scale-invariant measure. This measure serves for patch clustering and sparse model selection. The dominant phase angle of each low resolution patch is found and used to identify the cluster this patch belongs to. Then, the sparse coding coefficients of this patch with respect to the low resolution cluster dictionary are calculated. These coefficients are imposed on the high resolution dictionary of the same cluster to obtain a high resolution patch estimate. In experiments conducted on several images, the proposed algorithm is shown to outperform the algorithm that uses a single dictionary pair, and to be competitive to the state-of-the art algorithm. This result is validated quantitatively in terms of PSNR and SSIM and by visual comparison.

5:30 Moved to AIMS2014, Late Fee. Communality Performance Assessment of Electricity Load Management Model for Namibia
Godwin N. O. Asemota (College of Science and Technology, University of Rwanda, Kigali, Rwanda)
Communality represents the proportion of variance of any particular electricity load management variable as shared with all other variable items in the total aggregate. Out of 300 administered questionnaires, 127 were yielded for statistical analyses. The communalities closely mirror the predictors, whenever they were closer to unity. Using Borel's strong law of large numbers, we conclude that employing sample sizes larger than 127, the error will exceed 0.1 only once for every five runs. Furthermore, communality results are lower-bound solutions that belong to a class of nonsmooth optimisation algorithms useful for obtaining high quality results with rather elementary reasoning. Under the interval of communality, there is only minimum, which strengthens our claim of obtaining the optimal performance assessment criterion for the electricity load management model developed for Namibia.
3:30 PM - 5:50 PM

Tue.pm2.B: Engineering and Control

Chairs: Bogdan Manate (West University of Timisoara, Romania), Emanuele Zennaro (Sapienza University of Rome, Italy)

3:30 Decentralized Feedback Design for a Compliant Robot Arm
Houman Dallali (Istituto Italiano di Tecnologia (IIT), Italy), Gustavo A Medrano-Cerda (Istituto Italiano di Tecnologia, Italy), Nikos Tsagarakis (Istituto Italiano di Tecnologia, Italy), Darwin Caldwell (Istituto Italiano di Tecnologia, Italy) and Navvab Kashiri (Istituto Italiano di Tecnologia, Italy)

Enhancing safety during interaction with environment and improved force control has led to design of compliant arm robots. However, due to introduction of passive compliance in series with actuators the links' interactions and coupling effects become much more important. In this paper a direct decentralized approach for designing PD-PID gains, given the dynamic multivariable model of the compliant robot arm, is proposed. The proposed method is based on Linear Matrix Inequality (LMI) formulation with full state feedback in discrete time that automatically designs the decentralized gains for all the four joints of the robot in one shot. Experimental results for a four Degree of Freedom (DoF) compliant robot arm are provided to illustrate the effectiveness and performance of this method.

3:50 Modelling ETL Conciliation Tasks Using Relational Algebra Operators
Vasco Santos (School of Management and Technology & Polytechnic of Porto, Portugal) and Orlando Belo (University of Minho, Portugal)

The design and development of a data warehousing system (DWS) tends to be an exceptional resource consuming project which in turn makes it a high risk/reward project. In order to minimize the risk, some design methodologies and tools are used along the several phases of the project. The Extract-Transform-Load (ETL) component is normally one of the most critical components of a DWS since it gathers, corrects and conforms data in order to be loaded into the Data Warehouse (DW). Data conciliation task tends to be a dull and manual intensive job that often deals with several heterogeneous sources which is critical to the correct representation of the enterprise's information. The manual nature of this task makes it prone to errors and subject of intensive and successive monitoring. In this paper, we analyse some of the most common ETL tasks for data conciliation using a Relational Algebra approach, as an effort to standardize them for future use in a generic ETL environment. A slowly changed dimension scenario will be used to support the data conciliation modelling process designed for this work.

4:10 Evaluation and monitoring of physico-chemical properties of water streams through unconventional techniques
Ismael Matino (Scuola Superiore Sant'Anna, Italy), Erika Alcamisi (Scuola Superiore Sant'Anna, Italy), Giacomo Filippo Porzio (Scuola Superiore Sant'Anna, Italy) and Valentina Colla (Scuola Superiore Sant Anna, Pisa, Italy)

Evaluation and monitoring of physical and chemical water properties such as electrical conductivity (EC) and Langelier Saturation Index (LSI) are important in all industrial processes. Analytical representation of these water properties is useful since process modeling and simulation are exploited to investigate industrial system behavior under conditions that cannot be easily or safely tested. Common simulation softwares usually do not estimate the mentioned water properties but using literature information an estimation is possible through unconventional techniques. In particular Aspen Plus software has available calculator blocks to customize in order to represent specific features. In the paper modelling of FORTRAN based calculator blocks are described, which have been developed using literature information to calculate electrical conductivity and Langelier Saturation Index in Aspen Plus software.
4:30 Simplified Ionic Representation of Industrial Water Streams
Erika Alcamisi (Scuola Superiore Sant'Anna, Italy), Ismael Matino (Scuola Superiore Sant'Anna, Italy), Marco Vannocci (Scuola Superiore Sant'Anna, Italy) and Valentina Colla (Scuola Superiore Sant Anna, Pisa, Italy)

Industrial focus on environmental impact involves exploitation of internal resources. Water reuse is one of the topic and some characteristics have to be measured in order to evaluate the quality of a process water stream. Analytical estimation of water main properties becomes fundamental when preliminary study about reuse feasibility is required. This kind of evaluation for properties such as pH, electrical conductivity, Langelier Saturation Index, etc. depends on ionic composition of the solution. A simplified Excel-based model has been developed in order to represent the ionic composition of an industrial water stream, which allows user to obtain approximate but realistic values for some properties of interest. The paper presents the approach to the model development with the main assumptions and results.

4:50 Effect Of Varying Inter-Implant Distance In A Two Implant-Three Prosthetic Unit Dental System: A Finite Element Analysis Study
Sarthak Seth (Lovely Professional University, India) and Raja Sekhar Dondapati (Lovely Professional University, India)

The objective of this study was to calculate the stress produced at the implants as well as at the bone-implant interface under axial or vertical, oblique and para-axial loading due to different distances between the implants using FEA. Research was carried out on a two implant-three prosthesis unit system. Modeling of each component was done in CAM software SOLIDWORKS. After the assembly was done, ANSYS 14.0 was used for the finite element analysis. Material properties were assigned to every component and all the loading conditions were applied individually. Von Mises stress values have been evaluated at the implants and the jawbone. Since the jawbone is made up of cortical and cancellous bone, stresses were calculated on both of them individually. From the work done in this thesis it was concluded that oblique loading was the most critical loading followed by para-axial and axial loading, maximum stresses were produced in the prosthesis followed by implants, cortical bone and cancellous bone. Moreover the buccal side of the entire system was more affected than the lingual side.

5:10 Analytical and Numerical Calculations of Synchronous Motors for Industrial Drives
Iossif Grinbaum (ABB Switzerland Ltd., Switzerland), Cornelius Jäger (University of Applied Sciences of Eastern Switzerland (HSR), Switzerland), Axel Fuerst (Bern University of Applied Sciences, Switzerland) and Jasmin Smajic (University of Applied Sciences of Eastern Switzerland (HSR), Switzerland)

This paper presents the analytical and numerical methods for modeling and simulation of synchronous motors with salient pole rotor without damper winding for industrial drives. The entire industrial drive system and its requirements considering the motor calculation accuracy are described in detail. This result is of paramount importance for the daily motor analysis and design, as well as for the optimization of the entire system. The obtained results of the described fast analytical calculation algorithm are compared against the corresponding results of the in terms of CPU-time and memory more demanding field simulation based numerical algorithm (using FEM). The presented results and their comparison reveal some limitations of the analytical approach compared to the presented field simulation based numerical methodology.
The resolution power of experiments is improving steadily and the data rate production is rapidly increasing. The success of the experiments depends critically on handling effectively and efficiently huge amounts of data. The on-detector reduction of the data rate will be a major topic as only a fraction of the data can be archived for later long-term analyses.

In the project “Large Scale Data Management and Analysis” (LSDMA) several Helmholtz centres and German universities are cooperating in order to support researchers in maintaining their huge amounts of data. Besides supporting individual scientific communities, generic services are being developed, e.g.
- Federated identity management
- Federated data access
- Meta data repositories
- Archive services
- Monitoring, modelling, optimization
- Data intensive computing & analysis.

The talk will explore the general challenges of Big Data. Several instructive examples from different scientific communities are presented. An overview of the current status of the LSDMA project is given. In addition, recent results on real-time and near-real time analysis of Big Data are presented.
We are living with networks surrounding us. The first such network was probably the postal services, and now the youngsters are already using 4G mobile internet.

Megawatts and gigawatts are not so easy to handle than megabytes and gigabytes. Transferring huge amounts of electrical energy requires big investments. The story started at the end of the 19th century with steam engines, generating power first for the factories, later for the settlements of the workers, moving close to the big industrial centres. Connecting those resulted in national grids available at least for the urbanized areas. It may sound strange, but the consumption habits have changed very little during the last 120 years. There is a meter outside the house and anybody can draw any time as much energy as he/she pleases. All this happening with fixed prices not depending upon the actual state of the supply and the demand - which is rather strange nowadays.

The events on 11th of Sept. 2001 taught us that we are vulnerable even at home. The 2003 big blackout lasting four days on the east coast of USA and causing huge damages and even losses of lives implied that something has to be done: it should not happen any more. We already know from the information technology: networks should be redundant, diverse, distributed, hierarchically built, self-diagnosing and self-healing in order to be able to provide robust and reliable service. How to achieve that?

On the other hand, the unpredictable and renewable energy resources are growing very rapidly. Photovoltaic cells, wind turbines, biogas, etc. They are relatively small, but very numerous and they cannot be handled efficiently in the old-fashioned centralized way. We need local energy storage as much as possible to cover periods of time when the sun is down and the wind is not blowing. That implies that customers have to be smart, more intelligent to optimize the various possibilities in the environment of new, fast-changing flexible electricity tariffs.

Different countries are in different situation, depending upon the different history and levels of development. There is no common approach to improve. There will be different ideas, different methods presented and compared in a relatively easy understandable way. This is where our knowledge and experience steps in: simulation. Experimenting with big power is expensive, but the modeling is straightforward and reliable, and different approaches can be worked out relatively easy and this should not last very long periods of time.
10:15 AM - 12:15 PM


Chairs: Meisam Farrokhifar (Islamic Azad University & Heris Branch, Iran), Hassan Mashad Nemati (Halmstad University, Sweden)

10:15 State Estimation Techniques for Electric Power Distribution Systems
Barry Hayes (Institute IMDEA Energy, Spain) and Milan Prodanovic (Institute IMDEA Energy, Spain)
This paper provides a survey of techniques for state estimation in electric power distribution systems. While state estimation has been applied in the monitoring and control of electricity transmission systems for several decades, it has not been widely implemented in distribution grids to date. However, with the recent drive towards more actively-managed, intelligent power distribution networks ("smart grids") and the improvements in monitoring and communications infrastructure, Distribution System State Estimation (DSSE) has been receiving significant research interest. DSSE presents a number of unique challenges due to the characteristics of distribution grids, and many of the well-established methods used in transmission systems cannot be applied directly. This paper provides a detailed survey of the available methods for DSSE, reviewing more than 70 papers from the major journals. In addition, it discusses the potential for applying Advanced Metering Infrastructure (AMI) data and computational intelligence methods in DSSE.

10:35 Wind turbine sensor data analysis and production forecast
Visa Vaara (University of Jyvaskyla, Finland), Marko Pitkänen (University of Jyvaskyla, Finland) and Timo Hämäläinen (University of Jyväskylä, Finland)
In this paper we used wind power and meteorological data provided by a Finnish energy company and the Finnish Meteorological Institute as the research material. The study determined the most important factors which had influence to the effectiveness of the wind turbine power production. This was done by using the physical power function with statistical data analysis. Wind speed was found to be the most significant factor for the model. This was due to the fact that wind speed was the only variable which affect was exponential. Another significant factor when it comes to creating a forecast model was temperature. The affect wasn't as powerful as with wind speed but still notable. These observations were also confirmed in statistical interpretation. A tailored forecasting model was formed for our target wind turbine on the basis of these factors: suitable modelling for necessary meteorological factors was executed and the coefficient factor was calculated. The results and especially the forecast model was seen significant and would be used in creation of a production forecast program's first version for the energy company in question.

10:55 Parametric Evaluation of AC losses in 500 MVA/1.1 kA High Temperature Superconducting (HTS) Cable for Efficient Power Transmission
Gaurav Vyas (Lovely Professional University, India), Raja Sekhar Dondapati (Lovely Professional University, India) and Preeti Rao Usurumarti (PVK Institute of Technoogy, India)
High Temperature Superconducting (HTS) cables are used for efficient power transmission. In the present work, AC losses in High Temperature superconducting cable due to self field with various parameters are calculated and validated with the published results. A 500 MVA / 1.1 kArms HTS transmission cable operating at 50 Hz is considered for the AC loss (self field) calculations. The major AC losses arise due to self field in the HTS cable and can be obtained by the approximated Norris equation. Two different superconducting cables, one with BSCCO and the other with YBCO tapes are considered for the present analysis. For a transport current of 1.1 kArms, the analytically calculated self field loss is 0.4 W/m (with BSCCO tape) and 0.5 W/m (with YBCO tape) respectively are comparable with published experimental results.
11:15 Modelling Communication Based Train Control system for dependability analysis of the LTE Communication network in train control application

Thi Phuong Khanh Nguyen (IFSTTAR & ESTAS, University Lille Nord de France, France), Julie Beugin (IFSTTAR, ESTAS & University Lille Nord de France, France), Mohamed Kassab (IFSTTAR, LEOST & Univ Lille Nord de France, France) and Marion Berbineau (IFSTTAR, LEOST & University Lille Nord de France, France)

The Communication Based Train Control (CBTC) systems today has generated immense interest in transport domain because of its ability to enhance safety and improve operational effectiveness. The current communication solutions for urban guided transport system that is based on the Wireless local area network (WLAN) becomes obsolete with a number of shortcomings in term of capacity and capability. Hence, the Long Term Evolution (LTE) is considered as a new solution for railway communication technology. Before widely deploying this new solution in railway industry, it must be evaluated and tested to ensure the desired performance level for CBTC system according to the railway safety standards. Therefore, it is necessary to propose a model of CBTC system that allows to consider the behaviours of the LTE communication network in real time. In this paper, we propose to use Petri nets for modelling CBTC system based on a LTE architecture. Using this model, preliminary dependability analysis for the data communication system based on the LTE technology is then performed.

11:35 Modeling a Continuous and Accident-Free Intersection Control for Vehicular Traffic in TraffSim

Christian Backfrieder (University of Applied Sciences Upper Austria & Campus Hagenberg, Austria) and Gerald Ostermayer (University of Applied Sciences Upper Austria, Austria)

With the goal of accomplishing vehicular traffic simulations close to reality, modelling intersection control is a very important issue which affects the traffic flow and hence simulation results considerably. This paper presents an exhaustive intersection control applicable for continuous traffic simulators. Our work contains many types of road crossings and junctions occurring in real road networks, including unregulated intersections without prioritization (right-before-left rule), traffic light controlled ones, intersections regulated with road signs and combinations of them with different numbers of road segments inwards and outwards. Special situations such as route changes before intersections and multi-lane situations are addressed. The models are implemented for the continuous traffic simulator TraffSim, which demonstrates their applicability and range of features. With the introduced set of rules and situations, a great majority of intersections of real road networks can be parametrized and simulated virtually and the requirements for traffic flow investigations through dynamic simulations are fulfilled.

11:55 A hybrid Feature Selection method for classification purposes

Silvia Cateni (Scuola Superiore Sant'Anna, Pisa, Italy), Valentina Colla (Scuola Superiore Sant'Anna, Italy) and Marco Vannucci (Scuola Superiore Sant'Anna, Italy)

This paper presents a novel combination of filter features selection algorithms for classification problem. Feature selection is one of the most important issues in pattern recognition, machine learning and computer vision. The main objective of feature selection regards the dimensionality reduction, the performance of machine learning improvement and the process comprehensibility increase. Exhaustive search method is the only method which guarantees to find the optimal subsets but its computational time complexity is exponential. In this paper the set of available variables are firstly reduced using a combination of filter selection methods and then exhaustive search is performed in order to obtain a sub-optimal set of variables in a reasonable time. The proposed approach is tested on several commonly used datasets from UCI repository and two datasets coming from industrial context.
10:15 AM - 12:15 PM

**Wed.am2.B: VR, Visualization/Games and Internet Modelling, Semantic Web & Ontologies**

Chairs: Alexandra Emilia Fortis (West University of Timisoara, Faculty of Mathematics and Informatics &amp; Tibiscus University, Faculty of Computers and Applied Computer Science, Romania), Jasmin Smajic (University of Applied Sciences of Eastern Switzerland (HSR), Switzerland)

**10:15 3D Simulator Using Zorb Ball**  
Roger Achkar (American University of Science and Technology, Lebanon)  
The suggested 3D Simulator Using Zorb Ball, is to design and implement a new system that allows the user to apply his/her every day motor skills to simulate the game. This system adds to the known gaming techniques the physical benefits as well as the real interaction between user and machine. Moreover, the gamers around the world can benefit from this project as well as the people who need physical rehabilitation. The latter can use it to walk and jump without being forced to leave his/her place; a fact which can help them speed up their recovery. The system mainly consists of a Zorb ball that allows the movement of the user in all directions. The Zorb ball is enclosed in a mount to keep it stationary, where it floats on a certain level of water contained within the mount. Video glasses are also used to provide a realistic graphical interface for the user. In addition, an electronic gun is used for aiming and shooting.

**10:35 CFD Simulation and Comprehensive Data Visualization in eRobotics Systems for Storm Damage Prevention in Forest Planning**  
Nico Hempe (RWTH Aachen University, Germany) and Juergen Rossmann (Technical University of Aachen, Germany)  
CFD simulation tools typically are expert systems and demand for specific expertise; moreover, commonly provided visualizations of the simulation results are hard to analyze and interpret, especially to people not closely related to the specific area of expertise. As a recent example, the need for such simulations, as well as tools for comprehensive visualizations and analysis of the generated results became clear in 2007 when the windstorm "Kyrill" hit Europe and caused massive damages to the forests. Proper storm simulations can support forest planning in order to prevent future storm damages. The recently introduced concepts of eRobotics aim to bridge the gap between expert systems and comprehensive software applications by supporting the understanding of complex simulation results with realistic virtual environments. In this paper, we extend the eRobotics approach to the forest planning domain. Accurate CFD simulations are combined with comprehensive visualization approaches in order to act as a decision support system to optimize future forest developments under ecological and sustainable aspects. Finally, a comparison of real-world and simulated storm damage caused by the windstorm Kyrill will show the applicability and benefits of the presented system regarding damage prevention and sustainable forest development.

**10:55 Measuring the Performance of Ontological Based Information Retrieval from a Social Media**  
Eko Sediyono (Satyawacana Christian University, Indonesia), Suhartono Suhartono (Diponegoro State University, Indonesia) and Christian Nivak (STMIK Provisi Semarang, Indonesia)  
Users of social media website now can search, share, or just browse for information with ease. In the field of travel and tourism, it can easily find and share information about travel activities, travel destination, and travel accommodation due to plentiful source of information, but there is also a drawback related to the quality of the information. Traditional search engine that uses keyword to search for information about the meaning of a word or a sentence often produce biased and irrelevant search results. Ontology has been developed to overcome this problem. In this paper an ontology framework is presented, which was specifically developed for travel and tourism field using data set from twitter. A crawler application also presented to get the data needed for analysis. Finally a performance measurement is done by using Average Precision and Mean Average Precision. A search result is calculated using the ontology data and crawler data. The goal of this research is to develop ontology for travel & tourism domain and to analyze the quality of the search result on all environments. The result of this research is ontology for travel & tourism domain from twitter with MAP of 91.5%
**11:15 Data Consistency Management in an Open Smart Home Management Platform**

Jie Song (Universidad Politécnica de Madrid, Spain), Silvia Calatrava (Universidad Politécnica de Madrid, Spain), Jaime Caffarel (Universidad Politécnica de Madrid, Spain), Jorge M. Perandones (Universidad Politécnica de Madrid & CeDInt, Spain), Guillermo del Campo-Jimenez (Universidad Politécnica de Madrid, Spain), Jorge Olloqui (Universidad Politécnica de Madrid, Spain), Rocio Martinez García (Universidad Politécnica de Madrid, Spain) and Asunción Santamaría (Universidad Politécnica de Madrid, Spain)

In this paper, the authors introduce a novel mechanism for data management in a middleware for smart home control, where a relational database and semantic ontology storage are used at the same time in a Data Warehouse. An annotation system has been designed for instructing the storage format and location, registering new ontology concepts and most importantly, guaranteeing the Data Consistency between the two storage methods. In order to ease the data persistence process, the Data Access Object (DAO) pattern is applied and optimized to enhance the Data Consistency assurance. Finally, this novel mechanism provides an easy manner for the application development and integration with BATMP. An example application Parameter Monitoring Service is given for evaluating the feasibility of the system.

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**11:35 Infrastructure Management Support in a Multi-Agent Architecture for Internet of Things**

Bogdan Manate (West University of Timisoara, Romania), Teodor-Florin Fortiş (West University of Timisoara & Institute eAustria, Timisoara, Romania) and Viorel Negru (West University of Timisoara, Romania)

This paper examines the cloud resources management for a multi-agent IoT architecture. The resources tenancy is a costly operation, thus their allocation and management should be approached in an effective manner. On the other hand, the infrastructure should not be affected by the deployment or maintenance life cycle, operations that could put parts of the system offline, or even the entire system. We emphasize the need for infrastructure audit, which offers a good insight of how the resources are used, the geographical areas with an increased number of failures and where the allocation of supplementary resources is mandatory. Also, the security audit and its impact over a distributed multi-agent architecture that handles a large number of heterogeneous devices is discussed.

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**11:55 A Lattice Model to Verify Behavioral Equivalences**

Moonkun Lee (Chonbuk National University, Korea) and Yeong Bok Choe (Chonbuk National University, Korea)

This paper presents a new model to verify behavioral equivalences based on behavior ontology. There are two classical notions of equivalences by Norm Chomsky and Robin Milner: Strong/weak equivalences on parse tree and strong/weak bisimulations on automata, respectively. Since they are based on semi-formal structures, such as, parse tree and automata, analysis and verification for the equivalences and bisimulations take algorithmic or model-checking processes, which are exponentially time and space consuming task in nondeterministic state. Is there any way of defining, analyzing and verifying the equivalences, based on more formal, that is, mathematical structure with polynomial complexity and abstraction of nondeterminism? The paper proposes an approach based on behavior ontology. In the ontology, actions among processes or tasks are defined as interaction and movement, and, further, behaviors are defined as a sequence of such interactions and movements. Since some interactions and movements among the behaviors are overlapped, the behaviors are organized in a lattice structure, called, n:2-Lattice. Compared to other lattices, the lattice has special properties of multiple joins and meets. The property allows polymorphic interpretations of behaviors for equivalence, based on degree of abstraction. It guarantees abstraction of exponential and nondeterministic complexity of behaviors into polynomial complexity.
1:15 PM - 3:15 PM

Wed.pm1.A: Circuits, Sensors and Devices

Chairs: Valentina Colla (Scuola Superiore Sant'Anna, Italy), Meisam Farrokhifar (Islamic Azad University & Heris Branch, Iran)

1:15 *Electronically tunable current-mode quadrature oscillator derived from first-order allpass filter*
Amornchai Chaichana (King Mongkut's Institute of Technology Ladkrabang, Thailand) and Winai Jaikla (King Mongkut's Institute of Technology Ladkrabang, Thailand)

In this study, an electronic controllability current-mode quadrature sinusoidal oscillator based on first-order allpass filter employing current follower cascaded transconductance amplifier (CFCTA) is presented. The proposed sinusoidal oscillator uses two current follower cascaded transconductance amplifiers (CFCTAs), two electronic resistors and two grounded capacitor, which is easier for monolithic IC implementation. The condition of oscillation (CO) and frequency of oscillation (FO) are electronically and independently controlled which is well suited to use in modern electronic devices controlled by microprocessor. Moreover, the proposed sinusoidal oscillator possesses high output impedances and thus it enables simple current-mode circuit cascading. The PSPICE simulation results are included, verifying the workability of the proposed current-mode sinusoidal oscillator. The given simulation results agree well with the theoretical anticipation.

1:35 *Single DVCCTA based voltage-mode quadrature sinusoidal oscillator with electronic controllability*
Winai Jaikla (King Mongkut's Institute of Technology Ladkrabang, Thailand), Sunti Tuntrakool (King Mongkut's Institute of Technology Ladkrabang, Thailand) and Peerawut Suwanjan (KMITL, Thailand)

This paper presents simple voltage-mode quadrature sinusoidal oscillator. The proposed sinusoidal oscillator consists of one differential voltage current conveyor transconductance amplifier (DVCCTA), one electronic resistor (constructing from two NMOS transistors), and two grounded capacitors. The frequency of oscillation (FO) and condition of oscillation (CO) can be electronically tuned via external bias current which is easily controlled by microcontroller. T1.25V power supply voltages. With simple construction, the proposed voltage-mode sinusoidal oscillator is convenient to develop in monolithic chip. The PSPICE simulation results using parameters of 0.25us TSMC CMOS technology are included and found that with 10MHz frequency of oscillation, the total harmonic distortions (THDs) for VO1 and VO2 are about 0.643% and 0.489%, respectively. The power consumption is nearly 3.1mW at

1:55 *Multiphysics Design of a Magnetron High Power Transfer System*
Alberto Leggieri (Università degli Studi di Roma "Tor Vergata" & SIT Sordina IORT Technologies, Italy), Davide Passi (Università degli Studi di Roma "Tor Vergata", Italy), Giuseppe Felici (SIT Sordina IORT Technologies, Italy) and Franco Di Paolo (Università degli Studi di Roma "Tor Vergata", Italy)

This paper proposes a particular design technique of an X-Band Magnetron to Linear Accelerator High Power Transfer System based on an 8 slots resonant cavities Magnetron and a dedicated Vacuum Dielectric Window. Such study employs a Multiphysics modeling and considers thermal-structural effects due to the cathode heating for the Magnetron and the Joule effect for the DW. Moreover the thermal contact and the thermostatation with the LINAC have been considered. The proposed analysis takes into account that electromagnetic behavior and thus devices efficiency depend critically to the operating temperature and to the related thermal induced displacements of the materials. In this paper, we show how to compensate the thermal induced degradation of the device performances, by exploiting the consequent thermo-mechanical deformation of the opportunely designed device shape, which modify constructively the electromagnetic fields to re-increase performances. The proposed analysis involves Joule Heating and Thermal Expansion, Thermal Stress, Eigen-frequency and Particle Tracing computations performed with the Finite Element Method. The proposed study provided the evaluation of the Magnetron Working Points and Window Scattering parameters in Thermo-mechanical operational conditions.
2:15 Some Regularities of the Spectral Content of the Responses of Memristive Systems to Sinusoidal Excitation
Dalibor Biolek (Brno University of Technology, Czech Republic), Zdenek Biolek (Brno University of Technology, Czech Republic), Viera Biolkova (Brno University of Technology, Czech Republic) and Zdenek Kolka (Brno University of Technology, Czech Republic)
General first-order voltage-controlled memristive systems in periodical steady states are analyzed in the paper under their excitation via sinusoidal signals. Relationships are found between the spectral components of current and memductance which have to be generally fulfilled when generating v-i pinched hysteresis loops of crossing and non-crossing types with nth-order touching at v-i origin. The correspondence between the system model, the parameters of the excited signal, and the spectral components of the steady-state waveforms, is quantified in this work. Eight propositions are stated for determining the type of the pinched hysteresis loop from data coming from the Fourier analysis of the device waveforms. Based on the duality principle, the conclusions can be easily applicable also to general current-controlled memristive systems.

2:35 Integrated high speed current-mode frequency divider with inductive peaking structure
Hyeim Jeong (Chungbuk National University, Korea), Jung-Woong Park (Chungbuk University, Korea), Sehyuk An (Chungbuk National University, Korea) and Nam-Soo Kim (Chungbuk National University, Korea)
In this paper, a high performance current mode logic (CML) frequency divider is introduced in an integrated CMOS phase-locked loop (PLL). Inductive peaking structure and cascode circuit are applied in the CML frequency divider to obtain the broad-band and high frequency operation. In order to obtain a stable operation with low power, the resistor in the inductive peaking structure is replaced by the cascode circuit. DC bias voltage is applied in MOS gate as a current source in the divider. The proposed frequency divider is applied in the conventional PLL which is integrated with 0.18 µm CMOS process. Simulation test shows that the 2:1 divider is operated at the input frequency of 20 GHz with the power consumption of 15 mW.

2:55 Modeling and Optimization of Radiation Tolerant Microsystems
Vadim Shakhnov (BMSTU, Russia), Zinchenko Lyudmila (Bauman Moscow State Technical University (BMSTU), Russia), Ilya Kosolapov (BMSTU, Russia) and Ivan Filippov (BMSTU, Russia)
In the paper, several approaches to modeling and optimization of radiation tolerant microsystems (MEMS) are discussed. In a contrast to traditional approaches, microsystems are designed and manufactured at multiple length scales. It is shown that a multi-scale approach should be used in modeling and optimization of microsystems. We propose an algorithm of multi-scale Microsystems modeling that uses adaptation mechanisms. A multi-scale optimization algorithm that is based on the univariate marginal distributed algorithm (UMDA) is proposed as well. In the paper, our focus is on radiation effects in MEMS devices that use in space missions. Radiation damage on mechanical, electric, optical properties of materials are reviewed. We discuss several accelerometers and their advantages and deficiencies. Experimental results for our case study are given.
1:15 Energy Efficiency in Heterogeneous Wireless Networks using Cognitive Monitoring Strategy
Alef Bohli (National Engineering School of Tunis, Tunisia) and Ridha R. Bouallegue, B. (Ecole Supérieure des Communications de Tunis, Tunisia)
Given the rapid progress in wireless devices and the serious demands of higher communication rate, future solutions for wireless networks have to deal with these needs. Proposed solutions must take into account the limited spectrum resource while keeping the energy efficiency. So, a typical processing will realize a balanced tradeoff: max-throughput/min-energy consumption. In this paper, our contribution is to conceive a new infrastructure of wireless networks converging towards a fully heterogeneous systems based on the concept of opportunistic spectrum sharing. The basic idea is to allow active users to be seamlessly linked to different networks (licensed or unlicensed band). This architecture is based on Cognitive Monitoring Strategy (CMS) characterized by a new sensing model of unoccupied (free) licensed frequency belonging to heterogeneous wireless networks.

1:35 A software architecture for large multi-simulation experiments over ad-hoc networks using NS-3 discrete-event network simulator
Anton Chistyakov (Vyatka State University, Russia)
One of the challenges facing the researcher in the field of mobile ad-hoc networks is estimation of the mathematical models effectiveness. Due to very high complexity of network models consisted of large numbers of nodes moving with arbitrary speed, simulating using discrete-event systems has become the main tool to calculate the metrics of the developed models compared with the state of art solutions in the target area. NS-3 is one of the discrete-event simulators, widely used by researchers. Most papers omit technical details of experiment environment, making reproducing of results a difficult task. In this paper we propose a software architecture based on modern technologies that aims at creating reproducible and easy scalable computing environment to run, manage and collect results of multi-simulation experiments using NS-3. We decompose this task and observe different tools and approaches that can be used as part of such system. Proposed system can be useful for driving experiments in wide range of research areas from evaluating of software defined radio models to ad-hoc networks routing protocols.

1:55 Accurate estimation of vehicle attitude for satellite tracking in Ka Band SOTM
Antonino Laudani (University of Roma Tre, Italy), Salvatore Coco (University of Catania, Italy), Gianluca Chisari (University of Catania, Italy), Patrizia Di Falco (University of Catania, Italy), Enza Iraci (University of Catania, Italy) and Simona Militello (University of Catania, Italy)
The development of SOTM systems for land applications increases the need of use greater frequency (Ka band): this introduces new problems related to land systems SOTM that do not appear in aeronautics applications. Among these, satellite tracking/pointing is a very critical aspect, above all in Ka band for which the maximum pointing error. For these reasons the use of accurate open loop systems making use of inertial measurement system is fundamental. In order to improve the performance of this system and making it accurate for Ka band, novel solution in the prediction of the vehicle attitude must be studied. In this paper the performance of inertial measurement system are enhanced, without changing architecture or adding new sensors, by means of a tailored filtering and extended Kalman filters.
2:15 Communication Technology for Remote Locations – Case Study of Melghat Area in Maharashtra, India
Gautam Thakur (BITS Pilani Hyderabad Campus, India) and KC Jangir (Tata Teleservices, India)
Communication Technology for remote locations is a major challenge faced by Cellular Operators. Availability of civil infrastructure for setting up Cell Sites, transmission connectivity, availability of power supply and higher costs of maintenance are the main factors that have hindered growth of communication facilities in such areas. A case study of Melghat Area in Amravati District in India has been presented with different options considering the above aspects for providing Voice and Data Communication. Details of technical and financial aspects have been analyzed to provide affordable & reliable communication facilities in such wide areas in all weather conditions. The paper covers in a comprehensive manner all aspects to deliver a fully functional Telecommunication Network. The above then provides immense opportunities for growth in all facets of life herein.

2:35 Potential Throughput Improvement of FD MIMO in Practical Systems
Fangze Tu (Beijing University of Posts and Telecommunications, P.R. China), Yuan Zhu (Intel Corporation, P.R. China) and Hongwen Yang (Beijing University of Posts and Telecommunications, P.R. China)
Installing large number of antennas at the transmitter or/and the receiver can increase the channel capacity significantly in theory, however, practical implementations need to consider different system aspects, e.g. compatibility with existing beamforming scheme and reference signal overhead, in order to realize the system level throughput gain in practice. In this paper, we first use an idealized full dimensional multiple input multiple output (FD-MIMO) system to quantize the potential system throughput gain of FD-MIMO systems. We then introduce the reference signal overhead limitation by virtualizing large number of antennas to a limited number of antenna ports. The simulation result shows that through proper antenna virtualization the system throughput gain of one idealized FD-MIMO system can be achieved within reference signal overhead limitation.

2:55 An Evaluation of Relative Importance of Dynamic Network Performance and the Predictability of End User Movement
Niall Maher (Athlone Institute of Technology & College, Ireland), Shane Banks (Athlone Institute of Technology, Ireland) and Enda Fallon (Athlone Institute of Technology, Ireland)
Many existing network handover mechanisms trigger network selection based on dynamic performance characteristics such as Received Signal Strength (RSS), Delay, and Loss. These approaches do not take into account how the predictability of end user movement can be used to influence and optimize handover selection. Scenarios in which predictable movement can be observed include motorways, public service vehicles (buses and trains) and student class schedules in educational institutions. This work investigates if the consideration of predictability of movement, with dynamic performance characteristics, could improve handover decision management. A range of relative weightings of dynamic performance and mobility predictability are evaluated. Results presented illustrate that taking predictable movement as an input metric has a significant beneficial effect on the handover decision process.
3:30 PM - 5:50 PM

Wed.pm2.A: Circuits, Sensors and Devices and Finite Elements Modelling

Chairs: Alberto Leggieri (Università degli Studi di Roma “Tor Vergata” & SIT Sordina IORT Technologies, Italy), Bogdan Manate (West University of Timisoara, Romania)

3:30 On Hybrid Emulation of Mem-Systems
Viera Biolkova (Brno University of Technology, Czech Republic), Zdenek Kolka (Brno University of Technology, Czech Republic) and Dalibor Biolek (Brno University of Technology, Czech Republic)

The hybrid emulator is an electronic circuit which mimics the characteristics of a real device on its terminals. This paper describes a novel approach to the modelling and emulation of general memristive, memcapacitive, and meminductive systems based on digital signal processing. A microcontroller measures the independent port quantity (voltage or current), computes the response, and sets its value on a digitally controlled current or voltage source. The precision of emulation of some typical systems is studied. As the computational procedure may involve the use of numerical derivative or the model itself may be ill-posed the correct formulation of emulator algorithm plays the crucial role. The paper proposes two techniques to improve the emulator performance: the transformation into the native state variables and the transformation into integrator-only form.

3:50 Application of Model Reference Adaptive System in Natural Frequency Identification of an Active Beam Composite Structure
Wojciech Jarzyna (Lublin University of Technology, Poland), Michal Augustyniak (INDUSTER Sp. z o. o., Poland), Jerzy Warminski (Lublin University of Technology, Poland) and Marcin Bochenski (Lublin University of Technology, Poland)

In this paper, determination of the frequency of cantilever beam with embedded piezoelectric actuator is studied. A short overview of Model Based Methods is described. A nonlinear equation of motion of the beam is rewritten as an equation with step wise changes of its natural frequency. Proposed mathematical identification methods use some input and output variables for identifying lack of information about certain parameters in a mathematical model. Authors take into account Decoupling Observers and Model Reference Adaptive System (MRAS). Due to the structure of the mathematical description, MRAS system found out to be more adequate option. Algorithms based on Model Identification Techniques (MIT), as well as an algorithm satisfying Lyapunov stability condition, were tested. The latter was robust on certain residual effects. Therefore, the authors chose it for the final test. Obtained results confirmed this choice. Presented figures show characteristics of natural frequency that have been identified. Therefore, the implemented adjusting algorithm satisfying Lyapunov stability found out to be suitable for an application in DSP. However, reducing the processing time is still a problem for future studies.

4:10 Reconfigurable Platform with Polymorphic Digital Gates and Partial Reconfiguration Feature
Vaclav Simek (Brno University of Technology, Czech Republic) and Richard Ruzicka (Brno University of Technology, Czech Republic)

Nowadays, there can be identified at ease a number of significant areas based on a conventional digital circuitry, such as evolvable or adaptive hardware, fault-tolerant architectures, reconfigurable systems or circuit development, where the introduction of partial reconfiguration principles may bring significant benefits with respect to traditional approaches. In case of polymorphic digital circuits (polymorphic digital circuit is able to perform more than one intended function, it typically has one stable structure for all required functions and the actually performed function or mode depends on a state of an environment) only one small-scale solution has been reported so far - the REPOMO. In this paper, main attention is given to the proposal of an innovative approach with increased flexibility, where the resulting capabilities are demonstrated.
4:30 **Opto-electrical simulation of Organic Solar cells**
Meisam Farrokhifar (Islamic Azad University & Heris Branch, Iran)

In this paper the optical and electrical simulation of the organic solar cells are represented. It is shown that the results of optical simulation are consistent with previously calculated ones. Due to interference, the peak amplitude of wave and its position change within the structure and cause the exciton generation to oscillate inside the active layer. Electrical simulation of devices is done and it is seen that the solar cell fill factor decreases with enhancing the thickness due to the increased serial resistance. For the thickness of 90nm the fill factor of solar cell is 75% however by increasing the thickness to the 320nm it decreases to 42%. The effect of active layer thickness on the short circuit current and efficiency in organic solar cells is studied. Comparing our results with experimental data confirms that the model is well simulated the behavior of the Bulk Heterojunction Solar Cells. According to the obtained results from simulations, despite of the increased photon absorption, the power conversion efficiency is reduced by increasing the thickness due to the low mobility of organic materials and non-geminate recombination.

4:50 **Resistant Gates for Polymorphic Electronics**
Radek Tesar (Brno University of Technology, Czech Republic), Richard Ruzicka (Brno University of Technology, Czech Republic) and Vaclav Simek (Brno University of Technology, Czech Republic)

The field of electronics is exposed to emergence of advanced materials with semiconducting properties as a perspective replacement for conventional silicon technology. These materials may comprise, for example, organic semiconductors. Number of interesting properties, such as ambipolarity, are usually observed. It's possible to imagine a transistor which can work under certain conditions in a P-channel mode whereas it achieves N-channel mode of conductivity in a different situation. This particular type of transistor with ambipolar behavior turns out to be useful for development of polymorphic electronics. Its notion tends to simplify design procedure of complex digital circuits and it may also bring an additional features for a given application scenario. In fact, this is helpful especially in those situations when it's necessary to change the target environment where the device with polymorphic circuit blocks is required to be operating. For example, a solar power plant control circuit will have a different functions during the daylight period and at night. The important characteristics is that its physical structure still remains to be the same. Above all, the impact of ambipolar property coupled with adoption of the emerging materials opens up a new direction for physical realization of the polymorphic building blocks.

5:10 **A Finite Context Intrusion Prediction Model for Cloud Systems with a Probabilistic Suffix Tree**
Ahmed M. Yousof (Mansoura University, Egypt), Hisham Kholidy (Qatar University, Qatar), Abdelkarim Erradi (Qatar University, Qatar), Sherif Abdelwahed (Mississippi State University, USA) and Hesham Ali (Mansoura University, Egypt)

The success of the cloud computing paradigm depends on how effectively the cloud infrastructures will be able to instantiate and dynamically maintain computing platforms that meet Quality of Service (QoS) requirements. Most of the current security technologies do not provide early warnings about future ongoing attacks. This paper introduces new techniques in prediction model that is built based on Variable Order Markov Model and Probabilistic Suffix Tree. The proposed model uses a risk assessment model to evaluate the overall risk in the cloud system. According to our experiments on DARPA 2000 dataset, the prediction model has successfully signaled early warning alerts 58.983 minutes before the launching of the LLDDoS1.0 attack and 43.93 minutes before the launching of the LLDDoS2.0. This gives the system administrator or an autonomic system ample time to take corrective action.
3:30 PM - 5:50 PM

**Wed.pm2.B: Performance Engineering of Computer & Communication Systems**

**Chairs:** Fangze Tu (Beijing University of Posts and Telecommunications, P.R. China), Roger Achkar (American University of Science and Technology, Lebanon)

**3:30 Optimization of PHY Layer Protocol for Wireless and Mobile Networks**

Kenneth S Nwizege (University of SWANSEA, United Kingdom), Kponyo Jerry (University of Electronic Science and Technology of China & Kwame Krumah University of Science and Technology, P.R. China), Kwasi Adu-Boahen Opare (MobileLink LAB, University of Electronic Science and Technology, P.R. China) and Shedrack Mmeah (Rivers State Polytechnic, Nigeria)

Below the Media Access Control (MAC) layer is the Physical (PHY) layer which deals with the actual transmission of the bits received from the MAC layer above into electromagnetic signals. This layer is optimized to implore power management in wireless networks. Power management is a crucial issue in wireless and mobile networks. In this paper, we proposed an Adaptive Context-Aware Rate Selection (ACARS) algorithm to handle issue of power consumption in wireless networks. This algorithm is implemented by optimizing the PHY layer to efficiently transmit as nodes changes rate and estimates Signal-to-Noise Ratio (SNR) to the PHY layer. Results show that by using the appropriate power management technique, ACARS is reliable and efficient for power consumption in wireless networks which is a high demand for vehicular networks.

**3:50 Retrial queue with lattice distribution of inter-arrival times and constant retrial rate**

Chesoong Kim (Sangji University, Korea), Valentina I Klimenok (Belarusian State University, Belarus) and Alexander N Dudin (Belarusian State University, Belarus)

In this paper, we extend the result earlier obtained in the paper Kim, C.S., Klimenok, V. and Dudin, A.: A $G/M/1$ retrial queue with constant retrial rate. TOP 22, 509-529 (2014) for retrial queueing system with recurrent arrival flow to the case of periodic arrival process. We consider a single server retrial queueing system with lattice distribution of inter-arrival times, constant retrial rate and exponential service time distribution. For this queue, we derive the stationary distributions of the system states at arrival times and at an arbitrary times and the Laplace-Stieltjes transform of the customer sojourn time distribution. Little's formula for this system is derived. Results can be used for performance evaluation and capacity planning of telecommunication networks where effect of repeated calls is essential.

**4:10 Packet Drop Rate and Round Trip Time Analysis of TCP Congestion Control Algorithm in a Cloud Based Collaborative Virtual Environment**

Abdulsalam Ya’u Gital (Universiti of Technologi Malaysia, Malaysia), Abdul Samad Isma’iil (Universiti Teknologi Malaysia, Malaysia), Haruna Chiroma (University of Malaya, Malaysia) and Sanah Abdullahi Muaz (University of Malaya, Malaysia)

Collaborative Virtual Environment (CVE) has become popular in the last few years. In CVE the state of the virtual objects is witnessing rapid change. When a user performs an action in CVE, the information of the action needs to be transmitted to other users to maintain consistency in the cooperative work. Currently, in the design of most CVE systems, TCP is used for its reliability. When packet loss and round trip time are high during data transmission, it affects the performance of the CVE systems. This result to inconsistent state of virtual world even with the later retransmission of the lost packets. This paper implements a cloud based architecture for improving consistency and scalability in CVE systems proposed by Gital et al. (2014). We analyse and compares the drop rate and RTT of different TCP variants with CVE architecture. Our simulation results show that Vegas, Newreno and Reno can be promising TCP variants in the cloud based CVE systems compared to other variants. The Vegas, Newreno and Reno can effectively be used as an alternative to other variants of the TCP in efficient applications of the CVE.
**4:30 Perceptron Algorithm for Channel Shortening in OFDM System with Multipath Fading Channels**

Saeed Ghazi Maghrebi (Yadegar-e-Imam Khomeini (RAH) Branch, Islamic Azad University, Iran), Mohammad Alizadeh (Yadegar-e-Imam Khomeini (RAH) Branch, Islamic Azad University, Iran) and Amir Atashbar (Yadegar-e-Imam Khomeini (RAH) Branch, Islamic Azad University, Iran)

Channel shortening methods, in multicarrier systems, are applied for decreasing and almost compensating for the inter-symbol and inter-carrier interferences due to the channel delay spread. In this paper, we propose a new channel shortening technique for orthogonal frequency division multiplexing (OFDM) systems based. The proposed method is based on the neural network equipped with the Perceptron learning rule. Also we have tested our method in the OFDM system with multipath fading channels. The simulation results and mathematical analysis show the better performance of the proposed method, with BER criterion, compared to the commonly used channel shortening methods such as MMSE, MSSNR and MERRY in multicarrier systems. Also the proposed method has almost the same computational complexity, as well as the mentioned methods.

**4:50 Analysis of VoLTE end-to-end quality of service using OPNET**

Alessandro Vizzarri (University of Rome Tor Vergata, Italy)

Long Term Evolution (LTE) is a 3GPP standard for wireless transmission systems. It is also the first 3GPP wireless standard full IP-based. Due to its possibility to reach very high throughput (e.g. 100 Mbps in downlink), an efficient end-to-end QoS treatment is needed in order to guarantee a good QoS perceived by end user (QoE). Voice service delivered by LTE systems is Voice over IP (VoIP) service, with no QoS-aware mechanism. LTE provides a unique and native QoS-aware mechanism for end-to-end service delivering based on EPS bearer and QCI. Since efficient end-to-end QoS management of VOLTE should treat different aspects, this paper analyze the influence of voice codecs on end-to-end VoLTE performance. Different voice codecs are considered in different scenarios simulated using OPNET Modeler software tool. Final comparison among them is provided.